



**bioconexão
urbana**

a natureza é a solução

CITIES OF THE FUTURE

Nature-Based Solutions
for the climate emergency

Practical examples of Nature-Based Solutions
and expert source guide

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Presentation

In a world increasingly defined by extreme weather events, we all seek solutions. Thousands of people are being affected by the impacts of climate change, which exacerbate deficiencies in urban planning and city development. The latest IPCC (Intergovernmental Panel on Climate Change) report introduces the concept of "climate-resilient development," which involves integrating climate change adaptation measures with actions to reduce or avoid greenhouse gas emissions, aiming to provide broader and more equitably distributed economic and social benefits.

Knowing that **Nature** can be part of the **Solution** for climate-resilient development, protecting biodiversity becomes even more urgent. What kind of city do we want to live in? Cities that coexist with nature, with high quality of life and well-being, or cities vulnerable to climate impacts, like extreme heat and recurrent storms, with low quality of life?

This material aims to present, through practical examples and references, the concept of **Nature-Based Solutions** as a response and a possibility for a prosperous and resilient future. You will also find names of experts from various fields related to the topic, who can be consulted to bring new perspectives and enrich content and reports across diverse editorial sections. We have gathered some NBS projects already implemented, in Brazil or other parts of the world, in 14 types of solutions. We know this is not exhaustive, as new types are created daily, but here are some of the main and most commonly used in most projects.

Communication professionals play an important role in this cycle of information and education, and we are confident that you will make excellent use of this material to enhance the positive social, environmental, and economic impact of this agenda!

Protecting life by conserving nature is our mission at the Boticário Group Foundation for Nature Protection. With the support of other organizations that are part of the Bioconexão Urbana alliance, we seek to expand the reach of actions so that cities can become more resilient to the impacts of climate change through Nature-Based Solutions. We want cities to be prosperous and full of life, biodiversity, and socio-economic development.

Let's unite our voices for nature and life in all its diversity, in balance with climate-resilient development in Brazilian cities?

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What are Nature-Based Solutions?

Nature-Based Solutions (NBS) are **actions that use natural processes and ecosystems to address urgent societal challenges**, such as the risk of water scarcity or impacts from extreme weather events that affect the safety and health of the population.



INUNDATION



SLIDES



FLOODING



HEAT ISLANDS

The concept of Nature-Based Solutions (NBS) brings together key elements for the construction of sustainable cities, such as the concept of Green Infrastructure, Ecosystem-based Adaptation, among others. The concept of Infrastructure, in general, refers to the set of fundamental services for the socioeconomic development of a region such as sanitation, transportation, energy, and telecommunications. **Green Infrastructure** is the utilization of ecosystem services, or benefits derived from nature, to compose the necessary elements for establishing conventional infrastructure.

On the other hand, **Ecosystem-Based Adaptation (EbA)** focuses on people, dealing with a set of strategies to adapt to the adverse impacts of climate change based on ecosystem services. Both concepts are already adopted worldwide, including in Brazil. This is because **this approach to natural resource management benefits both biodiversity and socioeconomic development.**

In simpler terms, **Nature-Based Solutions (NBS) offer extra benefits beyond what a traditional solution provides, in addition to reducing potential costs related to damage caused by climate events.** They also promote a regenerative economy, which considers the value of socio-environmental resources, and **encourage the growth of companies and organizations** that promote careful conservation of nature.

How to know if a project fits as an NBS?

There are several criteria, but the main factor for an action or initiative to be considered an NBS is that it brings benefits to biodiversity and people at the same time. After all, NBS are actions that use natural processes and ecosystem services to solve a specific problem, and the better preserved the environment is, the more conditions it will have to contribute to the solution.

Other similar concepts, often confused with NBS, are nature-inspired solutions, or biomimicry (products that do not provide ecosystem services or necessarily benefit nature, they are just inspired by it), or nature-derived solutions (such as renewable energies like solar and wind, which do not depend on the functioning of natural ecosystems or necessarily benefit nearby ecosystems).

There is a Global Standard for NBS, developed by a global network of experts led by IUCN. The result is a robust framework that consists of 8 criteria with assessment indicators, that helps increase the impact and scale of Nature-based Solutions.



Criteria for NBS

(adapted from the IUCN Global Standard)

01

First, you need to identify the societal challenge that will be addressed by the NBS and the solution being proposed.

02

Projects should be designed according to the economic, social, and ecological context surrounding the challenge that is intended to be addressed with the NBS.

03

Every NBS should improve or maintain the quality of the ecosystem in which it is embedded.

04

NBS must be economically viable.

05

An NBS needs to be based on inclusive, transparent and empowering governance processes.

06

The ability to deliver multiple benefits simultaneously is a very important attribute for an NBS.

07

An NBS should be designed based on scientific evidence and local knowledge.

08

An NBS must be sustainable in the long term and integrated into an appropriate legal context.

Why use Nature-Based Solutions in cities?

Large Brazilian cities face immense challenges related to urbanization, which historically disregarded the original environments, landscape, and natural processes that occur within them. In this process, the topography has been profoundly altered, with the elimination of ecosystems and interference in landscapes, rivers, and other natural environments. Thus, there has been an intense process of urban area impermeabilization, associated with city growth and the reduction of natural areas. These deeply altered urban environments suffer from the impacts of heavier rainfall, heatwaves, widespread pollution, among other issues that affect the lives of city dwellers.

The increase in impermeable areas leads to changes in the water balance, with higher peaks in flow, speed, and volume of surface runoff, in addition to harming the water quality of receiving bodies by carrying sediments and residues. Metropolitan regions have also experienced changes in their dynamics, with often disorderly urban occupations, industrial development, or agricultural activities that alter the natural environment and reduce permeable areas, from native vegetation along water bodies.

Currently, urban areas host the majority of people living in cities, with 85% in Brazil¹ and 57% worldwide (2022)².

The quality of these cities directly reflects on the quality of life, well-being, and health of their inhabitants.

Nature in cities is essential for making the urban system more sustainable and resilient to climate impacts that may originate from local, regional, or global reasons. Therefore, Nature-Based Solutions are important tools in this context. Extreme weather events are becoming more frequent worldwide, with changes in the hydrological regime causing excess concentrated rainfall in short periods in certain regions, and water scarcity or prolonged droughts, often in the same region.

And the trends and scenarios identified by scientists indicate that, with the increase in the concentration of greenhouse gases in the atmosphere and rises in the planet's average temperature, extreme events are expected to occur with increasing frequency and intensity.

Nature-based solutions (NBS) can vary in scale, from solutions as small as the size of a parking spot or pocket park to landscape-scale solutions, such as restoration around water sources. Even on smaller scales, we should not underestimate the potential of these solutions to transform our cities for the better. This involves an integrated analysis of public policies for urban land management, treating NBS as an essential part of urban planning, forming a network of green infrastructure, in conjunction with other conventional infrastructure actions.

IBGE, PNAD, National Household Sample Survey, 2015.

<https://www.newgeography.com/content/007523-demographia-world-urban-areas-2022-released>



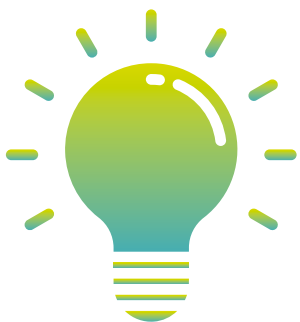
NATURE-BASED SOLUTIONS



*Source: Adapted from UCN, 2020.

NBS in practice: typologies and examples of existing projects

Here we present some Nature-Based Solutions (NBS) projects already implemented, primarily in Brazil, that use natural techniques and processes to address a wide variety of challenges, distributed among the most frequently encountered typologies. This material is not exhaustive; there are many other typologies, often adaptations of those described here, for specific contexts. More information and details about the NBS compiled here can be found in technical NBS catalogs (such as the CGEE Catalog*), on the websites of the presented projects, or through the recommended spokespersons at the end of the publication.



In this material, you will find illustrations of NBS typologies that can be downloaded and shared in publications, reports, and presentations (with proper credit).

NBS can be utilized at different scales, depending on the problem that needs to be solved. Landscape-scale solutions can address challenges such as water security, climate change adaptation, and greenhouse gas mitigation. Even those solutions at a more local scale can have high replicability potential and solve significant challenges, especially when associated with public policies and an integrated territorial vision.

**Discover some of them here,
and see how Nature is the Solution!**

Restoration around water sources

Landscape and forest restoration refers to a set of strategies and practices aimed at recovering degraded areas, which enhance the functionality of the restored area and can contribute to climate change mitigation and adaptation, particularly concerning water security.

Priority restoration of areas around water sources aims to rehabilitate the functions of ecosystem services. This involves enhancing vegetation's ability to retain sediment, improve water infiltration into the soil, reduce surface water flow velocity, and consequently manage drainage better. These improvements enhance conditions to meet the needs of populations directly or indirectly dependent on that water source.

AMONG THE GENERAL BENEFITS OF THIS NBS, WE CAN MENTION:

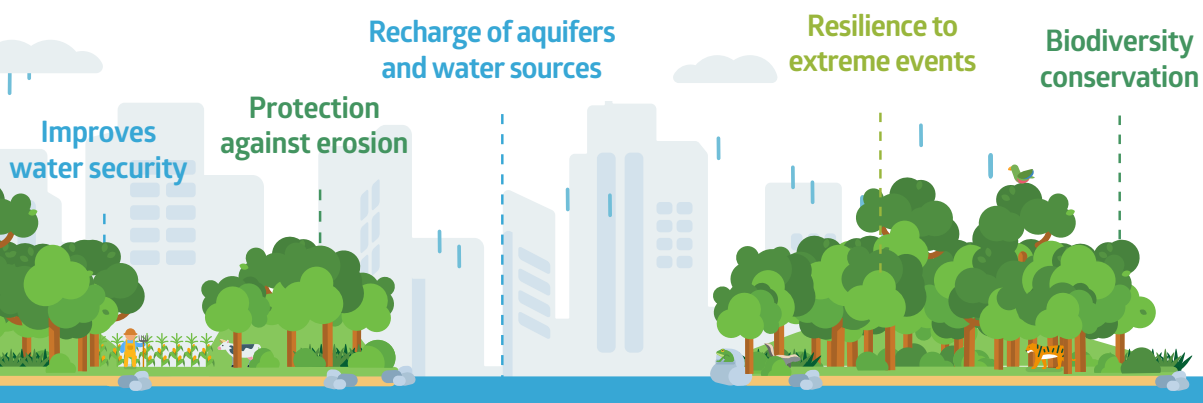
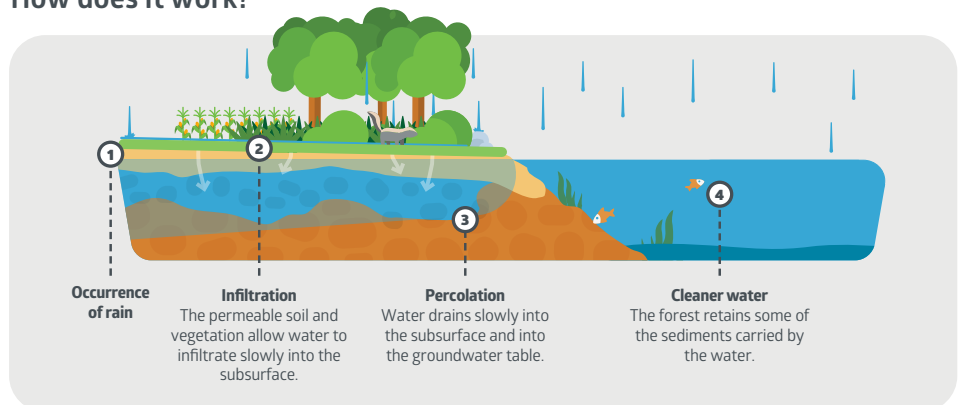
- **Reduced siltation of springs, streams, and water sources;**
- **Improved soil quality;**
- **Availability of higher-quality water with lower treatment costs;**
- **Improved quality of life for rural producers;**
- **Enhanced regional socio-economic development;**
- **Conservation of nature through sustainable use of natural resources.**

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RESTORATION AROUND WATER SOURCES

The restoration of priority areas around water sources aims to rehabilitate the functions of ecosystem services, such as vegetation's sediment retention, water infiltration into the soil, and reduction of surface water flow velocity. This improves water quality and promotes greater water security.

How does it work?





