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Access To Safe Water And Household Water-User Preference In Obunga Slums Of Kisumu Municipality, Kenya

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Abstract: ***The world's freshwater supply is finite with only about one percent of it being readily available for consumption by humans, animals and for irrigation. Similarly, the price and time taken to obtain clean water has proved to be a major problem to the poor households living in rural areas or informal settlements, ostensibly due to the fact that the utility providers hardly cover these areas in terms of water connections. There is therefore the need for wise water use by poor households so as to ensure sustainable supply of safe water. The purpose of this study was to determine whether access to safe water affects household water-user preference in Obunga slums, with the specific objectives being: (i) to establish the status of access to safe water by households, assess the water-user preference of households, and (ii) to determine the influence of access to safe water on household water-user preference in Obunga slums. Ex post facto research design was adopted for the study on a population of 2,507 households divided into four administrative units. Amin's table and stratified sampling technique were used to select 331 household for questionnaire administration. Test retest and expert consultations were used to ensure reliability and validity respectively. Questionnaire return rate yielded 254 respondents representing 76.7%. It was found that households in Obunga slums have moderate access to safe water, but poor water-user preference. The hypothesis that household water-user preference in the slums is dependent on access to safe water was therefore rejected ($\chi 2o = 13.158 > \chi 2c\ (4, .05) = 9.488$). It was concluded that water-user preference does not depend on access to clean water by households.***

Keywords: Water-user preference; households; access to safe water; Water supply; Water resource management;

I. INTRODUCTION

The growth of informal settlements poses serious challenges to the provision of safe water. On the supply side, since residents of these areas (alongside rural households) do not hold formal land titles, there is a constant risk of eviction, and thus loss or damage to infrastructural facilities of the utility holder. The utilities' lack of commitment to provide water to areas occupied by less privileged communities are fuelled by concerns including the perceived lack of willingness and ability of poor people to pay for water services, concerns over the safety of expensive infrastructure, problems of insecure or disputed land ownership, and the poorly planned construction exhibited in slums (Franceys and Gerlach, 2008).

In the last two decades, the number of people with access to safe drinking water improved from 77% to 87%, although around 884 million people (37% come from Sub Saharan Africa) still use drinking water from unsafe sports (WHO/UNICEF, 2010). According to UN World Water (2009), 340 million Africans are still in need of access to and sustainable supply of safe drinking water and the continent is lagging behind the attainment of the Millennium Development Goal. According to WHO/UNICEF (2010) update, the proportion of the African population who get accessed to safe drinking water accounts for only 60%, which is about 11% increase compared to the situation in 1990.

In areas that are most affected by frequent shortages of water, a key platform for ensuring household water security in the face of inadequate water infrastructure is through

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encouraging the communities to conserve the little water that is available (Spinks, Fielding, Russell, Mankad and Price, 2011). This, in essence, is the efficiency in water use. Increased water-use efficiency ensures that water resources are used in a reasonable, effective and sustainable manner. Greater attention must be given to the prevention of pollution and other forms of water quality degradation. According to Bates, *et al*., (2008) and Maoulidi (2012) current water use is often not sustainable, and new technologies and management methods are required which are underpinned by science.

For example, only about 7% of the water is used for cooking and drinking, while one third of the water is flushed down the toilet. Water use refers to the amount of water taken for a given task or for the production of a given quantity of some product or crop (Chenoweth, 2008). It also refers to water taken in for agriculture, industry, energy production and households, including in-stream take-ups such as fishing, recreation, transportation and waste disposal (Hoekstra, 2006). According to Hoekstra (2006), water can be used renewably and non-renewably. In psychology, preferences could be conceived as an individual's attitude towards a set of objects, typically reflected in an explicit decision-making process (Lichtenstein and Slovic, 2006). In this study, preference refers to a tendency of household water-users to choose one use of water in relation to another, or to others, or to allocation of more water for other uses as opposed to others.

