

REPUBLIC OF KENYA

REVIEW OF THE WATER SUPPLY AND SANITATION SECTOR

**Improving Urban Water Supply in Kenya:
Demand, User Perception and Preferences in Nairobi, Mombasa and Kakamega**

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Executive Summary

1. This survey of 674 households in Nairobi, Mombasa and Kakamega found that at least 50% of the households in each city are unconnected and at least a third of all households are forced to rely on multiple sources.
2. Access to other basic service is also low. More than one-fourth of the households surveyed in the 3 cities have no access to any of the following four basic services – that is, private piped water supply, private toilet, organized public or private collection of garbage, and electricity. The situation is particularly acute in Kakamega where only 1% of households have access to all four services and an astounding 42% do not have access to any of these basic services.
3. Although water supply is not the only problem that they face, the households overwhelmingly rated it as their most important development priority. Specifically, 35 percent of the households said that development and improvement of water supply is either their top priority or their second priority.¹ Electricity came in at a distant second place (15 percent of the votes) and development of sanitation/sewerage was the third priority (9 percent of the votes). Interestingly, the rank order of the priorities is the same for both the poor and the non-poor households and across the three cities – this makes it harder to dismiss the results as “biased.”
4. The survey confirmed that households rely heavily on sources such as kiosks and vendors and that the cost of water from these sources is high. Water from kiosks costs an average of Ksh4.1 per jerrican of 20 liters (Ksh205/m³ or US\$2.7/m³), the average price of water from vendors is Ksh12.6 per jerrican (Ksh630/m³, or US\$8.4/m³), and water tankers of 8 m³ capacity cost Ksh2,250 to Ksh7500 (Ksh280-750/m³ or US\$3.7-10.0/m³).
5. All households – including those with private connections – are coping with the poor water supply situation by spending a lot on water and consuming relatively little, an average of 40 liters per capita per day (lcd). Specifically, households with private connections consume an average of 47 lcd and pay an average of Ksh8.6 per capita per day (US\$0.11). By comparison, households relying on kiosks consume 35 lcd and pay Ksh9.3 per capita per day (US\$0.12), and those relying primarily on vendors consume 38.6 lcd and pay Ksh12.6 per capita per day (US\$0.17).
6. Drawers of Water II (DOW II) – a detailed study of domestic water use in Kenya, Tanzania, and Uganda – reports similarly low levels of water consumption. For Kenya, DOW II estimates that households with piped water consume 45.4 lcd and those without piped water consume 22.4 lcd. DOW II data, hence, provide support for our calculations on consumption levels and increase the confidence in our findings.
7. Disaggregation of the data by income shows that the poor households consume 33 lcd and spend about Ksh 7.6 per person per day. By comparison, non-poor households consume 44.8 lcd and spend Ksh 10.4 per person per day. The average price that they pay per unit of water (from all sources combined) is surprisingly similar – Ksh 230/m³ and Ksh 280/m³ for the poor and non-poor, respectively (there is no statistically significant difference between the two). As expected, when compared to the non-poor, the poor are more likely to be

¹ Households were asked to pick their most important and second most important development priority from the following list: (1) electricity, (2) water supply system, (3) sanitation/sewerage system, (4) solid waste, (5) roads, (6) schools, (7) water drainage, (8) health services, and (9) street lighting.

unconnected, spend a higher percentage of their income on water, have smaller water storage facilities, and rely on multiple sources to a greater extent. Nevertheless, non-poor households with private connections are as likely to be dissatisfied with their current water supply system as poor unconnected households (due to inadequate and unreliable service).

8. At the city level, households in Mombasa consume the most (49.8 lcd), followed by Nairobi (37.3 lcd) and Kakamega (33 lcd). Households in Nairobi face the highest unit price (Ksh 350/m³) followed by Kakamega (Ksh 200/m³) and Mombasa (Ksh 180/m³). The high prices in Nairobi appear to be due to the water shortage in the city during the period of survey. In Mombasa, both the public tariff and the price of water from private sources appear to be inefficiently low (and the consumption levels too high) given that its marginal cost of water supply is the highest among the three cities.
9. Half of the households are dissatisfied with their primary water source. About 33% of the households have to travel more than 20 meters to their primary source, 60% of the households report having to wait in queues at their primary source, and 45% of the households feel that the price of water from their primary source is high (as opposed to “fair” or “low”).
10. 75% of the *unconnected* households are willing to pay significantly high prices for improved water services. Unconnected households were offered four choices: a private connection, a yard tap, improved kiosk service, and maintaining their current system (status quo). About 59 percent of the households chose either a private or a yard connection and are willing to pay the price – that is, a deposit fee ranging from Ksh2500-5000 (US\$33-66) and a monthly water bill of Ksh300 to Ksh750 (US\$4.0 to 10.0). A majority of those that are unwilling to connect cited the deposit fee as the main problem.
11. Only a fourth of the sample households opted to maintain status quo. The data suggest that their decision reflects financial constraints, limited potential of cost savings, and/or lack of home ownership, rather than satisfaction with their current water supply arrangements.
12. An improved kiosk system was the least preferred option.

1. Survey Structure

1.1 Sample Size and Locations

A household-level survey was conducted in three urban centers—Nairobi, Mombasa and Kakamega—to understand current patterns of water consumption and demand in urban Kenya. In Nairobi, 300 households were sampled in eight residential sites based on the criteria of socio-economic status of households and the water supply situation. In Mombasa, using the same characteristics as in Nairobi, 199 households were selected in seven sites while 175 households were selected from seven sites in Kakamega. Thus, a total of 674 household were interviewed in the three urban areas (see Table A1 in the Appendix for site wise distribution of the sample and usual economic classification of those sites). Out of these, 365 households (accounting for 54.1% of the total) also participated in answering questions on Willingness To Pay scenarios for improving water supply systems. Three different tariff structures, based on connection fee and unit price for the improved water system, were used in the WTP part of the survey (see Table 1 below). Moreover, the participating households in Kakamega were given the option to pay their connection fee in 5 equal monthly installments.

Table 1. WTP Survey Structure and Number of Participating Households

Tariff structure		Number of households surveyed			
Conn. Fee (Ksh.)	Unit cost (Ksh./m3)	Nairobi	Mombasa	Kakamega	Total
2,500	50	29	-	38	67
2,500	75	-	29	-	29
2,500	100	27	-	39	66
2,500	125	-	24	-	24
5,000	50	32	-	39	71
5,000	75	-	18	-	18
5,000	100	32	-	33	65
5,000	125	-	25	-	25
Sub-Total		120	96	149	365
Additional households surveyed (no WTP scenario)		180	103	26	309
Total		300	199	175	674

1.2 Background on the Three Selected Urban Areas

The three urban centres selected to participate in the survey differ in various ways including in size, population, geographical situation, socio-economic status of household, nature of water supply and range of water sources. Nairobi, the capital, has a population of about 3 million, Mombasa has 700,000 people while Kakamega's population is estimated at 63,000.

Nairobi is situated in the central highlands with good rainfall (but recently rainfall has been unpredictable). It is estimated that about 60% of the population in the city resides in unplanned informal settlements. Moreover, the population within the informal settlements is estimated to be increasing at a rate of 7-12% per annum as compared to less than 3% annual growth for Kenya. The Nairobi City Council, as a matter of policy, does not provide services to informal settlements

such as designated piped water networks but provides water connection to those who apply and pay the connection charges. There does appear to be some softening of this stance and the government has of late advocated for the upgrading of the settlements as part of official housing policy. Unfortunately, this policy is not actually carried out in practice. Furthermore, the current land tenure rules offer no guarantee of stay and thus the level of investment and level of services that the residents and other interested partners can provide seem to be curtailed.

Nairobi City Council is the main provider of water supply but some consumers are supplied by privately run boreholes. The Council's tariffs are structured in blocks and charged according to usage. The tariff for bulk water is US\$0.15 per 1000 litres (or at US\$0.003 per 20 – litres). Kiosks retail water to end consumers.

Mombasa, located on the coast of the Indian Ocean, is endowed with the largest port in the region and has a budding industrial base. The population is estimated to reach 1.2 million during the day due to the influx of migrant workers from neighboring districts. Unfortunately, the water intakes supplying the town are far away, and expensive to maintain. Despite this situation, Mombasa region accounts for about 80% of the revenue of the National Water Conservation and Pipeline Corporation (NWCPC) which manages a number of urban water systems in Kenya. Mombasa is a major tourist destination, and home to many hotels and tourist resorts which are large consumers of water.

Kakamega, the headquarters of the Western Province, is relatively small but is representative of the average municipality in Kenya. It is situated in the Lake Victoria Region and enjoys good rainfall. Over the past two decades, the municipality benefited from the presence of two sister-program Kefinco and Kenafya, financed with support from the Government of Finland. Kefinco concentrated on water supply program for the rural areas but carried out major rehabilitation and augmentation of the Kakamega municipal water supply. Moreover, the Kefinco program was responsible for development of shallow wells and spring protection in the villages on the outskirts of Kakamega Municipality. These sources are providing water to a large number of households in the municipality that are not served by the municipal water supply system.

2. Current Situation and How do People Perceive It

2.1 Access to Basic Services

Table 2 below shows the proportion of households who have access to the four basic services: (1) private piped water supply; (2) private toilet²; (3) organized public or private collection of garbage; and (4) electricity. The survey results indicate more than one-fourth of the 674 households surveyed in the 3 cities have no access to any of the four basic services. The situation is particularly acute for Kakamega where only 1% of households has access to all of the four services and as many as 42% has no access at all to these basic services.

Table 2. Proportion of households with access to basic services

Service	All 3 cities		Nairobi		Mombasa		Kakamega	
	% with access	Sample size	% with access	Sample size	% with access	Sample size	% with access	Sample size
Private piped water	48%	674	54%	300	54%	199	31%	175
Private toilet	55%	674	57%	300	60%	199	49%	175
Organized public or private collection of garbage	34%	674	44%	300	46%	199	3%	175
Electricity	62%	674	74%	300	72%	199	32%	175
All the 4 services	26%	674	32%	300	39%	199	1%	175
3 of the 4 services	20%	674	23%	300	16%	199	18%	175
2 of the 4 services	9%	674	7%	300	6%	199	16%	175
1 of the 4 services	18%	674	16%	300	18%	199	23%	175
None of the services	27%	674	21%	300	22%	199	42%	175

2.2 Current Water Supply Situation

- *Range and number of water sources used*

Households in the 3 cities surveyed use a wide array of primary water sources (see Table 3) to meet their household needs. There are some statistically significant³ differences across the three cities in the use of various water sources. About 50% or less of the households in any city have private piped water supply, with Kakamega having the lowest proportion at 39%. Besides private piped water connection, the next two most commonly used primary water sources by Nairobi households are yard tap and water kiosks, while those by Mombasa households are water kiosks and vendors. In Kakamega, as many households are likely to use ground/natural water sources as private piped connection, with yard tap as a distant third most popular source. About a third or more of the households in each city rely on multiple water sources to meet their needs (see Table A-2 in the Appendix for more details), especially in Mombasa where over 50% of households rely on at least two sources.

² A toilet is classified as "private", irrespective of the type of the toilet, if a household does not share it with other households.

³ Unless mentioned otherwise, statistical significance in this report is based on 5% or less significance level.