Viva Água movement

Water security is one of the goals of the Viva Água movement, which began in 2019 to restore the hydrographic basin of the Miringuava River, one of the most strategic for supplying the municipality of São José dos Pinhais in Paraná, and has been replicated in the Guanabara Bay hydrographic region in the state of Rio de Janeiro.

It's an innovative model that operates through a multisectoral movement with funding from a Philanthropic Fund, enabling the development of nature conservation strategies and transition to a regenerative economy. It aims to foster impact entrepreneurship, sustainable agriculture, responsible tourism, as well as the ecological restoration of the local ecosystem.

viva  água

cuidar do **Rio Miringuava**
é proteger a vida

viva  água

cuidar da **Baía de Guanabara**
é proteger a vida

No forest, no water

A study conducted under the Viva Água Miringuava initiative compared four basins within the Upper Iguaçu Basin (Rio Pequeno, Rio Miringuava, Rio Palmital, and headwaters of Rio Passaúna) to evaluate the importance of native vegetation cover for water capture and maintenance in the soil. It revealed that during dry seasons, the minimum flow of rivers can decrease by up to 52% in urbanized basins with little remaining native vegetation. Conversely, in regions with a high degree of native forest cover, the decrease is only 6% to 11%.

[CLICK HERE TO ACCESS THE FULL STUDY](#)

[VISIT THE MOVEMENT'S WEBSITE](#)



Location: 1. São José dos Pinhais (PR) in the Miringuava River Basin, and 2. hydrographic region of Guanabara Bay (RJ), encompassing 17 municipalities.



Area: 277 km² in the Miringuava River Basin, 4810 km² of terrestrial area in the Guanabara Bay Hydrographic Region.



Beneficiaries: agro-industrial complex, predominantly small-scale agriculture, and populations dependent on these water sources, nature tourism.



Institutions involved: Boticário Group Foundation in partnership with various public and private organizations in each of the regions.



Miringuava River in São José dos Pinhais (PR)



Reforestation Program

The "Reforestation Program" promotes the restoration of the water cycle through the conservation, maintenance, and recovery of forest cover by planting seedlings of native species from the Atlantic Forest. The project also creates opportunities and income for rural producers, encouraging the adoption of sustainable soil use practices.

Payment for Environmental Services (PES)

Financial support through Payment for Environmental Services (PES) to assist in the acquisition of inputs such as seedlings, fencing materials, fertilizer, and others ensured the program's performance. Between 2015 and 2019 alone, over 21.3 thousand acres were preserved or restored.



Location: 74 municipalities in Espírito Santo.



Area: Over 21.3 thousand acres preserved or restored.



Beneficiaries: Rural landowners who have allocated part of their property for environmental preservation or sustainable rural practices, and the population dependent on these water sources.



Institutions involved: Secretaria do Meio Ambiente e Recursos Hídricos (Seama) do ES coordinating, and BANDES - Banco de Desenvolvimento do Espírito Santo, as the technical-financial agent.

[LEARN MORE ABOUT PAYMENT FOR ENVIRONMENTAL SERVICES HERE](#)

Pro Mananciais

The "Pro-Mananciais" program aims to protect and restore hydrographic micro-basins and recharge areas of aquifers used for water collection, treatment, and distribution to users in the state of Minas Gerais. The program operates primarily through partnerships with rural producers, facilitated by Environmental Collectives (Colmeias). The project includes various actions such as erosion control, restoration of degraded areas, and involvement of local communities through awareness campaigns, mobilization, and environmental education. It aims to stimulate behavior change and emphasizes shared responsibility.



Location: 291 municipalities in Minas Gerais.



Beneficiaries: Nearly 10 million people, including partner institutions that collectively build integration among the populations residing in the micro-basin regions served.



Institutions involved: Regulatory Agency for Water Supply and Sanitation Services (Arsae-MG) and the Sanitation Company of Minas Gerais (Copasa).





Catskills New York

The most classic case of Payment for Environmental Services (PES) in the world, which continues to inspire major cities to this day, emerged in the late 1980s when the city chose to acquire and restore areas in the Catskill watershed to conserve the surrounding water supply instead of investing in treatment plants or other forms of water capture. Rural producers in the area preserve their natural vegetation and adopt management practices that do not pollute the water, earning them the title of "water guardians." They are now compensated for the environmental services provided by the preserved areas.

Quality water, naturally

With this initiative, New York invested in conserving the Catskill watersheds and saved \$10 billion on water treatment costs, which is nearly seven times less than conventional treatment methods. Requiring only chlorine and fluoride for treatment, since the water quality meets or exceeds state and federal potability standards, this supply network is considered the largest gravity-fed and unfiltered water source in the world.



Location: Catskill Mountains - New York.



Area: 500,000 acres across the entire watershed.



Beneficiaries: Rural producers and the population supplied with water.



Institutions involved: New York City government and the United States Environmental Protection Agency (EPA).

Ecological corridors connect fragments of vegetation, enabling animal movement, seed dispersal, and increasing vegetative cover. They are also crucial for water security, helping to prevent erosion of banks and siltation of springs, rivers, and lakes. These corridors serve as a tool for land management and spatial planning, defined by the National System of Nature Conservation Units (SNUC, Law No. 9.985, July 18, 2000). Their objective is to "ensure the maintenance of ecological processes in areas connecting Protected Areas, allowing species dispersal, recolonization of degraded areas, gene flow, and the viability of populations that require more than the territory of a conservation unit to survive." In urban and peri-urban environments, their use is even more extensive, directly contributing to adaptation and water security strategies, especially when associated with water bodies' surroundings.

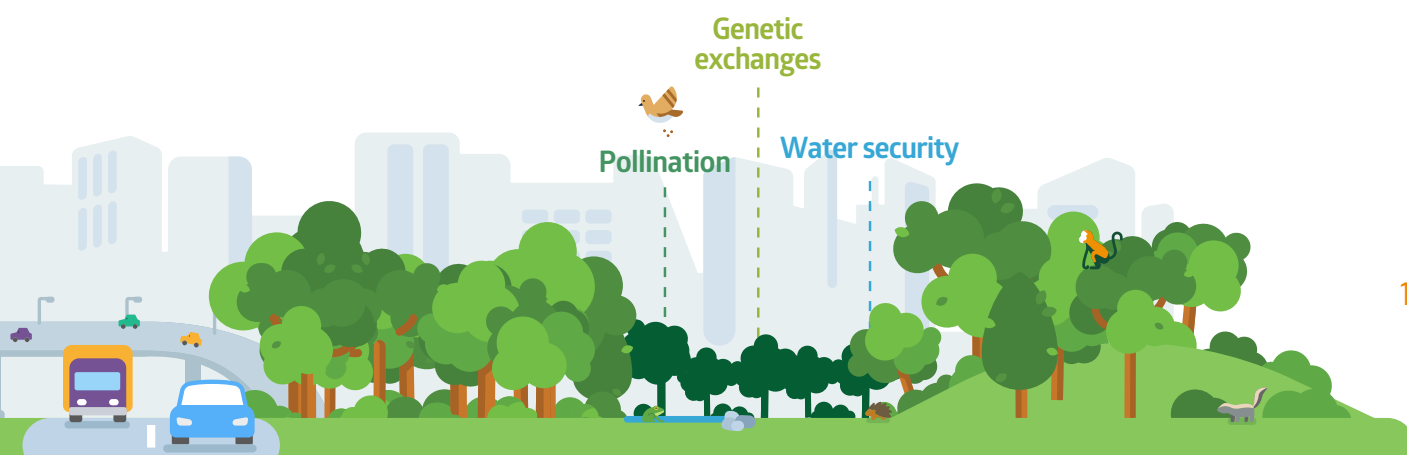
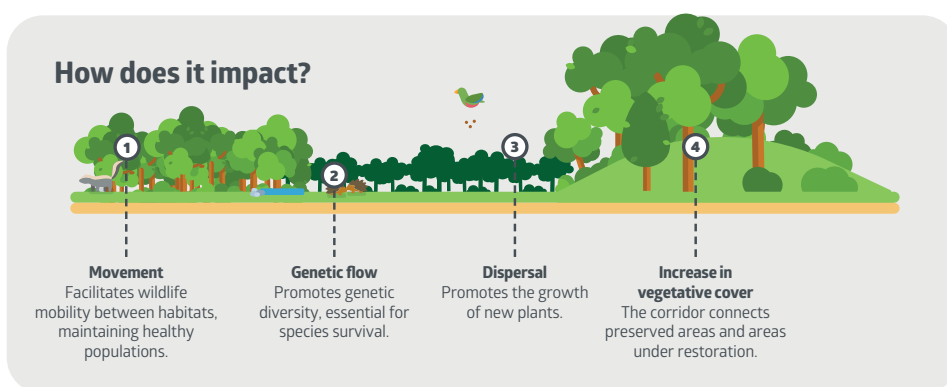
AMONG THE GENERAL BENEFITS OF THESE ECOLOGICAL CORRIDORS, WE CAN MENTION:

- **Reduction of siltation in springs, streams, and water sources;**
- **Space for circulation and maintenance of biodiversity, with genetic exchanges and less territorial isolation;**
- **Urban and intermunicipal planning, good management of land use and occupation;**
- **Development of the local economy, with potential for leveraging ecosystem services;**
- **Implementation of infrastructure projects to support ecological corridors;**
- **Awareness of the value of nature in urban and metropolitan contexts.**

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ECOLOGICAL CORRIDORS

Ecological corridors are Nature-Based Solutions (NBS) aimed at connecting vegetation fragments to facilitate animal movement, seed dispersal, and increased vegetative cover, promoting genetic exchange. They are essential for water security at a landscape scale and also help prevent erosion along banks and sedimentation in water bodies.



Reconecta RMC

The "Reconecta RMC" initiative has emerged to provide ecosystem services primarily related to water security and biodiversity conservation. Municipalities are developing joint strategies for the protection, conservation, and recovery of fauna and flora, integrating local actions already implemented, coordinating technical efforts into a regional plan, and defining inter-municipal actions aimed at improving the environmental conditions of the region in an integrated manner.



Location: Campinas (SP).



Beneficiaries: 20 municipalities in the Metropolitan Region of Campinas, with 48 km of established ecological corridors.



Institutions involved: Secretaria de Infraestrutura e Meio Ambiente (SIMA), Secretaria do Verde, Meio Ambiente e Desenvolvimento Sustentável de Campinas (SVDS) and ICLEI South America.



Photo: Archive of the Municipal Government of Campinas

Linear parks, or multifunctional green corridors, are linear extensions with native vegetation from the local ecosystem, which can be associated with infrastructure projects and support. These parks can serve multiple ecological and social functions, such as preventing erosion and siltation of urban rivers, controlling inundations in urban infrastructure, or connecting parks and other vegetation fragments within the urban fabric. They are spaces that can provide low-carbon transportation routes for cyclists and pedestrians, as well as areas for leisure and recreation, enhancing quality of life and health.

This type of Nature-Based Solution (NBS) can be designed along rivers and lakes (blue-green corridors) or other linear spaces, such as energy transmission networks or decommissioned railway lines.

