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**ENSURING AVAILABILITY AND SUSTAINABLE MANAGEMENT  
OF WATER AND SANITATION FOR ALL**

**Household access to groundwater and its implication in an  
urban poor community, Ghana**

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*The access to drinking water in urban informal settlements of developing countries is a challenge for the poor. The objective of the study was to determine access to groundwater supply and its implication to consumers. A survey of 300 households in the study site showed that the households' main water sources were public standpipe (37%), pipe water into buildings (20.67%), unprotected dug well (15%) and protected well (13%), motorized borehole (5.67%) and hand-pump borehole (4%). The groundwater use was high with about 78% of households accessing it as a main source or secondary source. Results showed that 96% of all the households use sachet water as a major source of drinking water. The households view the groundwater as unwholesome for drinking because of its salty taste, impurities and colour. The poor households pay more for public standpipe (11 Ghana Cedis per m<sup>3</sup>) compared to boreholes cost (GH6.17 per m<sup>3</sup>).*

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## **Introduction**

The population growth and urbanization in the Sub-Saharan Africa has led to the rapid expansion of slums and informal settlements in the urban centres. Access to drinking water in urban informal settlements of developing countries has a challenge for the poor and depends on technology selected (Isoke & van Dijk, 2013). Most of the population growth has occurred in peri urban slum neighbourhoods, and utilities have not been able to extend their networks fast enough. As of 2008, most city dwellers who do not obtain their water from a utility get it from wells and boreholes, which are the primary source of water for 24 percent of Africa's urban population (Banerjee et al, 2008). Due to the increase in economic activities and population growth, it is of a necessity for groundwater resources to be developed further since it is economically-viable option for improving water-supply for many African countries. Other water sources such as surface water or rainwater are less reliable and easily contaminated (Foster et al, 2006).

The ground water development comes at a cost depending on the technologies and fetch a return on the investment on development of ground water abstraction system. The determinants driving the costs and benefits also determine access to water supply (Nkrumah et. al, 2011). The cost of ground water use may change the choice between the available options for drinking water for the poor. Ground water use is an economic problem, since it is a scarce commodity with alternative applications, which come at a cost and fetch a return. The economics of ground water use seeks to ask the question: what are the costs to put a ground water abstraction system in operation and to operate and maintain it. The industrial and domestic value of groundwater is represented by the cost of obtaining alternative supplies, provided customers are willing to pay the additional amount to acquire the same volume of water (George *et al.* 2011). For domestic water use, the cost of fetching water from distant locations or cost of tanker-supplied water is used to determine the value placed on groundwater by urban uses. This provides a quantifiable measure of the value of groundwater.

The objective of the study was to determine access to groundwater supply and its cost implication to consumers in the area. Specifically, the following objectives were examined:

- To determine the access to water supply in terms of type of sources and water consumption,
- To assess the cost to consumers in terms of water prices and household water cost.

- To examine the variation in water cost with consumption and the cost implication on access to water.

## Methodology

### The study area

Dodowa is a peri-urban low income community in Accra with population of about 12,000. Water is rationed in Accra to many consumers with only a few customers able to get 24-hour supply. In the peri-urban areas and the densely populated poor urban areas customers receive supplies once a week or none at all. Improving access to water and pro-poor issues are issues of concern with the urban water supply that the government of Ghana seeks to address.