Table 3. Primary water sources

Source	All 3 cities	Nairobi	Mombasa	Kakamega
Private piped connection	46%	51%	45%	39%
Yard tap	15%	21%	4%	17%
Own source (well, borehole)	2%	3%	2%	2%
Water kiosk	19%	19%	31%	3%
Water vendors	5%	3%	12%	1%
Neighbors	2%	2%	3%	1%
Ground & natural sources	10%	0%	2%	34%
Others (incl. Bottled water)	1%	1%	1%	2%
Total	100%	100%	100%	100%
Number of respondents	672	300	198	174

- **Household Experiences with Primary Water Sources**

The high proportion of households using multiple water sources is not surprising when one looks at the households' experience with their primary water sources (see Table 4; for break-ups across primary water sources see Tables A3a-g in the Appendix). We highlight below the *statistically significant* salient findings across the cities and primary water sources.

- About 25% or more of the households in each city **travel** at least 20 meters, and often over 200 meters, to get water from their primary water sources. Households using ground/natural water sources and kiosks are more likely to travel much longer distance. So, the travel distance gets particularly high in Kakamega where about 40% of the households have to go over 200 meters to reach their primary water sources – because of their more wide spread use of natural/ground water sources (refer to Table 3 earlier).
- About 60% or more of the households in each city experience usual or occasional **queues** to get water from their primary water sources. As one would expect, the results indicate that households using ground/natural water sources and kiosks are more likely to experience queues.
- Households generally perceive the **quality** of water from their primary sources to be adequate for consumption. There is no statistically significant difference across households of the three cities as far as this overall quality perception sources with 80% or more households in each city deeming it to be “good” or “fair . However, the quality perceptions differ statistically across the sources. Households are likely to perceive the quality of water from ground/natural sources and vendors to be lower than that from private piped connection, yard taps or kiosks.
- Households whose primary water sources are kiosks and vendors are more likely to feel that the **amount** of water from their primary water sources is not adequate. In terms of differences across cities, about 25% of the households in Nairobi and Mombasa feel that the amount of water from their primary water sources is not adequate while that number for Kakamega falls to 11%. That difference is not surprising given that ground/natural source happens to be a major source of water in Kakamega (refer to Table 3 earlier). Although households in Kakamega have access to adequate amount of water, the trade-off is that they travel a longer distance to get water.

Table 4. Household experiences with their current primary water sources*

	All 3 cities	Nairobi	Mombasa	Kakamega
Distance of the primary water source from home				
Less than 20 m.	67%	74%	75%	38%
21 – 40 m.	8%	5%	12%	13%
41 – 200 m.	7%	7%	6%	11%
More than 200 m.	18%	17%	7%	39%
Number of respondents:	524	236	179	109
Prevalence of queue at the primary water source				
Usually:	40%	44%	31%	46%
Sometimes:	21%	12%	28%	30%
Rarely:	39%	44%	41%	24%
Number of respondents:	365	162	127	76
Perceived water quality of the primary water source				
Poor:	16%	17%	10%	20%
Fair:	36%	34%	38%	35%
Good:	49%	49%	51%	45%
Number of respondents:	605	267	191	147
Perceived adequacy of the amount of water from the primary water source				
Poor:	20%	24%	23%	11%
Fair:	38%	31%	41%	48%
Good:	42%	45%	37%	41%
Number of respondents:	604	267	190	147
Perceived availability of water from the primary water source				
Poor:	27%	30%	32%	14%
Fair:	39%	34%	42%	42%
Good:	35%	36%	27%	44%
Number of respondents:	604	267	190	147
Perception of the price paid for water from the primary water source				
High:	45%	46%	45%	39%
Fair:	33%	32%	38%	24%
Low:	23%	22%	17%	38%
Number of respondents:	510	247	175	88
Overall satisfaction with the primary water source				
Not satisfied:	50%	49%	51%	50%
Satisfied:	42%	39%	44%	45%
Very satisfied:	8%	11%	5%	5%
Number of respondents:	592	261	187	144

* The total percentage might not always add up to 100% because of rounding errors.

- Households who use vendors, yard taps and private water connections as their primary water sources are more likely to feel that the *availability* of water from their primary water sources is erratic/poor. (And, as one would expect, those who use ground/natural as their primary water source are least likely to feel that the availability of water from their primary water sources is erratic/poor.) In terms of differences across cities, about 30% of the households in Nairobi and Mombasa feel that the availability of water from their primary water sources is erratic/poor while that number for Kakamega falls to 14%. Again, that finding is consistent given that ground/natural source happens to be a major source of water in Kakamega.
- Households whose primary water sources are kiosks and vendors are more likely to feel that the *price paid* for water from their primary water sources is ‘high’. (Consistent with expectation, those who use ground/natural as their primary water source are least likely to feel that the price of water from their primary water sources is high.) In terms of differences across cities, about 45% of the households in Nairobi and Mombasa feel that the price paid for water from their primary water sources is high while that number for Kakamega falls to 39%. This difference is again consistent with the fact that ground/natural source happens to be a major source of water for Kakamega households.
- About half of the households express dissatisfaction with their current primary water sources, and there is no statistically significant difference across households of the three cities as far as this *overall satisfaction level*. However, the overall satisfaction level does differ statistically across the sources. Households using vendors and kiosks are likely to have the lowest satisfaction level while those using their own water sources (well, boreholes) are likely to have the highest. For other sources like private piped or yard tap connections, households are as likely to be satisfied as dissatisfied.

- ***Who in the Household Spends the Time and Effort to Get Water?***

An analysis of the primary drawers of water for households shows that it is overwhelmingly (70% or more) the female adults and the children in a household who had to spend the time and effort to collect water. There is no statistically significant difference in the proportion of females and children as primary drawers of water either with respect to the three cities or with respect to the distance of primary water source from home. However, when analyzed with respect to the types of primary water source, females are found to be more likely to be the primary drawers for households who use kiosks and natural/ground water as primary sources (for the detailed cross-tabulation results, refer to Tables A-4a-b in the Appendix).

- ***Primary Method Used to Treat Water***

Only about a quarter of the households do nothing to treat the water. The majority – about 70% – boil the water and this is their primary treatment method. The difference across cities in terms of proportion of households who *do not* use any water treatment is statistically significant with the highest in Mombasa and lowest in Nairobi. Analysis across various primary water sources also indicates presence of statistically different likelihood of treatment. Households who use kiosks as their primary water source are least likely to treat water, which is consistent with the earlier finding that households are likely to perceive the water quality from kiosk to be higher. Interestingly, even though households perceive the quality of water from private piped and yard tap connections to be relatively high, those who use private piped and yard connection are also most likely to at least boil their water (for the detailed cross-tabulation results, refer to Table -5 in the Appendix).

- **Water Consumption and Expenditure Patterns**

Table 5a below shows the current consumption and expenditure patterns based on the survey data. The water consumption averages about 40 liters per capita per day (lcd), with households in Mombasa consuming the most volume (49.8 lcd), followed by Nairobi (37.3 lcd) and Kakamega (33 lcd). On an average, about 75% of their total water consumption comes from the primary water source and the rest from other sources. This is consistent with our earlier finding of the widespread use of multiple water sources among households. Households are paying a relatively high price on an average for the water that they consume, with those in Nairobi paying the highest (Ksh 350/m³) followed by Kakamega (Ksh 200/m³) and Mombasa (Ksh 180/m³). The high prices in Nairobi reflect the water shortage in the city during the period of survey. Mombasa, which is estimated to have the highest long run marginal cost of water, has the highest consumption levels per capita and households in this city face the lowest unit prices in our sample.

- **Water Consumption and Expenditure Patterns by *Household Welfare Level***

To examine how welfare level affects water consumption and expenditure patterns across households, we used self-reported total monthly household income as the measure of welfare. Specifically, we use a monthly household income threshold level of Ksh. 10,000 for Nairobi and Mombasa, and Ksh. 5,000 for Kakamega. Households in a city who reported total monthly household incomes equal to or less than the threshold level set for that city are designated as “poor” and higher than the threshold level as “non-poor” (see note in box below). Such classification resulted in 37% “poor” households for the entire sample (37% for Nairobi, 39% for Mombasa and 54% for Kakamega).

Appropriateness of the welfare measure used?

Our income based welfare measure can be defended on following grounds:

- Statistical analysis of social/demographic characteristics of poor versus non-poor households as defined by our welfare measure yield results which are consistent with the findings in the existing literature. The results show that compared to non-poor households, poor households are likely to be in densely populated neighborhoods (likely slum areas), not own their homes, earn most of their earning in daily wages and have household heads who are much less educated and younger. Neither the gender of the household head nor the household size showed any statistically significant difference between poor versus non-poor households. In this context, one should recognize that household size as measured here is likely to be biased on the low side for the poor households because of a “split family” situation (a few members reside in the city while the rest are in their rural home). As a result, although family sizes are usually larger for poor households, in this case the finding of no significant difference in household size between poor and non-poor households is not inconsistent.
- The neighborhood specific sample proportion of poor households are also quite consistent with a priori expectations – generally acknowledged poor neighborhoods exhibiting a high proportion of poor households as defined by our welfare measure, and vice versa.
- The total sample proportion of poor households as defined by our welfare measure is 37%. By comparison, the 1997 welfare monitoring survey estimated the urban poverty rate at 49%, the rural poverty rate at 54% and the national poverty rate at 52%. In other words, our definition of “poor” is more stringent than that used in the welfare monitoring survey which means that the “poor” households in this study are, on average, likely to be poorer than those in the national welfare study.

Table 5a. Water Consumption and Expenditure Patterns¹

	All 3 cities			Nairobi			Mombasa			Kakamega		
	N	Mean		N	Mean		N	Mean		N	Mean	
Consumption from all sources												
• Daily household consumption (in litres)*	586	186.4		249	161.6		178	255.8		159	147.7	
• Monthly household consumption (in litres)	586	5579		249	4815.1		178	7674		159	4431	
• Daily per capita consumption (in litres)**	581	39.97		248	37.29		178	49.77		155	33.02	
Consumption from the primary source												
• Daily household consumption (in litres)*	461	142.5		189	129.9		157	167.6		115	128.9	
• Monthly household consumption (in litres)	461	4274		189	3897		157	5027		115	3867	
• Daily per capita consumption (in litres)**	457	30.56		188	28.72		157	33.50		112	29.51	
Total expenditure on water												
• Daily household expenditure (in Ksh.)*	411	39.17		183	31.68		151	33.11		77	21.39	
• Monthly household expenditure (in Ksh.)	411	1175		183	1550		151	993		77	635	
• Daily per capita expenditure (in Ksh.)**	409	9.06		183	11.97		151	7.27		75	5.54	
Unit price for water consumed												
• From all sources (in Ksh. Per litre)**	374	0.26		164	0.35		142	0.18		68	0.20	
• From kiosk service (in Ksh. per jerrican)*	156	4.07		76	5.19		67	3.13		13	2.35	
• From vendor service (in Ksh. per jerrican)	132	12.59		78	14.31		51	10.39		3	5.33	
Household Size (persons)*	669	4.92		299	4.52		199	5.24		171	5.23	

¹ Differences in means across the three cities are statistically significant for all the variables except for the “daily per capita consumption from the primary water source”.

* Based on direct responses of survey participants.

** Based on *computed* values derived for *each household* as follows: (1) Monthly household consumption is daily household consumption multiplied by 30; (2) Daily per capita consumption is daily household consumption divided by household size; (3) Monthly household expenditure is daily household expenditure multiplied by 30; (4) Daily per capita expenditure is daily household expenditure divided by household size; (5) Unit price for water consumed from all sources is daily household expenditure divided by daily household consumption.

