



NATURE-BASED CITIES

*NATURAL INFRASTRUCTURE
FOR URBAN RESILIENCE*

Fundação
GrupoBoticário 

www.fundacaogrupoboticario.org.br/en

The Boticário Group Foundation for Nature Protection

believes that the conservation of biodiversity promotes economic development and social well-being, and is today one of the main Brazilian institutions that work for the conservation of the country's natural heritage, engaging society and acting in a network, connecting strategic actors from all sectors.

Within this context, we believe that Nature-based Solutions (NBS) aim to enhance the **creation of more sustainable and resilient cities**. For this, we need to join forces, aiming at the high impact of the union of public power and private initiative, to gain scale in the transformation of cities and, as an additional result, contain the current rates of biodiversity loss and ecosystem degradation.



NATURE'S UNPAID LABOUR

NBS are actions that use natural processes and ecosystems to face the **most urgent challenges** of our time, such as the risk of lack of water and the impacts of extreme weather events, such as floods and landslides. It is a natural resource management approach that generates benefits for biodiversity while promoting solutions for socioeconomic development and human well-being.

The NBS concept is based on and intrinsically related to the UN Sustainable Development Goals (SDGs). Although the concept is quite broad, the Foundation's focus on the theme prioritizes actions related to the use of natural infrastructure for resilient cities. **Nature-based Solutions (NBS) also help to deliver on global agendas and their goals**, such as the 2030 Agenda - Sustainable Development Goals (SDGs), the New Urban Agenda (NAU), the Paris Agreement, the Aichi Targets and the Sendai Framework (for disaster risk reduction).

Ecosystem-based Adaptation, a type of Nature-based Solution (NBS) aimed at adapting to climate change, generates direct adaptation benefits, **better quality of life** and co-benefits such as mitigating climate change. This is because the capture of atmospheric carbon through the restoration and maintenance of natural areas and native vegetation (in soil, mangroves, wetlands, etc.) is one of the best ways to maintain stored carbon, thus reducing the atmospheric concentration of this important greenhouse gas and the impacts of climate change (factor with the greatest impact on biodiversity from 2020, according to IPCC, 2019).

NATURE-BASED SOLUTIONS



Climate



Economic Development



Risk Reduction



Health



Water Security



Food Security



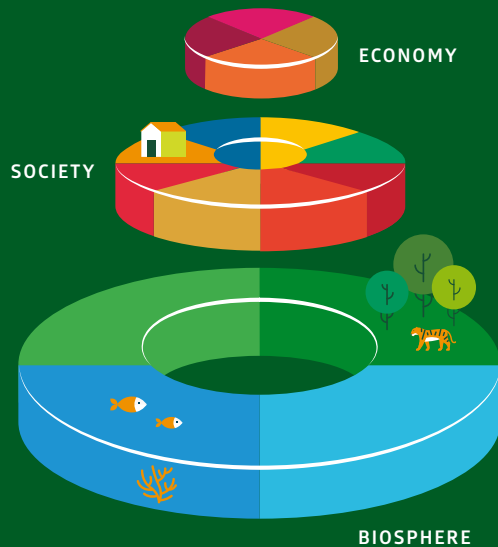
Environmental degradation and biodiversity loss

Social challenges

Biodiversity Benefits

SDG

Human well-being



SDG | Sustainable Development Goals

8 CRITERIA FOR BEING A NATURE-BASED SOLUTION

Several experts around the world have built together a new Global Standard for **Nature-Based Solutions (NBS)**, which aims not only to standardize the concept globally, but also to institute criteria that determine whether a given project is a Nature-Based Solution and evaluation indicators (IUCN, 2020):

- 1 **NBS effectively addresses societal challenges:** to be, in fact, a Nature-based Solution, the first step is to define what is the problem for which a solution is being proposed.
- 2 **The NBS project is guided by scale and considers interfaces and stakeholders:** even if projects are designed specifically for a particular location, they should take into account the economic, social and ecological context surrounding the challenge that is to be addressed with NBS.
- 3 **NBS results in benefits for biodiversity and ecosystem integrity:** the solutions to be implemented depend on the quality of the ecosystem on which the NBS is based, so any NBS should improve or at least maintain the quality of the ecosystem in which it is embedded.
- 4 **NBS are economically viable:** this is a criterion that must be taken into account if Nature-based Solutions (NBS) are to be sustained in the long term, or risk being sustained only during the time the project is funded.
- 5 **NBS are based on inclusive, transparent and empowering governance processes:** the governance of an NBS intervention includes opportunities for involvement and participation of all stakeholders in the processes of challenge identification, decision-making, monitoring and feedback.
- 6 **NBS equitably balances trade-offs between achieving its primary objective(s) and the continued delivery of multiple benefits:** the ability to deliver multiple benefits, simultaneously, is an important attribute of NBS. In some cases, the sum of the main benefits (e.g. water protection, carbon sequestration and public health through recreation) is determinant for the economic viability of the actions.
- 7 **NBSs are managed in an adjustable, evidence-based manner:** NBSs should be designed on the basis of scientific evidence and local knowledge, allowing for adjustments and adaptations according to the results obtained over time in the context of the challenge faced.
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OVERVIEW

