Access to Water among Slum Dwellers in Nakuru Town, Kenya: Lessons from Kaptembwa Location

Samwel B. Mokaya[*1]   Francis N. Wegulo[1]   Joseph O. Otieno[2]

1.Department of Geography, Egerton University, Kenya P. O. Box 536, Njoro, Kenya

2.School of Education University of Kabianga P.O Box 2030, Kericho, Kenya

Abstract

Majority of urban residents in sub-Saharan Africa live in slums often characterised by lack of basic services such as water and sewerage. With increasing pressures due to population growth, aging infrastructure, climate change, coupled with an unsustainable conventional water management, cities and urban areas in sub-Saharan African countries are facing enormous difficulties and will experience huge challenges in future in efficiently managing the scarce and increasingly unreliable water resources. This paper examines the level of access to water among slum dwellers in Nakuru town, Kaptembwo location, Kenya. The guiding questions the paper addresses are: (1) What is the level of households' access to water? and (2) Has NAWASSCO met the demand for water by residents? A descriptive survey design was used and structured questionnaire administered to 280 households to collect the requisite data. Data was analyzed using descriptive statistical techniques and statistical software (SPSS) version 20. Results show that only 65.6% of the basic water requirements of the residents are met and that only 25% of the households access the minimum recommended 50 l/c/d. The low levels of investment in water infrastructure is the major explanatory reason for reduced access to water services. The paper shows that the domestic water supply in Kaptembwo is quite low according to the international standards. This situation is attributed to poor and inefficient water distribution system, unreliable and irrational rationing system, and poor management of water delivery services by NAWASSCO. This paper thus recommends that NAWASSCO should improve its distribution network and related infrastructure in order to facilitate adequate and reliable water provision to the study area. Other strategies including roof-harvesting and collection of run-off water if properly planned and managed could increase the water supply situation in the study area.

Keywords: Access, water services, water supply, slums, household, water infrastructure

1.0 Introduction

An adequate and dependable supply of fresh water is essential for health, food production and socio-economic development (WB 2010). Though more than two thirds of the planet is covered with water, less than 0.01% is readily accessible for direct human use (AMCOW, 2006). Many countries facing water scarcity are low-income countries that have a rapidly growing population and are generally unable to make costly investments in water saving technologies (UN, 2010). Estimates indicate that over 1 billion people lack access to safe drinking water and two and half billion lack adequate sanitation. These factors contribute to deaths of more than 5 million people of who more than half are children (UNICEF, 2006).Water has been the focus of debate in both local and international meetings, conferences, seminars and other public functions (UN 2009). A central rallying point has been the issue of water access among urban residents (UNDP, 2006).

Globally, income disparities, infrastructural development, resource availability among other factors play a great role in determining access to water by the urban population (USAID, 2012). What most water practitioners are reluctant to tell us is that, though water may be available in enough quantities, its supply management may render it scarce (Onjala 2002). Shifting our attention to urban areas, an imbalance in water supply among the different income categories of people is observed (UN 2010). A notable difference exists between the high and low-income groups of people residing in urban areas across the globe (Bulland, 2007). Water supply and sanitation are intimately connected to major issues of sustainable livelihoods as enshrined in the recently concluded MDGs. The target of halving the proportion of people without sustainable access to safe drinking water was met by 2010, with the proportion of people using improved water source rising from 76% in 1990 to 89% in 2010 (UNDP, 2006). The UN-HABITAT asserts that between 1990 and 2010, over two billion people gained access to improved drinking water sources, such as piped supplies and protected wells.

In sub-Saharan Africa, there is a huge gap in the delivery of water services within urban areas, contributing to other inequalities in health and income (WB 2006). Low-income residential areas in sub-Saharan Africa urban centres pose a major development challenge (UN, 2010). Since the late 1990's, access to improved water supply in urban areas in sub-Saharan Africa has expanded slowly as compared to the rate of population growth (BanerJee and Morella, 2011). Access to improved water supply has not been commensurate to the increase in urban population (WB, 2010). The percent of urban population that had access to improved water supply only increased from 67% in the late 1990's to 69% in late 2000's (WB, 2010). This represented an increase of 47% of urban dwellers gaining access to improved water supply.

