UNDP-
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WATER AND SANITATION SERVICES FOR THE URBAN POOR

Small-Scale Providers: Typology & Profiles

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INTRODUCTION

For several years, the World Bank has been promoting the participation of the private sector in the water and sanitation sector at the formal level focusing on utilities performance and regulatory reforms. Recent evidence suggests however, that the poor urban populations are still without access to the water and sanitation services, despite sector modernization. This has raised interest in the small-scale and informal private sector. These small providers have the potential to deliver improved services to low-income areas at comparatively low investment costs;

Until now, little work has been done to understand and evaluate the operational capacity of these providers or to estimate their relative importance in the sector. (In some cities, as in Dakar, these small private providers serve more than 75 % of the population representing more than half the turnover of the sanitation sector). The UNDP-World Bank Water and Sanitation Program has a unique role to play towards a better understanding of these small providers

This survey is a first step toward understanding who these providers are, the range of services they offer and the key elements of their successful operations. This paper describes twenty small private providers: from community-based businesses, to NGOs, to commercial entrepreneurs, working in the water supply and sanitation sector in Africa, Latin America, Caribbean and Asia. The author describes the main characteristics of small providers - individual initiative, flexibility, adaptability to the market in terms of financial arrangements, technical options and outreach. She also underlines serious issues of complementarity and mini-monopolies in the context of scarcity. Sometimes, the small scale entrepreneurs can mirror their large-scale counterparts by organizing themselves to stake out geographic territories, by setting prices, or, in the case of some community based organizations, to protect rent-seeking advantages.

At the same time, these providers are able to fill service provision gaps for clients where the public utilities have been unable to act. They have improved coverage by investing their own funds, and, thereby, reducing the public burden on utilities which are already running deeply in the red. This first review suggests that the small scale entrepreneurs' activity should be supported, insofar as it proves an efficient way to scale up water and sanitation service levels and quality.

One of the options to support these providers is to enhance linkages and establish agreements between the small providers and the formal utility organizations. At the least, this implies the development of an enabling business environment to recognize and regulate their activities, roles and institutional position and to facilitate their access to financial resources while also looking out for the interests of the poor. These networks and professional organizations might increase professionalism and the quality of services, notwithstanding, risks of "cartelization".

This survey has been the starting point of a larger involvement by the Program in the field of small scale providers. It will be followed by a three-year program of activities including studies of selected small entrepreneurs, support to regional associations, and networks to promote the exchange of information and capacity building and to pilot projects. This program supported by the World Bank and with Belgian and Dutch cooperation aims to improve involvement of small entrepreneurs as partners with formal utilities and respond to the needs of low-income and informal areas.

The author of this paper, Suzanne Snell, began working with urban issues in developing countries in 1975, when she joined the newly formed Urban Projects Department of the World Bank. From 1978 to 1986, she contributed as staff economist with expertise in municipal finance and social services planning to urban projects in African countries. Her work on community facilities components and poverty analysis directly involved issues of service delivery to poor communities. As consultant for the World Bank, she revisited communities in Douala, Cameroon, in 1993 to assess resettlement activities in two urban projects she had helped to appraise more than ten years earlier. She has worked with the UNDP-World Bank Water and Sanitation Program as an editor and writer on urban sanitation issues.

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PART II: TYPOLOGY

Role of Small-Scale Providers

Peri-urban communities, the focus of this report, are the last to receive services from water and sanitation utilities. Still, as in all types of communities, their residents must every day find water for drinking, cooking, washing, and bathing, and must choose where to defecate and urinate. Even where piped water and sewerage networks do reach into poor neighborhoods, home connections are often unaffordable. Municipally-operated public standpipes, public toilet facilities, and public baths are usually poorly maintained if not out of service entirely. When such facilities are privately owned and operated, however, they must be clean and affordable to attract customers and bring in a profit. It is not surprising, therefore, that the majority of peri-urban residents buy water and sanitation services from small private providers who deliver what public providers are unable or unwilling to provide.

Small private providers are already the main operators in this market, delivering services to the urban poor in particular. In addition, NGOs are facilitating the organization of communities to improve water and sanitation provision on a self-help basis. Scaling up of activities to extend and sustain coverage to the urban poor means that small providers, whether community-based or commercial entrepreneurs, must acquire the credibility and standing necessary for negotiating with formal legal and bureaucratic systems, particularly when neighborhood systems need to be connected with primary public networks. Yet, with few exceptions, current planning for service delivery by water authorities, municipalities, and the donors who support them ignores existing small providers as well as working systems constructed by the communities themselves.

Main Provider Categories

This report will describe who these small providers are and what they can offer. Twenty profiles, drawn from information provided by the UNDP-World Bank Water and Sanitation Program, have been included – six from cities in Africa, eight from Asia, and six from Latin America and the Caribbean. On the basis of these profiles and a review of related reports, the following provider categories have been identified:[1]

(1) Providers in permanent partnership with water utilities, whose water they distribute at kiosks or standpipes: water kiosks in Nairobi, Kenya; standpipes managed by communities in Dakar, Senegal, Mopti, Mali, Port-au-Prince, Haiti, and Dhaka, Bangladesh; and a micro-enterprise–community-association standpipe partnership in Segou, Mali.

(2) Pioneers who bring piped water from their own sources to communities where water utilities have not yet expanded their networks: aguateros in Asuncion, Paraguay; community-built water systems in Buenos Aires, Argentina, [and El Mezquital, Guatemala City, Guatemala]; entrepreneur-built water systems in Guatemala City, Guatemala, [and Cuzco, Peru]; and water centers selling UV-purified river water in Manila, Philippines.

(3) Pioneers who build their own tertiary and secondary sewerage systems and get them connected to the sewer company's mains: community-financed and -managed small-bore sewerage systems in Karachi, Lahore; [and in Faisalabad and other cities in Pakistan[2]].

(4) Mobile water truckers, carters and water carriers who provide water (mostly drawn from water company taps) at times and places that water utilities are unable to serve: in Dakar, Senegal, Port-au-Prince, Haiti, [and Lima, Peru].

(5) Owner/operator/franchisers of public toilet and bathing facilities: Sulabh centers all over India [and public baths in Lima, Peru], and of septage treatment plants in Cotonou, Benin, and Manila, Philippines.

(6) Community-managed latrines in Addis Ababa, Ethiopia; and a community-managed water system in Dhulikel, Nepal.

The solid waste disposal market offers another big opportunity to small providers – both those that are community-based and those that operate as individual entrepreneurs. Information on small providers in this market in India, Bangladesh, and West Africa were

[1]Examples not profiled in this paper appear in brackets.

[2]This system is similar to the condominial sewer approach in BRAZIL except that the initiative comes from the water company rather than the community.

collected (see bibliography), but this subsector is not covered in this report.

The taxonomy is built on the following dichotomies: (a) water services vs sanitation services; (b) piped water vs water delivered by vehicle or on foot; (c) water supplied from a water company vs water from a source controlled by a small provider; (d) systems managed by a community vs systems run by a private entrepreneur; and (e) whether construction is financed by the system's owner/operator, the community receiving services, or the principal donor.

Who builds the system is less important than who manages and pays for it. In Sri Lanka, for example, the National Housing Development Authority (NHDA) pioneered a system in the late 1980s known as community contracting, under which legally registered Community Development Councils are contracted to build water and sanitation systems in their communities.[3] Municipal councils remain responsible for maintenance, however, and it is unclear whether the council has a say in what is built. In any case, they do not appear to be involved in management or maintenance. The community council is responsible for provision of labor only and is not really involved in providing the service.

Key Provider Characteristics

Individual innovation and enterprise. The typology suggests that individual entrepreneurs are important to the small provider market, and indeed they are. There is a sea of truckers, carters and prople with basins carrying water where it would not otherwise go. Examples are included here from Dakar, Senegal, Ségou, Mali, Port-au-Prince, Haiti, and Guatemala City, Guatemala. For decades, water kiosk owners have been selling water to poor residents in Kibera (Nairobi), Kenya, and aguateros have been piping water to poor homes in Guatemala City, Guatemala and Asuncion, Paraguay, and piping or trucking it in Peru.

There are also a few outstanding individuals who have single-handedly changed the face of sanitation provision in their respective cities:

- Pak Agus, a local resident who brought small-bore sewerage and treatment to 1,000 of his neighbors in Malang, East Java, Indonesia over a 10-year period;
- Marcelino de Vera, who lobbied his Barangay Council to — among other things — ban open defecation and urination and to punish offenders, and now makes a living running a public toilet in Dagupan City, Philippines, where municipally-managed toilets are not very popular or profitable;
- The director of the SIBEAU sludge treatment plan in Cotonou, Benin, who recently took sludge treatment over from the municipality, which had grown increasingly unable to cope over the last decade; and
- Michael Lim of the Bendix Sales Corp. in Makati (Manila), Philippines, who got nine water centers up and running in Metro Manila only two months after production of the UV Waterworks unit started in California, USA.

Individual technological innovation has had an enormous impact as well. Some examples:

- The Sulabh twin-pit toilet developed 25 years ago and marketed by Dr. Bindeshwar Pathak of New Delhi, India is now in used by millions of Indians and Nepalese who, otherwise, would most likely still be relieving themselves in fields and alleys.

- A similarly revolutionary invention for disinfecting water – which could have a worldwide impact on small-scale provision of clean water – is the UV Waterworks purifier, invented using off-the-shelf components by Dr. Ashok Gadgil of Berkeley, CALIFORNIA and Bengal, India. Although production began in California as recently as November 1997, nine of the units are already disinfecting Pasig River water for drinking in Manila, PHILPPINES.

- A lightweight (4 kg) single-unit fiberglass latrine is now being produced in two rural workshops for local sale to generate income for a mother and child community-based integrated project in La Union province, PHILPPINES, under the auspices of the Organization for Technical Resources and Technological Training (ORT), a London-based international NGO. While the fiberglass latrine was developed as appropriate technology for rural areas where cement is not used for construction, it has a number of qualities that could make it interesting for some urban applications:
  - it can be fabricated locally with minimal infrastructure and investment and is easily transported;

[3] ODA, 1996, pp 13–15.

- it is easily installed because the seat is incorporated into the design and can be adapted to a water-sealed model;
- when the transport cost of cement is considered, its cost compares favorably with that of concrete latrines.

Competition and pricing. Market behavior has a great influence as well. Where there is a variety of small providers in a single city – as in Dakar, Senegal and Guatemala City, Guatemala – their services are generally complementary. Each could be said to be a monopolist within its market niche and area of operation, as is reflected by the relative volumetric prices of water in such markets.

HIGH PRICE Water truckers, carters and carriers command the highest prices by volume, and can also provide the most tailored service because they have a choice of water sources and are mobile. These are the providers who serve the peak demand niches – people with little time for water collection or who, for other reasons, are willing to pay more at certain times. Extortionist waterlords (mastans in Bangladesh) also charge high prices, with little consideration for demand factors.

MEDIUM PRICE Standpipes and kiosks are the next most expensive source and the ones which supply the greatest volume in areas where well water is of poor quality or too expensive.

LOW PRICE The least expensive water on a volumetric basis is provided by a home connection, especially when tariffs have not been raised to cover capital costs, as is often the case for African utility companies. On the other hand, the hookup charge required for a home connection, the lack of financing for it, and the infrequency of billing by the African water utilities all exclude the very poor from benefitting from this low volumetric charge in Africa. In contrast, the aguatero entrepreneurs of Latin America offer hookups on an installment plan and get their money by threatening disconnection followed by a hefty reconnection fee.

CHEAPEST The least expensive water, whether offered by small providers or taken by women and children for free, comes from free natural sources such as rivers and streams but is usually of lower quality than treated, piped water (Dakar, Senegal) or in some cases becomes increasingly distant due to hillside erosion (Port-au-Prince, Haiti). Such low-cost sources, where available, are usually preferred for washing and bathing and can be used by construction entrepreneurs building on the urban periphery.

All in all, there does not appear to be any serious distortion in pricing, except in special cases such as certain bustees of Dhaka, Bangladesh, where price gauging and a stiff-arm management style are used by the mastans to forcefully maintain their monopoly on water provision.

There are repeated examples of direct and deliberate **competition** for the same customers. In the Kibera settlement of Nairobi, Kenya, it would appear that the water kiosk business is so lucrative that kiosks get into rough competition with one another.[4] In Paraguay, the areas covered by various "aguateros" often overlap, leading to direct competition for customers, which often culminates in price wars among themselves and even with the subsidized public agency. One example of rough competition comes from Peru, where a lone provider who took a water truck in the Puenta del Piedra section of Lima suffered damage to his vehicle because he was undercutting prices by his competitors. This trucker is the exception to the rule that the Latin American artesian well providers avoid competing with each other by staking out defined geographical areas where they install their piping to customers' homes. Such competition that does exist is usually found only in the boundary areas where the different aguateros' territories meet.

Factors of success

The main factors which emerge as important to the success of these providers are:

- an entrepreneurial or commercial approach to competition, and innovation to develop effective service or specialized customer relations;
- the multiple and indispensable roles played by community-based organizations;
- technical innovation matters – from better and cheaper toilet designs, manhole covers, and water storage tanks to new low-cost water purification technology;

[4]This might have something to do with the fact that while customers always pay, kiosk owners pay their water bills only rarely.

- investing in raising the awareness of the health benefits stemming from use of toilets rather than open defecation;

- the ease of independent water production resulting from drilling of wells or purification of natural sources; and

- the ability to offer installment plans for payment of hookup fees (removing a significant barrier to entry by new customers).

The indispensable roles of NGOs and the community. It is not an exaggeration to say that without the organization of communities facilitated by NGOs – such as those in Orangi and Lahore, Pakistan, Addis Ababa, Ethiopia, Taïkiri (Mopti) and Ségou, Mali, Dakar, Senegal, Dhaka, Bangladesh, Barrio San Jorge (Buenos Aires), Argentina, and Port-au-Prince, Haiti – and strong community management of water in these same locations, piped water and sewerage services would not be delivered. The investment by an NGO in a community's social capital is particularly essential in a country like Argentina where a long history of broken promises had destroyed trust and sapped community initiative. It took IIED ten long years to rekindle the flame, but in the end the Barrio San Jorge and even surrounding poor communities are getting connected to the water system.[5] In Ethiopia, a study of 118 recent community-based environmental sanitation projects found that the fact of community ownership is not sufficient to ensure community maintenance when there is no effective neighborhood governing structure to ensure proper handling of funds and enforcement of rules. Building such a structure is what NGOs do best.

An **exception** to this usual pairing of NGOs and community associations is found in Dhulikhel, Nepal, where four prominent businessmen (whose hotels were having problems with water supply) directly approached the local government and locally-based, German firms offering technical assistance; in this small and tightly knit community, the community already had an effective governing structure.

The other point to be made is that there is **no single identifiable role model** for community participation. Associations get involved at all stages of provision from identification and planning to hiring the workers and structuring cost arrangements.[6] When working in an experimental situation where hard and fast rules have not yet been developed, informal negotiation emerges as a key element in successful initiatives; continuous dialogue and negotiation provide a mechanism for agreeing on costs and resolving disputes.[7] And until the cultural gap disappears between community groups – who finance their own infrastructure with minimal written documentation and enforce contract agreements through social pressure (private orders) – and bureaucracies who enforce through court orders, there will be a need to educate communities to make them more comfortable with more formal arrangements and questioning of authority.

Technology and standards matter. In Asia in particular, a good deal of energy has been invested in developing low-cost, low-maintenance solutions to specific technical problems. Two examples are the development of the twin-pit latrine by the Sulabh organization and a new type of brick manhole cover developed by the NGO that organized the Orangi community of Karachi, Pakistan.[8]

One interesting aspect ot the technology question involves **technical standards**. The community association of Faisalabad, Pakistan refused to budge on the issue of the high standard of concrete sewer pipes specified in its contract with the government and prevailed. "People want a service which is *within their reach* [emphasis in original], and built to standards which are appropriate for their circumstances, rather than something which somebody else has decreed is better for them. Standards can no longer be 'absolute' and applied in a vacuum without reference to the customers.... But without high-level backing, relatively few middle-ranking engineers would be prepared to adopt anything other than the competitive tender, as this provides them with a solid alibi against potential audit questions."[9]

Sanitation habits: a hard nut to crack. In nearly all the profile cases, poor urban residents are well aware of the health benefits of better quality water, including treated water. For reasons of convenience or poverty, they might choose to drink lower quality water or reserve better quality water for drinking only. But there is still a long way to go to change public awareness regarding sanitation. Open defecation is still widespread in India, Bangladesh, and Africa.

[5]The dedication and patience of IIED was further aided by the election of an open-minded mayor.
[6]ODA, p.29.
[7]ODA, p. 31.
[8]This cover was then reworked by the first communities in Lahore to adapt the Orangi community-built sewerage designs.
[9]ODA, p. 36.

To extend the use of Sulabh toilet facilities in India and to build sewerage systems in Pakistan, the Sulabh organization and Pakistani NGOs had to invest substantial effort in public awareness campaigns to create demand for sanitation services.

Available water sources. Access by Latin American cities away from the coast to good sources of clean water from artesian wells makes a tremendous difference in the number of poor residents served; this is especially clear when comparing these cities to cities in Africa which lack such wells. This situation may be about to change as the lightweight, cheap and portable UV Waterworks purifier becomes widely available through local distributors like the one in Manila, which has already opened nine water centers in Metro Manila, Philippines. This product is ideally suited to purchase and operation by a single entrepreneur or a community and was designed for this purpose by its inventor, Dr. Ashok Gadgil. Dr. Gadgil was the first to combine existing knowledge and off-the-shelf components to build a cheap water purifier capable of delivering safe drinking water to up to 1,000 people. A Berkeley-educated scientist and inventor, Dr. Gadgil invented the UV Waterworks, a product outside his usual professional interests, following the 1993 cholera outbreak in his native Bengal, which reminded him of cousins who had died of water-borne diseases during his childhood. Now a scientist and inventor, this doctoral physicist decided to make a difference. He has been in contact with Dr. Bindeshwar Pathak, founder of the Sulabh organization which made equivalent developments in fecal waste disposal 25 years ago and whose toilet designs have been adopted all over India and Nepal. One can only hope that a partnership develops, since these two Indian innovators make a natural team, offering low-cost services in both clean water and sanitation.