The COVID-19 pandemic in 2020 brought a huge financial and social impact worldwide and the focus of public and private managers' attention revolves around concern for economic recovery.

Nature-based Solutions (NBS) play a relevant role in this scenario, offering opportunities for global transformation in pursuit of human well-being, with economic and environmental benefits.

Using natural infrastructure as part of this strategy can ensure smarter and more resilient cities for the future.

And there are several possibilities, for example:

- Urban infrastructure can rely on natural areas as part of the drainage system;
- Sustainable food production systems have the potential to amplify the food security of the population;
- The adoption of linear parks on the riverbanks prevents the floods and flooding negatively affect people's lives, resulting in more security in the face of the impacts of extreme weather events.

LINEAR PARKS

Get to know the case of Curitiba on page 10.



Linear parks are protected natural areas located riverbanks, which protect urban infrastructure, avoiding floods. Soil permeability reduces the surface runoff velocity of water, allowing rainwater to seep into the soil.

Thus they protect human life and offer quality of life, with space for the population to live in contact and harmony with nature. Linear parks also serve as a refuge for urban biodiversity, as well as a rest area for species in the migratory process.

WHAT ABOUT BRAZIL?

Brazil is a powerhouse for the bio-economy, according to information brought by the Special Report: **Environmental Power of Biodiversity**: an innovative path for Brazil, a Special Report of the Brazilian Panel on Climate Change and the Brazilian Platform for Biodiversity and Ecosystem Service, with support from the Boticario Group Foundation. The country has the right climate, abundant water and natural areas that provide several ecosystem services.

Added to this, it has a large portion of active population, willing to work and innovate, attracting new investments and generating employment and income. This is the sustainable development scenario that we aim to leave to the next generations.

NATURE-BASED CITIES

In a scenario of social isolation, many perceive the need for contact with nature. People acquire more plants, adopt animals, and even move, seeking spaces where contact with nature is facilitated. It is proven that contact with nature provides quality of life, with benefits for physical and mental health, more tranquility and a sense of peace.

According to the IBGE demographic census (2010) 84% of people in Brazil live in urban areas, and many of these areas have lost their characteristics of natural environments. The growth of cities, in most cases, was not planned and took place on the banks of the main rivers. The urban fabric transformed the natural environment and its benefits, channeling rivers and destroying areas of native vegetation. The consequences are flooding in urban areas, water scarcity, heat islands and compromising the safety of people and urban infrastructure.

Some NBS actions are viable and cost-effective options, such as the implementation of urban green areas, which include linear parks and the renaturalization of rivers to the creation of green corridors connecting urban green areas and other Protected Areas.



URBAN NATURAL AREAS



They improve the environmental conditions of cities: reduction of temperature and pollutants and increased soil permeability.

They improve the health of the population and increase the quality of life in cities.

They facilitate the population's contact with natural areas, in addition to being habitat for local and migratory fauna.

Increase urban resilience to extreme climate events.

Opportunities for communication and engagement of society, favoring other protected areas.

Adapted from: <<https://wrirosscities.org/our-work/project-city/cities4forests>>



NBS IN PRACTICE

Several cities around the world are already implementing NBS projects and proving their results in practice. In addition to solving the demand for which it was designed, Nature-Based Solutions (NBS) still help achieve the Sustainable Development Goals, especially SDGs 3, 6, 11, 12, 13, 15 and 17. Check out some cases of public or private sector projects that use NBS, even if sometimes they started before the concept existed with that name.

CASE 1

CURITIBA: THE CITY OF URBAN PARKS

Since the 1970s, Curitiba has invested in parks that make it possible to store rainwater a technically, economically and environmentally viable solution. It was in this context that the first park for this purpose was created - Parque Barigui, the most visited in the city. Over time, new investments have been made to implement more parks in the city in areas with the potential to store rainwater and keep riverbanks preserved to avoid major damage to the population, and thus reduce the impacts of extreme weather events, such as floods.