Inadequate supply capacity and inefficiencies associated with water provision in the region hamper

efforts to attain universal access to improved water supply sources (AMCOW, 2010). Existing tariff structures benefit the richest most, at the expense of slums and informal settlements where a large proportion of urban residents live (Ibid). The prevailing water access problems in many developing countries especially in urban areas is not only due to source limitations and high growth rate in population, but also due to other factors such as poor water distribution efficiency, inequalities in service provision between different sections of the city and poor and ineffective management system (WB, 2010). Research and water utility reports indicate that the major challenges facing water supply providers in sub-Saharan Africa is high levels of non-revenue water (Ibid). Such losses not only deprive millions of people clean water, but also lead to huge financial losses to water utilities.

Low income areas in urban centres in Kenya with access to piped water supply is 35%, and only 45% of the residents' basic water requirements are met (KNBS, 2011). This is attributed to shortage of water and to the rationing system introduced in 2004 in order to distribute water to different sectors of the city by rotation (NAWASSCO 2007).

Kenya is considered a water scarce country with less than 647 cubic metres of water available per capita compared to the international benchmark of 1000 cubic metres per capita (UNDP, 2006). Access to water is highly unequal between the high income and low-income areas within urban centres (USAID, 2011). Looking at policy and other areas, low income areas clearly fall "between the cracks" of traditionally rich income areas and industrial areas in the development and policy discourse (AMCOW, 2010). Challenging policy makers and practitioners alike, low income areas are generally characterized by rapid unplanned growth including concentrations of low income population and run down or often none existence basic infrastructure (UNDP, 2006). Most of the urban poor Kenyans have access to poor quality water, which has caused cholera epidemics and multiple other diseases, which affect their health and livelihoods (Onjala, 2002). Despite the critical shortage of clean water in Kenya's urban slums, there is also a large rural to urban discrepancy in access to clean water in the country (O' Connor, 2011).

Nakuru water supply system is beset with several problems affecting large proportions of the town's residents. The water related problems include low service coverage by the water service provider, intermittent supply, and long periods of cut-offs (Thoenen, 2007). These problems emanate from limited or scarce water sources, substantial water losses due to leakage, illegal connections, limited hydraulic capacity of the water distribution system and ineffective system of management (Bulland, 2007).

2.0 Materials and Methods
2.1 Study Area
Nakuru town is located in Nakuru County, Kenya (Figure 1). It lies between $0^0 15^'$ South of the Equator and between longitudes $36^0 04^'$ East of Prime Meridian. It is the capital of Nakuru County Nakuru with a population of 500,000 people (GoK, 2009). It had a population density of 974 persons per square kilometer and the average household size is five persons (NDDP, 2010). Nakuru Municipality has four administrative locations, Baruti, Kaptembwo, Lanet and Central, five sub-location and 20,000 households (KDHS, 2010).

As the headquarters of Nakuru County and a major business centre, Nakuru town has been growing relatively faster in recent years in surface area and population wise (NEMA, 2011). According to the recent research reports, Nakuru town is one of the fastest growing urban centres in Eastern Africa (Kimani-Murage and Ngindu 2007). The town is occupied predominantly by low income households, with more than 50% of the population categorized as poor (NDDP, 2010).

2.2 Research Methodology
This paper is an extract from a larger study focusing on water access. This paper reports on a household based research which sought to establish level of access to safe drinking water by residents of Kaptembwo, a low income (slum area) in the town of Nakuru Kenya.

