






## Africa, Water and Climate Change

Ciprian-Benjamin Benea<sup>1</sup>   
Adina Sacara Onita<sup>2</sup>   
Andra-Teodora Porumb<sup>3</sup> 

Received: August 29, 2023  
Revised: December 6, 2023  
Accepted: January 4, 2024  
Published: March 16, 2024

### Keywords:

Access to water;  
Colonial inheritance;  
Dams;  
Population;  
Water stress



Creative Commons Non Commercial CC BY-NC: This article is distributed under the terms of the Creative Commons Attribution-Non-Commercial 4.0 License (<https://creativecommons.org/licenses/by-nc/4.0/>) which permits non-commercial use, reproduction and distribution of the work without further permission.

**Abstract:** *This paper aims to bring to the European audience the importance of connections between water and climate change on the African continent; even though this continent could be regarded as somewhere in the southern hemisphere, the globalized world we already live in proves the contrary. In fact, it is very close to us. As population dynamics will put higher pressures on available natural resources in Africa, the migratory pressure from that continent, which already is felt on the European continent, not only could bring social or political upheavals there, but it could complicate the socio-economic equilibrium closer to us. Furthermore, in the context of climate change, there are needed some measures to be taken in order to prevent such a scenario from taking place. And among other key resources, the most important, which is related to everything, is water; the way it would be used in Africa and how would it be distributed could make a difference.*

## 1. INTRODUCTION

Africa. First political geography: 55 countries belong to this continent, some of them being islands such as Comoros, Cape Verde, or Seychelles; but the list of big African players focuses on continental countries such as, among others, South Africa, Egypt, Ethiopia, DR Congo or Nigeria.

What is specific to this continent related to water is the fact that it is unequally portioned, with access to water being determined not only by economic or social determinants but also by climate and relief. In Africa, this vital resource is either *abundant* or *scarce*, depending upon *region* and *season*. Everywhere, but especially in Africa – because of these specific traits – water is the most important element providing humans with life's necessities since, according to **U.N.E.P. (2010)** over “40% of Africans are located in arid, semi-arid regions or dry sub-humid areas, and about 60% live in rural areas” (p. x), depending directly on farming for their livelihoods. If we focus for example upon Ethiopia, also known as “Africa’s water tower”, **Swain (1997)** points to the enormous precipitation volumes in its northern, central, and southern regions, but the rainfall’s unpredictability and variability make difficult the efficient use of this huge amount of water (p. 675-694). The specific position of Ethiopian hydrology states **Verhoveven (2021a)** “resembles that of the continent as a whole” (p. 159).

To put things more specific and pressing, in the context of climate change and population evolution, over this natural trait, there is another trait, that has been brought upon the African countries by historical evolution; there manifests nowadays the influence of colonial past and power relations between African countries and political centers of power located far away from Africa.

<sup>1</sup> University of Oradea, Universitatii no.1, Oradea, Romania  
<sup>2</sup> University of Oradea, Universitatii no.1, Oradea, Romania  
<sup>3</sup> University of Oradea, Universitatii no.1, Oradea, Romania

For this reason, it is important to remember always what [Swyngedouw \(2004\)](#) mentioned, describing the connection between the flows of water and those of power: the “metabolisms of water are structured and organized through... relations of domination and subordination, access and exclusion, of emancipation and repression” (p. 29). These are the main factors that make unequal access to water a specific trait of the whole African continent and African countries.

Already mega-cities in the developing world are haunted by immense water shortages, and population dynamics will only add complexity in administrating these cities and their societies. As [World Population Prospects 2022 \(U.N.D.E.S.A., 2022\)](#) show, more than half of the projected increase in global population up to 2050 will be concentrated in 8 countries, 5 of them on the African continent: DR Congo, Egypt, Ethiopia, Nigeria, and Tanzania; the population of countries located in Sub-Saharan Africa “are expected to continuous growing through 2100 and to contribute more than half of the global population increase anticipated through 2050” (p. i).