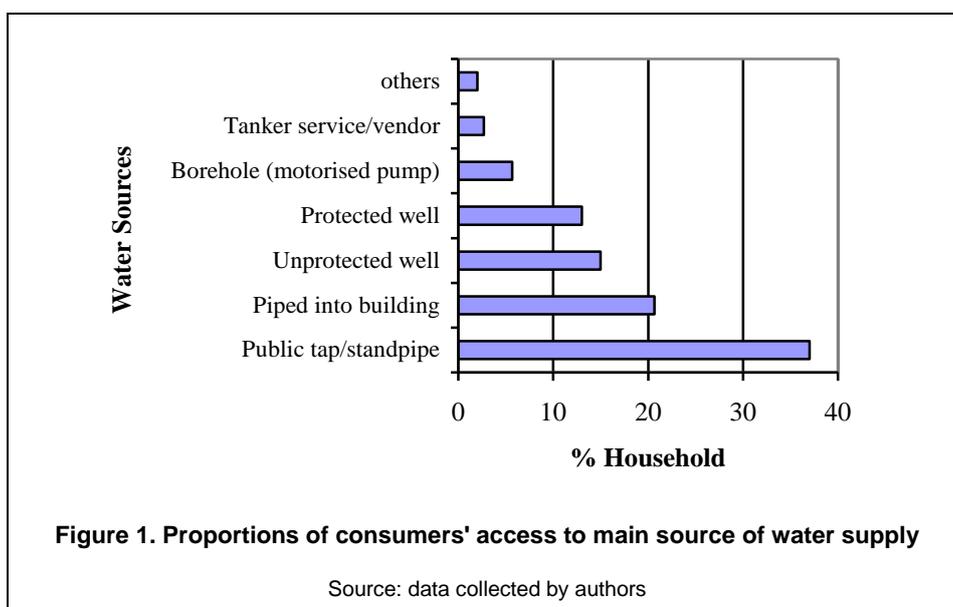
### Data collection method

The research involved survey 300 households in the Dodowa community in Accra, Ghana, to assess the groundwater use in the area. This approach would require besides collecting qualitative information through quantitative data through surveys of the units involved in production and consumption of this water. A systematic sampling of households was used where a household was selected for interview at every 5<sup>th</sup> house. The first household was selected at random. To ensure that the community is covered, a stratified sampling of households from the suburbs within the study area was adopted. Method involved both qualitative and quantitative survey among users of groundwater, formal or informal operators (households, informal and formal private water vendors, state-owned enterprises or utilities).

## Results and discussion

### Households' access to water supply in Dodowa

The main sources and types of water supply and that were identified in Dodowa. The proportions of consumers' choice and access to main source of water are shown in the Figure 1. The results showed that most of the people depend on more than one water source for consumption: a main source and a secondary source. The households perceived the main water source as fit for drinking and cooking and the secondary source for other uses such as washing. The results showed that the main source of water is the water that is used daily by the household for most of their activities such as for drinking, cooking, bathing and washing. Any other water source they use not too frequently is seen as a secondary or a backup water source.



It is evident from Figure 1 that out of the 300 households interviewed; access to public standpipe was 37% of households, pipe water into buildings was 20.67%, unprotected dug well was 15%, protected well was 13%, motorized borehole was 5.67%, and hand-pump borehole was 4%. A few (2.7%) depend on tankers and vendors for their main supply while the remaining 2% depend on other sources and types of supply such

as rainwater harvesting as their main supply. Though almost all the households use rainwater, but it was not recognized as their main supply because of its inconsistency and seasonal nature. It requires larger harvesting facilities to store water for major and consistent supply throughout the year. A few of these 2% have adequate harvesting facilities to store rainwater for consistent supply.

#### ***Water source usage rate among various sources***

Apart from the main source of water supply, most of the households use other water sources as secondary supply or backup as stated before. The combined groundwater usage rate with other water source accessed by the consumers either as a main source or a secondary source is shown in Figure 2.

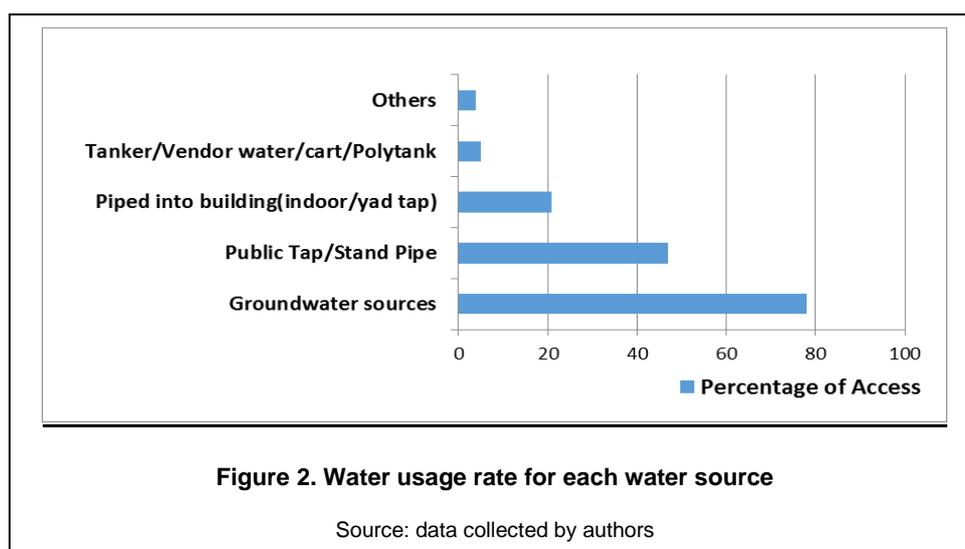


Figure 2 shows that groundwater (including protected and unprotected dug wells, motorized boreholes and hand-pump boreholes) in general has the highest dependency of water supply with about 78% of households accessing it for consumption either as a main source or secondary/backup source. It was discovered through the survey that most of the households do not recognize groundwater as their main source even though they still use it. The reason is that most of them neither drink nor use for cooking but for bathing and washing. The second widely accessed water source is the public pipe tap (47%) followed by piped into building (21%), then tanker/ vendor water services (5%) and other sources (4%).