Getting over the barrier of hookup fees. Where water is plentiful – as from the artesian wells of Peru, Guatemala, and Paraguay – entrepreneurs are ready to pipe it and the poor are ready to pay for home connections. In Paraguay, aguateros make loans for hookup connections part of their business.[10] Initially these aguateros extended credit for payment in 36 monthly installments but have since reduced the payment period to 14-18 months as the market has become saturated and the aguateros' operating environment becomes riskier and riskier with the threat of legal expropriation. High hookup charges are cited by both water companies and the poor as a reason for not making house connections but the aguateros and their customers had no problem finding a solution to this problem.

Constraints to Expansion

The main constraints to the expansion of service by small-scale providers are:

- lack of access to credit for capital investment (well drilling, purchase of water tanks and pipes);
- the need for transparent procedures for handling money and ensuring accountability;
- mounting arrears due to penalties for non-payment of water bills;
- problems with robbery and "pirate" connections; and
- security in the face of either unfair competition from public (subsidized) providers or outright confiscation.

Microcredit and financial analysis for capital investment. The possibility of buying another truck or holding tank or being able to purchase enough pipe to service an entire neighborhood are, at present, only dreams for many small-scale entrepreneurs providing water services. While NGOs can mediate loans or grants for capital investment and organize the raising of funds from within the community itself for both capital and operations and maintenance, the story is quite different for the watsan businessman or woman. Roberto Rodriguez, a water trucker serving the outskirts of Lima, Peru can borrow money to buy a new truck, but he can not get a loan for a well or a holding tank. Since the holding tank and piping cannot be repossessed, bank loans to pay for them cannot be guaranteed. Few banks in developing countries will stake a credit against cash flow.

It should be noted that some small providers could also benefit from financial analysis assistance in conjunction with loans for expansion. The SIBEAU sludge treatment facility in Cotonou, Benin is increasing the number of ponds it uses because it has become overwhelmed by demand (being the only sludge treatment plant in town), but the operator is aware that the fees he is collecting are not covering his long-run marginal cost; possibly he is constrained in raising them by the municipality which granted the concession. A study of a large number of community operated and managed latrines in Addis Ababa, Ethiopia revealed

[10]Effectively, they are also generating the funds to buy more pipes since they are unable to get loans to do so.

that in no case are the fees being charged high enough to cover periodic emptying and maintenance costs as estimated by the study; the NGO staff involved in the smaller number of cases studied in depth in Addis Ababa had, without exception, failed to calculate the level of fees required.

It's not the cost recovery. The myth that the poor cannot afford to pay for water and sanitation services has never been widely believed by small providers; whether entrepreneurs or communities, they *know* people will pay for water and sanitation. It's what happens to the money *after* it gets collected that is worrisome in many case studies involving community management. Where there is not an outside intermediary who shares the keys to the lockbox and the checkbook with community management, money is poorly managed, especially when the water company sends the bill once every six months and tends to make errors in billing anyway. This is one area where the presence of an NGO can be indispensable to sustainability and its pulling out can seriously jeapordize continuation of service (Taïkiri/Mopti, Mali). A lack of clarity and having too many intermediaries between collection and paying the bill can also spell trouble: in Ségou, Mali, the municipality gets the bill and sends it to a microenterprise which holds the standpipe concession, which then must collect water receipts from community associations, who have got them from the fontanier they hired – in other words, four sets of hands are involved between the fontanier and the water company. It's no surprise that the microenterprise wants to revise its contract to eliminate the neighborhood associations from the financial loop; it's also no surprise that the associations are vehemently opposed.

Poor water utility management. Common problems for small providers which must rely on water utilities include irregular and infrequent meter readings, broken or inaccurate meters, frequent billing mistakes, and time wasted in billing disputes which must be taken up in one downtown office a long walk or bus ride from poor areas. Kiosk operators in Kibera (/Nairobi), Kenya have stopped paying their bills altogether (leading to an overall payment rate of only 15 percent). Other significant problems include interruptions in service and low water pressure (Argentina, Paraguay, HAIITI, Mali, Senegal, Kenya). Communities which have invested in tanks can get around supply problems to an extent (Dhaka, Bangladesh), but the ability of small providers to deliver to their customers and the incentive to become in turn good customers to the water supplier would be greatly enhanced by improved customer relations and better delivery performance on the part of the utilities.

An apparent non-constraint: public policy environment. One hypothesis that can be tested is that the regulatory and public policy environment constrains small provider operations. This appears to be the case only when the scaling-up stage is reached. As long as a small provider sticks to his or her small area, even if the water company technically has a monopoly, few will bother the provider who is operating on a small scale, something which the water company is unwilling or unable to do. But when small-scale successes start to get replicated on any scale, as in the case of the community-managed water points in Dhaka, Bangladesh, transaction costs start to kick in. Both the community groups and the government officials and engineers invest a lot of their time in establishing mutual trust and working out the mechanics of meshing their different concerns and ways of doing business. There may be specific public policies that require interpretation in a given city or country, but there is no observable evidence across the profiles described here that this is a major concern.

Still, **lack of policy** can be a concern. Examples include Benin, where the sludge treatment plant operator wants to see agreement on environmental policy, and Mali, where local water managers are at liberty to determine the technical and service standards for standpipe service, level of charges, methods of selecting standpipe operators, and the division of responsibilities between the water company, the city authorities, and the users because there is no national policy on standpipe water delivery. In Dagupan City, Philippines, the Barangay Council had first to develop and implement rules – such as the one stating that "persons opnely defecating or urinating will be fined or punished" –before a private initiative by Marcelino de Vera to operate a toilet facility could be realized in a cost-effective manner.

Selling home water to neighbors. Regulations prohibiting the resale of water arriving at a private household can constrain the availability of water to poor households for the smallest providers of all – people's neighbors. This rule is widely observed in Africa, and a US researcher has attributed considerable benefits to reversing this prohibition in Thailand and Indonesia. In low-income areas in Bankgkok, Thailand and Jakarta, Indonesia, Dr. Randall Crane, Professor of Planning and Public Policy at the University of California at Irvine, found in a 1993 study that deregulation of water service in 1990

to allow homes with public service to resell municipal water was tantamount to a costless expansion of the water systems in the two Asian cities.[11]

The experience of two different cities in Mali suggests that selling home water is a temporary, stopgap measure: it works, but people don't like to do it. Where standpipes are not functioning and home connections are low (18 percent of households) and not growing (Mopti, Mali), buying from neighbors is the rule. But selling water to neighbors (queueing up at the front door at dawn) seems to generate a lot of friction, partly due to the need to handle and hold enough money to pay a six-month bill, and partly due to the fact that monetary payment goes against the grain of unmonetized reciprocity and hospitality traditions among neighbors. Not surprisingly, people abandon that model as soon as there is an alternative, as in Ségou, Mali, where home resale was common until the standpipe system was expanded (which now provides better and more extensive coverage).

Scaling Up Scenarios

The main issues for the formulation of schemes to scale up water and sanitation services offered by small-scale providers are:

- choosing preferred long-term roles – such as construction, management, operation, and delivery;
- working out relationships with utilities and municipalities, including legal status; and
- the high transaction cost and time investment required to negotiate technical standards and other terms with utilities and municipalities.

Plotting scenarios for expansion. One approach for cutting through the apparent complexity of the template and even of the taxonomy when looking at new cases, or when seeking to define a future scheme, is to stick to three indicators:

- the starting point – what were customers doing before the service was offered and what is the endowment of the providers;
- the providers' relationship with the water or sewerage utility and the municipality, and
- the specific constraints and indications of what is already underway to replicate the arrangement.

Following this approach, the following table offers suggestions for the different types of scenarios discussed here.

[11]See his article in *Water and Development* announced in *Voices from the City*, the Peri-urban Network newsletter, April 1994.

Chart 1. Future scenarios by small-scale provider type.

Provider type	Profile examples	Steps towards success
(1) Permanent partners with water utilities whose water they distribute at kiosks or standpipes	Kenya Mali Haiti Senegal Bangladesh (has already undertaken steps to success listed at right)	• Improve interface with utility with regard to metering and billing and installment payments for hookup charges. • Develop sound written contractual agreements with utility/city. • Develop forums for regular consultation among stakeholders. • Build more holding tanks. • Test UV Waterworks treatment unit as backup or substitute for unreliable utility water supply.
(2) Pioneers who bring water in advance of utility expansion (3) Pioneers who build sewerage systems and have them connected	Paraguay Argentina Guatemala Philippines Pakistan (has already taken steps to success)	• Find loan money to expand service area and invest in larger and more durable pipes and wells. • Establish agreements with utilities on standards to allow future connectivity. • Contracting market pipelaying and other specialized funtions to utility. • Consider change of legal status to ensure a stronger bargaining position during contract negotiations with utility.
(4) Mobile water truckers, carters and water carriers	Senegal Haiti Peru	• Find loan money to expand service area. • Offer easy payment plans (small individual payments) to keep customers connected and happy.
(5) Owner/operator /franchiser of public toilet and bathing facilities and of septage treatment plants	India Benin Peru Philippines	• Find loan money to expand service area. • Get in touch with other operators and exchange expertise. • Conduct financial analysis to set prices fairly (raise tariffs to cover LRMC), get loans to expand service, and improve quality over time. • Work with governments to establish sound environmental sanitation rules. • Increase public awareness of benefits of sanitation services.
(6) Community-managed latrines and water systems	Ethiopia Nepal Mali	• Build effective community governing structure, or hire permanent outside accountant, so that money is efficiently used to maintain system. • Increase tariffs to generate funds to attract good accountants and supervisors.

Takover and handover. In speculating about partnerships between small providers and utility companies and municipalities, it is intriguing to note that "takeover" of a system can go both ways. In Paraguay, the government is considering legislation which would, in effect, expropriate all the network and well investment sunk by the aguageros over the last 15 years and hand it over to large new private concessionaires; in the poor community of Barrio San Jorge in Buenos Aires, Argentina, the newly privatized water company stepped in to take over and manage the network which the community had just laid. But the tables are being turned in the opposite direction in Kenya and Nepal, where resource-strapped water districts and municipalities are interested in turning over management of water and sanitation services to community-managed organizations. This is one case where a sound contractual agreement is a necessity – ideally, one that is flexible and is worked out over time with experience.

Quo equilibrium?

From an economic standpoint, the interesting question is: to what extent are these different small providers going to be around long enough to make them worth nurturing –the persistent competitive advantage are they likely to have – and to what extent are they a temporary phenomenon? In a draft working paper which sheds economic light on this question, Dr. Tim Irwin of the World Bank's PSDPP division (Private Sector Development/Private Participation) points out that natural monopoly does not by itself justify a legal monopoly. The efficient, monopolistic outcome should occur even if the government permits entry. In industries that are normally thought of as natural monopolies, competition in the market has in fact been observed – as in the case of the water and gas distribution markets in British cities in the first half of the 19th century, in which multiple pipes were laid by different companies under the same streets. By the middle of the century, competition had died away in almost all cities, not because of government regulation but because of the operation of market forces.[12]

The problem is rather that the risks of legal monopoly are worse than the risks of competition. When legal barriers to entry remove even the threat of competition, regulation must assume a larger share of the burden of promoting productive efficiency, keeping prices down, and maintaining quality. In countries with poor governance, however, regulation is not likely to be better executed than are other aspects of infrastructure delivery and management (which is to say, not well).

Dr. Irwin then takes a look at the outcomes of free entry in the Yemeni electricity market and the water market in Paraguay and observes that "Yemen's choice may well have been between power supplied by a collection of small, technically inefficient companies, and no power supply in rural villages at all." In fact, the proportion of rural households in YEMEN with access to electricity is surprisingly high – 59 percent compared to middle income countries in South American where only 30 to 50 percent of rural households may be expected to have access to electricty. Likewise in Paraguay, the aguateros appear to have the benefit of supplying piped water to customers who would not have it if the water company had a *de facto* monopoly. He also points out that economies of scale and network externalities make subsequent interconnection desirable even when networks develop in a piecemeal fashion, and that therefore adoption of technical standards to make this possible becomes more important under free entry, as for water in Paraguay; this also applies to sewerage systems in Pakistan.

This brings us back to the poorly performing water company. Unquestionably, more and more people will be getting individual connections, but this will happen faster if coverage of the poor is included in private concession contracts. Utility performance would then improve because the companies would learn to adjust billing frequencies and payment venues to be more convenient for their customers, and would then start introducing installment payments for hookup charges, taking their cue from the success of the aguateros who have been doing so for years. But even if the utilities get their act together regarding what is essentially customer relations, it is harder to imagine them so readily resolving the problems of pressure and interruptions in supply.

There is little economic literature on the theoretical or empirical analysis of what happens in markets where there is a flawed dominant provider – as is the case here – and how to improve the functioning and outcomes in such markets. Empirical evidence in these profiles suggests two good reasons to support small providers for a long time:

- Small providers offer huge cost savings in extending service coverage. Community-built sewerage systems cost only one-half to one-third as much as systems built by governments, and there may be similar savings to be had by formally involving small providers in the construction and maintenance phases of secondary and tertiary networks.

- There will always be gaps in service provision until poverty recedes. Water carters and carriers in

[12]Irwin, p. 5.

Senegal and Haiti are a good example of the lowest class of small providers anxious to get out of the business, but people can't live without them. In Haiti, Mali, and Senegal, people use the water carrier as a last resort because of high cost; in Senegal, the women who earn their living this way are are at the bottom of the social scale.
Even most carters who have a horse to do the heavy hauling try to save enough to switch to a less strenuous way of earning a living. Yet, there is no indication that either of these types of providers will become scarce, especially while cities continue to grow so rapidly. In effect their largest customers are the construction businesses who need water to make their bricks, cement, plaster, and whitewash. Even if the water utility were hooking up people who until now have been completely unserved, the construction entrepreneurs would probably still contract with carters or truckers to bring water to their sites.

Conclusion

Supporting small-scale providers can unquestionably contribute to increasing water and sanitation coverage for the poor. The larger issue relating to long-run equilibrium is not whether small providers will continue to prevail, but in what roles. At the very least these small providers should be allowed to develop their entrepreneurial skills in whatever niche happens to be viable at the time. The aguateros of Paraguay learned a lot about building water systems in 15 years, and they will put that knowledge to good use somewhere in the economy. This is one of the great virtues of small providers – they are flexible, and respond and adapt quickly to market forces.

At the best, giving small providers the kind of help they need to expand their coverage could have a big impact on coverage. The first step in this direction is to get groups of small providers together and find out what their needs are. If he scenarios in Chart 1 are on the mark, priorities will need to be established. Moreover, bringing providers together to exchange experience increases their collective power and builds some solidarity, and possibly even enough critical mass to initiate mutually supportive activities. For example, in Addis Ababa, Ethiopia, following a study of all 118 NGO community-based latrine projects, the Stakeholder Reference Group which guided the study is being transformed into a forum through which integration of the fragmented and specialized efforts of individual groups can extend the impact of community sanitation services and develop a better interface between the community and the local governments through regular public meetings (and not just informal consultations) with municipal authorities.

Two closely related issues hover on the horizon of this effort to catalyze a movement among small providers, to get them to take their roles more seriously and to get them taken more seriously by governments, utilities and communities.

- Except where small provider networks remain self-contained and isolated, scaling up means meeting the network connectivity issue head-on. Negotiating this interface means looking at setting technical standards and making choices about moving small providers into a more formal legal status.

Promoting small providers cannot be done without taking stock of what is happening at the same time with the big providers: the best outcomes in the long-run equilibrium will most likely be reached by getting the assignment of roles right, and most likely there will be more than one way to do this. The market for provision of water and sanitation services to marginal urban communities needs to be worked at from both ends towards the middle, rather than splitting off small providers into a separate universe.

PART II: PROFILES

AFRICA

Benin: Cotonou

Provider name
Private sludge treatment plant, Société Industrielle d'Equipement et d'Assainissement Urbain (SIBEAU), Cotonou, Benin

Funding & technical assistance
Government of Benin (land)

Key features
- ***services:*** With a permanent staff of 3 managers, 3 supervisors, 6 assistants and 54 workers, plus about 200 temporary staff depending on work program, SIBEAU processes septic tank waste and maintains its own collections vehicles and equipment, Since then the company has carried out World Bank-financed works under contract to the municipality (drain cleaning, road paving, solid waste collection and disposal; may include composting of household organic waste).
- ***service area:*** SIBEAU receives 240Ð300 m3/day of sludge for processing at a plant with capacity of 180 m3/day. The treatment plant was designed to handle waste for 300,000 residents; it is currently seeking to respond to a market twice that size by expanding its plant from three to six ponds. Land is available for adding another four in the future.

- ***technologies:*** Sludge is brought in by SIBEAU's own collection vehicles and by those of other septic collector enterprises. SIBEAU carries out natural processing by lagoon treatment: waste is first pretreated and then held in an anaerobic pond, followed by transfer to two other ponds and dried. The ponds are lined with concrete to ensure containment.

- ***costs & financing***: SIBEAU was started with entrepreneur's own funds. Customers pay collectors for service at the time their waste is picked up

Key innovations
SIBEAU and ten other sludge collectors have formed an association which has standardized collection procedures and prices charged to consumers.

Key constraints
- ***Financial***: Current tariff levels do not cover cost of expansion.
- ***Operational:*** SIBEAU is to some extent dependent on waste delivery by private collectors.

Market characteristics
The firm handles about 60 percent of the latrine waste coming from urban areas within a 50-km radius, including Cotonou (600,000). In these areas, about 70 percent of households use a private latrine, 20 percent a latrine outside their own compound, and 7 percent use individual toilets with a septic tank.

Background
The company was started as a small private initiative and received help from government in finding a suitable site and obtaining permission from village residents to allow the plant to be built.

Sustainability
Tariffs have been increased periodically; current tariffs cover operating costs only.

