**AFRICA: when climate change accelerates water stress!**

**We have been talking about water stress for several years now. Although it depends on natural causes (population growth, deforestation, pollution, etc.), climate change has quickly accelerated this phenomenon. The consequences are visible on the environment as well as on human activities. Fortunately, alternatives exist, notably desalination, which is attracting many investors**.

Unlike water scarcity, where the threshold is less than 1,000 m3, the World Health Organisation (WHO) declares a situation of water stress when the availability of water per year and per inhabitant is less than 1,700 m³. Sub-Saharan Africa is the region in the world with the largest number of countries subject to (affected by) water stress.

The phenomenon has become more severe in recent years due to human-induced climate change, says the Intergovernmental Panel on Climate Change (IPCC). Its disruptions are such that they are reducing the frequency and quantity of rainfall, plunging states into drought (drought in some countries). This means that water reserves cannot recharge as they should to maintain a hydrological balance.

The link is therefore quickly made, water stress is a manifestation of drought which is also justified by high temperatures, drying up surface waters.

**What are the impacts of water stress?**

The damage is visible at several levels. In the agricultural sector, water stress reduces plant growth and, in turn, the agricultural yields on which local communities depend. This has led to the unprecedented famine situation in certain countries on the African continent, notably Madagascar, where more than a million people are exposed in the south of the country, and Namibia, where nearly 350,000 people are threatened by hunger. The human consequences of water stress are also reflected in the occurrence of malnutrition-related diseases in children, such as stunting and wasting.

Water stress also leads to the overexploitation of groundwater for several uses, including human consumption, with a deterioration in the quantity and quality of the resource. This situation could favour the transmission of diseases to humans, in particular typhoid, poliomyelitis, hepatitis A and diarrhoea.

Wildlife is also affected. Also in Namibia, a report from the Namibian Ministry of Agriculture in April 2019 stated that 63,700 animals had died in 2018 due to the drought. A situation that prompted the government of (this) southern African country to auction off almost 1 000 wild animals in June 2019. The funds from this sale, approximately $1.1 million, were allocated to wildlife conservation.

According to the UN, by 2030, 75 to 250 million people in Africa, as well as animals, will be living in regions where water stress will be (is) high. To date, the most affected regions are Southern Africa, North Africa and East Africa.

**Southern Africa: Botswana, Namibia and Zimbabwe**

The Western Cape Province in South Africa is the one that is bitterly experiencing water stress in Southern Africa. In 2015, the phenomenon gave rise to 'Day Zero' (a period during which people collect 25 litres of water per day per person from public distribution points). Since then, the situation has not changed much given the climatic hazards that follow one another in the capital of the rainbow nation, with the direct consequences of an estimated economic loss of 5.9 billion South African rand (0.4 billion dollars), as well as 30,000 people forced into unemployment and a 13 to 20% drop in exports according to the World Wildlife Fund (WWF).

According to the Swiss-based environmental organisation, the impact of water stress is equally significant in Botswana. In this country, which is home to numerous species such as giraffes, cheetahs, hyenas and wild dogs, 68% of the country is covered by the Kalahari Desert, which regularly leads to a drop in the water level of the Gaborone and Nnywane dams. These two waterworks supply water to 17 districts, including those near the Okavango Delta on the border with Namibia. This other landlocked country in southern Africa has been coping on a daily basis with the low rainfall it has experienced in recent years (has been marked by low rainfall in recent years).

According to the International Federation of Red Cross and Red Crescent Societies (IFRC), the majority of the 11 million people affected by water stress live in the southern part of the African continent. This is the case in Zimbabwe where scarce and late rains, combined with long-term increases in temperature, have caused cereal production to fall by 53%.

**North Africa: Morocco and Egypt**

North Africa is also suffering from water stress, particularly in Morocco, the most affected kingdom in the Maghreb, with only 500 m3 of drinking water per inhabitant per year, compared to 2,500 m3 in 1960, according to the United Nations (UN). This figure is below the recommended 1,000 m3 of water per capita per year. In 2015 and 2016, for example, the scarcity of rainfall has strongly affected the natural aridity of certain regions of the Cherifian kingdom, such as the Rif, Rhamma and Drâa-Tafilalet, where the city of Zagora, with a population of more than 152,000, is located.

In this kingdom where the semi-arid climate is characterised by alternating wet and dry years, the National Office of Electricity and Water (ONEE) has identified 53 urban centres with a deficit in 2021, i.e. 7% of the drinking water network managed by the office, and 22 centres exposed in 2022. According to the Water Information Centre based in Paris, France, only the cities of Marrakech in the south and Oujda in the east have had recourse to groundwater to ensure their water supply since December 2021.

