



DOCE VALLEY RIVER BASIN

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

The Doce Valley 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.

This specific stretch of the Doce River Basin is known as the 'Steel Valley' as it hosts Latin America's largest

steel complex and bustling urban centers. **This region thrives on industrial activities and extensive eucalyptus forestry, primarily catering to the steel mills' charcoal needs.**

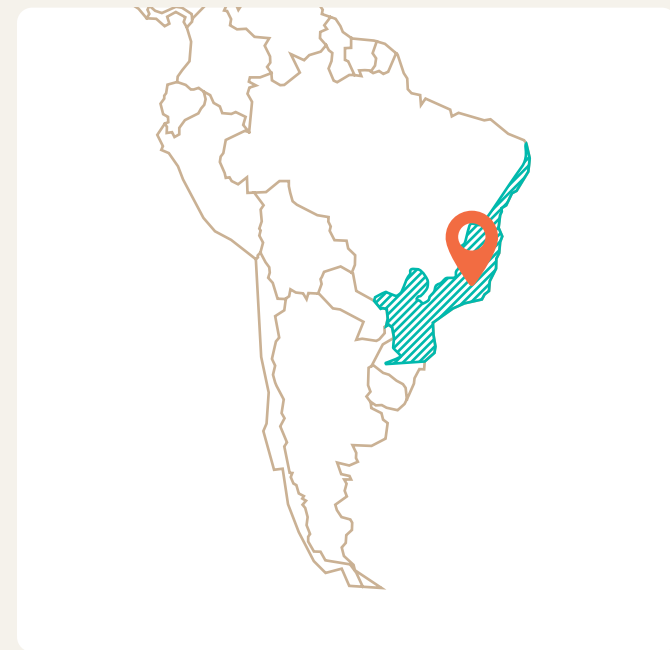
This area carries a legacy of environmental degradation dating back centuries. The 18th-century gold rush and subsequent 20th-century iron ore extraction triggered erosion in the basin's headwaters and contaminated the basin with mining byproducts. The catastrophic Fundão Dam collapse in Mariana in 2015 exacerbated the damage, releasing toxic waste and mine tailings leading to a mudflow ravaging the Doce River and its tributaries.

Beyond mining, deforestation has been driven by extensive livestock farming, sugarcane, and coffee cultivation. **A hilly, erosion-prone terrain combined with poor or limited soil conservation practices has accelerated erosion, high sediment fluxes,**

BE ONE WITH NATURE

water quality degradation, and siltation. Moreover, the majority of riparian buffers have been deforested, compromising the natural filtration provided by these forests and wetlands. In response to the Doce River's low water quality, excessive groundwater extraction has intensified water stress. **Though solutions such as restoring natural infiltration zones can be a game changer in current water resource management practices.**

Recurring floods pose threats to cities along the river's banks and floodplains. The Rio Doce State Park, an upstream protected lake complex, fortunately offers water retention capacity hence mitigating the impact of floods in the Doce and Piracicaba Rivers. **Inspired by this natural defence, implementing Nature-based Solutions (NbS) to restore lagoon systems and floodplains upstream of Doce's major urban centers emerges as a pivotal strategy.**



RELEVANCE FOR NBS

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

- **Essential water source** for downstream urban areas.
- **Increased flood and landslide risk**, and this vulnerability is amplified by the effects of climate change. Since 2010, more than 110,000 people have

suffered from heavy rains and associated floods, and material losses exceeded US\$44 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:** This basin stretch displays a substantial deficiency in adhering to the Brazilian Forest Code – 3,400 to 9,500 hectares in permanent preservation areas and 1,900 to 5,000 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 flood risks.
- **Water supply company:** Benefit from an improved groundwater supply security.
- **Industries:** Enjoy improved water quality and a decreased likelihood of water withdrawal restrictions.
- **Cattle ranchers:** Witness improved soil conditions and experience less erosion on pastures.
- **Ecosystems:** Improved environmental flow and biodiversity protection, leading to higher connectivity and ecosystem resilience.

POTENTIAL PARTNERS FOR NBS

- Watershed Committees of Rio Doce, Piracicaba, and Santo Antônio
- Water supply company (COPASA)
- Renova Foundation
- Local municipalities and communities
- Local farmers

NATURE-BASED SOLUTIONS:

WHAT IS POSSIBLE?