Replicability
Plant expansion already underway is one indication that the operation is already replicating itself.

Key dates
SIBEAU was created in 1989. Following completion of feasibility and engineering studies, construction of holding ponds began in 1991 and operations began in 1993. The director attended a UNDP-World Bank Water and Sanitation Program regional sanitation workshop in December 1997 and shared experience with other providers.

Ownership
SIBEAU owns all its equipment and buildings.

Documentation
Resource document prepared jointly by CREPA (Centre de réseau pour l'eau potable et l'assainissement), a center for low-cost water and sanitation in Benin, and the Department of Infrastructure, Equipment and Supplies within the Health Ministry, for the First Workshop for a National Sanitation Policy, Cotonou, September 1997.

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AFRICA

Ethiopia: Addis Ababa

Provider name
Community operated and managed latrines, Addis Ababa, Ethiopia

Funding & technical assistance
Ethiopian NGOs: Good Shepherd Family Care Services, CARE Ethiopia, Ethiopian Aid, and Redd Barna, a Save the Children affiliate. International religious NGO: Daughters of Charity. Donors: Ethiopian Social Rehabilitation Fund (local fund), Korean government (Redd Barna); German Agro-Action (Ethiopian Aid). The Italian government funded CERFE to study these and other sanitation initiatives in the city.

Key features

- ***services:*** The six similar case studies summarized here focussed on building new community-owned latrine blocks for previously unserved and often inaccessible communities of the poorest of the poor. In all cases, latrine user committees were organized for each latrine to clean and maintain them and collect fees for emptying the latrines. The community is furnished labor to build the latrines and usually were paid either in cash or with food (wheat and oil). In one case, a contractor provided skilled labor and supervision; in other cases, the NGO's own staff supervised works and also recruited skilled labor from the community. Three of the six projects also built standpipes and all of the projects built storm water drainage ditches. Other works included sullage soakway, access roads and a bridge.

- ***service area:*** Two of the six projects involved building about 50 blocks with a total of 250 seats to serve about 2,000 users; one built 22 blocks with 103 seats, and one 90 blocks with 252 seats to serve 3,200 users; two involved building only four or five latrines for a few hundred users, but also one or two standpipes to serve 1,000 to 1,500 users. One of the 50-block projects also involved building 16 standpipes, wash stands, and a shower house.

- ***technologies:*** The technology was the same for all six studies. VIP latrines were constructed with stone pits half-mortared with cement, concrete foundations, local wood frames, concrete block walls, PVC vent pipes, and corrugated iron roofs and were furnished with padlocked sheet metal doors. Latrines are emptied by vacuum trucks. Most drainage ditches were masonry lined; some were earth ditches and some were concrete pipe.

- ***cost/financing:*** Only one of the CARE projects did the community directly contribute cash for the construction costs; in the other CARE project, a cash contribution came from the local elected administrative unit (Kebele), which depends on government and donor funds. The community and NGO signed agreements that the community would pay for operations and would manage the latrines. Monthly fees range from about Birr 0.25 per person to Birr 1.0 per household (average 5 persons). For one latrine block, users who earn their living by selling local beer contribute Birr 2.20 per household per month because their customers are using the latrine. The other households contribute Birr 1.10 for its use. The study team estimated that the minimum required for emptying and maintenance costs comes to about Birr 0.50 per person per month, or Birr 2.50 for a household of five, two to ten times the amounts actually being requested. Not all households actually pay. In one case the Edirs (traditional funeral associations) have played a major role in convincing people to pay and in collecting money.

Key innovations
Organizational: the one project managed by an international NGO (Daughters of Charity) the latrine user committees and other types of community representatives to mediate, monitor, and enforce environmental rules. The latrines were being maintained two years after they had been handed over to the community and the problem of open field defecation had been solved. Another ongoing project (Redd Barnis taking a similar approach and is establishing a coordinating committee, elected neighborhood groups and Health Scouts, and is recruiting salaried grassroots workers from the community. ***Administrative:*** In the Ethiopian Aid project where the NGO employs the water seller at the standpipe, the arrangement works well even though the water fees are too low to cover maintenance costs.

Key constraints

- ***Land:*** Obtaining permission from public and private owners to contribute land needed for building latrines and drains was time-consuming. Some residents were unwilling to donate land for drainage.
- ***Administrative:*** The fact of community ownership is not sufficient to ensure community maintenance when there is no effective neighborhood governing structure. This applies to standpipes as well as latrines: In one of the CARE projects where a single standpipe was constructed, no one is in charge of it and the fittings for all but one tap have been stolen. In the Redd Barna project which includes 16 standpipes, each with four taps, and intensive community organization, fittings have been stolen from one.
- ***Financial:*** Cost recovery was planned for all six projects and user committees were responsible for collecting money for vacuum emptying and maintenance (especially lock and door replacement) but it was not implemented because users did not contribute regularly or it was unclear how much they owed. In several cases households were unhappy with charges being set on a household rather than a per capita basis, which created a hardship for smaller households.

Market characteristics

The existing sanitation system in Addis Ababa, a city of over two million residents, comprises limited conventional sewerage and on-site systems for excreta disposal, piped and open ditches for storm water drainage, and some dump trucks for waste disposal. Since 1981 a limited sewerage system has served the central part of the city and less than 10 percent of its residents. It is operating at less than a third of its design capacity of 175,000 people. On-site sanitation includes various types of dry-pit latrines, used by about 1.6 million residents, and septic tanks, used by 175,000; some 700,000 people have no access to any sanitation facilities. There is no system for household collection of solid waste so only those living near the few dozen dumpsters use them. Waste water and solid waste are commonly disposed of in storm water ditches.

Background

The CERFE study brought together city officials and other stakeholders to inventory all 118 recent community-based environmental sanitation projects in the city and prepared in-depth case studies of 12 projects. This summary is based on 6 of the 12 case studies. The study found that the combined impact of the projects constituted a significant response to the sanitation crisis in the city, building latrine blocks to serve a total of about 100,000 people and constructing a total of 1,170 km of drains. The impact of such projects could be greatly extended by integration of efforts across the spectrum of environmental sanitation needs in a given area, rather than targeting provision of one or two services such as latrines or water.

Sustainability

In the Daughters of Charity project, one of CARE projects and the Redd Barna project, where the latrine user committees are supported by other authoritative structures which play an active role in convincing people to use the latrines and pay for their use, the organizational conditions for sustainability may be met. But not all user committees are collecting the fees owed and in no case are the fees high enough to cover periodic emptying and maintenance costs as estimated by the study. In the Ethiopian Aid project, the cost recovery system is not clear to all participants despite a signed agreement and there is not a consensus to pay for the latrine. The study indicates however that a cost recovery system based on regular payments of small amounts in the context of an integrated environmental sanitation initiative including income-generating activities can work.

Replicability

In October 1997, a workshop organized by the Addis Ababa city administration and ESA brought stakeholders together to follow up the first workshop held in December 1996 and develop strategies for a city-wide Community Based Environmental Sanitation initiative. Both the European Commission and the World Bank are considering funding the initiative to ensure that the poor benefit from their next water and sanitation projects.

Key dates

All six projects have taken place over the 1993-1996 period. Four projects lasted from six to 11 months, one for 18 months, and one is a ten-year project planned for completion in 1999 (Redd Barna).

Ownership

Following construction on land ceded by the city or private land owners, the latrines become the property of the community. The ownership of the drain right-of-ways is less clear although they, too, could be built only with the permission of the public or private owner of the land.

Documentation
Environmental Sanitation in Addis Ababa: A Case Study, by Sylvia Klingi, In Focus, Vol. I: December 1997 (UNDP-World Bank Water and Sanitation Program CERFE, Environmental Sanitation Case Study in Addis Ababa, Vol. III: Case Studies, March 1997.

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AFRICA

Kenya: Nairobi

Provider name
Water kiosks, Kibera informal settlement, Nairobi, Kenya.

Funding & technical assistance
Study commissioned by ESA under the Third Nairobi Water Supply Project. All investment in water lines within the community and all kiosk structures has been financed by the kiosk owners.

Key features
- ***services***: Water kiosks account for 64 percent of the 1,014 water outlets registered with the Nairobi City Council (NCC) in Kibera and are the principal outlets through which NCC makes water available. Virtually all (98 percent) of kiosks are owned by individuals and many are operated as family businesses. The rest are operated by self-help groups, including women's groups. Kiosks are open 15 hours a day beginning at 6 am, but availability of water is problematic and much improvement is needed to make water readily available. A quarter of kiosks had no water to sell at any given hour. The average distance to the nearest kiosk is about 40 meters and consumption ranges from 16 to 20 l/day.
- ***market size***: Kiosks' main customers are neighbors, tenants, and nearby residents. Sales volumes range from about 100–150 m3/day, with 30 percent of the kiosks accounting for 70 percent of water sold. The general availability of water at the mains appeared to be a much more important determinant of sales volume than available storage capacity.
- ***technologies***: Kiosks draw water from the NCC mains and over 93 percent have complied with NCC technical standards for pipes. About two-thirds of kiosks, including all those owned by self-help groups, had water storage tanks constructed from galvanized iron sheets. Only about one in six kiosks had any form of physical superstructure, but a number are also operated from windows of buildings such as shops.
- ***costs & financing***: Capital investment ranges from Ksh 5,000 to Ksh 40,000 (US$80-645). The full cost of all pipe infrastructure from the main to the kiosk is borne by the owner and accounts for about 90 percent of total investment costs; kiosk owners have laid about 20,000 meters of pipe. The remaining 10 percent of initial investment goes to construction of shelter and water storage facilities. Official payments made to the water utility for water point installation are about Ksh 4,000 (US$ 66); informal payments to gatekeepers to facilitate installation are twice this (Ksh 8,000). Operating and maintenance costs amount to about Ksh 125/day (US$2) and are kept low by use of family labor. Water is sold at Ksh 2 per 20-liter jerrycan, twice the NCC recommended price of Ksh 1 per can; prices rise during water shortages. Kiosk owners are charged Ksh 10/m3 but meters are read infrequently and the payment rate is about 15 percent.

Key innovations
The Kibera kiosks are an example of a durable but financially and technically unsatisfactory partnership between a municipal water authority and private water distributors.

Key constraints
Institutional: The existence of 650 kiosks in an area of less than 2.5 kms has led to suboptimal investments and has bred unhealthy competition. Rather than continuing to license more kiosks, the city council needs to encourage kiosk owners to improve service quality. The council also needs to rebuild customer confidence in its meter reading and billing process, beginning with rapid clearing of all backlog billings and analysis of underbilling: the kiosk owners sell about 40,000 m3 of water monthly but the council appears to bill for only 3,400 m3 monthly. Meter readings are six months behind and bills are issued late and irregularly; the great majority of kiosk owners pay either late or not at all. The present 15 percent payment level must be improved. ***Supply***: Interruptions of supply and irregular flow are the key problems experienced by the kiosk owners. Thirty percent reported receiving water only one or two days per week, considered a poor or very poor level of service, with 70 percent receiving water at least 3 days a week, considered acceptable or better. ***Technical***: The incidence of bursts and breakage in the pipe network is high and the network needs to be upgraded. Three-quarters of kiosks use pipes of half to three-quarters of an inch in diameter which have a limited capacity for water delivery. Discharge rates are less than half the rate recommended by the water ministry. Storage provision is low, about 3,400m3 for the whole area; an additional 1,500 m3 of storage would make for a significant improvement. ***Environmental***: There is little or no provision for waste water disposal, leading to stagnant pools of water.

Market characteristics/background
With an estimated population of 500,000, Kibera is home to a quarter of the population of the city of Nairobi. In this, the oldest and largest informal settlement in Nairobi, densities approach 2,000 residents per hectare, making Kibera one of the most densely populated informal settlements in sub-Saharan Africa. Informal settlements such as Kibera account for about 60 percent of Nairobi's population. Absentee landlords build semi-permanent rooms for rent without providing water or sanitation facilities. Insecure land tenure remains a constraint to improving conditions in such settlements.

Sustainability
Economic analysis suggests that kiosks may be an unprofitable business. About 80 percent of kiosks reportedly sell less than 100 cans per day, or less than the number required to break even, assuming owners actually paid for the water they sell; fewer than a quarter sell more than 100 cans a day. This poor profitability may be partly offset by the availability of water to the kiosk owner and family. Non-payment of water bills may also contribute to a better profit margin. Water kiosks also seem to confer added value to adjacent rental houses and shops. Nonetheless, kiosks have been doing business for many years. Study recommendations to NCC to improve kiosk operating environment are expected to be acted on beginning in 1988, including upgrading the water network and improving water supply management.

Replicability
An Urban Environmental Sanitation Pilot Project to be undertaken in Kibera with support from the World Bank has been designed to test and develop institutional, financial and technical options for improving conditions in informal settlements, with a view to scaling up best practices in a city-wide investment project.

Key dates
Kiosks have been established over a period of years with present owners' operations dating back to the 1970s.

Ownership
All water lines within the community and all kiosk structures have been constructed and are owned by the kiosk owners.

Documentation
Study of Public Water Points (Kiosks) in Kibera, Nairobi. Draft submitted to ESA by Business and Economics Research Co. Ltd., Nairobi, August 1997. Project Update newsletter, "Water Kiosk Study", February 1998 Draft. Draft Proposal for Kibera UES Pilot Project, KUESP Preparatory Group, September 1977.

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AFRICA

Mali: Mopti

Provider name
Community standpipe management, Taïkiri neighborhood, Mopti, Mali

Name of secondary Providers
Organization: Action-Mopti, ONG; Cofinancing of standpipes: French town of Elancourt (Yvelines). Study of standpipe management in three cities in Mali: Ministre de la Cooperation, France

Key features
- ***services:*** Three standpipes were rehabilitated with community and donor funds and are managed by a local management committee whose president is the neighborhood head. The average distance from house to standpipe is 350 m, considered "far". The average waiting time is 45 min., considered "long". But residents are particularly unhappy about the early closing time of 6:30 p.m.

- ***service area:*** Virtually all 3.000 neighborhood residents use the standpipes for drinking water. There are few permanent wells and river water is used for washing and bathing.

- ***technologies:*** Standpipes appear to have a single tap; the platform is very worn and too small for washing.

- ***cost/financing:*** The community contributed money (200,000 FCF and in kind (materials, labor) to the repair and restarting of standpipe operations by EDM (l'Énergie du Mali, a public-private company under the Ministry of Industry, Energy and Hydrology). The water is sold at 5FCFA for a 20 l bucket, considered a fair price. EDM charges 80F/m3; with taxes and water sellers' fees, the delivered cost comes to 140 FCFA per m3 (1.4 million FCFA a year for total consumption of 10,000 m3). If water seller's fees were doubled to 20,000 F a month in order to attract more interest, the cost would be 170 FCFA/m3.

Key innovations
The community management system in Taïkiri is unique in Mopti. During the first year of operation (1995), Action-Mopti trained the management committee and monitored accounts. Each water seller maintained a notebook where he made a mark for each bucket purchased and the amount of water taken as shown on the meter. Each day's take was handed over to the treasurer, who paid the monthly bill, paid the water sellers their one franc per bucket sold, and kept the balance for maintenance. Since Action-Mali is no longer monitoring accounts, this bookkeeping has been abandoned.

Key constraints
Technical: All users want more taps per standpipe; 89 percent want longer hours of operation in the evenings; 40 want a larger platform for washing. ***Administrative:*** Since Action-Mopti is no longer supervising accounting, there is a lack of transparency due to the committee's' decisions to supervise directly with no written daily accounts. In July 1996, the water company accounts indicated that accounts for the three standpipes were past due by 4 to 5 months.

Market characteristics
An ancient town, several centuries older than Mopti itself, this Peuhl village is located at the south-east edge of Mopti, into which it has recently been subsumed (population of Mopti: about 150,000, including Sévaré). The village has stayed close to its rural roots and preserves the same use of land and dependence on raising crops and livestock. Lacking either regular layout or map, Taïkiri is one of the poorest areas of Mopti. Annual water consumption is about 3Ð4.000 m3 for each standpipe or 20l/day/resident in the dry season, 5 l/day/resident in the rainy season.

Background
Since 1979, Taïkiri's three village standpipes were managed by the municipality and then by the political party. They were closed in 1989 due to unpaid water bills. In 1992, Action-Mopti began to organize a local management committee in order to obtain matching funds from the French city of Elancourt.

Sustainability
At the current sales price of 5F per 20 l bucket, the system is barely sustainable, because the water seller's fee of 10 - 15.000 FCFA/month is not enough to live on (minimum wage=25,000/mo. or 45,000 FCFA/mo. to support an average family of five). Still, compared to household income levels, water purchases are a major expense even at this low rate. At a national scale, despite substantial increases in the water tariff charged by EDM, water supply remains heavily subsidized. Compare the tariff charged for water to standpipes of 88 FCFA/m3 including taxes in June 1996, to the real cost of delivery of 500 FCAF/m3 in Mopti. Water revenues do not even cover direct operating costs (materials and labor).

Replicability
Since 1994, it has been the intention of French aid and the three twinned French cities for Mopti, Maurepas; for Ségou, Angouleme, for Kayes, Evry) to carry out pilot activities in the three cities in Mali to work out management procedures based on negotiated contracts, and then to proceed to reorganize the standpipe operations in the three towns. The study shows that new standpipes should be restricted to those areas where the current system of water purchase from neighbors with connections cannot satisfy needs; in Mopti, there is need for 16 standpipes to do this (except for Taïkiri, where the pilot has already taken care of this, and for Sévaré, a large area with two-thirds of Mopti's residents which is being upgraded under the Third Urban Project of the World Bank).

The combined effects of administrative decentralization and the privatization of EDM have created a wait-and-see attitude on the part of most stakeholders, in particular EDM. Future standpipe management arrangements will depend heavily on the future water company and on the transfer to municipalities of infrastructure ownership.

Key dates
Standpipes in Taïkiri began operating under community management in 1995.

Ownership
Standpipes belong to EDM.