Another point to be brought to the reader’s attention is related to deficient access to water and poor water quality in Africa, both of them being directly related to different human diseases; in the meantime, it is expected that waterborne diseases would come and hit again, stronger, especially in the context of climate changes. Yet another aspect is related to the technological leap encountered on African rivers during the second part of the last century: it manifests because of large infrastructure projects built – with dams as their core element – as on African rivers there have been encountered multiple negative consequences, among them mentioning the destruction of fishing industries, erosion of the shoreline, degradation of aquatic systems, degradation of living standards for riparian communities, and an increase in waterborne diseases ([Isaacman & Musemwa, 2021, p. 13](#)).

Africa in the years to come will bring together a very *dynamic population* with fast-growing cities, a complicated *colonial inheritance* that has influenced and will determine the social and economic disparities as they are reflected in access to water and its distribution, *human diseases* due to both poor access to water and sanitation and to waterborne pathogens, *technological changes* due to large infrastructure projects aimed at controlling the flow of water, all in the context of *climatic changes* which only add complexity to this framework.

Having these in mind we can ask if there could be any sustainable solution to this problem? Is water a free resource to be provided by the state to its citizens, or water privatization and commodification could be part of a solution for water availability; could be there a magic formula or framework for all African countries, or are there better some local solutions to be identified?

## 2. PREVIOUS EVOLUTIONS

### 2.1. Dams

In Africa, as in other parts of the world, water resource development in the second half of the last century was concentrated on technical and economic aspects, in search of some specific economic gains, as [Tickner et al. \(2020\)](#) mentioned. Until the beginning of this century, scant attention was given to the ecosystems by most promoters of big water infrastructure projects, as financiers, developers, and politicians: the way of thinking of these promoters was one of available resources exploitation, all aiming to cover the rising demand for water, food and energy; little or no attention was given to nature, flora and fauna, or to the multitude of benefits they provide to society at large. As a consequence, the costs of such projects were thought to be only

those connected to construction, maintenance and operation, with social, and ecological costs, and landscapes' destruction being overlooked.

Even these actions were taken with such a magnitude that today there are in the world about 58000 large dams and smaller dams in the number of hundreds of thousands supplying sanitation, pipelines with water sustaining homes and businesses, and irrigations systems, around 65% of world population has to cope with water shortages at least one month yearly and around 2 billion people living with risks due to severe water scarcity; in Africa, South of Equator there are chronically over-busy water systems as a result of fast-growing population, generally speaking, and in urban areas, especially. In Africa, the population is around 1.5 billion (17% of the world population, respectively) while over the 80 years ahead it is expected to get to 2.5 billion, or 40% of the world total (King & Brown, 2021, p. 241).

Related to dams, all disrupt natural river flow, negatively influencing riparian ecosystems. For example, such a (large) dam could store waters from floods during seasonal high precipitation patterns, while downstream of it, floodplains or meadows wouldn't get sufficient amount of water to sustain habitat and grazing for wildlife and livestock. Furthermore, some fish species that need to move upstream for spawning or to cross downriver closer to the sea cannot cross it, and in time their number decline. Another important aspect is that connected to a relatively constant river flow during the year, which could push for favorable conditions that some plants or fishes would increase to a level that could be harmful. Sediments, which in normal conditions would move down the river together with water flows, are stored behind the dam and poor sediment water flow erodes the downstream riverbed and its shores, with direct negative consequences for gene pools (Zdankus et al., 2008, p. 130).

Africa boasts large dams, most of them dragging ecological and social problems; Cahora Bassa Dam on the Zambezi is regarded according to Davies et al. (2000, p. 2) as the "least environmentally acceptable dam project in Africa". Grand Ethiopian Renaissance Dam under construction triggered political and social movements both, in the damming country (Ethiopia) and downstream Egypt.

