KeSEBAE NEWS

Newsletter of the Kenya Society of Environmental, Biological and Agricultural Engineers

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Water Distribution in Kenya

By: Yvonne Madahana

Eng. Prof. Lawrence Gumbe presenting a copy of the Journal of Engineering in Agriculture and Environment to Sonja Leighton-Kone, the Acting Deputy Executive Director of United Nations Environment Programme.

Water distribution may be described as consisting of three basic components: the source of supply, the processing or treatment of the water, and the distribution of water to the users. Water from the source is conveyed to the treatment plant by conduits or aqueducts, either by pressure or open-channel flow. Following treatment, the water enters the distribution system directly or is transported to it via supply conduits. The water source must provide a quantity sufficient to meet all municipal, institutional, and industrial uses as well as the fire-fighting demand. Either surface water or groundwater may be used. Although most water systems are supplied from only one source, there are instances when both surface water and groundwater sources are utilized.

DEAR READER

Welcome to KeSEBAE Newsletter.

A fortnightly Newsletter touching on topical issues affecting our environment.

KeSEBAE NEWS is a Newsletter of the Kenya Society of Environmental, Biological and Agricultural Engineers (KeSEBAE)

Inside this Issue!

Surface water is drawn from large rivers or lakes. Groundwater is normally obtained by sinking wells into the saturated zone located beneath the water table.

Water resources are stressed and unevenly distributed throughout Kenya, with approximately 85 percent of the country classified as arid or semi-arid. Overall, 33 percent of Kenya's water resources originate outside of the country.

1.0. Water Resources

1.1.Surface Water Resources

Five basins account for 90 percent of Kenya's total annual renewable supply. An estimated 75 percent of surface water originates as precipitation runoff from five "water towers" in central and western Kenya. The Lake Victoria Basin is the most productive, accounting for 59 percent of surface water and 54 percent of total renewable freshwater. Over 80 percent of Lake Victoria's renewable water supply is from direct precipitation, while rivers and streams originating in Kenya and Tanzania account for the rest.

The Tana River Basin supplies 19 percent of freshwater resources and includes the Thika River, which is a key source of water for Nairobi. The Tana River is the longest in Kenya and flows 1,050 kilometers southeast from the Aberdare mountains and Mt. Kenya through arid and semi-arid lands before discharging into the Indian Ocean.

The Rift Valley Basin is an internal drainage basin with no outlets. Its headwaters are in the Mau Forest Complex and it accounts for 14 percent of Kenya's surface water, and includes Lake Turkana, the world's largest permanent desert lake, and Baringo, Naivasha, and Magadi, which range from fresh to brackish to saline.

The Athi River Basin accounts for less than 6 percent of Kenya's surface water and extends southwest from Nairobi through the Athi River, which ultimately drains into the Indian Ocean north of Mombasa.
The Ewaso Ng'iro Basin covers 36 percent of Kenya in the northeast but only accounts for two percent of the country's surface water resources.

1.2.Groundwater Resources

Renewable groundwater constitutes less than 12 percent of total renewable supply. Most boreholes are located in central, southwestern, and southeastern Kenya along the coast, however, groundwater is critical in the arid and semi-arid areas where surface water is less available, including the Ewaso Ng'iro Basin and the northwestern Turkana County.

2.0. Water Treatment

Surface water from the river, lake or fresh water wetland is treated using different methods, such as ultrafiltration systems and brackish water reverse osmosis.

Desalination is used for water from ocean, or sea source, which is also treated using seawater reverse osmosis systems and desalination machine.
Ground water or brackish water is usually treated using reverse osmosis systems and chemical dosing, UV water sterilizer.

Government water supply, which could have high level of hardness or high level of chlorine, is treated with water softener system and media water filters.

3.0.Water Distribution

Pipes used in the Kenyan drinking water distribution system can be broadly categorized in 2 main categories based on materials of the pipes; plastic pipes and metal pipes. Both plastic pipes and metals pipes again can be categorized based on the specific properties of the pipes.

