

# SENEGAL WATER SECURITY

## EXECUTIVE SUMMARY

*Water security is “the availability of an acceptable quantity and quality of water for health, livelihoods, ecosystems and production, coupled with an acceptable level of water-related risks to people, environments and economies.”<sup>1</sup>*

## WATER SECURITY KEY FACTS IN SENEGAL



**Senegal is already water stressed** and current water withdrawals are projected to increase by 30 to 60 percent by 2035



**Water-related extreme events and pollution** already cost Senegal over 10 percent of GDP every year, **threatening the country's ambition to become an emerging country**, even more so following the COVID-19 pandemic



**The Dakar area is especially at risk**, concentrating 50 percent of Senegal's GDP production and close to a third of its population, and will need to diversify water sources and improve cross-sectoral coordination



**Senegal urgently needs to prioritize water security** to achieve and sustain its development objectives (PSE)

<sup>1</sup> Grey and Sadoff 2007.

**1 Water security is the bedrock of Senegal's development and key to its socio-economic development goals.** Water security depends on the management of water resources for service delivery and risk mitigation. While the national socio-economic development plan (Plan Senegal Emergent - PSE) aims to mobilize "abundant, good quality water for all, everywhere and for all uses, in a healthy sustainable living environment, for an emerging Senegal" by 2035, it does not take into account constraints linked to water resources availability or management. Against this backdrop, the Government of Senegal, through the Ministry of Water and Sanitation (MEA), requested World Bank support to carry out a study on water security. This study first assesses the attention given to water resource management at the national level and identifies barriers to achieving water security, building on an overview of available resources and the institutional framework. It then takes a closer look at the Greater Dakar region where achieving water security will be most critical to development.

**2 Deteriorating water resources and an inadequate institutional framework are threatening water security in Senegal.** This study shows that the steadily decreasing water availability per capita already falls below the 1700 m<sup>3</sup>/capita/day threshold, under which a country experiences periodic water stress. This average situation of water resources in Senegal masks very significant geographic and temporal variations, meaning that water availability does not necessarily coincide with demand and makes meeting growing water needs sometimes complex, difficult and expensive. This situation is compounded by the degradation of water quality, significant spatio-temporal variability, limited exploitability – both technical and economic –, the largely transboundary nature of water resources, and climate change trends. Surface water represents the majority of renewable resources (about

90 percent) and is the main water source for agriculture, but already fails to meet associated uses in dry years, especially irrigation water demand in the Senegal River Basin during the dry season. Groundwater supplies 85 percent of potable water and most industrial uses but is threatened by overuse and pollution. Current water withdrawals are projected to increase by 30 to 60 percent by 2035, further exacerbating water stress and straining the country's ability to meet the water demand of a quickly urbanizing population and achieve its socio-economic development goals.

**3 Water insecurity poses serious constraints on the country's economic growth and the COVID-19 crisis further heightens the urgency.** Today, the cost of the water resources management status quo already impacts more than 10 percent of Senegal's GDP, due to water-related extreme events and pollution. Flooding costs associated with damage of infrastructure and habitat and premature deaths have been estimated over US\$ one billion, or 6.3 percent of GDP, while the cost of a year of drought is in the order of US\$500 million, or 3 percent of agricultural GDP.<sup>2</sup> Water pollution costs associated with untreated domestic wastewater discharges, taking into consideration impacts on the environment and on health, are estimated at 3.8 percent of annual GDP, far exceeding the order of magnitude for middle-income countries (losses of 2.5 percent of GDP). Supply-focused water source development has driven the marginal cost of water to triple since the late 1990s. Already the Government has spent millions on emergency measures to meet demand gaps for water supply and to remedy flood damages to people, infrastructure and the environment. Such pressures could jeopardize the acceleration of growth and poverty reduction Senegal had finally achieved after weak past performances that fell below the regional average, a trajectory which has already been put under considerable duress by the COVID-19 crisis.

<sup>2</sup> Croitoru, Lelia; Miranda, Juan José; Sarraf, Maria. 2019. *The Cost of Coastal Zone Degradation in West Africa: Benin, Côte d'Ivoire, Senegal and Togo*. World Bank, Washington, DC. © World Bank.