## 2.2. Colonial Inheritance

As dams that were built in Africa reflected the world political economy and power relations among main centers of world power specific to the second part of the last century, the colonial past determined – during the colonial era – and after it, the way water can be used, or abused, in Africa.

Water systems in Africa were designed and built by colonial centers with some specific peculiarities in mind: race, gender, geography and other elements of segregation were present in plans of colonizers in African colonies; related to access to water, Musemwa (2021) points that "infrastructure was designed to serve primarily White settlers while Africans living in segregated and overcrowded townships received limited amounts of water and sanitation services" (p. 27). Forty years after Zimbabwe's independence, the inherited unequal distribution patterns of water and sanitation manifests itself, too. Furthermore in Tanzania, Dar es Salaam repeats the same scenario: according to Bender (2021) this city is "a segregated urban space" with three concentric zones (p. 50); today it is the world's second fastest growing city with a population of over 6 million. And this is normal all over Africa. Colonizers settled the direction for water distribution, and consumption patterns, while native Africans had to comply...

If we go on further, development schemes in most African countries were realized in such a manner that health hazards have come with them and a lot of people felt on their bodies the “effects” of this top-down built civilization, as is indicated by [Livingston \(2021\)](#) and [Derr \(2021\)](#), who point to the fact that these actions haven’t taken into account the peculiarities of local/regional environment and how society was adapted to it.

Having these premises in mind, and the evolution of people living in African cities in the future, climate changes come to add a new layer of uncertainty, threatening lives and livelihoods, especially for those with low income; already the poor have disproportionately borne the impacts of climate crisis because of seasonal weather changes, waves of high temperatures, followed by floods and droughts ([McCarthy, 2020](#)).

### 3. HUMAN RIGHT TO WATER OR WATER’S COMMODIFICATION

Two opposing principles and frameworks stay here face-to-face. One regards water as a gift of divinity to serve and sustain all life on Earth, including humankind, the other says that the economy and market should moderate access to water, while pricing this good would contribute to a rising efficiency in its use and to its fair distribution. One is related to natural rights with its core element – life – and the other to neoliberal thinking, with its core elements: price and efficiency. One is related to common sense, the other to economic liberalization and free-market competition emanating from Chicago Schools and institutions such as the International Monetary Fund and the World Bank. He who has access to water – even if he must pay a price that is accessible for it – does not think too much (or at all) at these two different principles and possibilities, but one who must pay a *large* share of personal (family) income or spends a lot of *time* for getting access to water, sees things in a very different way.

As access to piped water is a luxury for a great part of native African city dwellers, private water vending has appeared as a solution and has become a marking part of the waterscape on the continent; but it comes with deleterious negative consequences: private water is *expensive*. The cost of water sold by vendors “can be as much as thirty times the price of water from a piped connection” ([Bayliss & Tukai, 2011, p. 18](#)). Prices vary very much depending on location, if fetching is necessary, and supply and demand, spiking during periods of scarcity. As a consequence, consumers in the poorest neighborhoods must pay the highest prices for access to needed water, and spend much time fetching it.

Lower water consumption per capita means poor sanitation and hygiene, posing great health risks, especially during rainy seasons, because of possible contamination of water sources from flood-water “invading” those poorly protected sources. Furthermore, in case one has a sick person in the family who lies in bed all the time, the excruciating question appears: should the so expensive water be used to clean the bed and wash the sick person, or save that water for drinking and cooking for the rest of the family? The greatest negative aspect of water’s private vending is the commodification of basic human rights; the most impacted is the poorest part of the urban population, perpetuating economic fault lines already existing and social inequalities. Even educational fulfillment can be strongly influenced by access to water: poor and expensive access means lower time and money for aspirants to education over the basic standards, further perpetuating social disparities.