In a study to demonstrate the relevance of protected areas for regional development, improvement of human well-being and the strengthening of the National System of Protected Areas (NSPA), the Boticário Group Foundation prepared a document to systematize the valuation of protected natural areas. **The study pointed out that for every \$1 invested in Barigui Park - the largest urban park in Curitiba, Paraná - \$12.50 of economic benefits are generated for the population.** In addition, the public use of the park, adopting Ecological ICMS data as a reference, can generate a benefit of more than R\$35 million per year.



CASE 2

CHINA: SPONGE CITIES

In the heart of the Chinese city Jinhua there is the encounter of two large rivers that caused constant floods. This flooded area was surrounded by a large wall (dike) which function was to contain the water in rainy periods, but which was not efficient. The region was aesthetically unpleasant and the population did not use this space. In 2013, a project was elaborated on the concept of “sponge cities”, rethinking the city’s infrastructure in relation to water.

The rivers were renaturalized, areas were transformed into parks that the population could enjoy and it was possible to store water in rainy periods. The result was enhanced by the use of tools such as permeable pavement, green ceiling, square- pool and flooded parks.

With this project the city gained a new identity, the population reconnected with nature, was efficient in combating flooding and today 40 thousand inhabitants use the park daily.

The project is part of a national policy to encourage the adoption of ecosystem approaches to dealing with floods, with the goal of having 250 “sponge-city” projects.



CASE 3

PAYMENT FOR ENVIRONMENTAL SERVICES IN NEW YORK

In the 1990s the city of New York faced a major water crisis and considered two alternatives to solve the problem. The first, and most common, would be the use of a large conventional engineering work that would cost \$5 billion and the second alternative, which was chosen, was to use nature as part of the solution at a cost of \$500 million.

Land was bought around the dams to ensure quality and quantity of water to supply the city. In addition, efforts have been invested for sustainability in food production on private farms that are 200 km away, and have strengthened New York's green belt through integrated systems and sustainable intensification in agriculture and livestock.

The use of nature as part of the solution was so effective that the only water treatment used in the city to date is filtering and it is not necessary to spend on pumping. For every US\$1 invested in nature, it was possible to save US\$7 demonstrating the effectiveness of these initiatives.

New York also invested in identifying leaks in century-old pipelines and made educational materials for the population and students in order to raise awareness of the importance of nature conservation and care for the surrounding and urban green areas. Today, New York has a program called PlaNYC, which goal is that every inhabitant of the city has a green public space within a 10-minute walk until 2030.





Foto: Fundação Grupo Boticário

CASE 4 VIVA ÁGUA MOVEMENT

The Boticário Group Foundation conceived in 2019 the Viva Água Movement, seeking in its own nature the solution to water crises. The movement began with the Miringuava River Basin, in the municipality of São José dos Pinhais (PR), near Curitiba, which supplies 230,000 people and several companies in the region.

The objective is to ensure water security through conservation and restoration of natural ecosystems, in addition to encouraging entrepreneurship with positive social and environmental impacts. Viva Água relies on the participation of organisations, rural producers, communities, public power, private initiative and universities that, together, aim at transforming the socio-economic and environmental reality of the region, and contribute to its adaptation to the effects of climate change.

To finance part of the planned actions, the Viva Água Fund was created, a philanthropic fund that aims to engage other actors to carry out actions in an integrated and transparent manner. The initial phase of the Movement had an investment of R\$2.3 million involving contributions from some of the MVA partners. At the end of 10 years of the Movement, it is expected an increase in water quality in the basin by 30%, and that 50% of the revenue of rural landowners/associations/cooperatives in the region comes from activities related to socio-environmental entrepreneurship, ecotourism and sustainable production.

Do you know what is the first recorded case of NBS in Brazil? Tijuca Forest!

The temperature of Rio de Janeiro could be between 4 and 7°C higher if the Tijuca Forest did not exist. In order to preserve the forest and the benefits it guarantees to the city, D. João VI decreed, in 1817, the protection of the Carioca river basins, and in 1861 D. Pedro I decreed the planting of new seedlings and forest conservation, reversing the degradation process resulting from years of unsustainable extraction.

Learn more about the **history** of the Park and its **Management Plan**.



NBS PLATFORMS IN THE WORLD

Several platforms address NBS actions and initiatives around the world. Most bring examples of projects, case studies, and some exclusively address the public policies necessary for the advancement and maintenance of NBS in the long term.