Documentation
Alain Morel à l'Huissier and Véronique Verdeil, CERGRENE (Centre d'Enseignement et de Recherché sur la Gestion des ressources naturelles et de l'Environnement, Ecole Nationale des Ponts et Chaussées). Gestion de bornes-fontaines: étude comparative et évaluation de projets réalisés ou en cours de réalisation: Villes de Kayes, Segou et Mopti, MALI. Rapport final, novembre 1996 (Taïkiri: pp. 27 - 37)

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AFRICA

Mali: Ségou

Provider Name
Standpipes managed by volunteer community associations and the microenterprise Jigiya (hope), Ségou, Mali.

Funding & technical assistance: Major extensions of water service in Ségou in the 1980s were co-financed by the government and German aid. The Twinning Committee (comité de jumelage) of the French town of Angouleme also financed materials for municipal construction of 20 standpipes in 1984-85, and more recently, extension of water infrastructure and standpipe construction in one area of town near the airport, since renamed Angouleme. The Dutch NGO Alphalog provides technical assistance and training to the GIE Jigaya. Documented in study of standpipe management in three cities in Mali: Ministère de la Coöperation, France.

Key features

- ***services***: The water company, EDU, provides water, Jigiya holds municipal distribution concession, and community associations hire standpipe operators, collect fees, and pass receipts to Jigiya. Jigiya pays the EDU bill forwarded to it by the municipality. The average distance from house to standpipe is 110 meters, considered reasonable; one in four (located on the periphery) must walk more than 230 meters and consider this "far", but half (living in the older parts of town) walk only about 50 m and consider this "close". Half of water buyers wait 5 minutes or less, which they consider "short"; even where the wait is considered "long" it amounts to 15 minutes (compared to the 45 minutes in the Taïkiri district of Mopti). Most users (85 percent) are happy with the standpipe service they receive; the main request is for faster-running taps to shorten water drawing time, and the main complaint is about standing water due to a lack of drainage around standpipe platforms. Because most washing and bathing takes place inside household compounds using on-site well water, there is no demand for washing facilities at the standpipe as in Taïkiri.
- ***market size***: In contrast to greater Mopti (1995 pop. 150,000), where 80 percent of households buy drinking water from the 14 percent who have individual connections and 16 of the 20 existing standpipes do not work, 70 percent residents of greater Ségou (1995 pop. 120,000) get their drinking water from the 108 standpipes and only 1 percent buy water from the 8 percent of households with private connections.
- ***technologies***: Standard water pipes with small concrete platforms.
- ***costs & financing***: In Ségou, most water is sold at the standpipe for 5 CFAF per 15-liter bucket (CFAF 313/ m3), with only a quarter of clients obtaining 20 liters for this price, as is standard in Mopti. Ninety percent of Ségou residents find this price fair. EDM charges CFAF 88/m3; with taxes and fontanier fees, the delivered cost comes to CFAF 213/m3. For an average monthly volume of 87 m3, the average monthly profit works out to CFAF 6,000, a negligible amount. Only the one-third of standpipes in Ségou where monthly volume sold exceeds 100 m3 can be considered profitable.

Key innovations
The municipality's granting of a formal concession to a microenterprise entity charged with involving the community in standpipe management appears a somewhat torturous arrangement, but it has a number of advantages over other unsuccessful past arrangements: (1) there is a written contract, however badly drafted the first time around; (2) the concession is granted after open bidding and is renewable every five years; and (3) the first concessionaire, Jigiya, is legally constituted as a for-profit microenterprise entity.

Key constraints
Policy*:* The water parastatal, EDM (Energie du Mali) has never formulated a national policy regarding the provision of water through community standpipes. While the policy of paying for standpipe water has been in place for some time, technical and service standards and the level of charges vary from city to city and within cities, as do methods of selecting standpipe operators and the division of responsibilities between EDM, the city authorities, and the users (especially with regard to maintenance). Local EDM managers have wide latitude in how they run the standpipe system. ***Availability of free water***: In the Pelengana area (pop. 11,000) of Ségou, there are many wells including tubewells with handpumps financed by Saudi aid, and standpipe water was free at first; because the benefits of better quality standpipe were not explained to residents, they simply returned to their previous sources once charges were laid on. ***Institutional****:* In contrast to the strict central supervision exercised by the city water committee between 1991 and 1993, the current city administration has failed to constitute the Water Supervision Committee specified in the concession contract between the city and Jigaya, so there is no effective central supervision. ***Contractual***: While Jigaya is the only entity legally constituted as a microenterprise, formally known as a groupement d'interêt economique or GIE, the volunteer associations with which it has subcontracted are also known as GIEs and the wording of the contract and its execution have resulted in a blurring of responsibilities between the two. Prior to the 1993 concession

contract, standpipe bills were automatically sent to the city authorities, who then forwarded them to whomever was in charge, and since 1993 no steps have been taken to respecify who exactly is responsible for the bill. Legally speaking, the 1993 contract can only involve Jigiya , however confused its wording, and in fact, Jigiya has actually drafted a revised contract which makes it clearly the responsible party. While waiting for the City Council to review the new contract, Jigiya itself continues to point the finger at the neighborhood association operators. The latter, in turn, see Jigiya's failure to actively support their complaints of frequent overbilling as evidence of collusion with the water company to overbill. And they are not happy with the revised contract provision for Jigiya to take over all funds management and keep centralized accounts, though it is based on the fact that Jigiya had to take over the finances for standpipes in by 6 of the 15 volunteer associations for a time due to the latters' mismanagement of funds.

Market characteristics: Annual water consumption is about 1,200 m3 for each standpipe or about 10 l/day/person during the dry season (about half of the amount consumed in the Taïkiri area of Mopti where standpipes are the main water source). More than 75 percent use well water for washing and bathing, and about 20 percent still drink well water after disinfecting it with bleach (eau de Javel), including those on the peri-urban fringe, although this water was found to be unsafe to drink in 1982 by GKW (German technical assistance). The market for water carters and carriers has diminished as coverage by standpipe has increased.

Background
Prior to 1979, standpipe water was a free public service managed by neighborhood leaders (chefs de quartier) and standpipe water bills were paid by the municipality. From 1979 to 1991, standpipe management was taken over by neighborhood-level units of the political party. Water charges were introduced in 1983, when the Women's Union of the party took over management. Under these decentralized arrangements, water bills did not get paid and in 1986, 35 of the existing 46 standpipes were shut down by the water company. In 1986 the municipality again resumed responsibility for paying the bills and the three-man committee did a good job of it. Following a change of government in 1991, standpipe management was handed over to the former head of the municipal committee, though no written contract seems to have been signed. He became guarantor of water bill payment, putting up his own house as surety, and ensured regular payment during the two years of transition to an elected city council. In 1993 the newly elected mayor revoked this manager's concession and, three months later, signed a formal contract to take over standpipe management with Jigiya, a microenterprise formed by unemployed recent graduates. However, the water company was not consulted, no contract exists between it and Jigiya, and lack of technical supervision and poor financial management have again led to accumulation of water bill arrears. Jigaya is legally constituted as a microenterprise and is the designated official interlocutor for the water company; its standpipe delegate works with the standpipe manager of the pre-existing neighborhood associations, purely voluntary organizations which continue to actually hire individual standpipe managers. The job description and terms of payment for standpipe managers are set out in a written contract between Jigiya and the volunteer associations.

Sustainability
At the current sales price, the system is barely sustainable, because the average fontanier's fee (40 percent of collections, or CFAF 10,000/mo. for an average monthly volume of 87 m3) is not enough to live on (minimum wage is CFAF25,000/month, or CFAF 45,000/month to support an average family of five). This low level of profitability may be one reason why 102 of the 108 standpipes are behind on their water bills; the total arrears is equivalent to 8 months of standpipe water sales. At a national scale, despite substantial increases in the water tariff charged by EDM, water supply remains heavily subsidized. Compare the tariff charged for water to standpipes of 88 FCFA/m3 including taxes in June 1996, to the real cost of delivery of 500 FCAF/m3 in Mopti. Water revenues do not even cover direct operating costs (materials and labor).

Replicability
Short run: Since 1994, it has been the intention of French aid and the three twinned French cities—for Mopti, Maurepas; for Ségou, Angouleme, for Kayes, Evry— to carry out pilot activities in the three cities in Mali to work out management procedures based on negotiated contracts, and then to proceed to reorganize the whole of standpipe operations in the three towns. The study shows that rapid expansion of the standpipe system in Ségou – thanks to financing from Angouleme and German aid – has succeeded in providing good coverage for the town, in contrast to the situation in Mopti where most people must buy water from their neighbors because the standpipe system is not working (except in Taïkiri). ***Long run:*** The combined effects of administrative decentralization and the privatization of EDM have created a wait-and-see attitude on the part of most stakeholders, in particular EDM. Future standpipe management arrangements will depend heavily on the future water company and on the transfer to municipalities of infrastructure ownership.

Key Dates
Water charges were introduced in 1983 but decentralized unsupervised management arrangements led to accumulation of arrears, and in 1986, 35 of the existing 46 standpipes were shut down by the water company. From 1986 the municipality, and later a competent private individual, ensured good technical and financial management of the standpipe system. In 1993 the newly elected mayor signed a formal contract with a GIE (groupement d'interêt economique) named Jigiya, to manage standpipes.

Ownership
Standpipes belong to EDM, the water company.

Documentation
Alain Morel à l'Huissier and Véronique Verdeil, CERGRENE (Centre d'Enseignement et de Recherche sur la Gestion des ressources naturelles et de l'Environnement, Ecole Nationale des Ponts et Chaussées). *Gestion de bornes-fontaines: étude comparative et évaluation de projets réalisés ou en cours de réalisation: Villes de Kayes, Segou et Mopti, MALI*. Rapport final, novembre 1996 (Ségou: pp. 41–66)

Contacts
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AFRICA

Senegal: Dakar

Provider Name
Fontaniers, water carters, and water carriers, Dakar, Senegal.

Funding & technical assistance
French aid financed a series of studies to evaluate the actual and potential role and constraints on private water distributors complementing or competing with large public providers, part of a larger water and sanitation program in peri-urban areas and small cities of Africa. The study in Dakar relied on a massive household survey conducted in 1997 with World Bank funding.

Key features
- ***services***: **Fontanier**: The fontanier offers service at the standpipe for about 8 hours a day starting early in the morning. They are generally long-time male residents, selected by the community due to their managerial or technical skill, and usually hire a relative to handle operations while continuing to work as masons, plumbers or shopkeepers. The financial management is handled by the neighborhood economic association (GIE for groupement d'interets economiques or economic interest groups); daily receipts are handed over to the GIE treasurer and he is responsible for paying the semiannual water bill when it arrives. Half of what is left after paying the bill goes to the fontanier, and half into a reserve for maintenance expenses. **Carters and carriers**: Starting early in the day, the carter fills his or her 40 l barrels and makes the round of construction sites. In growth areas, the carriers do the same with 20–25 liter basins. In older areas, water carriers provide mostly drinking water to households; carters also serve this market in areas dependent on standpipes alone where it is harder for households to stockpile water reserves.
- ***market size***: Fontaniers serve neighborhoods of varying sizes and densities, around 200 or 300 residents on average. Carters' and carriers' main clients are construction enterprises who need water to make cement and bricks, and for whom the carters also transport construction materials. Laundrywomen are another important customer category. There are fewer than 1,000 fontaniers managing the 1,000 standpipes, since some manage more than one. There are on the order of 2,000 carters and carriers.
- ***technologies***: The fontaniers manage water standpipes connected to the water mains supplied by SDE (water company). The water carters and carriers buy water from the water company (standpipes or private connections) but also get water from wells and springs.
- ***costs & financing***: **Fontanier**: The CFAF 100,000 hookup charge and the cost of constructing a new standpipe may be paid by the municipality or by the neighborhood to be served. The fontanier buys water from SDE at CFAF 240/m3 (compared to an average charge of CFAF 325/m3 for household connections) and may charge what the market will bear, generally CFAF 800–1,000/m3. Income from the job varies widely, with more being earned in a new fringe area where there are fewer alternatives (CFAF 6–15,000) and less in an established area where many residents will have house connections (CFAF 3–10,000). Some fontaniers may manage more than one standpipe. **Carter**: The CFAF 230,000 startup cost is typically financed by a loan or grant from a family, religious, or political group. Monthly operating charges include CFAF 30,000 for the horse and CFAF 1,250 municipal water tax. Carters' water charges vary little: CFAF 2,000/m3 or at least twice the retail fee at the standpipe. For their clientele, largely construction enterprises, the price is right and carters may be paid in advance for several days' work to ensure their service. In a typical workday – from dawn to 2 pm – a carter may make CFAF 10,000 or 1,000. For most carters, the objective is to save money to start a shop and get out of the heavy labor of hauling. **Carriers**: These women carry water in a 20–25 liter basin on their heads; the basin costs CFAF 1,500–2,500. Their charges are also relatively fixed at about 150 percent of the price at the standpipe (CFAF 50 per basis vs 20 at the standpipe).

Key innovations
The carters and carriers fill a temporary but ever present gap between what SDE can supply and the needs of households and businesses. Their most important service is reliability in a city where piped water service is unreliable and cuts frequent; the second most important service is daily or weekly payment schedule, since setting aside adequate funds for a semiannual water bill is a challenge.

Key constraints
The water company, SDE (société d'exploitation), would like to serve the whole market but it prefers to wait for a critical mass of built-up plots before extending primary and secondary infrastructure. Its service is also still subject to frequent interruption; some households cannot afford the connection charges (CFAF 100,000), and fontainers complain about irregular meter readings, frequent billing mistakes, and time wasted in billing disputes. The carters and carriers serve to bring SDE's water to the fast-growing urban periphery but have had no voice in the changes taking place in the water sector because they have no legal standing though they pay water taxes. SDE's response to fontanier complaints has been to put meter readers on a bimonthly schedule to allow for better planning. SDE could go further by defining the contractual relationship with the fontanier, and keeping fontaniers better informed and listening to their feedback. The neighborhood associations (GIEs for groupement d'interets economiques or economic interest groups), already recognized stakeholders in the water provision partnership, could serve as spokesman for the carters and carriers so their voices can be heard.

Market characteristics
Dakar, capital of Senegal, had a population of 1.8 million in 1995, expected to reach 3.8 million by 2010. About 65 percent of the city's residents have household connections (125,000 private connections), 26 percent obtain most water from fontaniers at the 1,000 city standpipes, and the remaining 8 percent get water from carters or carriers, public wells and taps at mosques, or other sources. The latter includes buying water from neighbors, but this, in principle, illegal practice seems to have fallen off considerably, possibly because of the proliferation of standpipes and the inconvenience of setting aside sufficient funds for the semiannual bill. The exception is that landlords generally sell water to their renters. Those with household connections consume on average 50 l/day/ person (this would be higher if service were not interrupted so frequently), 20 l/day/person for those whose main source is standpipes, and 11 l/day/person for those whose main source is carters and carriers.

Background
Prior to the 1989 conflict between Senegal and Mauritania, Mauritanians (outsiders) arranged with standpipe keepers (guardiens) to distribute water drawn at public standpipes by cart or on foot. Since 1989, poor women from ethnic minorities have taken over this trade. In 1991, municipal authorities switched standpipe management from volunteers selected by neighborhood leaders to private entrepreneurs—fontaniers— and started charging for public standpipe water. In 1996, the water distribution functions of the water parastatal were handed over to a newly created public/private company, SDE

Sustainability
During the transition from new subdivision to full household water service, standpipes will be the best solution to initial water provision in growth areas. Wherever there continue to be households which cannot afford private connection and do not buy all their water from neighbors, standpipes will occupy a permanent market niche. As long as there is a gap between supply by SDE and demand at the growing urban fringe, there will be a role for the carters and carriers.

Replicability
SDE's plans for the addition of 400 standpipes and 36,000 private connections for low-income households by 2003 are unfolding in a new environment where network extension needs to take community demand into consideration if investments are to pay their way rather than receiving the automatic subsidies of the past. GIEs are becoming increasingly involved in decisions about placement and management of standpipes and installation of household connections. The GIEs' voice could also represent the interests of private water distributors as well as those of water consumers.

Key Dates
Standpipe water became an economic good rather than a free social good in 1991. Neighborhood association GIEs became the recognized legal representative of communities as part of a 1994 urban land reform and restructuring of peri-urban settlements undertaken by the Urban and Housing Ministry. The water parastatal privatized distribution operations in 1996.

Ownership
Standpipes are owned by SDE. The carters and carriers own their equipment. SDE's monthly turnover amounts to about CFAF 2.4 billion; a fontanier's monthly turnover ranges from CFAF10–90,000 and a carter's is about the same (CFAF 15–100,000). A water carrier's turnover ranges from CFAF24–40,000.

Documentation
"Les operateurs privés de la distribution d'eau dans les quartiers défavorisés de Dakar" (Private water distributors in peri-urban Dakar), report prepared by Séverine Champetier, Philippe Durand, and Youssouph Mbargane Guisse. Association française des volontaires du progrès (French Volunteers for Progress) and Hydro Conseil consulting group. Dakar, October 1997. Part of a larger research project also covering Nouakchott (Chad), Port-au-Prince (Haiti), and three secondary centers in the Senegal River basin.

Contacts
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ASIA

Bangladesh: Dhaka

Provider Name
Community managed water points, low-income bustees in Dhaka, Bangladesh.

Funding & technical assistance
With DSK as guarantor, the community water society (samity) manages the water points and bears the cost of installation and security deposit through an interest-free loan from DSK. The Dhaka City Corporation (DCC) sites the water points on property they own and grants permission to DSK and the community to cut the access road and excavate for laying of pipe. The water authority, Dhaka Water Supply and Sewerage Authority (DWASA), lays the pipe, installs the water points, and supplies water. Testing of this approach on a wider scale is being supported by the Swiss Agency for Development and Cooperation and the Participatory Development Fund of the World Bank, under the active guidance and supervision of SA. A coalition of local NGOs, Coalition for the Urban Poor (CUP) is scaling up the approach with support from donors and international NGOs such as UNICEF and Water Aid.

