



Research Article

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New challenges of water resources management in African countries : Identification, monitoring, analysis, and solutions

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Abstract

The main challenges are: Securing water for people; Securing water for food production; Developing other job creating activities; Protecting vital ecosystems; Dealing with the variability of water in time and space; Managing risks; Creating public awareness and understanding; Forging the political will to act; Ensuring collaboration across sectors and boundaries; The traditional sectoral and fragmented approach to water resources management has often led to governing groups representing conflicting interests. Policy objectives have been set without consideration of the implications for other water users and without consultation across sectoral and institutional boundaries. Climate change is undoubtedly the primary cause of water insecurity in Africa. Unpredictable weather patterns and intense weather events have left several communities grappling with water scarcity in African states, including South Africa, Kenya, Ethiopia, and Somalia. The main causes of water scarcity in Africa are physical and economic water scarcity, rapid population growth, and the effects of climate change on the water cycle.

Key words: challenges of water security, pollution, climate change, urbanization, population growth, Africa

Résumé

Les principaux défis sont : la sécurisation de l'eau pour les populations ; la sécurisation de l'eau pour la production alimentaire ; le développement d'autres activités créatrices d'emplois ; la protection des écosystèmes vitaux ; la gestion de la variabilité de l'eau dans le temps et l'espace ; la gestion des risques ; la sensibilisation et la compréhension du public ; le développement de la volonté politique d'agir ; la collaboration entre les secteurs et les frontières ; l'approche sectorielle et fragmentée traditionnelle de la gestion des ressources en eau a souvent conduit à des groupes dirigeants représentant des intérêts contradictoires. Les objectifs politiques ont été fixés sans tenir compte des implications pour les autres usagers de l'eau et sans consultation entre les secteurs et les institutions. Le changement climatique est sans aucun doute la principale cause de l'insécurité hydrique en Afrique. Des conditions météorologiques imprévisibles et des phénomènes météorologiques intenses ont laissé plusieurs communautés aux prises avec la pénurie d'eau dans des États africains, notamment en Afrique du Sud, au Kenya, en Éthiopie et en Somalie. Les principales causes de la pénurie d'eau en Afrique sont la rareté physique et économique de l'eau, la croissance démographique rapide et les effets du changement climatique sur le cycle de l'eau.

Mots clés : défis de la sécurité hydrique, pollution, changement climatique, urbanisation, croissance démographique, Afrique

I-INTRODUCTION

Challenges faced by more and more countries in their struggle for economic and social development are increasingly related to water. Water shortages, quality deterioration and flood impacts are among the problems, which require greater attention and action. There are many challenges to strike a balance between the use of the resource as a basis for the livelihood of the world's increasing population and the protection and conservation of the resource to sustain its functions and characteristics. The main challenges are: Securing water for people; Securing water for food production; Developing other job creating activities; Protecting vital ecosystems; Dealing with the variability of water in time and space; Managing risks; Creating public awareness and understanding; Forging the political will to act; Ensuring collaboration across sectors and boundaries; The traditional sectoral and fragmented approach to water resources management has often led to governing groups representing conflicting interests. Policy objectives have been set without consideration of the implications for other water users and without consultation across sectoral and institutional boundaries. An important first step in deciding on future directions and therefore the challenges we face is to look closely at what are the key issues which water resources managers must address today and considering how these will evolve with time. The key issues today are: Climate change and Increasing vulnerability to severe weather event, Growing urban demand, Over-allocation of existing supplies, Unrestricted extractions, Land-use change, Environmental requirements :

II : The outcome of the consortium

Resolve some of Africa's major water management challenges:

1. **Water scarcity:** The availability of freshwater is limited and unevenly distributed. Many countries in the region face water shortages, especially in periods of drought, which affects the population, agriculture and industry. One of the main challenges lies in "how to optimize the management of this scarce resource throughout the entire water cycle, from catchment to potential reuse. Moreover, all the stakeholders interested in this cycle must be aligned to ensure fairer, more efficient water distribution."
2. **Water pollution:** Rapid industrial and urban development in some countries has brought water pollution from chemicals,

industrial waste and untreated sewage. This affects water quality and the health of water-dependent communities.