**4 Water availability and its management will shape the Senegalese recovery and future socio-economic development.** Senegal's growth has historically been exposed to significant vulnerability to climatic and exogenous shocks, making water security a top priority to protect the country's long-term recovery. Given the essential role of access to water and sanitation in responding to pandemics like COVID-19 and the role of agricultural livelihoods in economic recovery and self-sufficiency in Senegal, water security is essential to the achievement of PSE objectives and a building block of building back better for the country. Water availability will also shape how much urbanization can drive Senegal's development moving forward and whether the country can reap the positive dividends of urbanization. Further, water stress limits the nation's booming, thirsty private sector development – especially agribusiness, mining and tourism. Agricultural uses are the main water user in the nation (82 percent of withdrawals) while the mining sector accounts for 20 percent of total exports in value, contributes 2 percent of GDP and consumes 13 million m<sup>3</sup>/year, mostly from groundwater.

**5 Addressing water security will require managing water resources as a non-renewable and degradable resource with significant economic value.** The existing system is overburdened and showing its limits, hampered by uncoordinated and disparate sectoral strategies and plans. At the national level, water security requires a combination of institutional measures and investments focusing on the seven major hotspots where socio-economic importance and water security risks are most critical, as shown in Figure 1. The success of this agenda will depend on the reinforcement of the capacities and resources of the DGPRES so it can become the leading water resources authority, with a permanent abstraction fee-based financial foundation and presence in all regions, and the revision of the legal framework to focus on WRM, which is not limited to the management of the public water domain. The strengthening of intersectoral coordination requires giving a legal scope to the water resources management strategy in relation to the development strategies of the different sectors. In turn, these elements would strengthen the DGPRES's position to ensure that water resources availability and management are accounted for in sectoral plans, coordinating future services development around these key inputs.



**6 Nowhere are water security issues more prevalent than in the Dakar-Mbour-Thies (DMT) triangle, which comprises more than half of the Senegalese population and economic activity.**

Concentrating 50 of Senegal's GDP production and boasting a growth rate of four percent per year over the last decade, the DMT triangle faces key water security risks, including overexploited and polluted aquifers and endangered wetlands and ecosystems. The Lac de Guiers provides about 40 percent of the area's water supply and is threatened with regard to both quality and security of access. The share of the Lac de Guiers in DMT water supply is projected to increase to 60 percent, with serious implications were the transfer infrastructure to be damaged or the lake water irreversibly polluted, especially given growing conflicts around land and water use on its shores. Competition is growing between different uses for the development of space and the use of water resources. The urbanization of agricultural land drives land and water prices up while development invades the beds of intermittent streams, worsening flooding with dire consequences (damages of US\$67 million in 2009 in Dakar alone). As water demand for drinking water and irrigation already exceeds the available resources, it is essential that water sources diversification be explored, including loss reduction and efficiency measures, fit-for-purpose source allocation and the development of non-conventional resources such as desalination and wastewater reuse or recycling.

