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Provision of Water to the Poor in Africa

Experience with Water Standposts and the Informal Water Sector

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Abstract

Standpipes that dispense water from utilities are the most common alternatives to piped water connections for poor customers in the cities of Sub-Saharan Africa. Fifty-five percent of the unconnected urban population relies on standpipes as their first water source. Other informal water providers include household resellers and a variety of water tankers and vendors, which are the first water source of 1 percent and 3 percent of the urban population, respectively.

In the cities studied, the percentage of unconnected households ranges from 12 percent to 86 percent of the population. The percentage of unconnected people covered by standpipes is substantially higher for countries with higher rates of household connection, while the percentage of unconnected people covered by water tankers or water vendors is higher for countries with lower rates of household connection.

Water prices in the informal market are much higher than for households with private connections or yard taps. Although standpipes are heavily subsidized by utilities, the prices charged by standpipe operators are closely related to the informal water reseller price. Standpipe management models also affect the informal price of water. For example, the shift from utilities management to delegated management models without complementary regulation or consumer information has often led to declines in service levels and increased prices.

Standpipes are not the only or even the most efficient solution in peri-urban areas. Programs that promote private household connections and arrangements that improve pricing and services in the household resale market should also be considered by policy makers.

This paper—a product of the Sustainable Development Division, Africa Region—is part of a larger effort in the department to improve the global knowledge base on African infrastructure as part of the Africa Infrastructure Country Diagnostic. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The author may be contacted at skeener@worldbank.org.

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EXPERIENCE WITH WATER STANDPOSTS AND THE INFORMAL WATER SECTOR

Sarah Keener, Manuel Luengo, and Sudeshna Banerjee

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Sub-Saharan Africa is the fastest urbanizing region in the world, a phenomenon accompanied by growth in informal settlements. At the same time, its GDP per capita has been falling at an annual rate of 0.66 percent (WDI 2007). This combination of urban growth and economic recession has contributed to the expansion of informal settlements (Fay and Opal 2006). For example, for the 24 Sub-Saharan African countries included in this study, total population grew at an annual average of 2.5 percent, while the growth of slum population has doubled at 4.43 percent in the past decade.

Countries have been unable to match investment and maintenance in urban water and sanitation services with urban growth and have not prioritized expansion in informal settlement areas. Utilities, central actors in service delivery in the urban context, face risks and transaction costs in doing business in informal settlements; these include the unclear legal status of many residences in these areas, which increases the possibility of demolition of the settlement (Kariuki and others 2003), as well as physical challenges to planning networks for haphazard residences that may be later changed or regularized. At the same time, incentives to perform according to financial targets have discouraged utilities from prioritizing expansion in these areas.

The situation is especially acute in post-conflict areas. The urban process is accelerated by people from refugee camps and insecure rural areas that stream into unplanned urban areas. At the same time, conflict, particularly prolonged conflict, exposes infrastructure to deterioration, and diverts the attention of utilities away from improvements in finance, continued investment, and management. High-conflict countries tend to have higher percentages of unconnected population (table 1.1).

The gap in private water connections in urban areas has been filled by a wide range of alternative water providers. These include suppliers such as public standpipes/kiosks (part of the formal water sector), and alternative sources in the “informal” water market. In addition, households seek their own alternative free sources by harvesting rainwater, drilling shallow wells. and collecting surface water. The ability of the alternative suppliers to provide an adequate service to unconnected people is still under debate, but the literature recognizes their important role. That recognition is beginning to give us a better understanding of the function of alternative suppliers in water provision to the urban poor (Collignon and Vézina 2000; Kariuki and others 2003; Kariuki and Schwartz 2005; Keener and Banerjee 2007).

The unconnected market is heterogenous and made up of many players. Figure 1.1 presents the different categories of alternative providers considered in the study according to the relationship to the water source and technology employed in water service delivery. The formal alternatives include public standpipes/kiosks, which can be managed under a variety of schemes. The informal alternatives include sources that resell network water. In most countries with low- to medium-coverage, the most important informal source is people who resell water directly from their house connection. Given its importance, it is surprising that there are so few in-depth case studies of the prevalence of this practice, its coverage, and its market dynamics.

Table 1.1 Slum and unconnected population sorted by conflict incidence

Conflict index	Country	Slum urban popula (% of total urban pop
High	DRC	50
	Sudan	86
	Uganda	93
	Angola	83
Medium	Ethiopia	99
	Mozambique	94
	Rwanda	88
	Côte d'Ivoire	68
	Namibia	38
	Chad	99
Low	Kenya	71
	Lesotho	57
	Nigeria	79
	Ghana	70
	Benin	84
	Burkina Faso	77
	Niger	96
	Senegal	76
	South Africa	33
	Malawi	91
	Zambia	74
	Cameroon	67
	Cape Verde	70
	Madagascar	93
	Tanzania	92
	Mauritania	94
Average		77.73
High conflict index		78
Medium conflict index		81
Low conflict index		76

Source: UN Habitat 2005; AICD DHS/MICS Database, 2007.

Note: The conflict index is a compound indicator that takes into account four different measures related to conflict incidence: lapse of time since the last violent conflic

* 2001 data ** latest available data.

Figure 1.1 Typology according to source and technology employed

		Relationship to source	
		Dependent (source supplied by utility)	Independent (develop own source)
Technology employed	Small piped network (SPN)	Community SPN Private SPN	Community SPN Private SPN
	Point source	Public standpipe Private standpipe (kiosk) Household reseller (informal standpipe)	Private standpipe (kiosk) Community standpipe
	Mobile distributor	Water tankers Carters: Animal traction carters Hand carters Water bearers	Water tankers Carters:

Source: Kariuki and Schwartz, 2005

Mobile distributors, often referred to as vendors, supply a large share of the urban unconnected population in only a few countries. Private standpipes dependent on network water are even more rare. Non-network sources include small-scale independent providers (SSIPs)—businesses or people that sell water from sources they have developed or found such as boreholes, wells, or even rivers. In the past decade, these various sources, which together comprise the “ informal”water market, have gained more attention from the development community.

This paper summarizes the available knowledge on standpipes and the informal water sector, focusing primarily on coverage, price transmission mechanisms, regulation, and standpipe management in urban Africa. It identifies gaps in the research and outlines priorities in terms of future field work to fill those gaps. In preparing the paper, we performed an extensive review of all of the available literature on the topic and analyzed data from a subset of African countries (see below). Another objective of the study is to design indicators that show cross-country comparisons of the structure of the informal water market and its relative importance.

The paper draws upon two data sets, the AICD DHS/MICS database 2007 and the AICD WSS database (2007). The first database relies on 63 national Demographic and Health Surveys (DHS) covering households in 32 countries. This DHS database provides information on water services at the urban level based on household surveys. The second database, AICD WSS, is based on surveys of government officials and utility staff in the largest city of each of 24 countries in Africa [1]. Existing independent case studies based on sector-specific field research were used to fill specific data gaps and to test the validity of some utility-reported data appearing in the AICD WSS database (2007).

A study on the unconnected market is complicated by data constraints. The AICD DHS/MICS database (2007) on water coverage is very comprehensive, but the breakdown of water by source does not include household water resellers of water as a separate category; it therefore misses the coverage

[1] With the exception of Kaduna, Nigeria, the AICD 2007 Database is based on information collected during January – July 2007 in 24 countries in Africa, and included a module on SSIPs for the largest city in each country.

information of an increasingly important informal water service provider.[2] DHS data refers only to a primary source of water, and it fails to capture the fact that households in sub-Saharan Africa, and in particular the urban poor, are increasingly forced to rely on more than one source of water. In the case of the AICD WSS database, data is divided between information coming from utility staff and government documents (74 percent) and independent studies (10 percent);[3] comparing these two data sources provided for a more accurate assessment of what the current multi-country data sources were missing. Comparison of case studies and the AICD analysis on the informal sector revealed that there was serious bias depending on the source. Independent studies note that information from the utility or the government overestimated the coverage of the population by standpipes and underestimated the extent of the informal water sector. Because of these caveats, comparable cross-country information (DHS) on the urban informal water sector is most likely to provide an indication of its *minimum* coverage rather than an overall coverage level.[4]

There is tremendous diversity among countries in the size of the unconnected market as well as in the composition of coverage provided by each water supplier. The unconnected urban population can be anywhere above 80 percent in Uganda, Mozambique, Rwanda, Nigeria, and Madagascar. In contrast, the middle-income countries in Southern Africa—Namibia and South Africa—have 21 percent and 12 percent unconnected urban population respectively. Central and Eastern Africa rely to a greater degree on standpipes (almost as important as house/yard connections); Western Africa has slightly lower reliance on standpipes (21 percent of the urban population) but substantially higher reliance on wells and boreholes (37 percent of the urban population), which can also capture a portion of the informal sector market. It is interesting that ECOWAS countries, despite being only slightly richer in per capita terms than central ones, enjoy much better piped water coverage (table 1.2). This regional (DHS) data must be interpreted with caution, because informal water sellers can show up under several categories: “standpipe” (SSIPs), “boreholes” (SSIPs), “house connection,” and “vendor.”

[2] While DHS surveys ask respondents about water vendors, the informal water sector can take many forms, from resale of water from house connections, to resale from boreholes, to more traditional mobile water vendors who may obtain water for a variety of sources (including public standposts); some households who purchase water from their neighbor’s piped connection categorize this source as piped water from a house connection rather than a vendor, particularly in countries where such purchase is illegal or discouraged. By the same token, the DHS surveys asking about standpost use do not distinguish between public, private, network or non-network standposts. In addition, much of the cross-country data only accounts for a primary source of water, when in fact poor households may regularly rely on multiple sources for different uses. Nonetheless, to date the only available cross country primary data for urban areas comes from these imperfect sources.

[3] Due to the common problem of lack of adequate records for the informal sector, about 16 percent of the information on the 24 largest cities in the study was not available.

[4] Comparison of case study data with DHS data suggests that households reliant on resale from neighbor’s taps are likely to report in categories other than “vendor” (for example, private tap, standpost, etc.).

Table 1.2 Urban households connected and unconnected to piped water by region

Percent

		Unconnected					
Region	Connected	All unconnected	Standpipes	Wells and boreholes	Surface	Vendor	Other
West	28	72	21	37	6	7	0
Central	34	66	32	14	16	1	3
East	37	63	31	20	8	1	3
South	65	35	22	9	3	0	0
Total	38	62	25	24	7	4	2

Source: AICD DHS/MICS Database, 2007

Most utilities have pursued expanded coverage and financial viability primarily via household connections, which are typically used to subsidize the cost of standpipes. Almost no urban utilities have pursued standpipes as a primary mode of expansion of coverage.[5] The percentage of unconnected people covered by standpipes is substantially higher for countries with higher household connection rates. In countries with medium to high household connection rates, 71 percent of the unconnected population relies on standpipes, on average. In countries with low to medium household connection rates, 48 percent of the unconnected population relies on standpipes, on average; and in countries with very low household connection rates, 32 percent of the unconnected population relies on standpipes, on average. The very existence of a relatively expanded water network has spillover effects, allowing better access through standpipes.

The prevalence of the informal market is directly linked to the household connection rate. Not surprisingly, the DHS data show that the percentage of unconnected people covered by water tankers or water vendors is higher for countries with lower household connection rates. Countries with very low household connection rates have 13 percent of their urban unconnected population that relies on either water trucks or water vendors, on average. In countries with low-medium household coverage rates, 4 percent of the urban unconnected population relies on either water trucks or vendors, on average; for countries with medium-high household coverage rates, only 2 percent of the urban unconnected population relies on either water trucks or vendors, on average.

Standpipes

Standpipes represent the main source of water for unconnected households for most cities. Therefore, it is particularly important to take them into account if one is to understand not only the characteristics of water coverage but also the dynamics of the water market and supply chains. Average standpipe coverage in the cities studied is 28 percent, but standpipe coverage can provide up to 53 percent of the water supply for the unconnected households (table 1.3). These results are very much in line with the widespread belief that standpipes are the main water source for the urban poor and that the poor are likely to comprise a

[5] In recent projects in urban Burundi, there is a greater focus on standpipes, largely because of constraints in bulk water supply and capital financing.

larger proportion of standpipe users.[6] The wide inter-city variation in standpipe coverage implies that the policies governing standpipes need to be tailored. The approach to standpipes in Johannesburg, where this source provides almost the totality of coverage to the unconnected and disconnected, will clearly differ from that in Khartoum, where water vendors abound and there is only marginal standpipe coverage, or from that in another country where some portion of standpipe users may actually be eligible for house connections but unable to pay the high connection fees.

The "real" coverage of public standpipes falls when the results of independent sectoral surveys are compared to the official data from utilities and governments. Independent studies assessed the coverage provided by standpipes as well as by other alternative providers in detail and made it possible to compare results with official statistics. In Maseru, the capital of Lesotho, for example, MICS data revealed about 50 percent of the urban population did not have a piped connection but the utility assumed that this segment was reliant on its free public standposts. However, an earlier detailed sectoral survey undertaken in Maseru in 2002 showed that coverage by free public standpipes was as low as 16 percent of the population, with the coverage among the unconnected falling from 100 percent to 24 percent of that population group (Sechaba/Hall 2002).[7] In spite of the three year lag between surveys, it is unlikely that this accounts for the differences in these numbers. Similarly, in Ethiopia the formal standpipe coverage is overestimated, with the gap filled by resale from household connections.

Utility data deviate from sectoral household survey data in estimating standpipe coverage. The most common way utilities calculate standpost coverage is to multiply a "standard" number of people using a stand post (300–500ppl/standpipe) by the number of existing standpipes.[8] This estimation, however, can be highly inaccurate as it cannot take into account the variety of factors that affect the real usage of standposts (geographic distribution relative to population, distance, water pressure, operating hours, functioning or non functioning). In Ouagadougou, for example, the number of people that rely on standpipes was often calculated using a rate of 700 people per standpipe. However, detailed field studies showed that the real coverage was much lower; as a result, the utility reduced that "standard" number from 700 to 300 people per standpipe for water studies.[9]

[6] Standpipe users have higher incomes than those with no access to standpipes at the national level. The poorer rural population relies on less-improved water sources than standpipes. However, within urban areas, and in particular within primary cities, standpipes represent an important water source for lower income residents.

[7] These figures are likely to have changed. Since this study was completed, the WASA (the water utility) has undertaken a new standpost program focusing on token run standposts, with apparent success.

[8] For all the cities for which we could only rely on utility's information, coverage was calculated this way.

[9] Personal communication with Seydou Traore, WSP, on September 25, 2007.

Table 1.3 Coverage of water supply in the largest cities

23 cities included in AICD study

				Other				
Country	Largest city	Household connection (%)	Standpipes/ kiosks (%)	Water tankers (%)	Household resellers (yes/no/%)	Water vendors (yes/no)	Small piped networks (yes/no)	Ratio of stdp-kiosk/ unconnect. (%)
Benin	Cotonou	31	N/V	N/A	yes	no	yes	N/V
Burkina Faso	Ouagadougou	34	61	N/A	no	5	no	92
Ethiopia	Addis Ababa	39	40	N/A	yes	yes	no	66
Mozambique	Maputo	26	26	N/A	26	yes	12	35
Niger	Niamey	31	21	N/A	no	10	no	30
Nigeria	Kaduna	48	2	N/V	yes	yes	no	3
Rwanda	Kigali	35	51	3.21	10	no	no	79
Senegal	Dakar	77	19	N/A	yes	no	no	81
South Africa	Johannesburg	88	12	0.24	no	no	no	98
DRC	Kinshasa	36	N/V	N/A	yes	no	yes	N/V
Ghana	Accra	56	N/V	N/V	yes	yes	no	N/V
Kenya	Nairobi	51	41	N/V	no	8	9	84
Lesotho	Maseru	33	16	1.00	31	5	no	24
Malawi	Blantyre	47	N/V	N/A	yes	no	no	N/V
Namibia	Windhoek	73	20	N/A	no	no	no	74
Sudan	Great Khartoum	27	0.11	0.43	yes	60	no	0.1
Zambia	Lusaka	27	58	N/A	yes	yes	no	79
Cape Verde	Praia	34	60	6.30	no	no	no	90
Chad	N'Djamena	22	N/V	N/V	yes	yes	yes	N/V
Cote d'Ivoire	Abidjan	65	N/V	N/A	yes	no	yes	N/V
Madagascar	Antananarivo	42	34	N/A	yes	8	yes	58
Tanzania	Dar es Salaam	29	4	2.00	35	2	yes	6
Uganda	Kampala	30	5	N/V	yes	yes	yes	7
	Average	43	28	2.20	N/V	N/V	N/V	53
	Median	35	21	2	N/V	N/V	N/V	66
	Minimum	22	0.11	0	10	2	6	0.1
	Maximum	88	61.0	6	35	60	12	98.1
	Number of countries with relevant presence	all	all	11/23 (48)	17/23 (74)	14/23 (61)	9/23 (39)	

Source: AICD WSS data, other.

Note: For the unconnected market, the data obtained from independent studies have been highlighted. The remaining data come from utility and government sources.

These factors point to a trend of utility overestimates of coverage from public standpipes. But in some countries, that overestimation is mitigated by substantial mobile resale of standpipe water. In cities where standpipe coverage is very low, vendors sell water door-to-door or from existing household connections. In these cases, while people may occasionally obtain their water from the standpipe, they also obtain it from vendors who buy it from the standpipe. Since utilities and standpipe operators do not keep track of the different customers they serve, coverage numbers “hide” the breakdown by type of consumer. This is very important when it comes to understanding the price structure of the market, for the standpipe operator usually charges the direct consumer and the reseller differently. In peri-urban areas of Accra, although most water is sold primarily through standpipes, 20 percent of that water is resold by cart operators (Sarpong and Ambrampah 2006). Likewise, standpipes in Khartoum sell most of their water (80 percent) to cart operators, who then resell it to households (Elamin and Gadir 2006). Similarly, in Ouagadougou, more than 80 percent of water sold at standpipes is bought by carters and not by individuals (Collignon and Vézina 2000). In Luanda, Angola, most of the water delivered in peri-urban areas, where the majority of the population lives, is brought in by trucks that sell water obtained either from the piped water system or directly from the river. The water trucks then sell the water to an estimated 10,000 nonmobile water vendors, primarily households that have built water storage tanks; these households in turn sell the water to the rest of the population. In peri-urban areas of Luanda, 70 percent of the dwellers purchased their water from water vendors (Development Workshop 1995).

