Urban Climate Change Research Network
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ARC 3.3
Climate Change and Cities

Bringing the Waters to Casablanca

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Keywords	water supply, water stress, desalination
City Population (Metropolitan Region	4.27 million
City Area (Metropolitan Region)	1,615 km^2
City GDP	22.1 billion USD
Climate Zone	Csa (hot summer Mediterranean)
ARC3.3 Linkage	Infrastructure for a Net Zero and Resilient Future for Cities

"Rick: I came to Casablanca for the waters.
Renault: The waters? What waters? We're in the desert!
Rick: I was misinformed." - Casablanca (film), 1942

Introduction. In Morocco, government authorities, the private sector, and international organizations are working continuously to ensure that this excerpt from Casablanca (1942) no longer reflects reality in the 21st century. In practice, the country is facing an ever-increasing water stress situation, which is expected to reach the critical threshold of 500 m3 of water per person per year by 2030 (The World Bank, 2023). While the situation is more critical in the southern regions of Morocco, Casablanca and its metropolitan region, home to 20% of the country's population and economic engine of the country, face specific situations since most of the water used in the urban region of Casablanca originates from outside the region.

Brief History. Water distribution to the final consumer requires the mobilization of water resources from various sources. Typically, water can be captured from underground water sources and surface water (such as from rivers or water catchment sites). Additionally, water can be obtained by desalinating seawater or treating wastewater. Usually, it is estimated that around 80% of water can be reutilized after the first consumption if treated, with the remaining 20% being lost in the consumption process itself.

In Morocco, historical data shows that surface water represents nearly 82% of the national water resources available (The World Bank, 2022). However, in recent decades, there has been a steady decline in the available surface water (Figure 1), further stressing the water production and distribution sector due to the increasing demands arising from demographic and economic pressures. In Casablanca, most of the water consumed originates in the region of Rabat-Salé, namely in the water stations of Bouregreg and Oum Azza, which provide water to the densely populated coastal areas in the axis of Rabat-Casablanca, home to 12 million inhabitants. The Bouregreg station has a production rate of 9 m3/second, nearly double the production of Oum Azza, and it relies on the surface water of the river Bouregreg collected at the Sidi Mohamed Ben Abdellah dam. To the south of Casablanca, the Al Massira Dam provides the other primary water source to the metropolitan area.

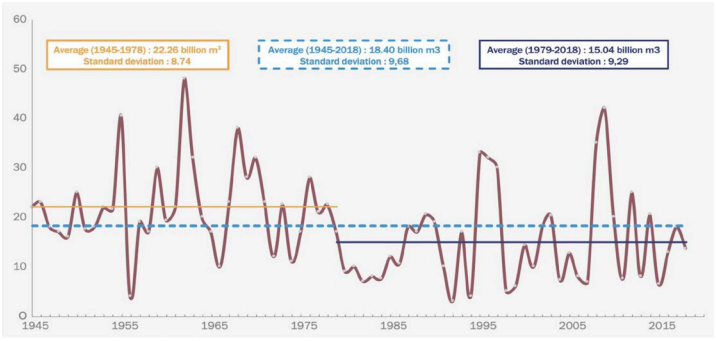

Figure 1. *Morocco's surface water inflows* (The World Bank, 2022).

The overall reduction of the surface water availability, as presented in Figure 1, led to very low levels at the Sidi Mohamed Ben Abdellah dam, which prompted mitigation responses from the responsible actors, namely the Ministry of Equipment, Transport, Logistics and Water, as well as from the national water and electricity utilities company, ONEE (Office National de l'Électricité et de l'Eau Potable). On November 17th, 2023, a Public-Private Partnership (PPP) was signed that included a 550,000 m3/day seawater desalination plant in the Casablanca-Settat region to be built over a period of 3 years (Sbiti, 2023). In parallel, and to face short to medium-term demands, a canal was built between the Sebou River and the Bouregreg River, to increase the water levels of the Sidi Mohamed Ben Abdellah dam (Royaume du Maroc, 2023). After this process of ensuring enough water production, the next step is water distribution.

In Casablanca, the distribution of water to the final consumer and the management of wastewater, including its treatment and subsequent re-entry into the distribution network, is assured by a private company named Lydec, part of the international Veolia Environment Group. The success of the

management of these complex activities requires a strong partnership between the private sector implementing partner and the public sector to maintain respect for the principles of good governance (Rezzouq, 2021).