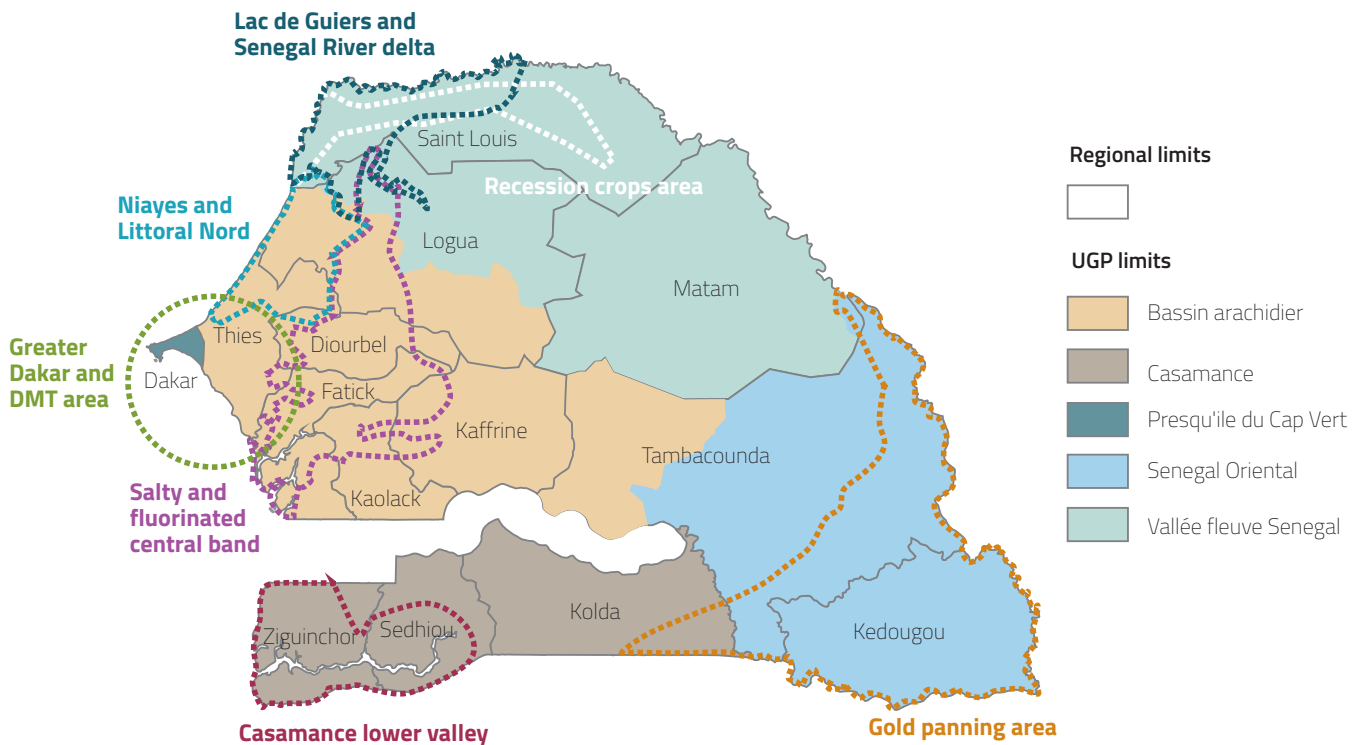
**7 The DMT has been facing a water deficit since 2011 and could greatly benefit from a circular economy approach to water security.** For the water sector, the circular economy approach promotes refocusing urban centers as users within a broader WRM perspective and closing the resource cycle by looking for efficiencies. Its key principles consist in delivering resilient water-related services, designing out waste and pollution and regenerating natural systems.<sup>3</sup> For urban water security, this will also require diversifying water sources to hedge against growing risks and harmonizing across water using sectors. The DMT

triangle is at the center of Senegal's territorial planning and development scheme and, as such, a leading recipient for major structuring projects already under way or in the pipeline, such as the development of the Blaise Diagne international airport and the special integrated economic zone (ZESI). While the Government has developed plans outlining required investments to strengthen water availability and services to 2035, channeling these plans into innovative "circular" solutions will require better integration across sectors through a harmonized strategic framework for water security and the consolidation of a platform for coordination across fragmented institutions.

**8 Existing plans must be prioritized into an Integrated Government Program for Water Security in the DMT following circular economy principles.**

This program would support improved coordination for planning and water resources management in the area through the consolidation of a cross-sectoral stakeholder group or water platform. A set of multi-sectoral investments focused on addressing the main water security challenges for the DMT triangle were identified, namely: support to finalize key institutional reforms, developing new water sources to diversify the portfolio and hedge against risks to current supply, improve service provision efficiency, roll out sanitation services and develop wastewater reuse for aquifer recharge and irrigation, and capitalize on wetlands and green infrastructure to improve stormwater management and capture. In addition to the development of unconventional sources, particular attention will be paid to safeguarding the Lac de Guiers as a strategic resource and protecting and replenishing groundwater resources. Given the uncertainties and risks faced by the DMT area today, planned investments will be subject to a thorough resilience analysis following the latest international best practice. The program will have positive impacts to fight future pandemics and increase human capital through the implementation of the sanitation component and the provision of improved WASH services in schools and health centers located in the area.

<sup>3</sup> World Bank, upcoming. Water in Circular Economy and Resilience (WICER) Position Paper.