Table 5b. Water Consumption and Expenditure Patterns: By welfare for all 3 cities combined¹

	All 3 cities		
	Poor ²		Non-Poor ²
	N	Mean	N Mean
Consumption from all sources			
• Daily household consumption (in litres)*	215	118.9	326 276.0
• Monthly household consumption (in litres)**	215	3567	326 6755
• Daily per capita consumption (in litres)**	213	33.01	324 43.81
Consumption from the primary source			
• Daily household consumption (in litres)*	168	87.6	260 173.8
• Monthly household consumption (in litres)**	168	2627	260 5014
• Daily per capita consumption (in litres)**	166	23.79	259 34.49
Total expenditure on water			
• Daily household expenditure (in Ksh.)*	156	25.47	221 49.65
• Monthly household expenditure (in Ksh.)**	156	764	221 1489
• Daily per capita expenditure (in Ksh.)**	155	7.63	220 10.35
Unit price for water consumed			
• From all sources (in Ksh. per litre)**	153	0.23	192 0.28
• From kiosk service (in Ksh. per jerrican)*	111	4.35	36 3.28
• From vendor service (in Ksh. per jerrican)*	77	12.26	44 13.02
Household Size (persons)*	227	4.17	389 5.25

¹ Differences in means across poor versus non-poor households are statistically significant for all the variables except three: daily per capita expenditure, unit prices for water consumed from all sources and from vendor service.

² "Poor" is defined in terms of *total monthly household income* of Ksh. 10,000 and less for Nairobi & Mombasa, and of Ksh. 5,000 and less for Kakamega.

* Based on direct responses of survey participants.

** Based on *computed* values derived for *each household* as follows: (1) Monthly household consumption is daily household consumption multiplied by 30; (2) Daily per capita consumption is daily household consumption divided by household size; (3) Monthly household expenditure is daily household expenditure multiplied by 30; (4) Daily per capita expenditure is daily household expenditure divided by household size; (5) Unit price for water consumed from all sources is daily household expenditure divided by daily household consumption.

Table 5b shows the current consumption and expenditure patterns for the “poor” and “non-poor” households for the entire sample. As the relative values between poor versus non-poor are quite similar across the three cities for the various variables of interest, we focus our discussion here on the values for the entire sample (for city specific analogous values, refer to Table A-6 in the Appendix). Differences in means across poor versus non-poor households are found to be statistically significant for all the variables except three: daily per capita expenditure, unit prices for water consumed from all sources and from vendor service. The findings thus indicate that while the per capita water consumption level for non-poor households are much higher than that of poor households, per capita expenditure on water for both groups are at similar level. In other words, poor households are spending a much higher percentage of their income on water. The data also shows that non-poor households get a higher percentage of their total water needs from the primary source than poor households, which indicates more reliance on multiple water sources by poor households.

The poor households pay a relatively high average unit price of Ksh. 230/m³ for water. The absence of statistical difference in the average unit price for water between poor and non-poor is surprising given usual evidence to the contrary in the existing literature. However, two possible factors may explain this apparent anomaly. First, the unit price from all water sources for a household is computed as the ratio of two direct responses by the household: daily total water expenditure to daily water consumption level for the household. For such self-reported measure of daily water consumption, past studies have found significant downward bias by those households who have running water supply through private piped connection. The intuitive rationale is that households with running water supply will intrinsically be less conscious of their water consumption level than those households who have to fetch water from outside sources. Thus, for non-poor households who usually have private piped water connections (a fact borne out by data in our survey – see discussions below), it is more than likely that their reported daily water consumption level will be biased downward, thus producing an upward bias in computed unit price as above. A second more survey specific reason might have to do with the fact that there was a problem in the normal piped water supply in Nairobi during the survey period. The non-poor Nairobi households, being more dependent on piped water supply, were thus more affected and probably had to in fact pay a higher price to get additional water from *ad hoc* sources during that period. Taking these two factors together, it is more likely that non-poor households usually pay a lower unit price than poor households for the water they consume, and also consume water at a still much higher level than self-reported in this survey.

How do poor and non-poor households fare in terms of access to private piped connection? What are the service quality perceptions and satisfaction levels of households who are connected to private piped water service, and how do such households compare with those who depend on alternative water sources? Table 6 presents the findings on various service quality and satisfaction levels for households with private piped water connections, while Table 7a presents the comparison between households with and without private piped connection. As the relative values between households with and without private piped connection are quite similar across the three cities for the various variables of interest, we focus our discussion here on the values for the entire sample (for city specific analogous values, refer to Table A-7a-c in the Appendix).

Table 6. Households with private piped water connections: Service quality and satisfaction levels

	All 3 cities		Nairobi		Mombasa		Kakamega	
	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample
No. of households connected	322	674	161	300	107	199	54	175
% of households connected	47.8		53.7		53.8		30.9	
Out of those connected:								
% of households who are poor ¹	7.3	247	3.8	133	4.3	70	22.7	44
% of working connections	91.3	322	93.8	161	86.9	107	88.9	54
% of metered connections	93.5	307	90.1	161	97.9	98	95.8	48
% of working meters	93.6	281	91.6	143	96.8	95	93.0	43
% receiving water bills	86.5	288	75.5	147	96.8	94	100	47
% receiving bills regularly (every 1-3 mos.)	86.0	257	74.8	119	93.5	93	100	45
% whose meter was last read more than 3 months ago	48.2	259	51.5	142	55.1	87	13.3	30
% who paid last bill 3 or more months ago	72.3	253	52.6	116	85.7	92	95.6	45
% who said nothing happens if bill unpaid	21.3	268	29.0	131	20.9	91	0.0	46
Avg. water bill amount in Ksh. per month ²	832.8	276	838.3	139	996.4	88	523.2	49
Household expenditure in Ksh. on water per month reported elsewhere in the survey	1375	155	1885	72	1108	52	637	31
Avg. numbers of hrs/day water available	13.00	269	15.34	146	8.85	75	12.33	48
% receiving up to 8 hrs. of service per day	43.1	269	29.4	146	73.3	75	37.5	48
% receiving more than 8 hrs. and up to 12 hrs of service per day	16.4	269	18.6	146	2.7	75	31.3	48
% receiving more than 12 hrs. and up to 24 hrs of service per	40.5	269	52.0	146	24.0	75	31.2	48
% Not satisfied with overall service	44.0	259	40.9	132	51.8	85	38.1	42
% Very satisfied with overall service	11.6	259	16.7	132	8.2	85	2.4	42

¹ "Poor" is defined in terms of *total monthly household income* of Ksh. 10,000 and less for Nairobi & Mombasa; and of Ksh. 5,000 and less for Kakamega.

² Only 16 households actually showed their recent bills for the entire survey across the 3 cities.

Table 7a. Comparison of households with and without private piped water service: All 3 cities combined #

	All 3 cities					
	Pvt. Conn.*		Yard Tap**		Alt. Sources***	
	N	Mean ¹	N	Mean ¹	N	Mean ¹
% of households who are "poor" ²	247	7.3	94	60.6	244	72.1
Household size	275	5.51	100	4.38	259	4.63
% of households stating "water" as top priority	271	45.4	99	51.5	260	68.9
Time spent on collecting water from the primary water source in minutes per day	166	5.3	65	14.5	221	46.9
% of households who need to go more than 200 m. to collect water from the primary source	210	0.5	69	1.5	237	38.4
Water storage capacity in litres	251	1825	82	777	231	448
Investment in storage system (Ksh.)	234	8994	80	1070	211	3626
% households who are not satisfied with the overall service of their primary water source	259	44.0	77	45.5	246	58.1
% households who are very satisfied with the overall service of their primary water source	259	11.6	77	3.9	246	5.3
Household consumption in litres per day	209	273.3	91	119.3	251	148.9
Household consumption in litres per month ³	209	8194	91	3580	251	4466
Per capita consumption in litres per day ³	208	49.2	91	33.07	248	35.31
Household expenditure on water in Ksh. per day	155	45.8	48	38.95	188	35.96
Household expenditure on water in Ksh. per month ³	155	1375	48	1169	188	1079
Per capita expenditure on water in Ksh. per day ³	155	8.87	48	9.02	187	9.50
Price in Ksh per litre for water consumed from all sources ³	124	0.26	48	0.31	184	0.25
Price in Ksh per jerrican from kiosk service	3	2.33	15	5.87	137	3.92
Price in Ksh per jerrican from vendor service	22	12.45	22	13.63	87	12.47

Differences in means across the three groups of households are statistically significant for all the variables except three: daily per capita expenditure, unit prices for water consumed from all sources and from vendor service. * "Pvt. Conn." are those households who have private piped water connection and use it as the primary water source; ** "Yard Tap" are those households who use yard tap as the primary water source; *** "Alt. Sources" are those households who use kiosk, vendors, neighbors, own source (well, borehole), ground/natural sources, and other miscellaneous sources (including bottled water) as their primary water sources. ¹ Except where it says that the variable is expressed in percentage. ² "Poor" is defined in terms of total monthly household income of Ksh. 10,000 and less for Nairobi & Mombasa; and of Ksh. 5,000 and less for Kakamega. ³ Based on computed values derived for each household as follows: (1) Monthly household consumption is daily household consumption multiplied by 30; (2) Daily per capita consumption is daily household consumption divided by household size; (3) Monthly household expenditure is daily household expenditure multiplied by 30; (4) Daily per capita expenditure is daily household expenditure divided by household size; (5) Unit price for water consumed from all sources is daily household expenditure divided by daily household consumption.

As noted earlier with reference to Table 3, about 50% or less of the households in any city have private piped water supply, with Kakamega having the lowest proportion at 39%. As expected, the findings in Table 6 show that poor households are the ones most likely to be without private piped water connections. Of all the households that have private piped connections, most (around 90% or more) are working and are metered. However, the proportion of households receiving regular water bills can vary across the three cities – from 100% in Kakamega to about 75% in Nairobi. Interestingly, the results also show that households in Kakamega are likely to pay their water bills most regularly and feel that there are adverse consequences from non-payment of water bills. *The findings indicate that regularity in billing from the water supply authorities has a positive association with household behavior in terms of regular payment of water bills and perception about “adverse consequences” from non-payment of bills. The findings further indicate that even with access to private piped water service, 40% or more of households in the three cities feel overall dissatisfaction with such service.* The reason for such dissatisfaction can probably be traced to the erratic supply of piped water – with about 60% of households actually getting only up to 12 hours of water per day from their private connections. The problem of limited hours of supply is most acute in Mombasa where about 73% of the households reported receiving less than 8 hours of service and a total of 75% reported receiving service for 12 hours or less.

Like the comparative findings between poor and non-poor households in Table 5b earlier, the comparative findings between households with and without private piped water connections in Table 7a indicate no statistical differences in mean values of daily per capita expenditure, unit prices for water consumed from all sources and from vendor service. Such similarity in results between the two comparisons are in fact consistent and expected given that poor households are essentially the ones without private piped connections. Combining the insights from the findings so far, the following “portrait” emerges about the poor versus non-poor households in terms of their current water supply situation in the three cities, which in most part consistent with expectations and findings from existing studies in others least developing countries.

