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PRESENT AND FUTURE CHALLENGES OF WATER RESOURCE MANEGEMANT IN ETHIOPIA

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Abstract

Water is an invaluable resource and is essential for sustainable developments and livelihoods. Ethiopia has vast potential for water resources, but it has not used water resources properly or wisely. Achieving the goals of household consumption and sustainable development, access to adequate water will contribute significantly to improved economic sectors. The main management issues and challenges are climate change, transboundary water resources conflicts, drawbacks of institutions, and water weeds. To address these challenges and facilitate the dissemination of best practices, this study recommends that: linking the physical and biological conservation structures of watersheds, groundwater management be separated from surface management and activities related to income generation and improving people's livelihoods; adjust applied science and implementation processes, and co-manage surface and groundwater reservoirs to increase water use efficiency; Strengthen the institutional framework to promote cooperation among stakeholders and ensure sustainable water management in line with sustainable development goals.

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1. Introduction

Water is an essential need for all life forms on Earth and is the most important irreplaceable natural resource on which the socio-economic growth and long-term development of a country depend on greatly (Assegide et al., 2022). Ethiopia has significant groundwater and surface water resources. Due to its abundant surface water resources, Ethiopia is known as the water tower of Africa (Mekuriaw, 2019). Ethiopia's Ministry of Water, Irrigation and Energy (MOWIE) estimates the country's annual groundwater flow to be 40 billion cubic meters (BCM) and surface water flow to be 122 BCM (MOWIE, 2021). Ethiopia's annual surface water flow is generated by 12 transboundary rivers that supply water to neighboring countries, leaving very little for irrigation development. Although Ethiopia's agriculture relies heavily on rainfall, the country is blessed with abundant water resources, including 12 major river basins and 22 natural and artificial lakes. Considering both surface water availability and annual flow, it is estimated that there will be about 1,707 m³ of water/person/year (Koyra & Mesene, 2020). Improved access to drinking water supply is one of the key factors contributing greatly to the socio-economic transformation of the district by improving lifestyle and health, thereby enhancing living standards and the economic productivity of society (Benyam, 2016). Millions of people around the world face a lack of drinking water in both quantity and quality. The majority of developing countries in Africa and Asia are severely affected by problems in accessing clean and safe drinking water supplies (Tekle, 2019). Most developing countries, like Ethiopia, still cannot get enough drinking water and have low water availability. covering drinking water supplies, causing people to suffer from water shortages (Mekuriaw, 2019; Mola & Ping, 2021).

Ethiopia, the second-most populous country in Africa after Nigeria, has a population of over one hundred million people and one of the fastest-growing economies in the world (Birhan, 2016). Ethiopia is blessed with abundant water resources known as "white oil" or "green oil" and has 12 major rivers and 11 major lakes with an annual renewable flow of 122 billion m³. Ethiopia is very famous for its huge water resource potential, which is entirely generated in the tertiary sector and is still known as the water tower of Africa (Kumar. & Getu, 2018; Mekuriaw, 2019; Tariku, 2018). But access to drinking water supplies in Ethiopia is among the lowest in sub-Saharan Africa and worldwide (57.3% in 2015). However, the Ethiopian government is making efforts to address the issue of access to safe drinking water in different countries. the country's cities (Mola & Ping, 2021).

To meet the city's water needs, a long-pipe water supply network was born as a solution when nearby water sources are scarce, polluted or insufficient to meet high demand due to changing and growing living standards. increase. in the city population (Tarekegn & Truye, 2018). Water availability provides usable groundwater and ensures the correct transmission of rainfall to recharge aquifers that create and sustain streams later in the season. Groundwater still plays an important role in domestic and commercial facilities in most regions of the country, especially in rural areas and urban communities (Gedefaw, 2019). The document is used to evaluate websites, Google reviews of scientific literature, and official government reports. Identify the quantitative potential of water resources and the

factors that need to be explored to meet the growing demand for water as well as develop and manage the necessary plans within the sector. In all of this, it is important to assess what are the challenges associated with water management issues and what are the future opportunities for the industry. Historically, the production and management of the water sector in Ethiopia has been influenced by many factors.

