



UPPER TIETÊ RIVER BASIN

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

The Upper Tietê 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.

The headwaters of the Upper Tietê encompass about 265,000 hectares, extending from the slopes of Serra

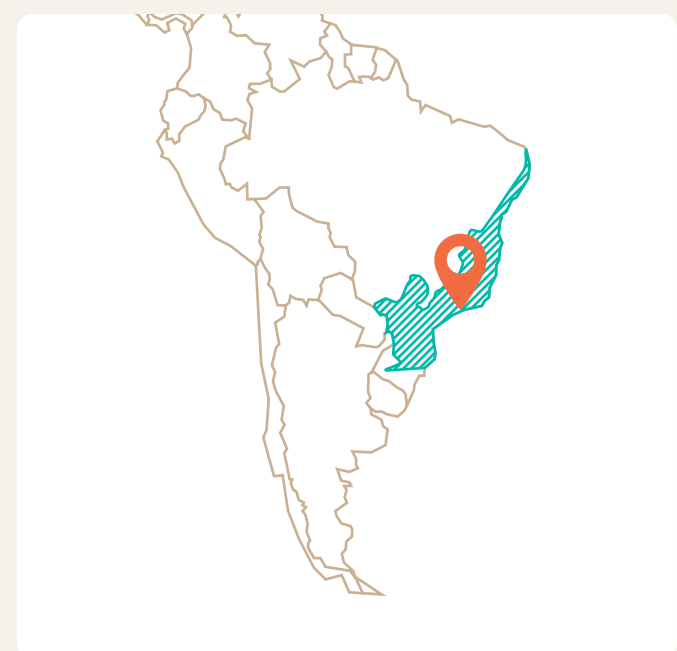
do Mar to the confluence of the Pinheiros River. This region holds paramount importance for the São Paulo Metropolitan Area, the largest urban settlement in South America. **The water demands of the local population, numbering over 18 million people, account for 91% of the basin's total water use.** However, the current water availability in the Upper Tietê remains critically low with 131 m³/person/year, far below the UN-threshold of 1,500 m³/person/year. Furthermore, the basin is home to native forests and wetlands, reliant on the flow of the river to sustain their ecosystems and associated ecosystem services.

The region is prone to frequent flooding due to its specific morphology and limited water retention and storage capabilities. Encroachment on slopes and floodplains for urban development contributes to the damages and casualties resulting from floods and mudslides during periods of heavy rainfall. Moreover, heightened sediment transport leads to the siltation of rivers and dams, thereby diminishing water quality in

BE ONE WITH NATURE

conjunction with urban, industrial, and rural sources of pollution, forcing high water treatment and dredging costs.

Despite a substantial investment of over US\$240 million in flood mitigation measures since 2011, the use of Nature-based Solutions (NbS) has received little attention. **NbS can provide effective strategies for reducing flood risks and sedimentation by emphasizing water retention on vegetated slopes and floodplains.** For instance, modeling studies have shown that restoring ecosystems and adopting improved agricultural practices in merely 2% of the basin would reduce sediment export by 55%, translating to an estimated annual saving of approximately US\$2.4 million on water treatment and desilting costs.



RELEVANCE FOR NBS

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

- **Essential water source** (surface and subsurface) for downstream urban areas.
- **Heightened flood risk**, and this vulnerability is further amplified by the impacts of climate change. Over the period 2011-2020, almost 170,000 people were affected by floods with about US\$110 million of material losses.

- **Escalating drought threat**, with more extreme droughts further exacerbated by climate change.
- **Negative water balance**, as the current water demand exceeds the water supply of the Upper Tietê, 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 – 11,000 to 18,000 hectares in permanent preservation areas and 330 to 550 hectares in legal reserves – particularly concerning the degradation of riparian zones.

MAIN BENEFICIARIES OF NBS

- **Local population:** Experience enhanced water supply security, reduced exposure to flood risks, and improved options for leisure activities.
- **Water supply company (SABESP):** Benefit from a reduction of operational constraints due to flooding 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 receive benefits from enhanced ecosystem services.
- **Ecosystems:** Improved environmental flow and biodiversity protection, leading to higher connectivity and ecosystem resilience.

POTENTIAL PARTNERS FOR NBS

- Upper Tietê Watershed Committee
- SABESP (São Paulo Water Sanitation Company)
- DAEE – State Department of Water and Electric Energy (responsible for Tietê Wetlands Program)
- Local municipalities
- Local farmers (main agriculture and livestock hubs)
- Private sector, national and international companies

NATURE-BASED SOLUTIONS:

WHAT IS POSSIBLE?