- Poor households consume at much lower level per capita than non-poor households. Specifically, they are found to consume on an average 33 lcd versus 44 lcd by non-poor households. However, as discussed earlier, the difference is likely to be much more pronounced as non-poor households with access to running water supply tend to underestimate their consumption levels.
- Poor households are likely to spend a higher percentage of their income on water. They currently pay a high unit price (mean Ksh. 230/m³) for the water they consume, which is most likely to be higher than that currently paid by the non-poor households. As discussed earlier, our finding here of similar price paid for water by poor and non-poor is most likely due to the usual downward bias in self-reported water consumption level (which in turn produces an upward bias on the unit price paid) by non-poor households.
- Poor households are the ones most likely to be without private piped water connections, smaller water storage facilities with limited investment abilities for larger facilities
- Without private piped water connections, poor households are likely to spend much more time and effort (in terms of distance) in collecting water daily, with the major share of the collection responsibility falling on adult females and children of the family.
- Not surprisingly, they will have much lower overall satisfaction with the current water supply system. However, the surprising and interesting result is the finding that non-poor households with private piped water connections are equally likely to be dissatisfied with the current water supply system. One can speculate that while poor households’ dissatisfaction stems from the inconvenience and enormous effort associated with water collection, the non-poor households’ dissatisfaction stems from the frustration with the limited and unreliable piped water service.
- Such dissatisfaction with current water supply situation is likely to put improvement in water supply as a relatively high in terms of development priorities for both poor and non-poor households. That expectation is confirmed with the findings below.

3. Household preferences and priorities

3.1 General development priorities

Based on responses of priority rank order of a set of 9 development areas, the frequency distributions for the entire sample and for each of the 3 cities are presented in Tables 8a and 8b respectively. The results indicate that development of a water supply system is by far the top priority in all the three cities, especially in Kakamega. The next most important priority varies across the cities with households in Nairobi choosing a sanitation system and those in Mombasa and Kakamega opting for electricity supply.

Table 8a. Development Priorities – All 3 Cities Combined

Development Priority	1 st most important	2 nd most important	Total*
Electricity	11%	20%	15%
Water supply system	56%	13%	35%
Sanitation/sewerage system	9%	10%	9%
Solid waste	5%	10%	8%
Roads	5%	11%	8%
Schools	4%	8%	6%
Water drainage	2%	6%	4%
Health services	5%	12%	8%
Street lighting	3%	10%	6%
Total	100%	100%	100%
Sample Size	666	654	1320

* "Total" here refers to frequency with which a particular priority was mentioned either as first or second most important.

Table 8b. Development Priorities – Across Cities

Development Priority	Nairobi			Mombasa			Kakamega		
	1 st most important	2 nd most important	Total*	1 st most important	2 nd most important	Total*	1 st most important	2 nd most important	Total*
Electricity	9%	17%	13%	16%	20%	18%	8%	25%	16%
Water supply	50%	10%	30%	57%	18%	38%	67%	11%	40%
Sanitation/sewerage	15%	12%	13%	3%	6%	5%	5%	11%	8%
Solid waste	7%	13%	10%	6%	13%	9%	0%	2%	1%
Roads	6%	12%	9%	2%	5%	3%	6%	17%	12%
Schools	4%	8%	6%	3%	8%	5%	6%	7%	6%
Water drainage	2%	6%	4%	4%	6%	5%	1%	4%	2%
Health services	5%	8%	7%	6%	11%	8%	6%	18%	12%
Street lighting	3%	12%	8%	3%	12%	7%	1%	5%	3%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%
Sample Size	300	299	599	194	188	382	172	167	339

* "Total" here refers to frequency with which a particular priority was mentioned either as first or second most important.

- **Do the poor have the same development priorities as the non-poor?**

To look into the question as to whether and how welfare level affects choice of development priorities across households, the frequency distributions of development priorities for the poor vs. non-poor households for the entire sample⁴ are presented in Table 9a. The results generally indicate that both poor and non-poor households are likely to attach highest importance on water supply as development priority.⁵ Electricity and sanitation/sewerage system appear to be the next two priorities for both groups.

Table 9a. Development Priorities by welfare – All 3 Cities Combined

Development Priority	1 st most important		2 nd most important	
	Poor*	Non-Poor	Poor	Non-Poor
Electricity	12%	10%	21%	18%
Water supply system	62%	53%	15%	11%
Sanitation/sewerage system	7%	10%	10%	11%
Solid waste	3%	6%	10%	11%
Roads	3%	7%	14%	10%
Schools	8%	2%	10%	7%
Water drainage	1%	3%	3%	7%
Health services	3%	5%	12%	11%
Street lighting	1%	4%	5%	14%
Total	100%	100%	100%	100%
Sample Size	227	387	225	378

* “Poor” is defined in terms of *total monthly household income* of Ksh. 10,000 and less for Nairobi & Mombasa; and of Ksh. 5,000 and less for Kakamega.

Since development priorities of households are likely to be influenced by a host of heterogeneous factors across households including the city of residence and the income level of households, a 2-way frequency cross-tabulation analysis, such as the one above, is not suitable to identify the underlying “drivers”. In order to investigate the major drivers of reported development priorities by the households in our sample, we run multivariate statistical analyses that control for household heterogeneity in terms of following variables (i.e. to test their role as drivers or determinants of household priorities):

- City of the household
- Household welfare level (poor versus non-poor as defined earlier)
- Gender of the household respondent
- Education level of the household respondent
- Age of the household respondent
- Household size
- Population density of the household’s neighborhood
- Overall satisfaction with the primary water source used by the household
- Overall satisfaction with the sanitation (toilet) system used by the household
- Overall satisfaction with the refuse disposal system used by the household

⁴ As the frequency distribution of development priorities between poor versus non-poor are quite similar across the three cities, we focus our discussion here on the values for the entire sample (for city specific analogous values, refer to Table A-8 in the Appendix) and also use statistical analyses to identify any systematic difference in priorities across the cities after controlling for welfare levels of households.

⁵ Given that the survey was administered by operational people with strong “ties” to water supply infrastructure development, one can argue for potential introduction of positive bias on the self-reported development priority given to water supply system. However, the significantly high importance placed on water supply system relative to any other development areas is also arguably difficult to explain away solely as the result of such bias.

The three satisfaction measures are used as potential “drivers” to check how experience with a current system influence development priorities directly of that system as well as “cross-influence” development priorities of other systems. For example, does satisfaction with current water system shift development priorities to other areas like sanitation or solid waste? Such “cross-influences” are likely to exist as general economics and psychology literature (e.g., Maslow’s hierarchy of needs) have found that people have an implicit hierarchy in terms of satisfying their needs. The existence of such hierarchy in terms of satisfying development “needs” potentially implies that households who are currently satisfied with a development need that is *higher* in the hierarchy are likely to shift their priority to other development needs *lower* in the hierarchy and vice-versa. Also, the existence of such a hierarchical structure in terms of satisfying development needs means that despite a lack of access to a service, that service may not be accorded priority if it is *lower* in the hierarchy. It may get low priority until the need for some other services *higher* up in the hierarchy has been met “to the satisfaction/expectation” of households. Finally, the existence of such a hierarchical structure in terms of satisfying needs means that if people attribute a link between two development needs, then households who are currently *satisfied* with one such related development need is likely to attach *lower* priority to the other related development need and vice-versa.

We present below only the statistically significant (*at 7.5% level or below*) “drivers” for each of the development priorities based on our initial econometric analysis:

- The importance of **water system** as a development priority for a household is likely to be *relatively higher*:
 - For poor households
 - For older respondents
 - For larger household size
 - For households with lower level of overall satisfaction with their primary water source
 - For households in Kakamega
- The importance of **electricity** as a development priority for a household is likely to be *relatively higher*:
 - For households in Mombasa
- The importance of **sanitation system** as a development priority for a household is likely to be *relatively higher*:
 - For non-poor households
 - For households in Nairobi
- The importance of **solid waste system** as a development priority for a household is likely to be *relatively higher*:
 - For households with *higher* level of overall satisfaction with the sanitation (toilet) system used by the household. This presents preliminary evidence of shift in development priorities from sanitation to waste removal with satisfaction with the former, thus indicating a lower position of waste removal relative to sanitation in the hierarchy of satisfying “needs”.
- The importance of **road system** as a development priority for a household is likely to be *relatively higher*:
 - For non-poor households in general, but also for poor households located in high density neighborhoods
 - For male respondents
 - For educated respondents
 - For smaller household size
- The importance of **school system** as a development priority for a household is likely to be *relatively higher*:
 - For poor households

- For households with *higher* level of overall satisfaction with their primary water source. This presents preliminary evidence of shift in development priorities from water supply to education with satisfaction with the former, thus indicating a lower position of education relative to water supply in the hierarchy of satisfying “needs.”
- The importance of **water drainage system** as a development priority for a household is likely to be *relatively higher*:
 - For non-poor households in general, but also for poor households located in high density neighborhoods
- The importance of **health services system** as a development priority for a household is likely to be *relatively higher*:
 - For male respondents
 - For younger respondents
 - For households with *lower* level of overall satisfaction with the sanitation (toilet) system used by the household. Based on the notion of hierarchy of satisfying “needs”, this presents preliminary evidence of attribution of a link between poor sanitation and health risk by households.
- The importance of **street lighting system** as a development priority for a household is likely to be *relatively higher*:
 - For households located in low density neighborhoods

To get a more direct insight into the underlying development need hierarchy structure of the people, we also looked into frequency distribution of the development priorities of households *who do not have access to any of the four basic services* (private piped water, private toilet, organized public or private garbage collection and electricity). The results are presented in Table 10a-b. It shows that water supply is by far the most important development “need” followed by electricity. It also provides support and thus our confidence in the statistical findings above – that solid waste removal occupies a lower position relative to sanitation and education occupies a lower position relative to water supply in the hierarchy of satisfying development “needs”.

Table 10a. Development Priorities for households without access to any of the four basic services¹: All 3 Cities Combined

Development Priority	1 st most important	2 nd most important	Total*
Electricity	10%	24%	17%
Water supply system	65%	14%	40%
Sanitation/sewage system	5%	11%	8%
Solid waste	2%	7%	4%
Roads	2%	16%	9%
Schools	7%	8%	8%
Water drainage	2%	2%	2%
Health services	5%	13%	9%
Street lighting	2%	5%	3%
Total	100%	100%	100%
Sample Size	180	178	358

* "Total" here refers to frequency with which a particular priority was mentioned either as first or second most important.

¹ Private piped water, private toilet, organized public or private garbage collection and electricity services.

Table 10b. Development Priorities for households without access to any of the four basic services¹: Across Cities

Development Priority	Nairobi			Mombasa			Kakamega		
	1 st most important	2 nd most important	Total*	1 st most important	2 nd most important	Total*	1 st most important	2 nd most important	Total*
Electricity	11%	23%	17%	14%	23%	18%	7%	24%	15%
Water supply system	69%	8%	38%	52%	23%	38%	69%	14%	42%
Sanitation/sewage system	6%	14%	10%	5%	9%	7%	4%	9%	6%
Solid waste	2%	9%	5%	5%	11%	8%	0%	1%	1%
Roads	2%	19%	10%	0%	7%	3%	4%	20%	12%
Schools	5%	11%	8%	9%	7%	8%	8%	7%	8%
Water drainage	2%	0%	1%	7%	7%	7%	0%	1%	1%
Health services	3%	6%	5%	7%	9%	8%	6%	21%	13%
Street lighting	2%	9%	5%	2%	5%	3%	1%	1%	1%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%
Sample Size	64	64	128	44	44	88	72	70	142

* "Total" here refers to frequency with which a particular priority was mentioned either as first or second most important.

¹ Private piped water, private toilet, organized public or private garbage collection and electricity services.

3.2 Preferred options for improving water supply

As noted in Section 1 on sample structure, 365 out of the 674 households participated in a WTP survey under different scenarios of improvements in current water system and tariff structures. Out of these 365 households, 54 were found to already have private piped water connections. Findings from this part of the survey presented below are based on the balance 311 participating households who currently do not have private piped water connection.

