



PARAÍBA DO SUL VALLEY

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

The Paraíba do Sul Valley 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.

The Paraíba do Sul Valley, covering 926,000 hectares, holds vital significance for Brazil, serving as a critical

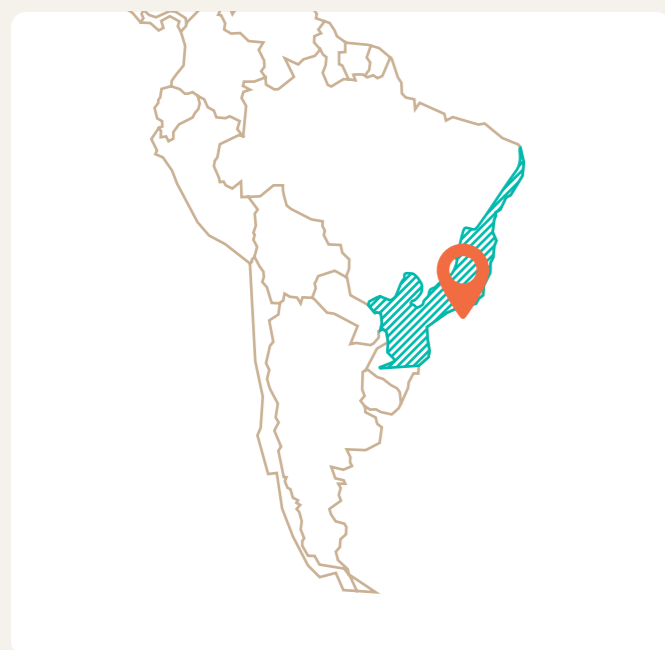
hydrographic region nestled between the major metropolitan hubs of São Paulo and Rio de Janeiro. Serving as the primary water source for the Guandu Water Supply System, **the Paraíba do Sul River caters to the water needs of approximately 12 million residents** in the Rio de Janeiro metropolitan region (RMRJ) and other nearby cities, while also supporting various industrial activities in the area. sustainable farming practices across the basin.

Historically, the region witnessed extensive deforestation driven by sugar cane and coffee plantations during the 18th and 19th centuries, later compounded by intensive cattle ranching for dairy production. This deforestation resulted in severe erosion of rural lands within the basin. Subsequent industrialization fostered economic growth but concurrently amplified pollution levels in the Paraíba do Sul River. **Currently, over 60% of the basin's territory has been altered by human activities,**

BE ONE WITH NATURE

leading to recurrent fires and erosion. Encouragingly, the past decades have seen a notable regeneration of approximately 200,000 hectares of forests, owing to reductions in cattle ranching activities.

With major urban centers emerging along the main river, managing urban drainage has emerged as a significant challenge. **Human activities have diminished permeability in floodplains, terraces, and hills surrounding the Paraíba do Sul River, thereby augmenting flood risks.** Upstream within the river basin, the water balance is most critical, with water demand surpassing supply by 50%. A scarce natural vegetation coverage in the basin limits water infiltration and recharge, leading to diminished water flows during the dry season and reduced water availability during droughts. **Given these precarious circumstances, the implementation of Nature-based Solutions (NbS) for water security is recommended.**



RELEVANCE FOR NBS

The Paraíba do Sul Valley 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. Since 2010, the region has encountered over 200 hydroclimatic hazards, impacting nearly 220,000 individuals and resulting in property damages exceeding US\$30 million.

- **Escalating drought threat**, with more extreme droughts further exacerbated by climate change.
- **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 – 46,000 to 55,000 hectares in permanent preservation areas and 10,000 to 11,500 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.
- **Water supply companies:** Benefit from more consistent river flow and lower water treatment costs due to cleaner water.
- **Industries:** Enjoy improved water quality and a decreased likelihood of water withdrawal restrictions.
- **Farmers:** Witness improved soil conditions and experience economic wins because of higher productivity.
- **Ecosystems:** Improved environmental flow and biodiversity protection, leading to higher connectivity and ecosystem resilience.

POTENTIAL PARTNERS FOR NBS

- CEIVAP (Integration Committee of the Paraíba do Sul's Watershed Committee)
- SABESP & Águas do Rio/AEGEA (State's Water Sanitation Companies)
- Conexão Mata Atlântica partners: the Ministry of Sciences, Technology, and Innovation (MCTI) and the Environmental secretaries of the State of São Paulo and the State of Rio de Janeiro.
- Local municipalities

NATURE-BASED SOLUTIONS:

WHAT IS POSSIBLE?