Kenya has a population of approximately of 53 million people as per the year 2022, 15 percent of Kenyans rely on unimproved water sources, such as ponds, shallow wells and rivers, while 41 percent of Kenyans lack access to basic sanitation solutions. These challenges are especially evident in rural areas and urban slums where people are often unable to connect to piped water infrastructure.

According to Water.org, in rural Kenya, the average total coping costs for an unreliable or distant water supply are approximately $38 per month. In comparison, the average water bill of a typical household in Nairobi that is connected to a piped system is only $4.46 per month. This comparison highlights the economic burdens that often fall more heavily on unconnected rural customers than on households with piped connections.

3.1. Spatial Distribution of Water Scarcity

Uneven distribution of water may be linked to precipitation, the geographical landscapes, availability, population distribution as well as socio-economic factors. However, variation in the water supply occurs mainly when the supply during dry seasons does not meet the demand, and this could be with the total quantity and quality supplied and the reliability of supply.

For many years there has been an increased need for funding, management and development of water resources in Kenya because of the increasing population as well as the country's increasing use of water for agriculture.

According to Samantha Marshall (2011), Kenya's government devised a plan in 1974 to ensure safe water to all households by the year 2000. The government established many different plans along the way to manage water effectively, such as the National Water Conservation and Pipeline Corporation (NWCPC). By the year 2000 the NWCPC was managing piped water systems in urban and rural areas, which served about 3.8 million people. Other people benefited from the NWCPC, but it was not enough, as less than half the rural population had access to clean water and in urban areas only two thirds of the population had access to clean water.

The realizing that it cannot meet its mandate by 2000, the government handed over rural water systems to people of communities and urban water systems to departments within local authorities, where they would take responsibility for controlling and preserving the water systems.

In 2010 constitution, which came into effect in 2013, water supply and sanitation services was declared a basic right. Water and sanitation functions were then devolved to the county level. However, even after devolution, Kenya still faces the following challenges:

4.0. Challenges Facing Distribution of Water in Kenya

Droughts

Over the past decade Kenya has experienced a severe drought, which has brought about scarcity of water.

Forest Degradation

Deforestation has contributed to the prolonged drought Kenya is experiencing. The largest forest in Kenya, Mau, distributes water to six lakes plus eight wildlife reserves, and some 10 million people depend on its rivers for a living. However, loggers and farmers have destroyed a quarter of Mau's 400,000 hectares. The problem with deforestation is that it almost always leads to increased runoff, which has negative implications in both the rainy as well as the subsequent dry season.

Floods

Kenya also suffers from floods, though either at different periods or in different regions. Most parts of Kenya have two rainy seasons, March to May and October to November, with the intensity of these rains having increased recently due to an increased climate variability. The drought dries up the vegetation and when the rains come, the ground is bare leading to increased runoffs which in turn increases the level of water in rivers.

Contamination of Water

The disability to maintain clean water in Kenya is another main reason for the worsening of the water distribution in Kenya. Many Kenyans use wells to obtain domestic water and also use pit latrines that are often close in distance to the wells. This causes contamination of the wells because the microorganisms travel from the pit latrines to the wells.

Population Growth

Kenya's relatively high population growth has had another negative impact on having access to safe water. According to the World Bank (2010), the population in Kenya in 1990 was about 23 million and in 2019 the population increased to about 47. 5 million people. Increase in population means increase in infrastructure which requires funding.

Poverty, inequality and government failure are also some of the reasons affecting water distribution in Kenya.

4.1. Solutions

Some of the solutions Kenya can practise in order to improve its water distribution includes:

- Rehabilitation and protection of indigenous forests in the five Water Towers (Mau Escarpment, Mt. Kenya, Aberdare Ranges, Cherangany Hills and Mt. Elgon.
- Need to construct borehole wells and rainwater harvesting tanks in urban and peri-urban areas
- National water and supply sanitation.
- Education and Awareness.
- New Conservation Technologies.
- Recycle Wastewater.
- Improve irrigation and agriculture water use.
- Regulating water pricing.
- Water conservation and management
- Flood protection
- Land development
- Watershed Management.