- **Given the option, what system will the households select and why?**

The results in Table 11 suggest quite a bit of “latent” demand for some type of improvement in the current water system, with about only about one-fourth willing to maintain the *status quo*. More than 50% of the households wanted either private or yard water connections. Reselling or sharing water from one’s private connection seems a common practice with nearly one-third (53 of 165 respondents who wanted private connection) saying that they will do so if they have private water connection.

Table 11. How did the households chose among the various options?

Choice Options	Proportion of households			
	All 3 cities	Nairobi	Mombasa	Kakamega
Private piped water connection	32.80	20.51	28.57	50.49
Yard connection	26.05	38.46	21.98	15.53
System of water kiosk	16.72	16.24	19.78	14.56
Status quo	23.15	23.08	27.47	19.42
Not sure	1.29	1.71	2.20	0.00
Total	100%	100%	100%	100%
N	311	117	91	103

Since the survey design uses different tariff rates across the participating 311 households and the 3 cities, the raw frequency figures for various option chosen in Table 11 may not give the true picture of difference in preference among options across households in the three cities. Accordingly, we ran multivariate statistical analyses *that control for differences in tariff structures used across participating households* to see how each of the four options chosen by households are influenced by each of the following factors⁶: (1) city of residence, (2) current primary water source, (3) number of rooms in house of residence, (4) ownership of current home, (5) daily household water expenditure, and (5) per capita water consumption. Only the statistically significant findings are reported below:

- The likelihood of *private piped connection* option being chosen by a household:
 - Increases if the household resides in Kakamega
 - Decreases if its current primary water source is kiosks

⁶ Since the participating households for the WTP part of the survey are predominantly poor, income level was not used in the analysis due to very limited sample variation. Also, note that the findings reported here are based on preliminary econometric analysis. For the final report, we intend to test for the influence of several additional factors on choice options.

- Increases with larger number of rooms in its house of residence
 - Increases with ownership of its house of residence
 - Increases with its daily water expenditure level
 - Increases with per capita water consumption level
- The likelihood of *yard connection* option being chosen by a household:
 - Increases if the household resides in Nairobi
 - Increases if its current primary water source is vendors
 - Decreases with ownership of its house of residence
 - The likelihood of better *kiosk service* option being chosen by a household:
 - Increases if its current primary water source is yard tap
 - The likelihood of maintaining *status quo* by a household:
 - Increases if its current primary water source is kiosks
 - Decreases with its daily water expenditure level
- **Stated reasons for not choosing a particular improvement option**

The stated reasons for not choosing each of the three improvement options are shown in Tables 12a-c.

Table 12a. Reasons for not choosing the private piped water connection:

Reasons Given	Proportion of households			
	All 3 cities	Nairobi	Mombasa	Kakamega
Connection deposit fee too expensive	51.80	50.00	45.45	64.52
Monthly cost too expensive	7.91	12.5	4.55	3.22
Happy with the current supply	21.58	21.88	31.82	6.45
Deposit too expensive & house too	12.23	3.12	15.91	25.81
House too small	4.32	9.38	0.00	0.00
Deposit & monthly cost too expensive	2.16	3.12	2.27	0.00
Total	100%	100%	100%	100%
N	139	64	44	31

Table 12b. Reasons for not choosing the yard connection

Reasons Given	Proportion of households			
	All 3 cities	Nairobi	Mombasa	Kakamega
Connection deposit fee too expensive	36.36	46.15	26.47	31.43
Monthly cost too expensive	6.61	7.69	2.94	8.57
Happy with the current supply	28.10	32.69	32.35	17.14
Deposit & monthly cost too expensive	26.45	7.69	38.24	42.86
Impossible to share bill due to distrust	2.48	5.78	0.00	0.00
Total	100%	100%	100%	100%
N	121	52	34	35

Table 12c. Reasons for not choosing the improved kiosk service?

Reasons Given	Proportion of households			
	All 3 cities	Nairobi	Mombas	Kakamega
Price too high	37.41	11.32	37.5	67.39
Plan is not an improvement in service	56.83	84.91	47.5	32.61
Not convenient	5.76	5.77	15	0.00
Total	100%	100%	100%	100%
N	139	53	40	46

High connection fee was cited most frequently as the reason for not opting for a private and yard tap connection. The option to pay in monthly installments (offered in Kakamega) seemed to make little difference – only about 14% (8 out of 57) of the respondents changed their initial intention of not having a private connection based on lump-sum payment of the connection fee. Consistent with the low level of overall support for improved kiosk service in Table 11, majority of the respondents do not consider kiosk service as a means of improving the current water supply system.

Few respondents have a clear knowledge of the current official connection fee and opinion varied widely as to what it might be and only a few households expressed their opinion. For the few who did respond, the mean *perceived* official cost of a private connection comes to Ksh. 9,469 (sample size of 35), and mean “unofficial” cost is Ksh.1,214 (sample size of 7). The median value for the perceived current official connection cost is Ksh. 4,000 with values ranging from as low as Ksh. 600 to as high as Ksh. 50,000. The maximum amount that they are *willing* to pay as deposit fee varied from 0 to Ksh. 5,000 (see Table A-9a-c in the Appendix for sample frequency distribution to the prevailing perception of current connection fee as well as the amount they are willing to pay as a deposit). Interestingly, they are willing to pay a relatively higher amount as deposit fee for yard rather than private connections, with mean values Ksh. 1,620 and Ksh. 1,352 respectively. One of the possible explanations for this difference is that households can share the deposit fee for a yard connection among themselves and thereby reduce the effective fee per household.

- **Rationale behind the choice of the “status quo” option**

The fact that three-fourth of the unconnected respondents are willing to pay for one of the three improvement options confirms that users are dissatisfied with their current water supply arrangements and that there is a strong demand for service improvements. This does not mean that those 25% (72 out of 311 respondents) who opted for status quo are satisfied with their water supply arrangements. To analyze why, these 72 respondents are first divided with respect to their current primary water source (see Table 13 below). 65% of these status quo respondents are not happy with their primary source; that number jumps to 75% for the subgroup whose primary source is water kiosk. Also, these proponents of status quo on average currently spend much less on water than the sample as a whole: only Ksh. 27 versus Ksh. 39.17 per day per household. Further, 76% of them do not own their place of residence. Overall, the data show suggest that their decision to opt for status quo has more to do with financial constraints and/or not having enough of an economic incentive (i.e. modest cost savings due to their relatively small expenditure on water). To further verify this conclusion, we look into the three major subgroups: those who currently use the yard tap, water kiosk and ground/natural sources.

Table 13. Current primary water sources for those who opted for status quo

Current Primary Source	% of those who opted for status quo
Yard tap	18.06
Own source (well, borehole)	0.00
Water kiosk	48.61
Water vendors	12.50
Neighbors	1.39
Ground & natural sources	18.06
Others (incl. Bottled water)	1.39
Total	100%
N	72

- The 18% who currently use yard tap essentially had only two instead of the three improvement options – private connection versus kiosk services. It is not that surprising that they opted for the status quo, which in any case is equivalent to one of the improvement options offered in the survey. When asked for the reasons for not choosing private connection, two-third of them gave financial reasons (high deposit fee and unit price) while the rest said they are happy with their current yard tap. When asked for the reasons for not choosing kiosk services, half of them said that it is not an improvement vis-à-vis their current yard tap and the other half said the price of the kiosk service is too high.
- Of the 18% who currently use ground/natural sources, all of those that rejected a private connection or yard tap cited financial reasons (high deposit fee and unit price). As for not choosing kiosk services option, two-third of them said price is too high for the service and the others said it is not an improvement vis-à-vis their current ground/natural source.
- That brings us to the 49% (35 out of the 72 status quo respondents) who currently use kiosk as their primary source and decided to maintain status quo. At first glance this seems to suggest a strong “endorsement” of kiosk services. However, a closer look yields a different picture. For one, as noted earlier, 75% of these 35 households said that they are *not satisfied* with their current water supply situation, even as they decide to stick with it. Why is that? All of them give financial reasons (mostly high deposit fee, but some also high price and small house) for not choosing private connection or yard tap. Conversely, *none of them said they want to stick with kiosk services because they are happy with the current situation*. Further, these households spend relatively much lower (on an average Ksh. 27.77 versus Ksh. 39.17 per day per household) on water and have much smaller house (on an average 1.5 rooms versus 3.8 rooms) than the sample as a whole. Together, these lead to the conclusion that households opted to maintain status quo not because they are satisfied with kiosk services (their current water supply situation), but because of their limited financial means and/or the limited potential for cost savings given their relatively small expenditure on water.

4. Conclusions and Policy Implications

Households in all three cities rated development and improvement of water supply as their top priority – 35 percent of the households placed it as their first or second priority.⁷ Electricity came in at a distant second place (15 percent of the votes) and development of sanitation/sewerage was the third priority (9 percent of the votes).

The households are also willing to pay significantly high prices for the for their top development priority. Unconnected households were offered four choices: a private connection, a yard tap, improved kiosk service, and maintaining their current system (status quo). An overwhelming majority (about 75%) of the unconnected households are willing to pay for at least one of the three proposed improvement schemes. This is consistent with the evidence that majority of the households without private piped water supply are dissatisfied with their current primary water sources.⁸ Specifically, 59 percent of the households chose either a private or a yard connection and were willing to pay the price – that is, a deposit fee ranging from Ksh2500-5000 (US\$33-66) and a monthly WSS bill of Ksh300 to Ksh750 (US\$4.0 to 10.0). A majority of those that are unwilling to connect cited the deposit fee as the main problem. Only a fourth of the sample households opted to maintain status quo. The data suggest that their decision has more to do with issues such as financial constraints, lack of home ownership and limited reduction in water expenditures, rather than satisfaction with their current water supply arrangements.

As for which of the three improvement options is preferred, it depends on whether they are evaluated from demand or supply perspective (See Table 14a-b). From the supply side perspective, the final choice is likely to depend on the availability of capital investment funds and recovery potential of such investments. From the demand side perspective, private piped connection is clearly the preferred choice of unconnected households in Kakamega and Mombasa, while yard taps are the preferred choice of the unconnected in Nairobi. Although improving kiosk services is likely to entail the least capital investment and least effort in terms of cost recovery, it is also the choice that is least preferred by households in all the three cities. When evaluating the capital cost recovery potential of various improvement options, one needs to take into consideration the likely trade-off between the up front capital investment required and its long-term demand with the availability of more desirable options to households. For example, based on the trade-off between capital cost, cost-recovery effort and demand side desirability, one approach might be to provide new yard taps and improved kiosk services in Phase I followed by private piped connections in Phase II. However, when private piped connection becomes available in Phase II it is likely to adversely effect the demand for (and thus the cost recovery potential of) kiosk and yard tap services. This means that achieving full cost recovery of Phase I capital investments would require that Phase II be delayed “sufficiently” (even if new capital investment funds become available).

In choosing among the four options for improving their water supply, the unconnected households made trade-offs between service level and price. Their decisions appear to be based

⁷ Households were asked to pick their most important and second most important development priority from the following list: (1) electricity, (2) water supply system, (3) sanitation/sewerage system, (4) solid waste, (5) roads, (6) schools, (7) water drainage, (8) health services, and (9) street lighting.