Key features
- ***services***: Water is available by the pitcher or bucket (about 4 gallons). There are washing and bathing facilities, and public toilet facilities are also available in communities that have decided to pay for them. The water centers are open 12 hours a day, from 8 am to 8 pm. The presence of a sunken tank is very useful when water pressure in the mains is low.
- ***market size***: Individual bustees vary in size; the first two where water points were installed, Koilar Colony and Begunbari, had 555 and 833 households respectively (about 3,300 and 5,000 residents respectively). Each water point in the first two bustees served about 300 to 400 users; subsequent water points are used by about 250 to 300 users each.
- ***technologies***: The water point includes an underground reservoir with pipe connection, two suction pumps and a bathing space. The first water point in Koilar included a sunken water tank, a surface tank, and a platform, the whole fenced with bamboo matting. The second one in Begunbari was more modest, with a smaller sunken tank and no surface tank.
- ***costs & financing***: The total cost for the Koilar water center was Tk 70,000, including the security deposit; in Begunbari, the cost was Tk 20,000. The rates charged cover all operating and capital costs—water bills and two caretakers' salaries per water point (each receives a monthly salary of Tk 500), and repayment of the loan from DSK covering installation and initial security deposit. Some communities prefer to charge households monthly rates, some per use, and some a combination of the two. The rate per use is normally Tk 0.50 for a bucket of water, Tk 1.0 for washing or bathing, and Tk 0.50 for use of toilet. The monthly household rate is set at Tk 10 per person or Tk 30 per household, whichever is higher (Tk 43 = US$ 1). Receipts are deposited in a bank account which is jointly managed by the PKS president and treasurer and a representative of DSK. Despite such low rates, the samity is able to recover costs, because the rates are much higher than the unit rate charge by DWASA (Tk 0.5 for 4 gallons is Tk 125 per 1,000 gallons compared to Tk. 16 per 1,000 gallons charge by DWASA). Rates charged for water are about half those previously charged by the water lords (mastans): Tk 1 per pitcher and as high as Tk 5,00 for bathing and washing.

Key innovations
For the first time, bustee residents have access to permanent and legal water sources and are getting potable water regularly at half what they previously paid. Also for the first time, DWASA is able to recover costs from bustee users, in contrast to the free street hydrants in poor areas, which it is accustomed to providing at a loss. DSK does not provide water but acts as a facilitator, working with the leaders of poor settlements to organize the community, first in groups of five households, and then into a cluster of 20 to 30 groups which becomes the unit for the water point. A motivated community ultimately forms a gender-balanced water society, the Pani Kal Samity, which elects a 13-member executive committee. The committee and DSK work together to select the site for the water point, formulate rules for water access, set rates for water use, and define arrangements for management, accounting operations, and maintenance. DSK negotiates with DWASA for the water connection and with DCC for road cutting and excavation. An agreement is signed between the samity and DSK before commissioning of the water point. DSK provides management supervision and attends monthly samity meetings. SA prepared a case study on DSK's work and worked with DSK to scale up the approach and obtain funding for a pilot project. The pilot project brings together the communities, the water authority, DWASA, and the Dhaka City Corporation in an alliance directed to put up more water points in bustees and to identify institutional changes required to formalize, sustain and scale up the project in Dhaka and beyond. So far, 31 more water points have been installed, and another 30 to be done through the NGO coalition, CUP, have been sanctioned by Water Aid .

Key Constraints
Institutional*: DWASA*: Since bustee dwellers do not have title to the land they occupy, the water authority, DWASA, was reluctant to provide water points for the first bustee, and the initial response of DWASA's chairman was negative. Even after the first two water points were installed, DWASA officials did not even visit the water points. Persistent advocacy on the part of DSK and SA succeeded in winning over the agency, and officials have become very supportive of the project to extend provision of water points to bustees. *Mastans*: The power structure of older bustees is often dominated by local mastans, musclemen. Prior to the arrival on the scene of DSK, there was no strong community organization to counter their influence, and initially DSK took no initiative to form user groups. DSK initially signed an agreement with an existing group to run the first water center in Koilar, who had taken over the water center and were paying the water bill but refused to pay back the DSK setup loan. DSK then decided that in subsequent bustees, it would need to organize residents in a way that would preclude domination by the mastans. *Corruption*: As under the mastan system there were deals to provide a lower bill in exchange for payment to the reader, the meter reader wasted no time in contacting DSK and the samity in Begunbari once the water point was installed to see what he could arrange. This temptation will continue to persist.

Market characteristics: Bustee residents are long-time city residents who have built up squatter communities on government land over the last 30 years. They are employed in marginal occupations at very low wages. The monthly income of an average household of six persons varies from Tk 2,000 to Tk 3,000 (US$ 45–70). Men work as laborers, rickshaw pullers, vendors, and rag pickers; some have small tea stalls and grocery stores. Women find jobs as household help, ayahs (nannies) or construction workers. Children work as rag pickers and vendors.

Background
About 70 percent of Dhaka's estimated 2 million bustee dwellers are deprived of safe drinking water. Because bustee dwellers or their slumlords do not have title to the land on which they have built, they are not eligible for services from government agencies. Environmental conditions are deplorable: Walkways are unpaved, there is little drainage, and stagnant cesspools abound. There are few pit latrines and open defecation is common. The ramshackle structures are of bamboo, board, plastic, scrap metal and other discarded materials.

Sustainability
Upon recovery of the capital cost and improvement of the management capacities of the samities, DSK will phase out its involvement, and the samities will be fully responsible for management and operation and maintenance of the water points.

Replicability
The approach developed by DSK for bringing water to the Koilar Colony and Begunbari bustees has been successfully replicated in more than 30 communities in Dhaka and replication is set to continue in Dhaka and beyond. The recovery rates are quite satisfactory and it is expected that the samities will be able to repay their loans within the project time frame.

Key Dates
DSK was established in 1988 and began working in Koilar Colony bustee in 1989. The first water point in Koilar was commissioned in October 1992, and the first water point in Begunbari was commissioned in April 1994. A pilot project to test the DSK approach in 19 other bustees was launched in 1996. Water Aid is now scaling up the approach in 40 more bustees (10 completed, 30 more planned).

Ownership
DWASA owns the water network and water points.

Documentation
"Small Private Initiative: Water Supply for Urban Poor," Project Fact Sheet, SA, August 1997. "Social Intermediation: A Key to Water Supply Provision for the Urban Poor in Dhaka City", Haroon Ur Rashid and Iftekher Haider, 1995.

Contacts
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ASIA

India

Provider Name
Sulabh (means "easily available" in Hindi) International Social Service Organization, 22 states and 2 Union Territories, India.

Funding & technical assistance
State governments and municipal corporations finance construction.

Key features
- ***services***: The Sulabh organization developed a low-cost latrine design called Sulabh Shauchalaya ("easily available toilet" in Hindi) and sells them to replace the dry and bucket privies commonly used in Indian households. Sulabh also constructs public facilities using this design. Sulabh guarantees to operate and maintain all public Shauchalaya facilities for at least 30 years. They also carry out the necessary awareness campaigns to encourage the use of public pay-and-use toilet facilities, the larger of which also include bathing and washing facilities where there is water and free hand soap 24 hours a day. Since 1994, some Sulabh complexes also offer primary health care services run by the Sulabh International Institute of Health and Hygiene.
- ***market size***: As of March 1995, over 10 million people were using Sulabh facilities every day. There were about 800,000 Sulabh public toilet units in about 3,000 complexes in about 1,200 towns— about 2,000 pay-and-use toilet complexes, and about 1,000 larger complexes which include public laundry and bathing facilities. There were also 68 human excrete-based biogas plants associated with pay-and-use facilities. In addition, there are about 800,000 household toilets. Sulabh is also operating and maintaining Shauchalaya complexes at railway stations, port facilities, and hospitals.
- ***technologies***: Sulabh's founder developed affordable twin pit pourflush latrines, called Sulabh Shauchalayas, because sewerage-based toilet remains and will remain out of the reach of most Indians. This design requires only two liters of water to flush, does not require manual handling of human excreta, is easy for a householder to maintain, and may be upgraded if sewer connections become available. The two-pit water seal latrine has honeycombs in the walls of the pit. The pits are sized to be maintained for three years. The pits are used alternatively; after the first pit is filled, human excreta is diverted into the second pit. After two years, the contents of the first pit turns into a semi-dried manure what can easily be dug out by the householder and used as manure. While almost free from pathogens, this manure can be made completely free from pathogens by being sundried for two to three weeks. Sulabh also developed a way to convert the dried lumps into odorless granular manure which is easily transported and mixed with soil.
- ***costs & financing***: Land and construction costs of Sulabh's low-cost sanitation program are funded by Indian state governments and by municipal corporations. Individual toilets are constructed as per the subsidy provided by the national or state government. Men pay half a rupee for pay-and-use of complexes with toilet, bathing and washing; women and children use the facilities for free. In complexes with toilet only, use of urinals is free and toilet is pay-and-use.

Key innovations
Sulabh introduced pay-and-use toilets in a context where open defecation was the norm. The introduction of Sulabh toilets has helped to end the practice of open-air defecation and has had a major impact on the environment of the urban poor. In areas where Sulabh Shauchalayas have been installed, about 40,000 scavengers have been liberated from manual handling of human excreta and are being trained for free by the Sulabh organization in other trades; 240 towns are now scavenger-free. The generation and use of biogas from public toilet complexes is also an innovation. At the 68 biogas plants run by Sulabh, biogas from human excreta at a Sulabh complex is converted into electricity for street lighting by a dual fuel engine and is also used to cook food and heat water and buildings.

Key Constraints
Public resistance: Initially Sulabh faced some resistance due to the age-old habit of open defecation; the notion of a clean public pay-and-use toilet was also a novelty. These resistances were overcome through mass awareness campaigns carried out by Sulabh. ***Technical:*** The latrine technology works better where the water table is lower, so the design is modified in areas where the water table is too high in order to prevent possible ground water contamination.

Market characteristics
Out of 950 million people in India in 1995, 700 million either defecate in the open or use unsanitary bucket or drypit privies which expose their communities to health and environmental hazards. Of the 764,000 bucket and dry privies in India, about 540,000 are located in cities.

Background
The Sulabh Social Service Organization mobilizes 35,000 volunteer social workers who work to promote environmental sanitation, waste management, health and hygiene, non-conventional sources of energy, human rights, and social reforms. Besides public toilets, the Sulabh International Institute of Technical Research and Training has designed and operates five low-maintenance waste water treatment plants (LOMWATS) constructed by donors for institutional domestic waste and one for agro-industrial waste, and a Sulabh-developed Thermophilic Aerobic Composter (STAC) solid waste management project for quick conversion of wastes into compost. Sulabh's Centre for Action Sociology also opened a Vocational Training Centre in Delhi in 1992 and started a free basic literacy and health program for slum children in Delhi in 1994.

Sustainability
The twin pourflush latrines have been sustained on a massive scale at both household and neighborhood levels for nearly 25 years.

Replicability
The Sulabh Shauchalaya low-cost sanitation technology is being replicated throughout India as a component of the national government's Integrated Development of Small and Medium Towns (IDSMT) Program. India's Housing and Urban Development Corporation (HUDCO) also gives financial assistance for low-cost sanitation to their beneficiaries. The Sulabh Institute has itself prepared project designs for implementing public toilet complexes in a number of countries, including Bhutan, Nepal, Tanzania, and Kenya. Sulabh has also worked as a consultant on a number of World Bank-assisted rural and urban projects in India. Sulabh technologies, innovations and methodologies are sustainable, replicable, and affordable and are recommended by WHO, UNDP, UNICEF, and the World Bank. UNCHS recognized Sulabh's sanitation system as a global Urban Best Practice at the 1996 Habitat II conference, and Sulabh has been granted Special Consultative Status by the UN's Economic and Social Council.

Key Dates
Dr. Pathak founded the Sulabh organization in 1970. In 1974, the first Sulabh Shauchalaya Complex with pay-and-use toilets plus bathing and laundry facilities with attendant service around the clock was opened in Patna.

Ownership
Facilities are owned by Sulabh.

Documentation
"Sulabh Movement: Aims, Activities and Achievements", "Sulabh Public Toilets and Bath Complexes", Sulabh International, 1995. *Improved Sanitation and Environmental Health Conditions: An Evaluation of Sulabh International's Low Cost Sanitation Project in Bihar*, Edgar F. Ribeiro, Chief Planner, Ministry of Urban Development (India), Model Press, New Delhi, 3rd ed., 1987. The organization also publishes a monthly magazine, *Sulabh India*.

Contacts: Dr. Bindeshwar Pathak, Founder; Dr. P. K. Jha, Advisor. Sulabh Bhawan, Mahavir Enclave, Palam Dabri Road, New Delhi 110-045. Tel: (9111) 555-3823, 555-3370, 555-4844. Fax:(9111) 555-6445.

ASIA

Indonesia: Malang, East Java

Provider Name
Bpk. Agus Gunarti (local resident), Indonesia, Malang, East Java

Secondary Providers
Entirely community-based.

Key features
A small bore reticulated neighborhood sewerage system with off-site primary/secondary treatment, initially serving 70 households plus trucked-in septage sludge (probably up to 20 cubic meters per day), planned, implemented (i.e. 100% self-financed), managed and maintained by the community. Has been replicated in approximately 10 (ten) other neighborhoods, totaling around 1,000 households.

Key innovations
In addition to the 'home grown' nature of the initiative, and the use of small bore technology, a notable innovation is the high level of revenue supplementation from growing and selling aquaculture products from the treatment ponds, from the treatment of imported sludge, and from selling dried sludge.

Key constraints
The approach presents a potential threat to existing institutionalized informal incentives structures which favor more traditional 'end-pipe' sanitation projects in the Indonesian urban development sector.

Characteristics of Beneficiaries
Reliable socio-economic information on the participating communities is not currently available to the author but we know that the residents are mostly lower/middle class owner-occupier kampung dwellers. i.e. not the very poor and not squatters.

Background
The first project was initiated in 1987 by a local resident, an otherwise unskilled bemo driver (small public transport road vehicle). Out of a personal concern for the poor environmental state of his neighborhood, he and a few 'colleagues' designed the system, negotiated to obtain a treatment facility site within the local cemetery next to the river, and marketed the idea to the local citizenry. He received no financial nor technical assistance for this first scheme - "I'm not an engineer, so I read a few books, and designed the system". In 1989, Pak Agus joined the City Sanitation Office, where he has been responsible for replicating his initiative throughout the city. He has followed much the same model, but with some financial support coming from neighborhood women's associations (PKK). This expansion program is ongoing.

Sustainability
The system built in 1987 is still operating as conceived and designed. Sustainability appears to be high. There are no operating subsidies provided.

Replicability
Appears to be high, if the original model is followed (but with tolerance for appropriate technological improvements, especially treatment component). A very low level of absolute and relative subsidy (locally generated) has been necessary for some of the subsequent systems - for instance, Rp. 1.5 million out of a total capital cost of Rp. 31.5 million for a system serving a *kelurahan* of 300 households.

Key Dates
The 'program' started in 1987.

Ownership
The assets are owned by each community.

Documentation
A thesis on the program has been written by a local graduate student and will be translated.

Contact

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ASIA

Nepal: Dhulikhel

Provider Name
Water Supply Users Committee, Dhulikhel, Nepal

Funding & technical assistance
Investment costs and technical assistance from GTZ (German aid); technical support from District Water Supply Office (DWS) as needed.

Key features
- ***services:*** The Water Supply Users Committee makes all decisions regarding operation and management of the new water system and also of public latrines. It hires officials and staff to manage the system, formulates rules of business and service rules, fixes water tariffs and user contribution for sanitary latrines, collects the fees, and decides how to spend revenue. A Technical Unit (civil engineer with stafhas been recruited by the committee to look after all technical matters. The Users Committee decides on applications for new connections and approves the annual operation and maintenance program prepared by the Technical Committee. For ease of coordination the town mayor sits on the committee as an ex officio member and the water system manager acts as committee secretary.
- ***market size:*** A total of 8.000 people, or more than 80 percent of the city's residents, get water from 605 private and 22 public taps.
- ***cost/financing:*** The rates for water use are progressive, rising with the volume of water use. Revenue has been used to pay for repair, maintenance and extension of the pipelines, reservoir and intake.

Key innovations
This the only urban water supply project in Nepal which has been operated and managed fully by the users themselves. The user management approach had previously been implemented in rural areas and it was thought difficult to apply it in urban areas. The project has shown that the approach is successful in the urban areas as well and is better than the top-down management by the government line agency. Incidence of water-borne diseases has decreased. Women and girls spend less time collecting water and use the time for productive purposes and for taking care of children.

Market characteristics
Nepal is a predominantly rural country with 10 percent of its population of 20 million living in 36 municipalities. The pace of urbanization has been rapid since the early 1980s (current annual growth rate, 5 percent). Nepal's municipalities vary from the size of Dhulikhel (10,000) to 600,000 in size. Dhulikhel is a hill town located about 34 km east of Kathmandu. Except for a dense and compact core, the rest of the city is predominantly rural in character.

Background
In the 1980s there was a small water supply system with no house connection. Water supply to the 15 public standpipes was intermittent and erratic. People could not get enough water for drinking and cooking and had to go long distances for washing and bathing. Only 200 households or less than 5 percent of households had latrines and open defecation was common. There was no storm water or waste water drainage. The users in Dhulikhel constituted an ad hoc users committee in 1991 which mobilized residents and raised Rupees 300,000 towards the cost of a water system (about 1 percent of total cost). The committee decided on the total number of users and the placement of distribution lines and vetted applications for house connections. During 1991-92 the program was jointly managed by the District Water Supply Office (DWSO) and the ad hoc committee. On completion of the project all users with house connections elected a permanent committee for a five-year term. DWSO and a German-funded Nepal-wide municipal technical assistance project called UDLE (Urban Development through Local Efforts) provide technical backstopping when necessary.

Sustainability
From the day the scheme was handed over to the community, the communities have been managing the scheme effectively. All maintenance works have also been done by the users themselves. The scheme is proven to be financially feasible.

Replicability
The revenue from the water system balances expenses on salaries, operation, regular repairs, and maintenance. Major repairs, rehabilitation or future expansion will require external financing.