Analysis. As surface water levels continue to decline and may no longer be able to meet growing demand, new sustainable solutions must be implemented. Seawater desalination plants imply various well-known concerns due to the energy-intensive process (Salomons et al., 2023). In Morocco, the electricity mix is carbon intensive (El Ghazi et al., 2021), therefore seawater desalination, while supporting adaptation measures to reduce water availability, has a negative impact on the mitigation of carbon emissions and on environmental sustainability.

However, by removing the pressures of supplying water to the metropolitan area of Casablanca from available surface water, more resources will be available to support the demand in rural areas that depend on the same sources. The agricultural sector in Morocco is responsible for employing a large percentage of the population in rural areas and for making a significant contribution to the national economy while being very vulnerable to climatic variability (The World Bank, 2022). Therefore, reducing the water demand in urban areas might lead to improvements in this sector and in rural areas in general, which are already facing overexploitation of groundwater to cover their needs (Hssaisoune et al., 2020).

So, while desalinating water is a solution that, given the energy required, can respond to the resource needs, it places the responsibility exclusively on the production side and does not include the processes involved in distribution and consumption. In fact, the National Water Plan of Morocco relies extensively on engineering actions and structural investments on reducing water losses and increasing water reduction. These solutions ensure that water is made available to the final consumer but require a high mobilization of public resources (The World Bank, 2022). With respect to the energy demands of the Casablanca desalination plant, while a new wind farm is planned to support its electricity needs, in practice this renewable generation will be integrated into the national grid, which remains heavily dependent on fossil fuels (ONEE, 2022).

Regarding distribution, there are various tools available to improve efficiency and reduce water wastage throughout the distribution network, such as by reducing leakages and privileging localized irrigation (Cody & Narasimhan, 2020; The World Bank, 2022; Nascimento et al., 2023). However, like the situation presented for water mobilization and production, they require large-scale investments. For example, in an urban area such as Casablanca, marginal reductions of water leakages require multi-million investments. Therefore, it is extremely relevant to consider other options that would not further strain the public financial resources (The World Bank, 2022). The remaining area of intervention is consumption. Water demand is expected to rise in every scenario of climate change impacts with or without the implementation of the National Water Plan (Figure 2).

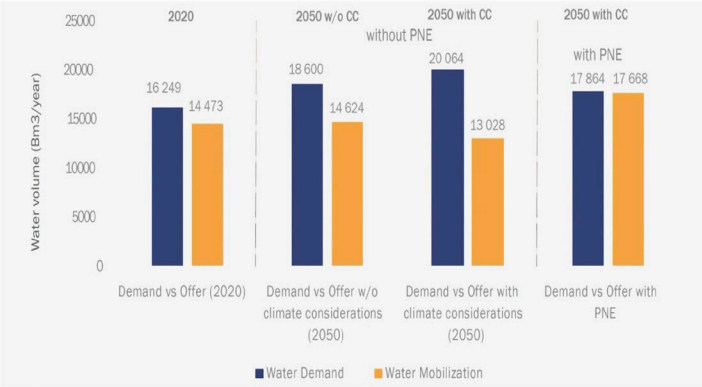

Figure 2. *Projected Water Deficit 2020-2050, with and without climate issues, and with and without National Water Plan Interventions (in millions of cubic meters/year)* (The World Bank, 2022).

Concluding Thoughts. Significant investments in infrastructure and a focus on technological solutions have been the focus of the National Water Plan. Diverting water from rivers to feed dams and a large desalination plant cannot be truly sustainable if the water demand does not cease to increase. An active engagement with the general population regarding water consumption habits is not taking place, despite the possibility that it could afford to better understand the reality and ways to improve the rational use of water.

While large-scale structural investments in water production and distribution are necessary, they require levels of financing that Morocco, as a lower-middle-income country, cannot easily mobilize. With the transfer of water (and electricity) utility management to decentralized entities through public–private partnerships across all regions, it is urgent to ensure that all stakeholders align with the priority of sustainable water use, including end consumers. Communication and education are therefore critical tools for promoting more rational resource use, yet their potential remains significantly underutilized.

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Additional Data

- **Population Density:** 14,694 people/km^2
- **Per Capita Gross National Income (GNI):** 3,760 USD (Lower Middle Income) [2024]
- **Gini Coefficient:** 39 [2023]
- **Human Development Index (HDI):** 0.710 (High) [2023]
- **Type of Climate Intervention:** Hybrid (both mitigation and adaptation)