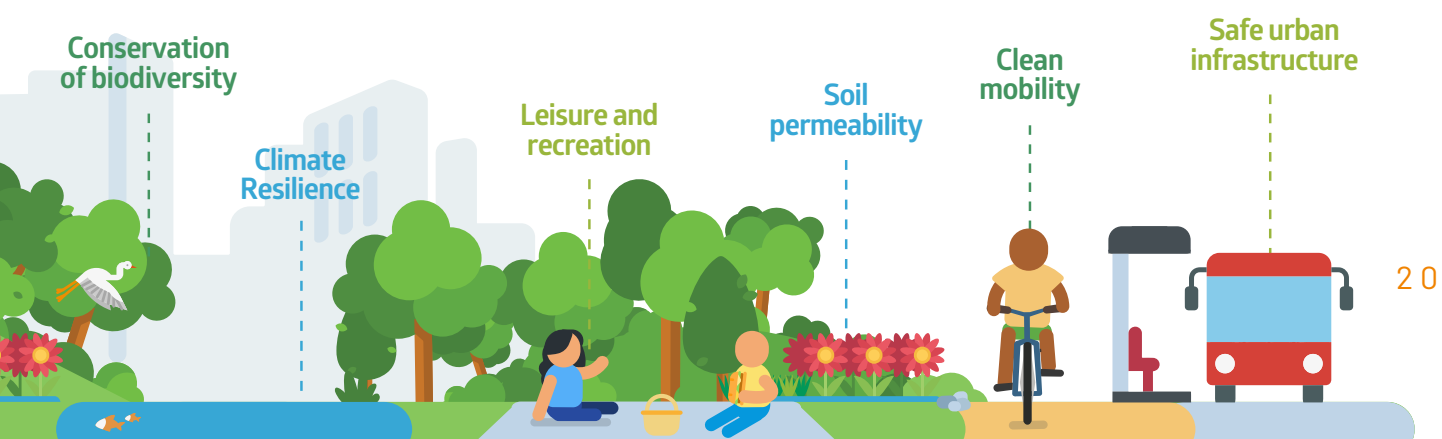
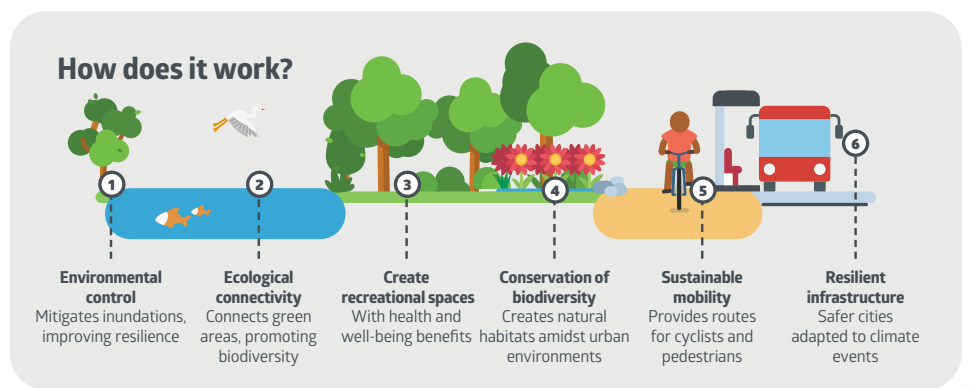
AMONG THE GENERAL BENEFITS OF THIS NBS, WE CAN MENTION:

- **Reduction of siltation and erosion along urban riverbanks;**
- **Space for circulation and maintenance of biodiversity, with genetic exchange and reduced territorial isolation;**
- **Urban planning integrating water bodies into the landscape;**
- **Development of the local economy, diversifying service offerings and revitalizing urban environments;**
- **Awareness of the value of nature in urban contexts, making natural areas accessible to the population and highlighting their benefits.**

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LINEAR PARKS

Linear extensions with native vegetation, can serve multiple ecological and social purposes, such as preventing erosion and siltation of urban rivers, controlling inundations, or connecting parks and other vegetation fragments within the urban fabric.



Guairacá Park

The park is part of a preservation and leisure program replicated along the Barigui, Belém, and Atuba rivers in Curitiba (PR). In addition to reducing inundation risks in the surrounding areas, the park provides recreational facilities that foster a sense of community belonging, such as shared trails for walking and biking, volleyball and soccer courts, as well as spaces for leisure and contemplation like the lakeside deck, benches, and children's playground.



Photo: Curitiba City Hall's Archive



Location: Curitiba, PR.



Area: 120 km².



Institutions involved:
City Hall of Curitiba.

High Line Park, NY

High Line Park is a public linear park in New York City, built on an old abandoned train line from the 1980s that used to transport meat from butcher shops to meatpacking plants. The goal was to revitalize this region of the city and provide alternatives for services and economic development.

As a suspended garden, the park serves as an observation deck and open-air art gallery in Manhattan, exclusively for pedestrians, spanning approximately 19 blocks along the Hudson River, offering space for leisure, contemplation, and urban relaxation away from the city hustle and bustle.



Location: New York, USA



Area: about 2 km along a disused railway line



Beneficiaries: population



Institutions involved:
Field Operations (design company) and the New York City Government



River and stream renaturalization

The recovery or renaturalization of rivers involves restoring their hydrological and biological functions with native biodiversity, aiming to approximate the original characteristics as closely as possible. Revitalization should have an integrated and systemic approach that considers processes throughout the entire basin, in the water body in question, and along its banks. Ideally, the river should revert to a course similar to its original one, when possible, restoring its meanders and original paths, as well as part of its preservation area along the banks. However, the urban context and local limitations determine the potentials for obtaining the greatest benefits from its requalification within local possibilities. These projects can and should be associated with multifunctional urban parks of high ecological and social performance or linear parks.

What is diffuse pollution?

Diffuse pollution originates from the surface runoff of water in urban areas, resulting from activities that deposit pollutants sporadically over the watershed's contributing area.

BENEFITS OF THIS NBS

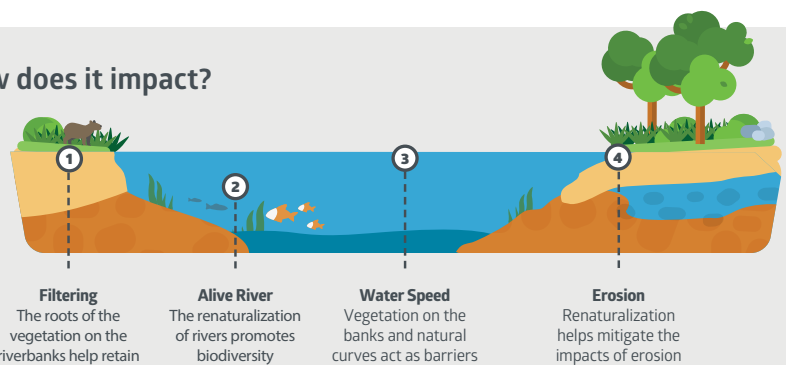
- **Protection of urban springs and streams;**
- **Reduction of the impact of heavy rainfall;**
- **Mitigation of urban heat islands, improving water and soil quality with reduced diffuse pollution;**
- **Restoration and conservation of local biodiversity;**
- **Promotion of quality of life for the population through spaces for leisure and contemplation.**

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RESTORATION AROUND WATER SOURCES

The restoration of priority areas around water sources aims to rehabilitate the functions of ecosystem services, such as vegetation's sediment retention, water infiltration into the soil, and reduction of surface water flow velocity. This improves water quality and promotes greater water security.

How does it impact?



Resilience and Adaptation

Biodiversity Conservation

Long-term Economy

Improves the local microclimate

Lago do Cabrinha

The recovery of the spring of Lago do Cabrinha in Londrina (PR) consolidates the formation of small pools, delimited by a few steps. The intention is to dissipate the energy of the water arriving from the galleries of the conventional stormwater drainage system.

Vegetation was planted to form a containment barrier to reduce the velocity of rainwater. Rocks were placed to create stepped small pools (with the first ones deeper than the following ones) to prevent issues like inundations and landslides, and to enable the control of diffuse pollution.



Location: Londrina (PR).



Area: 127 km².



Beneficiaries: Population.



Institutions involved:
City Hall of Londrina, ICLEI South America.



Photo: Emerson Dias

Recovery of Cheonggyecheon Stream

The restoration of Cheonggyecheon Stream in Seoul, South Korea, demonstrates how integrating a river into the landscape can completely transform the urban environment and enhance the quality of life for the population. In 2002, the project began with the demolition of roads that spanned over the riverbed and its banks, along with improvements to the drainage and sanitation systems. Additionally, the project aimed to create urban spaces that connect people with biodiversity. A green corridor was constructed with native species adapted to potential flooding, linking the stream to the Han River and passing through an ecological reserve with over 1.1 km of swampable areas.

Concurrently, improvements were made to the road system and public transportation, and no significant increase in congestion was observed in the region. The project transformed the relationship between people and this city area, fostering more local businesses driven by pedestrian traffic and utilizing community centers and art installations that were implemented in the region, which has become a high-end financial and commercial center. The population has recognized the benefits of various ecosystem services provided by nature, such as reduced urban heat islands and spaces for leisure and contemplation, bringing numerous advantages to the entire local community and its many visitors.



Location: Seoul, South Korea.



Area: 5.84 km²



Beneficiaries:
General public and tourists.



Institutions involved:
Seoul City Hall.



Drenurbs Program

The Environmental Recovery Program of Belo Horizonte - Drenurbs was implemented over 10 years ago in Belo Horizonte (MG), serving as a significant guideline for urban and environmental policy under the current Municipal Master Plan. It represents a crucial adaptation measure to the impacts of climate change in urban areas, focusing on reintegrating watercourses into the landscape.

The program's implementation included the creation of three linear parks where riparian areas were restored and preserved, and water quality was improved. Detention basins were installed to reduce inundation risks, and local communities were actively engaged in the urban space recovery processes. These parks are now providing ecosystem services with restored rivers and public spaces used and enjoyed by the communities.



Photo: Belo Horizonte
Municipal Government Archive



Location: Belo Horizonte (MG).



Area: Approximately 200 km of watercourses, encompassing 73 streams and 47 watersheds.



Beneficiaries: General society and directly involved communities.



Institutions involved: Belo Horizonte City Hall.

Multifunctional Parks and Squares

Urban parks can be multifunctional, featuring rich biodiversity and various types of green and blue infrastructure elements combined. They should be designed to integrate natural (green and blue) and grey infrastructure elements within the same space. Associated with water networks, effective management of stormwater or lakes are prominent features within these linear parks, which are typically longer than they are wide. These parks predominantly feature natural elements that often provide multiple functions and accommodate various uses.

BENEFITS OF THIS GREEN AND BLUE INFRASTRUCTURE:

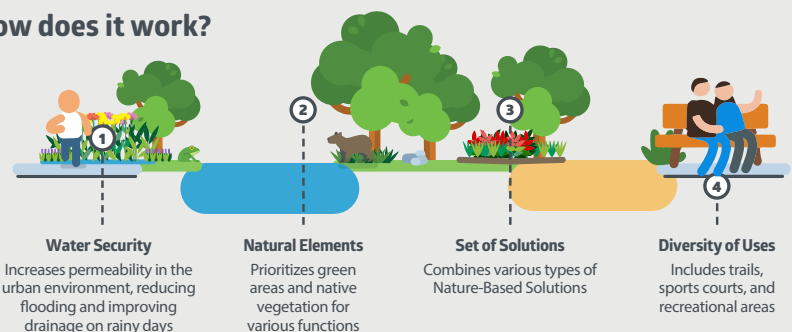
- **Creation of vegetated areas and drainage networks for flood control, enhancing water security.**
- **Reduction of erosion along streambanks and urban lakeshores.**
- **Decrease in sedimentation of water bodies.**
- **Conservation of natural areas with native vegetation.**
- **Increase in urban tree cover and permeable areas, reducing urban noise and mitigating heat islands.**
- **Promotion of a water purification and treatment system based on natural processes.**
- **Provision of bike paths, pedestrian walkways, multipurpose sports courts, and other recreational areas.**

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MULTIFUNCTIONAL PARKS AND SQUARES

Multifunctional parks and squares can incorporate multiple types of Nature-Based Solutions (NBS) together, which can also be associated with other ecological or conventional engineering solutions. They provide benefits such as flood control, biodiversity conservation, and improvement of environmental quality, thereby promoting health and well-being for nearby populations.

How does it work?





Barigui Park

Barigui Park was created in the 1970s, stemming from the need to create the lake, which functions as a retention basin. The existence of the lake, combined with other actions, increases the city's resilience, especially in the face of extreme variations in precipitation. At the same time, the protection of native vegetation around the lake allows for the conservation of biodiversity, with vegetation consisting of patches of primary native forest and secondary forests, which serve as refuges for animals and help regulate air quality and the local microclimate. The park also offers an important space for leisure and health promotion for the entire population, with recreational and cultural activities for citizens and visitors.



Location: Curitiba (PR).



Area: 1.4 km².



Beneficiaries: Fauna, flora, and citizens.



Institutions involved: Curitiba City Hall.



Pajeú Park

Pajeú Park is an example of a multifunctional park that offers solutions with multiple benefits. The area now meets environmental demands, with tree planting that improves the microclimate and drainage, and the construction of fitness centers, playgrounds, and a soccer field meets social demands. A filtering garden naturally and sustainably treats effluents discharged into the river and has also been integrated into the landscaping. Its enhancement took place in 2018 to improve the quality of public services and the socio-environmental development of the municipality, integrating investments in environmental sanitation infrastructure with the expansion of social facilities and the requalification of public spaces.



Location: Sobral (CE).



Area: 51 km².



Beneficiaries: Population.