In this study, survey research design was utilized. A sample of 280 households was randomly selected to provide a basis for data collection. Both primary and secondary data were collected, from among the households, NAWASSCO and other stakeholders, as well as grey literature, respectively. A standard stand alone questionnaire administered to the sample households to elicit their perception on issues focusing on access to water, and the degree of satisfaction by households. An interview schedule was administered to officials of NAWASSCO, and other key stakeholders. In this research paper, a blend of qualitative and quantitative data analysis approaches was used. Descriptive statistical techniques were employed in order to explain resident's satisfaction with regard to water delivery and service provision. The statistical analysis of data was done using the statistical software (SPSS) version 20.0.
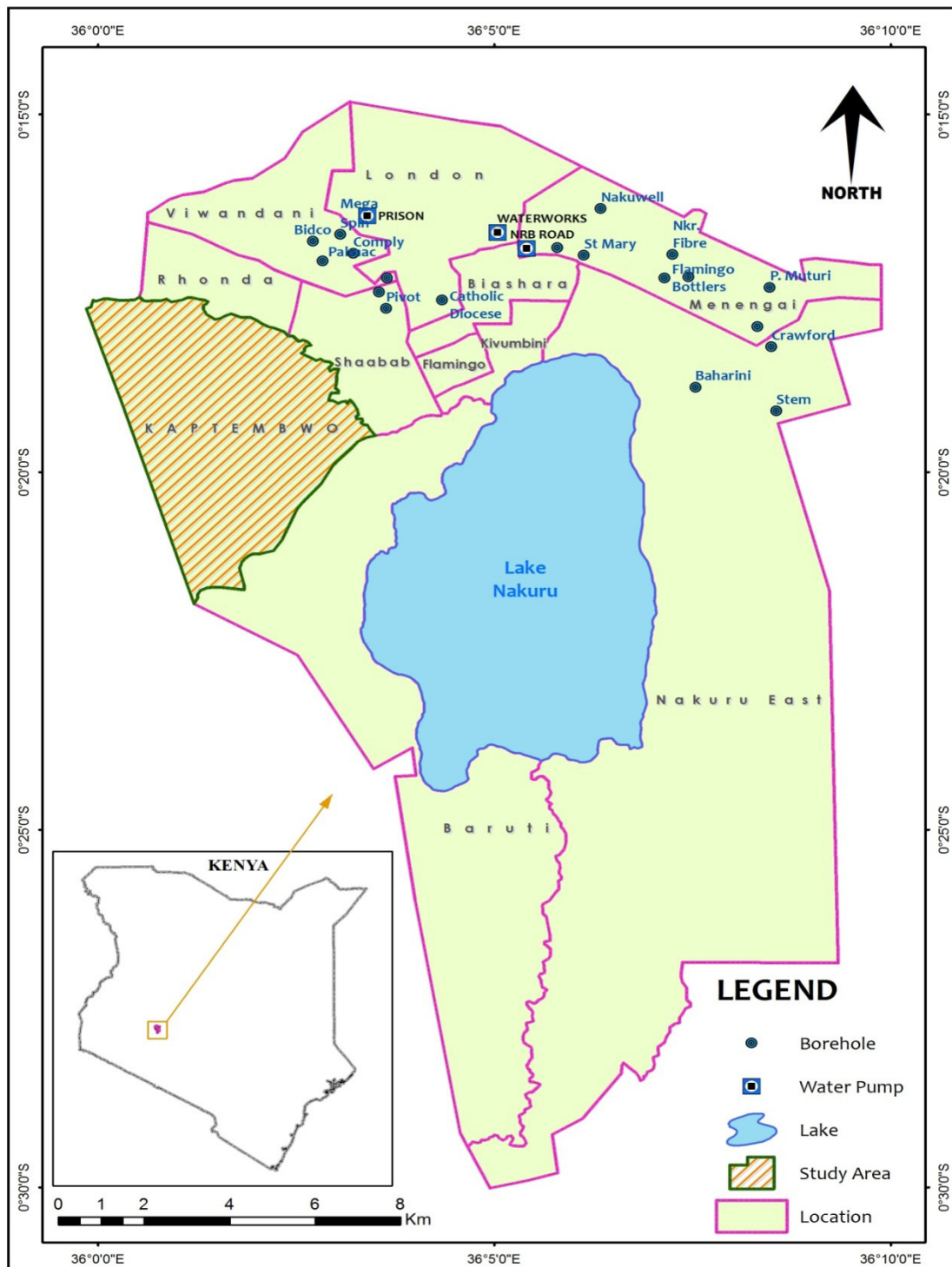
Figure 1: Map of study area and Distribution of Water Sources.

3.0 Results and Discussion

3.1 Households' Access to Water

It is evident from Table 1 that the main source of drinking water for majority of the residents of Kaptembwo is piped water. This water is supplied by NAWASSCO. A smaller percentage of the residents depend on piped water but this was only available within their plots or outside their residential houses. Other respondents relied on boreholes and rainwater. The rest of the residents relied on other sources of water for instance run-off water.