If the availability of water is a more stringent issue in Middle Eastern countries than in Africa, being overcome through investments and facilitating access, in Africa the *scarcity* is at the

center of the water crisis, being connected to power relations, poverty, and inequality, and not to its physical existence. Rising population and rapid urbanization in Africa coupled with climatic shocks could generate great problems on the continent; climate changes can exacerbate already manifesting drawbacks: Africa has the greatest number of least-developed countries than any other continent, the poorest water infrastructure, and the highest proportion of population highly dependent on weather conditions as they live in the countryside. Specifying that on the African continent lives the largest pastoralist community on Earth – around 20% of its population (Verhoeven, 2021b, p. 260) – increasing disorderly precipitation patterns would be extremely stressful for it, and urban dwellers.

Migration towards urban centers in Africa is not a transitory phenomenon but one structured in the world political economy, African countries strive to develop and industrialize fast, their actions being promoted by their new supporters – China, India, and the Russian Federation. So, urbanization is not a transient phenomenon in Africa; it is influenced by birth rate and urban advantages versus rural poor development; but it could become unsustainable in case of quick and dramatic climatic shifts when rural and pastoralist populations would forcefully and chaos migrate towards the already overcrowded cities with an already poor water and sanitation infrastructure. Diseases, mass starvation, social upheaval, and dramatic political changes could be routine scenarios in some parts of the continent. In such a case it can be seen that the question related to mass migration inside Africa, and beyond its limits, towards an already fragile continent – Europe – could become a daunting reality.

In the past period colonial regime determined the way water infrastructure was conceived, while after gaining independence African countries had to strive with the requirements emanating from the International Monetary Fund's neoliberal doctrines where anything has a price based on market peculiarities, water being no exception. In a lot of countries cost recovery related to provided water, and the privatization of companies and services related to water have been contested and protests have taken place against such a policy, as it hasn't succeeded in delivering sufficient water to poor dwellers; Isaacman and Musemwa (2021) mentioned that “market-determined reforms within the water supply domain became one of the critical factors that helped create patterns of unequal access to water.” (p. 11).

As in other parts of the world, in African countries, there is a linkage between water commercialization and openness to world investors and companies activating in water areas in order to be *competitive* (another key-aspect of neoliberal doctrine) in a globalized economy, and the rising household number cut from the water system, especially in poorer areas, as a result of non-payment of bills. We can note that solely market-based solutions simply do not function in providing access to water for all the people – especially to the poorest – raising serious questions about the human right to a sufficient amount of water to ensure health and life quality. In some cities' poorer areas, the price of water can be four times as much as it costs in wealthy neighborhoods (Livingston, p. 94), while Adams et al. (2019, p. 248) mention that in “Nairobi, consumers pay ten times as much for vendor-delivered water than for water piped into private homes”.

So, the way access to water regarded as a human right, not as a marketable commodity, will be provided, will influence the stability and smooth working of African states and societies, but there is no unique solution for that. The solution must take into account not only economic development but also environmental protection, the river system's conservation, and cultural continuity for African communities.

## 4. POSSIBLE SOLUTIONS

A water crisis triggered by climate modifications looms over 25% of humankind; this will bring economic problems (poverty), natural problems (environmental breakdowns or degradation), and socio-political (weakening of already fragile governments). And the continent which has already strongly borne the effects of global warming is Africa; water insecurity has become an existential crisis for a lot of Africans and as [Isaacman and Musemwa \(2021\)](#) mention, nowadays around 1/3 of “Africa’s people live in regions prone to droughts and semi-aridity (p. 9); intensifying climate change has put the number of Africans at risk at 325 million.

Changing rainfall patterns have already negatively influenced the quantity of available water, nature fully feeling it, and people’s lives being stressful; food shortages have intensified as soil erosion manifested, while the spread of diseases overlaps this daunting scenario; mass migrations says [Yamba et al. \(2011, p. 620\)](#) are already common things in Africa.

What we can strongly affirm from the beginning is that there is no unique solution to cope with the stressful events we are expecting in Africa; climate change, rising population, and urbanization, coupled with inherited inequality in African society are and will remain pressing problems. As water is so important for energy, agriculture, industry and urban life, and for ecosystems, the way *local or regional solutions* related to its use and distribution are to be found, the more resilient society would be and the economic development would head on a sustainable path.