⁸ As noted in Table 7a earlier, nearly 50% of the households who do have private piped water supply currently are also dissatisfied with that supply situation. So, while policy implications in this section focuses on providing improvements in current water supply situations for households with private piped water supply currently, an implicit policy implication is improvement of the current service to those households who already have piped connection. Without such improvement, the cost recovery and financial viability of the existing piped water supply system will further deteriorate.

on pure economic rationale than rather than on some notion of “perceived rights” and/or a social equity or justice perspective. Unconnected households are currently paying an effective unit price⁹ (Ksh. 230/m³ to 260/m³ on an average) for water which is at least twice as high as the highest tariffs presented in the willingness-to-pay scenario for the private connection (Ksh. 100/m³ in Nairobi and Kakamega; Ksh. 125/m³ in Mombasa). A “simulation” analysis of the potential impact – at various proposed price levels – on households who are willing to connect is shown in Table 15. Allowing households to change their water consumption from their current levels in response to the unit price of the new private piped service, the impact analysis in Table 15 shows significant monthly savings for most households compared to their current expenditure on water. The analysis also suggests that the one-time private connection cost may not look that unattractive in terms of monthly savings, especially for households that have high water consumption levels. In other words, households that are currently “large” consumers of water will prefer private connections to yard taps, given that the tariff structure is the same for both. To overcome the general reluctance of households to pay an up front lump sum connection fee, one strategy is to amortize the capital investment cost with the unit price charged. It seems that such amortization can be based on a reasonable time frame of about 1-2 years without increasing the unit price to a level that would cause consumers to decide against connecting.

Apart from the direct monetary benefit in terms of monthly saving in water expenditure, Table 15 results also show considerable savings by households in terms of time and effort spent on collecting water currently. As households realize both these direct and indirect positive economic impacts, it is likely to have a significant positive effect on capital cost recovery potential for these new private piped connections, provided they are complemented with reasonably decent level of service quality and stricter enforcement of penalties for bill defaulters. Although the results in Table 15 show the benefit of private piped connections, the results will be very similar for new yard tap connections as they will have the same tariff structure as those proposed for private piped connections. The only difference is that the yard tap option is likely to result in a relatively lower reduction in the time spent in collecting water. For improved kiosk service options, similar analysis will yield a much reduced positive impact both in terms of monetary and time savings for households as they have to pay a relatively higher unit price and travel a longer distance to collect water.

Finally, apart from significant positive economic benefits in terms of direct monetary and time savings, any of the three proposed water supply improvement options will also achieve policy objectives in terms of social and gender equities which are likely to have positive externality effects on child education, economic opportunities for women and public health. For example, since it is mainly the females and children in the households without private piped water connection who spend significant amount of time and effort in collecting water from alternative sources, improvement in the current water supply system can “free-up” valuable time which they can potentially channel into educational activity for children and productive economic activities for female adults. The fact that per capita water consumption levels of unconnected households tend to be very low (see Table 22 in the Appendix), raises a potential public health problem. Any of the proposed improvements in the water system are likely to make water more easily available to these households at a price lower than currently paid – this is likely to increase per capita consumption of water and generate some public health benefits.

⁹ For more detailed information on the distribution of the unit price for water currently paid by these households in the three cities, please see Table A-10 in the Appendix.

Table 14b: Comparison of various water supply improvement options from supply side perspective

	Public policy perspective of supply side						
	Relative benefits/costs to households & society			Capital investment necessary	% of "target market" expected to use the option	Full cost recovery	
	Direct cost and time	Child education & gender equity	Public health			Effort needed	Potential
1. Improved kiosk service	Highest unit cost, but no up-front cost Least time & effort saving	Lowest potential positive impact on child education and gender equity because of least time & effort saving	Lowest potential positive impact on public health as expected increase in consumption level is least	Lowest	48.72 (Nairobi) 31.87 (Mombasa) 44.66 (Kakamega)	Lowest (because it requires dealing with the least number of "direct" subscribers)	Proportional to the effort spent
2. Yard tap	Lowest unit cost, and up-front cost is shared Moderate time & effort saving	Moderate potential positive impact on child education and gender equity because of moderate time & effort saving	Moderate potential positive impact on public health as expected increase in consumption level is moderate	Moderate	41.88 (Nairobi) 37.36 (Mombasa) 47.57 (Kakamega)	Moderate	Proportional to the effort spent
3. Private piped connection	Lowest unit cost, but up-front cost Most time & effort saving	Highest potential positive impact on child education and gender equity because of most time & effort saving	Highest potential positive impact on public health as expected increase in consumption level is the most	High	33.33 (Nairobi) 37.36 (Mombasa) 58.25 (Kakamega)	High	Proportional to the effort spent
4. Yard tap & kiosk services	A combination of options 1 & 2 above across the entire market based on the option chosen	A combination of options 1 & 2 above across the entire market based on the option chosen	A combination of options 1 & 2 above across the entire market based on the option chosen	Moderate	67.52 (Nairobi) 47.25 (Mombasa) 62.13 (Kakamega)	Moderate	Proportional to the effort spent
5. All 3 options together	A combination of all of the above across the entire market based on the option chosen	A combination of all of the above across the entire market based on the option chosen	A combination of all of the above across the entire market based on the option chosen	Highest	75.21 (Nairobi) 70.33 (Mombasa) 80.58 (Kakamega)	Highest	Proportional to the effort spent (which will be helped by the fact that all subscribers will choose the option they prefer most)

¹ The sample size is considered as the "target market" for the analysis under the assumption that the long term policy objective is to provide private piped connection to all households who currently lack that service.

Table A-3d. Perceived adequacy of the amount of water from the primary source

	Source	Poor	Fair	Good	Total
All 3 cities	Private piped connection	52	85	139	276
	Yard tap	13	36	31	80
	Own source (well, borehole)	0	1	10	11
	Water kiosk	38	60	25	123
	Water vendors	12	17	2	31
	Neighbors	2	2	7	11
	Ground & natural sources	4	27	33	64
	Others (incl. Bottled water)	1	3	4	8
	Number of respondents	122	231	251	604
Percentage of respondents	20%	38%	42%	100%	
Nairobi	Private piped connection	23	35	85	143
	Yard tap	7	16	21	44
	Own source (well, borehole)	0	0	5	5
	Water kiosk	27	26	5	58
	Water vendors	5	4	0	9
	Neighbors	1	1	3	5
	Ground & natural sources	0	1	0	1
	Others (incl. Bottled water)	0	0	2	2
	Number of respondents	63	83	121	267
Percentage of respondents	24%	31%	45%	100%	
Mombasa	Private piped connection	21	28	38	87
	Yard tap	3	2	3	8
	Own source (well, borehole)	0	1	3	4
	Water kiosk	10	31	19	60
	Water vendors	7	12	2	21
	Neighbors	1	1	3	5
	Ground & natural sources	0	2	1	3
	Others (incl. Bottled water)	1	0	1	2
	Percentage of respondents	43	77	70	190
Number of respondents	23%	41%	37%	100%	
Kakamega	Private piped connection	8	22	16	46
	Yard tap	3	18	7	28
	Own source (well, borehole)	0	0	2	2
	Water kiosk	1	3	1	5
	Water vendors	0	1	0	1
	Neighbors	0	0	1	1
	Ground & natural sources	4	24	32	60
	Others (incl. Bottled water)	0	3	1	4
	Number of respondents	16	71	60	147
Percentage of respondents	11%	48%	41%	100%	

Table A-3e. Perceived availability of water from the primary source

	Source	Poor	Fair	Good	Total
All 3 cities	Private piped connection	70	110	96	276
	Yard tap	27	37	16	80
	Own source (well, borehole)	0	3	8	11
	Water kiosk	52	44	27	123
	Water vendors	5	18	8	31
	Neighbors	3	2	6	11
	Ground & natural sources	2	18	44	64
	Others (incl. Bottled water)	2	1	5	8
	Number of respondents	161	233	210	604
Percentage of respondents	27%	39%	35%	100%	
Nairobi	Private piped connection	29	44	70	143
	Yard tap	19	15	10	44
	Own source (well, borehole)	0	2	3	5
	Water kiosk	28	22	8	58
	Water vendors	2	6	1	9
	Neighbors	2	2	1	5
	Ground & natural sources	0	1	0	1
	Others (incl. Bottled water)	0	0	2	2
	Number of respondents	80	92	95	267
Percentage of respondents	30%	34%	36%	100%	
Mombasa	Private piped connection	29	41	17	87
	Yard tap	4	3	1	8
	Own source (well, borehole)	0	0	4	4
	Water kiosk	22	21	17	60
	Water vendors	3	12	6	21
	Neighbors	1	0	4	5
	Ground & natural sources	0	2	1	3
	Others (incl. Bottled water)	1	0	1	2
	Percentage of respondents	60	79	51	190
Number of respondents	32%	42%	27%	100%	
Kakamega	Private piped connection	12	25	9	46
	Yard tap	4	19	5	28
	Own source (well, borehole)	0	1	1	2
	Water kiosk	2	1	2	5
	Water vendors	0	0	1	1
	Neighbors	0	0	1	1
	Ground & natural sources	2	15	43	60
	Others (incl. Bottled water)	1	1	2	4
	Number of respondents	21	62	64	147
Percentage of respondents	14%	42%	44%	100%	

Table A-3f. Perception of the price paid for water from the primary source

	Source	High	Fair	Low	Total
All 3 cities	Private piped connection	93	96	72	261
	Yard tap	18	23	19	60
	Own source (well, borehole)	0	5	2	7
	Water kiosk	80	34	9	123
	Water vendors	29	1	1	31
	Neighbors	5	1	0	6
	Ground & natural sources	2	5	12	19
	Others (incl. Bottled water)	0	1	2	3
	Number of respondents	227	166	117	510
Percentage of respondents	45%	33%	23%	100%	
Nairobi	Private piped connection	46	52	38	136
	Yard tap	8	16	12	36
	Own source (well, borehole)	0	2	2	4
	Water kiosk	48	8	2	58
	Water vendors	9	0	0	9
	Neighbors	3	1	0	4
	Ground & natural sources	0	0	0	0
	Others (incl. Bottled water)	0	0	0	0
	Number of respondents	114	79	54	247
Percentage of respondents	46%	32%	22%	100%	
Mombasa	Private piped connection	26	35	23	84
	Yard tap	2	1	1	4
	Own source (well, borehole)	0	2	0	2
	Water kiosk	31	24	5	60
	Water vendors	19	1	1	21
	Neighbors	1	0	0	1
	Ground & natural sources	0	3	0	3
	Others (incl. Bottled water)	0	0	0	0
	Percentage of respondents	79	66	30	175
Number of respondents	45%	38%	17%	100%	
Kakamega	Private piped connection	21	9	11	41
	Yard tap	8	6	6	20
	Own source (well, borehole)	0	1	0	1
	Water kiosk	1	2	2	5
	Water vendors	1	0	0	1
	Neighbors	1	0	0	1
	Ground & natural sources	2	2	12	16
	Others (incl. Bottled water)	0	1	2	3
	Number of respondents	34	21	33	88
Percentage of respondents	39%	24%	38%	100%	