In Morocco, agriculture is also threatened by climate change. The phenomenon is degrading the soil and drying up water resources, which are essential for agriculture. According to the French Development Agency (AFD), this near-death situation is due to an average temperature increase of 20% above the global average. According to the Paris-based financial institution, the situation is expected to worsen in the coming years in Morocco and elsewhere in the region. For its part, the Mediterranean Expert Network on Climate and Environmental Change (MedeCC) predicts a temperature of +2.2°C by 2040 and up to +3.8°C in some countries, such as Egypt, where drought does not facilitate the supply of water to local populations.

The country of the Pharaohs has also led a military intervention against Ethiopia over the construction of the Renaissance Dam. Egypt and Sudan fear the consequences of the dam, which will store 10 million m3 of water on the flow of the Nile, a river that is essential for drinking water supply and irrigation in both countries.

**East Africa: Ethiopia, Kenya and Somalia**

Ethiopia, like Kenya and Somalia with which it forms the Horn of Africa, is subject to extreme heat. However, the prolonged droughts that affect this eastern part of the continent are also affecting the food security of 25 million people, according to the UN Food and Agriculture Organisation (FAO). In Kenya, for example, water stress is driving migration from rural to urban areas, increasing pressure on "already inadequate" urban water supplies, says the Organisation for Economic Co-operation and Development (OECD) in its 2021 report Water Governance in African Cities. The French-based institution cites Mombasa County, a four-hour drive from the capital Nairobi, where water stress has driven up food prices for 1.2 million people since 2021. This precariousness in Kenya is also noticeable in Uganda. The two countries that share Lake Victoria are also experiencing tensions over transboundary water. Conflicts that have intensified with the drought that has reduced the resource. A peace dam was commissioned in September 2021 in Kases, on the border between Kenya and Uganda.

1200 km away, Somalia experienced an unprecedented heat wave in March 2022 which displaced 17,000 people, most of whom are deprived of shelter, drinking water and food resources. The phenomenon of water stress has already affected the fauna and flora of certain areas in the south of the country, particularly in Mogadishu, the capital, and in Baidoa in the Bay region. Yet Somalia, with a population of 16 million, is constantly faced with poverty, limited access to services, conflict and climate-dependent livelihoods.

*"The rate of people with safe access to drinking water has only increased from 17.9% to 23.7% in sub-Saharan Africa since 2000. And water stress is expected to worsen,"* says the UN.

Although West Africa is less affected than the rest of the continent, water stress nevertheless affects some countries in the region, notably Burkina Faso and Niger, but even more so Mauritania. In this Islamic Republic, rural areas are experiencing drought episodes that manifest themselves in irregular rainfall. According to the African Development Bank (AfDB), Nouakchott's daily drinking water needs are 100,000 m3 , while the production of the Mauritanian National Water Services Office (ONSER) does not currently exceed 55,000 m3 per day. Indeed, Mauritania is supplied by a single water table, located in Trarza in the southwest.

**Exploitation of non-conventional water resources**

To overcome water stress, several African countries are opting for rainwater harvesting, water resource rationalisation, seawater desalination and the reuse of treated wastewater (Reuse). These alternatives, although unconventional, are helping to quench the thirst of many populations on the continent. Desalination is a process by which brackish or salty water is transformed into fresh water. This process is applied in desalination plants that treat water pumped from the sea or from salt lakes without overexploiting groundwater. One desalination technique widely used by plants in Africa is reverse osmosis, which is based on the principle of salt-water separation using a semi-permeable membrane. Wastewater treatment is also an essential lever for meeting water demands for domestic (watering of green areas, cleaning of public spaces), agricultural (irrigation) and industrial (supply of air conditioning and cooling systems) uses. Increasingly, such facilities are being built to counteract water stress.

**Morocco**

This is the case of the Agadir desalination plant in Morocco, currently under construction, with an expected capacity of 275 000 m3 per day. Part of the treated water, i.e. 125,000 m3 per day, will supply an irrigation system in the Chtouka plain, in the centre-west of the country.

At the same time, the Moroccan government wants to create a 5,200-hectare area irrigated with desalinated seawater in the Dakhla-Oued Ed-Dahab region of Western Sahara. To achieve this goal, Morocco's Agricultural Development Agency (ADA) has announced that it will set up a public-private partnership (PPP). The future perimeter will be created from the desalination of sea water in Dakhla. A new wind-powered plant will be built in the region by Dakhla Water & Energy Company (DAWEC), a joint venture between International Power, the subsidiary of the French group Engie, and Nareva, the subsidiary of the Moroccan group Al Mada. According to the Moroccan Ministry of Agriculture, Maritime Fisheries, Rural Development and Water and Forests, the majority of the water treated by this desalination plant, i.e. 30 million m3 per year, will be used to irrigate agricultural land. The other part of the production, i.e. 7 million m3 per year, will be used to supply drinking water to the city of Dakhla.