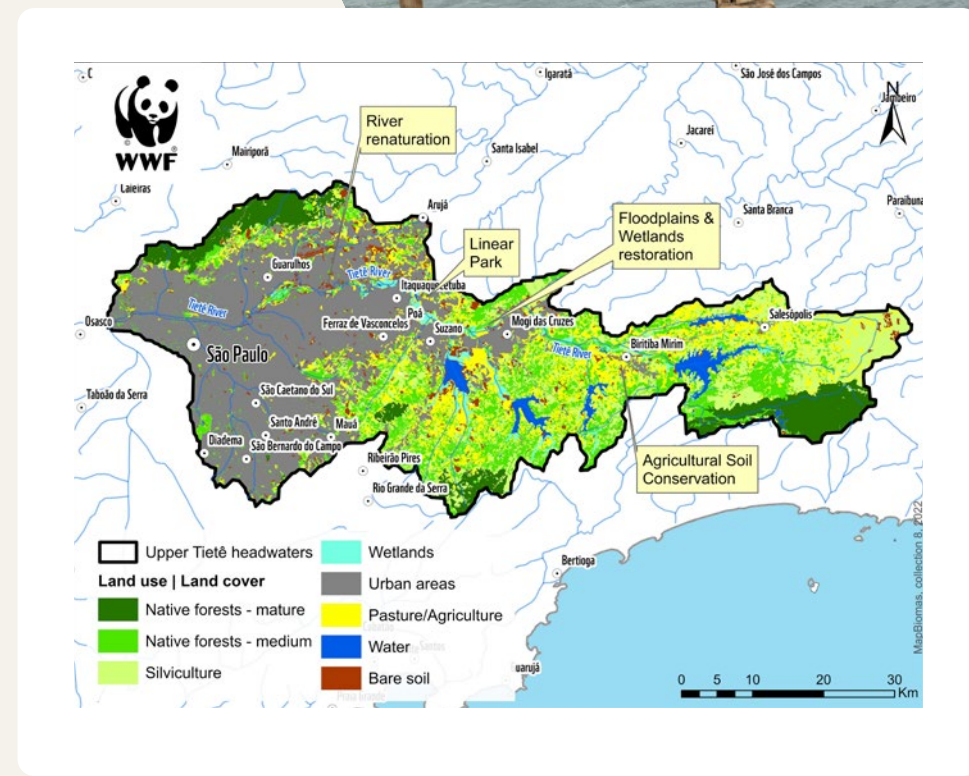


Figure 1: Land use and land cover in the Upper Tietê River Basin, with the suggested NbS.

RIVER RENATURATION

By reestablishing the original course of the river and reintroducing natural riverbanks, the natural dynamics of the river system are being restored. This way, ecosystem services that were previously lost due to the use of artificial structures are recovered. These include cooling effects, erosion control, water filtering properties, and an increase in biodiversity by making the river an ecological corridor.

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 Upper Tietê valley, by creating various forms of water buffers and retention areas along the river. The Tietê Ecological Park is a good example of a multifunctional linear park, with leisure centers, bike lanes, and preserved or restored floodplains.

AGRICULTURAL SOIL CONSERVATION

Fostering good practices in agricultural soil management increases water ecosystem services as infiltration, humidity regulation, and retention of sediments, nutrients, and chemicals. Good examples of NbS approaches for agricultural soil conservation in the Upper Tietê headwaters are the adoption of no-tillage systems and creating terraces on steep slopes by using vegetated fences.

ENABLING CONDITIONS FOR NBS PROJECTS

Economically relevant area: The São Paulo Metropolitan Region is home to many private sector actors. NbS for water security and climate adaptation fit their Environmental, Social, and Governance (ESG) agendas.

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.

- **Watershed-based land use planning and management:** The Upper Tietê Watershed Committee's management plan includes sub-programs that could be executed by making use of a NbS approach. These are the "Protection and Conservation of Water Sources" and "Restoration of riparian vegetation and vegetation cover". For the planning period 2024-2027, there is US\$3.8 million available for investing in those two sub-programs.
- **Programa Parque Várzeas do Tietê¹:** This State program foresees the creation of the largest linear park in the world (75 kilometers in length), with floodplain conservation and restoration for flood mitigation as a primary goal. After completion of the first three phases (2009-2020), US\$100 million was made available for the execution of the fourth phase, the Renasce Tietê Program, which is focused on the rural eastern part of the basin and runs until 2028.

- **Produtor de Água Salesópolis²:** Initiated in 2015 by the Salesópolis City Hall and partners, the project aims to restore riparian forests on smallholder properties. Through a partnership with the private sector, participating rural producers receive Payments for Ecosystem Services (PES), for which funding is sourced from the Water Producer Program Municipal Fund.

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 multi-stakeholder coalitions** for NbS implementation in the region.
3. **Development of a proposition for large-scale NbS implementation,** further engagement of key partners, and integration with ongoing programs (such as Tietê Wetlands Park Program) where possible.
4. **Large-scale implementation** of the selected NbS.

Criteria

The Upper Tietê 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 – Upper Tietê River Basin [Fact sheet].

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1. <http://www.daee.sp.gov.br/site/daee-recebe-representante-do-bid-para-tratar-medidas-do-programa-renasce-tiete/>
2. <https://www.gov.br/ana/pt-br/acesso-a-informacao/acoes-e-programas/programa-produtor-de-agua/pasta-projetos/salesopolis>