Utilities reported that 19 percent of public standpipes were dysfunctional, but the real number is probably higher. Estimates of working standpipes obtained from independent studies gave much lower rates—with an average of 42 percent of standpipes in working order, versus the utility generated estimate of 81 percent (table 1.4). This raises reasonable doubts about the accuracy of the numbers reported by utilities on the status of standpipes.[10]

Further, many utilities do not have an updated inventory of existing public standpipes and their current operating conditions, reflecting a low level of monitoring of this generally low-revenue-generating service for the utility—and an absence of regulation. Recent studies conclude that standpipes in many cities have been poorly maintained, with a decline in the number of standpipes in use as well as in the quality of their service (hours of operation and pressure) over time. For future research, it will be very important to understand the capacity that utilities have to deal with these issues, in terms of financial and human resources. Finally, the information base is weak in part because regulators often track hours of water service of the system, but not the number of standpipes in good working condition.

Support for the premise that charging for standpipe water will provide incentives to the utility or to a standpipe manager to keep it in good working order does not clearly emerge from a review of 15 city utilities. However, because of the caveats noted on utility reporting, this finding needs to taken with caution and prioritized for further scrutiny in future research. Countries with a higher conflict incidence show a somewhat lower percentage of standpipes in good working condition.

Table 1.4 Public standpipes in good working order and free of charge in 15 cities

Country	Largest city	Share in good working order (%)	Share free of charge (%)
Sudan (HCI)	Great Khartoum	100	0

[10] As reported in AICD WSS data. Since water provision through standpipes is considered an “improved” source in the MDGs (a person supplied through a household connection counts the same as one supplied by a standpipe), there is an incentive for government officials and utility staff to err on the side of “inflating” coverage numbers (Cudjoe and Okonski, 2006).

Public standposts are by and large connected to a city-wide utility water system. Standposts that rely on groundwater for their supply are found only in cities with accessible groundwater resources and in less densely populated peri-urban areas with low exposure to pollution hazards. In these places, private boreholes have flourished, as noted below. These are most often found in specific areas within a city where the utility does not have a water network.

DRC (HCI)	Kinshasa	21	N/V
Mozambique (MCI)	Maputo	58	0
Rwanda (MCI)	Kigali	75	0
Namibia (MCI)	Windhoek	100	100
Lesotho (LCI)	Maseru (a)	48	100
Kenya (LCI)	Nairobi	89	0
Nigeria (LCI)	Kaduna	55	96
Benin (LCI)	Cotonou	100	0
Burkina Faso (LCI)	Ouagadougou	100	0
Cape Verde (LCI)	Praia	100	0
Niger (LCI)	Niamey	98	0
Zambia (LCI)	Lusaka	97	0
Malawi (LCI)	Blantyre	90	0
Madagascar (LCI)	Antananarivo	82	40
	Average	81	24

Source: AICD WSS Survey, 2007.

Note: Data obtained from independent studies have been highlighted. The remaining data come from utility and government sources.

a. A negligible percentage of the standpipe/kiosk coverage is paid.

LCI = low conflict index; MCI = medium conflict index.

Household resellers

Perhaps the most significant sign of the inability of utilities to keep pace with urban growth is found in the development of household resellers in countries with medium to low water coverage levels. This phenomenon is somewhat hidden, but it emerges clearly when comparing detailed case studies. About 70 percent of utilities surveyed have reported that the resale of water from households is commonplace, and consumer assessment surveys in cities in Mozambique, Lesotho, Ethiopia, and other countries have shown that reliance on household water resellers can account for as much as 50 percent of water resources for a city’s population, and up to 80 percent of water resources for the urban poor.

Households usually “hide” in the surveys the fact that they buy water from their neighbors because household water resellers often are not listed in the established categories of household surveys. Therefore, the household water resellers are concealed in the “piped water” or “other” coverage categories. Independent sectoral surveys on the coverage of household water resellers for four cities included in the AICD study ranges from 10 to 35 percent for the connected and from 15 to 50 percent for the unconnected. Evidence from case studies suggests that household water resellers can be as important as standpipes for the supply of the unconnected in Sub-Saharan cities.

This market can represent a significant loss for the utility. Detailed analysis in a consumer assessment in five cities in Mozambique in 1996 showed that the estimated annual sales of water in Maputo totaled $3.2 million, of which $1.2 million could be attributed to formal house connections and yard tap sales and $1.5 million to yard tap owners who resell water to their neighbors (SAWA 1997; Keener and Banerjee 2007). Thus, the sales volume in the informal resale market exceeded the size of the domestic consumer market, representing a benefit for yard tap owners and lost revenues for the water utility. Ironically, the other delivery vehicle for low-volume water sales, standposts, was also in a state of decline. In the much-smaller secondary city of Quelimane, the size of the resale water market was constrained by very low and irregular supplies of network water. The approximate value of water sold per annum was $711,000, of which only 32 percent ($230,000) went to the water utility. As in Maputo, the largest source of sales from water in the informal market came from the resale of yard tap water, accounting for estimated annual sales of more than $400,000. Standpost sales generated roughly $60,000 in sales; with less than $8,000 received by the water company in revenues. In Maputo, residents with yard taps were able to resell this water for 219 percent of the price they paid for it, and in Quelimane water was re-sold for 686 percent of the purchase price (see below).

Household water resellers often provide a competitive service preferred by consumers over standpipes, though this depends also on relative pricing. In some cases, household resellers offer a "middle" level of service between a full house connection and a standpipe. Household water resellers are also common in cities where the distance between standpipes is too large or the usage (in terms of people per standpipe) too high, as in Dakar, Abidjan, Conakry, and Addis Ababa (Hall 2002; Kariuki and others 2003; Lauria and others 2005; Boyer 2007; O'Connor 2007). Certain studies indicate that there are several additional reasons why households may prefer to choose to buy water from their neighbor instead of using the standpipe. Neighbors can offer more convenient hours of operation and a better water pressure level; because neighbors are located close by, less time is needed to collect the water. In addition, neighbors may offer more flexible payment mechanisms than either public standpipes or one's own house connection (Maputo: SAWA 1997; Boyer 2007; Accra: Sarpong and Abrampah 2006; Maseru: Hall 2002; Abidjan, Cotonou, Conakry, Kampala, and Yaouandé: Kariuki and others 2003; Dakar: Brocklehurst and Janssens 2004; Blantyre: Chirwa and Junge 2007; O'Connor 2007).

Certain neighborhood types are fertile for household resale, such as insecure, high-density slum areas. Households in high crime areas tend to prefer purchase of water from household resellers because they want to avoid going out after dark. Moreover, public standposts in such areas are more likely to have been vandalized, and no longer functional.

In some instances, resales from household connections are linked to deterioration in standpipe service. The low quality of standpipe service comes from poor maintenance by the utility, or the delegated manager, but also from illegal connections of standpipe lines. For instance, in inner peri-urban areas of Maputo and Dar es Salaam, low pressure and shortages at the standpipes are associated with illegal connections. Most of the illegal connections are made in the periphery of the network where the water pressure is usually the lowest, thus further degrading the water pressure of standpipes, which are often located near the ends of the network (SAWA 1997; Kjellén 2006). Low pressure adds to waiting time at standpipes and makes the purchase from neighbor's yard taps more competitive. In Maseru, Lesotho, a similar pattern occurred in terms of the decline in standpipes relative to household resellers; there standpipe coverage fell from an estimated 66 percent to 16 percent (Hall 2002) of the urban population, while household water resellers provided water to 31 percent of the urban population and to almost half of the unconnected population. In Maputo's inner peri-urban areas, the standpipe system suffers from the most acute maintenance problems, and thus household reseller coverage can be as high as 69 percent of the population (Boyer 2007).

Mobile vendors

Although mobile vendors do not represent a significant source of water for the unconnected in most African countries, they do serve a significant portion of urban households in some African countries.[11] For two-thirds of the African countries surveyed, less than 1 percent of the urban population reports that they purchase from vendors, although, as noted, this likely represents only a portion of the informal water market. There are exceptions, however. In Mauritania, 32 percent of urban residents purchase water from mobile vendors, and in Khartoum, 60 percent of the population is served by water tankers. Cities in Burkina Faso, Chad, Niger, Nigeria and Tanzania also had more than 5 percent of households reporting they were dependent on vendors. The estimates of coverage are based on household surveys or calculated indirectly to determine coverage from the sources. The literature shows little quantitative data on the different ways water carters get their water and their different prices. Water vendors often provide water to communities situated a long distance from the network and to informal settlements where private connections and standpipes have not been installed (Kariuki and others 2003).

Water truckers often supply mostly upper- and middle-income households. They are especially present in cities where the piped water service is very poor, both in terms of reliability and extension of the network, such as in Nairobi, Dar es Salaam, and Kampala. Half of the cities considered in the study have mobile distribution for water, but coverage is relatively limited to a small percentage of the population, from 0.24 percent to 6.5 percent (see table 1.3). In other cities, such as Accra and Luanda, water tankers supply directly to upper- and middle-income households but also play a key role in the supply chain. Due to the limited extension of the piped water network, a great part of the kiosks depend on water supplied by tankers. In fact, in informal settlements of Accra, 70 percent of the water bought in kiosks comes from water tankers (Sarpong and Abrampah 2006). In the case of Luanda in the mid- to late-1990s, the majority of the population (between 70 and 100 percent) living in peri-urban areas purchased water from water vendors that sold from household water tanks usually filled by water tankers (Development Workshop 1995).

Small-scale independent providers

There are small secondary water networks operated by small-scale independent providers (SSIPs) in almost 40 percent of the cities in the study. These may be connected to the main city network, as in Nairobi, Cotonou, and Abidjan, or completely separate from the city network, as in Kampala, Nairobi, and Maputo. However, the coverage of small secondary water networks is in general low—only 12 percent in Maputo and 9 percent in Nairobi (table 4). Those that are not connected to the utility's network, but rather to independent boreholes, are referred to here as "independent standpipes/kiosks." These have emerged in peri-urban areas that are less densely populated and often out of reach of the utility's water network. Although they are not prevalent in any African city, independent standpipes/kiosks appear to be one of the fastest-growing segments of the informal water market.[12] This source often offers consumers a

[11] Although not specified in the DHS, this category is often associated with mobile water sources.

[12] Of 19 AICD cities, 8 reported some standpipes connected to independent systems. In five cities (Maputo, Nairobi, Kaduna, Maseru, and Lusaka), this service caters to a minority of the overall urban population. In Kinshasa, Dar es Salaam, and Khartoum all or most standposts use groundwater that is independent from the utility network.

good quality service because it is not constrained by network hours of supply and often offers good water pressure and more flexible hours, albeit at a higher price than standpipes connected to the network that are managed by community organizations or local leaders (Maputo: SAL 2007; Dar es Salaam: Materu and Mkanga 2006). It would be useful to have data on the coverage provided by each modality (i.e. connected to the main network vs. independent from the main network) in order to assess the future potential of each option. It would be equally interesting to have information on the income level of the households currently covered by this source.

Case study of the evolution of water sources: Mozambique

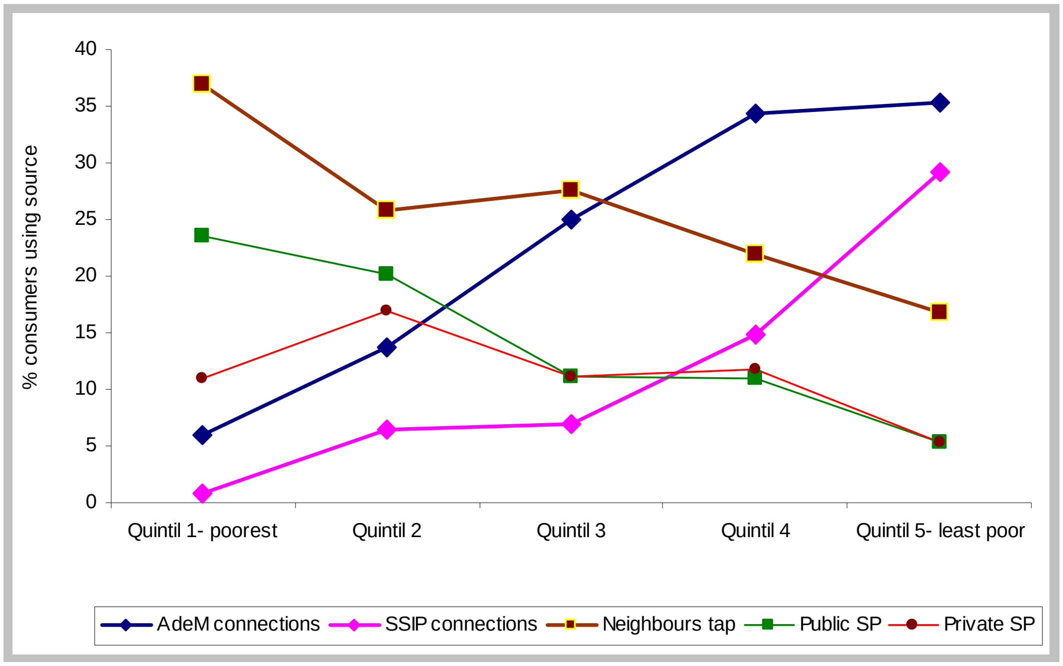
The case of Mozambique provides an interesting example of how various segments of the water market interact over time. In Maputo and several other cities in Mozambique, periodic surveys of the water market were carried out over a 10 year period in tandem with its water sector reform. First, a 2006 consumer assessment confirmed that poorer peri-urban households were more likely to depend on higher-priced re-sold yard tap water and on standposts. The assessment grouped households into poverty quintiles using standard factor analysis of 21 variables of household assets and indicators of wealth (figure 1.3).

Second, the series of consumer assessments showed that the number of people reliant on formal house and yard tap connections has continued to decline since 1996 to a low of 23 percent of peri-urban residents' primary water source. However, because of long-term improvements in the financial and management aspects of the utility (currently under a lease contract), in recent years the sector has made improvements to bulk water supply, thus increasing the availability of water in urban systems. The utilities have also been able to attract funding and are about to undertake a large new wave of network expansion, which should have a substantial impact on these figures.

Between 2001 and 2006, independent providers who supply small piped systems connected to boreholes (SSIPs) increased their market share to 23 percent from 9 percent, largely in the outer peri-urban areas where use of standpost water has also declined (figure 1.4).[13] Consumers reported that SSIPs provided a very efficient service and responded more quickly for a request for a connection than did the utility, Aguas de Maputo. On the other hand, SSIPs were priced higher than some other sources and out of reach of the lower quintiles. Purchases from neighbors' taps continued to grow, accounting for 26 percent of peri-urban water sources.

[13] Data are also available for 1996. However, because the 1996 data also included a center urban area that was not included in the later surveys, the 2001 and 2006 surveys provide a better comparison.

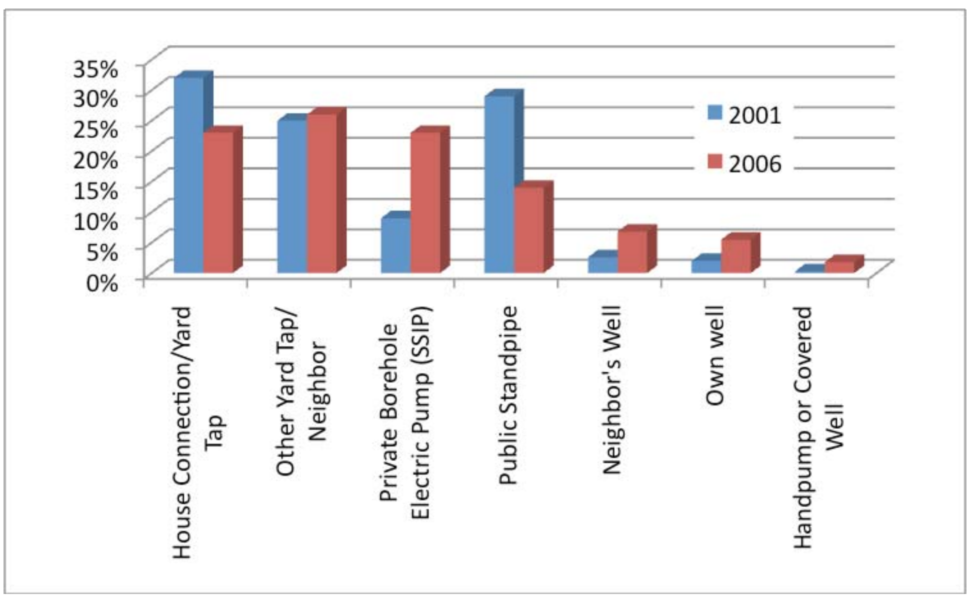
Figure 1.3 Source of water by wealth quintile: Maputo, Mozambique, 2006



Source: Thompson, SAL Consultants 2007.

Note: Includes Maputo and adjacent areas of Matola and Boane.