Key dates
The German-funded Dhulikhel Water Supply Scheme was started in 1989 as a component of the Dhulikhel Development Project. The construction of the scheme was completed in 1993/94.

Documentation
Urban Water Supply Project in Dhulikhel, Nepal, Improving Environments through Best Practices, Government of Nepal, National Habitat II Committee, presented at the City Summit, 1996.

Contacts
Mr. M. L. Shrestha, Chairman, Users Committee. Tel: 977-011-61224.
Mr. Bel Prasad Shrestha, Mayor, Tel: 977-011-61324 or 61329.

ASIA

Pakistan: Karachi

Provider Name
Orangi Pilot Project (OPP), Karachi, Pakistan

Funding & technical assistance
BCCI Foundation, social service wing of the former Bank of Credit and Commerce International, and other donors. Karachi Municipal Corporation (KMC)

Key features

- ***services:*** OPP is an action research institute that has developed model program for low-cost sanitation, housing upgrading, home health, family enterprise credit, school, women work centers, and rural development. OPP provides community organization for self management; it does no construction but offers technical assistance to the community which carries out the construction. Since 1988 its work has been carried out by four autonomous institutions: OPP Society to channel funds, OPP Research and Training Institute to manage the Sanitation, Housing and Social Forestry Program and its replication, Orangi Charitable Trust to manage credit programs, and Karachi Health and Social Development Association (KHASDA) to manage the health program.
- ***market size:*** OPP oversaw installation of the latrines, sewers and drains in about half of the Orangi settlement. BCCI Foundation, OPP's sponsor, invited UNCHS (Habitat) to start a sanitation project in the other half of the settlement in 1982. As of November 1993, Orangi residents in the OPP and UNCHS areas had built a total of 76,000 sanitary pourflush latrines, 236 miles (1,243,954 feet) of underground sewerage lines, and 30 miles (160,218 feet) of secondary sullage/sewerage drains at a cost of Rs. 57.2 million. About 80 percent of the drains and two-thirds of the latrines and sewerage lines were build in the OPP area.
- ***technologies:*** Households installed individual sanitary pourflush latrines in their homes. Underground sewerage lines were built to connect these to the city sewerage system
- ***cost/financing:***. Costs were lowered to less than a quarter of what contractors would have charged by using simplified designs for latrines and standardized steel moulds for manholes, and by providing free technical guidance to lane managers. The owners desire to improve their real estate, protect their children's health, and reduce heavy expenditure on medicines to treat sanitation-linked diseases proved powerful motivations for investing in sanitation. When the communities realized that by investing Rs. 1,000 (average one month's income they could get these benefits, they took on the responsibility for sanitation (Rs. 300 for a latrine, 200 for the house connection, and 500 for their share of lane and secondary drain line).

Key innovations
Development approach: OPP took the research and extension (R&E approach which had been extremely successful in the case of small farmers and applied it to the low-income house owners in the katchi abadi. They successfully developed and introduced methods for building their own low-cost sanitation and housing. In this case OPP's R&E activities included simplifying latrine designs and methods of construction, surveying and mapping, preparing models and instructions, finding activists and training them to be lane managers, providing plans and loaning tools, and supervising work. ***Organizational approach***: OPP designed a new kind of organization meant for constructive work, in contrast to the existing anjuman associations which are effective at lobbying and canvassing. After OPP's technicians had surveyed and prepared maps and estimates, the social organizers found an activist who was trained to become a lane manager. The lane manager then held more meetings, created consensus, settled disputes, collected money, and supervised work. ***Financial:*** OPP's cost of R&E activities from July 1981 to November 1993 (construction periowas about Rs. 4 million; residents mobilized Rs. 57.2 million more than 15 times this amount to build the system during the same period.

Key constraints
According to OPP's analysis, there were four key constraints:

1. Psychological: residents initially believed that official agencies would provide sanitation and sewerage for free.
2. Economic: the conventional cost was beyond the paying capacity of low-income families.
3. Technical: residents did not know how to build underground sewerage lines.
4. Sociological: construction of sewerage lines requires social organization for collective actions which did not exist in 1980. OPP overcame each one of these constraints by convincing residents they would be better off doing it themselves, developing innovative low-cost models and methods, training, and innovative organizing.

Market characteristics
Orangi's 1990 population was estimated at about 800,000, including many immigrants from India and Bangladesh. Householders are working class people, including artisans, shopkeepers, peddlers, clerks, and laborers. Average monthly family income in 1990 was around Rupees 1500, and the average Orangi family had invested Rs. 20 - 25,000 in their house, so investing an additional Rs. 1,000 for proper sanitation was not beyond their means.

Background
The unplanned settlement or katchi abadi of Orangi began in 1965 and grew rapidly after 1972. The settlers bought land from dalals and built their own homes. The dalals, who occupied, subdivided and sold land from the 1950s, provided roads and plot markers. Official agencies provided some main roads, water lines, electricity, and a few schools, hospitals and banks. In 1980 bucket latrines or soakpits were being used for the disposal of human excreta and open sewers for the disposal of waste water. Typhoid, malaria, diarrhea, dysentery and scabies were rampant and medical expenses high, conditions OPP calls medieval sanitation. Poor drainage was causing waterlogging and reducing the value of property. Along with the individual household sanitary pour flush latrines, the streets, houses, and private schools have been built by the residents.

Sustainability
Lane sewerage lines and sanitary latrines built with their own money and under their own management are being maintained by the lane residents at their own cost. They have become accustomed to a higher standard of sanitation for which they are willing to pay. They have also gained a high level of skill in both organizational and technical skills and have become less dependent on OPP for guidance.

Replicability
OPP found that house owners can build and maintain 80 to 90 percent of the system but the main drains and treatment plant must remain the responsibility of a central authority. OPP sees its role as the de facto research and extension wing of the municipality and hopes that some day all municipal corporations will recognize the need for such a wing to assist low-income house owners. The Orangi experience did convince the mayor of Karachi, UNICEF, and the World Bank that this kind of internal development by low-income residents dramatically reduces the cost, increases the speed of implementation, and ensures the maintenance of sanitation infrastructure compared to conventional approaches. Since 1988, the Orangi model has been replicated in other katchi abadies in Pakistan. OPP has prepared plans and estimates for the work, trained government engineers to prepare low-cost designs for trunk sewerage, trained community-based organizations and NGOs to implement these projects, and trained local surveyors to assist the CBOs and NGOs (Karachi, Sukkur, Hyderabad, Lahore, and Gujranwala).

Key dates
As a first step a small office was set up in 1980 with a team of social organizers and technicians. For a whole year the focus of OPP's research was on the question: is it possible to lower the cost of sanitary latrines and sewerage lines to such an extent that the house owners could afford to pay for them. In 1981 they presented their plan to the community and work began. Works completed by the end of 1993 are described here.

Ownership
The on-plot facilities belong to the household and the lane sewers belong to the lane organization.

Documentation
Orangi Pilot Project Programs by Akhter Hameed Khan, third edition, OPP, Karachi, January 1994. OPP also has published case studies and monographs along with its quarterly progress report with financial statements and quarterly and cumulative tables of work.

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ASIA

Pakistan: Lahore

Provider Name
Qadri Social Welfare Society (QSWS), CBO, working with Youth Commission for Human Rights (YCHR), independent NGO, Qadri Colony No. 1, Qadri Colony No. 2, and Farooq Colony, Kot Lakhpat area, Lahore, Pakistan.

Funding & technical assistance
Support for YCHR administrative costs received from the Swiss Development Corporation, the Swiss NGO Program Office, and the Department for International Development Fund. The cost of constructing lane sewers (tertiary) and in-house pour-flush latrines is borne entirely by the community, with lane committees also making arrangements for operation and maintenance of lane sewers. The Lahore Cantonment Board (LCB) financed and constructed and maintains secondary and trunk lines.

Key features
- ***services***: Lane sewers, septic tanks, and latrines constructed and managed by community. Sewer lines were laid in 25 out of 27 lanes (92 percent) during the first two years of construction. Once all 27 lanes were completed in Qadri Colony No. 1, the program was extended to Qadri Colony No. 2 and Farooq Colony, where, so far, 4 out of 33 lanes and 7 out of 30 lanes respectively have been constructed..
- ***market size***: Total population of Qadri Colony is about 3,500 people living in 27 lanes. Qadri is a mixed ethnic and economic status community with average monthly household income ranging from 700 to 2,000 Rs. Total population of Kot Lakhpat, which includes Qadri Colonies Nos. 1 and 2, Farooq Colony, and others, is about half a million residents. To date, 22,409 feet of lane sewers in 97 lanes have been laid in the three communities with a total population of about 10,500.
- ***technologies***: Designs for small-bore shallow sewers, pour-flush latrines, and septic tanks are provided by YCHR, based on work done by the Orangi Pilot Project in Karachi (see separate profile). Manhole design was modified based on feedback from the community: it was found that better access for maintenance could be provided with cone-shaped manholes which allow use of bamboo poles to clean clogged pipes. Sewer design also had to be modified to cater for stormwater flows not provided for in the original Orangi designs because of differences in annual rainfall in the two cities.
- ***costs & financing***: Construction is 100 percent community-financed. Cost is three to four times less than for government-financed sewers: Rs 2,000 per manhole and Rs120 per running foot for YCHR model, vs Rs 5,500 per manhole and Rs 210 per running foot for government programs.

Key innovations
Social motivation and mobilization are key components of YCHR sanitation programs. Mobilization of women became a new activity after YCHR realized that the initial focus on men as lane managers and lane committee members reduced the potential for success by excluding the participation of women, who are a crucial group for operation and maintenance. Community motivation is greater than before the project. Pressure from the community welfare society, QSWS, overcame initial resistance by the cantonment board, LCB, which agreed to lay a 100-meter secondary sewer to link the lane sewers to the trunk.

Key constraints
The cantonment board may not always build the primary and secondary sewer lines as indicated in the plans, and lack of interagency coordination can lead to problems. Lane managers sometimes became overloaded with responsibility and found themselves supervising construction on a full-time basis because other committee members failed to contribute their time once contributions were collected; some lane managers could not complete their assignments. Lack of involvement by women was discovered and corrected during the construction stage.

Market characteristics
The low-income communities of Lahore (pop. 7 million), provincial capital of Punjab, lack proper sanitation and sewerage systems. Most of the drains in such localities are open and spilling of sewage is not uncommon; stagnant ponds of liquid waste and heaps of solid waste emit foul odors and foster diseases. YCHR is concentrating its efforts in Kot Lakhpat, an industrial area located in the suburbs of Lahore, and neighboring cantonment Lahore, and is also facilitating introduction of similar programs elsewhere in Punjab by training other CBOs and NGOs from Okara, Kasur, and Faisalabad.

Background
YCHR is a non-profit, non-partisan development organization formed to help the low-service areas of Lahore develop as pressure groups to allow them to participate in the policy- and decision-making process. YCHR is also providing consulting services to the Water and Sanitation Agency Sewer Cleaning Directorate for an awareness campaign and a solid waste management project in a target area of Lahore of more than half a million residents (Bilal Gunj and Walled City). YCHR also runs health education, home school education, and solid waste management programs. Qadri Colony was selected for a low-cost sanitation project by a social organizer from a neighboring colony which had a successful sanitation project because of Qadri Colony's proximity to trunk service. After obtaining basic training from the Orangi Pilot Project, YCHR set out to replicate OPP's low-cost sanitation model in Lahore. Meetings with slide shows were held to mobilize the community and explain the rules for lane committee formation. YCHR carried out surveys, prepared cost estimates and detailed designs, provided technical assistance, supervision and training, and lent tools and equipment – including shuttering for manholes. The community formed lane committees and selected lane managers. The committees collected funds for construction, hired the labor, and supervised the works.

Sustainability
Contributors of funds and labor develop a sense of ownership, resulting in sustainable operation and maintenance. Lane sewers continue to be community-maintained.

Replicability
The success of YCHR's adaptation of the Orangi model demonstrates its replicability, as does its extension to Qadri Colony No. 2 and Farooq Colony (33 and 30 lanes respectively) in Lahore and other areas where YCHR is active. The YCHR sanitation program is also being replicated in other Punjabi cities with the help of YCHR's social and technical training of local CBOs and NGOs.

Key Dates
YCHR was established in 1990. The low-cost sanitation project was launched in Qadri Colony No. 1 in 1992, and construction began in May 1995 and was completed in Qadri Colony No. 1 in 1997. Construction is ongoing in Qadri Colony No. 2 and Farooq Colony in Lahore.

Ownership
The on-plot facilities belong to the household and the lane sewers belong to the lane organization. Responsibility for paying for and maintaining the infrastructure is incumbent on the respective stakeholder.

Documentation
Website document at www.syberwurx.com/ychr/sani.htm. A manual on YCHR's low-cost sanitation program is being prepared.

Contacts
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ASIA

Philippines: Dagupan City

Provider Name
Mr. Marcelino de Vera, manager of the Zamora Street community public toilet in Barangay IV of Dagupan City (216 km NE of Metro Manila), Philippines.

Funding & technical assistance
The local government provided the capital cost of 200,000 Pesos and the engineers of the Barangay Council provided technical assistance.

Key features
- ***services***: The public toilet, located near the Zamora Street of Barngay IV, is a six-seat facility – with three seats each for men and women. Urinals and showers are also provided in each compartment. Two seats are reserved for use of Barangay Council staff, and are also open to public use when demand is high. Mr. de Vera's strategy includes vending water, selling sanitation commodities such as shampoo, sanitary napkins, toothpaste, and bath soap, and providing sanitation facilities all at the same location. The facilities are open 24 hours a day, lit by 20-watt fluorescent bulbs, and operated and maintained by four paid workers/supervisors. The facilities are seldom clogged, though water seals are sometimes clogged due to sanitary napkins or stolen wallets discarded into the pans.
- ***market size***: The facility is serving 175 to 200 shops including local street vendors, along with the passengers of a nearby bus terminus. About 150 customers are using the latrines, 200 are using the urinals, and 50 are using the showers.
- ***technologies***: The water supply comes from the piped water system through two faucets. There is a private handpump to collect water for latrines to minimize the water tax to be paid. The male and female compartments each have a septic tank toilet with a conventional porcelain bowl-seat, a channel urinal, a shower, and an uncovered vent pipe. The facilities have been de-sludged three times since 1988.
- ***costs & financing***: The capital cost of the toilet, built by a contractor, was Pesos 200,000; the cost can be lower if privately constructed. Based on costs as of April 1996, each worker is paid Pesos 65 for 12 hours work, with free snacks and a meal. The electric power bill is Pesos 3,300 a month, including electricity used by the Barangay Office. The water charge is Pesos 2,400 per month, and the rental charge paid to the Council is now Pesos 1,300 (up from Pesos 600 in 1995). Monthly maintenance costs, including plumbers' fees, amount to Pesos 19,000. Users are charged Pesos 0.80 for a bucket of water, one peso for use of the urinal, 3 pesos for use of the toilet plus one tissue for defecation (and half a peso for each additional tissue), 3 pesos for use of the shower, 3 pesos for shampoo, and Pesos 4.50 for a sanitary napkin. Daily income from selling water is 100 Pesos/day (125 buckets) and from selling sanitary products, 100 Pesos/day.

Key innovations
A case study team from the Water Supply and Sanitation Programme Management Office's Department of Interior and Local Government (WSSPMO/DILG) evaluated the reasons for success of this public toilet, which – unlike many others – is well-maintained and run at a profit. Success was attributed to the following factors: Mr. de Vera offers sanitation services as an economic good; the Barngay Council established clear and transparent rules for the charges for using the facilities; Mr. de Vera has properly evaluated both cost and demand and considered the socio-economic profile of his clientele in setting his charges; and Mr. de Vera has the confidence and interest necessary to promote his facility to the clientele. The privatization process helps the Barangay Council to sustain the system and recover the capital cost, provides free service to the Barangay office, and Mr. de Vera claims his own earnings to be higher than those of a rural bank manager.

Key constraints
Lack of established rules was initially a constraint. Once the Barangay Council developed and implemented rules such as "persons going for open defecation or urination will be fined or punished", it became possible to harness private initiative to sustain the system in a cost-effective manner. Currently there is a lack of investors interested in the construction of community toilets. The local government's efforts to maintain their own systems make it difficult for entrepreneurs to replicate the system in peri-urban areas. The lack of information flow to other parts of the province or country also hinders replication.

Market characteristics
Dagupan City, which has a population of 125,000 (1991 census), is an important provincial trading center. Ninety percent of households are served by the Dagupan Water District, and sanitation coverage is 70 percent. The city had a few community public toilets constructed by the city government and then handed over to the Barangay Councils, who have invited private individuals to run them. Some of these public toilets are now being maintained privately by individuals.

Background
Mr. de Vera's successful track record in managing the Magsaysay Market public toilet, badly damaged in the 1990 earthquake, convinced the Barangay Council that he was the right person to manage their community public toilet.

Sustainability
Mr. de Vera has been managing this toilet successfully since it was built in 1988.

Replicability
The case study team concluded that Mr. de Vera's successful experience could be replicated providing that operators follow the same principles of proper assessment of cost and demand, clear charge-setting, and a strong commercial approach.

Key Dates
A public toilet was constructed at Zamora Street of Barangay IV in 1988. In 1995 an additional two seats were added – one for men and one for women – for use by Barangay Council staff; these additional seats are also managed by Mr. de Vera.

Ownership
The facility is owned by the Barangay Council and Mr. de Vera pays a monthly rental fee.

Documentation
Visit report by Rogelio B. Ocampo (WSSPMO/DILG), Ernie T. Demaisip, Marilou R. Mahinay, and Santanu Lahiri, April 1996.

Contacts
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ASIA

Philippines: Manila

Provider Name
Nine UV Waterworks Water Vending Stations, Manila, Philippines.

Funding & technical assistance: Early product development was supported by USAID, the US Department of Energy, private charities and corporate donations. WaterHealth International, Inc. of Napa, CA (USA) invested in production design and manufacturing start-up for US production in 1997. Urminus Industries, Bombay, India, is marketing the product in India.

