

Water Resource Management and Sustainability in Kipkelion West Sub-County, Kenya

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Indisputably, water is an important resource. On the other hand, sustainable water resource management forms part of the key global development concerns. The present study, therefore, sought to establish sustainable measures used in the management of water resources in Kipkelion West Sub-County, Kenya. The descriptive research design was used in this study. A total of 394 households were surveyed together with interviewing 10 key informants within Kipkelion West Sub-County. The descriptive research design was used in this study. Findings from the present study revealed that for, household use, most residents sourced their water from rivers and streams at 35%, rainwater collection at 25%, springs at 22%, piped water at 11%, water vendors and boreholes at 3% and finally ponds and dams sharing 1%. In addition, most households do not incur any direct financial charges when sourcing for water. It was further pinpointed that negative indicators affected the sustainability of the water resources in Kipkelion West Sub-County and the manner in which the residents manage the available resources. Taken together, stakeholders in water resource management work independent of each other with occasional collective efforts.

Keywords: Water; consumption; management; sustainability.

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1. INTRODUCTION

It has always been said that water is life, and indeed this is true. Realizing the importance of water as a resource, the United Nation instituted the UN-Water [1]. This became the organization tasked with all the United Nation's issues of water and sanitation that cut across the departments of the United Nations. Sustainable water resource management includes both water availability and usability without compromising its quality. Sustainable water resource management should meet the socio-economic and environmental needs of society [2-4]. To understand the water quantity demand, there is a need to understand the geographical profile, natural and human resources, socio-economic structures, and the features of water resources in the region [5].

A study conducted by Beall et al. [6] indicated that for sustainable water management, there is a need to understanding the water balance in a given region. They further asserted that water conservation, reuse and recycling are feasible mechanisms for increasing available surface water and groundwater supplies. One of the key factors that affect water quality is land use practices. Land management programs, including hubs and corridors, working lands, and aquifer protection programs, all affect water resources and their sustainability. Land-use changes can impede or contribute to sustainable water, so sustainable water resources management also must include integrated watershed management.

Local communities hold different views about water availability for today and future use. Others feel that there is enough water for use by all generations while others feel the need for sustainable use of water. Those that promote sustainable use of water are advocating for water conservation. Since there are divergent opinions concerning water availability, water managers and other stakeholders need to work together in sustainable water resources management strategies [7].

Increased pressure in water resources nationally and globally has threatened water sources both in terms of quantity and in terms of quality all of which; questions sustainable development. This is true since water sources are very important in sustaining the social, economic and environmental ecosystems in this rapidly changing environment. Despite the existence of

fragmentation in water management governance, and coordination among water-related agencies in Kenya, there is still a disconnection between environmental policies on water management and their implementation strategies. The present study, therefore, sought to establish sustainable measures used for the management of water resources in Kipkelion West Sub-County, Kenya. Findings obtained in this study would be used in water management policy development and implementation.

2. RESEARCH METHODOLOGY

2.1 Research Design

This study employed a descriptive survey research design using both quantitative and qualitative study approaches. Descriptive study assists in describing the attitude, ideas and other personal attributes relating to a given topic under study [8].

2.2 Study Area

The study location was Kipkelion West Sub-County in Kericho County, Kenya. Kericho County is located in Western Kenya with its capital at Kericho Town. Kipkelion West is one of the Constituencies in Kericho County with approximately 98,054 persons residing in 24,512 households [9].

Table 1. Household population breakdown in the study area

Ward	No. of households
Kunyak	5416
Kamasian	4994
Kipkelion	6336
Chilchila	7766
Kipkelion West Sub-County	24512

The Sub-County receives relatively high annual rainfall with cool temperatures throughout the year. The study area is green in most parts of the year with coffee and maize being the most grown crops. Most of the water issues in the Sub-County and Kericho County as a whole is managed by the Department of Water, Environment and Natural Resources and Lake Victoria South Water Services Board officially situated in Kericho town. Below is a map of Kericho County.

Table 2. Sample size per ward

Ward	Targeted households	Sample size
Kunyak	5,416	87
Kamasian	4,994	80
Kipkelion	6,336	102
Chilchila	7,766	125
Kipkelion West Sub-County	24,512	394

2.3 Sample Size Determination

From a total population of 24,512 households in the study area, 394 households were chosen randomly based on a formula by Naissuma [10] and their distribution as shown in Table 2.

In addition, two officers from each of the water management agencies in the area (KEWASCO, WRMA, NEMA, Sub-County Water Office and Lake Victoria South Water Service Board) giving a total of ten (10) officers were further purposively sampled for the study.