Table 1: Respondents Main Source of Drinking Water

Sources	Frequency	Percent
Rainwater	1	0.4
Piped water	223	82.0
Borehole	9	3.3
Other	39	14.3
Total	272	100.0

3.2 The influence of household size on water demand in Kaptembwo

One of the key factors that influence the demand for water is the size of the household. The size of a household determines the volume of water consumed by a particular family. The paper shows that the study area is characterised by relatively higher household sizes given that 30.5% of the households had four people while 20% had three people (Table 2). Such households' sizes imply higher demand for water. Smaller household sizes make it easier for the family to meet its daily water requirements, as fewer heads consume relatively less amount of water a day. On the other hand, larger households are under pressure to obtain more water because of the expected higher family needs. Table 2 displays the results of the relationship between the two variables.

Table 2: The influence of household size on households daily water demand.

		Daily water consumption by household size			Total
		20litres	20-100litres	>100l	
Household size	1 person	16.0%	76.0%	8.0%	100.0%
	2 people	2.1%	97.9%	0.0%	100.0%
	3 people	9.1%	90.9%	0.0%	100.0%
	4 people	4.8%	94.0%	1.2%	100.0%
	5 people	3.2%	90.3%	6.5%	100.0%
	>5 people	7.7%	84.6%	7.7%	100.0%
Total		6.4%	91.0%	2.6%	100.0%

Table 3: Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Chi-Square	17.889[a]	10	.047
Likelihood Ratio	17.818	10	.058
Linear-by-Linear Association	1.619	1	.203
N of Valid Cases	267		

It is observed that the estimated Chi-square statistic is significant at the 95% confidence level (because the p-value $0.047 < 0.05$). The differences in the amount of water a household consumes in a day, and the size of the household are statistically related. This suggests that change in either of the two variables affects the other. These results underscore the argument that households with more heads consume more water.

Figure 2: Influence of household size on water consumption

From the findings it is evident that only 2.6% of the households in the study area accessed the 50 l/c/d recommended for drinking, cooking and personal hygiene (WB, 2009). The paper further shows that domestic water consumption in Kaptembwo is much lower according to international standards. Other studies also show that the domestic water consumption in Kaptembwo is quite low according to international standards (NEMA 2011). Similarly studies conducted in Nakuru slums found that poor, inefficient and unreliable service delivery, low coverage of water supply and dilapidated water supply were bottlenecks to the access to water services (Kimani-Murage and Ngindu, 2007).

This is attributed to shortage of water partly explained by the rationing system introduced in 2004 in order to distribute water to the different sectors of the town on rotation. Inadequate water has serious health implications as evidenced by the prevalent water related diseases in the study area (NEMA, 2011). A study in Nairobi's Kibera slums found out that availability of water is extremely low relative to subsistence benchmarks, partly due to deficiencies in water treatment infrastructure (Global Water Intelligence, 2005).

A survey conducted in sub-Saharan Africa indicated that actual water consumption per capita varies with the mode of water connection (Dangerfield, Bernard 1983). Households with water connections are reported to consume more, ranging from 100 to 150 l/c/d. For households who obtain water from hand pumped wells and those that fetch water between 100 to 500m, consume much less, between 10 to 15% compared to those households with access to pipe connections (Ibid).

Further, studies conducted in Lagos showed that there is a correlation between water consumption per capita and continuity of water supply (WB, 2006). The research established that intermittent supply leads to many problems including severe supply pressure losses and great inequalities in the distribution of water.

3.3 Supply and Demand for Water Kaptembwo Location
This paper has confirmed that NAWASSCO is the major agent involved in the supply and regulation of water in Nakuru town. In this section the paper analyses residents' perception of water supply and the extent to which it meets their demands. The present water demand for Nakuru is estimated to be 100,000m³/day (NAWASSCO, 2007). NAWASSCO currently supplies only 40,000 cubic metres of water to the residents living in the study site, an amount far short of the required amount.

Table 4: Perception of supply and demand for water by residents of Kaptembwo.