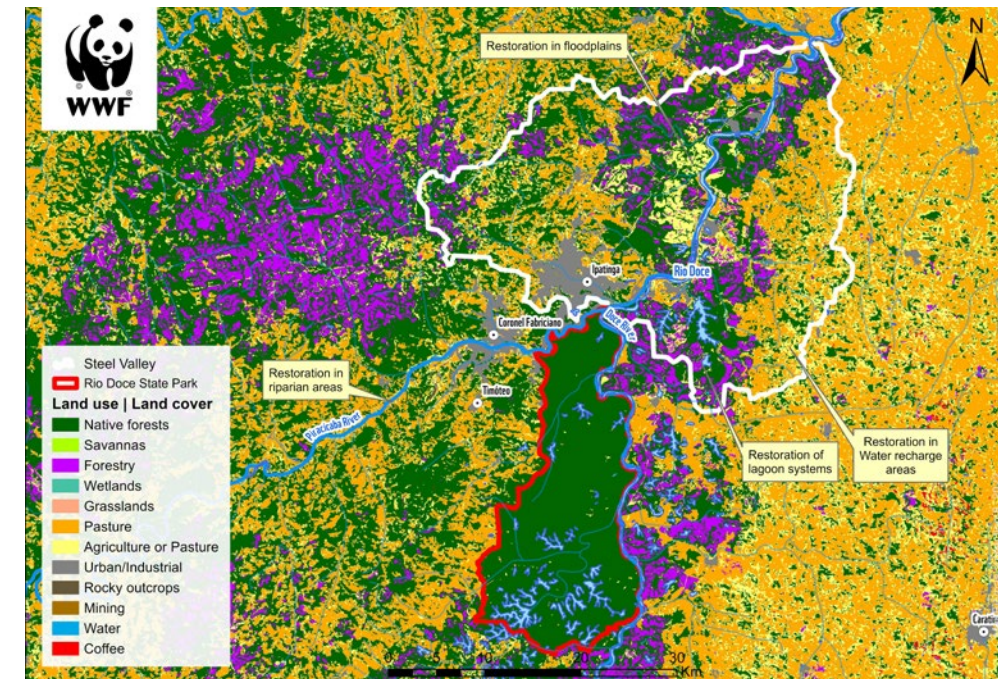


Figure 1: Land use and land cover in Doce Valley, with the suggested NbS.

FLOODPLAIN ECOSYSTEM RESTORATION

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

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.

ENABLING CONDITIONS FOR NBS

Availability of financial resources: Water use fees of the respective Watershed Committees are a potential source of NbS funding.

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.

- **Rio Vivo¹:** The Rio Vivo initiative, led by the Rio Doce Watershed Committee, focuses on recovering natural springs in 54 municipalities in the Doce basin and unites three programs on sediment runoff control, improving sanitation, and spring recovery. By 2025, the plan is to restore approximately 5,000 springs, construct over 3,000 rural sewage systems, and implement soil conservation measures. About US\$12 million is to be invested by 2042.
- **PRO-Mananciais Program²:** This program aims to revitalize micro watersheds by restoring natural vegetation in critical areas for water infiltration and erosion control, in addition to fostering sustainable agricultural practices for soil conservation. The program is funded by COPASA, which allocates 0.5% of its annual revenue to this program, amounting to approximately US\$2 million, thereby benefiting nearly 200 municipalities.
- **Somos Todos Água³:** As a strategic program for water security and the revitalisation of river basins by the Minas Gerais State Government, it aims to conserve and recover the natural vegetation cover as well as to protect water quantity and quality. Although this program initially runs from 2020 until

2023 and just focuses on one pilot basin, it has identified key areas for revitalisation for future state investments in water security.

- **Fundação Renova:** After the Fundão dam's collapse, the involved companies compensate for the environmental damage by investing almost US\$300 million in restoring degraded riparian buffers (APPs) and recovering water recharge areas and springs between 2018 and 2027.

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 a coalition 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 Rio Vivo) where possible.
- 4. Large-scale implementation** of the selected NbS.

Criteria

The Doce Valley 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 – Doce Valley River Basin [Fact sheet].

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1. <https://www.cbhdoce.org.br/rio-vivo/rio-vivo>

2. <https://www.copasa.com.br/wps/portal/internet/meio-ambiente/pro-mananciais>

3. <https://portalinfohidro.igam.mg.gov.br/sem-categoria/336-para-saber-mais-1-somos-todos-aguas>