1.1.Objective of the Review

The Objective of the Paper Was to Take an Introductory Overview of Current and Future Challenges of Water Resource Management in Ethiopia with its specific objective to

- ❖ Identify The Water Resource Potential Available in Ethiopia
- ❖ Investigate The Water Resource Management in The Country
- ❖ Justify The Present and Future Challenges of WRM In Ethiopia

2. Methods

- ❖ This article review is conducted by searching of different published research literature or journal articles
- ❖ So, all of information has been collected from secondary data.

3. The related literature

3.1.Water resources in Ethiopia

In total, 12 river basins in Ethiopia contribute about 125 billion m³ of runoff per year, with the Abbay basin in central and northwestern Ethiopia contributing 45% of this total (Tegegne et al., 2024). Ethiopia does not have the water infrastructure to use this surface water, although much of this runoff could be used for farming or other purposes. Of the total water resources, about 75% is supplied to neighboring countries (MoWR, 2006). Most lakes, with the exceptions of Ziway, Tana, Longano, Abaya, and Chamo, are eutrophic, meaning they do not have surface water outlets. High concentrations of the chemical can be found in Lake Shala and Abiyjata, and Abiyjata is used to produce sodium carbonate (Tegegne et al., 2024). Ethiopia has a diverse climate, varied terrain, and abundant water resources. Rainfall in the multi-weather system in this country characterizes the spatial and temporal variability of water supply. During the three main rainy months (June–August), most river systems fill and flood the surrounding area (Melesse et al., 2014). Land and water are at the forefront of economic growth and development efforts.

3.2.Water resources management in Ethiopia

Water resource management is one of the most pressing issues facing the world today. Despite its importance to humans, water is the most poorly managed resource in the world, especially in developing countries, and is seriously threatened by a range of anthropogenic activities (Kumar et al., 2021). To meet the needs of different users, more emphasis should be placed on the efficient use of all water sources (surface water, groundwater, and precipitation), as well as water supply plans that maximize economic profits from limited water resources while protecting the environment. negligible ecosystem (Kassie, 2020).

Capacity expansion is part of long-term water resources development studies when current water storage, extraction, and transportation facilities to consumers are insufficient and acceptably reliable due to demand. of resources and services (Karamouz et al., 2003) Furthermore, incorporating uncertainty analysis into water resource modeling helps to understand the difficulties involved and thus minimize them (Yassin, 2020). Understanding the quantity and quality of water available is essential for effective and responsible water resource management (Lorenz and Ziegeweid, 2016). Poor water resource management, growing and unsustainable domestic water demand, and a lack of effective management and sector coordination will further exacerbate the basin's water scarcity problem (Gadain and Mugo, 2009). IWRM is concerned with managing water resources, supply, and demand (Global Water Partnership (GWP), 2000). In this regard, sustainable use of water resources can be achieved through a comprehensive, multidisciplinary approach. “The purpose of integrated water resource management arises from the constant interaction, use, and interests of interdependent groups converging around a unified whole” (GWP, 2000: 17). Ethiopia's improved food security and economic growth will be facilitated by irrigation, provided water is used efficiently (Haile and Kassa, 2015). Comprehensive water management involves a number of functions that are closely related but which are carried out by different agencies and organizations. The functions include water law and policymaking, regulation, technical assistance and coordination, monitoring and evaluation, administration and financing, public education and involvement (MoWR, 2006; Yericho & Mulugeta, 2019).

The general water resources policy among many others include: enhancing integrated and comprehensive management of water resources that avoids fragmented approach. Recognizing that water resources development, utilization, protection and conservation go hand in hand and ensure that water supply and sanitation, irrigation and drainage as well as hydraulic structures, watershed management and related activities are integrated and addressed in union (Koyra & Mesene, 2020)

Any water management action will address the underlying causes of land change, habitat destruction, agricultural runoff and soil nutrient depletion and a Others not discussed in depth in the literature include the consequences of multidimensional negative impacts such as downstream streams and rivers (Shako & Ping, 2021).