Institutions involved:

Sobral City Hall and the Development Bank of Latin America (CAF), through the Socio-environmental Development Program of Sobral (Prodesol).



Urban Parks: A Gift for Cities

In addition to the numerous benefits that urban parks can offer in terms of ecosystem services, parks can also provide economic benefits. A study by the Boticário Group Foundation demonstrated that for every R\$1 invested in Barigui Park, the return for the municipality would be R\$12.00.

Coastal areas are highly valued, but their original ecosystems are often altered by intense human occupation. Without the natural barrier provided by coastal ecosystems (such as dunes, mangroves, coral reefs, among others), the sea can encroach upon urbanized areas, causing disruptions for residents and tourists and impacting the local economy.

The restoration and conservation of coastal ecosystems are Nature-Based Solutions (NBS) that effectively increase resilience against climate challenges such as heavy rainfall, high tides, and storm surges. Rising sea levels must also be considered when planning and designing the protection of coastal ecosystems. In addition to their importance for coastal protection, these ecosystems serve as nursery and feeding grounds for various animal species, making them significant biodiversity hotspots.

BENEFITS OF THIS NBS:

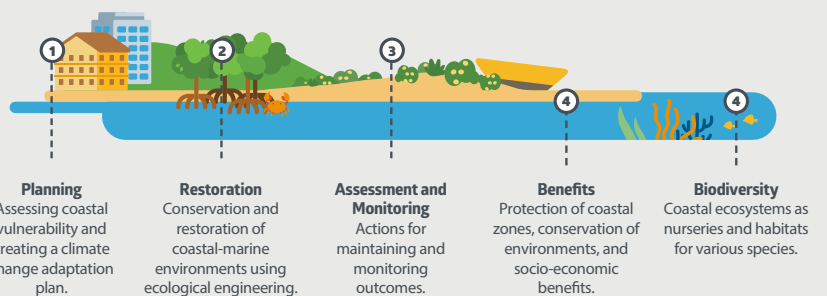
- **Reduces the impact of waves on urban coastal infrastructure;**
- **Protects coastal regions against coastal erosion and other impacts from extreme weather events and sea level rise;**
- **Preserves coastal-marine environments rich in biodiversity, crucial for food security for a large part of the population;**
- **Provides healthy environments for the reproduction and habitat of various marine species that use mangrove areas and coral reefs as nurseries;**
- **Stabilizes dunes through coastal vegetation;**
- **Maintains local microclimate by regulating heat islands;**
- **Enhances biological diversity of the landscape.**

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COASTAL PROTECTION

Nature-Based Solutions (NBS) for coastal protection include the conservation or restoration of coastal-marine environments (such as dunes, mangroves, coral reefs, among others), which can be associated with ecological or conventional engineering actions. These ecosystems can act as a natural barrier against the primary adverse impacts of climate change, such as coastal erosion, sea level rise, and flooding, while also providing additional benefits to the population and biodiversity.

How does it work?



Coral Biofactory

Corals are considered the "rainforests of the ocean" due to their rich biodiversity: one in every four marine species depends on corals for shelter, reproduction, or food. However, a projection by UNESCO has indicated that unless climate change is reversed, coral reefs will be extinct by the end of this century.

In an effort to contribute to reversing this scenario, the Coral Biofactory initiative, which has been working for several years on developing coral restoration techniques, launched the "scientific tourism program" in 2022 to engage the local community in solving the problem of reef degradation. The initiative includes a coral restoration program divided into four management programs: coral transplantation, mapping and monitoring, recovery of sick colonies, and educational experiences.



Location: Porto de Galinhas, Pernambuco.



Area: Natural pool 'Poço da Paixão', covering 0.115 acres (1150 m²).



Beneficiaries: Coral reefs, tourism sector professionals, local community, and tourists.



Institutions involved: Funding institutions (Boticário Group Foundation, CNPq, WWF Brasil, Instituto Neoenergia, CAPES, FACEPE, Porto de Galinhas Convention & Visitors Bureau, and YEPIST); operational partners (Porto Point Mergulho, Associação dos Jangadeiros de Porto de Galinhas, and CIA DO LAZER); regulatory agencies (ICMBio, IBAMA, Secretaria de Meio Ambiente e Sustentabilidade de Pernambuco, Prefeitura Municipal do Ipojuca).



Photo: Filipe Cadena

A coral to call your own

Have you ever thought about adopting a coral? Learn more about the coral biofactory, and see how nature can be our greatest ally!

[CLICK HERE](#)

Ipanema and Recreio dos Bandeirantes

The restoration of dune vegetation at Ipanema and Recreio dos Bandeirantes beaches was carried out using native Restinga vegetation, a distinct type of coastal tropical and subtropical moist broadleaf forest in eastern Brazil. This solution protects the dunes from wind erosion, reduces the impact of waves during storm surges, attracts birds, and provides habitat for various species, thereby conserving the ecosystem.



Location: Rio de Janeiro.



Area: 6.5 acres with over 36,000 seedlings planted.



Beneficiaries: Local population and flora.



Institutions involved: Instituto-E.

Corals are amazing!

Coral reefs act as a barrier to wave energy, along with beaches, mangroves, marshes, and sand dunes. A groundbreaking study conducted by Boticário Group Foundation, "Ocean without mysteries: Unraveling coral reefs," evaluated the economic and social benefits of shallow coral reefs in northeastern Brazil, highlighting their importance for coastal protection.

WANT TO LEARN MORE? ACCESS THE FULL RESEARCH HERE.



Restoration in slope areas with native species from the local ecosystem is a Nature-Based Solution (NBS) with the potential to mechanically stabilize soils, reducing landslide risks, regulating surface water flows, and contributing to improving downstream watershed quality by reducing erosion and sedimentation. This NBS can also have social impacts, as it reduces the vulnerability of regions with settlements in high-risk areas, especially considering the increasing frequency and intensity of extreme weather events. Green areas restored with the participation of surrounding communities are effective in containing uncontrolled urban expansion, among other public policies for land use planning. Additionally, slope restoration and conservation actions can be significant measures for greenhouse gas mitigation. In some cases, soil stabilization may require the use of various geological techniques in conjunction with vegetation planting.

BENEFITS OF THIS NBS:

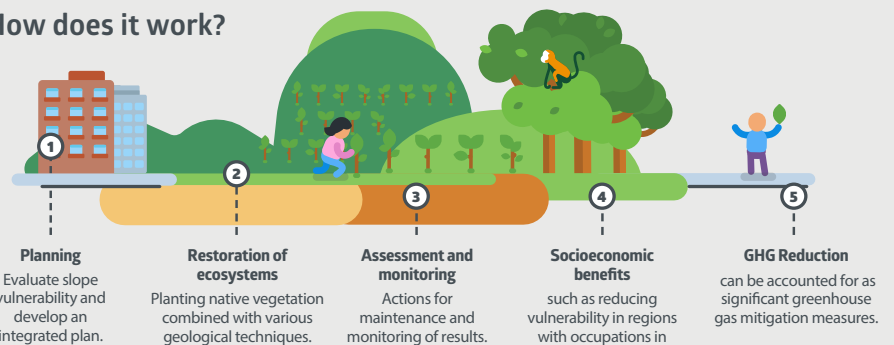
- **Restoration of degraded landscapes through the planting of native vegetation on slopes;**
- **Prevention of sedimentation in the drainage system and downstream watercourses;**
- **Connection of forest fragments through ecological corridors;**
- **Conservation of natural areas with native vegetation;**
- **Reduction of landslide risks during extreme weather events;**
- **Reduction of social vulnerability by preventing unplanned occupation in risk areas.**

SLOPE RESTORATION

Nature-Based Solutions (NBS) have the potential to mechanically stabilize soils, reducing landslide risks, regulating surface water flows, and contributing to the improvement of downstream watershed quality by reducing erosion and sedimentation. In some cases, soil stabilization may be necessary through the combination of different geological techniques with vegetation planting.

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How does it work?



Conservation of biodiversity

Risk reduction of landslides

Improvement of microclimate

Prevention of sedimentation

Water security

Tijuca National Park

Known as the first recorded case of Nature-Based Solutions (NBS) in Brazil, the Tijuca Forest underwent a reforestation process when local authorities at the time realized that the lack of forest cover was potentially causing issues, including water scarcity. In the 19th century, Emperor D. Pedro II appointed Major Archer to afforest the hills, aiming to rehabilitate water flows in the region. Between 1861 and 1888, approximately 100,000 seedlings were brought and planted in the area, including non-native fruit trees, ignoring which today is a pivotal factor in NBS projects, biodiversity benefits. Over the following years, with the creation of the park and maintenance of the preserved area, the forest has been naturally regenerating.



Location: Rio de Janeiro (RJ).



Area: 39.58 km².



Beneficiaries: City population.



Institutions involved: The Chico Mendes Institute for Biodiversity Conservation (ICMbio) is responsible for maintaining the park.



Mutirão Reforestamento Program

The Mutirão Reforestamento Program was a pioneering program, created in 1986 to prevent erosion of riverbanks and estuaries through planting in riparian buffer zones, reducing vulnerability. The initiative improves urban climate by reducing heat islands and promotes green jobs. Additionally, the project captures and retains carbon stored in biomass and soil, aids in the restoration of the city's hillside landscapes, boosting tourism, and controls invasive grasses, reducing the incidence of wildfires.



Location: Rio de Janeiro (RJ).



Area: 92 neighborhoods.

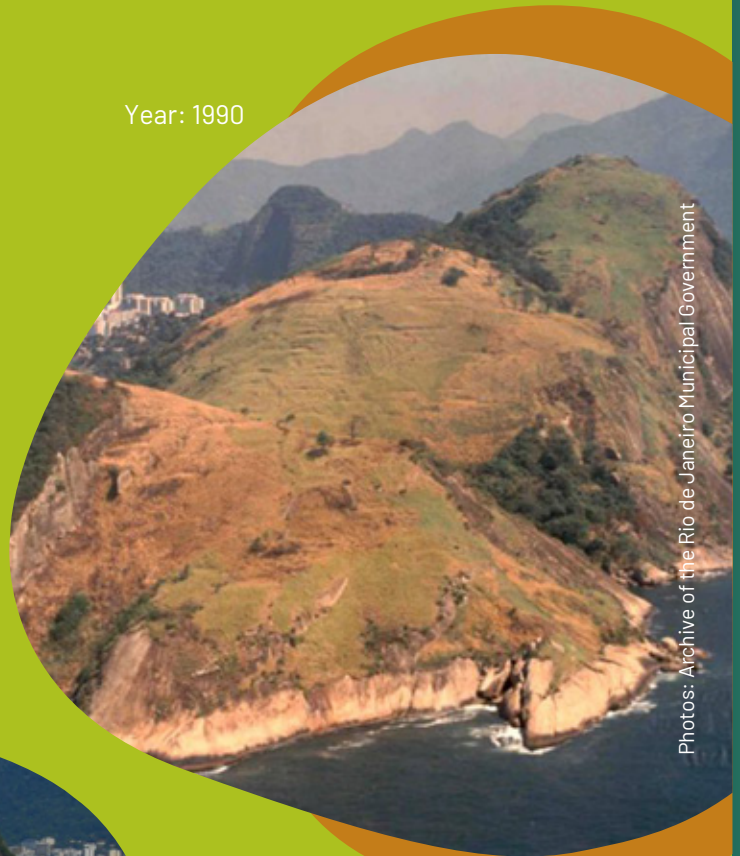


Beneficiaries: Residents of surrounding communities who participate in paid collective planting activities, involving six nurseries, 15,000 residents, and 150 specialized professionals.



Institutions involved: City of Rio de Janeiro Government, Secretariat of the Environment, and Department of Environmental Restoration.

Year: 1990



Photos: Archive of the Rio de Janeiro Municipal Government



Year: 2008

Montes Verdes Project

It is a program focused on revegetating degraded areas in Belo Horizonte (MG), prioritizing actions in spaces affected by wildfires or irregular occupations. Native species from the Atlantic Forest and endangered fruit-bearing trees have been selected for planting.

The importance of slope restoration

Landslides can be natural, depending on the characteristics of soil and terrain in each region. However, deforestation, cutting, and occupation of these steep areas expose the soil, leading to erosion and increased surface water runoff, which facilitates landslides. This risk is especially heightened during periods of intense rainfall over short durations, exacerbated by climate change and its impact on extreme weather events. In essence, steep areas devoid of natural vegetation become more vulnerable, resulting in potentially significant losses for the city and its residents. Source: CGEE



Location: Belo Horizonte (MG).