Ho et al. (2001) point out that for effective and wise-water-use, households should use water in strict proportions of: gardens (6.10%), laundry (14.00%), toilets (25.00%), car washing (0.70%), direct heating system (0.10%), dishes (7.70%), drinking and cooking (13.10%), and personal washing (33.30%). These ratios have been adopted and recommended by the United Nations as ideal ratios for wise-water-use all over the world (UN, 1997, 2001). Access to safe water is measured by the number of people who have a reasonable means of getting an adequate amount of water that is safe for drinking, washing, and essential household activities, expressed as a percentage of the total population (Arnell, 2006). This means that the cost of water to the household (and this must be related to the household income), the distance to the consumer's residence and the source of water, and the number of users accessing the water. According to a UNDP (2006) report, almost two in three people lacking access to clean water survive on less than $2 a day, with one in three living on less than $1 a day. People living in the slums of Jakarta, Manila and Nairobi pay 5 to 10 times more for water than those living in high-income areas in those same cities and more than consumers in London or New York. In Manila the cost of connecting to the utility represents about three months' income for the poorest 20% of households, rising to six months' in urban Kenya.

A. STATEMENT OF THE PROBLEM

Access to water from improved sources is a step ahead in improving household livelihood. Kenya's per capita water supply stands at 696 cm^3 per year against a population of about 40 million. This is far below the internationally recommended benchmark of 1,000 cm^3 per capita a year, rendering Kenya a water-scarce country. But since water resources cannot be expanded, the key to water security remains in the efficient wise water-use. The Kenya census of 2009 reports the main water sources per household for Kisumu County as 39% streams and rivers, 24% wells, 13% ponds and dams, 10% springs, 8% piped water, 8% from rainwater harvesting while 4% gets directly from the lake (KNBS, 2009). Kisumu Municipality is generally water insecure, and over 60% of households in Kisumu do not have access to safe water, and about 53% of the households lack adequate water supplies (ibid). About 62.3% of the water sources are not sustainable, and the quality of water is generally poor and not suitable for household use (ibid). The status of water use by households in Kisumu Municipality in relation to access to safe water has not been determined despite the evidence of high water insecurity in the municipality. This study was set to determine this relationship.

II. LITERATURE REVIEW

Target 10 under the Millennium Development Goals (MDGs) is to halve by 2015 the proportion of people without sustainable access to safe drinking water. However, according to UNDP (2006), Africa will not reach the MDG of sustainable access to safe water until 2040. This has since been proved right with most countries in Africa, including Kenya failing to meet the MDG goal 7 on access to water from improved sources. The annual average water availability per person in Africa is estimated at 4,008 m^3 per capita per year, well below the global average of 6,498 m^3/ capita/year (FAO, 2007). It has been predicted that the proportion of the African population at risk of water stress and scarcity will increase from 47 per cent in 2000 to 65 per cent in 2025, affecting 18 countries (Bates et al., 2008; Waggah et al., 2010). In Kisumu, the number of people without access to improved water sources has not decreased; instead, it has increased with 24% (WHO/UNICEF, 2010). Moreover, the number of urban dwellers un-served with safe drinking water even more than doubled (to 112%), according to WHO/UNICEF (2010).

The UN-Habitat (2007), states that the urban poor get their water by queuing for hours to collect water from standpipes or illegal connections. Others buy their water from vendors who can charge up to twenty times more for water than the price paid by their wealthier neighbours. As such, not only do the poor suffer financially; they also suffer in health from using unsafe water and poor sanitation facilities. Most households from informal settlements prefer to use water in respect to how such water is accessible to them; that is water-user preference is dictated by access to clean water (Foeken, Chung, Mutune and Owuor, 2013).

Wise water use in the face of water scarcity is the responsibility of individuals, exhibited within the households. Afullo (2014) comparative research on water footprint between the Kenyan and USA students shows a worrying trend, with the Kenya water footprint being fairly high, and still increasing. Ho et al., (2001) point out that for effective and wise water-use, households should use water in strict proportions of: gardens (6.10%), laundry (14.00%), toilets (25.00%), car washing (0.70%), direct heating system

(0.10%), dishes (7.70%), drinking and cooking (13.10%), and personal washing (33.30%). These ratios have been adopted and recommended by the United Nations as ideal ratios for wise-water-use all over the world (2004). Yet studies done by Lake Victoria South Water Service Board (LVSWSB, 2008) in 2008 indicated that water used for drinking by households in Obunga (among other two slums) was contaminated and unclean. Hunter *et.al* (2010), as cited by Afullo and Danga, observed that a safe, reliable, affordable, and easily accessible water supply is essential for good health. Similarly, Wagah, Onyango, and Kibwage, (2010) observed that only 65.6% of the basic water requirements of the residents of Kisumu Municipality are met. No study has been done in Obunga slums covering which links water user preference with access to safe water, and whether the residents from this area have poor or better water user preference.