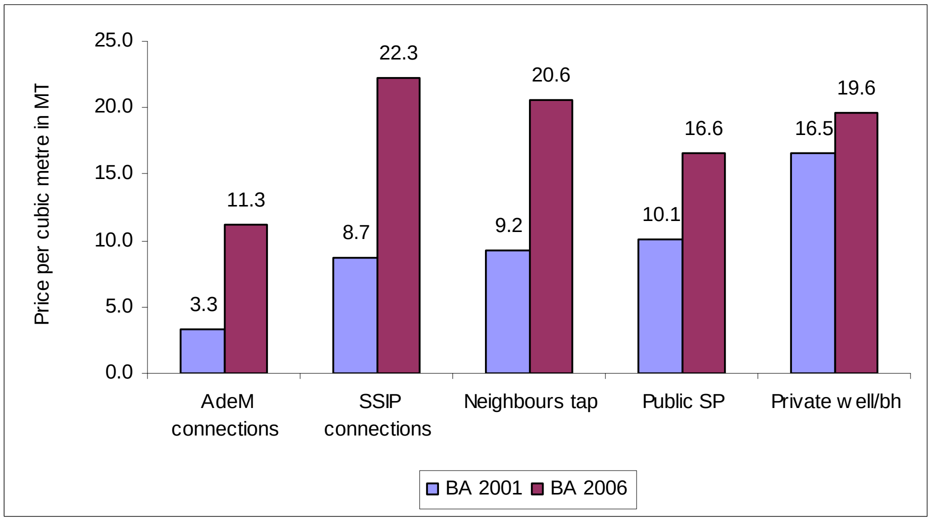
Figure 1.4 Primary water source in peri-urban Maputo, 2001 and 2006



Source: Thompson, SAL Consultants 2007.

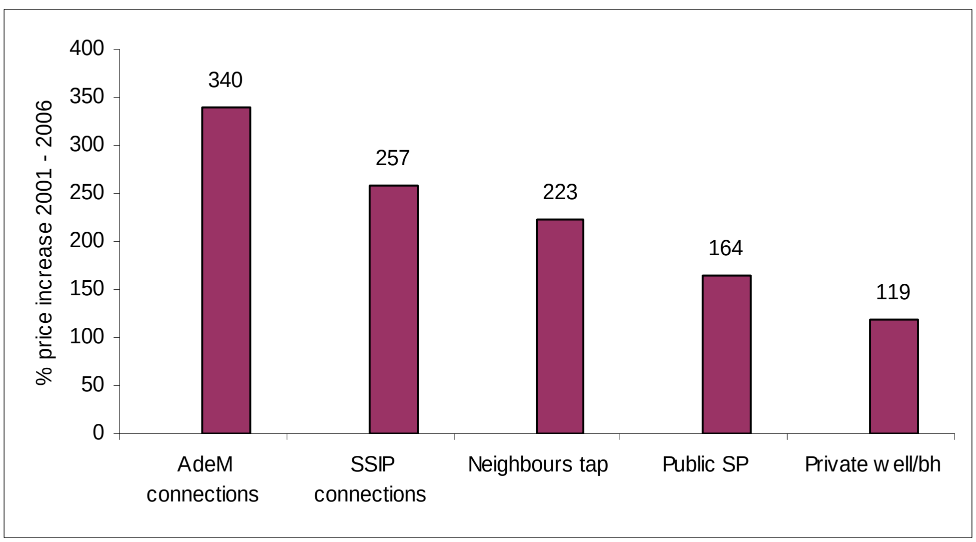
The assessments also provided an indication of how prices have varied over time (figure 1.5). While those with connections to the utility (AdeM) saw increases of 340 percent in prices over the five-year period from 2001 to 2006, the price for household resale only increased by 223 percent (figure 1.6).

Figure 1.5 Price per cubic meter by source in peri-urban Maputo, 2001 and 2006



Source: Thompson, SAL Consultants 2007.

Figure 1.6 Percent price increase by source in peri-urban Maputo, 2001 and 2006



Source: Thompson, SAL Consultants 2007.

Finally, by dissagregating the different types of peri-urban neighborhoods by social, water, and density characteristics, one can see that in the outer peri-urban areas where the utility's piped network did not reach, SSIPs quickly filled the gap (table 1.5), while in inner peri-urban (slum) areas, purchases from those with house connections were more important than public standpipes.

Table 1.5 Maputo water source by type of peri-urban area, 2006

Percent; N = 600

Water sources used	Inner peri-urban	Middle peri-urban	Outer peri-urban
Formal household connection	30	30	2
SSIP connection	1	8	31
Neighbors tap/other neighborhood	36	30	6
Public standpipe	22	13	7
SSIP standpipe	6	8	25
Private well/borehole (neighbors)	4	5	14
Own well/borehole	1	7	10
Public handpump (on well/borehole)		0	7
Total	100	100	100

Source: Thompson, SAL Consultants (2007).

2 Management of the unconnected water market

There has been much debate on how management arrangements for public standpipes and kiosks affect the final retail price, the quality of service, payment to the utility, and the proper functioning of the standpipe, but data gaps remain. Information on the success of management models for standposts and kiosks is still based on individual case studies and anecdotes. Cross-country primary research on the effectiveness of different management models under different conditions is needed in order to draw more definitive conclusions.

There are many variations on how public standpipes are managed and who retains responsibility for payment, supervision, and maintenance (table 3.1). However, management systems tend to fall into two general patterns where: (i) the utility retains control; or (ii) the utility delegates various functions to third parties and serves primarily as a bulk water supplier. [14] In a little more than one-quarter of the cities studied, utility staff retains responsibility for managing standpipes along one of three management models (free, pre-payment, or managed by a paid utility staff member). In almost three-quarters of the cases, utilities had entered into a contract with a third party (whether a private individual or a community organization) or with a support institution (local government, CBO or NGO) for management of the standpipe.[15]

Direct management by utilities

Standpipes have been directly managed by utilities in three ways: free of charge, attended, and prepaid (figure 3.1).

In the last three decades, there has been a shift from standpipes owned and managed free of charge by the utility to standpipes run either by private individuals or community groups, and kiosks that are privately or community owned. The data reveal that free standpipes are declining, largely because they are viewed by many utilities as transaction-intensive and a financial drain. As a result, among the sample cities only five (27 percent) still had standpipes free of charge.

With the exception of Madagascar, for which less than half the standpipes provide free water, free public standpipes were mostly concentrated in larger piped systems or cities with sufficient levels of piped coverage to cross subsidize the costs—in South Africa, Namibia, Lesotho, and Nigeria. Further, other cities are moving towards paid standpipes or kiosks, except for Kaduna, Nigeria; the cities of Johannesburg, Maseru, and Windhoek are installing prepaid standpipes, and Antananarivo is installing kiosks.

[14] In the majority of Sub-Saharan cities, the utility follows one of these two models. There are examples of kiosks that are both owned and operated by private individuals that use utility water, as in Nairobi and Blantyre (Oenga and Kuria 2006;Chirwa and Junge 2007) or that are owned and operated by community groups, as in Dakar (Brocklehurst and Janssens 2004). However, these are largely the exceptions.

[15] In about half of the AICD cities, more than one management model was being used, either because one model is in the process of being replaced by another (Lesotho for example) or because of heterogeneous areas demanding different management approaches.

Table 2.1 Modes of standpipe management

Ownership	Country	City	% free of charge	Management (% by:) Private	Utility	Community *
Utility	South Africa	Johannesburg	100	0	100	0
	Namibia	Windhoek	100	0	100	0
	Lesotho	Maseru	100	0	97	3
	Zambia	Lusaka	0	5	90	5
	Madagascar	Antananarivo	40	60	0	40
	Nigeria	Kaduna	96	4	96	0
	Cape Verde	Praia	0	0	100	0
	Sudan	Great Khartoum	0	0	100	0
Private	Benin	Cotonou	0	100	0	0
	Burkina Faso	Ouagadougou	0	100	0	0
	Niger	Niamey	0	100	0	0
	Rwanda	Kigali	0	100	0	0
	Kenya	Nairobi	0	88	0	12
	Senegal	Dakar	0	85	0	15
Community	Mozambique	Maputo	0	44	0	56
	Ethiopia	Addis Ababa	0	0	0	100
	Malawi	Blantyre	0	N/V	N/V	70

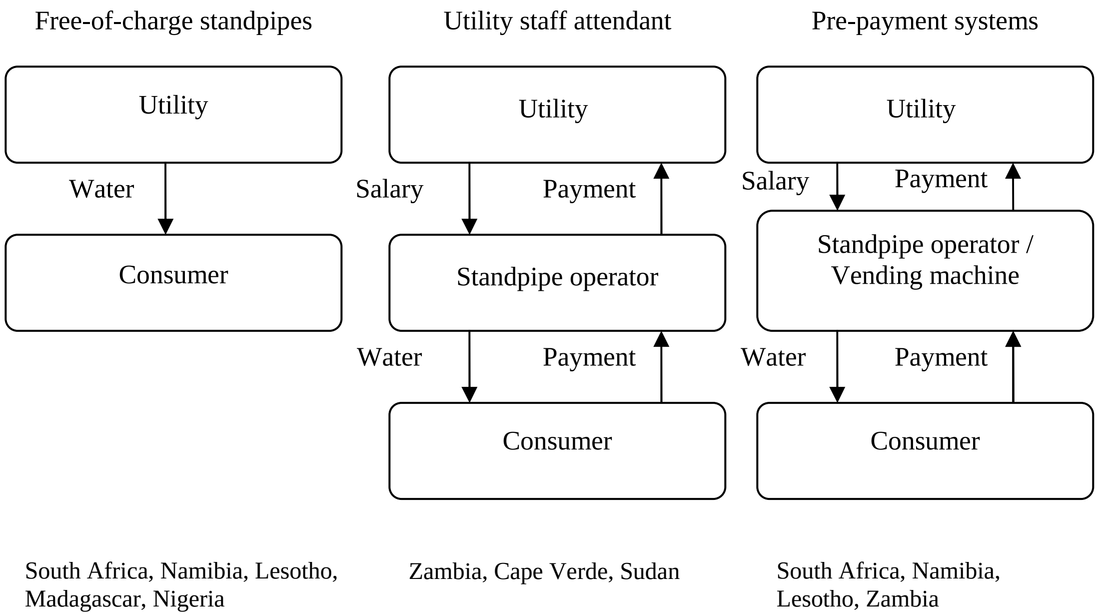
* In the community category we merge the delegated management model with direct contracting with a community group and the delegated management model with institution support as discussed later in this section.

Source: AICD WSS Survey, 2007.

The second model, in which the utility directly hires a salaried attendant, is an increasingly uncommon practice still in use in a few countries (3 out of 18 sampled). This model has been rejected in some countries because experience has shown that there is limited incentive for a wage-earning employee to ensure cost-recovery. In Zambia, the utility has tried to improve this model by introducing water commissions.

Pre-paid electronic standpipes have no on-site manager, and are intended to reduce management costs. Lower management costs should reduce costs to the consumer and avoid the politically charged problem of non-payment and consequent need to shut standpipes down. A pre-paid system also has the potential to provide more targeted subsidies, as the tokens for pre-payment can be distributed via existing safety net systems. Electronic pre-payment cards and vending machines are currently in use in South Africa and are being introduced in Lesotho and Namibia. In Zambia, as an alternative to vending machines, tokens or monthly cards are used. These systems allow for tariffs to be set at a unit rate that is lower than the smallest coin (Kariuki and others 2003; Brocklehurst 2004) and may allow for more efficient transmission of prices as they eliminate the middleman. In Lesotho, the water utility sells the pre-paid cards, which are also sold at retail outlets. In some instances, however, self-styled “operators” set up at the standpipes and offered higher priced tokens; while this can provide a convenience to some customers, information dissemination on formal prices and formal outlets is important.

Figure 3.1 Utility direct management models

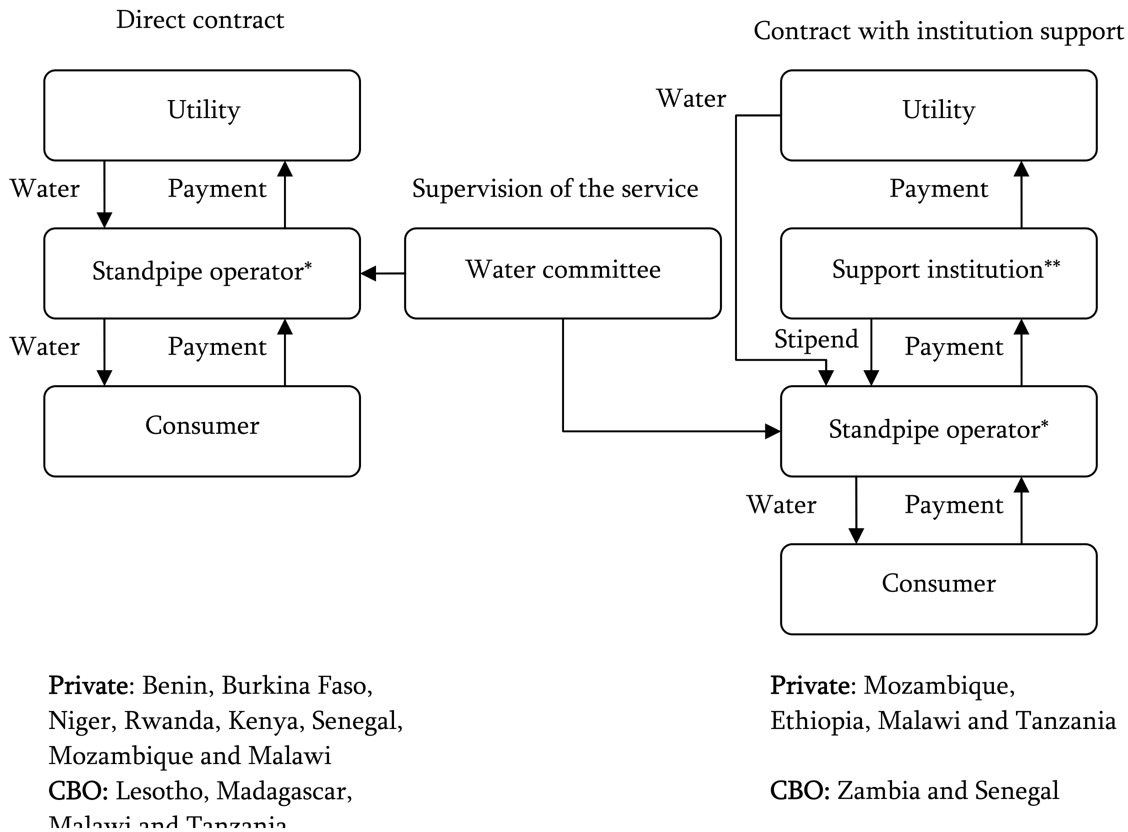


The delegated management model

In the increasingly common delegation model for public standpipes (figure 3.2), utilities either sign a contract directly with a standpipe operator, who maintains responsibility for paying the standpipe bill (and in some cases for maintaining the standpipe), or they sign a contract with a support institution. In the support institution model, the operators are then supervised by members of a water committee or supervised directly by local officials. The utility issues a bill for each standpipe at a bulk water price that is paid by the institution in the institution support model. In most of the cities studied, even though the water provided at the standpipes is subsidized, this subsidy does not reach the final consumers, who pay several times the subsidized rate. The selection processes for standpipe operators typically involves a community-level group or a local government representative, and is generally far from transparent, subject in many cases to local political influence.

Existing case studies suggest that, over the medium-term, the delegation model has had very mixed results in terms of providing a reliable service with timely bill payment to the utility; in terms of providing a subsidized or "social" price to the end-consumer, as the next chapter will show, it has by and large not been effective. The cases that have been most successful have involved sufficient utility (or external) oversight and monitoring, thus adding to the costs of administering the schemes. Conversely, where the utility has delegated all aspects (management, monitoring, maintenance, oversight), it has often been at the cost of higher consumer prices, and break-downs in service. There are exceptions, particularly in areas with high social capital.

Figure 3.2 Delegated management models



* Standpipe operator can be a private individual or a community based organization

** Support Institution: Local leaders, local authority administrators or NGOs

Another important disincentive to payment of standpipe fees is that standpipes receive less attention from the utility. In Maputo, standpipes account for less than 1 percent of total water consumption from the utility and less than 0.5 percent of total revenues for the utility (Boyer 2007). For certain cities with available data, we find similar low percentages for the utility's market share. In Dakar and Addis Ababa, standpipes account for 6.4 percent and 8 percent of total revenues respectively (Boyer 2007; AICD WSS database). The fact that standpipes comprise a small percentage of the utility business, together with the highly polititical reaction to shutting down the operation of standpipes when bills are unpaid, creates incentives for utilities to focus their attention on increasing their revenue base through better maintenance and improved billing collection from household connections. In some other cities, utilities informally admit to rationing water to standpipes in order to minimize losses.

Community-based management

Local leaders: There are wide variations on how communities and their representatives are involved in standpipe management and oversight. In some cases, utilities have assumed that local leaders will represent the broader public interest of their communities, and have handed over responsibility for operations and maintenance to these leaders (in parts of Maputo, Blantyre, Addis Ababa, and Dar es

Salaam). In these cases, performance of the standpost in terms of pricing, maintenance, timely bill payment and so forth, is largely a function of local social context, the skills in financial management and legitimacy of the local leader and the degree of oversight by an external party. In many cases, utility staff does not have the skills or personnel with time to assess these issues up-front, nor to monitor them sufficiently.

Management by Community Organizations: In an effort to improve the accountability of standpipe/kiosk operators towards consumers, several schemes have implicated community organizations in management or oversight, and have been somewhat more effective than schemes that simply delegate management to a local leader. This is still very limited in urban and peri-urban areas of sub-Saharan countries and in those cases where there is not enough social cohesion, strong local power structures, and no oversight from a supporting institution, the model can also lead to corruption and mismanagement. In Blantyre and Lilongwe, community managed kiosks that had been developed with extensive community involvement were captured by local elites as soon as the mediating NGO left. In another case in Dar es Salaam, pricing policies did not cover standpost operation and maintenance, and voluntary community contributions (in kind or in cash) do not bridge the gap.