2.4 Research Instruments

The researcher used household questionnaires and interview guides during data collection.

2.5 Household Questionnaires

The questionnaires were the main data collection instrument in achieving the three objectives of the study. It has been reported that questionnaires are commonly used to obtain important information about the population [11]. Also, they were employed in this study since the study targets a bigger population easy to administer and can be answered easily and quickly by the respondents [12].

2.6 Other Stakeholders' Interview Schedule

Interviews are qualitative in-depth interviews that target people who are widely knowledgeable concerning a given topic under investigation in this case water resource management. The interview guide in this study targeted officers from KEWASCO, WRMA, NEMA, Sub-County Water Office and Lake Victoria South Water Service Board who are directly charged with the responsibility of water resource management. The interview guide generally focused on themes related to water resource management in the area.

2.7 Instrument Validity and Reliability

The present study validated the research instruments through triangulation, which is the use of more than one method in data collection (questionnaires, interview schedule and observation). Triangulation was useful in showing the concurrent validity of qualitative and quantitative data [13]. This enabled the researcher to check on the content, construction of items and criterion of the research instruments. In addition, the randomization procedure that was used in selecting the study samples further assured the researcher on the validity of the instruments to eliminate biasness. On the other hand, the instruments were pre-tested for reliability using Cronbach's alpha (α) approach during the pilot study. In order to ascertain the reliability of the research instrument, the numbers construct for each variable were expanded. An alpha value was expected to be greater than 0.7 to be accepted as a reliability index [14].

2.8 Data Collection Procedures

The data required to meet the objectives of this study were mainly collected using questionnaires as it provides respondents an opportunity to give significant feedback. The questionnaires were issued at random to the respondent in Kipkelion West Sub-County and their location noted down in case of callbacks. There was a keen bias toward water management institutions where key informant interviews were conducted. Field observation was also done near water resources.

2.9 Data Analysis and Presentation

Descriptive statistics were used in the data analysis. This comprised of frequencies, percentages, means and standard deviation (SD) to give the overall description of the opinions of the respondents. Findings were further presented using tables and graphs.

3. RESULTS AND DISCUSSION

3.1 General Information of the Respondents

Source of water for domestic use for different households in the study area are summarized in Fig. 1.

Albeit the difference is important as it points out that unimproved sources of water still overwhelmingly dominated the results. Rain water, however, in this section performed better going up from 17% to 25%. This is because people trusted rainwater more when it came to domestic use as compared to other sources of water. It was also easier to collect rain water as opposed to fetching the water from rivers, streams or springs. Rainwater also had better quality in terms of chemical composition and particles suspension. Streams and river however still remained the most consistent water sources for domestic use in Kipkelion West Sub-County in view of the seasonality of rain as a source of water.

3.2 Water Quality for Household Uses

One of the reasons that the data on the sources of water in Kipkelion West Sub-County was different from the data on where the households actually sourced the water was the quality of the water for the intended uses. The study was therefore interested on the suitability of the water

derived from the various sources for different uses. Fig. 2 shows the results that were derived from the data that was collected.

From the Fig. 2 it can be noted that over 50% of the water sources in Kipkelion West Sub-County have water that is safe for direct drinking. 62.8% of these sources had water that was safe for cooking, 78.8% had water that was fit for washing clothes, 92.3% had water useful for watering animals whereas 10% of the sources had water that was suitable for crop irrigation.

Further observations indicated that the water quality was affected by sedimentation, surface runoffs, erosion and the misuse of the sources. It was further observed that even though the water was 100% suitable for irrigation, almost no one in Kipkelion West Sub-County grew crops through irrigation. This is mainly because the population depends on a reliable rainfall regime for the farming activities. The three most dominant use of water therefore were drinking, cooking and watering animals.

From the collected data, 96% of the respondents do not incur any direct financial costs in their efforts to acquire water for domestic use. To them, water is a completely free commodity with the only challenge being how to move it from where it is abundantly available to the household where it is required. Of the 4% that incurred direct financial costs to acquire water, 0.7% had it directly piped into their residents whereas the