III. METHODOLOGY

A. STUDY AREA

The study was conducted in Obunga slums in Kisumu Municipality between the months of April and August, 2013. Administratively the slums are in Kanyakwar Sub-location, in East Kisumu Location, of Kisumu West sub-county, in Kisumu County. The population of Kisumu municipality by Kenya National population and Household census of 2009 (GoK, 2009) was 473,649. This is when Obunga slums had population of 8211. The River Obunga, which is actually a stream, runs through three slums of Obunga Sega Sega, Obunga Kasarani and Obunga Central. The stream does not have high volume of water for use as a reliable source of water by the residents of the slums. Its water volume is low and polluted by activities of small scale farming and sewage dumping. The residents don't use it for drinking and cooking because it is highly contaminated by effluents from raw sewage dumped on it directly.

Figure 3.1: Map of Kenya showing location of Kisumu town
Source: The Researcher data, 2015

The housings in Obunga slums are characterized by congested dwellings. These houses lack water piping. They depend on stand pipes which are a few metres away or in the same compounds, for water. The residents buy water from sellers at the standpipes or from water vendors who bring water in 20 litres jerricans to the house. The residents buy water from standpipes for drinking and cooking, but use water from shallow wells for washing, toilet and gardening. The shallow wells in the slums are within reach and the residents get much water as they need without buying. This has encouraged much use of water from shallow wells for washing, toilet purposes and gardening. They use tap water and water from the shallow wells according to their preferences.

The numbers of shallow wells, according to Obunga Watsan office data, are 22 in the entire area. There is little commercial activities in the area, save for small scale fish drying businesses and green grocery. The slums are about 2.5 km from the Central Business District (CBD) of Kisumu municipality. Figure 3.2 is the map of Kisumu Municipality showing the location of Obunga slums.

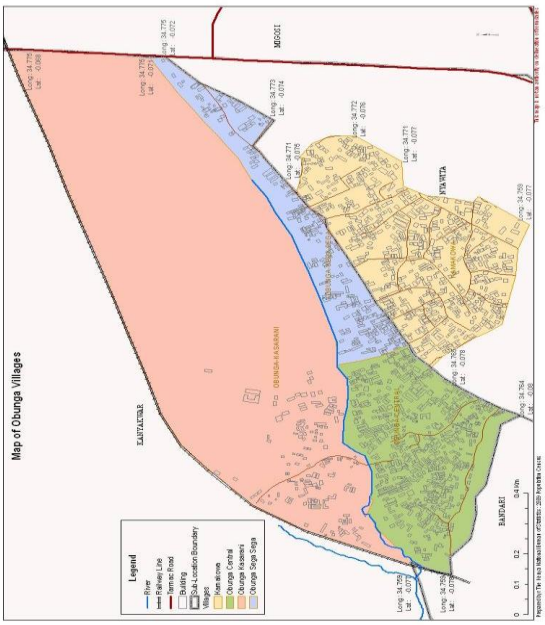

Figure 3.2: Map of Obunga slums in Kisumu municipality
Source: KNBS data, 2009

B. STUDY POPULATION, SAMPLING PROCEDURE AND DATA COLLECTION

All the people under consideration in any field of investigation constitute targeted population (Kombo, 2006). The slums have a total population of 8,211 comprising 4,275 males and 3,936 females in 2,507 households; the population density of the area is 4,561 persons per km^2. The area of study covers 1.8 Km^2. The slums have one of the highest population densities in Kisumu municipality (KNBS and PC, 2009). The target population for this study comprised the 2,507 households in the 4 administrative units, being: Obunga Central, Obunga Kamakowa, Obunga Segasega, and Obunga Kasarani.

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The sample size comprised 331 households in Obunga slums. The sample was determined according to Amin's (2005) table of samples, and was distributed among the 4 administrative units in the slums. Amin (2005) recommends a sample of 331 for a population of 2,507, at 0.05 level of confidence and 5.0% margin of error. These were the same conditions which the researcher used on the study. For each administrative unit, the sub-sample size was determined as: *Sub-sample size = (sub-population size/total population) required sample size*.

ss = (sp/tp) Sample Size;

Where ss denotes sub sample size; sp is sub population size; tp is total population.