Area: 3 acres.



Beneficiaries: Particularly residents of 3 communities in the region.



Institutions involved: Municipal Secretariat of the Environment and the Urbanization and Housing Company of Belo Horizonte (Urbel).



These are structures typically formed by lakes or vegetated and/or permeable depressions that, during rainfall, delay water entry into the urban drainage system. They receive surface runoff water through natural or traditional drainage systems and accommodate rainwater, reducing peak flow to a level compatible with the receiving environment's capacity. This helps reduce flooding. These solutions also enable aquifer recharge and can be implemented at various points in the drainage basin.

Rainwater ponds or retention basins accommodate excess rainfall, gradually returning water levels to normal. This allows for infiltration and reduces the rate of flow during intense rain events, while also supporting aquatic biodiversity and improving environmental quality.

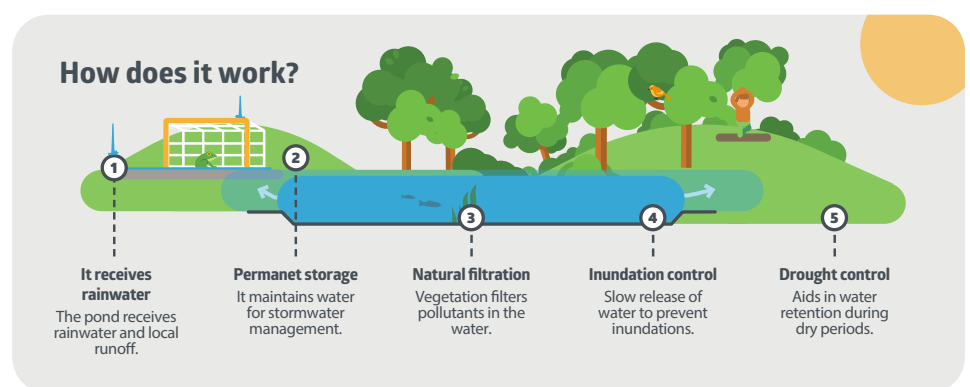
BENEFITS OF THIS NBS:

- **Temporary reduction in the volume of water reaching water bodies during heavy rainfall.**
- **Reduction in the speed of surface runoff during intense rain events.**
- **Prevention of flooding.**
- **Improvement of water quality through bioretention and sedimentation processes.**
- **The population can use the reservoir for recreational, leisure, or contemplative activities, as appropriate.**
- **Enhances the value of the surrounding area.**
- **Habitat for biodiversity.**
- **Recreational areas.**

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RAINWATER PONDS AND RETENTION

This Nature-Based Solution (NBS) is a sustainable stormwater management approach that utilizes natural elements such as vegetation, soil, and topography to control and treat rainwater runoff. It allows the water to be gradually absorbed, evaporated, or released in a controlled manner into the drainage system.



Recreational and contemplative space

Reduction of flooding

Habitat for biodiversity

Buriti City Program

The program involved the design of a green-blue infrastructure reservoir with different levels, allowing for multiple uses based on estimated water surface elevation (EWE) for recurring periods ranging from 2 to 100 years. The initiative reduced the volume of rainwater from 180,000 to 46,000 liters per second and increased retention capacity from 6,000 to 21,000 m³ through the implementation of dams on the Lagoinha Stream. This prevents water from reaching Avenida Rondon Pacheco too quickly in Uberlândia (MG).



Photo: Archive of the Uberlândia Municipal Government



Location: Uberlândia (MG).



Area: 20 kilometers.



Beneficiaries:
General population.



Institutions involved:
City Hall of Uberlândia.

Bacacheri Park

General Iberê de Matos Municipal Park

The Bacacheri Park, located in Curitiba, PR, was known in the 1970s as "Tanque do Bacacheri", or Bacacheri Tank, and the local population used it as a recreational and bathing area. It was officially recognized as a park in 1988, formally named General Iberê de Matos Municipal Park. In addition to serving as a flood control basin, the park features areas of vegetation, leisure equipment, a walking track, a snack bar, and various services for local residents and tourists. Native species of local vegetation have also been reintroduced, and the park's habitat attracts various animals, including birds and aquatic species. As a result, the park provides numerous ecosystem services and helps increase the city's resilience to intense rainfall events.



Location: Curitiba, PR.



Area: 152 000 m²,
with a lake of 22,000 m².



Beneficiaries:
City population.



Institutions involved:
Curitiba City Hall.



Photo: Curitiba City Hall

Constructed wetlands for effluent treatment (filtering gardens)

Various natural ecosystems have the potential to purify water through filtering and retaining contaminants, such as marshes, mangroves, peatlands, among others. Constructed wetlands are nature-based technologies that can be used for treating water contaminated by diffuse pollution before it reaches water bodies, or for treating both domestic and industrial effluents.

They stand out for using vegetation within their systems, where plants absorb organic matter and create a conducive environment for bacteria that break down pollutant particles. There is no application of artificial chemicals or microorganisms from outside the environment. It is expected that each system will undergo variations and adaptations according to demand and local conditions, including the specific plant species used and the level of maintenance required.

BENEFITS OF NBS:

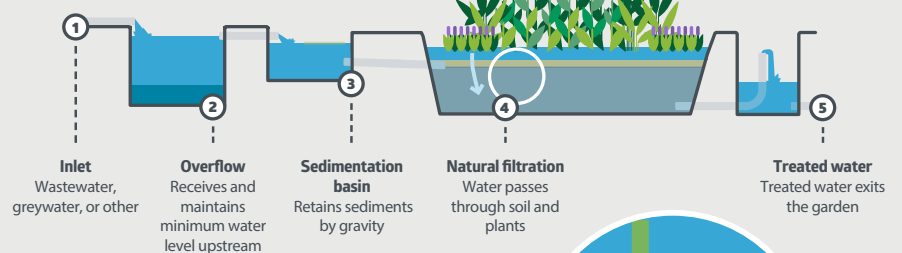
- **Protection and restoration of ecosystems and their surroundings;**
- **Improvement of urban sanitation and environmental quality of water/bodies of water;**
- **Provision of leisure, recreation, contemplation, cultural, and environmental education facilities and spaces, investment in overall infrastructure;**
- **Help recharge groundwater and regenerate natural processes;**
- **Aid in mitigating flooding;**
- **Alternative treatment of effluents.**

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CONSTRUCTED WETLANDS

Nature-Based Solution (NBS) for treating wastewater, using plants and microbiology, chemical-free. Inspired by marsh ecosystems, mitigates flooding by accommodating rainwater, as well as filtering and infiltrating water, recharging underground reserves. Attracts pollinators, captures carbon, and contributes to improving the local microclimate.

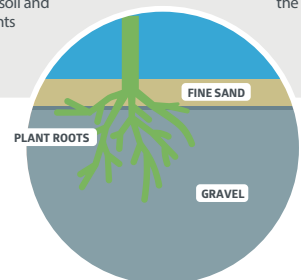
How does it work?



Preserves biodiversity

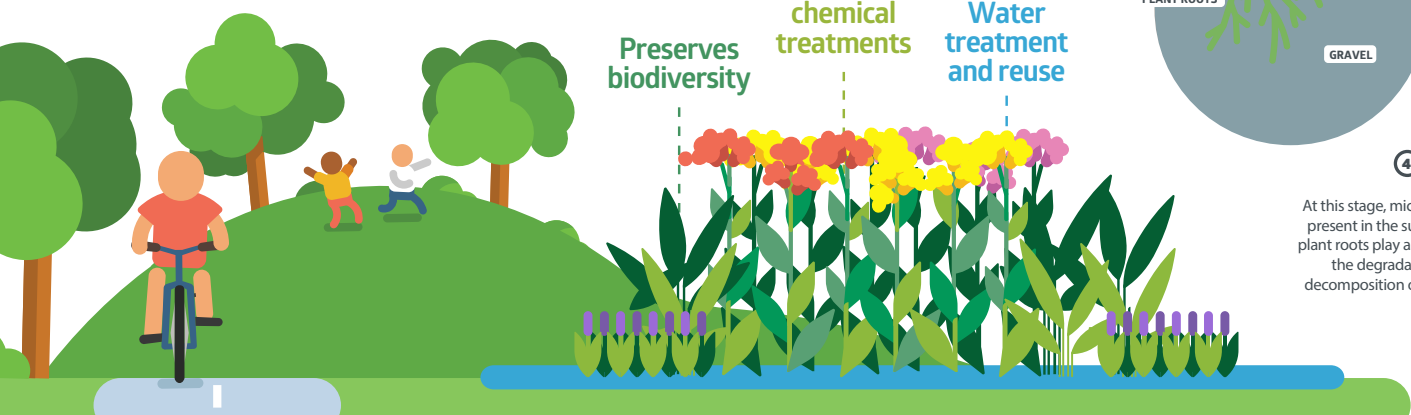
Without chemical treatments

Water treatment and reuse



4

At this stage, microorganisms present in the substrate and plant roots play a crucial role in the degradation and decomposition of pollutants.



Orla Piratininga (Alfredo Sirkis Park)

Orla Piratininga Alfredo Sirkis Park is one of the most innovative and comprehensive multifunctional parks implemented in Brazil. It combines ecological and cultural features with elements of NBS (Nature-Based Solutions), representing a case of constructed wetlands for water treatment (filtering gardens). The park accommodates and treats water from both the upstream watershed and runoff from paved areas in its surroundings through green infrastructure devices such as constructed wetlands and bio-swales. The gardens receive and filter water from the three main basins draining into Piratininga Lagoon: Rio Cafubá Basin, Rio Arrozal Basin, and Rio Jacaré Basin. It spans 35,000 m² of constructed wetlands, which not only treat water before it reaches the lagoon but also provide a suitable environment for biodiversity to return to the region, as well as leisure and contemplation opportunities for the local population.



Location: Niterói (RJ).



Area: 680 km².



Beneficiaries: General population.



Institutions involved: City Hall of Niterói.



Photo: Collection FGB

Rachel Queiroz Park

The redevelopment of Rachel de Queiroz Park is part of the Sustainable Fortaleza City Program, which combined the need for infrastructure improvement with environmental concerns and public usability. The Presidente Kennedy neighborhood, the largest area available for intervention, previously struggled with irregular effluent discharges and domestic waste disposal. Today, it features nine small lakes within the park.



Location: Fortaleza (CE).



Area: 203 acres.



Beneficiaries: 300,000 people across 14 neighborhoods.



Institutions involved: Municipal Secretariat of Regional Management.

Photo: Architecture Gallery

Caiara's Park

The project was created to contribute to the process of cleaning up the Cavouco Stream, one of the most important in the West Zone of Recife and a tributary of the Capibaribe River. The stream is 6 km long and originates at the Federal University of Pernambuco (UFPE), from a tributary affected by pollution. The initiative has the capacity to filter approximately 360,000 liters of water per day and improves the oxygenation of the stream water that flows into the Capibaribe River. The garden is composed of 7,500 native macrophyte plants selected based on the region's climate, landscaping design, and filtering capacity.



Location: Recife (PE).



Area: 7,000 m².



Beneficiaries: General population.



Institutions involved: CITInova; Ministry of Science, Technology, and Innovation; Global Environment Facility; Phytorestore; Recife Agency for Innovation and Strategy (ARIES); Porto Digital and City Hall of Recife.

Interesting fact:

Constructed wetlands for effluent treatment (filtering gardens) are ideally located in areas that were previously natural inundations during times of high water levels in rivers. This placement enhances the resilience of the system to inundations and floods. Source: CGEE.



Photo: Gadelharia

Urban Forestry - Green Streets

Urban forestry is the ensemble of trees, palms, and shrubs, whether cultivated or spontaneously grown, within the urban perimeter and peri-urban region, in public and private areas, that interconnect and are part of the green infrastructure network of cities. It can be associated with NBS typologies like wet plazas or other typologies such as rain gardens. Arborization is extremely relevant as an adaptation measure to climate change in urban areas, especially due to its relative ease of implementation and scalability. These solutions help maintain areas available for urban biodiversity, including pollinators and decomposers, directly contributing to conservation. Urban arborization is the most common point of contact between the local community and nature and can be implemented in a variety of situations.

It is very important that arborization is included as public policy in urban areas, as well as prioritizing native species of the local ecosystem and establishing urban arborization plans with rules for planting and the removal or replacement of specimens when necessary.