3. **Flood management:** The lack of sound infrastructure and efficient flood management systems exacerbates this problem.
4. **Cross-border water resource management:** Many rivers and river basins are shared by multiple countries, which can lead to disputes over the use and management of cross-border water resources.
5. **Climate change:** Rising temperatures and changes in rainfall patterns due to climate change have a significant impact on water availability and the frequency and intensity of extreme events such as droughts and floods.
6. **Sustainable development:** Balancing economic development and environmental conservation is a major challenge for water management. The economic development experience has led to increased demand for water (and energy), which in turn exacerbates water scarcity and pollution problems.
7. **Groundwater overexploitation:** In some areas, excessive groundwater extraction for irrigation and domestic use leads to aquifer depletion and saltwater intrusion, making water unsuitable for drinking and agriculture. In these locations, additional measures are essential, including programs to improve non-conventional water sources, surface water storage, and demand management.
8. **Poor infrastructure:** Many parts of the region lack good water infrastructure, such as water treatment facilities, distribution networks and drainage systems, which affects access to safe drinking water and increases flood vulnerability. "Countries in this region must urgently improve water management with strong leadership and provide solutions in the most affected areas" stated Martin Shaw. In addition, Asia accounts for about half of the world's bottled water market, a further factor that discourages investment in public infrastructure.
9. **Population growth:** The increase in population and economic activities in cities, combined with rapid urban development, puts added pressure on water resources as the demand for water increases. Additionally, yields from irrigated agriculture need to be increased, with 70% of water resources being used for this type

of agriculture, causing greater water scarcity.

10. **Water governance and policies:** Inconsistent water governance, lack of integrated water management and the overlap in responsibilities between various agencies often hinder the effectiveness of water management strategies. Environmental policies cannot be taken locally but must be wide ranging and take in the complexity of ecological systems.

III . Analytical perspectives on water problems

Climate change is undoubtedly the primary cause of water insecurity in Africa. Unpredictable weather patterns and intense weather events have left several communities grappling with water scarcity in African states, including South Africa, Kenya, Ethiopia, and Somalia. The main causes of water scarcity in Africa are physical and economic water scarcity, rapid population growth, and the effects of climate change on the water cycle. Water scarcity is the lack of fresh water resources to meet the standard water demand. Notable challenges plaguing water and sanitation practices in the region include poverty, malnutrition, poor data reporting, illiteracy, climate change, and poor healthcare financing. This results in adverse health consequences, including waterborne infections like cholera, typhoid, dysentery, and diarrheal diseases. Drinking dirty water causes harmful diseases such as diarrhea, vomiting, lethal parasites, typhoid, dysentery, polio, and sanitation-based illnesses.

All of these diseases, combined with inadequate medical attention, quite often cause deaths, especially in children in Africa. Water scarcity limits access to safe water for drinking and for practicing basic hygiene at home, in schools and in health-care facilities. When water is scarce, sewage systems can fail and the threat of contracting diseases like cholera surges. Scarce water also becomes more expensive. Agriculture consumes more water than any other source and wastes much of that through inefficiencies. Climate change is altering patterns of weather and water around the world, causing shortages and droughts in some areas and floods in others. At the current consumption rate, this situation will only get worse. While East Africa shows strong growth, Central Africa struggles with stagnant oil production and political instability. Challenges remain, including high unemployment, persistent debt, and inflation above 10% in several countries as presented in figures 1 and 2.

One of the primary challenges in sustainable water resource management is the growing global population, which drives increased demand for water. This demand is not only for drinking water but also for agricultural and industrial uses. As the population grows, the need for food production rises, which in turn increases the demand for irrigation water. This creates a significant challenge in ensuring that there is enough water to meet the needs of all sectors of the community, while maintaining sustainability of this vital resource. Climate change introduces significant uncertainty into water resource management. Changes in precipitation patterns, increased frequency of extreme weather events, and prolonged droughts all impact the availability and reliability of water supplies in Africa. This uncertainty complicates planning and management efforts, making it difficult to ensure a stable water supply for future needs. The rehabilitation of aging infrastructure and the construction of new dams and bore holes are often seen as solutions, but these measures alone are insufficient without considering the broader ecological impacts and the need for integrated management approaches : Effective governance is crucial for sustainable water management, yet it often faces numerous obstacles. Unclear leadership and responsibilities, lack of funding, and insufficient stakeholder participation are common governance issues that hinder the implementation of sustainable water management practices.