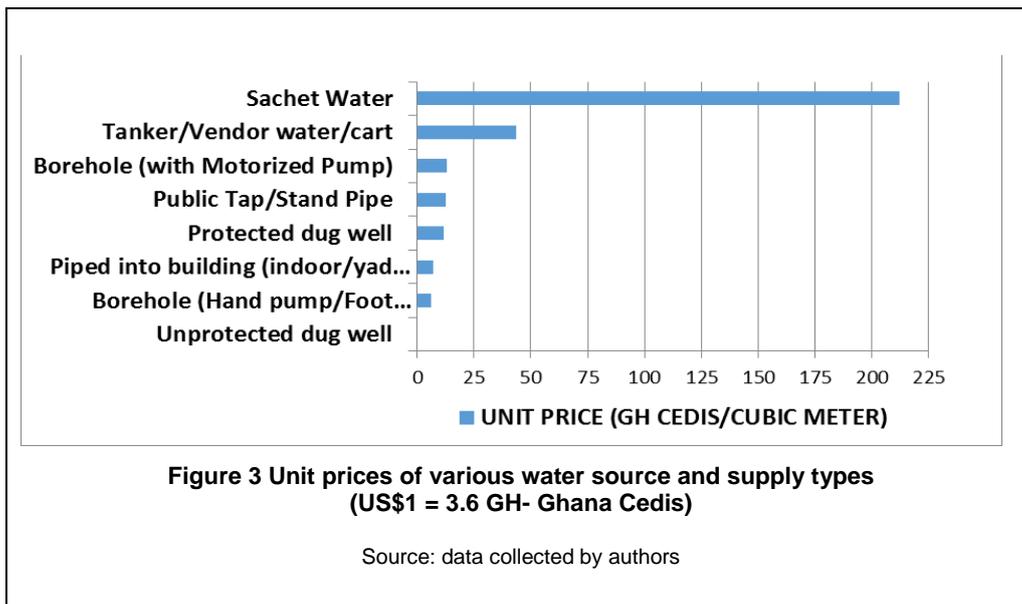
#### ***Use of sachet water***

The results showed that about 96.3% of all the households use sachet water as a major source of drinking water. Though water sources such as public pipe tap and pipe into buildings are accepted by consumers as fit for drinking, most of them still prefer the use of sachet water for drinking due to the perception that it is cleaner and safer. The households who use the unprotected dug wells as their main source of water supply view the wells as not fit for drinking because of its salty taste, impurities and colour. The same reason applies to the consumers of protected dug wells. Also because of the complaints about the salty taste of the boreholes, most of them buy sachet water. These consumers use the wells for bathing, washing and cooking while they buy sachet water for drinking. All the households depending on tankers and vendors also use sachet water for drinking. The perception is that the quality of the water is compromised through the transport in tankers, polytanks and other containers.

### **Cost implication for access to groundwater supply**

#### ***Unit prices of water sources***

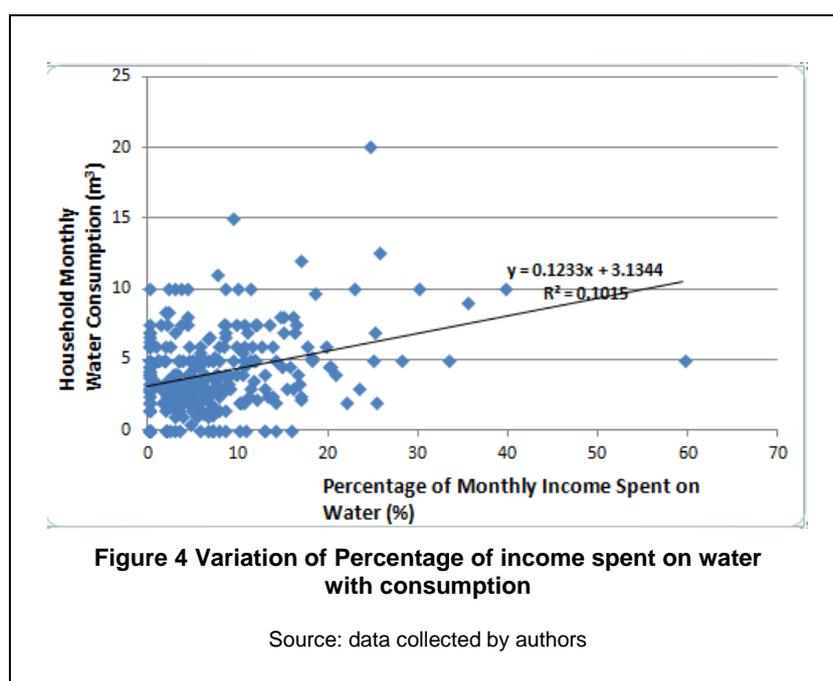
Based on the survey, the unit prices of the various water sources supplied in Dodowa have been computed and shown in Figure 3. It is evident that sachet water which was widely used by the households has relatively very high cost to consumers with a unit price of GH¢ 212/ m<sup>3</sup> (Ghana Cedis per cubic meter) (US\$59 per m<sup>3</sup>). This implies that the households' expenses on water are greatly increased by the purchase of sachet water.