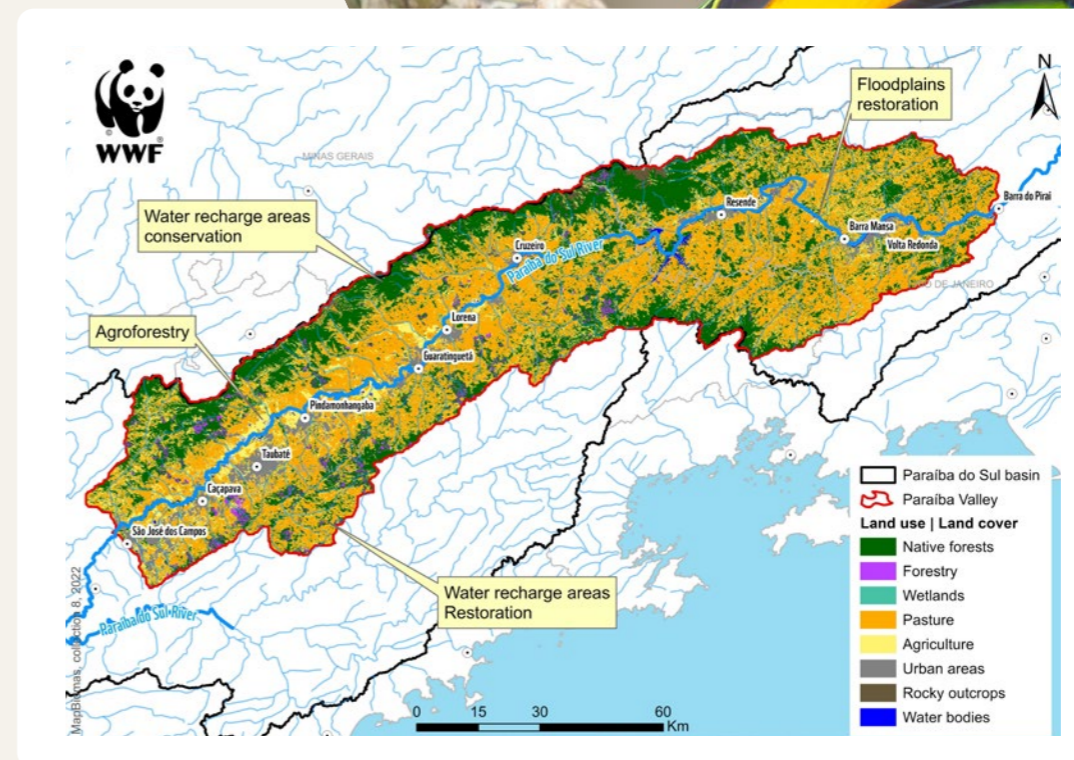


Figure 1: Land use and land cover in the Paraíba do Sul Valley, with the suggested NbS.

FLOODPLAIN AND WETLAND 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.

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.

AGROFORESTRY

Agroforestry is an agricultural practice that includes biodiversity and ecosystem services recovery, increasing infiltration rates and reducing erosion and sedimentation. Areas degraded by overgrazing can be transformed into areas of regenerative agriculture, especially using an agroforestry approach. Where cattle ranching remains, livestock-forest integration (with native trees) is a fitting NbS option.

ENABLING CONDITIONS FOR NBS

Socioeconomic relevance: The industrial, sanitation, livestock, and agricultural sectors of the Paraíba Valley are dependent on a stable and reliable water supply. These sectors depend on sufficient volumes of clean water, thereby highlighting a need to collaborate 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 initiatives enhances the success of NbS adoption in the basin.

- **Atlantic Forest Connection/Conexão Mata Atlântica¹:** Initiated in 2016, this project collaborates with rural landowners to conserve and restore native forests in the southeast corridor of the Brazilian Atlantic Forest. Moreover, it stimulates sustainable production practices such as agroforestry through the financial mechanism of Payments for Ecosystem Services (PES). The total budget amounts to US\$53 million, funded by the Global Environment Facility (GEF) and the state governments of Rio de Janeiro, São Paulo and Minas Gerais.
- **Green Infrastructure Agenda - CEIVAP²:** This initiative of the Paraíba do Sul Watershed Committee, part of their broader Water Resources Plan, is specifically aimed at the conservation and recovery of riparian buffers and soil conservation practices. Payments for Ecosystem Services (PES) are used to incentivize these practices, in which local municipalities are key partners. A budget of US\$13 million, funded by water use fees, has been allocated for investment until 2035.

Criteria

The Paraíba do Sul Valley 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 – Paraíba do Sul Valley [Fact sheet].

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 a coalition for NbS implementation** based on the outcomes and lessons learned from Conexão Mata Atlântica.
3. **Development of a proposition for large-scale NbS implementation,** further engagement of key partners, and integration with ongoing programs (such as Conexão Mata Atlântica or the Green Infrastructure Agenda) where possible.
4. **Large-scale implementation** of the selected NbS.

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1. <https://conexaomataatlantica.mctic.gov.br/cma/portal/>

2. https://ceivap.org.br/revista_digital/ed14/infraestrutura-verde-para-producao-de-agua