**Figure 1:** Critical water security hotspots and UGPs

Thousands of jobs will be created on construction sites and farms, mostly for youth and young 'agripreneurs.' Disruptive technology will be used to monitor water resource and quality and strengthen citizen engagement through digital interactions between service providers and citizen.

**9 An analysis of the proposed Integrated Government Program for Water Security in the DMT triangle shows that integrating circular economy principles as outlined above yields economically sound investments.** From a public finance perspective, the investment plan (US\$1,530 million for 2020-2050 including US\$500 million for drinking water) is sustainable in the long term as the annual investment value for all sectors combined is US\$54 million, or about 0.5 percent of the GDP produced in the DMT triangle, significantly below the current costs of

poor sanitation and floods in Senegal (about 10 percent of GDP) and within the current range of sector spending in Africa.<sup>4</sup> SONES (Société Nationale des Eaux du Sénégal) has the financial capacity to support a significant portion of the sector's debt service: over the last twenty-five years, the water service provider has invested an equivalent of US\$51.5 million per year in the Dakar region. Further, the existing sector financial model has allowed costs sharing for investment and operations between the State, SONES and users, while maintaining a socially and politically acceptable tariff. During the same period, water tariffs increases below 1 percent per year allowed SONES to maintain financial equilibrium. The recently signed contract of the private operator running until 2035 includes substantial investments and incentives to reduce non-revenue water and water losses and improve bill collection ratio.

<sup>4</sup> A review of 18 African countries estimated their economic losses due to poor sanitation at US\$5.5 billion per year - which represents between 1 and 2.5 percent of the GDP of the countries reviewed (Economic Impacts of Poor Sanitation in Africa, WSP World Bank, 2012).



**10** Failure to implement the investment program could have a considerable impact on the economy of the DMT triangle in terms of lost income for agriculture and industry, public health and the well-being of the populations confronted each year with recurrent floods. Water insecurity already affects economic growth and recovery at the national level through significant GDP losses linked to damages, lost income and public health. The three drought episodes that occurred over the past 20 years caused a fall in GDP of between 11 and 26 percent compared to the ten-year average and a rise in the number of persons affected by food insecurity of between

300,000 and 800,000. In the Greater Dakar area, flooding cost US\$63 million in damages in 2009 and affected 290,000 people in 2012. Specific measures are proposed to preserve the quality and availability of the city's groundwater resources, which are being rapidly depleted and polluted, and protect the Lac de Guiers, where drinking water standards are exceeded due to the presence of pesticides, heavy metals and bacteriological germs, from nearby agricultural activity and untreated wastewater discharge.

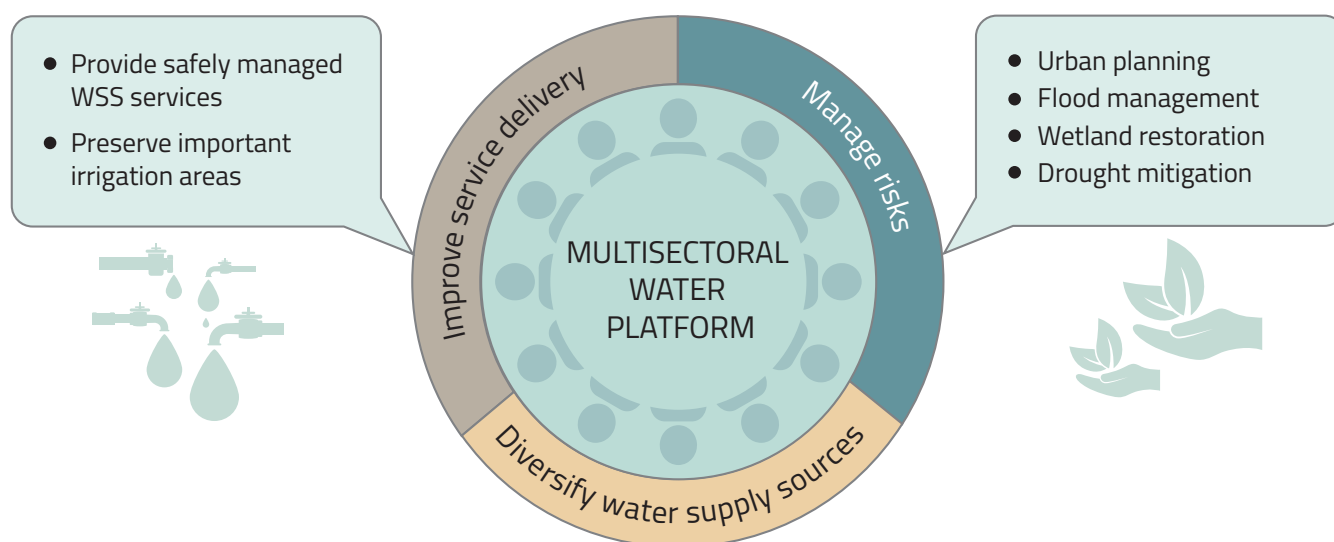
**11** **Achieving water security in Senegal will thus require key actions around institutions and investments for resilient growth.**