3.3.Challenges of WRM in Ethiopia

The greatest challenge within the administration and allotment of water in Ethiopia is the constrained information on the amount, quality, and spatial conveyance of groundwater resources (Assegide et al., 2022). Giving coherent gauges with the accessible, small, and unreasonable information and the complex hydrogeological setup is troublesome. Arrival and surface water quality debasement in Ethiopia was negligible some time ago, but recently before the last 30 years due to the low population density that practices slash and burn agriculture with minimum agricultural inputs (Zewde et al., 2024). Be that as it may, due to common and anthropogenic sources, Ethiopia's arrival and surface water quality have as of late been helpless to a wide range of contamination, counting natural matter, salts, supplements, silt, overwhelming metals, and so on (Melaku, et al., 2020). Later increments in

sedimentation biodiversity misfortune in Ethiopia have been driven by quick environment misfortune and arrive utilize alter, which is mostly inferable to agrarian escalated (Moges et al., 2017)

Developing countries like Ethiopia face rapid population growth, urbanization, agricultural intensification, and climate change that are putting great pressure on the supply and quality of water resources (Wedajo et al., 2024). Most policy agencies and stakeholders involved in water management have begun to face new challenges, increasingly associated with complex issues, requiring a rethinking of traditional management methods. Growing demand, coupled with overexploitation of resources and intensification of production, has created scarcity, environmental degradation, and increased greenhouse gas (GHG) emissions, accelerating climate change. (Li et al., 2021).

Agriculture has been the main driver of the Ethiopian economy, accounting for 40% of the economic value addition and approximately 45% of export earnings(Wedajo et al., 2024).

The country is vulnerable to recurrent droughts and food shortages because of its dependence on rainwater for subsistence and agriculture. A total of 90% to 95% of the crops in the country are produced during the rainy season recording 70% to 90% of precipitation between June and September (Worqlul et al., 2017). Evidently, the challenge is that agricultural production is heavily reliant on the rainy season, which in turn is vulnerable to weather changes. These problems can be considered as challenges in providing quality and quantity of water to its residents.

Ethiopia's population increased from 22 million in 1960 to 112 million in 2019 (average annual growth rate of 2.5%) and reached 117 million in 2021, while doubling in 1987, 2011 and 2021, up from 44, 89 and 117 million, corresponding. The amount and frequency of irrigation water withdrawals affect the sustainability of water resources (de Graaf et al., 2019). Although Ethiopia's population is growing rapidly and the country faces food shortages, its current irrigation potential is less than 5%. Therefore, expanding arable land and developing irrigation methods is very important (Koyra & Mesene, 2020). These studies suggest that in addition to climate change, there will be a significant increase in irrigated land area and competitive water use among different sectors (Meier et al., 2018). Additionally, increasing anthropogenic activities, such as deforestation, land degradation, and urbanization, have changed soil properties and land cover, and will affect water availability (Bagley et al., 2014). In Ethiopia Water shortages, electricity disruptions, rapid urbanization, changing living conditions, pipes and valves constitute major challenges, while eliminating waste unmonitored and private groundwater exploration, causing water pollution, unplanned land use, requiring large investments to control and improve water quality, population and environmental growth fast. Degradation and poor and ineffective management of water resources are key issues that require urgent solutions to use water resources effectively and sustainably, and are essential for sustainable growth and poverty reduction. (Yericho and Mulugeta, 2019).

The challenges of water resources are extreme and increasing, as well as the challenges of climate change, invasive weeds, especially in lakes, challenges of government organizations, and conflicts of transboundary waters in

neighboring countries(Mola Shako & Ping, 2021). All of this has led to long-term internal and external management and development challenges, creating future cognitive mistrust.

4. CONCLUSION

The situation with neighboring countries has long been accused of a lack of technical consultation and quantitative intervention based on potential water resource uses, institutions and political actors, as well as significant distribution costs and disproportionate benefits of water management to neighboring countries. Nation. Domestic-only use is governed by international agreements, and differing views have prevented Ethiopia from asserting its rights. Significant efforts are needed to facilitate transboundary cooperation with riparian countries to use transboundary water resources more effectively.

Given the current state of psychology, use and conflict between transboundary rivers in neighboring countries, it is necessary to focus on perfecting policies, strategies and regulations to ensure sustainable management and use. Water resources sustainability is effective from the bottom up and works in a coordinated manner. approaches, especially in relation to river basin management and their use, require reform and strategic transformation.

To address these challenges and facilitate the dissemination of best practices, this study recommends that: linking the physical and biological conservation structures of watersheds, groundwater management be separated from surface management and activities related to income generation and improving people's livelihoods; adjust applied science and implementation processes, and co-manage surface and groundwater reservoirs to increase water use efficiency; Strengthen the institutional framework to promote cooperation among stakeholders and ensure sustainable water management in line with sustainable development goals.

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