The principle of community pressure only works where there is a mutually recognized sense of “community” and where there is personal security and common social values in confronting those who digress. Unlike rural areas, urban areas exhibit a greater degree of heterogeneity among different types of neighborhoods. Residents in some neighborhoods – for example in the outskirts of a city - may retain a sense of belonging to a community, know their neighbors, share social norms that can create “community pressure,”; in many other inner urban or core slum neighborhoods, residents may come from different ethnic or geographic areas and live in the area for a short time, without any of the social bonds that contribute to social capital, and face crime and insecurity that causes them to refrain from confronting someone who may not have managed a standpipe well. In such areas, information also may not circulate sufficiently on the accountability arrangements for a standpipe. In such areas, it is not clear that a designated “community” leader is accountable to any wider public.

Political economy issues are central to many problems both with standpipe payment and with selection of who manages and captures revenues from standpipes. An example of the types of implementation challenges experienced with schemes involving communities and their designated leaders can be found in Maputo, Mozambique. In Maputo, communities would elect a neighborhood water commission which would, in turn, elect a caretaker for a standpipe responsible for maintenance of the water points, together with the collection of the consumers’ payments. Although designed to be apolitical, local party structures in Mozambique are very strong, and some local leaders have ensured that they are represented in these commissions that are ultimately responsible for payment to the utilities. Many local officials interfered in the operation of the standpipes to an extent that far exceeded a mere oversight role. Since the utility encounters strong political opposition to shutting down a standpipe with a large account in arrears, non-payment of standpipe bills is very common. Local officials have an incentive to develop rent-seeker behaviours, for they can keep the money collected by the standpipe attendant, pay the attendant a small stipend and then withhold payment to the utility because they know that the utility will not close the standpipe. One study found that bill collection rates in Maputo were only 37 percent in 2002 and 44 percent in 2003 (Boyer 2007). As a result, few public standposts had ever had repairs, and many have fallen into different levels of degradation. Similarly, in slum areas of Luanda, Angola, in the 1990s, where the informal price of water was extremely high, there were reports in some areas that local party leaders had taken over the revenue collection at standpipes to provide capital for local party activities.

In schemes that have experienced problems, information dissemination to the broader community or consumers is often lacking. At the same time, community pressure only works when there is sufficient information dissemination. In the Mozambique case, a 2006 assessment confirmed that: (a) the majority of consumers did not know who water committee members were; (b) few consumers had a clear idea of the roles and responsibilities of the local structures for standpipe management and oversight; (c) and consumers generally played no role in the selection of management structures.

Experience with schemes involving community organizations varies across countries and depends on the degree of social cohesion of the community, management capacity in the community and external monitoring. A WSP Report on the role of small and medium-size organizations providing water in urban areas stressed the limitations of community-based management models without enough external monitoring and support as: i) there is a tendency to minimize expenses by limiting the extension of the system; ii) although in principle based on the voluntary participation of members of the community to reduce operating and maintenance costs, actual management is often controlled by a small group that may not be representative of all the users and that monopolizes control of the finances (Vézina 2002). With such arrangements, elite capture remains a problem that requires strong institutional controls, and active monitoring.

Some more recent models for community involvement integrate more sophisticated incentives, and monitoring to mitigate corruption by larger water user associations or NGOs. In Blantyre, Malawi, water users associations (WUAs) control as many as 70 water points each. The utility provides technical assistance, legally registers the WUA, and monitors operation of the standpost. The WUA employs both the kiosk attendants and meter inspectors. The latter check the meter readings; if there is a difference between the meter reading from the inspector and the amount of revenue collected, it is subtracted from the attendant's salary. Although the price of this water is 25 percent higher than at other kiosks, because the quality of service is monitored and reliable, households prefer to purchase from these kiosks than from their neighbors. This is not the case with other neighborhoods with kiosks. In Senegal (Dakar), about 15 percent of the public standposts were built through a partnership between the utility and NGO (Enda Tiers Monde). ENDA works with communities and local neighborhood associations (women's groups, self-help groups), and arranges for them to pay 25 percent of the capital costs of a standpipe which is built by the utility. Once operational, the utility bills a standpost operator selected by the community, and ENDA assists in the creation of a local water council.

Private management

Utilities also contract out the operation and management of standpipes to private managers on the premise that commercial management promotes efficiency and cost-recovery and avoids some of the implementation challenges noted above, but experience has also been mixed. Many utilities in African cities such as Cotonou, Ouagadougou, Niamey, Kigali, Nairobi, Dakar, Quelimane and Blantyre have leased their installations to private operators and sold the operators bulk water. There are two particular weaknesses of the model: the poor transparency of the selection procedures for the standpipe operators, particularly when the municipality is involved in choosing the manager; and the lack of monitoring efforts by the water utility in collecting water revenues, ensuring good quality service and maintaining adequate tariff levels.

Privately managed standpipes tend to be better maintained (in working order) than those managed under alternative schemes (table 2.2) but they are more expensive for consumers. However, because of issues with utility reporting and the sample size, this finding is not conclusive. The estimation problem arises as utilities may over-estimate the number of properly working standpipes/kiosks if these are not regularly monitored.

Table 2.2 Type of standpipe/kiosk management and percentage in good working condition

Standpipe / kiosk operator	% good working condition
Private	91
Utility	83
Community	74

Source: AICD WSS database

This model is dependent on regular hours of supply and pressure of water to the standpipe by the utility. In the 1990s in Quelimane, Mozambique, private standpipe operators were invoiced according to fixed estimates of water consumption, but water supply was extremely limited and intermittent. Certain standpipe operators found it difficult to generate enough water revenues to pay back the water bill and did not have funds for adequate maintenance of the standpipes (SAWA 1997).

3 Analysis of water prices, costs, and regulation

The range for prices of water by service provider goes from 1.3 times the utility price for small piped networks to 10 to 20 times the utility price for mobile distributors (table 3.1). Standpipe prices include "formal"rates by the utility which differ from "retail" prices (referred to here as "informal" prices) faced by the consumer when there is a delegated management model.

Table 3.1 Prices by water service provider

Country	Largest city	HH connection (US$/m3)*	Small piped network (US$/m3)	Standpipe (US$/m3)	HH reseller (US$/m3)	Water tanker (US$/m3)	Water vendor (US$/m3)
Benin	Cotonou	0.41	N/A	1.91	1.91	N/A	N/A
Burkina Faso	Ouagadougou	0.90	N/A	0.48	N/A	N/A	1.67
Ethiopia	Addis Ababa	0.19	N/A	0.87	1.44	3.85	N/V
Mozambique	Maputo	0.96	0.98	0.98	0.98	N/A	N/V
Niger	Niamey	0.52	N/A	0.48	N/A	N/A	1.79
Nigeria	Kaduna	0.17	N/A	N/V	N/V	3.43	5.71
Rwanda	Kigali	0.44	N/A	1.79	1.79	4.48	N/A
Senegal	Dakar	0.37	N/A	1.53	N/V	N/A	2.29
South Africa	Johannesburg	0.05	N/A	N/A	N/A	N/V	N/V
DRC	Kinshasa	0.05	2.11	1.02	1.01	N/A	N/A
Ghana	Accra	0.52	N/A	5.51	1.53	5.46	6.89
Kenya	Nairobi	0.18	0.60	1.73	N/A	3.74	3.47
Lesotho	Maseru	0.40	N/A	2.58	N/V	N/V	N/V
Malawi	Blantyre	0.12	N/A	1.16	3.38	N/A	N/A
Namibia	Windhoek	1.45	N/A	N/A	N/A	N/A	N/A
Sudan	Great Khartoum	0.37	N/A	1.15	N/V	4.32	3.00
Zambia	Lusaka	0.56	N/A	1.67	N/V	N/A	3.00
Cape Verde	Praia	2.67	N/A	9.44	N/A	9.67	11.38
Chad	N'Djamena	0.22	N/V	N/V	N/V	N/A	N/V
Cote d'Ivoire	Abidjan	0.04	N/V	0.93	1.82	N/A	3.35
Madagascar	Antananarivo	0.11	0.47	1.24	N/V	N/A	2.33
Tanzania	Dar es Salaam	0.39	N/V	0.87	0.98	2.40	2.56
Uganda	Kampala	0.25	N/A	1.40	1.40	N/V	4.50
	Average	0.49	1.04	1.93	1.63	4.67	4.00
	Median	0.37	0.79	1.24	1.49	4.08	3.00
	Min	0.04	0.47	0.48	0.98	2.40	1.67
	Max	2.67	2.11	9.44	3.38	9.67	11.38
	Overprice**		2.14	3.36	4.02	11.03	8.11

** 4 m3 / month*
*** Price SSIP/HH connection*
Source: AICD WSS database, Other

Note: Data from 23 cities. Standpipe price is the "retail" otherwise referred to as informal price paid by the consumer at the tap.

Standpipes

In almost three quarters of the sampled cities,[16] utilities had set a formal/wholesale standpipe price below the unit price for those with house connections, implying a "social" tariff or tariff reflective of the lower level of service.[17] Only in Sudan, Madagascar, Tanzania and Ghana did utilities have a standpipe rate that was above that of household connection water.

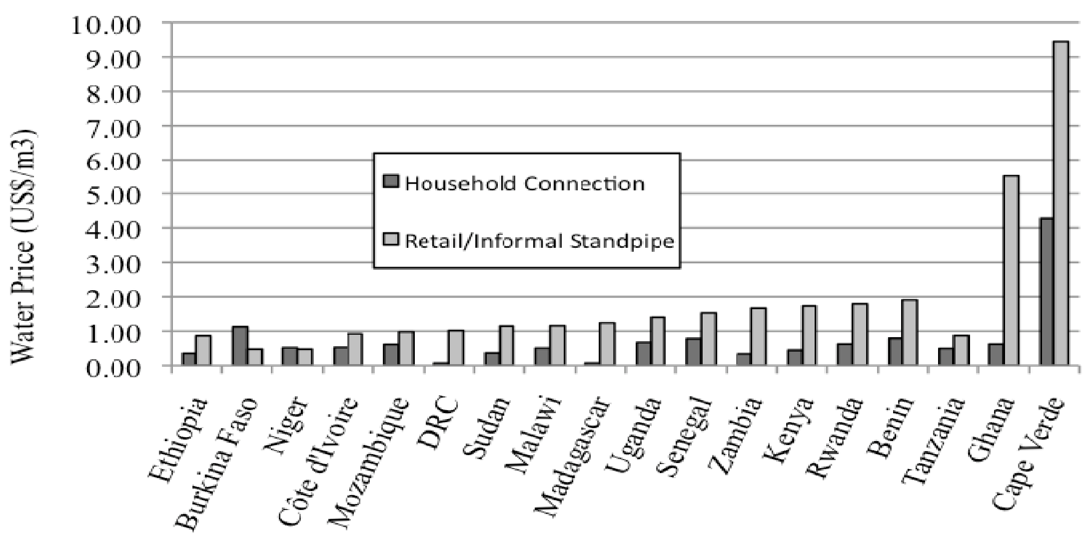
[16] Analysis based on data from 9 cities.

[17] For this analysis it was assumed average household consumption of 10 M3 for house connections (60 l/c/d).

While standpipe water appears to be cross-subsidized by utilities, only in a minority of cases does this subsidy reach the ultimate water consumers. In 89 percent of the sample cities, the informal or retail standpipe unit price exceeded that for house connections (figures 3.1 and 3.2), in some cases by a large degree—as in Kinshasa, where consumers pay over 20 times the formal price. Thus the social tariff has not, by and large, been effective at reaching the end-consumer, who pays a median of three times the "wholesale" or formal price of water to the standpipe. [18]

The cases of Burkina Faso and Niger are worth further exploration, as these were the only two countries (out of 18) that appear to have a social tariff that reaches the actual consumer (see figure 3.1). A social tariff is defined here as a retail/informal standpipe price that is below the unit price for water from a household connection. Key analysis should include both the management structures, incentives for these schemes, as well as the financial impact on the utilities themselves.

Figure 3.1 Comparative water price from household connection vs. from standpipe



Source: AICD WSS database 2007.
Note: Unit price household connection based on assumption 10m3 consumption per household per month.

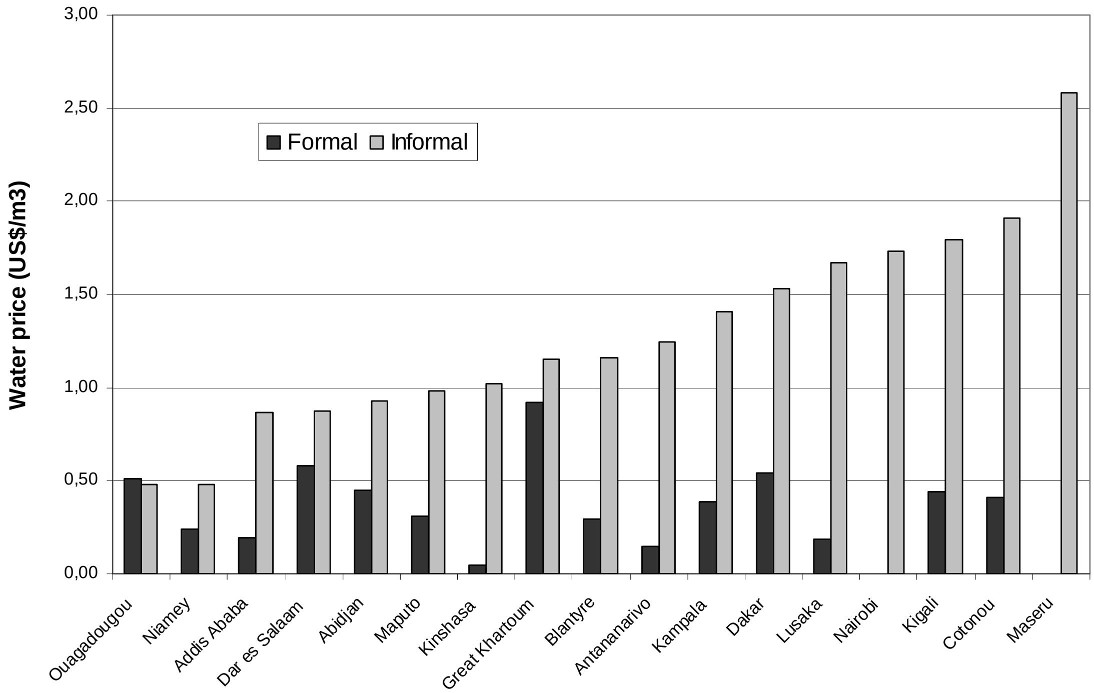
In most cases, the utility sets a formal/wholesale price for standpipes that is below the price for house connections (table 3.2). The differential, or cross-subsidy, amounts to between $0.19 million per annum to $1.3 million per annum per country. In many cases, a significant percentage of this cross-subsidy is used by the standpipe operator.

In the case of standpipes / kiosks that depend on the utility's water, the literature suggests that the underlying causes for higher informal tariffs are not driven by high operation and maintenance costs, but are, in some cases, linked to high profits (Whittington 1991; CollignonandVézina 2000; Brocklehurst and Janssens 2004; Gulyani and others 2005; Boyer 2007). The main reasons for this situation are as follows: (a) low operating and maintenance costs due to inadequate maintenance of the standpipes; (b) low water costs due to the existence of "social" tariffs subsidized by the government; (c) underpayment of water

[18] Where there is a standpipe manager, the formal price refers to the wholesale price that the manager pays to the utility; where the utility takes care of operations and maintenance, the formal price is the suggested price.

bills to the utility; (c) low level of regulations / enforcement of formal and subsidized tariffs; (d) social factors (degree of community cohesion, community pressure or lack thereof, high crime).

Figure 3.2 Formal and Informal standpipe prices



Due to the combined factors of high informal prices and large population coverage by standpipes, the total gross profit[19] captured by standpipe operators in economic terms is quite high. In the cities in which it could be estimated, the annual value of the gross profit ranges from $15,477 in Khartoum to almost $10 million in Lusaka. In relative terms, the gross profit captured by the standpipe operator compared to water revenues of the utility can represent a significant percentage: Maputo 12 percent, Addis Ababa 44 percent and Lusaka 120 percent. Because there is a great variability in costs by country, further research is needed on the factors that affect why some operators charge the maximum the market will bear (which may lead to high profits) while others appear to charge a level below the maximum rate for the informal sector.