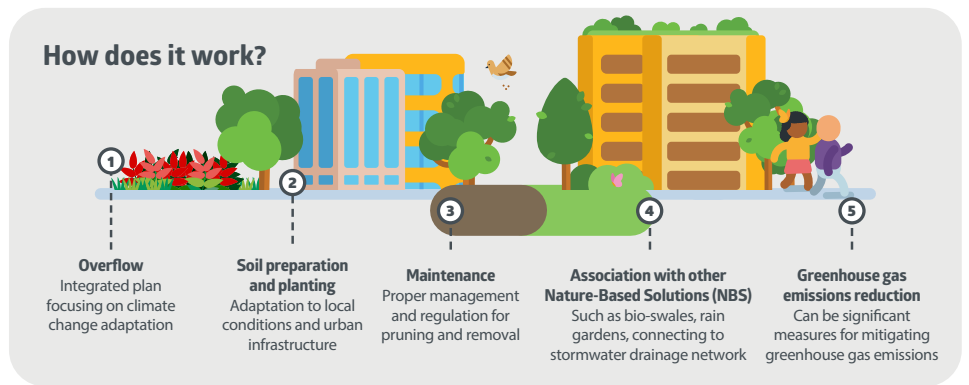
BENEFITS OF THIS NATURE-BASED SOLUTION (NBS):

- Increased humidity, shaded areas, and consequent reduction of urban heat islands;
- Rainwater retention in biomass and soil when associated with permeable areas;
- Potential to reduce air pollution and urban noise;
- Improvement of urban biodiversity, not only through trees but also other associated species;
- Promotion of pollination cycles, particularly for native bees and other pollinators;
- Enhancement of culture, community interaction, environmental education, and promotion of environmental stewardship;
- Improvement of well-being, quality of life, health, and leisure opportunities for the population;
- Significant enhancement of scenic beauty, contributing to urban aesthetics and landscaping.

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GREEN STREETS

Urban forestry involves trees in both public and private areas, serving as a Nature-Based Solution (NBS) crucial for adapting to climate change in urban settings. These solutions are easily implemented and scalable, maintaining areas for urban biodiversity, including pollinators and decomposers, thereby directly contributing to biodiversity conservation.





Green City of Brazil

According to the demographic census conducted by IBGE in 2010, the rates of tree planting in public streets were analyzed in Brazilian cities with over one million inhabitants. Goiânia ranked first in the country as the most tree-lined city, with approximately 1,200 trees spread throughout the city and about 94 m² of green area per inhabitant, earning the title of Green Capital of Brazil. Goiânia has an Urban Forestry Master Plan (PDFU), a document that provides a precise diagnosis of the tree planting on public streets in the city and establishes guidelines for tree planting, pruning, and removal in these areas. The plan aims to preserve the 950,000 trees present on public streets in the city, making Goiânia the state capital with the highest number of trees per inhabitant in Brazil (0.79 trees per inhabitant), and it recommends the most suitable species for each type of area and the correct methods for planting and cultivating them.



Location: Goiânia (GO).



Area: 950 thousand trees throughout the city.



Beneficiaries: General population.



Institutions involved: City Hall of Goiânia.



Photo: Jackson Rodrigues

Rain gardens contribute to the infiltration and retention of rainwater in the soil or its slower redirection to the drainage system, thereby delaying peak runoff. Generally, these structures are designed to receive rainwater and surface runoff in depressions in the ground, preferably covered with native vegetation. Water accumulates in these depressions and gradually infiltrates into the soil or is slowly directed to drainage systems associated with the gardens.

They can also utilize the biological activity of plants and microorganisms to remove pollutants from stormwater and diffuse pollution, although this is not their primary function. Ideally, rain gardens should be integrated into the drainage system, complementing traditional systems to enhance their capacity for stormwater retention and drainage, which is increasingly important as an adaptation measure to climate change. In urban areas, they should be properly sized and located based on technical drainage studies and local characteristics.

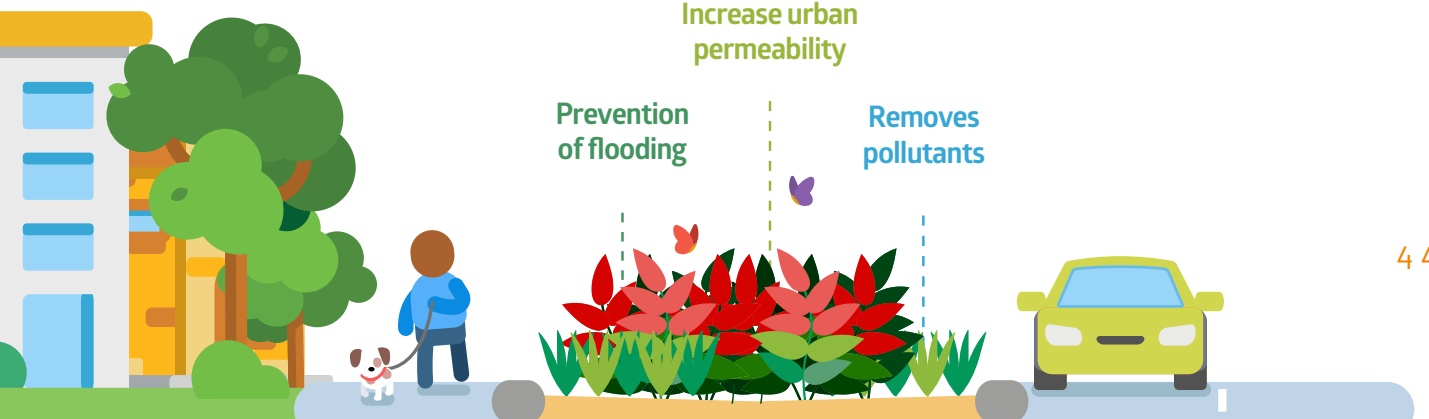
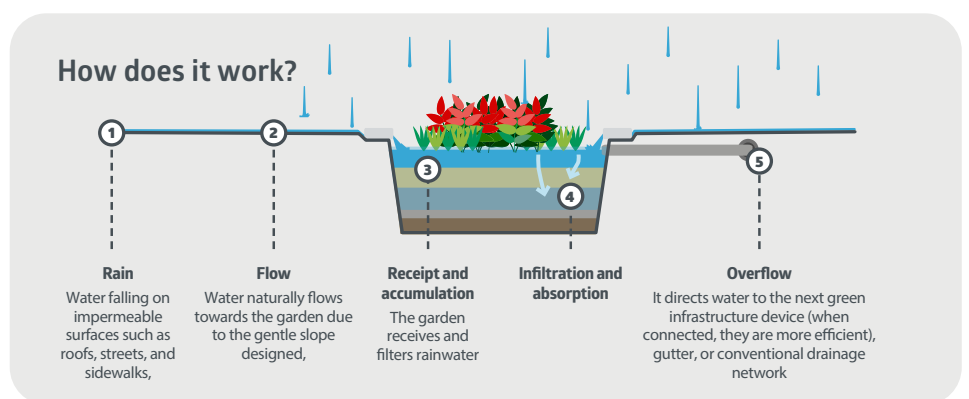
BENEFITS OF THIS NBS:

- Sustainable rainwater drainage, groundwater recharge, and infiltration;
- Reduction of flooding;
- Enhancement of local landscape with native species that benefit biodiversity;
- Potential improvement in well-being and quality of life in urban areas.

[DOWNLOAD HERE](#)

RAIN GARDENS

Nature-Based Solution (NBS) for managing stormwater runoff and reducing the impact of urban impermeability on the environment. It is a landscaped area with native vegetation, designed to receive, treat, and infiltrate rainwater from roofs, streets, and other impermeable surfaces.



Salvador – BA

The first rain garden in a public area in the capital of Bahia is a central planter on Anísio Teixeira Street, in the Pituba neighborhood, chosen because it experiences occasional flooding. The pilot project is an opportunity for monitoring and learning about the functionality of rain gardens.

Photo: Lara Caccia



Location: Salvador (BA).



Area: 270 m² Rain garden area: 17.5 m².
Rain garden capacity: 5.92 m³.



Beneficiaries: Local community.



Institutions involved: Cities4Forests, WRI Brasil, C40 Cities, German Agency for International Cooperation (GIZ), and City Hall of Salvador.

São Paulo - SP

One of the largest rain gardens in Brazil is located on Major Natanael Street in Pacaembu. It consists of a complex of 11 installed rain gardens covering an area of 2300 m² on this street alone, generally connected to the drainage system. The project aims to increase urban permeability, minimizing the effects of surface runoff from rainwater.

This initiative by the São Paulo City Hall includes landscape interventions to better utilize public space and the environment in the central region. In addition to rain gardens, other NBS typologies are associated, such as bio-swales, green parking spaces, infiltration wells, green staircases, land art, and urban conservation groves. All these NBS typologies help the city better manage excess rainwater, providing additional benefits of NBS, such as spaces for improving and increasing urban biodiversity, generating direct benefits for the population.



Location: São Paulo (SP).



Area: Over 313 gardens spread across the city.



Beneficiaries: Local community and urban biodiversity.



Institutions involved: Department of Urban Management of the Municipal Secretary across the 32 District offices.

Photo: São Paulo City Hall



Goiânia - GO

Goiânia has begun implementing rain gardens in critical flooding areas, which later evolved into a public policy initiative. A bill was approved instituting rain gardens in roundabouts, sidewalks, and central planters throughout the city, improving rainwater drainage and absorption. In addition to drainage benefits, these gardens enhance the landscape beauty with native Cerrado (Brazilian savanna) species and can be integrated into interventions to reduce vehicle speed on roads.



Location: Goiânia (GO).



Area: 270 m².



Beneficiaries: Local community and urban biodiversity.



Institutions involved: Municipal Department of Infrastructure and Public Services (Seinfra) and Urbanization Company of Goiânia (Comurg).



Photo: City Hall of Goiânia

Fazenda Lagoa do Nado Park

The project was created to contribute to the process of cleaning up the Cavouco Stream, one of the most important in the West Zone of Recife and a tributary of the Capibaribe River. The stream is 6 km long and originates at the Federal University of Pernambuco (UFPE), from a tributary affected by pollution. The initiative has the capacity to filter approximately 360,000 liters of water per day and improves the oxygenation of the stream water that flows into the Capibaribe River. The garden is composed of 7,500 native macrophyte plants selected based on the region's climate, landscaping design, and filtering capacity.

Photo: ICLEI South America



Location: Belo Horizonte (MG).



Beneficiaries: General population.



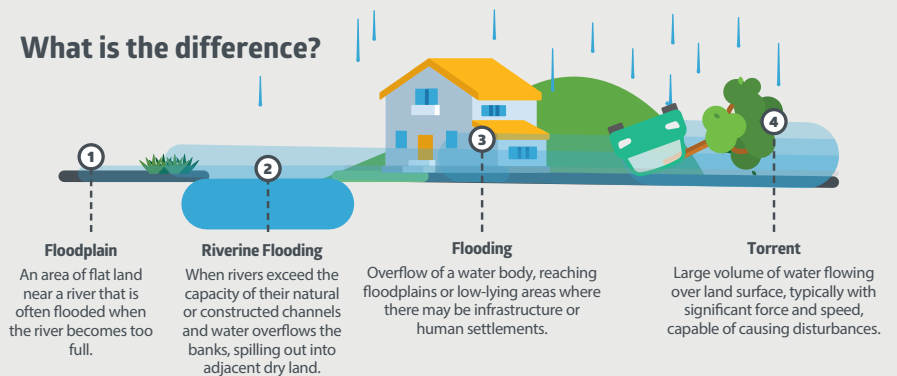
Institutions involved:
City Hall of Belo Horizonte and
ICLEI South America.