KeSEBAE Courtesy Visits

KeSEBAE have paid courtesy visit to a number of partners from the beginning of this year; they include:

i. Engineers Board of Kenya
ii. Agriculture and Food Authority
iii. United Nations Environmental Programme
iv. Rural Electrification and Renewable Energy Corporation
v. The National Environment Management Authority
vi. KCB Bank Group

During those visits, KeSEBAE presented their memorandum which gave an insight on what KeSEBAE is and the mandate it stands for. The memorandum also had a number of requests to the partners, as outlined below:

- Purchase of advertisement space in our journal, the **Journal of Engineering in Environment and Agriculture** and publishing in it.
- Advertisement of our annual upcoming conference in their websites and purchase of advertisement space in the conference magazine.
- Sponsorship of events during the Conference
- Supporting our mentorship programme of transitioning graduate engineers to professional engineers.
- KeSEBAE to use its pool of experts to offer guidance and training in different fields as the partners prefers.

The courtesy visits have improved KeSEBAE network a great deal. Apart from that, the meetings have been productive, with most partners agreeing to a Memorandum of Understanding, to sponsor advertisement and to participate in the conference. KeSEBAE is looking forward to meeting more partners.

From the left:Eng. Kennedy Makudiuh, Eng. Mwamzali Shiribwa, Eng. Claudia Bess, Eng. Prof. Ayub Gitau, Eng. Prof. Lawrence Gumbe, Eng. Erastus Mwongera, Eng. Margaret Ogai, Eng. Richard Kanui, Eng. Okere A. Makokha and Tony Kibet

Left: KeSEBAE Executive Members with EBK during the courtesy visit

Right: Eng. Erastus Mwongera, EBK Chair, gifting KeSEBAE Chairperson, Eng. Prof. Lawrence Gumbe.

From Left: Justus Agumba, Eng. Claudia Bess, Yvonne Madahana, Ezekiel Oranga, Eng. Prof. Lawrence Gumbe, Sonja Leighton-Kone, Jane Akumu, Melissa de Kock, Levis Kavagi and Rami Abdel Malik shared a photo during the courtesy with UNEP.

Left: Eng. Claudia Bess, Ezekiel Oranga, Eng. Prof. Lawrence Gumbe, Dr. Kennedy Ondimu, Yvonne Madahana and David Onga're

Right: Eng. Prof. Lawrence Gumbe Presenting a Copy of The Journal of Engineering in Agriculture and Environment, JEAE to David Onga're, Director Compliance, NEMA, during the courtesy visit with NEMA.

Left: Yvonne Madahana, Eng. Amos Kiptanui, Eng. Dr. Jedidah Maina, Paul Russo, Eng. Prof. Lawrence Gumbe, Eng. Claudia Bess, Eng. Shiribwa Mwamzali, Eng. Kennedy Makudiuh and Prof. Michael Okoth.

Eng. Prof. Gumbe (left) Presenting a Copy of JEAE to Paul Russo, Group CEO KCB Group During Courtesy with KCB Group.

Further Middle, Eng. Enosh Akumu, Director Coffee Directorate, AFA, Further Right, Eng. Prof. Lawrence Gumbe, Chairperson KeSEBAE together with their team during courtesy visit with AFA.

AfroAgEng

Kenya Society of Environmental Biological and Agricultural Engineers

JOINT INTERNATIONAL ANNUAL CONFERENCE 2023

THEME: Engineering Agenda 2063: The Africa We Want

AGENDA 2063 is Africa's blueprint and master plan for transforming Africa into the global powerhouse of the future.