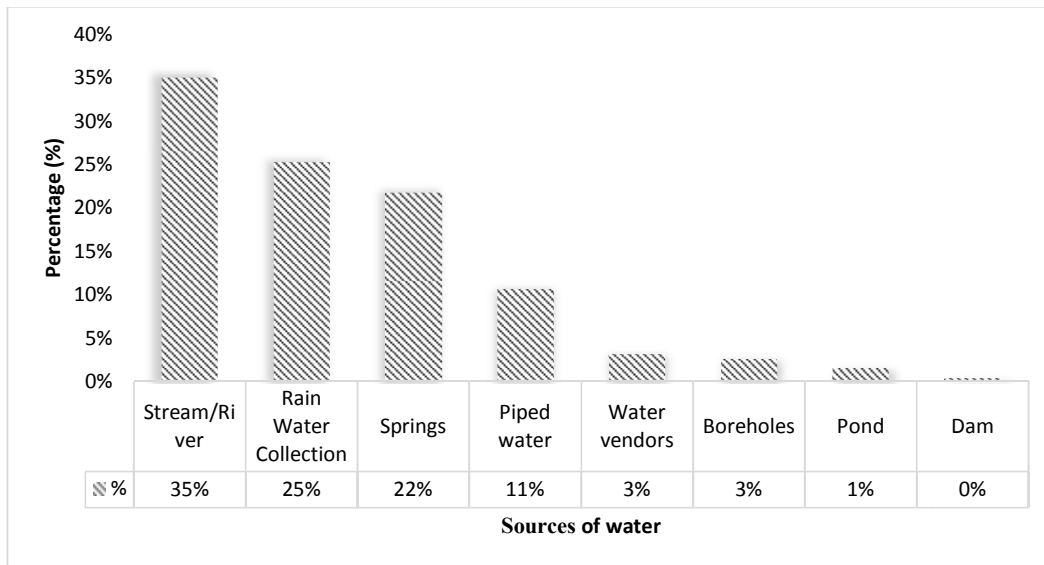


Fig. 1. Source for water for domestic use in Kipkelion West Sub-County

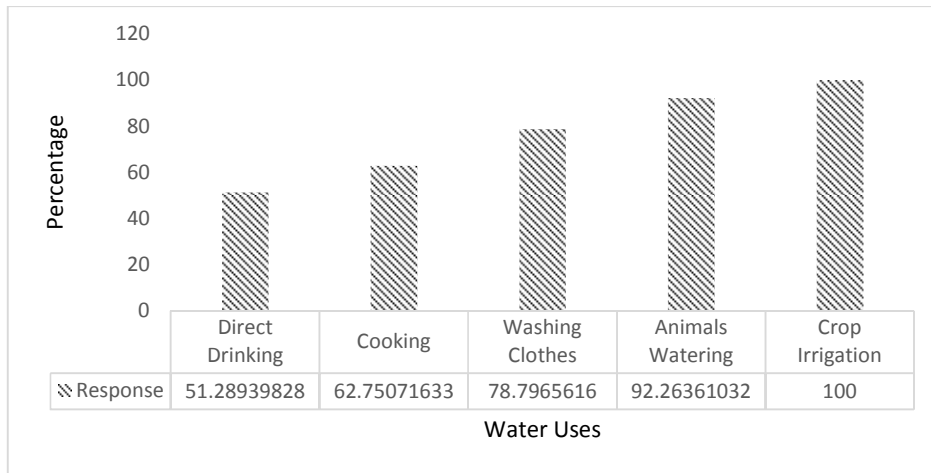


Fig. 2. Water quality vs. usage in Kipkelion West Sub-County

Table 3. Water tariff structure for Kipkelion West Sub-County

Type of customer	Consumption block in M	Approved Tariff KES/ M ³
Domestic/Residential/ Government Institutions	0-6	270 (Flat Rate)
	7-20	65.00
	21-50	85.00
	51-100	100.00
	101-300	120.00
	300 and above	140.00
	Commercial/Industrial	0-6
7-20		70.00
21-50		90.00
51-100		105.00
101-300		125.00
300 and above		145.00
Standpipes/Kiosks		35
Public Schools, Universities and Colleges	0-600	50.00
	601-1200	70.00
	1200 and above	90.00

rest 3.3% seemed to acquire it through middlemen where a 20 litter container was found to cost between 5 shillings and 20 shillings depending on the distance from the residence to the source. This translated into between 30 to 120 shillings daily and between 900 to 3600 monthly. The 0.7% who had tapped water directly piped into their dwellings paid for the water using the KEWASCO tariffs shown in Table 3.

From the Table 3, it can be noted that the payment and cost depended on the type of customer and the volume of water that is consumed monthly. Contrary to the initial

assumption that was made before the data was collected, this study concluded that there was no significant financial cost accrued by households in Kipkelion West Sub-County when sourcing for water. However, there were other nonfinancial costs like time, energy and convenience because most water sources albeit being free were located between 500 Meters to 3 Kilometers from the households.