To cope with these negative phenomena one must not repeat the mistakes of the past; as in the past economic and technological aspects imposed solutions taken from top-down, in order to give a chance to sustainable development, the environment with its components and socio-cultural elements must take the center of the debate. Economic models should be included in a larger framework that should become eco-social, reuniting specialists from the economy, technology, hydrology, and specialists in public and livestock health, social and cultural areas and resource economics. All these reunited should think of projects which are best fitted from the local or regional point of view. Regional implications should be analyzed especially when it is about international river basins and when there are intended to be built storage capacities such as dams, whose storage capacity could harm hard downriver countries.

### 4.1. Ecological integrity

Having this on the decision’s desk means that the environment is no longer seen as being exploitable without any care, just to generate huge profits for a few, while the river per se and all which depends on its natural flow would support all negative influences. River development must take care of its natural flow pattern, life (of plants, animals, and fishes) it sustains, communities’ culture, and social patterns as they were determined by historical experiences directly influenced by that specific river; in case a river crosses national borders, smart decisions must take care of downriver riparian states. The environment and river’s water at large should not be seen as resources ready to be exploited, but as key support systems that are fast degrading.

### 4.2. Social equity

Access for all people at affordable costs should be the new framework for decision-making. As urban spaces expand, water infrastructure should be there, too, facilitating this expansion, but not

based on past thinking patterns with spatial (and water) segregation, but on a more equalitarian basis; access to water should become a key human right. Without such an approach, informal dwellings without connection to the water network will bear the brunt of costs related to the high price of water or time loss generated by fetching this vital resource, while deprivation brought upon by them will impede upward social mobility for a lot of people. In another way, the perpetuation of inequality with all that it means will be the main trait; in this case, one cannot speak about social equity.

### 4.3. Economic wealth

As a continent that boasts a dynamic population rise, having a remarkable spirit of adaptation, while in an economic field, some countries have good perspectives, Africa should create such a framework related to the availability of water that thinking about how a household should decide the way it uses water it can get, disappears. Water is central to life and to all economic activities; creating equitable access to water will contribute to the bill's value reduction (as a percentage of income), the remaining part of income being used for other goods and services, rising demand for them, possibly resulting in greater production capacity, higher incomes, lower unemployment, and much better economic perspectives.

## 5. CONCLUSION

We can already see and say we live in a world with water scarcity, especially in some areas, which in a lot of cases are the poorest; so the poor will bear the most negative impacts of climate changes reflected in lower water availability. Population dynamics, especially in those specific poor areas, seem to register spectacular growth in years to come; Africa is and will be at the intersection of water stress and rising population, with ever larger urban centers (formal and informal). If there are not found sustainable solutions for facile access to water in African countries, climate changes – which will only exacerbate these trends – will bring with it not only water stress but famine and diseases, which already are, unfortunately, part of normal life in a lot of African countries. Migration inside Africa and beyond its margins towards Europe can be a plausible scenario.

In order to prevent that, a new way of thinking is necessary, one that is different from that of the past where top-down decisions were taken by a few to the detriment of most people which had become after project fulfillment, societies in distress and prone to illnesses (mental or physical).

Bringing water from the countryside could be a solution that could be coupled with larger infrastructure projects (dams or dykes); successful water development projects must be found at the crossroads of formal and informal, connecting large-scale projects with small(er) projects which would be community-based. Community experiences based on the long history of those who lived in the countryside – and who have carried these experiences with them as collective memory – would bring more resilient solutions for future problems related to water stress and food shortages. Furthermore, differential use of water concerning its final use could be a sustainable solution in the years ahead; clean/bottled water could be used for drinking or cooking, used water could be used for irrigation, non-drinkable water could be used for washing toilets, sewage, clothing, house or car washing. The existence of multiple sourcing can be the key-element here: water networks providing homes with drinkable water brought from rivers' reservoirs or underground aquifers could be supplemented with boreholes and storage capacity for raining water, or with vending water. In case one source is not available, there could be other temporary options, but this *diversity* can make a great difference between thirst and how to quench it,

diminishing the possibility of diseases' spreading, avoiding social collapse and even contributing to economic performances' rising.