[19] Gross Profit = Revenues from water sales – Cost of water sales. This calculation does not include OandM ,other overhead costs, taxes and financial costs

Table 3.2 Formal and Informal standpipe / kiosk price

Country	City	Formal (US$/m3)	Informal (US$/m3) Min	Max	Avg.	Rate	House-hold conn. (%)*	Annual cross-subsidy ($)	Annual gross profit ($)	Conflict index	Population coverage (%) House-hold connec. (%	Stdpipe/ kiosk
Burkina Faso	Ouagadougou	0.51	0.42	0.50	0.48	0.9	0.76	1,278,002	-164,241	Low	34	61
Niger	Niamey	0.24	N/V	N/V	0.48	2.0	0.36	191,293	375,635	Low	31	21
Ethiopia	Addis Ababa	0.19	0.58	1.15	0.87	4.6	0.24	545,418	7,210,815	Medium	39	40
Tanzania	Dar es Salaam	0.58	0.55	1.20	0.87	1.5	0.45	–109,102	250,715	Low	29	4
Côte d'Ivoire	Abidjan	0.45	0.60	1.25	0.93	2.1	0.06			Low	65	N/V
Mozam-bique	Maputo	0.31	0.31	1.51	0.98	3.2	0.38	224,480	2,078,976	Medium	26	26
DRC	Kinshasa	0.05	N/V	N/V	1.02	20.4	0.05			High	36	N/V
Sudan	Great Khartoum	0.92	N/V	N/V	1.15	1.3	0.37	–37,232	15,477	High	27	0.1
Malawi	Blantyre	0.29	0.63	1.48	1.16	4.0	0.29			Low	47	N/V
Madagascar	Antananarivo	0.14	N/V	N/V	1.24	8.6	0.06	–394,068	5,360,254	Low	42	34
Uganda	Kampala	0.39	0.25	2.00	1.40	3.6	0.74	214,305	612,383	High	30	5
Senegal	Dakar	0.54	1.15	1.91	1.53	2.8	0.37	–614,036	3,608,063	Low	77	19
Zambia	Lusaka	0.19	N/V	N/V	1.67	9.0	0.39	1,368,437	9,818,638	Low	27	58
Kenya	Nairobi	N/V	1.39	2.08	1.73	N/V	0.60			Low	51	41
Rwanda	Kigali	0.44	N/V	N/V	1.79	4.1	0.50	201,407	4,937,298	Medium	35	51
Benin	Cotonou	0.41	0.50	2.50	1.91	4.7	0.63			Low	31	N/V
Lesotho	Maseru	N/A	1.48	3.69	2.58	N/A	0.43			Low	36	N/V
Ghana	Accra	3.64	N/V	N/V	5.51	1.5	0.52			Low	56	N/V
Cape Verde	Praia	N/V	N/V	N/V	9.44	N/V	3.09			Low	34	60
	Average	0.58	0.71	1.75	1.93	4.64						
	Median	0.40	0.58	1.51	1.24	3.40						
	Minimum	0.05			0.48	0.94						
	Maximum	3.64			9.44	20.40						

Source: AICD WSS database 2007.

* Household connection at 10m3/month

Although numerous utilities and governments had made an effort to set a "retail" price for standpipe water, in general, the final "informal" price tends to be fixed by the manager of the standpipe. To better understand the underlying causes of the high standpipe prices, it is necessary to assess who acts as a price-setting agent (table 3.3). For standpipes and kiosks managed by private individuals or community groups, the price is primarily fixed by the kiosk manager or the community group respectively. In standpipes managed by utility staff, there is no principal actor setting the price. The number of standpipes managed directly by utility staff has been decreasing in all the cities studied and their relative weight is marginal.

Table 3.3 Price setting in standpipes/kiosks[20]

	Price-setting agent					
Management (% of countries)	Kiosk manager	Utility	Government	Community	Other	TOTAL
Private individual	47	13	27	0	13	100
Utility	0	14	29	29	29	100
Community	0	11	22	67	0	100

Source: AICD WSS database 2007.

The delegated management contract model for public standpipes, used by close to three quarters of utilities studied, falls short in terms of effective regulation of standpipe prices. Under this model, individual standpipes are directly regulated by local authorities or community groups and indirectly regulated by the utility or the water regulator agency. It is generally acknowledged that both the regulator and local officials lack the capacity, resources and incentives to regulate and monitor this activity. There is evidence of the lack of standpipe control in many cities, including the following: Dakar; Addis Ababa; Maputo; Kampala; Maseru; and Dar es Salaam.

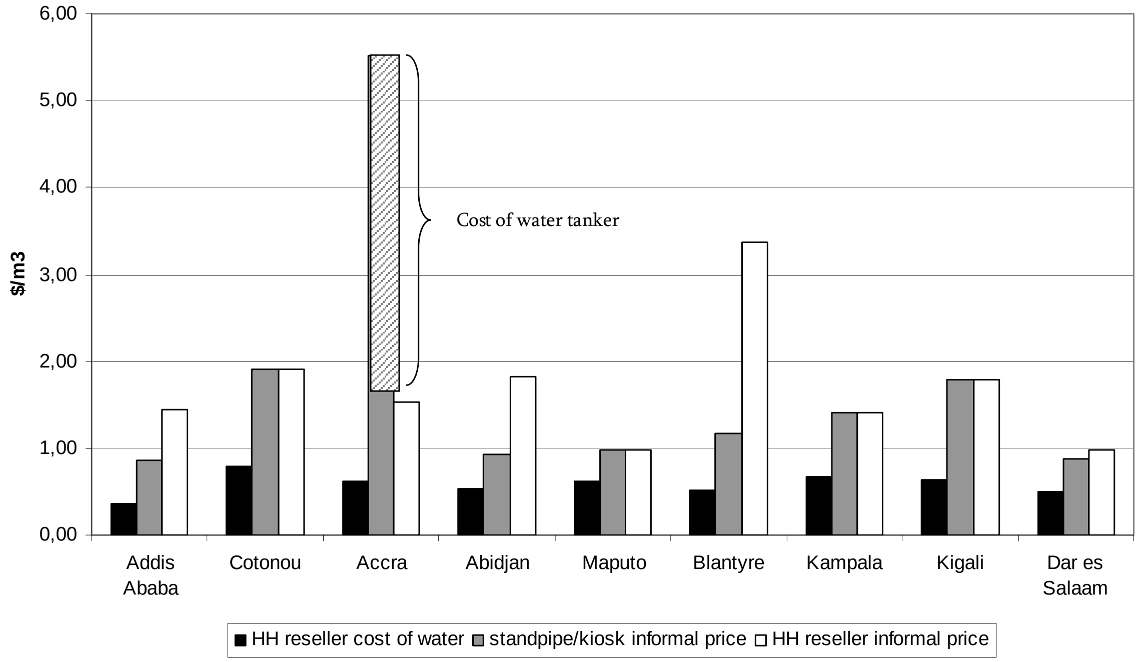
Household water resellers[21]

In general, household water resellers emerge largely as a result of malfunctioning or absent standpipes, or because of high connection costs. In two-thirds of the cities studied, the informal household reseller price is similar to the informal price for standpipes (figure 3.3). However, two cities are exceptions to this trend– Accra and Blantyre – because of supply-chain specificities. The vast majority of kiosks in Accra are supplied by water tankers; they have to pass-through the cost of the transport by water tankers. Discounting this cost, the water price of a household reseller is quite similar to the standpipe informal price. In Blantyre, certain parts of the city experience a huge increase in the price of water due to restrictions on the supply side. A couple of years ago, the price of water from the household resellers was equal to the informal price of the standpipes (Chriwa and Junge 2007).

[20] Analysis based on data from 15 cities.

[21] Analysis based on data from 9 cities.

Figure 3.3 Costs and informal prices of household water resellers and standpipes / kiosks



Source: AICD WSS database 2007.

The average household water reseller sells water at three times its cost (table 3.4). This generally covers the cost of water sold, plus their own consumption, and in some cases provides a small amount of extra income. Household water resellers face an increasing block tariff (IBT) in most of the countries studied, and can be charged a high tariff even if the final costumers are low-income households (Whittington 1992; Collignon and Vézina 2000). It is not clear whether increasing block tariffs (IBT) are hurting the poor by increasing water costs of household resellers. In many countries, the IBT has defined large "social" blocks in terms of consumption, and the difference between the prices paid by the different blocks is small (Komives and others 2005; Banerjee and others 2007). [22] As some utilities have not kept pace with metered consumption, but rather charge based on flat or estimated rates, the volume of water sold through household resale can represent a significant loss of income for the utility (as the case in Mozambique illustrated). In these cases (as in Maputo), the household reseller can make a substantial profit.

Payment mechanisms to household resellers include monthly payment schemes, as well as payment by bucket. Case studies point to the importance of personal relations and mutual trust in determining which scheme is used, but also in determining prices. In Maputo, Mozambique, 40 percent of household resellers had monthly payment agreements; standpipe managers started to offer such schemes to customers also in order to compete with household resale (Thompson, SAL consultants, 2007).

[22] In the case of Côte d'Ivoire, the resale of water by household consumers is a regulated activity, and therefore there is a record of the average amount sold per reseller, which is 40m3/month (Kariuki and others 2003). This level of consumption, which represents 5 people per household consuming 40 l/c/d (6.7 households/household reseller), is the one used for estimation of the water costs of the household reseller.

An important area for future research relates to how formal water tariffs and quality (hours of service) affect the household resale market. If policy makers increase prices in the formal sector in an effort to make pricing more equitable, this may harm the lower income purchaser of household resale water more than the seller. At the same time, if the utility improved hours of supply and pressure of water, and if the resale market is competitive, this could serve to lower prices, particularly where there are flat or estimated payments on household connections. The one case providing time series data on this is in Maputo, Mozambique. In Maputo, the unit price of water from a household connection had increased by 340 percent between 2001 and 2006, but the price increase from household resale increased by only 223 percent. While the formal price of water had increased over this period, many of those with yard taps who were reselling water continued to be metered on estimated (likely lower than actual) consumption.

Table 3.4 Prices charged by formal and informal standpipes / kiosks and by household water resellers

	Standpipe / kiosks					Household resellers				
		Informal					Informal			
	Formal	Min	Max	Average	Rate	Cost*	Min	Max	Average	Rate
City	(US$/m3)	(US$/m3)	(US$/m3)	(US$/m3)	(inf/for)	(US$/m3)	(US$/m3)	(US$/m3)	(US$/m3)	(inf/cost)
Addis Ababa	0.19	0.58	1.15	0.87	4.6	0.36	1.2	1.7	1.44	4.0
Cotonou	0.41	N/V	N/V	1.91	4.7	0.79	N/V	N/V	1.91	2.4
Accra	3.64	N/V	N/V	5.51	1.5	0.63	N/V	N/V	1.53	2.4
Abidjan	0.45	0.60	1.25	0.93	2.1	0.53	1.5	2.1	1.82	3.5
Maputo	0.31	0.31	1.51	0.98	3.2	0.62	0.6	1.1	0.98	1.6
Blantyre	0.29	0.63	1.48	1.16	4.0	0.51	0.8	8.4	3.38	6.6
Kampala	0.39	0.25	2.00	1.40	3.6	0.67	N/V	N/V	1.40	2.1
Kigali	0.44	N/V	N/V	1.79	4.1	0.63	N/V	N/V	1.79	2.9
Dar es Salaam	0.58	0.55	1.20	0.87	1.5	0.50	0.8	1.2	0.98	2.0
Average	0.74	0.49	1.43	1.71	3.24	0.58	0.99	2.92	1.69	3.05
Median	0.41	0.56	1.36	1.16	3.63	0.62	0.84	1.73	1.53	2.45
Min	0.19	0.25		0.87	1.51	0.36	0.65		0.98	1.60
Max	3.64		2.00	5.51	4.66	0.79		8.44	3.38	6.63

Source: AICD WSS database 2007, other.

* Household reseller cost is calculated using domestic tariff 40m3/month

Reselling of water by households with private connections is commonly believed to be illegal in Sub-Saharan cities (Collignon andVézina 2000; Kariuki 2003; Boyer 2007), but only 4 out of 15 cities in the study with prevalence of household water resellers[23] explicitly prohibit the resale of water by households (table 3.5). Only 3 cities have legalized household resale and require a permit for this business. In the majority of cases, a confusing legal limbo prevails; household water resellers are neither prohibited nor legalized. Even if regulations are in place prohibiting household water resellers, they are not enforced, as in Dakar or Dar es Salaam. Utilities and government simply do not control and rarely contest this practice, and in the case of Kampala the practice is encouraged in areas at the end of the network. Detailed case studies that highlight the importance of this source in allowing access where standposts or

[23] See Table 8

individual connections have not kept pace point to the serious impact prohibition of this source would have on poor urban households.

Given the coverage gap and the ready distribution system that household resellers provide, a valid question is whether to explore methods to partner with private households to increase coverage. Abidjan is one of the few cities with experience in attempting to regulate this sector, though they also the focus was on removing illegal connections; although the results have been disappointing because of a lack of incentives, there is still potential to explore better mechanisms for using this source. In the early 1980s, the utility SODECI and the national government decided to address the increasing growth of household water resellers that tapped in to illegal connections to the network. They would provide permits to the household water resellers as long as they converted their connections into formal ones. The expected outcomes were an increase in sales among the poor, a reduction in illegal activity and an improvement in revenue collection. The campaign did not provide any incentive to the resellers; they were billed as domestic customers and faced an increasing block tariff (IBT). Moreover, the water vendor was required to provide a title deed for the permit and to invest in an extension from the meter to the water point. As a result, only 1 percent of the total resale at the household level is currently conducted through legalized resellers (Kariuki and others 2003).

Table 3.5 Regulation of household water resellers

Country	City	Prohibited	License
Benin	Cotonou	no	no
Ethiopia	Addis Ababa	no	no
Mozambique	Maputo	no	no
Nigeria	Kaduna	yes	N/A
Rwanda	Kigali	no	yes
Senegal	Dakar	yes	yes
Lesotho	Maseru	N/V	N/V
Malawi	Blantyre	N/V	N/V
DRC	Kinshasa	no	no
Sudan	Great Khartoum	yes	no
Zambia	Lusaka	no	no
Ghana	Accra	no	no
Chad	N'Djamena	no	N/V
Cote d'Ivoire	Abidjan	no	yes
Madagascar	Antananarivo	no	no
Tanzania	Dar es Salaam	yes	no
Uganda	Kampala	no	no
	% yes	24	18

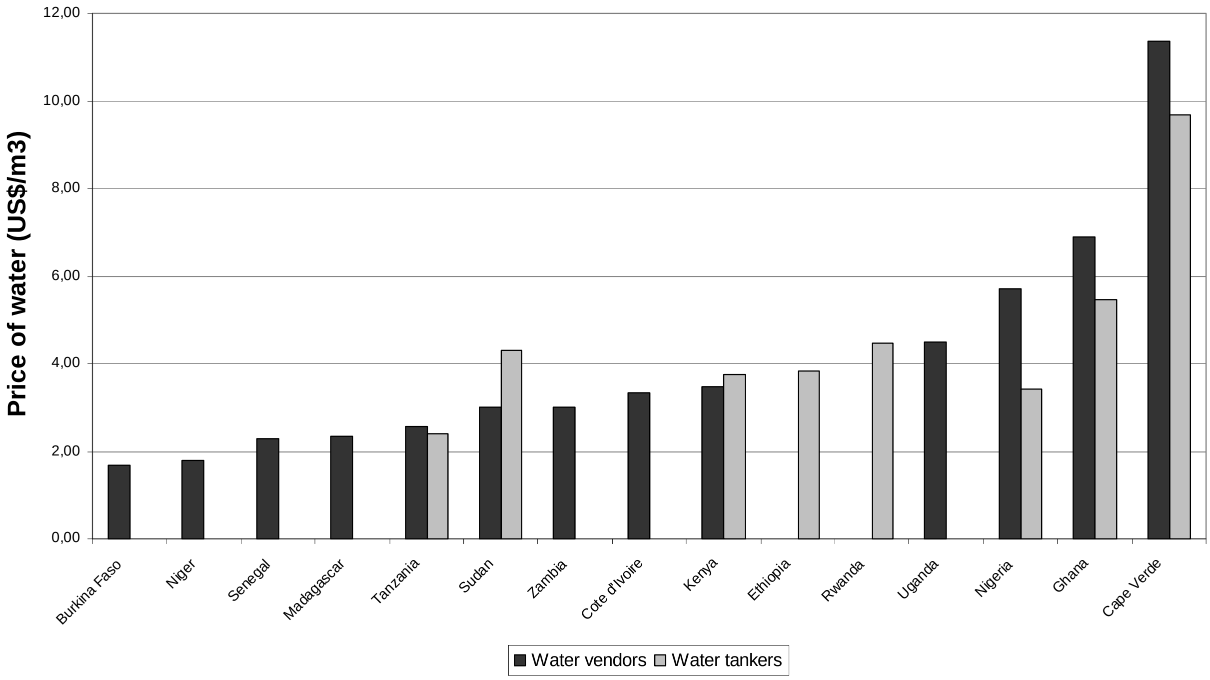
Source: AICD WSS database 2007.

Mobile distributors[24]

Mobile distributors charge the highest prices among all the different water service providers. The water delivered by water tankers and carters costs between $2 and $8 per cubic meter. But the economic burden among the unconnected people in different cities is not evenly shared. There are cities where the lack of access to the network makes unconnected people heavily reliant on water tankers, as in Accra and Luanda, or heavily reliant on water vendors, as in Khartoum. Figure 3.4 presents a comparison of the prices of water tankers and water vendors in cities where data is available. There is little difference between the unit sale price of water tankers and water vendors, probably because of the strong competition between the two for the provision of water to certain types of clients.

[24] Analysis based on data from 15 cities.

Figure 3.4   Prices of water tankers and water vendors



The high price charged by mobile distributors is generally justified by high transport costs. The literature reveals that carters do not yield large profits on the water that they sell; actually, the salaries that they earn are among the lowest in their cities (Collignon and Vézina 2000; Kariuki and others 2003). Table 3.6 illustrates this reality in Accra, Khartoum and Luanda, where water supply systems for the unconnected are mainly based on mobile distributors, either as wholesalers or retailers. The profits that these distributors make are not very high; in the case of carters, sales are relatively low level, and carters barely make a subsistence salary. Even at zero profit, the water prices are very high in volumetric terms.

Table 3.6   Operating accounts for mobile distributors in three cities

	Tanker		Vendor
USD/m3	Luanda	Accra	Khartoum
Sale Price	5.46	5.46	3.00
Transport costs	3.85	4.09	1.53
Water costs	0.44	0.55	0.84
Profit	1.17	0.82	0.63
Profit (% income)	21	15	21

Source: For Luanda, Development Workshop 1995; for Accra, Sarpong and Abrampah 2006; for Khartoum, Gadir 2006.

