



## VELHAS RIVER BASIN

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

The upper and middle Velhas 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.

A large share of the upper Velhas River Basin is officially classified as extremely important for biodiversity

conservation, as it is part of the transition zone between the Cerrado and the Atlantic Forest. The third largest urban area in Brazil, the Metropolitan Region of Belo Horizonte (RMBH), interacts with this basin in various ways. **With approximately 5 million residents within the RMBH, 44% of the population relies on the Velhas River.** For the state's capital, Belo Horizonte, this figure climbs even higher with three out of four individuals depending on the Velhas as their primary water source. The region is also heavily industrialised and stands as one of the key mineral production centres in Brazil.

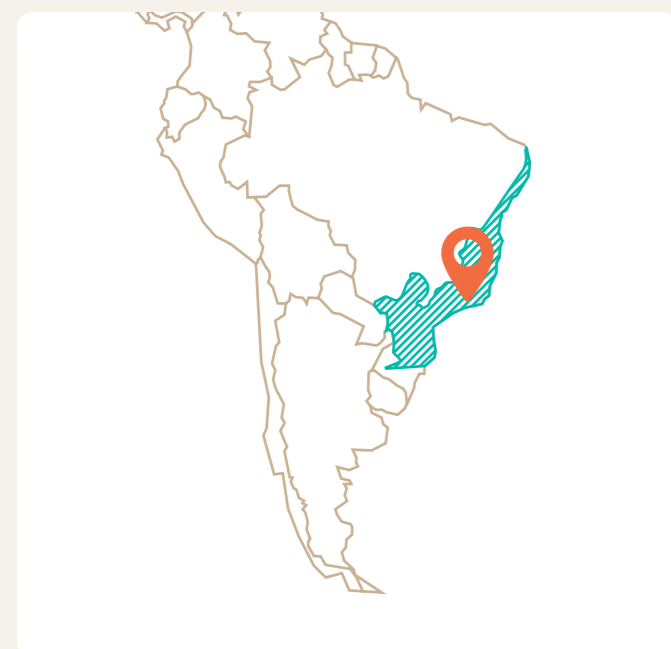
**The Velhas Basin suffers from various forms of degradation**, primarily driven by the following activities: 1) mining activity leading to the discharge of (toxic) residues into water bodies, 2) domestic and industrial sewage pollution, 3) deforestation of riparian vegetation, 4) construction of hydropower dams, 5) unauthorised water withdrawal for irrigation purposes, 6) gradual filling of wetlands, floodplains, and lagoons.

**BE ONE WITH NATURE**



In addition to these degradation factors, **the basin has faced several severe water crises over the past decade.** While the low river flow during 2013-2015 could be attributed to reduced rainfall during that period, recurrent low flows in 2017 and 2019 indicated a more persistent issue of water scarcity.

**Nature-based Solutions (NbS) present a promising approach to enhance water availability and security** by promoting options for groundwater recharge during the rainy season, retaining and storing water for use during dry periods. This strategy can serve as a crucial step towards addressing the challenges of water scarcity and environmental degradation within the upper Velhas River Basin.



## RELEVANCE FOR NBS

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

- **Essential water source** for downstream urban areas.
- **Heightened flood risk**, and this vulnerability is further amplified by the impacts of climate change. Since 2010, more than 4.8 million people have been damaged by heavy rains and consequent floods, with material losses greater than US\$220 million.
- **Escalating drought threat**, with more extreme droughts further exacerbated by climate change.

- **Negative water balance**, as the permitted water withdrawal volume for drinking water, agriculture, and industries surpasses the total water availability in the basin by 60%, highlighting a structural water imbalance that is likely to lead to future conflicts.
- **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 – 37,000 to 42,000 hectares in permanent preservation areas and 4,000 to 7,000 hectares in legal reserves – particularly concerning the degradation of riparian zones.