Key features

- ***services***: Since January 1998, the Manila distributor of UV Waterworks (Michael Lim, Bendix Sales Corp., Makati) has opened eight water vending stations in Navotas, Quezon City (two stations), Mandaluyong, Moonwalk Village, Makati, Benavidez, and the Sta. Mesa areas of Metro Manila, and in the town of San Pedro. At these stations, Pasig River water is first filtered and then run through the UV Waterworks unit and sold to consumers. Another UVWW purifier has been providing clean drinking water to the Lily of the Valley Orphanage in Durban, South Africa, since August 1997. Fifty purifiers are on order for use in rural areas in five Mexican states following testing by the Mexican National Water Commission. Prototypes were tested in ten Indian villages in 1996.
- ***market size***: The UV Waterworks disinfection unit can disinfect 4 million liters of water a year, operating 12 hours a day. Using a per capita drinking water requirement of 10 l/day, a single device can provide drinking water for about 1,000 people.
- ***technologies***: Housed in a durable, molded plastic container about 3 square feet in size (28" x 16" x 11" or 71 cm x 40 cm x 28 cm) and weighing 15 pounds (7 kg), the UV Waterworks purifier is constructed of stainless steel and UV lamps. Water is pumped into the closed unit where it is exposed to 12 seconds of UV light before flowing out a spigot. There are no moving parts. The UV light disables the DNA of pathogens by fusing adjacent thiomide bases, thereby destroying the pathogens' ability to reproduce. Light with a wavelength of 254 nm gives the highest germicidal efficacy, and since this is the wavelength at which a low-pressure mercury vapor lamp emits roughly 90 percent of its light, standard fluorescent lamp technology can be used. The lamp used is similar to a standard fluorescent lamp; in contrast to the phosphor coating of the standard lamp – which absorbs UV light but lets visible light through – the germicidal lamp is made of a special glass that is transparent to UV light, also a standard product. Water disinfected by the unit may be consumed safely for up to 36 hours after disinfection. Pathogens tested include e-coli, salmonella, cholera, shigella, and other enteric pathogens. The unit effectively disinfects water with up to 20 NTUs of turbidity; turbidity can be reduced through use of a settling tank and filters or a roughing filter. UV treatment is ineffective against certain micro-organic cysts with protective coverings such as girardia and cryptosporidium, which can be removed effectively by a flocculating agent, settling tank, or sand filter. Worms and other large organisms are not affected by UV disinfection at the levels of UV used in UV Waterworks.
- ***costs & financing***: The unit costs about $800 retail and is expected to last 15 years with annual replacement of the UV lamp. The full vending station costs about $7,000 including all pumps, filters and tanks. Assuming the system operates for 12 hours a day and the price of electricity is 8 cents/kWh, the cost of electricity to operate the UV bulb in the unit is about $14 a year, or 2 cents per ton of water. Using only about 40 watts of electricity, it provides four gallons of disinfected drinking water per minute. The disinfection process is highly energy-efficient and uses about 20,000 times less primary energy than the standard alternative—boiling water over a cookstove—and releases no carbon dioxide into the air, as does a firewood-burning stove.

Key innovations
The germicidal action of UV has been known for a century but the UV Waterworks is the first device designed to put it to work to disinfect water for poor people. Unlike other UV water purifiers, UV Waterworks does not require pressurized water delivery systems or normal electrical outlets to work. The unit relies on gravity for water flow and can be used with any water source. The only electricity needed is for the UV light, so it can be powered by a car battery, a bicycle pump generator, or solar, wind or hydro power. Because the UV lamp is not submerged in water like other UV-based water purifiers, UV Waterworks requires maintenance (cleaning of the water pan with a rag and bleach) only twice a year. The purifier was designed by Dr. Ashok Gadgil, a Senior Scientist at Lawrence Berkeley National Laboratory, University of California at Berkeley, CA, who also works in the areas of energy efficiency and air toxicity. Dr. Gadgil assigned the patent to UC Berkeley which empanelled experts to select a private manufacturing licensee. WaterHealth International of Napa, CA, was selected to exercise worldwide patent rights (excluding India). Dr. Gadgil was honored by the Lemelson Center for Invention, which donated a purifier unit to the Smithsonian's National Museum of American History in April 1998. The UV Waterworks purifier received *Discover* magazine's 1996 Award for

Technological Innovation in the Environment category, and *Popular Science* magazine's 1996 Best of What's New Award.

Key Constraints
Technical: Where utility grid-provided electricity is either unavailable or unreliable, a variety of renewable energy options – wind, solar, or hydro power – are available from Energy Unlimited Inc., (W. Conshohocken PA) through the manufacturer of the purifier, WaterHealth International Inc. O&M. The unit being tested in Durban functioned well for nearly six months without routine cleaning with bleach (usually recommended every two months) because the unit is functioning round the clock. It resumed functioning to standard once cleaned. The test is scheduled for completion in July 1998.

Market characteristics
Its low capital and operation and maintenance costs make the UV Waterworks purifier affordable to poor communities. The minimal maintenance requirements—cleaning with bleach and a rag once every several months—make it widely adaptable to different operating environments, including disaster relief and remote farms or ranches.

Background
Following an outbreak of cholera in 1993 in Bengal, Dr. Gadgil began developing a simple, cheap UV water purifier himself when he found his colleagues in India lacked resources to undertake the project. Though Dr. Gadgil had been living in the United States since returning to Berkeley from India in 1988 (he received his doctorate at Berkeley in 1979), he vividly remembered the death of cousins from water-borne diseases during his youth in Bombay and knew he could do something about this problem. The first prototype, field-tested in a village in India using a car battery as a power source, produced 8 gallons a minute and was made of stainless steel. The villagers told the researchers it was too big and produced more water than they could use. The redesigned production unit has half the output of this prototype (4 gallons/min) and weighs only 7 kg. Beginning earlier this year, WaterHealth International has been collaborating with a UNICEF pump manufacturer to integrate UV Waterworks with a handpump which can be solar-powered. Dr. Gadgil is providing technical advice to India's largest bank about loans to industries for better environmental management, and is also working on: a low-environmental-impact energy plant for Manaus, Brazil; the effect of indoor air pollution on telecommunications equipment; and energy efficiency in semiconductor manufacturing.

Sustainability
The longest continually running UV Waterworks unit has been operating since 1997. The simplicity of the unit's construction, without moving parts and using easily available components, indicates a working life of at least 15 years.

Replicability
The UV Waterworks unit has been successfully field-tested in laboratory and field conditions on four continents (USA, Mexico, India, South Africa, Philippines). It is in production in California, USA and Bombay, India. Laboratory tests at Lawrence Berkeley using WHO protocol found that water treated by the UV Waterworks purifier contained less than one colony-forming unit of e-coli per 100 milliliters. The unit was also tested at the research lab of the Durban (South Africa) Metro Water District for six months in 1997 prior to installation at the orphanage, and tests are being conducted by the National Water Commission prior to shipment of 10 units each to five Mexican states. Independent tests on the production unit carried out by BioVir Laboratory in Benicia, CA, confirm the efficacy of the unit.

Key Dates
Research began in the summer of 1993. The UV Waterworks purifier won the *Discovery* and *Popular Science* innovation awards in 1996. Laboratory and field tests in Durban, South Africa, were begun in 1997. WaterHealth International, Inc. began production of UV Waterworks purifiers in November 1997. The purifier's inventor, Dr. Ashok Gadgil, was honored in April 1998 by the Lemelson Center for the Study of Invention and Innovation (National Museum of American History, Smithsonian Institution). The US Department of Energy received a unit in April 1998 from the Lemelson Center, for which it plans field tests in South Africa.

Ownership
Lawrence Berkeley National Laboratory holds the patent; patent rights for manufacturing and sales are assigned to WaterHealth International, Inc., and Urminus Industries in Bombay, India.

Documentation

"UV Waterworks: Reliable, Inexpensive Water Disinfection for the World," http://eande.lbl.gov/CBS/NEWSLETTER/NL9/waterworks.html. "Water, Pure and Simple: Winner, Lawrence Berkeley National Laboratory's UV Water Purifier", Seventh Annual Technology Awards, *Discover* magazine, July 1996. Website of WaterHealth International, Inc.: wwww.waterhealth.com. Website of the Lemelson Center: www.si.edu/lemelson.

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LATIN AMERICA & CARIBBEAN

Argentina: Buenos Aires

Provider Name
Community-built water and sewerage system, Barrio San Jorge, Buenos Aires, Argentina.

Funding & technical assistance
The International Institute for Environment and Development (IIED), a Buenos Aires-based NGO, provided community support to this barrio over a ten-year period. Financial support (total US$ 771,000) was provided by IIED, Save the Children–Netherlands, Caritas, Homeless International (UK), IDRC, Misereor (Germany), the Canadian and German embassies, Fundación Antorchas, and other donors (US$ 328,000), the community (US$92,000), and government agencies (US$48,000). GTZ ran a 1990 workshop to develop an integrated community development plan.

Key features
- ***services***: Using US$10,000 provided by the International Development Research Center (IDRC) for a health project in 1992, the community improved the water supply and sewerage system for a pilot group of 25 families. Following success in the pilot effort, additional funding of US$131,000 provided by Misereor (Germany) was used to buy materials to lay pipes and make connections to the rest of the barrio. Despite much skepticism and mistrust, one group of neighbors and then another decided to buy the materials and lay the pipelines in their streets. Within three months, 250 houses were connected. One week before a contractor hired by IIED was to have drilled a well for the non-potable system, the newly privatized water company, Aguas Argentinas, confirmed that an extension of the piped potable water system would reach Barrio San Jorge. Aguas Argentinas took over the operation, maintenance and repair of the system and the residents now pay the agency at a fixed rate for services.
- ***market size***: Barrio San Jorge (1990 pop. 2,400) is located in San Fernando (1991 pop. 143,000), one of 19 municipalities and the federal district which make up the Buenos Aires greater metropolitan area. The barrio's origins are as a resettlement site for 60 families who were moved from areas prone to frequent flooding in 1961. They were joined in 1979 by 200 more families resettled from another flood-prone area. Residents face precarious working conditions and unstable income sources, and incomes are very low: 35 percent of incomes did not cover the cost of a basic basket of food. The settlement is located on the bank of the Reconquista River, heavily polluted by untreated industrial effluents. Most of the land is owned by the Province of Buenos Aires and the Municipality of San Fernando; 6 percent still belongs to a private landowner. In 1990, 55 percent of residents used public standpipes and 39 percent had connected their houses to the same pipeline. Piped water was available for a couple of hours a day at best. Most households used cesspits and latrines, but the water was often contaminated with infiltration from waste water; diarrhea and other intestinal infections were widespread. There were no paved roads, no drainage, and no garbage collection.
- ***technologies***: The water supply uses a double system: one system connected to the water network – which provides small volumes of potable water – and another which draws on groundwater sources too salty for drinking but usable for washing and bathing. The sewerage system is based on a combination of cesspits within each household where solids are retained, plus a small-bore sewage pipe network to carry off liquid waste.
- ***costs & financing***: Financing of community development staff was provided by IIED; capital funds were provided mainly by international donors and private Argentine donations. The community paid for the materials to lay pipes and pays the water company for piped water.

Key innovations
The national government has awarded the project with second prize, out of 600 cases presented, in a competition on social innovation. ***Institutional:*** A ten-year development process gave birth to a representative community organization which changed the status of the settlement. It is no longer illegal as residents' security of tenure and provision for water and sanitation are now managed by the official utilities. Through this project, the private water company, Aguas Argentinas, had its first direct experience working in partnership with a low-income community, an NGO, and a local government. ***Technical:*** Because of the high water table and the lack of a reliable source of potable water, innovative approaches were required. The water supply required the use of a double system: one system connected to the existing network which would provide small volumes of potable water, and another which could draw on groundwater sources too salty for drinking but usable for washing and bathing. The sewerage system is based on a combination of cesspits within each household where solids were retained and a small-bore sewage pipe network. Aguas Argentinas acknowledged the merits of the innovative technology used in San Jorge and has been applying it in other low-income settlements. ***Organizational:*** Poverty is not solved through one or two quick sectoral interventions. Because absolute poverty and lack of external support erode social capital—the norms, trust and reciprocity networks that facilitate mutual beneficial cooperation in a community—low-income illegal settlements need a long and continuous support

program to address the deprivation and renegotiate their status with the authorities. But international funds can play an important catalytic role in helping communities develop their own representative organizations and negotiate successfully with local governments and utilities for provision of infrastructure and services, provided that the lesson of "no shortcuts" is understood.

Key Constraints
Technical: The site occupied by the barrio could not legally be transferred to its occupants because it lies below the minimum elevation required for the protection of permanent settlements from flooding, though this requirement does not take into account lessened flood conditions due to the dredging of the river. ***Institutional:*** There was a lack of commitment by the provincial and municipal governments to respect the agreement of cooperation to improve San Jorge signed with IIED in 1990. A national program to build water networks in low-income settlements emerged unexpectedly in San Jorge in 1994 just when IIED and Nuestra Tierra were about to begin a community pipelaying project, but was never finished. ***Politico-cultural:*** The attitude of many urban poor in Argentina since the 1940s was that the state should provide for their basic needs, and that political patronage was the way to solve many problems. This attitude was promoted by the state, church, and private charities in general, and by the priest who acted as the governor of the barrio – and later by the elected mayor of the municipality of San Fernando in particular – through the 1980s. With the departure of this mayor in 1994 following charges of corruption and the arrival of a new group in the Mayor's office, support began to be given to the work in Barrio San Jorge. The change in municipal government has also been of great importance in accelerating the expansion of the support team's work into other settlements.

Market characteristics
Argentina's largest concentrations of poverty are within the Buenos Aires metropolitan area in precarious neighborhoods and squatter settlements – known as villas miserias – mostly in the peripheral municipalities. During the period of military rule from 1976 to 1983, many such settlements were bulldozed, and later regimes considered them temporary products of economic difficulties which would disappear once the economic crisis ended. Local and provincial governments in Argentina have long mistrusted community-based organizations and non-government organizations.

Background
IIED began work in Barrio San Jorge in 1987. Between 1987 and 1989, several small initiatives were carried out, including a mother and child center, a women's sewing workshop, and purchase of a community center; a bimonthly community news bulletin began publication as well. From 1990 to 1992: IIED signed an agreement of cooperation with the provincial and municipal governments with transfer of property rights the top priority; first elections were held for a neighborhood cooperative, Nuestra Tierra; and the municipality donated an additional seven-hectare site. Between 1993 and 1996, initiatives reached the entire barrio and expanded into other settlements: the water and sewerage system was extended to the whole barrio and was taken over by the newly privatized water company; a building materials bank was set up; a new municipal authority began supporting the work in San Jorge; and the national government approved financing of a housing program for San Jorge and four other barrios.

Sustainability
Despite the failure to get the formal transfer of land ownership, which had been the residents' primary goal, residents have begun investing in their homes and have gained effective security of tenure. With the takeover of the water system by the utility and construction of new community facilities, the community has received the recognition of change of status it was seeking.

Replicability
IIED-America Latina's Community Support Program is now drawing on its experience in Barrio San Jorge, and in the new community built on the seven hectares donated by the municipality – named Bario Jorge Hardoy – to develop comparable support programs for other low-income settlements in the area. The Integral Improvement Program for Barrio San Jorge is becoming the Integral Improvement Program for Five Neighborhoods in San Fernando. In 1996, the national government agency Social Development Secretary approved financing for a five-neighborhood program including the improvement of 1,000 homes and construction of 240 new homes and the provision of a water and sewerage network in Barrio Jorge Hardoy.

Key Dates
IIED began work in Barrio San Jorge in 1987. Between 1987 and 1989, several small initiatives were carried out. Between 1990 and 1992, IIED signed an agreement of cooperation with the provincial and municipal governments with transfer of property rights the top priority item, the first elections were held for a neighborhood cooperative, Nuestra Tierra, and the municipality donated an additional seven-hectare site. Between 1993 and 1996, initiatives reached the entire barrio and expanded into other settlements.

Ownership
The land is still technically government-owned but residents have security of tenure. The water network is owned by Aguas Argentinas.

Documentation
"Reconstructive social capital in a poor urban settlement: the Integral Improvement Programme in Barrio San Jorge", Ricardo Schusterman and Ana Hardoy, *Environment and Urbanization*, 9:1, 91– 120 (April 1997). "Building community organization: the history of a squatter settlement and its own organizations in Buenos Aires", Jorge Enrique Hardoy, Ana Hardoy, and Ricardo Schusterman, *Environment and Urbanization* 3:2, 104–20.

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LATIN AMERICA/CARIBBEAN

Guatemala: Guatemala City, ACOVA

Provider Name
ACOVA - *Asociación Comunitaria de Vecinos en Acción* (Community Action Neighborhood Association) Colonia el Milagro, Municipio de Mixco, Greater Guatemala City, Guatemala

Key features
ACOVA represents some 7,500 families (population estimated at 40,000) in 5,000 households in a marginal area of Guatemala City. After a two year period of negotiations, ACOVA was granted concessionary dominion of the aqueduct in 1995 by the Municipality of Mixco. ACOVA is primarily a water cooperative but it also does community education, organization and formation.

- ***services:*** ACOVA relies on five artesan wells, four of which were municipal property passed on to the cooperative and one which ACOVA has built itself. ACOVA is currently planning to build one additional well. ACOVA is managed by a General Assembly which includes all active water subscribers (i.e. subscribers in good standing) and elects a managing board of 7 members. The board in turn hires a Manager, who works with an assistant and secretary. ACOVA employs 75 persons; 10 in administration, and 65 in maintenance, operations and new construction.

- ***cost/financing:*** ACOVA relies entirely on internally generated funds. It has slowly been replacing parts of the system it inherited from the municipality with new piping and home water meters. It uses a two tier tariff system according to whether or not households are connected to the old or new system. The old system provides water twice a week for a period of two hours (or a total of four hours/week) and people pay a monthly fixed rate of (approximately) US$ 1.50. 50% of the clients are in good standing.