Two of the places where there is a buoyant mobile water sector are in Luanda, Angola, and Accra, Ghana; in these cities, empirical studies show that the market is quite competitive. However, this does not necessarily imply low prices compared to other water service providers. Almost half of the cities that have water tankers in operation to supply water have regulations in place (table 3.7).

The utility emerges as a minor player in the operation of water tankers. The formal and informal private sectors are the main operators in 4 out of 9 cities with water tanker supply. When the formal private sector is the main operator, the market is more competitive than when the informal sector is the main operator. These results should be taken with certain reservations because they are based on impressions by utility staff, and not necessarily based on empirical analysis.

Table 3.7 Regulation of water tankers

Country	City	Regulated	Regulated
Ethiopia	Addis Ababa	yes	1
Nigeria	Kaduna	no	2
Rwanda	Kigali	no	2
South Africa	Johannesburg	no	2
Ghana	Accra	no	2
Kenya	Nairobi	yes	1
Sudan	Great Khartoum	yes	1
Cape Verde	Praia	yes	1
Chad	N'Djamena	yes	1
Tanzania	Dar es Salaam	no	2
Uganda	Kampala	no	2

Source: AICD WSS database, 2007.

Small piped networks

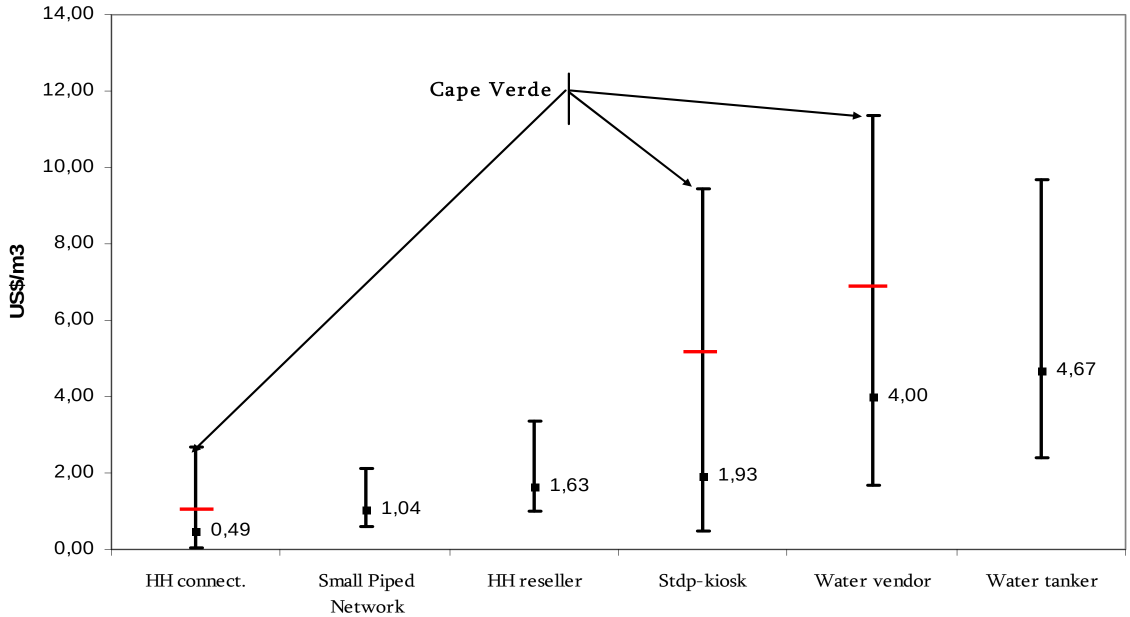
The price charged by small piped networks is slightly higher than the prices charged by the utility for a household connection. In the cities studied, the prices charged by small piped networks range from $0.47/m3 in Madagascar to $2.11/m3 in the DRC. Since small piped networks are a relatively recent solution to inadequate water supply, less is known about the costs that they bear or their performance according to management by private individuals or by community groups.

Half of the cities do not have regulations that control the number of boreholes or restrict the amount of water withdrawn from them. For those cities in which regulations exist, regulations are unclear or rarely enforced. As utilities expand service into peri-urban areas, they are likely to increasingly operate in areas where these boreholes and small piped networks exist, and the pressure is likely to grow to either put them under the purview of the utility or to regulate them. Although there are limited data, analysis of SPNs shows most of the cities do not regulate these activities.

An indicator for measuring the distortion in the water sector

Two main conclusions emerge from the overall price analysis. First, households without private connections or yard taps pay unit water prices significantly higher than those with these connections. Second, the prices for each water provider in the informal sector show a greater degree of variability than the prices for water offered by utilities to connected households. The standard deviation of the prices for each informal water service is 1.3 to 5 times higher than the price of water for connected households. There can be a great degree of variability in prices in different neighborhoods within the same city. Figure 3.5 shows the price ranges by water provider. In the case of the standpipes/kiosks, the Cape Verde example is highlighted because its high price is directly related to its very specific water production system; the red mark represents the upper value from comparison cities.

Figure 3.5 Price by water service provider



Source: AICD WSS database 2007; other.

The growing importance of the informal water market is forcing policymakers to assess the impact of their policies on this market segment both in terms of its coverage, but also in terms of how higher prices influence informal market prices and access to improved water. In countries where the formal sector water market is unable to keep pace with urban growth yet has low tariffs, and the informal market thrives, one might find a large distortion between the formal and the informal water price. At the same time, if a utility is not recovering costs because its formal tariffs are too low, it may be less able to keep pace with service expansion and one would expect the distortion to grow. In order to measure both the weight of the informal sector, and the degree to which its prices exceed those in the formal sector, one can use the weighted average informal overprice (WAIO), calculated as follows:

$$WAIO = \frac{\sum_i P_i \times C_i}{P_c \times \sum_i C_i}$$

Where:

P_i: End-user price of each water service provider (US$/m^3)

C_i: coverage of each water service provider (percent)

P_c: end-user price of residential customer 10m^3 (US$/m^3)

i: type of water service provider

Since the overall WAIO applies to all water service providers, including the household connections provided by the utility, the calculation indicates the total disruption at the city or urban level. It can be hypothesized that efficient coverage and functioning of formal networks is associated with lower informal prices (figures 3.6 and 3.7). The burden of service disruption is unequally shared between the connected and the unconnected households, because connected households enjoy the low price charged by the utility, whereas the unconnected have to face the high prices associated with the rest of suppliers. For this reason, if one wants to assess how distorted the market is for the unconnected versus the connected, the WAIO can also be calculated just for the unconnected population.[25]

Figure 3.6 Urban WAIO (HH consumption 4m3/month)

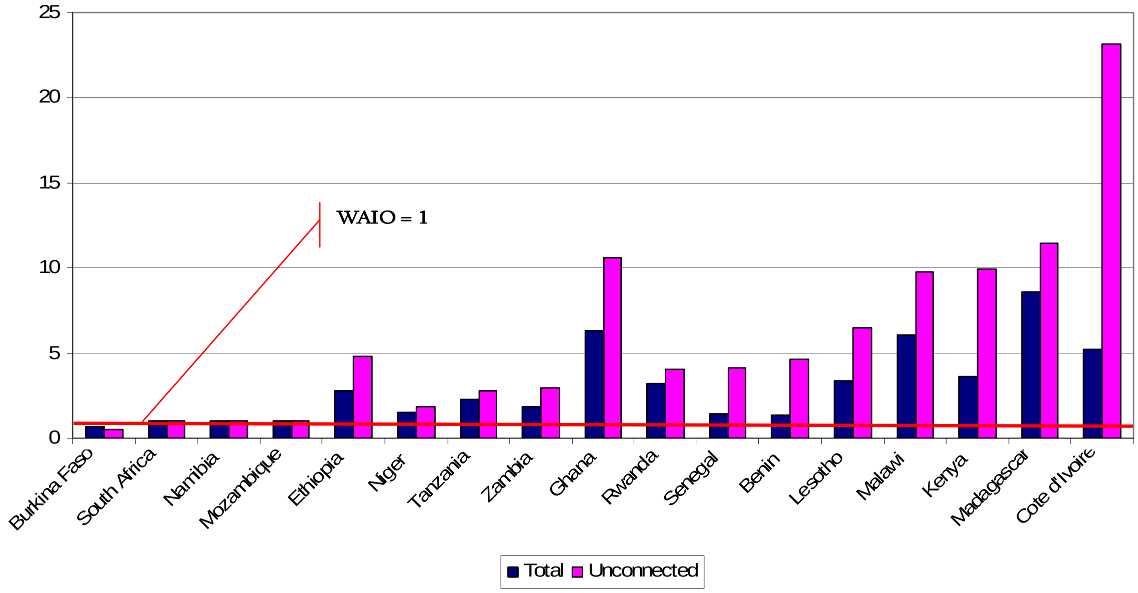
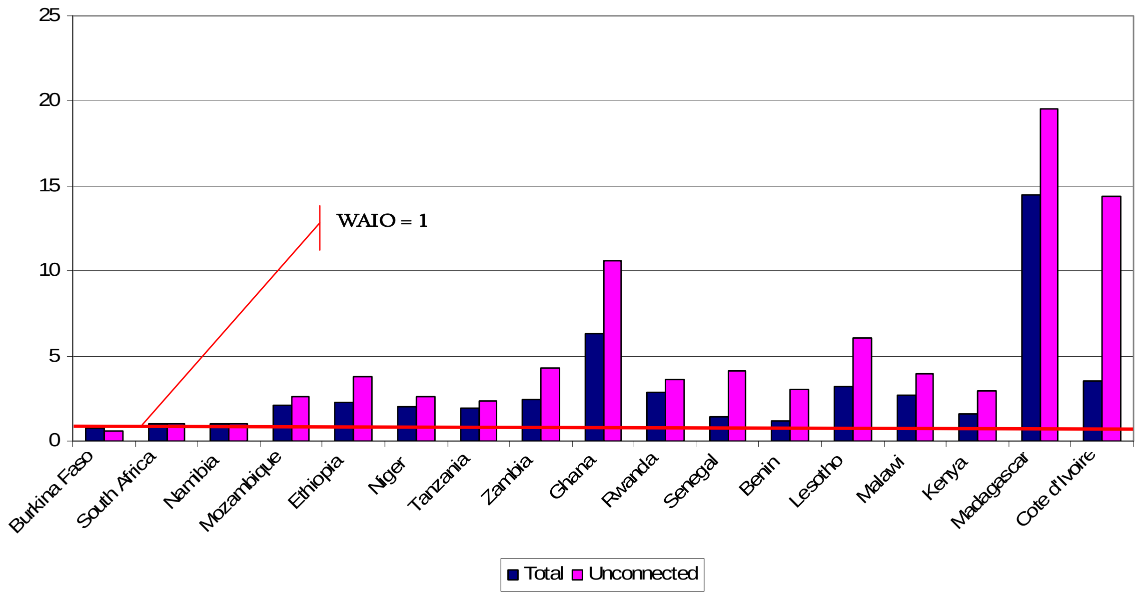


Figure 3.6 Urban WAIO (HH consumption 10m3/month)



Source: AICD WSS database 2007.

[25] See Appendix 5-2

The median value of the total WAIO varies between 2 and 2.7 for the total population and for the unconnected population only between just under 4 and 4.5, depending on the assumptions on household consumption.[26] The data thus confirms that inadequate water supply by water utilities places a heavy burden on the unconnected population. Burkina Faso has a low WAIO because its informal/retail standpipe price is actually below that of house connections.[27] South Africa and Namibia have WAIO's close to 1 because they have high levels of formal connections, and low prices for alternatives (including standpipes). In contrast, despite having one of the highest household connection rates (77 percent), urban Senegal has a WAIO for the unconnected population of 4.15 but an overall WAIO of only 1.42, reflecting the relatively high unit prices faced by the minority of urban residents without connections, but the high overall coverage rate.

There are three important caveats of this indicator: First, it does not include owned or free resources such as private wells or the fetching of water directly from a river. Second, it measures the higher price of water compared to the price for the household connection. In certain cities with a formal standpipe price that is highly subsidized (with a substantially higher household connection price), the informal standpipe price might be equal to or slightly higher than that of the household connection. As a result, the coefficient is close to one, whereas the ratio of the informal over the formal standpipe price could be much more than one. Third, this analysis does not consider service quality measures such as distance to the supplier, time needed to collect the water or water quality and pressure.

This measure does provide an indication of distortions in the urban water market and help to better track the impact of policies on access and price for the whole water market, not just for the connected market. In Mozambique, the regulator (CRA) regularly carried out consumer assessments to measure formal and informal water prices, coverage, and quality.

While the WAIO calculated above uses DHS data and thus provides cross-country information, it does not specifically include the household reseller market, for which there is almost no comparable cross-country data. Nonetheless, the case of Maputo, Mozambique, which throughout its urban water reform process has tracked prices and coverage of both the informal and the formal water market through detailed beneficiary assessments, allows one to calculate the full WAIO below (table 3.8). The results confirm the order of magnitude of the calculations performed at the urban level with DHS and AICD data. The median value of the total WAIO on a consumption of the water volume of 10m3/month with DHS and AICD data is 2.08, and rises to 2.57 for the unconnected population. The median value of the total WAIO on a consumption of the water volume of 10m3/month based on the Maputo data is 1.62, and rises to 1.82 for the unconnected population (BA Maputo 2006).

[26] On a consumption of the water volume of 4m3/month, the median value of the total WAIO is almost 2, and rises to almost 4 for the unconnected population. For the water volume of 10m3/month, the median value of the total WAIO is 2.7 and rises to 4.5 WAIOs for the unconnected population. Another important clarification is that the water price used for the household connections has been calculated assuming the same level of consumption for all countries, both at 4m3/month and 10m3/month level. More detailed analyses are needed to understand the effect that real consumption levels have on the price, and therefore in the calculation of the indicator.

[27] Based on price data as reported under the AICD by utilities, and coverage data as reported by DHS.

Table 3.8 WAIO in Maputo

	Coverage (%)	Price (US$/m3)
Adem connection	22.8%	0.44
SSIP connection	11.5%	0.88
HH reseller	25.8%	0.81
Public standpipe	14.3%	0.58
SSIP standpipe	11.4%	0.92
Pvt B/H /neighbours	6.9%	0.99
Own B/H	5.6%	0.00
Public handpump	1.9%	0.00
Total	100%	

Source: BA Maputo 2006

WAIO (total)	**1.62**
WAIO (unconnected)	**1.82**

The lack of attention to standpipe pricing and management issues, together with the constraints that utilities face in expanding service to a rapidly growing population, means that in low coverage countries, the poor remain largely outside of the formal sector. This indicator provides a more accurate picture of the reality faced by all of the urban population in low coverage countries than formal coverage and prices alone, and can therefore provide a useful tool for monitoring purposes before and during reform processes.

4 Conclusions

Utilities in African cities have not been able to keep up with the rapid pace of urban growth, in spite of increasing the number of water connections. As a result, the urban populations with no direct water connections are expanding. This paper assesses the current level of knowledge and data on this important segment of water consumers, and identifies priorities for further research.

Public water provision to the unconnected

Water supply through public standpipes has been the most common public solution to extend improved water services in newly developed areas in the city and to an increasing slum population. Standpipes are the most important source for the urban unconnected population, according to utility data; household survey (DHS) data confirm that all types of standpipes (not just public) accounted for 28 percent of urban coverage in surveyed countries, the most important source after house connections. However, this coverage has generally been overestimated for a variety of reasons; many public standpipes (almost one-third) are nonfunctional.

There has been a shift away from provision of free public standpipes managed by utilities to the delegation of standpipe management to private operators, to communities, or to community leaders. Only 27 percent of the utilities sampled still had standpipes free of charge. Delegation represents an effort to reduce the management burden (and cost) on the utility. The experience with different management models has been very mixed, both within cities and among cities, and has generally not resulted in the provision of a lower cost service.

While standpipes theoretically can offer a lower cost service to a larger number of consumers, there have been significant implementation challenges with these schemes. In particular, delegating standpipe management to community leaders or groups has run into problems when such schemes assume that complex urban social environments have well formed “communities”. Urban areas within cities are often heterogeneous, with varied levels of social capital and community cohesion. Failure to take this context into account has led in some cases to political involvement in the selection of standpipe managers, to the “capture” of kiosks or standpipes by local elites or individuals with little accountability to consumers, to a failure to pay utilities because of the known political cost of shutting off standpipes for non-payment and to the provision of a low quality service at a higher price. Private contractors can increase the efficiency of water provision, but they also tend to increase the cost to the consumer.

In general, many standpipe management schemes have lacked a focus on information sharing to broader groups of consumers (on prices, management structures, feedback mechanisms, or recourse for mismanagement), and transparency in the selection and management processes. Further, regulators have, by and large, not provided sufficient attention to monitoring, pricing or quality issues in this sub-sector.

Utilities are often not well equipped to deal with these political economy issues. The culture of many utilities, particularly those without incentives aligned to broader policies of expanding access, tends to center around technical aspects of service delivery, and meeting financial performance targets. Further, utilities have little incentive to prioritize attention to this sector, as in many large cities, standpipes account for a small portion of revenues (typically less than 10 percent); in some cases, this leads to a low level equilibrium where a minimal amount is invested in standpipes that tend to offer low levels of service and bring in little revenue. Thus, cost recovery from standpipes tends to be low, and in response, some utilities informally ration water to standpipes to limit losses or allow them to fall into disrepair.

The result of some of these implementation problems has been higher prices for standpipe water to consumers, in spite of "social" tariffs for almost three-quarters of sampled cities. In 89 percent of the sample cities, the informal/retail standpipe unit price exceeded that for house connections, often by a significant margin, and tended to align with the going rate in the informal water market. At the same time, the formal or wholesale standpipe price falls far below the retail/informal price that consumers actually pay. Analysis of maintenance and management costs suggests that this price difference represents a substantial transfer of profits from the utility to the standpipe manager, rather than a reflection of operating costs. Among the cities studied, this transfer can represent between $0.19 million to $1.3 million per annum per city. Thus, while standpipes are already heavily subsidized by utilities, almost none of this subsidy reaches the ultimate consumers of the water.