To alleviate water stress and improve water supply to the population, Morocco is also banking on Reuse. To this end, the authorities of this North African kingdom intend to mobilise 2.34 billion Moroccan dirhams (nearly 220 million euros) between now and 2025 for the implementation of the National Shared Liquid Sanitation Programme (PNAM). The programme aims to recycle wastewater for the irrigation of green spaces and crops in the face of water stress. Specifically, Morocco plans to implement 65 resilience projects to provide 100 million m3 of treated wastewater to Moroccans per year by 2027. By 2050, this figure is expected to rise to nearly 340 million m3 per year, representing an 80% treatment rate in Morocco. According to the forecasts of Amendis, which provides the public water and sanitation service in Tangiers, the reuse of treated wastewater in the port region will make it possible to save 2.8 million m3 of water by 2023.

According to the local subsidiary of the French group Veolia, this water will be compensated by treated wastewater dedicated to watering green spaces. Moreover, Amendis began the "reuse" since 2016 with the rehabilitation of the first wastewater treatment plant of Boukhalef with a capacity of 11,000 m3 per day. For the period from 2023 to 2024, the company plans to expand this irrigated area through the construction of a new 18,000 m3 per day treatment plant in the rural locality of Bougdour.

Other solutions being experimented with by the Kingdom of Morocco are rainwater harvesting, notably in Tadla, a region located in central Morocco. The Moroccan government also aims to build 20 dams to store rainwater, as part of the PNAM launched in January 2020. In the kingdom, restrictions are also imposed on water consumption for irrigation. The objective is to save 2.5 billion m3 by 2030.

**Egypt**

Egypt is also following the lead of non-conventional alternatives to challenge water stress. In July 2020, for example, the Egyptian government launched a 45.18 billion Egyptian pound, $2.8 billion five-year plan to build 47 seawater desalination plants. The initiative is aimed at exploiting unconventional water resources to preserve the dwindling freshwater resources in the land of the pharaohs. This project is part of the Public Policy and Citizen Dialogue Support Facility, an initiative financed by AFD.

In September 2022, the Egyptian company Tatweer Misr announced that it was going to equip the Fouka Bay hotel complex located in Ras El-Hekma with two new plants, one dedicated to wastewater treatment with a daily capacity of 2 800 m3 and a second using reverse osmosis (7 000 m3) to desalinate sea water. The water from these installations will be used to operate the establishment that it built itself on the northern coast of Egypt.

As in Morocco, the land of the Pharaohs also charges for water used for irrigation. Farmers in the North African country will pay about $16 (250 Egyptian pounds) a year, or more than $79.6 (1,250 Egyptian pounds) in five years, for a licence to operate.

**Southern Africa (South Africa, Botswana and Namibia)**

According to a report published by Research and Markets in March 2021, the global desalination market will be worth $32.1 billion by 2027. South Africa is aiming to be part of this, despite the fact that the Desalination Africa investment conference held in Cape Town in November 2022 confirmed that surface water resources are becoming scarce in the Rainbow Nation. Faced with water stress in South Africa, some companies have turned to seawater desalination to supply their plants. This is the case for Lucky Star, a manufacturer of canned fish. The company has acquired two desalination plants built by the South African company ImproChem in partnership with Suez Water Technologies & Solutions, a subsidiary of the French group Suez. The two plants provide 624 m3 of fresh water per day.

Neighbouring Botswana (which has no maritime border), for its part, wants to take advantage of a seawater desalination plant project in the town of Walvis Bay, located to the west of Namibia. The project involves pumping water from the Atlantic Ocean and treating it via a large desalination plant built in the port city. The water will then be used to supply the capital Gaborone in Botswana and Windhoek in Namibia, where droughts are also causing groundwater and surface water to dry up.

 To cope with this, small desalination units are increasingly being built in several Namibian localities to supply the population. It is in this context that the state-owned Namibia Water Corporation (NamWater) recently commissioned the Bethany brackish groundwater desalination plant in the //Kharas region. The plant, which has a capacity of 487 m3 of drinking water per day, has equipment that can operate during periods of power shortage thanks to solar panels. At a total cost of N$37 million (US$2.3 million), NamWater was supported in the implementation of this project by the Desert Research Foundation of Namibia (DRFN), the Adaptation Fund (AF) and the Multilateral Environmental Agreements Division of the Namibian Ministry of Environment, Forestry and Tourism. In terms of wastewater, the southern African country is the first on the continent to recycle it into drinking water.

In the Namibian capital, Windhoek Goreangab Operating Company (WINGOC), a subsidiary of the French giant Veolia, has been operating a system for reusing treated wastewater for 50 years. In this system, the treated water is injected directly into the drinking water network.

East Africa is not left behind in the rush to find alternative solutions to water stress. Like Morocco, Tanzania is relying on rainwater harvesting to supply farmers, livestock keepers and households in times of severe drought.

In August 2022, the government launched a project to build ten dams to store rainwater in the Dodoma and Singida regions.

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