3.3 The Cost of Water in Kipkelion West Sub-county

From the study, it was found that most households composed of an average of about

eight to nine individuals. Knowing this average was important in determining the water requirements per household and the labour requirement to meet the water needs for the particular household. The study estimated from the collected data that residents in Kipkelion West Sub-County used an average of 15 liters of water per capita. With an average household composition of 8 to 9 persons, it thus followed that each household used approximately 120 liters to 135 liters a day.

It is worthy comparing this particular data with the Food and Agricultural Organization (FAO) data. FAO [15] estimates the per capita water consumption in Africa to be at 47 liters per person. This is at least three times more than the average per capita consumption in Kipkelion West Sub County.

At 15 liters per capita consumption of water in a household of 8 to 9 people, this would imply that the members of a particular household would have to look for at least 6 containers of water. The standard and most popular container quantity in the Sub-County was the 20 liter containers. The study found out that if the duty of fetching the water was assigned to only one individual per turn in a household as was the case, the individual would have been required to visit the water source at least 6 times.

3.4 Sustainable Measures used in the Management of Water Resources

The sustainable measures used in the management of water resources by households depend on the innate characteristics of the households in question. According to the Kenya National Bureau of Statistics [16], Kipkelion West Sub-County drags behind on most important development indicators. For example, whereas 22% of the residents in Kericho County have secondary level of education or above, Kipkelion West Sub-County, has the lowest share of all the Sub-Counties at 15%. Whereas 62% of the County residents have primary school level of education only, Kipkelion West Sub-County has the highest for all the Sub-Counties at 66%. Whereas 16% of the County residents have no formal education, Kipkelion West Sub-County still has the highest for all the Sub-Counties at 19%. In fact, Kunyak Ward in Kipkelion West Sub-County has the highest percentage of all the Wards with 21% of residents not having any formal education.

Whereas 84% of County residents depend on firewood for energy, Kipkelion West Sub-County has the highest percentage of firewood use amongst all the Sub-Counties at 95%. In fact, Kammasian Ward in Kipkelion West Sub-County also has the highest percentage of firewood use for all the Wards in the County at 97%.

This is 34 percentage points above Ainamoi constituency, which has the lowest share. Kipkelion West constituency is about 11 percentage points above the county average. Four Wards, Tebesonik, Ainamoi, Kamasian and Cheboin, have the highest level of firewood use in Kericho County at 97% each. This is thrice the level in Kipchebor Ward, which has the lowest share. Tebesonik, Ainamoi, Kamasian and Cheboin are 13 percentage points above the county average.

Whereas 11% of the residents in the County use electricity for lighting, the percentage in Kipkelion West Sub-County is only 3% with all the other residents depending on alternative means of lighting. Chilchila and Kunyak Wards have the lowest percentage of households connected to electricity.

All these negative indicators affect the sustainability of the water resources in Kipkelion West Sub-County and the manner in which the residents manage the available resources. In fact, resources management has been entirely left to the local administration and the resource owner. This has led to cases of resource misuse and so affects the total water resources.

There is rampant river bathing, washing of clothes directly in rivers and pouring the dirty water back into the rivers. Some residents practice intensive farming adjacent rivers and springs which threaten the water quality.

From the field study, it was noted that there has been water resources degradation due to pollution, unsustainable farming practices and the encroachment of riparian land. Most of the measures put in place are actually reactive in nature and mostly applied after a problem has occurred. Some of the challenges of water resources management in Kipkelion West Sub-County stems from the norms and traditions of the residents. These include river bathing and watering their animals directly into rivers.

Key water resource management stakeholders in Kericho West Sub-County are however gradually

changing these norms that have led to water resources misuse and degradation. Most springs are being improved to provide water with better quality. River bathing has been discouraged by the stakeholder with the chiefs given the responsibility of punishing residents that still practice this.

Residents are now being encouraged to fetch water for their livestock instead of watering the livestock directly into water sources. CBOs have come up to encourage the sustainable use of water resources in Kipkelion West Sub-County and the participatory management of water resources in the county. The County Government of Kericho through KEWASCO has a target of improving water availability and access in Kipkelion West Sub-County through government-funded projects. Resident has increasingly adopted rainwater harvesting that is also geared towards improving water availability and sustainable management of water resources.

4. CONCLUSION

Streams and river are the most consistent water sources for domestic use in Kipkelion West Sub-County in view of the seasonality of rain as a source of water with each household using approximately 120 litres to 135 litres a day. In addition, the sustainable measures used in the management of water resources by households depend on innate characteristics. It was further pinpointed that negative indicators affected the sustainability of the water resources in Kipkelion West Sub-County and the manner in which the residents manage the available resources. Overall, the stakeholders in water resource management work independent of each other with occasional collective efforts.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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