Table A-3g. Overall satisfaction with the primary water source

	Source	Not satisfied	Satisfied	Very satisfied	Total
All 3 cities	Private piped connection	117	121	31	269
	Yard tap	35	39	3	77
	Own source (well, borehole)	0	5	6	11
	Water kiosk	78	45	0	123
	Water vendors	21	10	0	31
	Neighbors	7	3	1	11
	Ground & natural sources	33	26	3	62
	Others (incl. Bottled water)	4	1	3	8
	Number of respondents	295	250	47	592
Percentage of respondents	50%	42%	8%	100%	
Nairobi	Private piped connection	54	61	23	138
	Yard tap	20	21	2	43
	Own source (well, borehole)	0	2	3	5
	Water kiosk	42	16	0	58
	Water vendors	9	0	0	9
	Neighbors	3	2	0	5
	Ground & natural sources	0	1	0	1
	Others (incl. Bottled water)	0	0	2	2
	Number of respondents	120	103	30	261
Percentage of respondents	49%	39%	11%	100%	
Mombasa	Private piped connection	44	34	7	85
	Yard tap	4	3	0	7
	Own source (well, borehole)	0	2	2	4
	Water kiosk	32	28	0	60
	Water vendors	11	10	0	21
	Neighbors	3	1	1	5
	Ground & natural sources	0	3	0	3
	Others (incl. Bottled water)	1	1	0	2
	Percentage of respondents	95	82	10	187
Number of respondents	51%	44%	5%	100%	
Kakamega	Private piped connection	19	26	1	46
	Yard tap	11	15	1	27
	Own source (well, borehole)	0	1	1	2
	Water kiosk	4	1	0	5
	Water vendors	1	0	0	1
	Neighbors	1	0	0	1
	Ground & natural sources	33	22	3	58
	Others (incl. Bottled water)	3	0	1	4
	Number of respondents	72	65	7	144
Percentage of respondents	50%	45%	5%	100%	

Table A-4a. Primary drawers of water for households, by distance to primary water sources

	Source	Male adults	Male childre n	Female adults	Female childre n	Male & female children	Total
All 3 cities	Less than 20m.	56	5	165	6	3	235
	Less than 40 m.	5	1	32	0	0	38
	Less than 100 m.	6	1	28	0	0	35
	More than 200 m.	19	5	62	4	1	91
	Number of respondents	86	12	287	10	4	399
	Percentage of respondents	22%	3%	72%	3%	1%	100%
Nairobi	Less than 20m.	15	2	68	0	1	86
	Less than 40 m.	1	0	4	0	0	5
	Less than 100 m.	2	0	10	0	0	12
	More than 200 m.	8	4	25	0	1	38
	Number of respondents	26	6	107	0	2	141
	Percentage of respondents	18%	4%	76%	0%	1%	100%
Mombasa	Less than 20m.	38	2	74	1	2	117
	Less than 40 m.	3	0	16	0	0	19
	Less than 100 m.	3	0	8	0	0	11
	More than 200 m.	4	1	6	2	0	13
	Number of respondents	48	3	104	3	2	160
	Percentage of respondents	30%	2%	65%	2%	1%	100%
Kakamega	Less than 20m.	3	1	23	5	0	32
	Less than 40 m.	1	1	12	0	0	14
	Less than 100 m.	1	1	10	0	0	12
	More than 200 m.	7	0	31	2	0	40
	Number of respondents	12	3	76	7	0	98
	Percentage of respondents	12%	3%	78%	7%	0%	100%

Table A-4b. Primary drawers of water for households, by type of primary water source

	Source	Male adults	Male children	Female adults	Female children	Male & female children	Total
All 3 cities	Private piped connection	41	6	101	6	3	157
	Yard tap	16	1	49	4	0	70
	Own source (well, borehole)	2	0	6	0	0	8
	Water kiosk	22	5	92	3	1	123
	Water vendors	9	0	20	1	1	31
	Neighbors	4	0	8	0	1	13
	Ground & natural sources	7	2	51	3	0	63
	Others (incl. Bottled water)	4	0	3	0	0	7
	Number of respondents	105	14	330	17	6	472
	Percentage of respondents	22%	3%	70%	4%	1%	100%
Nairobi	Private piped connection	4	3	39	0	1	47
	Yard tap	15	0	27	0	0	42
	Own source (well, borehole)	2	0	2	0	0	4
	Water kiosk	9	4	44	0	1	58
	Water vendors	2	0	5	0	1	8
	Neighbors	2	0	3	0	1	6
	Ground & natural sources	0	0	1	0	0	1
	Others (incl. Bottled water)	1	0	1	0	0	2
	Number of respondents	35	7	122	0	4	168
	Percentage of respondents	21%	4%	73%	0%	2%	100%
Mombasa	Private piped connection	32	2	37	0	2	73
	Yard tap	1	0	5	0	0	6
	Own source (well, borehole)	0	0	3	0	0	3
	Water kiosk	11	1	45	3	0	60
	Water vendors	7	0	13	1	0	21
	Neighbors	2	0	3	0	0	5
	Ground & natural sources	0	0	3	0	0	3
	Others (incl. Bottled water)	1	0	0	0	0	1
	Number of respondents	54	3	109	4	2	172
	Percentage of respondents	31%	2%	63%	2%	1%	100%
Kakamega	Private piped connection	5	1	25	6	0	37
	Yard tap	0	1	17	4	0	22
	Own source (well, borehole)	0	0	1	0	0	1
	Water kiosk	2	0	3	0	0	5
	Water vendors	0	0	2	0	0	2
	Neighbors	0	0	2	0	0	2
	Ground & natural sources	7	2	47	3	0	59
	Others (incl. bottled water)	2	0	2	0	0	4
	Number of respondents	16	4	99	13	0	132
	Percentage of respondents	12%	3%	75%	10%	0%	100%

Table A-5. Primary method used by households to treat water given their primary water sources

	Source	None	Boiling	Filtering	Settling	Chemical treatment	Boiling & filtering	Boiling & Chemical treatment	Total
All 3 cities	Private piped connection	34	250	11	0	4	7	4	310
	Yard tap	23	70	4	0	0	1	0	98
	Own source (well, borehole)	2	10	1	0	1	0	1	15
	Water kiosk	60	64	0	0	0	0	0	124
	Water vendors	12	23	0	0	0	0	0	35
	Neighbors	6	7	0	0	0	0	0	13
	Ground & natural sources	17	38	5	2	0	0	0	62
	Others (incl. Bottled water)	3	6	0	0	1	0	0	10
	Number of respondents	157	468	21	2	6	8	5	667
Percentage of respondents	24%	70%	3%	0%	1%	1%	1%	100%	
Nairobi	Private piped connection	5	130	4	0	2	7	4	152
	Yard tap	13	46	2	0	0	1	0	62
	Own source (well, borehole)	1	4	1	0	1	0	1	8
	Water kiosk	20	38	0	0	0	0	0	58
	Water vendors	3	6	0	0	0	0	0	9
	Neighbors	4	2	0	0	0	0	0	6
	Ground & natural sources	0	0	0	0	0	0	0	1
	Others (incl. Bottled water)	0	3	0	0	1	0	0	4
	Number of respondents	47	229	7	0	4	8	5	300
Percentage of respondents	16%	76%	2%	0%	1%	3%	2%	100%	
Mombasa	Private piped connection	11	75	2	0	2	0	0	90
	Yard tap	2	5	0	0	0	0	0	7
	Own source (well, borehole)	1	3	0	0	0	0	0	4
	Water kiosk	38	23	0	0	0	0	0	61
	Water vendors	9	15	0	0	0	0	0	24
	Neighbors	2	3	0	0	0	0	0	5
	Ground & natural sources	2	1	0	0	0	0	0	3
	Others (incl. Bottled water)	0	2	0	0	0	0	0	2
	Percentage of respondents	65	127	2	0	2	0	0	196
Number of respondents	33%	65%	1%	0%	1%	0%	0%	100%	
Kakamega	Private piped connection	18	45	5	0	0	0	0	68
	Yard tap	8	19	2	0	0	0	0	29
	Own source (well, borehole)	0	3	0	0	0	0	0	3
	Water kiosk	2	3	0	0	0	0	0	5
	Water vendors	0	2	0	0	0	0	0	2
	Neighbors	0	2	0	0	0	0	0	2
	Ground & natural sources	14	37	5	2	0	0	0	58
	Others (incl. Bottled water)	3	1	0	0	0	0	0	4
	Number of respondents	45	112	12	2	0	0	0	171
Percentage of respondents	26%	65%	7%	1%	0%	0%	0%	100%	

Table A-6. Water consumption and expenditure patterns, by welfare across cities

	Nairobi				Mombasa				Kakamega			
	Poor ¹		Non-Poor		Poor ¹		Non-Poor		Poor ¹		Non-Poor	
	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean
Consumption from all sources												
• Daily household consumption (in litres)*	96	104.9	137	206.2	65	138.2	87	331.7	54	120.6	102	162.5
• Monthly household consumption (in litres)**	96	3147	137	6126	65	4145	87	9950	54	3618	102	4874
• Daily per capita consumption (in litres)**	96	32.08	136	41.28	65	36.53	87	58.50	52	30.32	101	34.57
Consumption from the primary source												
• Daily household consumption (in litres)*	74	80.4	105	168.3	57	85.6	80	212.1	37	104.9	75	140.6
• Monthly household consumption (in litres)**	74	2412	105	5048	57	2568	80	6363	37	3146	75	4219
• Daily per capita consumption (in litres)**	74	21.94	104	34.10	57	22.32	80	39.78	35	30.08	75	29.38
Total expenditure on water												
• Daily household expenditure (in Ksh.)*	77	30.60	99	68.94	62	22.40	63	43.57	17	13.47	59	23.78
• Monthly household expenditure (in Ksh.)**	77	918	99	2068	62	672	63	1307	17	404	59	713
• Daily per capita expenditure (in Ksh.)**	77	9.58	99	14.03	62	6.22	63	8.55	16	3.66	58	6.02
Unit price for water consumed												
• From all sources (in Ksh. per litre)**	76	0.30	81	0.39	52	0.16	58	0.19	15	0.16	53	0.22
• From kiosk service (in Ksh. per jerrican)*	61	5.24	11	4.91	46	3.26	16	2.91	4	3.25	9	1.94
• From vendor service (in Ksh. per jerrican)*	55	13.15	19	17.53	21	10.29	23	9.96	1	5.00	2	5.50
Household Size (persons)*	105	3.93	176	4.88	55	4.02	101	5.68	57	4.77	112	5.46

¹ "Poor" is defined in terms of *total monthly household income* of Ksh. 10,000 and less for Nairobi & Mombasa; and of Ksh. 5,000 and less for Kakamega.

* Based on direct responses of survey participants.

** Based on *computed* values derived for each household as follows: (1) Monthly household consumption multiplied by 30; (2) Daily per capita consumption is daily household consumption divided by household size; (3) Monthly household expenditure is daily household expenditure multiplied by 30; (4) Daily per capita expenditure is daily household expenditure divided by household size; (5) Unit price for water consumed from all sources is daily household expenditure divided by daily household consumption.