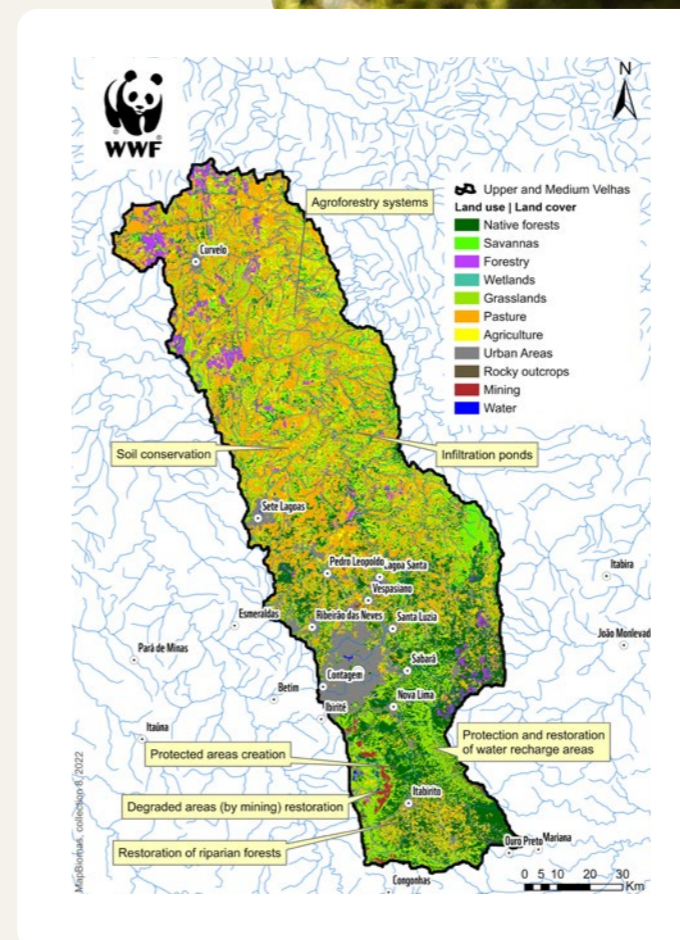
## MAIN BENEFICIARIES OF NBS

- **Local population:** Experience enhanced water supply security and reduced exposure to long periods of drought.
- **Water supply company (COPASA):** Benefit from more consistent river flow and lower water treatment costs due to cleaner water.
- **Industries and private sector:** Enjoy improved water quality and a decreased likelihood of water withdrawal restrictions.
- **Farmers:** Witness improved soil conditions and have the opportunity for diversified crop cultivation.
- **Ecosystems:** Improved environmental flow and biodiversity protection, leading to higher connectivity and ecosystem resilience.

## POTENTIAL PARTNERS FOR NBS

- COPASA (Minas Gerais Water Sanitation Company)
- Velhas Watershed Committee
- Minas Gerais State Public Ministry
- Local municipalities
- Local farmers

## NATURE-BASED SOLUTIONS: WHAT IS POSSIBLE?



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

## BARRAGINHAS (INFILTRATION PONDS)

Small half-moon-shaped dams, ideally constructed in degraded pasture lands or alongside roads, prevent soil erosion by limiting surface runoff and stimulate groundwater recharge by creating more time for the water to infiltrate the soil. In the end, this can support the revitalization of streams.

## 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.

## 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 SYSTEMS

Agroforestry is an agricultural practice that includes biodiversity and ecosystem services recovery, increasing infiltration rates and reducing erosion and sedimentation.

## ENABLING CONDITIONS FOR NBS

**Socioeconomic relevance:** With the largest industrial and extractive hubs in the State, 62% of Minas Gerais' GDP is generated in the Velhas Basin. This strategic economic position makes the basin extremely relevant for actions focused on water security and climate adaptation.

**Financial resources available:** Mining-tax incomes (CFEM) must be invested in projects with social and environmental goals. In 2022, these taxes collected by two Upper Velhas municipalities amounted to approximately US\$100 million available for investment. Additionally, the State government has allocated about US\$400 million for investments in water supply systems (including the Upper Velhas system).

### 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.

- **Water Conservation and Production Program:** Starting in 2021, the Velhas Watershed Committee's program fosters both soil protection in productive areas as well as ecosystem conservation and restoration. Through erosion reduction and simultaneously promoting infiltration, the water production potential in the priority sub-basins is being maximised. Until 2030, US\$20 million (sourced from water use fees) can be invested in NbS for ecological restoration in riparian zones and water recharge areas.
- **PRO-Mananciais Program:** The Social and Environmental Program for Protection and Recovery

of Water Sources (PRO-Mananciais), coordinated by COPASA, acts in watersheds and aquifers that recently experienced water scarcity and water quality issues. The program's goal is to control erosion and revitalise micro watersheds by creating infiltration ponds, performing soil conservation practices, and restoring and conserving recharge areas and riparian zones. COPASA spends 0.5% of their total revenue on this program, distributed amongst 200 municipalities.

## 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. **Identify existing coalitions** with visions on NbS implementation and support their empowerment.
3. **Development of a proposition for large-scale NbS implementation**, further engagement of key partners, and integration with ongoing programs (such as the Water Conservation and Production Program or PRO-Mananciais) where possible.
4. **Large-scale implementation** of the selected NbS.

### Criteria

The Velhas River 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 – Velhas River Basin [Fact sheet].*