The new system provides water daily, but for only two hours/day and users pay a rate of US$0.30/ m3 for the first 30 meters and $0.55 for every m3 after that. 71% of the users pay without delay

Key constraints
Lack of financing sources; hampered by collection problems. ACOVA is looking for ways to make payment easier. People will be able to pay in banks soon since going down to ACOVA offices may be difficult. Water quality is not "100% potable."

Replicability
Hook up costs are charged entirely to the beneficiary, but are recovered in two years. Initial payments are US$50, followed by monthly payments of approximately US$40 dropping to US$23 in the second year.

Sustainability
Annual operations and maintenance expenses - Q 230,000.oo (not including electricity donated by municipality) which increases to 745,000.oo when administrative costs and the costs of a new well are included; Income is reported as Q1.017,265 leaving a 37% profit margin. Roughly calculated the business seems sustainable. But there are clear subsidies in addition to electrical power. ACOVA pays no corporate taxes and pays no charge for extraction of subterranean water.

Documentation
"Situacion del Recurso Hidrico en la Area Metropolitana Guatemala" Lair Espinoza and marco Augusto Recinos (ECOTEC, Guatemala)

LATIN AMERICA/CARIBBEAN

Guatemala: Guatemala City, ECOTEC

Provider Name
ECOTEC, Guatemala City, Guatemala

Non-Profit Consulting and Engineering Firm specializing in community development through infrastructure: alternative technologies, water, sanitation, electrical power -prefers working with community based organizations. ECOTEC staff includes 12 professionals and 3 support staff.

Key features
Community dialogue; design, studies, cost calculations and financial planning. In 9 years has developed a total of 20 projects; 15 rural groups and urban benefiting a total of some 16,000 families (half urban, half rural.) Water and sanitation represent about half of their work since they specialize in projects which are not gravity driven - i.e. where water must be powered by pumps and on-site electrical generators, particularly solar and wind powered.

Another half of their work involves education, local economic development, legal support and health projects.

ECOTEC also helps groups find financing and has experience with some of the banking organizations which finance local water and sanitation.

ECOTEC has been in operation for 9 years and appears to be sustainable economically. ECOTEC does not seek grant financing, although it is employed by grant-funded and grant-driven agencies. One of its serious constraints lately has been government policy to outsource development work in response to pressures to down-size. The result has been that most planning and community development contracts are going to former government employees who have been put out of work.

- ***cost/financing:*** ECOTEC charges $150 - 200/ day for technical consultants and $300 for coordinator, or senior consultant's time when it is working for international agencies. It charges communities its expenses and a symbolic charge usually less than 1% of project cost.

LATIN AMERICA/CARIBBEAN

Guatemala: Guatemala City, GTEA

Provider Name
Nimja and El Pozón, Independent providers (two separate companies) - belong to a federation the: *Gremial de Transportistas Extractores de Agua GTEA* - founded 1997. Nimja is a corporation owned by 7 stockholders. El Pozón is owned by a single individual.

Key Features
Nimja and El Pozón deliver water service to diverse neighborhoods through tank trucks. Each company owns artesan wells and trucks and serves clients from residential, commercial and restaurant sectors. El Pozón has three trucks and four employees, NIMJA 7 and 14 employees. (There are more than 20 such businesses listed in the Guatemala City telephone directory.) The client group is limited to those who have large holding tanks (2,000 gallons.) However, this does not necessarily exclude poor neighborhoods, since many informal communities have constructed community water holding tanks.

Each company maintains its own artesan well(s) on privately held land. There are no limits to extracting subterranean water by law, although no wells may be drilled within 200 meters of a municipal well.

- ***cost/financing:*** 2,000 gallons costs between US$18 and US$25 depending on the distance, or between US$2 and $3 per m3.

Key innovations
The independent water providers have formed a federation (see above). They also work in neighborhoods where EMPAGUA, the municipal water company supplies water to community water tanks, competing with EMPAGUA for lower costs. El Pozón for example owns one 200 foot well and pump which have been operating since 1990. Nimja has a 600 foot well in operation since 1992.

Sustainability
The total income and expenses of the private operators belonging to the GTEA is estimated at Q50,000,000.oo per year and Q10,000,000.00

LATIN AMERICA/CARIBBEAN

Haiti: Port-au-Prince

Provider Name
Water committees, Comités DLO (d'Eau), Port-au-Prince, Haiti

Funding & technical assistance
GRET (Groupe de Recherche et d'Echanges Technologiques), a French NGO, runs water supply component of a broader emergency program funded in low-income urban areas since 1994 by the European Union (EU) which also covers health, nutrition, and sanitation. EU also funds FIL (Fond d'Investissement Local), which provides matching funds to communities for other local investments.

Key features
- ***services:*** Old standpipes are repaired and new ones placed where communities indicate they are needed. Comités DLO are chosen by each community and they negotiate and contract with the local water company, CAMEP (Centrale Autonome Métropolitaine d'Eau Potable), for a set volume of water to be delivered at a set time each day to local storage tanks. CAMEP agrees to sell the water at wholesale price and sends one bill per standpipe. CAMEP gains customers it would not otherwise have reached and communities get water closer to home for about a third less than from other sources.
- ***service area:*** During the pilot phase (09/95Ð11/96), 32 standpipes were brought into service in 8 quartiers (neighborhoods). As of 09/97, a total of 70 standpipes in 11 quartiers had been brought into service, serving a total of 150,000 poor residents.
- ***technologies:*** Each quartier is served by two to five standpipes. They are supplied from storage tanks pipefed from CAMEP's watermains. Each tank supplies one day's water to one or two standpipes. Each standpipe has three to four taps and a sales kiosk with a water meter from which the water seller (fontanier) turns the taps on and off and collects fees. Galvanized steel pipe is used because PVC cannot withstand being driven over by heavy trucks and is subject to vandalism and incorrect installation. This solution was adopted in preference to trucking water despite the additional investment cost because it is cheaper to operate, it delivers better quality water, and it serves CAMEP's objective of recapturing its market as a public monopoly rather than involving private entrepreneurs.
- ***cost & financing:*** CAMEP bills the comités at 15 Gdes/m3 (compared to as much as 50 Gdes/m3 residents pay for non-standpipe water sources, and about 10 Gdes/m3 paid by other CAMEP customers). The comités charge their customers the same price (0.3 Gdes for 20 l bucket) and hand over the money promptly to the GRET office. There are no collection problems and GRET can pay bills promptly. The first year's experience indicates that about a third of the revenues go to pay CAMEP. Remaining funds go for fontainier fees, maintenance costs; any extra can be used to seek matching EU FIL funds.

Key innovations
- Paying for standpipe water, which had historically been free, has been accepted in a community context where comité members are volunteers and water is delivered in a spirit of community service rather than private gain. The whole community and its power structure jointly responsible through the comités for water payment works because the community knows everyone would suffer without the water and the comité knows it would lose face.
- Because controlling water confers great power, all existing power holders have become involved and made their influence felt in the selection of comité members. GRET had also sought to establish grassroots involvement by creating resident subcommittees but this has not materialized.
- The possibility of using excess funds to obtain matching EU FIL funds for other local improvements such as road and drain maintenance constitutes a powerful incentive, and communities which have been able to get matching funds have been very satisfied. However not all communities have had extra funds because of social and technical problems they have encountered.
- During 1997, a new experiment was underway in one quartier to group into a single billing arrangement both individually connected households (500 new connections planned and standpipes for poor or physically inaccessible areas within the same neighborhood.

Key constraints

- Because of supply problems CAMEP has not consistently provided as much water as residents would like. Also the water prices charged have sometimes been higher than the expected tariff, and sometimes the standpipes close before everyone has their water.
- While the volunteer character of comité management is in harmony with the community's preferences and fontanier turnover is low, it limits the pool of labor. The fontaniers were to have been remunerated on a commission basis but so far the comités have paid flat fees to limit their exposure. In some areas the comité plumber and treasurer also seek remuneration.

Market characteristics

Consumption is stable at around 19 l/day/resident, not including well and rainwater. Water purchase prices can vary from 25 to 100 Gdes*/m3 depending on seasonal and market factors. The average cost per household per day was found to be about 5 Gdes, about 10 percent of the "minimum official salary." High cost is the main complaint, followed by the low quantities of water available to them. But households' first criterion when choosing water source is proximity and water quality is second. A survey of three representative low-income quartiers prior to the GRET pilot indicated that most poor households get water from multiple sources. There were no working public standpipes in the quartiers surveyed. Three-quarters of households collect rainwater and 60 percent buy water from neighbors with house connections. But since only 13 percent of Port au Prince's 1.6 million residents were served by individual connections in 1995, other solutions are also necessary: 46 percent of households surveyed buy from a truck-filled private storage tank, and 41 percent buy or are given water from private wells; 10 percent buy water from private water carriers. Use of truck-filled community storage tanks installed by international donors including WHO and UNICEF was often suspended during the 1991Ð94 embargo (no gasoline for trucks) and ceased altogether once donors' subsidies dried up. Truck-delivered water remains prohibitively expensive. Traditional springs in the hills have shrunk because of deforestation and erosion and are distant and difficult to reach.

Background

More than half of Port-au-Prince's population of about 1.7 million lives in bidonvilles or slums. The city's population has doubled since the fall of the Duvalier government in 1986 while the water distribution system has deteriorated and coverage has shrunk. Water is available for a few hours a day in the best case and a few hours a week in outlying areas. Many new bidonvilles are made up of immigrants uprooted from their rural homes in the political turmoil of the last 15 years and political and economic issues imbue every aspect of life.

Sustainability

The comités have demonstrated that they can make a commercial system work and abide by the contract with CAMEP, as long as GRET is there to accept financial responsibility. The phase of handing over the management and payment to the community will take some time.

Replicability

CAMEP does not lack water sources but water losses are about 50 percent. Flat monthly tariff rates ranged from 56 to 135 Gdes/month in 1994. Water tariffs do not cover production costs. CAMEP would like to install meters and switch to volume-based tariffs.

Key dates

GRET has run the EU water supply component since 1995.

Ownership

All water in Haiti belongs to the state and all wells must be registered. CAMEP owns all its infrastructure.

Documentation

Case study, Approvisionnement en eau et assainissement dans les secteurs a faibles ressource financières, Ville de Port-au-Prince (Haiti), 9 pages, 1997.

*(1$US=15 Gdes)

LATIN AMERICA/CARIBBEAN

Paraguay

Provider Name
Aguateros, owners of private piped water systems (aguaterías), Paraguay.

Funding & technical assistance
Aguateros provide all their own financing from income, and all their own technical assistance by hiring each other for specialized work.

Key features

- ***services***: Aguateros provide piped water to households in areas not served by the public water utility. They construct the well and plant, lay the pipes and install the connections, and also carry out such system construction work for second parties. They also provide installment payment plans to help customers pay for the hookup charge (in 12 to 24 monthly installments). They do not usually install meters unless the customer requests it or for customers that are heavy users, such as small industries. Some larger aguaterías usually add chlorine to the water, while others argue that deep-well water is potable without chlorine. There is little concern about water-related illnesses because people in Paraguay are used to having good water, whether piped or from wells. Lack of water pressure is a common customer complaint along with frequency of service interruption. There is a great spread in the quality of services offered in terms of pressure, continuity of service, and length of hookup payment period (up to 35 months). Customers of newer systems seem to have fewer and less serious complaints.
- ***market size***: There are 300 to 400 aguaterías in Paraguay, about two thirds located in the central area of greater Asuncion. Though their systems are sometimes interconnected to each other, they seek to avoid direct competition with each other, being of the opinion that competition is good for consumers and bad for the aguateros. Such price competition that does take place occurs around the borders where two systems grow into each other. Only by miscalculation would an aguatero enter an area where the public water company already operates or is about to operate; competition from the public water company is regarded as unfair because of government subsidies. However the threat of entry by public water services influences some aguateros to keep their prices relatively lower and quality higher. On the low end there are many "mom-and-pop" aguaterías, or vecinos, small neighborhood systems serving 5 to 40 households from a single well. In the middle are entrepreneurs with one to three systems or medios, and on the high end there are the grandes, about ten large operators with 3 to 20 systems, averaging about 800 households for each operator. One of the steps in going from medio to grande is often to register as a limited company. An aguaterías in the central area of Asuncion is operating units of about 300 connections with a separate plant for each 300 connections. A typical 4-inch-diameter well with a pump of 3 hp has a capacity of 14,000 l/hour, sufficient to supply about 100 to 130 households with an average consumption per connection is 1,000 l per day.
- ***technologies***: The typical system consists of one or more deep wells with a submersible pump, a ground-level reservoir, centrifugal motors, and a hydro-pneumatic tank. The distribution network is made of polyethylene pipes typically 1 to 2 inches in diameter. A less common version found in systems constructed in the 1980s uses an elevated tank between the reservoir and the distribution system. The great majority of systems have the well and tank in the same location. In the Central area, wells are 80 to 135 meters deep; the deepest well was 156 meters in the Central area, with one 240 meters deep drilled by a Brazilian company in Encarnación. One larger well of 5 inch diameter and a 7.5 hp pump serves more than 500 households.
- ***costs & financing***: All capital and operating costs are financed by the aguateros. A typical 300-connection system in an area 20 km from Asuncion where land costs are low would cost about $190 per connection (Gu 413,333), or Gu 124 million for the system (roughly $60,000). Excavation and laying of the pipes would amount to about 60 percent of the cost, and land and plant cost, including excavation of wells about 40 percent. The operation and maintenance cost would be about $4.60 a month (Gu 10,000), with about a third going to payroll , 40 percent to electricity charges and the rest to depreciation charges for the wells and tanks. The capital cost would be about 50 percent higher in an area within the city where both land and excavation costs are higher; O&M costs in this case would be about $6 a month. The average price of a connection ranges from G400,000-800,000 (US$186–372), with prices ranging up to $500 in certain areas. The most common monthly consumption charge for unmetered connections is around G12,000 to G14,000; for metered connections the charge per m3 ranges from G900 to G 1,900. Average minimum consumption is around 10 to 12 m3.

Key innovations
Quality of technical construction and profitability are enhanced by the practice of do-it-yourself for work in which aguateros are specialized, with aguateros specialized in other tasks hired to perform other tasks; for example, those who are engineers design their own systems and hire other aguateros who are electricians to do their electrical work, and vice versa. Aguateros are tough on non-paying customers and consequently they do collect the money within a month or two, using the threat of termination of service, followed by high reconnection fees.

Key Constraints
Technical: The distribution system is the most trouble-prone. Even when pipes are installed at sufficient depth (70–80 cm), rain and the poor quality of roads mean that the surface level of the road sinks over time. The pipes then come too close to the surface and break, especially when tractors drive over them while repairing the road. ***Financial****:* The aguateros see the difficulty of gaining access to sufficient and reasonably priced credit as one of their main problems and limiting factors of expansion. The aguatero must come up with other collateral than the aguatería itself and the interest rates charged are seen as prohibitively high (around 35 percent).

Market characteristics
Aguaterías in areas where water is scarce or which are of recent construction often reach full coverage of households. In more established areas where water is easy to extract from deep wells (semi-artesano), the expansion is slower, with coverage typically reaching about 50 percent after five years because most new constructions opt for piped water. The contract between the aguatería and the consumer is most often for five years, the maximum duration allowed by law. Consumption per household tends to increase over time from a low use level of 3–4 m3/mo. to 20 m3 or more because people become used to having water on tap and also are likely to install flush toilets and washing machines once they are connected. Consumption is lower in metered households, around 10–12 m3 and up to 16 m3 in the summer, compared to 30 m3 and more in unmetered areas.

Background
Aguatero lore relates that a Paraguayan engineer built the first aguatería in 1980 on returning from the USA, where he had visited small private water systems; the second was built in 1985 by two brothers who brought back the idea from work in Guinea Bissau. Seeing this, a neighboring water vendor decided that piped water was the future and built the third aguatería. The numbers increased in the early 1990s on the expanding urban fringe of Asuncion, ahead of public sector coverage. Growth slowed recently due to economic slowdown and the possibility of expropriation as part of pending water sector legislation.

Sustainability
Aguaterías have been operating successfully for a good ten years and quality of service is increasing as experience, competition, and customer activism have increased over time. The business strategy of most aguateros is to grow first and reap profits at a later stage; they are in business for the long run. In fact because of lack of credit, all internally generated funds must be reinvested for two to four years before any real profits materialize. The aguateros boast that they can set up a functioning temporary system with a functioning well and connections within two weeks, and this approach is necessary because their only source of income and their principal means of finance is the connection fee.

Replicability
Expansion of aguaterías' coverage has slowed for two reasons: market saturation is approaching and growth areas harder to find, and the aguateros' investment has reached a scale where it has become attractive for a potential takeover. There are currently proposals for legislation which would transfer all water supply rights and ownership of systems to the private sector by selling water supply rights to large geographical areas. This proposal is termed "expropriation" by the aguateros, since there is no mention of compensation to aguateros losing ownership of their systems. The proposed geographical areas are also considered too large for a single aguatero to bid for. (This transfer would not apply to systems run by rural sanitation committees (Juntas de Saneamiento) created to own and operate rural water supply systems in rural communities with the support of three projects funded by the World Bank in 1997–1992 and executed by SENASA, Servicio Nacional de Saneamiento Ambiemental, a government agency under the Health Ministry responsible for water and sanitation in Paraguay's rural areas).

Key Dates
The first systems were built in the early 1980s and rapidly multiplied during the late 1980s and early 1990s. Growth has slowed in the late 1990s because of market saturation and legislative and regulatory uncertainties.

Ownership
All aguaterías systems are owned by aguateros. Assuming the study's minimum of $200 capital investment per connection and making a gross estimate that the number of connections is at least double the 130,000 found in a SENASA 1992 survey (which underestimates the present number of aguaterías by about 50 percent and also underestimates their average size), the total investment would be on the order of $25 million.

Documentation
Untitled, unpublished report of unnamed consultant on aguaterías, carried out in 1997 as part of preparation of Fourth (Rural) Water Supply and Sewerage Project for financing by the World Bank.

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