Table A-7 Comparison of households with and without private piped water service: Nairobi#

	Pvt. Conn.*		Yard Tap**		Alt. Sources***	
	N	Mean ¹	N	Mean ¹	N	Mean ¹
% of households who are "poor" ²	133	3.8	57	57.9	83	75.9
Household size	141	5.06	62	3.89	86	4.30
% of households stating "water" as top priority	142	38.0	62	43.6	86	76.7
Time spent on collecting water from the primary water source	139	0.15	50	14.52	76	65.95
% of households who need to go more than 200 m. to collect	113	0.0	39	2.6	78	47.4
Water storage capacity in litres	132	2200	54	1013	81	565
Investment in storage system (Ksh.)	133	10571	53	1395	83	7864
% households who are not satisfied with the overall service	132	40.9	43	46.5	80	67.5
% households who are very satisfied with the overall service	132	16.7	43	4.6	80	6.2
Household consumption in litres per day	99	208.0	57	114.4	83	146.1
Household consumption in litres per month ³	99	6239	57	3432	83	4383
Per capita consumption in litres per day ³	98	38.4	57	35.08	83	35.51
Household expenditure on water in Ksh. per day	72	62.8	30	44.46	77	45.66
Household expenditure on water in Ksh. per month ³	72	1885	30	1334	77	1370
Per capita expenditure on water in Ksh. per day ³	72	11.8	30	10.19	77	12.88
Price in Ksh per litre for water consumed from all sources ³	53	0.40	30	0.32	77	0.34
Price in Ksh per jerrican from kiosk service	1	3.00	13	6.23	62	5.01
Price in Ksh per jerrican from vendor service	4	21.25	20	14.00	53	14.11

Differences in means across the three groups of households are statistically significant for all the variables except three: daily per capita expenditure, unit prices for water consumed from all sources and from vendor service. * "Pvt. Conn." are those households who have private piped water connection and use it as the primary water source; ** "Yard Tap" are those households who use yard tap as the primary water source; *** "Alt. Sources" are those households who use kiosk, vendors, neighbors, own source (well, borehole), ground/natural sources, and other miscellaneous sources (including bottled water) as their primary water sources. ¹ Except where it says that the variable is expressed in percentage. ² "Poor" is defined in terms of *to. of monthly household income* of Ksh. 10,000 and less for Nairobi & Mombasa; and of Ksh. 5,000 and less for Kakamega. ³ Based on *computed* values derived for each household as follows: (1) Monthly household consumption is daily household consumption multiplied by 30; (2) Daily per capita consumption is daily household consumption divided by household size; (3) Monthly household expenditure is daily household expenditure multiplied by 30; (4) Daily per capita expenditure is daily household expenditure divided by household size; (5) Unit price for water consumed from all sources is daily household expenditure divided by daily household consumption.

Table A-7b Comparison of households with and without private piped water service: Mombasa[#]

	Pvt. Conn.*		Yard Tap**		Alt. Sources***	
	N	Mean ¹	N	Mean ¹	N	Mean ¹
% of households who are "poor" ²	70	4.3	7	42.9	88	65.9
Household size	90	6.22	8	4.75	100	4.43
% of households stating "water" as top priority	86	53.5	8	75.0	99	57.6
Time spent on collecting water from the primary water source	22	38.2	6	27.0	81	26.13
% of households who need to go more than 200 m. to collect	83	1.2	8	0.0	88	14.8
Water storage capacity in litres	82	1794	7	267	98	515
Investment in storage system (Ksh.)	67	8783	7	534	79	1125
% households who are not satisfied with the overall service	85	51.8	7	57.1	95	49.5
% households who are very satisfied with the overall service	85	8.2	7	0.0	95	3.2
Household consumption in litres per day	73	388.8	8	152.5	96	165.3
Household consumption in litres per month ³	73	11665	8	4575	96	4959
Per capita consumption in litres per day ³	73	64.42	8	36.37	96	39.95
Household expenditure on water in Ksh. per day	52	36.94	5	34.6	93	31.03
Household expenditure on water in Ksh. per month ³	52	1103	5	1038	93	931
Per capita expenditure on water in Ksh. per day ³	52	6.81	5	5.84	93	7.58
Price in Ksh per litre for water consumed from all sources ³	45	0.16	5	0.16	91	0.19
Price in Ksh per jerrican from kiosk service	0	-	0	-	66	3.14
Price in Ksh per jerrican from vendor service	16	11.13	2	10.00	33	10.06

[#] Differences in means across the three groups of households are statistically significant for all the variables except three: daily per capita expenditure, unit prices for water consumed from all sources and from vendor service. * "Pvt. Conn." are those households who have private piped water connection and use it as the primary water source; ** "Yard Tap" are those households who use yard tap as the primary water source; *** "Alt. Sources" are those households who use kiosk, vendors, neighbors, own source (well, borehole), ground/natural sources, and other miscellaneous sources (including bottled water) as their primary water sources. ¹ Except where it says that the variable is expressed in percentage. ² "Poor" is defined in terms of total monthly household income of Ksh. 10,000 and less for Nairobi & Mombasa; and of Ksh. 5,000 and less for Kakamega. ³ Based on computed values derived for each household as follows: (1) Monthly household consumption is daily household consumption multiplied by 30; (2) Daily per capita consumption is daily household consumption divided by household size; (3) Monthly household expenditure is daily household expenditure multiplied by 30; (4) Daily per capita expenditure is daily household expenditure divided by household size; (5) Unit price for water consumed from all sources is daily household expenditure divided by daily household consumption.

Table A-7c Comparison of households with and without private piped water service: Kakamega[#]

	Pvt. Conn.*		Yard Tap**		Alt. Sources***	
	N	Mean ¹	N	Mean ¹	N	Mean ¹
% of households who are "poor" ²	44	22.7	30	70.0	73	75.3
Household size	44	5.50	30	5.30	73	5.30
% of households stating "water" as top priority	43	53.5	29	62.1	43	53.5
Time spent on collecting water from the primary water source	5	2.0	9	5.89	64	50.75
% of households who need to go more than 200 m. to collect	14	7.1	22	0.0	71	57.8
Water storage capacity in litres	37	555	21	339	52	137
Investment in storage system (Ksh.)	34	3237	20	397	49	479
% households who are not satisfied with the overall service	42	38.1	27	40.7	71	59.2
% households who are very satisfied with the overall service	42	2.4	27	3.7	71	7.0
Household consumption in litres per day	37	219.4	26	120.0	72	130.2
Household consumption in litres per month ³	37	6584	26	3600	72	3905
Per capita consumption in litres per day ³	37	48.21	26	27.66	69	28.61
Household expenditure on water in Ksh. per day	31	21.22	13	27.92	18	19.94
Household expenditure on water in Ksh. per month ³	31	637	13	838	18	598
Per capita expenditure on water in Ksh. per day ³	31	5.48	13	7.55	17	4.68
Price in Ksh per litre for water consumed from all sources ³	26	0.17	13	0.33	16	0.16
Price in Ksh per jerrican from kiosk service	2	2.00	2	3.5	9	2.17
Price in Ksh per jerrican from vendor service	2	5.50	0	-	1	5.00

[#] Differences in means across the three groups of households are statistically significant for all the variables except three: daily per capita expenditure, unit prices for water consumed from all sources and from vendor service. * "Pvt. Conn." are those households who have private piped water connection and use it as the primary water source; ** "Yard Tap" are those households who use yard tap as the primary water source; *** "Alt. Sources" are those households who use kiosks, vendors, neighbors, own source (well, borehole), ground/natural sources, and other miscellaneous sources (including bottled water) as their primary water sources. ¹ Except where it says that the variable is expressed in percentage. ² "Poor" is defined in terms of total monthly household income of Ksh. 10,000 and less for Nairobi & Mombasa; and of Ksh. 5,000 and less for Kakamega. ³ Based on computed values derived for each household as follows: (1) Monthly household consumption is daily household consumption multiplied by 30; (2) Daily per capita consumption is daily household consumption divided by household size; (3) Monthly household expenditure is daily household expenditure multiplied by 30; (4) Daily per capita expenditure is daily household expenditure divided by household size; (5) Unit price for water consumed from all sources is daily household expenditure divided by daily household consumption.

Table A-8 Development priorities by welfare, across cities

Development Priority	Nairobi				Mombasa				Kakamega			
	1 st most important		2 nd most important		1 st most important		2 nd most important		1 st most important		2 nd most important	
	Poor*	Non-Poor	Poor	Non-Poor	Poor*	Non-Poor	Poor	Non-Poor	Poor*	Non-Poor	Poor*	Non-Poor
Electricity	10%	8%	21%	13%	18%	16%	18%	18%	7%	8%	25%	26%
Water supply system	62%	43%	10%	9%	54%	56%	22%	17%	72%	65%	16%	8%
Sanitation/sewerage system	10%	17%	12%	13%	5%	3%	6%	8%	7%	4%	11%	11%
Solid waste	4%	8%	13%	14%	3%	9%	12%	16%	0%	0%	4%	1%
Roads	2%	10%	17%	9%	3%	1%	5%	4%	3%	8%	16%	17%
Schools	5%	3%	11%	6%	9%	0%	11%	6%	9%	4%	6%	9%
Water drainage	1%	2%	1%	10%	3%	5%	8%	3%	0%	2%	2%	5%
Health services	4%	5%	8%	9%	5%	4%	12%	8%	2%	7%	18%	17%
Street lighting	3%	4%	6%	16%	0%	5%	6%	19%	0%	2%	2%	6%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Sample Size	105	177	105	176	65	98	65	93	57	112	55	109

* "Poor" is defined in terms of *total monthly household income* of Ksh. 10,000 and less for Nairobi & Mombasa; and of Ksh. 5,000 and less for Kakamega.

Table A-9a. Perceived official connection fee for private piped water connection

Official connection fee (Ksh)	% of households
Up to 1000	11.1
1001 – 2000	22.2
2001-5000	25.0
5001-10000	13.9
More than 10000	27.8
	35
Sample size	
Mean perceived fee (Ksh)	9,469
Minimum perceived fee (Ksh)	600
Maximum perceived fee (Ksh)	50,000

Table A-9b. Maximum willing to pay as connection fee for private piped water connection

Maximum willing to pay (Ksh)	% of households
Up to 500	26.6
501 – 1000	32.3
1001-2500	33.0
2501-5000	8.1
Sample size	124
Mean willingness to pay (Ksh)	1,352
Minimum willingness to pay (Ksh)	0
Maximum willingness to pay (Ksh)	5,000

Table A-9c. Maximum willing to pay as connection fee for yard connection

Maximum willing to pay (Ksh)	% of households
Up to 500	23.0
501 – 1000	28.3
1001-2500	31.9
2501-5000	16.8
Sample size	113
Mean willingness to pay (Ksh)	1,620
Minimum willingness to pay (Ksh)	0
Maximum willingness to pay (Ksh)	5,000

Table A-10. Price currently paid for water by households with alternate water sources*

Price paid for water in Ksh. per m3	Proportion of households		
	Nairobi	Mombasa	Kakamega
Up to 50	4.67	4.17	17.24
More than 50 but less than or equal to 75	1.87	8.33	6.90
More than 75 but less than or equal to 100	1.87	7.29	13.79
More than 100 but less than or equal to 125	9.35	30.21	3.45
More than 125 but less than or equal to 150	1.87	4.17	3.45
More than 150 but less than or equal to 200	14.02	15.62	3.45
More than 200 but less than or equal to 250	20.56	10.42	27.59
More than 250 but less than or equal to 500	33.64	16.67	20.69
More than 500	12.15	3.12	3.45
Total	100%	100%	100%
Number of respondents	107	96	29

* These are households which do not have private piped water connection *and* depend on yard tap, water kiosk, water vendors, neighbors, own source (well, borehole), ground/natural sources, and other miscellaneous sources (including bottled water)

Table A-11. Water consumption rate by households with alternate water sources*

Consumption rate in litres per capita per day	Proportion of households		
	Nairobi	Mombasa	Kakamega
Up to 20	36.43	25.96	45.26
More than 20 but less than or equal to 30	25.71	18.27	24.21
More than 30 but less than or equal to 40	15.00	23.08	16.84
More than 40 but less than or equal to 50	5.71	7.69	4.21
More than 50 but less than or equal to 60	5.00	12.50	5.26
More than 60 but less than or equal to 70	2.14	5.77	2.11
More than 70	10.00	6.73	2.11
Total	100%	100%	100%
Number of respondents	140	104	95

* These are households which do not have private piped water connection *and* depend on yard tap, water kiosk, water vendors, neighbors, own source (well, borehole), ground/natural sources, and other miscellaneous sources (including bottled water).