Wed 6 – Fri 8 Dec 2023

Nairobi

EARN 20 CPD POINTS

SUB-THEMES

1. Seamless connections (Roads, Railways, Air Transport and Water Transport)
2. Energy for Africa
3. Industrialized Agriculture
4. Housing
5. Free Trade in Services
6. Security
7. Sustainable Environment
8. Engineering Education and Practice

KEY DATES:

Abstract Submission: 11 Oct 2023
Paper Submission: 10 Nov 2023
Payment Deadline : 25 Oct 2023

CHARGES

Members: KES 15,000 ($150)
Non Members : KES 20,000 ($200)
Undergrad Students: KES 2,000 ($20)
Field Visit : KES 5,000 ($50)
Virtual: KES 5,000 ($50)

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Call for Papers

To the Next Editions of the JEAE

JEAE

Journal of Engineering in Agriculture and the Environment

The Journal of Engineering in Agriculture and the Environment (JEAE) is a Publication of the Kenya Society of Environmental, Biological and Agricultural Engineers (KeSEBAE) through which researchers in the fields of Environment, Agriculture and related fields share research information and findings with their peers from around the globe.

The JEAE Editorial Board wishes to invite interested researchers with complete work in any relevant topic, to submit their papers for publication in the next editions of the Journal.

Manuscripts may be submitted online or via email to:

Prof. Lawrence Gumbe, Chairperson, JEAE Editorial Board
Via Email: info@kesebae.or.ke or online via: https://www.kesebae.or.ke/journal/manuscript_submit.php

Criteria for Article Selection

Priority in the selection of articles for publication is that the articles:

a. Are written in the English language
b. Are relevant to the application of engineering and technology in agriculture, the environment and biological systems
c. Have not been previously published elsewhere, or, if previously published are supported by a copyright permission
d. Deals with theoretical, practical and adoptable innovations applicable to engineering and technology in agriculture, the environment and biological systems
e. Have a 150 to250 words abstract, preceding the main body of the article
f. The abstract should be followed by the list of 4 to 8 "Key Words"
g. Manuscript should be single-spaced, under 4,000 words (approximately equivalent to 5-6 pages of A4-size paper)
h. Should be submitted in both MS word (2010 or later versions) and pdf formats (i.e., authors submit the abstract and key words in MS Word and pdf after which author uploads the entire manuscript in MS word and pdf)
i. Are supported by authentic sources, references or bibliography

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CALL FOR ARTICLES TO KeSEBAE NEWS

KeSEBAE NEWS Editorial wishes to call for topical articles for publication in future editions of KeSEBAE NEWS.

Please transmit the same to the **Editor: Ezekiel Oranga** via Email: info@kesebae.or.ke

NOTE: A payment will be made to the author of each selected article

CALL FOR MEMBERSHIP

Be a KeSEBAE Member:

The annual subscription fees, admission fees and reinstatement fees for members of all grades (except Honorary and Life Members who shall pay no dues or fees) are indicated below: The annual dues are as follows:

Membership Category	Annual Subscription (KES)	Admission Fees (KES)	Reinstatement Fees (KES)
Fellow	5,000	1,000	2,000
Member	2,000	1,000	2,000
Ass.Member	1,000	1,000	2,000
Aff.Member	500	1,000	2,000
Student	300	100	-

Membership Renewal

Members of all grades are requested to renew their **2022 membership as follows.**

Membership Category	*Annual Subscription Fee (KES)*
Fellow	**5,000**
Member	**2,000**
Ass. Member	**1,000**
Aff. Member	**500**
Student Member	**300**

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Currency	**Kenya Shillings**

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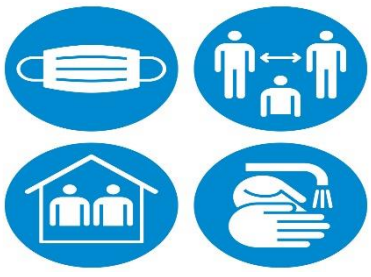

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