As we can see, Africans have a remarkable spirit of adaptation, and bringing in the decision-making process this experience from grass-root can generate better and more sustainable solutions.

## References

- Adams, E. A., Sambu, D., & Smiley, S. (2019). Urban Water Supply in Sub-Saharan Africa: Historical and Emerging Policies and Institutional Arrangements. *International Journal of Water Resources Development* 35(2), 240-263.
- Bayliss, K., & Tukai, R. (2011). *Services and Supply Chains: The Role of the Domestic Private Sector in Water Service Delivery in Tanzania*. New York, UNDP.
- Bender, M. V. (2021). Water for Bongo: Creative Adaptation, Resilience & Dar es Salaam Water Supply. *Daedalus*, 150(4), 48-63.
- Davies, B. R., Beilfuss, R., & Thoms, M. C. (2000). Cahora Bassa Retrospective, 1974-1997: Effects of Flow Regulation on the Lower Zambezi River, *Verhandlungen* 27 (4), 1-9.
- Derr, J. L. (2021). The Dammed Body: Thinking Historically about Water Security & Public Health. *Daedalus*, 150(4), 143-157.
- Isaacman, A., & Musemwa, M. (2021). Water Security in Africa in the Age of Global Climate Change. *Daedalus*, 150(4), 7-26.
- King, J., & Brown, K. (2021). Africa's Living Rivers: Managing for Sustainability. *Daedalus*, 150(4), 240-259.
- Livingston, J. (2021). Water Scarcity & Health in Urban Africa. *Daedalus*, 150(4), 85-101.
- McCarthy, J. (2020). Why Climate Change and Poverty Are Inextricably Linked, *Global Citizen*, <https://www.globalcitizen.org/en/content/climate-change-is-connected-to-poverty/> (July 5, 2023).
- Musemwa, M. (2021). Urban Struggles over Water Scarcity in Harare. *Daedalus*, 150(4), 27-47.
- Swain, A. (1997). Ethiopia, the Sudan, and Egypt: The Nile River Dispute. *The Journal of Modern African Studies*, 35(4), 675-694.
- Swyngedouw, E. (2004). *Social Power and the Urbanization of Water: Flows of Power*. Oxford, Oxford University Press.
- Tickner, D., Opperman, J. J., & Abell, R. (2020). Bending the Curve of Global Freshwater Biodiversity Loss: An Emergency Recovery Plan. *BioScience*, 70(4), 330-342.
- U.N.D.E.S.A. (2022). *World Population Prospects 2022. Summary of Results*. New York, United Nations.
- U.N.E.P. (2010). *Africa Water Atlas*. Nairobi, United Nations Environment Programme, Division of Early Warning and Assessment.
- Verhoeven, H. (2021a). The Grand Ethiopian Renaissance Dam: Africa's Water Tower, Environmental Justice & Infrastructural Power. *Daedalus*, 150(4), 159-180.
- Verhoeven, H. (2021b). Climate and Water in a Changing Africa: Uncertainty, Adaptation & Social Construction of Fragile Environments. *Daedalus*, 150(4), 260-276.
- Yamba, F. D., Walimwipi, H., Jain, S., & Zhou, P. (2011). Climate Change/Variability Implications on Hydroelectricity Generation in the Zambezi River Basin. *Mitigations and Adaptation Strategies for Global Change* 16(6), 617-628.
- Zdankus, N., Vaikasas, S., & Sabas, S. (2008). Impact of a Hydropower Plant on the Downstream Reach of a River, *Journal of Environmental Engineering and Landscape Management*, 16(3), 128-134.