Therefore, the sample size of households in each administrative unit was determined as follows:

Administrative unit	Determinant	Sample size
Obunga Central	(766/2507) x 331	101
Obunga Kamakowa	(645/2507) x 331	85
Obunga Kasarani	(573/2507) x 331	76
Obunga Sega sega	(523/2507) x 331	69

Table 3.4: Determination of Sample size

Simple random sampling method was used to select the households to be used in the study, while purposive sampling technique used to select key informants who were interviewed in the study.

Questionnaires and interview schedules were used for data collection, whereby test retest method was used to ensure instrument validity. Similarly, reliability and validity of the instruments were obtained through checking for representativeness of data, checking for bias due to observer bias or the influence of the researcher on the research situation, cross-check data with evidence from other independent sources and comparing and contrasting the data during the stage of qualitative investigation on the conflicts. Through pilot testing, the instruments were reorganized and some parts modified to enable the researcher get a working instrument. The final instrument obtained was the one used to collect the required data.

C. DATA ANALYSIS AND RESULTS PRESENTATION

Qualitative data obtained from personal interviews and open-ended questions were analyzed qualitatively through content analysis and organized into themes and patterns corresponding to the research questions. This helped the researcher to detect and establish various categories in the data which are distinct from each other.

Quantitative data such as statistical information on biographical backgrounds of the respondents, household water-user preference and sustainable supply of water was analysed by the help of statistical packages for social sciences (SPSS). SPSS package is able to handle a large amount of data and given its wide spectrum in the array of statistical procedure which are purposefully designed for social sciences; it was deemed efficient for the task. Descriptive statistics such as frequency distribution and percentages were run on all the quantitative data.

Chi-square was used to compare the differences between water securities of households as a result of different household water-user preferences. In this study, the independent variable (household water-user preference) is categorical. Categorical variables are best analyzed through Chi-square (Amin, 2005; Oso and Onen, 2008). It was therefore suitable to analyze these data using Chi-square, which is a technique that compares group differences of subjects that are exposed to different treatments. Treatment in this study was household water-user preferences in each household. The study classified household water-user preference for each household as good, moderate and poor, and then compared the differences between the elements of sustainable supply of water, categorized as water conservation and curtailment behaviour.

IV. RESULTS AND DISCUSSIONS

A. RESULTS

In order for the researcher to establish the actual effect of household water-user preference on access to safe water, the household water user preference was first analyzed.

a. HOUSEHOLD WATER-USER PREFERENCE

Household water-user preference was assessed based on the UN- WWAP (2003) ratios on the water that was used on; personal washing, gardens, laundry, toilets, car washing, dishes and cooking, and drinking. The respondents in each household were asked to indicate how much water they use on each of these aspects per 100 litres or five 20 litres jerricans of water. The ratios were then compared to the UN WWAP (2003) Model, in line with the scores indicated in Table 4.1. The results indicated in Table 4.2 were obtained.

	N	Percent – N
Levels of Household water-user Preference		
Poor	114	44.9
Moderate	66	26.0
Good	74	29.1
Total	254	100.0

Table 4.1: Levels of household water-user preference

This shows that 44.9% of the households have poor household water-user preference while 29.1% have good household water-user preference. It can be seen that most households do not use water in the good proportions as recommended by the UN-WWAP (2003).

b. WATER-USER PREFERENCE AND ACCESS TO WATER

This study regarded access to water to mean cost of water, distance of collection point to the households, and times of supply for water. Respondents were asked to respond to these issues and the responses assessed and scored and rated them such that households that scored 6-12 were rated poor and coded 1, those that scored 13-19 were rated moderate and coded 2, while those that scored 20-28 were rated good and coded 3, as highlighted in Table 4.1. The level of access to water was compared against the status of water-user preference for each household to determine the actual number of households in the slums that have 'poor', 'moderate' and 'good' access to water, against the poor, moderate and good water-user preference. The results are summarized in Table 4.2.

