

## **XXIV SIMPÓSIO BRASILEIRO DE RECURSOS HÍDRICOS**

### **A SUMMARY OF: UNVEILING WATER SECURITY IN BRAZIL - CURRENT CHALLENGES AND FUTURE PERSPECTIVES**

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#### **INTRODUCTION**

We provide a summary of the detailed overview of water availability and demand of the main consumptive uses affecting water security in Brazil. Moreover, the discussion of the current and future challenges concerning regional and national water security, mainly those related to negative impacts caused by climate change. At the end, perspectives are provided to guide the next steps towards overcoming water insecurity in Brazil. We present a summary of the scientific paper entitled “*Unveiling Water Security in Brazil: Current Challenges and Future Perspectives*” recently published in the *Hydrological Sciences Journal* (Gesualdo et al., 2021).

#### **An overview of water security in Brazil**

Total water consumption has steadily increased in Brazil, comprising the main consumptive uses as irrigation, human and animal consumption, industrial purposes, power generation, and mining. At the national level, annual water consumption increased by 17 billion m<sup>3</sup> from 1950 to 2000, an average annual growth of 8.7%. Nevertheless, the average annual growth in the subsequent years, from 2000 to 2017, declined from 8.7% to 3.9%. According to ANA’s projections, the water consumption average annual growth may continue to decrease reaching 1.1% per year for the period from 2017 to 2030. Despite the decrease in relative annual growth rate in recent years, water consumption reached 36.5 billion m<sup>3</sup> in 2017. Irrigation accounting for 52 - 68.4% of total water withdrawal and consumption respectively, urban and rural supply for 25.5 - 11%, industry for 9.1 - 8.8%, livestock for 8 - 10.8%, thermopower for 3.8- 0.2 %, and Mining for 1.6 – 0.8%. The Northeast and Southeast regions respectively accounted for 23% and 34% of the total national water withdrawal and consumption. Conversely, both regions have presented historical cases of drought spells and water shortages such as the most severe drought recorded in the Northeast from 2010 to 2018 (Marengo et al., 2018, Pontes Filho et al., 2020) and the unprecedented drought mainly faced by the São Paulo e Rio de Janeiro States in 2014 and 2016 (Nobre et al., 2016) (two of the most important states in Southeast). In this context, supply-demand water resources imbalance reveals the high-water supply vulnerability affecting the socioeconomic sectors in these regions, which have endured an increase in frequency and magnitude of extreme events according to Marengo (2014).

#### **Main challenges in the Brazilian context**

Over the last two decades, water withdrawal increased by 80%, and projections show a further increase of 30% by 2030 to meet the population growth and, consequently, future demand for water, food, and energy. The water demand growth indicated by projections and historical data is

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intrinsically linked to the pattern of increase in the CO<sub>2</sub> emissions in the country, mainly due to the population growth and economic development. Emissions increased by 80% from 1990 to 2014 (from 600 to 1080 Mt CO<sub>2</sub>), the Gross Domestic Product (GDP) only increased 50% in the same period (from US\$ 8,000 to US\$12,000 per capita). Furthermore, there is still a positive trend in CO<sub>2</sub> emissions indicating that Brazil will possibly fail to comply with the 2025/2030 Nationally Determined Contributions (NDCs) under the Paris Agreement goals. Climate change is one of the main challenges regarding water security worldwide. Nonetheless, the National Water Security Plan (PNSH) (ANA, 2019) does not consider climate change scenarios and models for defining its objectives and developing its strategies. This represents a major limitation in the conceptualization of the plan, jeopardizing the national water security. Despite the uncertainties related to the future climate, several countries already struggle to overcome the negative impacts of climate change on the environment, society, and economy. Brazil has made little effort to align the apparatus of the government with national and international climate-change policies. In addition, there is a general lack of investment in building resilience, and there is no municipal policy for preparation, education and mitigation of medium- and long-term impacts of water-related climate extremes. The complexities involved require political will to support development and execution of policies aimed at better understanding, mitigating, and adapting to current and future challenges in water resources. It is worth emphasizing the importance of integrated management encompassing all Brazilian regions and their particularities. Still, the integration of legal frameworks for water resources (Act 9,433/1997), basic sanitation (Act 11,445/2007 and Act 14,026/2020), climate change (Act 12,187/2009), and civil defense (Act 12,608/2012) are missing. Further, we need to implement active regulatory mechanisms (top-down) and community action with citizen science (bottom-up) to manage the sector's water demand.

## Concluding remarks and future perspectives

There is an urgent need to look for water security in other regions besides the large urban centers such as the north and northeast regions, where most of the population is subject to vast water inequality. If the environmental policies follow the track of the last years, we expect a water stress aggravation and a water conflict rise regarding the projected increase in frequency of extreme events all over Brazil. Ensuring water security depends on a participative management, flexibility to adapt to the current and future climate change, and mainly political will. Climate variability and anthropogenic pressures have made the Brazilian biomes more vulnerable, risking ecosystem functioning and water availability. The Brazilian government urgently needs to move towards integrated risk management focusing on optimizing water use and storage (ANA, 2018) whether on a macro scale or on a local scale. It requires planning and implementation of adequate water infrastructure and non-structural measures for water resources management.

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