			Basic water needs have not been met					Total
			Strongly disagree	Disagree	Unsure	Agree	Strongly agree	
Improved water supply by NAWASSCO	**Strongly disagree**	Responses	30	3	0	4	19	56
		%	53.6%	5.4%	0.0%	7.1%	33.9%	100.0%
	Disagree	Responses	5	5	0	0	2	12
		%	41.7%	41.7%	0.0%	0.0%	16.7%	100.0%
	Unsure	Responses	6	1	23	4	10	44
		%	13.6%	2.3%	52.3%	9.1%	22.7%	100.0%
	Agree	Responses	37	11	1	64	23	136
		%	27.2%	8.1%	0.7%	47.1%	16.9%	100.0%
	Strongly agree	Responses	15	2	0	0	5	22
		%	68.2%	9.1%	0.0%	0.0%	22.7%	100.0%
Total		Responses	93	22	24	72	59	270
		%	**34.4%**	**8.1%**	**8.9%**	**26.7%**	**21.9%**	100.0%

Table 5: Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Chi-Square	200.111[a]	16	.000
Likelihood Ratio	166.928	16	.000
Linear-by-Linear Association	1.219	1	.270
N of Valid Cases	270		

The estimated Chi-square statistic for the relationship between water supply by NAWASSCO and the amount of water accessed by the residents is significant at 95% confidence level with 16 degrees freedom (because the p-value 0.001 < 0.05). Hence, we can deduce that the relationship between the supply of water by NAWASSCO and the amount of water accessed by residents is statistically significant. The statistic tells us that the role played by NAWASSCO in water provisioning has impacted negatively on the general availability and

accessibility of water in low income households in Kaptembwo.

Studies by Citizens Report Card (2007) on urban water, sanitation and solid waste services undertaken in Kenya's three largest cities - Nairobi, Mombasa and Kisumu in 2006, revealed distinct inequalities in access to water between the poor and the non-poor, with the poor reporting lower access. The difference was particularly dramatic in Kisumu, where only 7% of the poor reported having access to main connections to water compared to 81% of the non-poor.

While NAWASSCO is the leading water provider within the entire of Nakuru Municipal, reticulation of water by the organization has been confined to the built up area. Research findings revealed that the existing water network done by Nakuru Municipal Council is outdated (Kimani-Murage, Ngindu, 2007). Hence vast areas of Nakuru town are not served by the distribution network thereby affecting water accessibility in the low income area (WB, 2010).

3.4 To what Extent has NAWASSCO improved water supply in the Study Area?

Table 6 shows feedback from respondents' level of satisfaction with regard to the supply water situation by NAWASSCO to their area. It is noted that a half of the residents (50.5%) are on agreement that there has been increasing water supply to the study area. However, 20.5% strongly disagree that NAWASSCO had increased water supply. On the other hand, 8.1% of the respondents strongly agree that there had been an increase in water supply to Kaptemwbo. Nevertheless, 16.5% were not sure as to whether there had been change in the supply of water by NAWASSCO. Majority of this latter group had recently moved to Kaptembwo location. This partly explains the relatively high percentage of those not sure of water supply status. NAWASSCO's water supply network covers about 65% of the Municipality.

However, most of the low income neighbourhoods are not connected to water supply system (KNBS, 2011). This confirms field work carried out in Nakuru by Onjala (2002) which revealed that 55% of the population is not served by the public water utility.

Although efforts were made by NAWASSCO to replace old pipelines and maintain pumping stations, the current water distribution system is inadequate and unreliable and is characterized by many deficiencies to the extent that it cannot cope with increasing demand (NEMA 2011).

Table 6: Households' Perception of water supply by NAWASSCO in Kaptembwo.

Respondents' opinion	Frequency	Percent
Strongly disagree	56	20.5
Disagree	12	4.4
Unsure	45	16.5
Agree	138	50.5
Strongly agree	22	8.1
Total	273	100

3.5 How does the current water supply compare to a situation 5 years ago?

Residents' views of the current water supply compared to a period 5 years ago is depicted in Figure 4. It is observed that a significant number of residents (47%) felt the supply of water had improved. However 38% felt that the supply situation had more or less remained the same. Nevertheless, 15% of the residents felt the situation had worsened compared to the last 5 years. This finding is in agreement with a study which showed that urban population growth out paces expansion of improved water supply sources (UNDP, 2006).
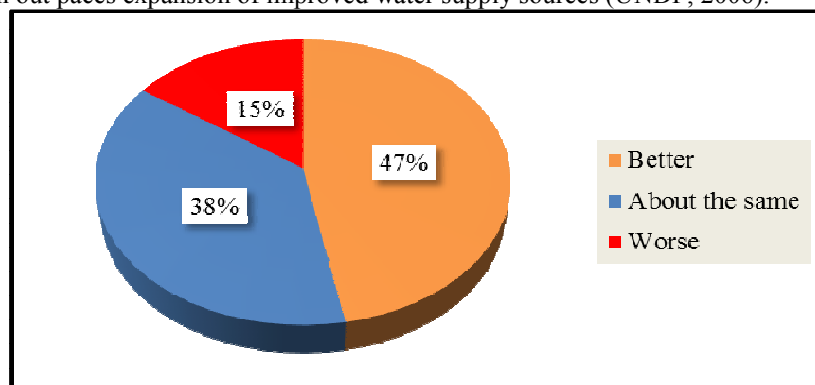

Figure 3: Current water supply Compared to a period 5 years ago.