The next higher unit price is that of the tanker/ vendor water supply (GH¢43.42/m<sup>3</sup>, US\$12/m<sup>3</sup>). This is also a relatively high cost which is partly due to the cost in transporting the water to the consumers' house. The next higher unit price is that of motorized borehole which is found to be GH¢13.06/m<sup>3</sup>. This is so because of the cost involved in construction, operation and maintenance. These motorized boreholes are owned by private businesses and hence their profit is not compromised in fixing the prices. Public pipe tap is the next higher priced water source of about GH¢12.4/m<sup>3</sup> followed by protected dug well (GH 11.52/m<sup>3</sup>). Households who have access to pipe in buildings pay relatively less for water. They pay GH¢7.17/m<sup>3</sup> for their water consumption. This is not beneficial for the poor because most of poor do not have access to pipe water into their buildings; they are more dependent on public pipe taps, motorized boreholes and other shared sources of supply. The poor pay more for water. However, there is also community owned hand-pump boreholes which cost relatively lesser (that is about GH¢6.17/m<sup>3</sup> and unprotected wells are free to fetch.

#### Variation in water cost with consumption

The Figure 4 shows a graph of household monthly water consumption (in cubic meters) against percentages of household monthly income spent on water to assess the correlation and variation of water cost with consumption. The results show that an increase in households' expenditure on water (as a percentage of their monthly income) causes a corresponding increase in consumption. In a normal economic theory, an increase in the cost of a commodity is expected to cause a reduction in the use of that commodity, but the water consumption analysis shows an opposite phenomenon. This is due to the fact that there is no substitute for water and therefore shows an inelastic demand for water. Hence there appears to be no alternative for the poor, who are affected by high water costs. The cost of water forms a higher percentage of the monthly income of the poor. Hence, as they consume more water, they will lack enough funds to cater for other competing aspects of their lives.



### Implications of water quality and cost on access to water

The groundwater use was high with about 78% of households accessing it for consumption as a main source or secondary source. The study showed that 50% of the households use groundwater as secondary source due to the lower cost while 28% use it as main source. The results showed about 96% of all the households use sachet water as a major source of drinking water due to poor quality of groundwater and the perception that the sachet water is cleaner and safer. The households perceive the groundwater as unwholesome for drinking because of its salty taste, impurities and colour. There is the need to improve unprotected wells and the quality of groundwater in the community. This calls for protection of hand-dug well with covers and the provision of low cost hand pumps (for example rope pump) to prevent contamination during fetching. The improvement in the quality of groundwater will reduce the dependence on high cost sachet water which is commonly used in the community.

The poor households pay more for public standpipe at about GH¢11.00 and water sachet GH¢ 212.00 compared to GH¢7.17 per cubic meter for users of pipe into buildings. The community owned hand-pump boreholes cost relatively lesser (GH¢6.17 per cubic meter) and unprotected wells are free to fetch.

### Conclusion

The study examined access to groundwater supply and the implication in Dodowa community in Accra, Ghana. About 78% of households use groundwater as a main source or secondary source. The conclusion drawn from the studies is that the water supply in Dodowa does not favour the poor in terms of cost, compelling them to access unprotected wells and other high cost water sources than their income can support. The lesson learnt is that high cost of water will compromise the effort to meet the sustainable development goal of access to water for all by 2030. The poor pay higher than the well-to-do consumers. The sachet water is inevitably in high demand irrespective of its high cost to consumers, and it is patronized most as a source of drinking water than all other water supply sources. The water cost to households is therefore increased by the purchase of sachet water. It is recommended that further research be made into the water quality of the groundwater and the development of groundwater source to improve the water supply in such communities to help relieve the poor of the higher cost of accessing water.

### Acknowledgements

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