

Ksh. 3,000

**QUALITY OF DRINKING WATER FROM MASINGA-KITUI WATER SUPPLY
SYSTEM IN KITUI COUNTY, KENYA**

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Q21/CE/34347/2016

**A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF
SCIENCES IN WATER, SANITATION AND HYGIENE IN THE SCHOOL OF
HEALTH SCIENCES OF KENYATTA UNIVERSITY**

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Quality of drinking water
from Masinga - Kitui water*



JUNE, 2023



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DECLARATION

This thesis is my original work and has not been presented for a degree in any other university

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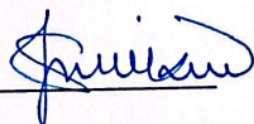
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ABSTRACT

Kenya, like in other developing countries has experienced a population increase for the last three decades. Major towns depend on municipal water supplied through pipeline system. Kitui Town which is located in Arid and Semi-Arid region, 80% of the population depend on municipal water which is sourced from Masinga reservoir located 75KM from the Town. Prolonged droughts in the region have contributed to water rationing. There is minimal information and data on water quality in the supply system. Previous studies show that the alternative sources of household water are prone to fecal contamination due to poor waste management in Kitui Town. Rationing and inadequate maintenance of Masinga-Kitui water has been associated with contamination of water in the system but limited information is available to ascertain all that. This study sought to establish the bacteriological and physio-chemical quality of Masinga-Kitui water as well as the perceived environmental and household factors influencing the quality of piped water being supplied in Kitui Town. The study adopted an analytical cross-sectional research design. Stratified sampling technique was applied to identify households for the study. Purposive sampling technique was then applied to select 184 respondents from the selected households. Quantitative data was collected using data sheets, questionnaires and laboratory analyses. Qualitative data was collected using Key Informants Interview guides. Water samples were collected in triplicate from 30 sampling sites for quality analysis. These sites included 24 households and 2 communal water points in Kitui Town, Masinga reservoir, the treatment plant, one reservation tanks at Katheka, and the distribution tank at Kwa Ngindu in Kitui Town. A total of 90 water samples, 3 per sampling site were collected. Water quality analyses were performed at Kenya Water Institute laboratory in Nairobi. Statistical Package for Social Sciences (version 24) and Advanced Microsoft Excel (2016) were used in the statistical analysis. Descriptive and inferential statistics were applied in data analysis. Simple regression and Analysis of Variance as well as coefficient of Variations were used to explain the relationship and variation of study variables. All the analyzed water samples were compliant with World Health Organization and Kenya Bureau of Standards physio-chemical quality standards of drinking water except for the phosphate that was found exceeding the WHO limit of 1.0 mg/l with a mean value of 1.3mg/l. High EC levels was strongly associated with total hardness of water ($r=0.89$), TDS ($r=0.65$), Sulphates ($r=0.85$), Magnesium ($r=0.65$), calcium ions ($r=0.77$), Fluorides ($r=0.74$) and Nitrates ($r=0.65$). The visible color of household water was associated with change in the turbidity of water ($r=0.67$) and the presence of residual chlorine ($r=-0.53$). TDS increased with increasing concentration of nitrates ($r=0.80$) and calcium carbonates in the water ($r=0.65$). Total hardness of water was strongly associated with calcium concentration ($r=0.74$), magnesium ($r=0.83$), and sulphates ($r=0.80$) in the water. The study revealed that, Masinga-Kitui water was highly contaminated with fecal (*E. coli*) and Total Coliforms hence unsafe for drinking. Chlorine residue was found to be below the WHO/KEBS requirement in the entire supply system. Contamination of the water was attributed to intrusion of pollutants into the distribution system through the water storage tanks, broken and poorly maintained sections of the water pipeline. Kwa Ngindu distribution tank was the main source of water contamination where fecal coliform was first detected in the system. Deteriorated water quality at the household was also associated with unhygienic practices such as failure to clean water storage facilities. Use of water-guard and boiling were the most common water treatment methods applied by the residents of Kitui Town. This study recommends that the Water Service Provider-KITWASCO should conduct regular water quality checks, ensure optimum chlorine dosage, undertake prompt repairs & maintenance, and enhance connection of Kitui Town households to public sewer system and promote behavior change in household water treatment.