It is clear from Figure 3 that there are varied views concerning water needs by residents of Kaptembwo location. Majority strongly oppose the view that their water needs have been met, while others strongly support it.

A significant number agreed with this position as opposed to those who disagreed. The rest were not sure whether their water needs had been met or not (Figure 5). These findings are in tandem with a report which showed that urban centres with high population growth rates have relatively lower levels of access to improved water supply (Thoenen 2007).
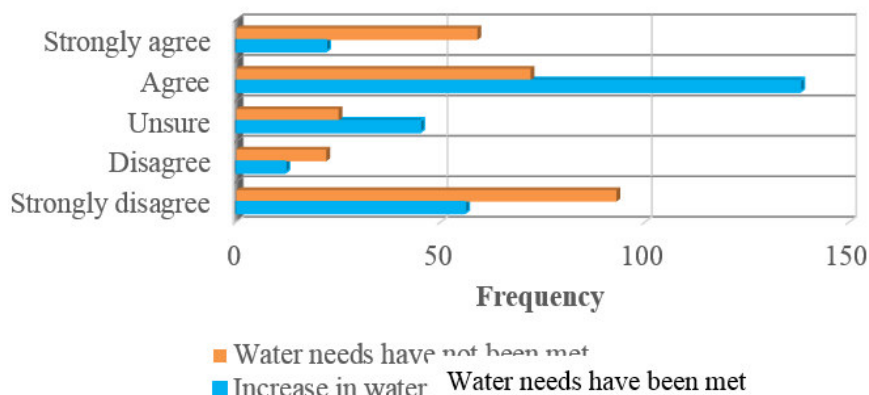

Figure 4: Has "increase" in water supply by NAWASSCO met residents water needs

The per capita daily water consumption in sub-Saharan Africa is exceptionally low due to deficiencies in water treatment infrastructure (Global Water Intelligence, 2005). Based on study findings the paper reveals that 7% use 20 litres per day.

4.0 Conclusion and Recommendations

An adequate supply of safe drinking water is universally recognised as a basic human need. Access to clean water and societies ability to manage their water supplies have been two key factors in human development. Increased and easier access to water can increase poor people's productivity and reduce poverty.

Based on research findings, this paper shows that the proportion of households with access to adequate water in the study area of Kaptembwo location is quite low, far below the national average. The current water supply to the Kaptembwo location by NAWASSCO is 2,000m^3, while the present demand is estimated at 10,000m^3 (NAWASSCO, 2007), this indicates a big short fall. The current water distribution conditions in Kaptembwo are constrained due to several problems affecting large proportion of the households. The problems include: low service coverage by the distribution system, intermittent mode of water supply, and long periods of cut-offs.

In view of these problems residents have devised coping strategies including reliance on multiple sources to meet the daily water demand. This is both costly and inconvenient.

In view of the foregoing, the paper recommends that NAWASSCO the organization with mandate for water distribution in Nakuru town should improve its distribution network facilities to make water services more accessible to the residents of low income areas such as Kaptembwo and others in the town. In addition, rehabilitation of the treatment plants, pumping stations, old pipes and extension of the water supply facilities should be restored and improved.

Other strategies that could help to increase water supply in the study area include water harvesting from roofs as well as run-off. And here, local residents, especially land-ladies and land lords could play an important role with the support of NAWASSCO, and the County government of Nakuru.

5.0 Acknowledgements

6.0 List of Abbreviations

AMCOW   : African Ministers' Conference on Water
GoK   : Government of Kenya
KDHS   : Kenya Demographics Health Survey
MDGs   :Millennium Development Goals
NAWASSCO   : Nakuru Water Services and Sanitation Company
NBS   : National Bureau of Statistics
NDDP   : Nakuru District Development Plan
NEMA   : National Environment Management Authority

SPSS	: Statistical Package for the Social Sciences
UNEP	: United Nations Environmental Programme
UNICEF	: United Nations International Children's Education Fund
UN	: United Nations
USAID	: United States for International Development
WB	: World Bank
WHO	: World Health Organization

7.0 References

African Ministerial Conference on Water, (2006). Africa Development Bank and the World Health Organization (WHO).