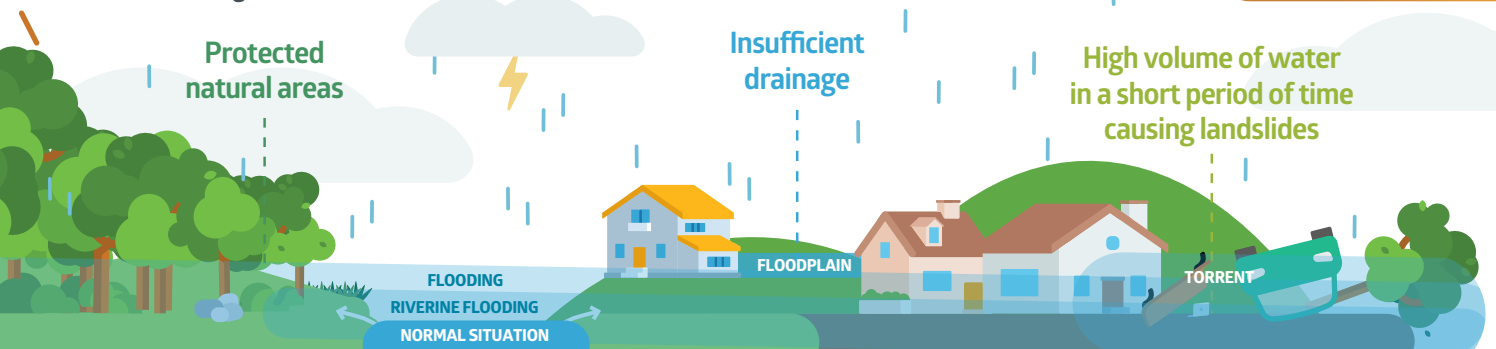
FLOODPLAIN, RIVERINE FLOODING, FLOODING AND TORRENT

Heavy rains, with a high volume of precipitation concentrated in a short period of time, tend to cause disruptions, especially when they impact urban infrastructure or settlements. Maintaining riparian buffer zones (APPs) is crucial, and Nature-Based Solutions (NBS) can reduce the impact by capturing and retaining rainwater.

What is the difference?



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Pocket Parks and Green Parking Spaces (or Living Lots)

Pocket parks are usually small areas located in central areas of large cities, which are very important as "refuge" points for the health and well-being of those who live or pass by, as well as habitats for urban biodiversity, even if small in scale. Designed to be public and outdoor living rooms, these parks feature elements such as benches or chairs for resting, the presence of trees, and even waterfalls in some cases. Similarly, green parking spaces, also known as parklets, usually occupy one or more parking spaces on street edges, democratizing the use of public space. To be considered NBS, they must have direct benefits for biodiversity, therefore, featuring native vegetation and soil permeability.

The creation of urban microenvironments, in downtown street beds, replacing car parking spaces with leisure areas, aims to complement the urban surface drainage system through these draining and water-collecting microenvironments, as well as allowing for arborization without many restrictions from utility networks.

BENEFITS OF THIS NBS:

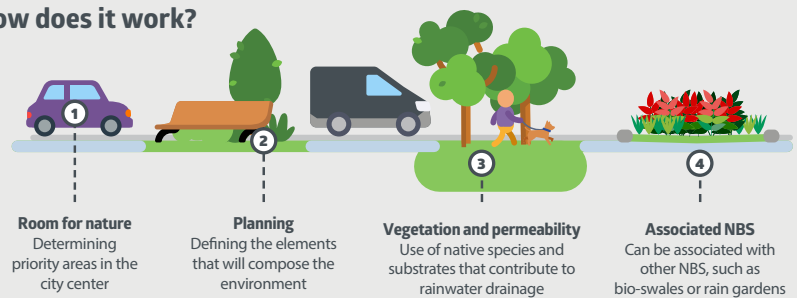
- **Habitat for urban biodiversity, primarily composed of small species due to space restrictions;**
- **Enables the population to interact with nature amidst urban space;**
- **Improves quality of life for local users and the population in general, due to ecosystem services provided;**
- **Reduces urban heat islands and regulates local microclimate;**
- **Increases opportunities for nature appreciation among the population, with potential to promote NBS and biodiversity concepts.**

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POCKET PARKS

They occupy small areas, typically near urban centers, with native vegetation and space for socializing. They provide a refuge for urban biodiversity, improve local microclimate and soil permeability, contributing to better quality of life for the population. In the case of green parking spaces, the concept is similar, but the space utilized generally corresponds to the area of one or more vehicle parking spots.

How does it work?



Reduction of heat islands

Permeable areas

Life quality

Parque da Juventude

On the site of the former Carandiru Penitentiary, around 200 people came together to plant 600 native trees from the Atlantic Forest of São Paulo, representing 60 species. The area underwent a process of redefinition by the local community, creating a space for the presence of a pocket of Atlantic Forest trees.



Location: São Paulo (SP).



Area: 900 m² (intervention area).



Beneficiaries: General population, visitors, urban biodiversity.



Institutions involved: Voluntary action, supported by the Verdejando Festival.



Photo: News Agency,
Government of the State of São Paulo

Bosque da Batata

In the Pinheiros neighborhood, a plot of land that was previously used for irregular dumping of waste and debris has been revitalized. Following the renovation of Largo da Batata, a group of entrepreneurs dedicated efforts to its restoration through the planting of native trees from the local ecosystem. After clearing away the debris, the original soil was accessed and properly prepared for planting. Approximately 350 volunteers collectively planted 400 seedlings of 90 different species native to the original Atlantic Forest of the region, with an emphasis on the Brazilian pine, the Araucaria, after which the neighborhood is named.



Location: São Paulo (SP).



Area: 900 m² (intervention area).



Beneficiaries:

General population, visitors, urban biodiversity.



Institutions involved:

Volunteer action.



Photo: Casacor

Shadow and fresh water

In some European cities, wooded areas are, on average, up to **12°C cooler** than urban spaces without trees, according to a study published in the scientific journal Nature Communications. These "cool islands" are places in the city where the temperature is significantly lower compared to areas without vegetation.

Green Roof

It is a solution consisting of vegetated roofs, preferably with native biodiversity, which can also include areas for food production. The solution can be installed on existing or new buildings, depending on the technology used. They help reduce the impermeable areas of cities, decreasing the quantity and speed of surface runoff. They also aid in reducing urban heat islands and insulate the interior of buildings from heat and cold, regulating temperature. They can be combined with photovoltaic solar panels for energy generation.

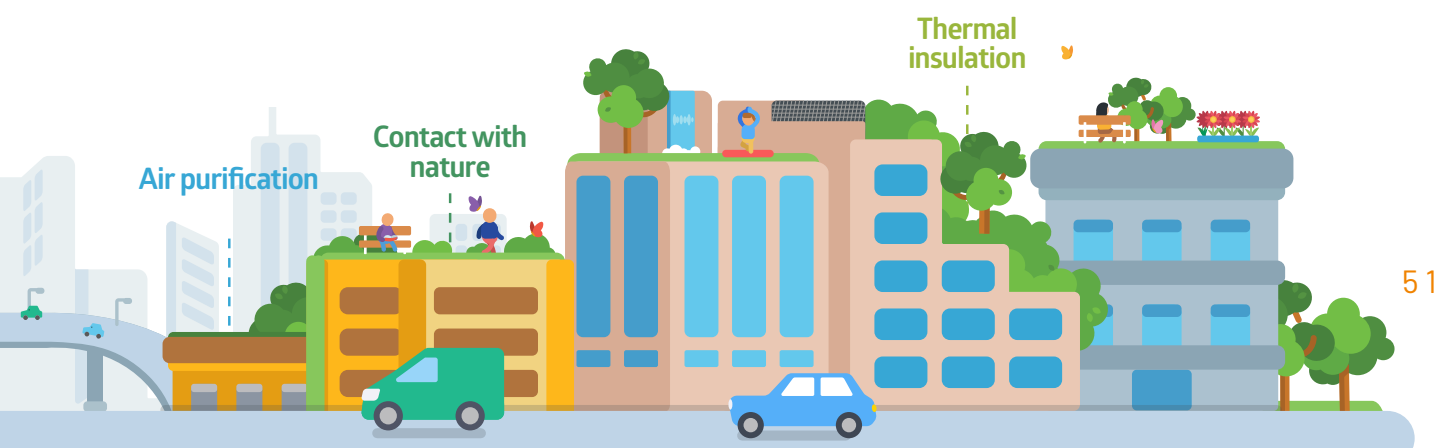
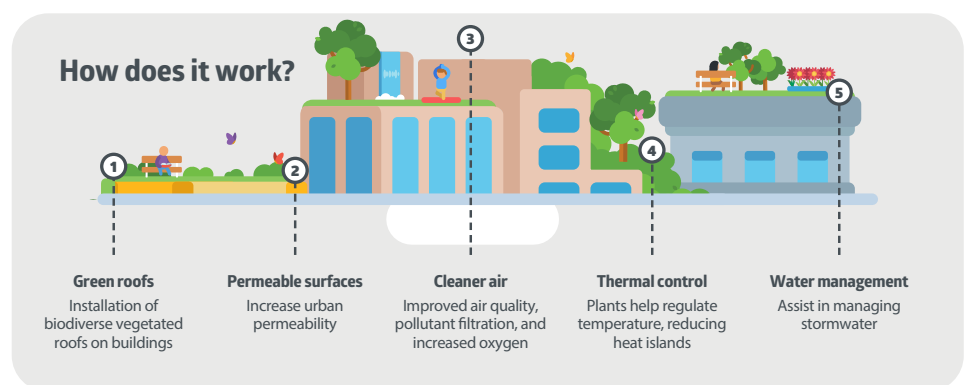
BENEFITS OF THIS NBS:

- **Reduction and maintenance of internal temperatures in residences and buildings;**
- **Mitigation of the urban heat island effect;**
- **Air purification and increase in relative humidity;**
- **Reduction of solar radiation reflection, regulating the local microclimate;**
- **Raising public awareness about the importance of respecting the environment;**
- **On a larger scale, it can promote noise reduction and regional temperature reduction;**
- **Reduction of peak stormwater runoff, contributing to better efficiency of the drainage system.**

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GREEN ROOF

Green roofs are a Nature-Based Solution (NBS) consisting of vegetated coverings. They help reduce impermeable areas in cities, decreasing the quantity and speed of surface runoff. They also contribute to reducing urban heat islands and insulate the interior of buildings from heat and cold, regulating temperature. They can be combined with photovoltaic solar panels for solar energy generation.



Teto Verde na Favela

The Teto Verde na Favela (Green Roof in the Favela) project was implemented through a partnership with a local resident, on a roof made of asbestos. The planting support uses geotextile with epiphytic vegetation to minimize weight on the house structure. Green roofs can and should be implemented in communities to mitigate indoor temperatures, reduce urban heat island effects, manage stormwater runoff, and enhance quality of life in low-income communities. Extreme heatwaves pose a public health challenge and are expected to become more intense and frequent due to climate change. Implementing this type of Nature-Based Solution (NBS) should be considered on a larger scale through public policies that promote social well-being and biodiversity conservation within urban areas.



Location: Parque Arará, Rio de Janeiro (RJ).



Area: More than 36 m².



Beneficiaries: Residents of Rio de Janeiro favelas, and the general community.



Institutions involved: Community project.



Green Roof with Atlantic Forest

Innovative planting project with native Atlantic Forest tree species on the terrace of a bank building on Avenida Paulista. Local ecosystem species were used, offering multiple ecosystem services, benefiting biodiversity and people. The project uses only 15 centimeters of a "special soil" layer, and the composition/spacing of tree species is similar to that used in restoration projects. As a result, there are dense forests up to 3.5 meters high, which withstand strong winds, consume very little water, can house various fauna species, and weigh about 300 kg/m², the same as a common lawn on a slab. Additionally, this solution helps in obtaining special sustainability certifications.



Location: São Paulo (SP).



Beneficiaries: Building users and neighborhood residents, urban biodiversity.



Institutions involved: SkyGarden, Aflalo/Gasperini Architects, and Citibank.



Photo: Ricardo Cardim Paisagismo

Bioswales

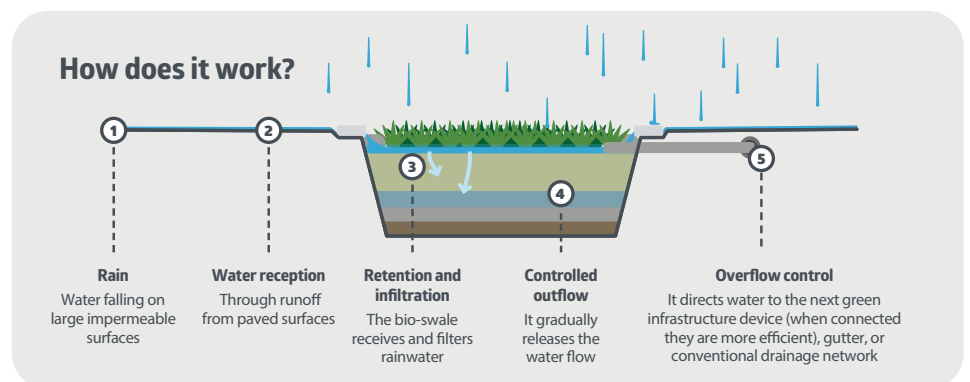
Bioswales, or vegetated swales, are used to direct and reduce the speed of urban stormwater runoff. This solution captures, infiltrates, and conveys excess water to appropriate areas, while its vegetation helps to purify diffuse pollution from runoff surfaces. They are ideal for parking lots, street margins, and other paved areas.

