



## MUNDAÚ RIVER BASIN

### IMPROVING WATER SECURITY AND ADAPTING TO CLIMATE CHANGE IN THE ATLANTIC FOREST WITH NATURE-BASED SOLUTIONS

**The Mundaú Basin is one of the basins identified in a study conducted by WWF on key river basins in the Atlantic Forest that urgently require Nature-based Solutions (NbS) to bolster water security and climate resilience. Compared to conventional interventions, NbS offer long-term affordable and sustainable solutions to major water-related societal challenges, and have multiple co-benefits. The objective is to – together with partners – scale these solutions to generate significant positive impact on biodiversity, water security, and climate resilience.**

Sourced from a semi-arid region in the State of Pernambuco, the Mundaú River is of critical importance to the Lagunar Mundaú-Manguaba estuary complex.

This lagoonal ecosystem is fundamental for sustaining the local economy of Maceió, the capital of Alagoas. **The eastern stretch of the river basin is known for its high levels of biodiversity.** Home to 434 distinct bird species, comprising two-thirds of the total bird species in the Atlantic Forest, and with 18 species exclusive to this region, it is a priority area for conservation.

**However, the basin currently faces a very critical water imbalance.** Exponential population growth in recent decades has resulted in conflicts over water usage between residential needs, sanitation services, agribusiness, and industries such as sugar and alcohol production. The negative water balance is further compounded by the impacts of climate change. **By 2050, a projected decrease in overall precipitation by 10-20%, marked by fewer yet more intense rainfall events, along with a 70% reduction in aquifer recharge will contribute to the 'aridization' of the region.**

**BE ONE WITH NATURE**



Droughts are alternated with intense rainfall events, leading to floods and landslides. Despite dam construction for flow regulation following a flood in 2010, floods in 2017 and 2022 affected approximately 62,000 and 63,000 people, respectively, with a total economic loss exceeding US\$ 140 million since 2010.

**Facing this critical situation, Nature-based Solutions can offer effective strategies for maximizing upstream groundwater infiltration, mitigating intense rainfall impacts through reduced runoff while also enhancing water reserves for dry periods.**



## RELEVANCE FOR NBS

The Mundaú River Basin is a priority basin for NbS due to the following key attributes:

- **Essential water source** (surface and subsurface) for downstream urban areas.
- **Increased flood and landslide risk**, and this vulnerability is amplified by the effects of climate change.
- **Escalating drought threat**, with more extreme droughts further exacerbated by climate change. From 2012 to 2017, Brazil's northeast endured its longest recorded drought in the past 170 years, leading to unprecedented economic, social, and

environmental damage affecting over 570,000 people.

- **Negative water balance**, as the current water demand exceeds the water supply of the Mundaú, leading to water stress.
- **Classified as critical basin** by the National Water Agency (ANA), signifying the urgency to act.
- **Low Compliance with Forest Regulations:** The basin displays a substantial deficiency in adhering to the Brazilian Forest Code – 9,200 hectares in permanent preservation areas and 17,900 hectares in legal reserves – particularly concerning the degradation of riparian zones.

## MAIN BENEFICIARIES OF NBS

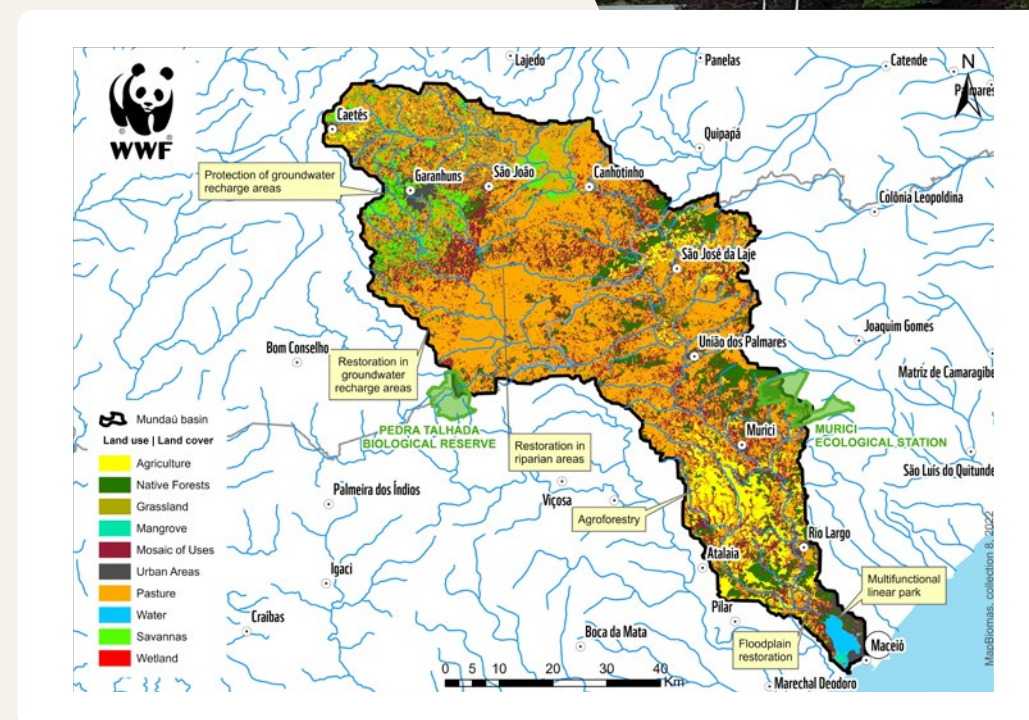
- **Local population:** Experience enhanced water supply security and reduced exposure to flood risks and drought.
- **Water supply companies (CASAL/COMPESA):** Benefit from improved groundwater supply security.
- **Farmers:** Witness improved soil conditions and have the opportunity for diversified crop cultivation.
- **Tourism industry:** Options to expand sustainable tourism in highly-biodiverse areas and improved lagoonal conditions.
- **Ecosystems:** Improved environmental flow and biodiversity protection, leading to higher connectivity and ecosystem resilience.