African Ministerial Conference on Water, (2010). Regional synthesis Report, country, status overviews on water supply and sanitation 2010. August, led by the World Bank Development Bank, the United Nations Children's Fund (UNICEF) and the World Health Organization (WHO) (2007).

BanerJee, S. and Morella, E. (2011). Africa's Water and Sanitation Infrastructure; access, affordability and alternatives. Directions in development, Infrastructure Series. The World Bank, Washington, DC.

Bulland, R. (2007). Growing smarter; Achievinglikable communities, Environmental Justice, and Regional Equity. The MIT Press. ISBN 978 – 0 – 202 – 52470 – 4.

Citizen's Report Card (2007). Citizens report card on urban water, sanitation and solid waste services in Kenya: Summary of results from Nairobi, Kisumu and Mombasa. Nairobi: CRC Initiates, Kenya.

Dangerfield, Bernard, J. (1983). Water Supply and Sanitation in Developing Countries: Water Practice Manuals. London.

Government of Kenya, (2009).Human and Population Census Report. Nairobi Kenya, Ministry of Planning and National Development.

Global Water Intelligence, (2005). Tariff Survey" Tariffs flat a head of cost Crunch. London, United Kingdom.

Kenya Demographic and Health Survey, (2010). Ministry of Planning and Development, Nairobi: Kenya.

Kimani-Murage, E. W. & A.M. Ngindu, (2007). Quality of water the slum dwellers use: The case of a Kenyan slum. Journal of Urban Health 84(6): 829-838.

Nakuru Public Health, (2006). Nakuru Municipal Health Department Annual report (2006) Nakuru Kenya.

Nakuru District Development Plan, (2010). Nakuru District Development Plan (2010-1015). Nakuru Kenya.

National Bureau of Statistics, (2011). Demographic Health Survey, Nairobi: Kenya.

National Environment Management Authority, (2011). State of Water and Hygiene –Nakuru Kenya.

NAWASSCO, (2007). Nakuru Water and Sewerage Company Strategic Plan 2007-2012.

O'Connor, T. (2011). Survey Research Design: Mega links in Criminal Justice. Htt://www.d.tomoconnor.com/3760/3760/ect04.htm. (Accessed on 17/7/2011.

Onjala, J.O. (2002). Managing Water Scarcity in Kenya; Industrial Response to Tariffs and Regulatory Enforcement. Roskilde; Roskilde University, Department of Environmental, Technology and Social Studies (PhD Thesis).

Thoenen, R. (2007). Private Participation in the Provision of Basic Information, Private Participation in Infrastructure No. 66, UNECA, Addis Ababa.

United Nations Development Programme (2006). Human Development Report 2006: Beyond Scarcity: Power, Poverty and the global water crisis. New York, NY.

United Nations Development Programme, (2006). Human Development Report 2006 - Beyond Scarcity: Power, poverty and the Global Water Crisis, New York.

United Nations International Children's Fund, (2006). Progress for Children: A Report Card on Water and Sanitation UNICEF, New York.

United States Agency for International Development (2006).Water for life Report within urban centres in Kenya. Washington, DC. 2006-2011-2012

United Nations, (2010). World Urbanization prospects: The 2009 Revision Department of Economic and social affairs, population Division.essa.un.org/unpolicy24.wup/index.htm

United Nations, (2009). World Water Development Report 3: Water in a changing world. WWAP.

United Nations-Habitat, (2008). The state of African cities 2008: A frame work for Addressing Urban Challenges in Africa. Nairobi, Kenya.

World Health Organization / United Nations Children's Education Fund, (2010). Progress on Sanitation and Drinking Water: 2010 update, Joint Monitoring Programme. Geneva, Switzerland.

World Bank, (2010). World Development Indicators (Washington, DC; The World Bank); as posted on the World Bank website (downloaded on October 5, 2010.

World Bank, (2009).World Development Report 2009.Reshaping Economic Geography, Washington DC.

World Bank, (2006).World Development Indicators 2006.CD-ROM, Washington DC.