The trend towards high standpipe prices, declining service levels, and in some countries, lower effective standpipe coverage has implications for the poor. In countries that already have relatively high price structures, this could lead to a shift from improved to unimproved sources of water. A clear indicator of "stress" on this front can be seen in the diversity of sources used; in countries such as the Copperbelt region of Zambia in 2000, most households used one source of water because coverage was relatively high and formal water prices relatively low. In countries where prices begin to approach affordability limits, households ration the use of standpipe water for drinking/cooking and seek other sources for other uses, further adding to the time burden on the household.

Standpipe schemes that have succeeded have generally had more monitoring by a supporting institution – whether the utility, or outside groups (such as larger more formalized water associations with accountability procedures, or larger more professional NGOs). Monitoring by a supporting institution can add to the administrative cost. Successful schemes have also involved taking the social context and level of social cohesion into account in determining management structures and arrangements. This implies increasing the "soft" skills of utility staff to be able to assess local market and social conditions. Finally, more successful schemes have included well-thought-through checks and balances to minimize political interference in management and rent-seeking behavior by standpipe managers. Service of good quality at a fair and transparent price is directly associated with dedicated participation of the utility in the model in monitoring the adequate status of the standpipes, regularly collecting the water revenues, and providing technical assistance to the standpipe operators. It is essential to define a good set of incentives so that the utility maintains an interest in participating in the standpipe business.

One promising standpipe model is that of the pre-paid standpipe, currently being implemented in Lesotho, South Africa and Namibia. This promises to reduce management costs for the utility (although the up-front cost of the equipment is not low), and do a better job of passing lower tariffs onto the end-consumer. It must be noted, however, that even with this service, it is important to ensure good publication of prices and management arrangements because these could be "captured" as well by local individuals.

Overall, beyond the review of case studies, there is little empirical cross-country data to refine the analysis of the characteristics of well functioning standpipes. However, most of the case studies reviewed point to the importance of maintenance, monitoring and the site-specific social and competitive water context (the existence of alternatives to the standpipe). This suggests that one solution for better management should include more flexibility at the design and siting stage.

The informal urban water market

A thriving “informal” water market has stepped into the coverage gap. The three most common providers in this market consist of people who resell from their network house connection, independent small piped systems or kiosks not attached to the network supply, and mobile vendors or water tankers.

By far the most significant informal water source consists of those who resell from their household connection, particularly in medium-low coverage countries (70 percent of surveyed utilities noted that this was common). In the few places where resale has been measured, the sales volume of this market can be significant (for example, US$1.5 million in Maputo in 1996) and can actually exceed the total residential sales volume received by the utility. This source can account for as much as one third of overall coverage in a city, and more than this among the unconnected urban population, particularly in cities with low to medium levels of connection, with high up-front costs to connect to the network, or where utilities are simply unable to respond to requests for connections.

Households, particularly those in high crime “inner” peri-urban areas, often prefer to buy water from their neighbor instead of relying on a standpipe because of distance and time factors. However, many also use this source because it is the only one available (particularly as standpipes break down). In addition, low income households may not have a sufficiently steady income to allow for their own household connection. However, a 2006 study in Mozambique showed that 40 percent of those purchasing from neighbors had established monthly payment systems that were more cost effective per unit.[28] This points to the importance of understanding the composition of the unconnected consumers in determining the appropriate service mix.

Despite the common belief that water reselling by households with private connections is illegal in African cities, in reality water resellers are neither prohibited nor legalized in many cities; utilities and governments simply do not control and rarely contest this practice. In the cities with available data, standpipes acted as price-markers for the household water reseller price and vice versa.

Mobile water vendors and tankers, although more visible, provide water to a small portion of the overall water market in all but a few countries. Those countries that rely on mobile water vendors have some specific physical or supply constraints (as in Khartoum, Accra, and Luanda).

SSIPs, typically kiosks or small piped systems, are among the fastest growing informal water source as they generally offer a good level of service and hours of supply because they are not dependent on network sources. However, SSIPs tend to be important in niche areas of cities that are generally just beyond the network and can represent between 9 percent and 12 percent of a city’s water coverage.

[28] Thompson, SAL Consultants 2007.

An issue likely to emerge in the next ten years will be the increasing competition between utilities and private operators, particularly SSIPs, as utilities expand their network and begin to operate in the same areas as these providers. This will likely raise issues about whether utilities should explore contracts with these providers, or seek to regulate their prices.

All water service providers are interconnected in terms of the final price offered to the consumer. The more disrupted the piped water system is, the higher the price in the informal sector compared to the formal sector. Inadequate water supply by utilities places a heavy burden on the unconnected population as a whole.

Considerations for policy makers

Meeting the MDGs: the service mix

Recent literature on Africa has highlighted the challenges ahead in terms of meeting the Millennium Development Goals for water access, given gaps in infrastructure financing and institutional constraints in terms of utility efficiency and capacity. In light of limited resources, policymakers may look towards greater focus on standpipes at the expense of household connections to increase coverage more quickly at lower cost. However, there is a significant discord between the policy goals and the incentives faced by utilities; to date, most utilities have only extended standpipes to the degree that they also extend household connections that allow them to cover the cost of service extension.

Clearly, if one were to shift towards a greater proportion of standpipes in the service mix, this would require a substantial shift in strategy and incentives for utilities, both in terms of better management and monitoring, but also in terms of the pricing structure and financial gain for the utility. Under the current pricing and management schemes, moving this approach to scale is not likely to be financially sustainable. As noted above, this will also likely require some investment by utilities in “soft” aspects of service extension; indeed, one option would be to re-direct subsidies that currently benefit connected customers and standpipe managers to support this capacity in human resources in the utilities. New standpipe models, such as the pre-paid standpipe, should be closely monitored as they may provide a viable solution to some of these challenges.

If utilities continue to ignore this sub-sector, there will be consequences for the poor. In some cities with higher connection rates (Johannesburg, parts of Dakar), standpipe customers are often primarily the poor or those who have been disconnected. Eliminating standpipes, or allowing them to deteriorate, would have a negative impact on this population. In other countries, standpipes serve a more heterogeneous group of consumers, including those who may be eligible for house connections, and those who are able to purchase from neighbors. Policymakers and utilities need to better understand the nature of their standpipe customer before eliminating or reducing their attention to this source.

An obvious option for expanding coverage would be to further explore the existing distribution mechanisms of resale of house connection water. To start, if better data were available on this sector, one could conceivably include in coverage estimates those purchasing water from households with connections; if this were done, indications suggest that formal coverage rates in Africa would increase substantially.

There are several advantages to household resale of water. It can reduce the burden of bill collection on the utility, and for consumers who have trouble managing a monthly payment (which is the majority of those in the informal sector), household re-sale offers a “middle ground” between standpipe and house connection service. However, this source is not necessarily equitable in terms of access (it can be denied at will and pricing is often different depending on whether one is known or not) nor in terms of prices compared to the person paying for a house connection. Nonetheless, for countries where utilities face financial constraints in terms of service extension or where the next incremental customer is unlikely to be able to sustain the monthly cost of a house connection, there is potential to better explore partnerships with private individuals over resale of water. This would imply focusing public efforts on providing good models for equitable pricing among neighbors, and providing support for safe storage of water.

Better monitoring indicators

For countries with a significant informal sector, surveys and policymakers should consider monitoring not only the formal sector water prices and access, but also informal sector prices and market share (for example, using the WAIO measure introduced here). This is particularly true during periods of water sector reform, and would provide a better indication of the health of the overall water market. Mozambique provides a good example of how this was done over time.

In addition, in assessing the impact of higher formal tariffs, it would be useful for standardized surveys to assess and track the number of water sources per household over time, and to explore whether this is driven by supply constraints or by price. The use of multiple sources can be one sign of stress in terms of pricing.

Regulators need to play a greater role in monitoring the standpipe sector, including the number of operational standpipes and quality of service (in terms of price, water pressure, hours of service operation).

More transparency in pricing, increased social accountability and feedback mechanisms

One way to increase the transparency of pricing mechanisms could be through the intensive publication of formal prices and of management arrangements and responsibilities to broader groups of consumers. This would increase the accountability of standpipe operators and could potentially place downwards pressure on prices. To improve the efficiency of this sector, and potentially reduce the amount of resources that are currently “captured” by middlemen, steps could include the following: provide regular feedback mechanisms for consumers; conduct beneficiary assessments to assess whether consumers are even aware of the responsibilities of the operator or rights of the consumer; monitor retail standpipe prices.It is likely that utilities will need to follow the example of standpipe arrangements that have been more successful, and invest in adequate incentive structures and monitoring. However, doing so may reduce the profit levels of standpipe managers, and allow the utility to raise the wholesale price for standpipe water.

Priorities for future research

Given the importance of the unconnected market, there are several priorities for future research. These include: expanding the empirical cross-country research on management models (and management costs) for public standpipes; assessing the size and price of the resale market and improving existing cross-country household surveys to reflect the major providers in this market; developing more accurate assessments of the percentage of public standpipes that are functional and/or disconnected and reasons for non-functioning; exploring factors behind the variations in retail pricing of public standpipes; and tracking and better understanding how changes in formal tariffs for house connection customers feed into informal tariffs in the resale market.

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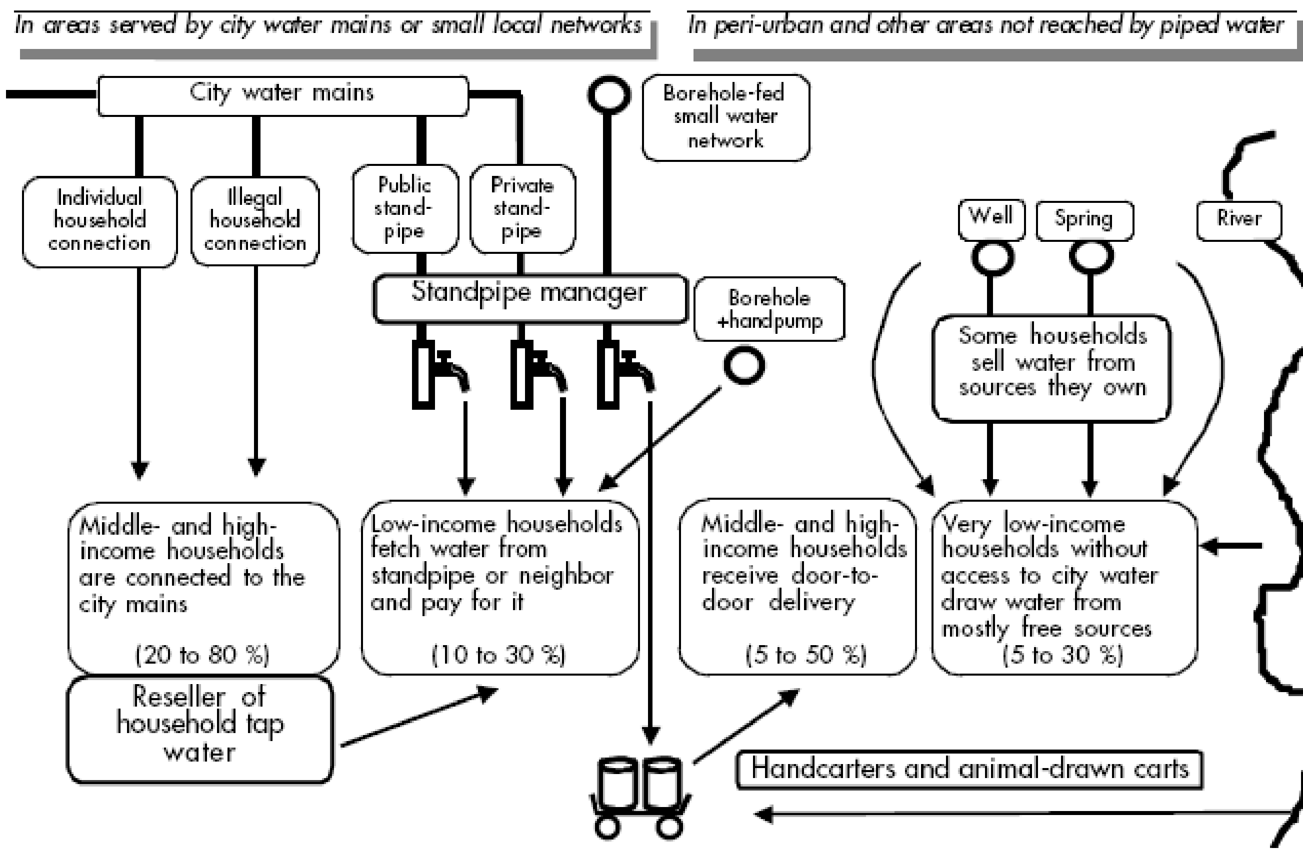
Appendixes

Appendix 1 Water provision diagram



Source: Collignon and Vézina 2000.

Note: 10 capital cities. Benin, Burkina Faso, Côte d'Ivoire, Guinea, Mali, Mauritania, Senegal, Kenya, Tanzania, Uganda.

Appendix 2 Total, urban, and slum population growth, sorted by urban population growth

	Growth (annual average)			Urban
	Total	Urban	Slum	Pop
	(1990-2005)	(1995-2000)*	(1990-2001)	(2005)
Country	(%)	(%)	(%)	(%)
Mozambique	2.60	6.30	6.94	38
Tanzania	2.50	6.06	6.16	38
Niger	3.30	5.92	5.89	23
Kenya	2.50	5.77	5.88	42
Mauritania	2.80	5.32	5.60	64
Sudan	2.20	5.09	5.19	41
Cameroon	2.20	5.05	4.20	53
Malawi	2.10	5.04	3.92	17
Nigeria	2.50	5.01	4.98	48
Angola	2.80	5.00	5.28	37
Burkina Faso	2.90	4.95	3.97	19
Benin	3.30	4.51	5.34	46
Chad	3.20	4.45	4.26	26
Namibia	2.50	4.35	2.88	34
Ghana	2.40	4.03	1.83	46
Ethiopia	2.20	4.02	4.81	16
Senegal	2.50	4.00	4.05	51
Cape Verde	2.42	3.96	5.42	58
Uganda	3.20	3.60	5.32	12
Madagascar	2.90	3.33	5.33	27
Cote d'Ivoire	2.40	3.31	N/V	N/V
Rwanda	1.60	3.20	3.55	22
DRC	2.80	2.87	3.61	33
South Africa	1.90	2.51	0.91	58
Lesotho	0.80	1.41	6.32	18
Zambia	2.20	0.94	2.88	37
Average	2.49	4.23	4.58	36.11
pop weighted av	2.50	4.39	4.43	36.51

* Except for Rwanda (1990-1995)

Source: WDI 2007,UN-Habitat 2005

Appendix 3 Conflict Index

							Score				Compounded score			
	Number of years since the last violent conflict in the last 30 years (1)	Duration of the last conflict (2)	Intensity of the last violent conflict (3)		IDPs (4)		1	2	3	4	1+2	1+2+3	1+2+4	1+2+3+4
	(yr)	(yr)	(# casualties)	(% casualties / population)	(#)	(% IDPs / Population)	>30=0; 10-30=1;<10=2	<5=0; 5-10=1;>10=2	<1%=0; 1%-3%=1;>3%=2	<1%=0; 1%-3%=1;>3%=2				
Angola	5	27	500,000	3.14%	61,700	0.4%	2	2	2	0	4	6	4	6
Sudan	0	22	2,300,000	6.35%	5,355,000	18.6%	2	2	2	2	4	6	6	8
Uganda	0	25	12,000	0.04%	1,297,000	8.2%	2	2	0	2	4	4	6	6
Mozambique	15	15	900,000	4.55%		0.0%	1	2	2	0	3	5	3	5
Namibia	18	24	N/V	N/V		0.0%	1	2	0	0	3	3	3	3
Chad	0	5	614	0.01%	172,600	0.9%	2	1	0	0	3	3	3	3
Cote d'Ivoire	2	5	1,800	0.01%	709,000	1.9%	2	1	0	1	3	3	4	4
DRC	0	13	4,000,000	6.96%	1,000,000	10.3%	2	2	2	2	4	6	6	8
Ethiopia	7	30	310,000	0.08%	190,000	1.6%	2	2	0	1	4	4	5	5
Lesotho	8	1	0	0.00%		0.0%	2	0	0	0	2	2	2	2
Rwanda	13	1	900,000	10.00%	650,000	1.8%	1	0	2	1	1	3	2	4
Benin	>30	0	0	0.00%		0.0%	0	0	0	0	0	0	0	0
Burkina Faso	>30	0	0	0.00%		0.0%	0	0	0	0	0	0	0	0
Niger	>30	0	0	0.00%		0.0%	0	0	0	0	0	0	0	0
Senegal	>30	0	0	0.00%	64,000	0.5%	0	0	0	0	0	0	0	0
South Africa	>30	0	0	0.00%		0.0%	0	0	0	0	0	0	0	0
Malawi	>30	0	0	0.00%		0.0%	0	0	0	0	0	0	0	0
Zambia	>30	0	0	0.00%		0.0%	0	0	0	0	0	0	0	0
Cameroon	>30	0	0	0.00%		0.0%	0	0	0	0	0	0	0	0
Cape Verde	>30	0	0	0.00%		0.0%	0	0	0	0	0	0	0	0
Madagascar	>30	0	0	0.00%		0.0%	0	0	0	0	0	0	0	0
Tanzania	>30	0	0	0.00%		0.0%	0	0	0	0	0	0	0	0
Mauritania	>30	0	0	0.00%		0.0%	0	0	0	0	0	0	0	0
Nigeria	>30	0	0	0.00%	200,000	1.0%	0	0	0	1	0	0	1	1
Ghana	>30	0	0	0.00%	190,000	2.1%	0	0	0	1	0	0	1	1
Kenya	>30	0	0	0.00%	431,000	3.7%	0	0	0	2	0	0	2	2

Source: UN DPKO; IDMC Global Statistics

Appendix 4 Percentage of unconnected population at the city level with population density

Conflict index	Country	City (largest)	Unconnected (%)	Density (ppl/km2)	Conflict Index
High	Sudan	Great Khartoum	73	6,850	8
	DRC	Kinshasa	64	10,650	8
	Uganda	Kampala	70	118	6
Medium	Angola	Luanda (2)	80	1,093	6
	Ethiopia	Addis Ababa	61	5,457	5
	Mozambique	Maputo	74	4,400	5
	Cote d'Ivoire	Abidjan (2)	35	1,728	4
	Rwanda	Kigali (1)	65	1,067	4
	Chad	N'Djamena (2)	78	819	3
	Namibia	Windhoek	27	362	3
Low	Lesotho	Maseru (1)	67	112	2
	Kenya	Nairobi	49	4,230	2
	Nigeria	Kaduna	52	132	1
	Ghana	Accra (1)	45	3,300	1
	Malawi	Blantyre	53	191	0
	Cameroon	Douala (2)	76	109	0
	Cape Verde	Praia	66	477	0
	Madagascar	Antananarivo (1)	58	79	0
	Senegal	Dakar (1)	23	26,208	0
	Zambia	Lusaka	73	18,000	0
	Benin	Cotonou (1)	69	14,905	0
	Tanzania	Dar es Salaam	71	14,399	0
	South Africa	Johannesburg	12	2,500	0
	Burkina Faso	Ouagadougou (1)	66	1,512	0
	Niger	Niamey (2)	69	1,269	0
	Mauritania	Nouakchott (2)	72	558	0
		Average	60	4,636	
		Median	66	1,390	
		Minimum	12	79	
		Maximum	80	26,208	

Source: AICD WSS database, UN data, DHS Urban, other sources.
Note: Shading = density of province in which city is located.