BENEFITS OF THIS NATURE-BASED SOLUTION (NBS):

- Improves the quality of receiving water bodies for urban drainage;
- Sustainable rainwater drainage, infiltration of water, and recharge of the water table or redirection to the urban drainage system;
- Reduces flooding;
- Enhances the local landscape with native species that provide benefits to biodiversity.

BIOSWALES

Bioswales, or vegetated swales, are linear depressions filled with substrate, vegetation, and other filtering elements. They receive rainwater or surface runoff, filter it, and direct it to other green infrastructure or conventional drainage systems. They are an excellent Nature-Based Solution (NBS) for large paved areas, roadside margins, or parking lots, with the potential to help reduce the risks of flooding when used on an appropriate scale.



[DOWNLOAD HERE](#)

Prevention of flooding

Increases urban permeability

Filters the water

Realengo Jornalista Susana Naspolini Park

The Realengo Jornalista Susana Naspolini Park is an old demand from the residents of the Realengo region in Rio de Janeiro. Its project includes a network of Nature-Based Solutions (NBS) responsible for capturing all surface water in the park, filtering it, and directing this water to retention gardens. The park also offers multiple activities for the population amidst nature.



Location: Rio de Janeiro (RJ).



Area: 7,209 m² in bioswales.



Beneficiaries:
General population.



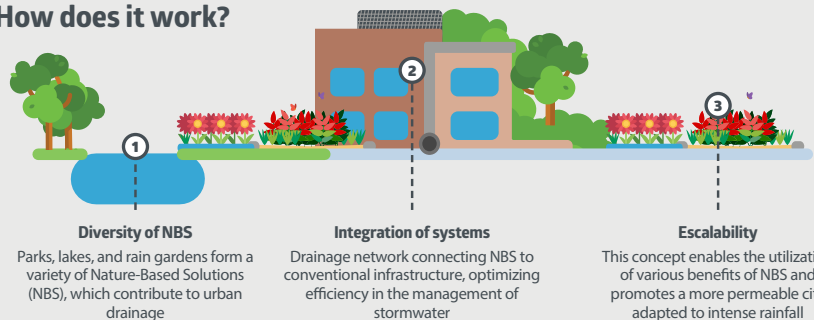
Institutions involved:
Office of Urban Planning and Landscape Architecture
Ecomimesis.

SPONGE CITY

It's a concept of a city capable of dealing with excess rainwater using Nature-Based Solutions (NBS) or green infrastructure associated with conventional drainage. These technologies help capture, retain, purify, and infiltrate water, directing excess to flooding areas or drainage systems. By integrating various NBS with sustainable construction techniques and land use regulations, cities become more resilient, adapting to increasingly frequent heavy rains and storms.

[DOWNLOAD HERE](#)

How does it work?



Conservation of biodiversity

Reduction of flooding

Improvement of microclimate

Urban permeability

Do you know about the Bioconexão Urbana alliance?



**bioconexão
urbana**
a natureza é a solução

The Bioconexão Urbana alliance is a network working to promote more resilient cities prepared for the impacts of climate change through Nature-Based Solutions (NBS), designing shared solutions that support the development of public policies and increase investment in NBS in Brazil.

Its proposal is to promote interventions inspired by healthy ecosystems to address urgent societal challenges, especially in large cities. Water scarcity, floods, biodiversity loss, health issues, and sea-level rise are some of the issues that can be tackled by considering nature as part of the solution, generating environmental, social, and economic benefits.

The alliance aims to disseminate the concept of NBS so that the population understands and values the presence of nature and urban green areas, contributing to ensuring that both the public and private sectors are committed to the necessary investments in this type of strategy.

Members of the Alliance

BPBES

The Brazilian Platform on Biodiversity and Ecosystem Services (BPBES) was initially established as a Working Group of the Brazilian Society for the Advancement of Science (SBPC), restructured in 2019 to support and promote the development of new thematic reports. It is a significant player in the academic field, especially in supporting the preparation of reports for decision-makers.

C40

C40 is a global network of mayors from the world's major cities united in actions to address the climate crisis.

Center for Management and Strategic Studies (CGEE)

A non-profit organization linked to the Ministry of Science, Technology and Innovation, aiming to support decision-making processes on science, technology, and innovation issues through studies and strategic evaluations based on collaboration with experts and institutions.

Boticário Group Foundation for Nature Protection

Established in 1990, the Foundation is a national non-profit organization. Its actions include supporting projects from other organizations, protecting its own natural areas, investing in innovative conservation strategies, disseminating knowledge, and raising awareness in society so that nature conservation is recognized as one of the most relevant causes globally.

GIZ

German Cooperation for Sustainable Development operating in Brazil on renewable energies, energy efficiency, protection, and sustainable use of tropical forests. It also develops strategies for cities and economic development.

ICLEI Brazil

An international organization of local and regional governments committed to sustainable development. One of its main focuses is on Nature-Based Solutions, making it a leading institution internationally on this topic. ICLEI provides a deeper knowledge contribution in the context of resilient cities due to its proximity to local governments.

Sustainable Cities Institute (Instituto Cidades Sustentáveis)

An organization operating nationally aimed at sensitizing and mobilizing Brazilian cities towards economically, socially, and environmentally sustainable development. This institution offers public managers a comprehensive sustainability agenda, including a set of indicators and a database of best practices.

PBMC (Brazilian Panel on Climate Change)

The Brazilian Panel on Climate Change (PBMC) is a national scientific body aimed at gathering, synthesizing, and evaluating scientific information on relevant aspects of climate change in Brazil through the publication of National Assessment Reports.

Rede Brasil do Pacto Global da ONU (UN Global Compact Network Brazil)

The Global Compact, an initiative proposed by the United Nations (UN), encourages companies to adopt corporate social responsibility and sustainability policies. It promotes the dissemination of best practices within the corporate world, participates in strategic forums, and supports the development of public policies and business guidelines to help companies implement these practices effectively.

TNC Brasil (The Nature Conservancy - Brazil)

The Nature Conservancy (TNC) is a global environmental conservation organization dedicated to protecting lands and waters. TNC creates innovative local solutions to the world's most pressing challenges so that nature and people can thrive together. Operating in over seventy countries, the organization employs a collaborative approach involving local communities, governments, the private sector, and civil society. In Brazil, TNC has been present for over 30 years, focusing on conservation challenges in the Amazon, Cerrado, and Atlantic Forest.

WRI Brasil (World Resources Institute Brazil)

WRI Brasil is a research institute that seeks to promote the integration of environmental protection, economic opportunities, and human well-being. An initiative within its alliance is called Cities4Forests, a movement to catalyze political, social, and economic support among municipal governments and city residents to integrate internal, nearby, and distant forests into development plans and programs.

Sources and spokespeople on Nature-Based Solutions (NBS) and climate change

Interested in learning more about the subject?
Here are some sources you can interview.

Contact

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+55 (11) 98259-7250 (WhatsApp)

Experts



Aliny Pires

Institution: BPBES (Brazilian Platform on Biodiversity and Ecosystem Services).

Position: Researcher at BPBES and Professor at UERJ (State University of Rio de Janeiro).

Interview Theme: Biodiversity, Nature-Based Solutions (NBS), adaptation.



Ana Luísa Oliveira da Silva

Institution: GIZ Brasil (Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH).

Position: Technical Advisor.

Interview Theme: Environmental rehabilitation of urban spaces, Nature-Based Solutions (NBS) in the context of public policies, environmental sciences, maintenance of ecosystem services, climate change.



André Ferretti

Institution: Boticário Group Foundation.

Position: Senior Manager of Biodiversity Economics.

Interview Theme: Climate and Nature-Based Solutions (NBS), urban adaptation.



Andrea Santos

Institution: Brazilian Panel on Climate Change (PBMC) and Programa de Engenharia de Transportes (PET), COPPE UFRJ.

Position: Executive Secretary of PBMC and Professor at the Programa de Engenharia de Transportes (PET), COPPE UFRJ.

Interview Theme: Climate in general, energy efficiency, science.



Cecília Herzog

Institution: PUC-RJ (Pontifícia Universidade Católica do Rio de Janeiro)

Position: Professor, urban landscape architect, and specialist in Nature-Based Solutions (NBS), member of RECn.

Interview Theme: Nature-Based Solutions (NBS) in general, experience living in Portugal, knowledge of European cases, sustainable cities, climate crisis, regenerative cultures.



Daniela Rizzi

Institution: ICLEI Europe.

Position: Sustainable Resources, Climate and Resilience Team.

Interview Theme: Nature-Based Solutions (NBS) in general, typologies, global NBS cases.



Emerson Oliveira

Institution: Boticário Group Foundation.

Position: Biodiversity Conservation Manager.

Interview Theme: Nature-Based Solutions (NBS) and Protected Areas.



Henrique Evers

Institution: WRI Brasil.

Position: Urban Development Manager.

Interview Theme: Urban development and adaptation.



Igor Pantoja

Institution: Instituto Cidades Sustentáveis (ICS).

Position: Coordinator of Institutional Relations.

Interview Theme: Urban and metropolitan development policy, state capacities, Resilient and Sustainable Cities, indicators.



João Guimarães

Institution: Aquaflora.

Position: Executive Director and Forest Engineer with a master's degree in Nature Conservation.

Interview Theme: Nature-Based Solutions (NBS), modeling, valuation of NBS, Payment for Environmental Services.



Juliana Baladelli Ribeiro

Institution: Boticário Group Foundation.

Position: Project Manager.

Interview Theme: Climate and Nature-Based Solutions (NBS), urban adaptation.



Marília Israel

Institution: ICLEI South America.

Position: Biodiversity Advisor.

Interview Theme: Nature-Based Solutions and public policies.



Pedro Ribeiro

Institution: C40.

Position: Manager of the Urban Flooding Network.

Interview Theme: Nature-Based Solutions and urban adaptation, specializing in urban floods.



Raiza Gomes Fraga

Institution: Centro de Gestão e Estudos Estratégicos (CGEE).

Position: Technical Advisor.

Interview Theme: Sustainable Cities.



Ronaldo Christofolletti

Institution: UNIFESP (Universidade Federal de São Paulo).

Position: Professor at the Institute of Marine Sciences, UNIFESP.

Interview Theme: Nature-Based Solutions and coastal protection, climate and oceans.



Rubens Filho

Institution: Rede Brasil do Pacto Global.

Position: Recognized Leader of the Water and Oceans Action Platform, UN Global Compact Brazil.

Interview Theme: Water, corporate sustainability.



Samuel Roiphe Barrêto

Institution: TNC Brasil - The Nature Conservancy.

Position: National Water Manager at TNC and Movimento Água para São Paulo - MApSP.

Interview Theme: Water security, climate adaptation, Nature-Based Solutions, water governance, watershed protection, coalitions.



Prof. Wilson Cabral

Institution: ITA (Instituto Tecnológico de Aeronáutica).

Position: Full Professor at the Instituto Tecnológico de Aeronáutica.

Interview Theme: Climate, climate modeling.

Inspirations and references

You may also be interested in...

Nature-Based Solutions and Climate Adaptation in Brazil: Study of Vulnerable Coastal Cities 

Webinar "Nature-Based Solutions for Water, Climate, and Biodiversity" 

Nature-Based Solutions: Examples Implemented by Brazilian Cities 

Interactive Map from the Observatory of Innovation for Sustainable Cities 

Ocean without Mystery 

**United Nations World Water Development Report 2018:
Nature-Based Solutions for Water Management, Executive Summary** 

**(Full Report in English) United Nations World Water Development Report 2018:
Nature-Based Solutions for Water Management, Executive Summary** 

Green Infrastructure: A Landscape Strategy for Urban Water 

IBGE, PNAD, Search National per Sample in Households, 2015 

Demographics world urban areas: 2022 released 

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Marilia Israel - ICLEI Brazil

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EXPEDIENT

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