Levels of Accessibility of Water and Households Distribution		Water-user preference Poor	Moderate	Good	Total
Poor	Frequency	36	18	28	82
	Percent	9.6	4.8	11.6	32.3
Moderate	Frequency	38	38	36	112
	Percent	13.7	16.4	15.1	44.1
Good	Frequency	40	10	10	60
	Percent	17.1	4.8	6.8	23.6
Total	Frequency	114	66	74	254
	Percent	44.9	26.0	29.1	100.0

Source: (Field Work 2015)

Table 4.2: Household water-user preference and Access to water in Obunga slums

This shows that most (44.1%) of households in the slums have moderate accesses to water while just 23.6% of the households have good access to water. The table further shows that most (17.1%) of the households have good access to water and poor water use preference, and that only 4.8% of the households with good access to water have moderate water-user preference. There seems to be a link between access to water and water-user preference, with water-user preference getting poor with improving access to water. The information in Table 4.2 suggests that water-user preference is not dependent on the access to water, and that water-user preference and access to water are inversely associated.

The data in Table 4.2 were further tested using a Chi-square test to determine if there were significant differences in the frequencies between the categories indicated in the table; and to test the hypothesis that household water-user preference in the slums is dependent on access to safe water. The results of the chi- square test are summarized in Table 4.3.

Variable	N	Df	χ^2_c	χ^2_o	A	Decision
Water-user preference and access to water	254	4	9.488	12.138	0.012	Reject Ha

Table 4.3: Table 4.3: Summary of chi-square analysis of water-user preference and access to water

The results in the table 4.3 indicate that there is a significant difference in household water-user preference based on the status of access to water. This decisions was arrived at since $\chi^2_o = 12.138 > \chi^2_{c\ (4,\ .05)} = 9.488$, which indicates that the differences in the frequencies are too large to be explained by chance. This led to the rejection of the alternate hypothesis Ha that water-user preference among households in the slums is dependent on the access to water**.** The finding suggest that water user preference of households in Obunga slums is not influenced by access, the price of water or the time taken for collecting water.

V. DISCUSSIONS AND CONCLUSIONS

A. DISCUSSIONS

Given that user preference of households in this area is not dependent on the access to water, it implies that household water-user preference in the slums is in disregard to the state of water. This means that the UN WWAP (2003) ratios on the water that is recommended for use on personal washing, gardens, laundry, toilets, car washing, dishes, cooking and drinking are not adhered to, seemingly because habits associated with slum dwellers is inclined to unwise water use.

This failure to use water wisely could be one of the causes of water insecurity in the slums. This would mean that the view of Levine and Asano (2004) on grey water recycling is not taken seriously by the households in the slums. Grey water, or sullage, recycling is the reuse of water from the sinks, showers, washing machine and dishwasher in a home and this ensures that safe water which is supposed to be drunk or used for cooking is not used in the gardens, etc. Hence, it can be said that households in the slums do not separate grey water and black water, to send black water to conventional wastewater treatment systems, while sending untreated grey water for outdoor washing and irrigation. This is a threat to water security. Further, as WHO (2006) also note, methods of lowering demand on water supplies and attain water security such as the collection of rainwater for domestic water consumption have been ignored.

Spinks, et al. (2011) suggested that there must be a sense of personal and moral obligation to conserve water, and this is observed in intentions by individuals to curtail misuse and to conserve water by using water in appropriate proportions and for the right purpose in one hand, and installing efficiency and conservative devices on the other hand. By promoting water conservation and disrupting water wasting habits and replacing these with water saving habits is a way of ensuring sustainable supply of water.

Similarly, in the view that majority of households have moderate access to safe water, water insecurity that has been reported in the informal settlements is attributable to lack of water conservation behaviour on the side of household members. According to Dillon (2011) installing rainwater tanks increases the amount of water that is captured usefully and enables households to harvest water directly for drinking, gardening, cooking and washing, etc. Another strategy is to increase the capacity to store water using large reservoirs tanks that can last for at least 5 days with a family of 4 members. The observation by the researcher revealed that families in the slums only store water in 20 litres plastic containers, and these cannot last for long.

B. CONCLUSIONS

With regard to access to safe water to residents of slum areas, a number of steps can be taken which can limit excesses on the side of household water users that interfere with water supply. Poor water-user preference causes water insecurity which in turn leads to spread of water borne ailments. In this regard, households in informal settlements use water depending on the sustainability of water supplied to them. This often led to these households into using water for domestic use from unprotected and unsafe sources.

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REFERENCES

[1] Afullo, A. O. and Danga, B.O. (2013). Are the water trips in the dry land Kenya for sustainable development, Journeys in vain or trips to oblivion. *Ethiopian Journal of Environmental Studies and Management Vol. 6 No.3 2013*

[2] Afullo, A. O. (2014). Water footprint among the students in Kenya and the United States of America. Conference proceedings: 1st International conference for Maasai Mara University, Narok, Kenya. November 2014.