## POTENTIAL PARTNERS FOR NBS

- Federal government (Semeando Águas Program)
- State governments (Alagoas and Pernambuco)
- CASAL and COMPESA (water supply companies)
- Local municipalities
- Local farmers and cattle ranchers

## NATURE-BASED SOLUTIONS:

### WHAT IS POSSIBLE?



**Figure 1:** Land use and land cover in the Mundaú River Basin, with suggested NbS.

## PROTECTION AND RESTORATION OF WATER RECHARGE AREAS

Groundwater recharge can be stimulated by protecting and restoring natural vegetation in areas that have enabling infiltration conditions, such as flatter slopes or better permeable soils and geology. These activities can lead to improved infiltration capacity in former pastures and agricultural areas by 182% and 291%, respectively. Ultimately, NbS enhance groundwater input, which is crucial in regulating water supply.

## RESTORATION AND PROTECTION OF RIPARIAN FORESTS

Riparian forests act as a buffer and natural water filter, reducing the sediment input to the river by 33% to 95%. By restoring and protecting these forests, sediment and other pollutants are trapped before they reach the river, thereby improving the river's water quality.

## FLOODPLAIN AND WETLANDS ECOSYSTEM RESTORATION

Floodplains and wetlands act as sponges and filters during flood events, storing large volumes of water, slowing the

flow of water, and filtering upstream-sourced pollutants. Reconnecting these to the river system creates additional space for water retention, reducing in situ and downstream flood risk.

## MULTIFUNCTIONAL LINEAR PARK

A linear park follows the course of the river and is often designed for urban areas. This NbS addresses flood risk mitigation in the Mundaú basin, by creating various forms of water buffers and retention areas along the river. Maceió, Alagoas' state capital, finds itself at the Mundaú Lagoon and would greatly benefit from this NbS as it reduces flood risk.

## AGROFORESTRY SYSTEMS

Agroforestry is an agricultural practice that includes biodiversity and ecosystem services recovery, increasing infiltration rates and reducing erosion and sedimentation. It also offers an opportunity for crop diversification thereby generating a more diversified source of income for smallholder farmers.

## ENABLING CONDITIONS FOR NBS

### Presence of programs and initiatives facilitating NbS:

There are already initiatives in place that promote the use of green infrastructure for improving water security, biodiversity, and/or climate change adaptation. The presence of the following initiative enhances the success of NbS adoption in the basin.

- **Serra do Urubu-Murici Corridor<sup>1</sup>:** This corridor connects the two biodiversity hotspots of Murici, the largest patch of the Atlantic Forest which is located north of the São Francisco River, and the Urubu mountain range in the state of Pernambuco. Restoration activities positively contribute to ecological connectivity and the protection of many endemic bird species. Agroforestry is considered a restoration technique in which smallholder farmers are encouraged to produce more biodiversity-friendly while creating a more diversified livelihood. Birdwatching tourism is also being developed. SAVE Brazil, an NGO specialized in bird species conservation, started the project in 2011 and has partnered with organizations like WWF, local municipalities and farmers. The goal is to have restored 70 hectares before the end of 2023.
- **Pernambuco State Reforestation Program<sup>2</sup>:** Starting in 2020, this state program aims to restore 1,400 hectares of forest in three years time. It also guides other public policies to additional forest cover restoration efforts, since these efforts foster the

provision of ecosystem services. The restoration is funded by the State's environmental funds and environmental offsets of large private companies.

## THE WAY FORWARD

1. **Focused feasibility study on NbS implementation.** Outputs include the identification of priority areas and activities considering water security and biodiversity needs, the integration of climate scenarios with socio-economic and cost-benefit analyses, and the design of a NbS implementation plan.
2. **Build or strengthen coalitions** for NbS implementation in the region, identifying the main actors and commitments needed.
3. **Development of a proposition for large-scale NbS implementation,** further engagement of key partners, and integration with ongoing programs (such as the Pernambuco State Reforestation Program) where possible.
4. **Large-scale implementation** of the selected NbS.

### Criteria

The Mundaú basin was selected as 'priority basin' from a selection of 87 basins in total, based on three criteria as outlined in a policy brief of WWF Brazil (WWF Brasil, 2024). These criteria are: 1) importance in providing water ecosystem services, 2) vulnerability to water security risks, and 3) suitability for developing or enhancing NbS.

*WWF Netherlands. (2024). Improving water security and adapting to climate change in the Atlantic Forest, Brazil, with Nature-based Solutions – Mundaú River Basin [Fact sheet].*