Appendix 5 Water supply chain in two African cities

Figure 1: Accra

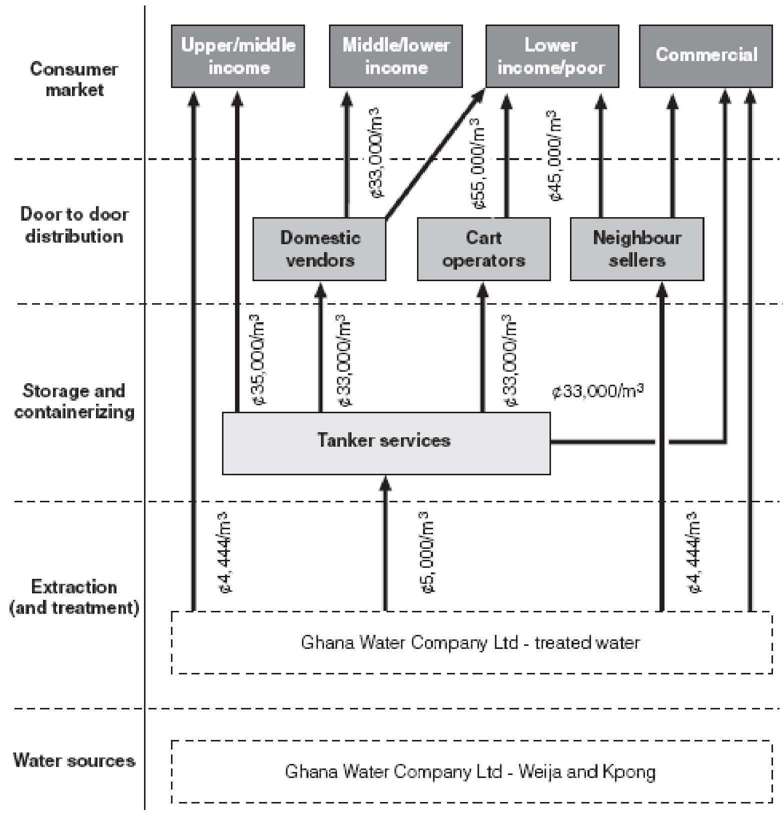
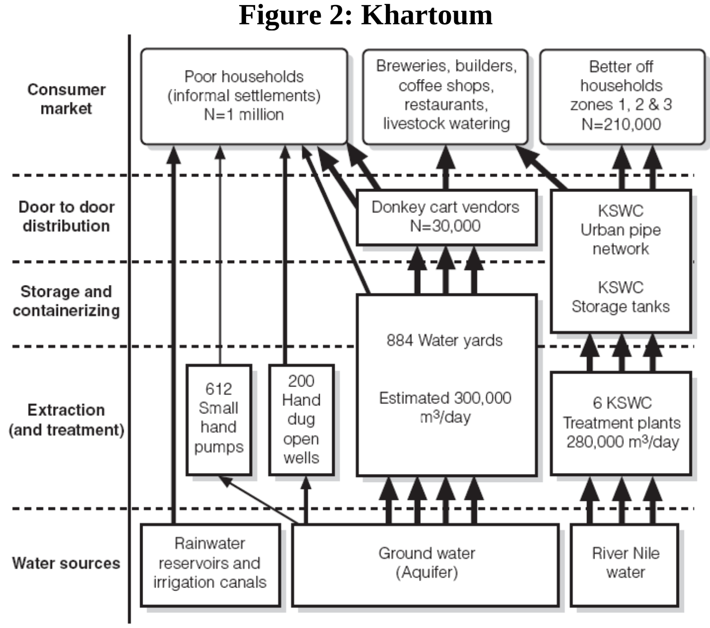


Figure 2: Khartoum



Appendix 6 Coverage of water supply in urban areas

Group	Country	Connected households (%)	Unconnected households (%)	Standpipes (%)	Water tankers (%)	Water vendors (%)	Standpipe / connected households (%)	Tank + vendors / unconnected households (%)
medium-high coverage (>60% HH connected)	South Africa	ht	12	10	0.2	0.1	82.7	2.5
	Namibia	79	21	19	0.0	0.0	90.2	0.3
	Senegal	77	23	12	0.0	0.1	50.4	0.4
	Cote d'Ivoire	65	35	15	0.0	0.0	43.4	0.0
	Benin	60	40	6	0.0	0.0	15.0	0.1
low-medium coverage (30%-60% HH connected)	Lesotho	50	50	38	0.2	0.0	77.4	0.3
	Kenya	50	50	20	0.0	0.6	40.6	1.2
	Ethiopia	48	52	41	0.7	0.0	79.3	1.3
	Zambia	46	54	36	0.1	0.0	67.6	0.2
	DRC	40	60	25	N/V	N/V	40.9	N/V
	Sudan	37	63	12	N/V	N/V	18.7	N/V
	Ghana	34	66	38	2.3	1.8	57.7	6.2
	Burkina Faso	33	67	53	0.0	0.0	79.4	0.0
	Malawi	32	68	43	0.0	0.0	63.3	0.0
	Niger	31	69	37	0.0	21.0	54.5	30.6
very low coverage (<30% HH connected)	Mauritania	28	72	24	6.8	25.3	32.8	44.3
	Cameroon	24	76	43	0.0	0.0	57.1	0.0
	Tanzania	22	78	45	2.8	3.7	58.0	8.4
	Chad	22	78	23	0.0	16.3	29.4	20.8
	Mozambique	20	80	43	0.0	0.0	53.4	0.0
	Madagascar	17	83	47	0.0	0.0	56.2	0.0
	Rwanda	16	84	41	0.1	0.1	48.3	0.1
	Nigeria	15	85	17	6.0	5.5	20.0	13.6
	Uganda	14	86	47	0.2	0.3	55.5	0.5
Urban population	Medium-High	83	17	10	0.2	0.1	70.7	1.9
weighted average	Low-Medium	41	59	28	0.7	2.0	48.2	4.0
	Very Low	18	82	27	4.2	6.0	33.9	12.7

Source: DHS database

Appendix 7 Standpipe and kiosk management models

					Dependent on utility water					
								Delegated manager		
			Independent from utility water		Utility direct management			Third party		Sup
Majority group	Country	City	Private	Community	Free of charge	Utility Staff	Pre-payment	Private	Community	Privat
Utility	South Africa	Johannesburg								
	Namibia	Windhoek								
	Lesotho	Maseru								
	Zambia	Lusaka								
	Madagascar	Antananarivo								
	Nigeria	Kaduna								
	Cape Verde	Praia								
	Sudan	Great Khartoum								
Private	Benin	Cotonou								
	Burkina Faso	Ouagadougou								
	Niger	Niamey								
	Rwanda	Kigali								
	Kenya	Nairobi								
	Senegal	Dakar								
Community	Mozambique	Maputo								
	Ethiopia	Addis Ababa								
	Malawi	Blantyre								
	Tanzania	Dar es Salaam								

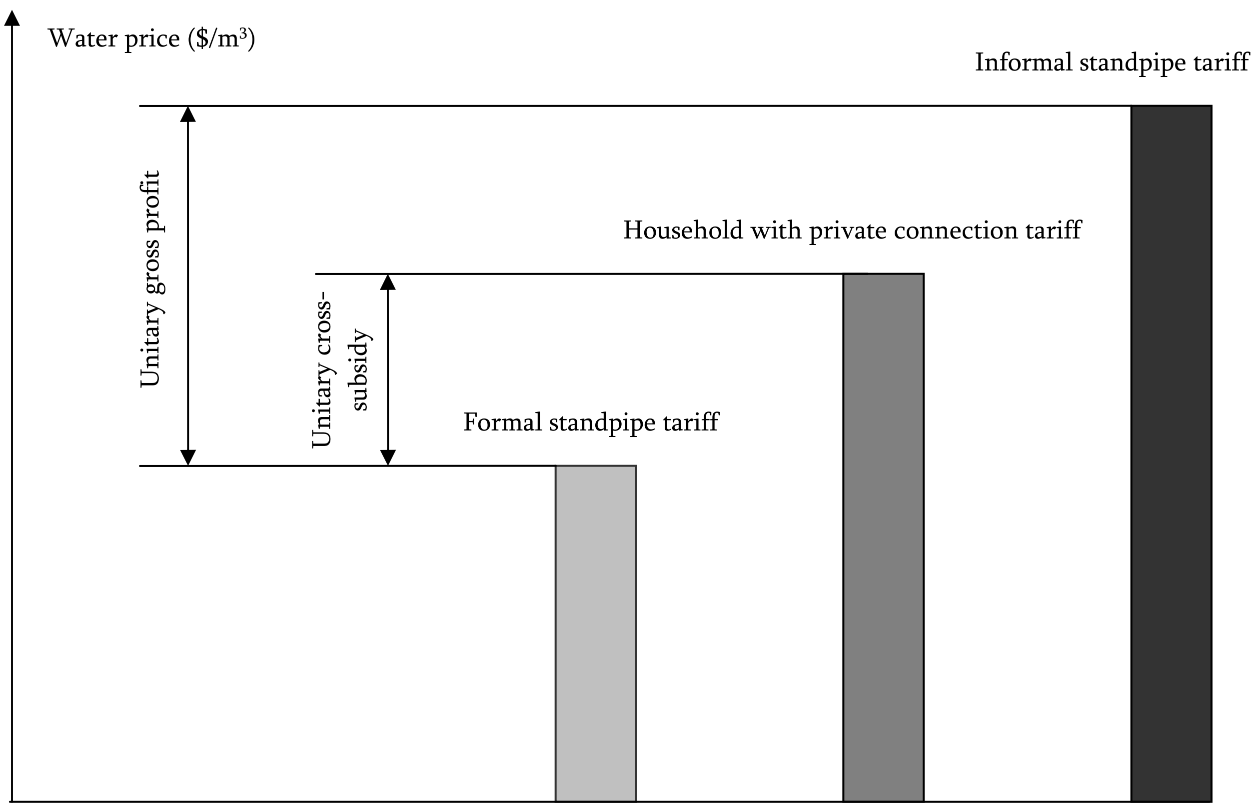
Source: AICD WSS database 2007 and other.

Appendix 8 Methodology for estimating the annual gross profit and the annual cross-subsidy between household consumers and standpipes captured by standpipe operators in a city

The following figure shows the price charged by the utility to the standpipe operators (formal or official standpipe price) and to a household with a private connection; and the price charged by the standpipe operator to the consumers (informal standpipe tariff). We define *unitary standpipe operator gross profit* and *unitary cross-subsidy between consumers with a household connection and standpipe operators* in the following way:

Unitary standpipe operator gross profit ($\mathbf{P_G}$) (\$/m^3) = Informal standpipe price (\$/m^3) – Formal standpipe price (\$/m^3)

Unitary cross-subsidy HH connection-Standpipe operator ($\mathbf{S_{HH\text{-}Stdp}}$) (\$/m^3) = HH consumer price (\$/m^3) – Formal standpipe price (\$/m^3)



Since the tariff of a household with private connection in volumetric terms depends on the level of consumption, we have to define a common level of consumption to compare tariff structures across countries. For that, we take as a reference the average consumption level of 60 l/c/d for people with a household private connection as it appears in Banerjee and others 2007, which in its turn is based on the recent survey by Water Utility Partnership in 2002. When analyzing the cross-subsidies between small and large consumers in Banerjee and others 2007, one interesting finding is that the fixed fee and minimum consumption charge means an economic burden on low volume consumers with a household connection. Therefore, despite the fact that the inverted block tariff is commonplace in African countries, the two-part tariff structure can fail to lead to a price favouring small consumers (Banerjee and others 2007). In fact, except for a few countries, the consumers with a household connection that pay the lowest price are not the small consumers (25l/c/d) but the average ones (60l/c/d). In that sense, taking 60l/c/d as a reference can help us to define the lower boundary (and a better estimate) of the cross-subsidy between consumers with a household connection and standpipe operators.

In order to estimate the annual gross profit of the standpipe operators and the annual cross-subsidy between the consumer with a household connection and the standpipe operator, we use the following formulation:

Annual gross profit of standpipe operators (\$/yr) = P_G x U x 365 (d/yr) x 1000 (l/ m^3) x P x C

Where:

P_G (\$/m^3): Unitary standpipe operator gross profit

U (l/c/d): Standpipe unit consumption. Based on the AICD data, it is fixed at 25l/c/d

P (#): City population

C (percent): Coverage of the water service by standpipes

Annual cross-subsidy between the consumer with a household connection and the standpipe operator (\$/yr) = $S_{HH\text{-}Stdp}$ x U x 365 (d/yr) x 1000 (l/ m^3) x P x C

Where:

$S_{HH\text{-}Stdp}$ (\$/m^3): Unitary cross-subsidy between household consumer-Standpipe operator

U (l/c/d): Standpipe unit consumption. Based on the AICD data, it is fixed at 25l/c/d

P (#): City population

C (percent): Coverage of the water service by standpipes

About AICD

This study is a product of the Africa Infrastructure Country Diagnostic (AICD), a project designed to expand the world's knowledge of physical infrastructure in Africa. AICD will provide a baseline against which future improvements in infrastructure services can be measured, making it possible to monitor the results achieved from donor support. It should also provide a better empirical foundation for prioritizing investments and designing policy reforms in Africa's infrastructure sectors.

AICD is based on an unprecedented effort to collect detailed economic and technical data on African infrastructure. The project has produced a series of reports (such as this one) on public expenditure, spending needs, and sector performance in each of the main infrastructure sectors—energy, information and communication technologies, irrigation, transport, and water and sanitation. *Africa's Infrastructure—A Time for Transformation*, published by the World Bank in November 2009, synthesizes the most significant findings of those reports.

AICD was commissioned by the Infrastructure Consortium for Africa after the 2005 G-8 summit at Gleneagles, which recognized the importance of scaling up donor finance for infrastructure in support of Africa's development.

The first phase of AICD focused on 24 countries that together account for 85 percent of the gross domestic product, population, and infrastructure aid flows of Sub-Saharan Africa. The countries are: Benin, Burkina Faso, Cape Verde, Cameroon, Chad, Côte d'Ivoire, the Democratic Republic of Congo, Ethiopia, Ghana, Kenya, Lesotho, Madagascar, Malawi, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, South Africa, Sudan, Tanzania, Uganda, and Zambia. Under a second phase of the project, coverage is expanding to include as many other African countries as possible.

Consistent with the genesis of the project, the main focus is on the 48 countries south of the Sahara that face the most severe infrastructure challenges. Some components of the study also cover North African countries so as to provide a broader point of reference.

The World Bank is implementing AICD with the guidance of a steering committee that represents the African Union, the New Partnership for Africa's Development (NEPAD), Africa's regional economic communities, the African Development Bank, the Development Bank of Southern Africa, and major infrastructure donors.

Financing for AICD is provided by a multidonor trust fund to which the main contributors are the U.K.'s Department for International Development, the Public Private Infrastructure Advisory Facility, Agence Française de Développement, the European Commission, and Germany's KfW Entwicklungsbank. The Sub-Saharan Africa Transport Policy Program and the Water and Sanitation Program provided technical support on data collection and analysis pertaining to their respective sectors. A group of distinguished peer reviewers from policy-making and academic circles in Africa and beyond reviewed all of the major outputs of the study to ensure the technical quality of the work.

The data underlying AICD's reports, as well as the reports themselves, are available to the public through an interactive Web site, www.infrastructureafrica.org, that allows users to download customized data reports and perform various simulations. Inquiries concerning the availability of data sets should be directed to the editors at the World Bank in Washington, DC.