[3] Amin, M. (2005). *Social science research: Conception, methodology and analysis*. Kampala: Makerere University Printers.

[4] Arnell, N. W. (2006). Climate Change and Global Water Resources: SRES emissions and socio-economic scenarios. *Global Environmental Change, 14*, (1), 31 52.eprints.soton.ac.uk/15513.

[5] Bates, B. C., Kundzewicz, Z.W., Wu, S. and Palutikof, J.P. (2008). *Climate change and water*. Technical paper of the Intergovernmental Panel on Climate Change (IPCC). Geneva, Switzerland: IPCC SecretariatBjørn, L. (2001). *The skeptical environmentalist: Measuring the Real State of the World*. Cambridge, UK.Cambridge University Press. ISBN 0-521-01068-3.

[6] Chenoweth, J. (2008). Re-assessing the standard indicator of water scarcity. *Water International, 33*(1), 5-18. University of Surrey-Guildford Press.

[7] Dillon, P. (2011). "Water Security for Adelaide, South Australia", in R.Q. Grafton and K. Hussey (eds.), *Water Resources Planning and Management*, Cambridge University Press, Cambridge.

[8] FAO (2007). Coping with water scarcity. Challenge of the twenty-first century. UN-Water, FAO.

[9] Foeken, D., Chung, H.C., Terry N. Mutune, T.N. and Owuor, S.O. (2013) *Urban water interventions livelihoods in low- income neighbourhoods in Kisumu, Kenya*; ASC Working Paper 112 / 2013, African Studies Centre 2300 RB Leiden, The Netherlands.

[10] Franceys, R.W.A. and Gerlach (ed) (2008) *Regulating water and sanitation for the poor, Economic regulation for public and private partnerships*, Earthscan, London, UK.

[11] Ho, G. E., Dallas, S. C., Anda, M. and Mathew, K. (2001). On-site waste water technologies in Australia. *Water Science and Technology. Vol. IV*, no. 6.pp.81-88. IWA Publishing.

[12] Hoekstra, A. Y. (2006). The global dimension of water governance: Nine reasons for global arrangements in order to cope with Local Problems. *Value of Water Research Report Series no. 20.* Unesco-Ihe Institute for Water Education.

[13] Kenya National Bureau of Statistics (KNBS, 2009) Kenya Population Census Report; Retrieved March 2015from: http://www.knbs.or.ke/pdf/Basic Report (Revised Edition).pdf

[14] Kombo, D.K. (2006). *Proposal and Thesis writing*, Pauline publication: Africa.

[15] Millennium Development Goals (MDG, 2000).Un.org. 2008-05-20. Retrieved 2014-10-18.

[16] Lichtenstein, S. and Slovic, P. (2006). The construction of preference. New York: Cambridge University Press.

[17] Levine, A. D. and Asano, T. (2004). Recovering sustainable water from wastewater. *Environmental Science and Technology*, June, 2004, pp. 201-08

[18] Maoulidi, M. (2012). Multi sector Household Survey. Millennium Cities Initiatives; Kisumu Millennium Development Goals, *MCI social sector working paper series N° 12*/2010 A. Earth Institute of Columbia University 475 Riverside Drive, Suite 253, New York, NY, 10115, United States. Website: http://mci.ei.columbia.edu

[19] Spinks, A., Fielding, K. Russell, S., Mankad, A. and Price, J. (2011). *Water Demand Management Study: Baseline Survey of Household Water Use (Part A)*. Urban Water Security Research Alliance Technical Report No. 40.

[20] UNDP (2006). Human Development Report 2006. *Average water use by country (3446*) – Water poverty threshold(2218). http//undp.org/sites/default/files/reports/267/hdr06-complete.pdf

[21] UNICEF and WHO (2008). Monitoring Programme, Progress on Drinking Water and Sanitation.

[22] United Nations World Water Assessment Programme (UN-WWAP, 2003). *Water for People, Water for Life. World Water Development Report*. Paris,

[23] Wagah, G.G., Onyango, G. M., and Kibwage, J.K. (2010). Accessibility of water services in Kisumu Municipality, Kenya. *Journal of Geography and Regional Planning; 3*:114–125. *Water Resources Planning and Management*, Cambridge University Press, Cambridge.