More so, the lack of uniform guidelines and cost data on sustainable solutions further complicates efforts. Governance structures that engage stakeholders and promote participatory decision-making are essential for overcoming these challenges. Water scarcity is a pressing issue in many regions, exacerbated by uneven spatial and temporal distribution of freshwater resources. This scarcity is often coupled with poor water quality, which poses a threat to human health and ecosystems. Ensuring equitable access to clean water for all stakeholders, including aquatic and terrestrial ecosystems, is a significant challenge. Addressing these issues requires integrated management and innovative solutions that consider the interconnectedness of water systems at multiple scales. Economic disparities and social factors also play a critical role in water resource management. In many parts of the world, economic development and urbanization increase the pressure on water resources. The need for better living standards drives higher water consumption, further straining available supplies. Additionally, the lack of investment in water infrastructure and the need for better pricing mechanisms to reflect the true cost of water use are significant challenges that need to be addressed. To achieve sustainable water resource management, integrated and participatory

approaches are essential. These approaches involve considering the various levels of water management, from local to basin scales, and incorporating the needs and inputs of all stakeholders. Solutions must be scalable and adaptable to different regional contexts, taking into account the specific challenges related to water scarcity, climate, governance, and population requirements. Sustainable water resource management faces numerous challenges, including

population growth, climate change, governance issues, water scarcity, and economic and social factors. Addressing these challenges requires integrated, participatory approaches that consider the interconnectedness of water systems and the needs of all stakeholders. By fostering collaboration and innovative solutions, it is possible to move towards a more sustainable and equitable management of water resources.

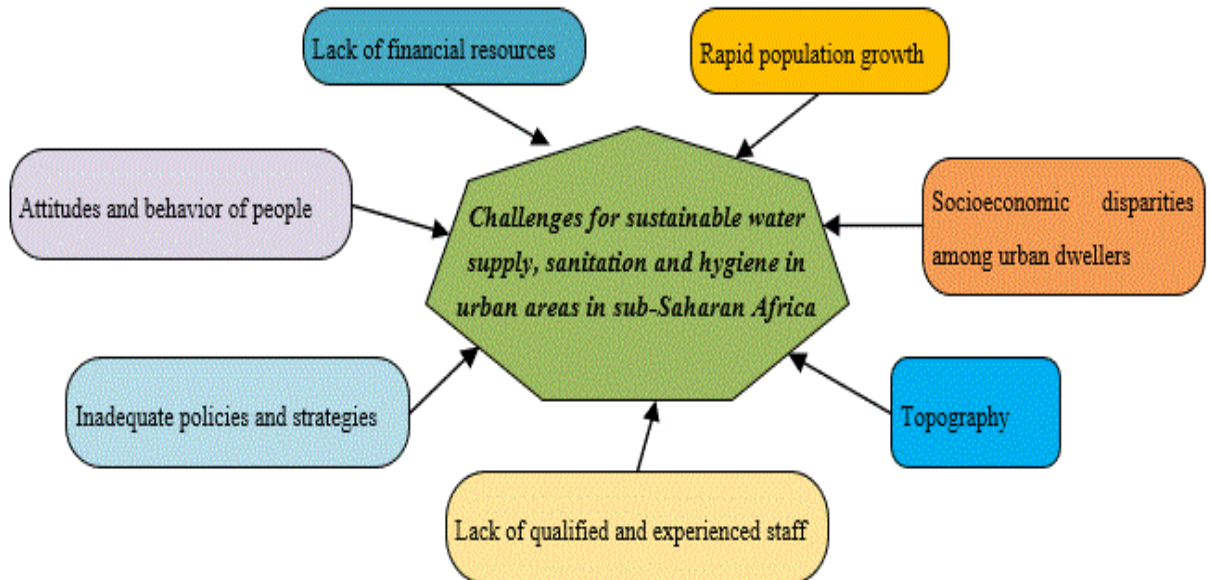


Figure 1. Challenges for water supply and sanitation in urban Sub-Saharan Africa



Figure 2. Challenges of water crisis in Africa .coined from Matthew Adah Onu et al, [Environmental Challenges](#) .Volume 11, April 2023, 100686

III - Conclusion

Rapid global population growth, industrialization growth are the main drivers of the quality of freshwater in the African continent. The global WW production has been estimated to be $\sim 360 \text{ km}^3/\text{y}$, with an average of 60% being collected and $\sim 50\%$ treated yearly, leaving the untreated WW to be discharged into waterways and thereby creating health issues, environmental and climate-related threats, African countries need to adopt comprehensive water management approaches that include implementing sustainable policies, strengthening water infrastructure, promoting water conservation, efficient water use, and regional cooperation to manage cross-border water resources jointly and fairly if they are to tackle these challenges. In addition, public awareness of the importance of water and the active participation of local communities are also crucial to achieve more effective, sustainable water management in the continent.

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