## STRENGTHENING WRM INSTITUTIONS

While strengthening DGPRES's financial and human resources is a prerequisite to efficient management of water resources, Senegal will not be able to meet the current and future water security challenges without in-depth reforms of the legal and organizational frameworks for WRM.

- The draft Water Code must be revised in line with international good practices and refocused on WRM.
- **The status of DGPRES must be raised** as it currently has a fairly low hierarchical rank and autonomy level in the public administration, considering international practices in countries with similar water security issues. At the same time, the management of water resources quality and quantity, as well as of groundwater and surface water, should be brought together into a single institution as they are different facets of the same resource.
- **The "upgraded" DGPRES must be present in all regions**, have adequate staffing and be permanently financed from abstraction fees, which must be extended to all users and the generated revenues be fully allocated to the management of the resource.
- The Conseil Supérieur de l'Eau (CSE) needs to be reactivated, ascribed to the presidential council, and its real functions duly defined in the revised Water Code, to give it the political and legal support to ensure water security issues are reflected in the national socio-development plan and promote effective inter-sectoral coordination nationally.
- At the decentralized level (five management and planning units - UGP) and in the sub-UGPs corresponding to the hotspots, the stakeholder committees must be put in place. To facilitate their role as effective and sustainable entities, their functions, composition and financing must be defined in the revised Water Code.



**Figure 2:** Achieving water security in the Greater Dakar area

## INVESTMENTS IN WATER SECURITY FOR RESILIENT GROWTH

To ensure long-term water security in the DMT triangle, the application of the circular economy principles helped identify priority actions:

- Set up a **multisectoral and multi-actor collaboration platform** with a view to strengthening water governance in the DMT aiming to restore and maintain the balance between the use of water resources today and their protection for future uses
- **Diversify water supply sources**
  - a. Better protect the Lac de Guiers from pollution, strengthen the water transfer from the lake and obtain the required allocations from the OMVS Permanent Water Commission to transit raw water to the Dakar region.
  - b. Implement a voluntary groundwater replenishment program starting in 2022 to allow the safeguarding of key depleted aquifers that supply the DMT triangle.
  - c. Increase volumes of wastewater being treated and promote the reuse of treated wastewater in agriculture and for groundwater recharge
  - d. Promote the use of rainwater in agriculture in the Niayes area
- Increase the population's access to **safely managed sanitation services** while solving the recurring flooding problems in the suburbs of Dakar through an **aquifer recharge and wetland restoration program** using treated wastewater and rainwater, complemented with water from dams and retention basins.
- **Preserve the agricultural Niayes area** through urgent precautionary measures, including **land use control**, the prohibition of precarious settlements in depressions and stream beds and strict management of real estate development in this area.

**Water Security in the remaining six hotspots.** This report provides preliminary recommendations to address the water security issues of the remaining hotspots (see Annex 1). Those recommendations would be fine-tuned through the Water Development and Management Master Plans (SDAGE) and the detailed plans being financed by a World Bank project at sub-UGP level. By addressing the issues identified in the other six hotspots, the WRM analysis and proposals, combined with the SDAGEs, should ensure the achievement of the socio-economic goals stated in the PSE.