Check out some of these platforms below:

Innovation Observatory for Sustainable Cities

> <https://oics.cgee.org.br/>

Naturvation

> <https://naturvation.eu/>

Panorama Solutions for a Healthy Planet

> <https://panorama.solutions/en>

Oppla

> <https://oppla.eu/>

AskNature

> <https://asknature.org/>

Nature-based Solutions Policy Platform | Oxford University

> <https://www.nbspolicyplatform.org>

PUBLIC POLICIES

NATIONAL AND INTERNATIONAL

The NBS approach can and should be considered in public policies related to health, safety, development, energy efficiency, restoration and conservation of natural environments, among others. This is the **most efficient way to promote actions at the federal, state and municipal levels**, ensuring that this practice becomes an essential component in matters related to urban infrastructure.

NBS can be included in urban policies in several ways - through integration into existing sectoral policies, regulation of specific policies to stimulate NBS, or even through economic incentives. Some types of economic incentives are the mechanisms of commercialization of carbon credits, compensation of impacts on biodiversity, payments for ecosystem services, tax benefits, among others (Somarakis, et al., 2019).

Another way to enable the implementation of the NBS **in the urban environment is the integration of actions in urban infrastructure, such as road, housing or drainage works.**

The consideration of nature as part of the solution may cause these projects to bring additional benefits beyond those for which they were proposed and, therefore, several development agencies around the world are already requesting the inclusion of the NBS as a counterpart for financing urban infrastructure works.

Public policies help to enable and offer guidelines for the implementation of the NBS.

Especially in Europe, many laws and guidelines include the concept of NBS and encourage its use, although few locations present explicit goals or monitoring indicators (Davis et al., 2018). There are already many examples of policies in the world to regulate the deployment of Nature-based Solutions (NBS). Some of them have already been addressed in the cases above, and others you can check out below:

CASES

California

California's 2016 law recognizes natural areas as water infrastructure. The law was approved due to several studies demonstrating the importance of investment in the restoration and conservation of natural areas to ensure more water, with greater quality, and greater resilience to the impacts of climate change.

California Law AB2480/2016

Peru

Peru has passed a law requiring water companies to allocate part of their revenues for investment in green infrastructure, such as reforestation projects and sustainable agriculture, prior to investments in water treatment plans.

www.ecosystemmarketplace.com/articles/inside-peru-coming-green-water-revolution-2/

Campinas

The Linear Parks program was developed under the Campinas Municipal Green Plan (Plano Municipal do Verde) (Municipal Decree nº 19.167/16), which after several analyses, identified the Deficit of Social Green Areas of the Municipality and proposed to minimize it through the implementation of 49 Linear Parks.

www.campinas.sp.gov.br/governo/meio-ambiente/parques-lineares.php

Bristol

The city included the concept of green infrastructure in its urban planning documents based on the Urban Planning Policy established at the national level.

<https://oppla.eu/bristol-nbs-ensuring-sustainable-future>

HOW YOU CAN STRENGTHEN AND ENABLE NATURE-BASED SOLUTIONS?

NBSs can be part of a natural capital management strategy focusing on opportunity identification and risk management. According to the performance of each stakeholder, there are several ways to support this theme.

Public sector

- **Integrated management by river basin:** not always the solution to the challenge that your municipality faces is in its own municipality. Often, the preservation of natural areas around water sources in a neighboring municipality is what can ensure water security* in all municipalities downstream.
- **Integration between existing policies:** There are already several laws governing urban spatial planning. NBS should be integrated not only in environmental policies, but also in spatial planning, mobility, health and sanitation policies. Drainage plans should consider natural infrastructure as part of the system, as permeable areas rainwater infiltration or lakes as containment basins. Master plans should assess the most vulnerable areas of the city, and keep urban infrastructure and population at a safe distance from flood areas, for example. Spatial planning in cities in the coastal zone should consider the impacts of climate change, such as rising sea levels, saline intrusion, more intense and frequent floods and storm surge.
- **Innovative mechanisms for natural capital management should be stimulated and used**, such as Payment for Environmental Services programs, stimulation of **Social and Environmental Impact** investments, use of instruments provided by law, such as the constructive potential for the maintenance of green areas in urban centers.

Have you accessed the Foundation's position on impact investment in nature conservation? [Check it out!](#)



* Water Security, according to the concept of the United Nations (UN), exists when there is sufficient quantity and quality of water available to meet human needs, the practice of economic activities and the conservation of aquatic ecosystems, accompanied by an acceptable level of risk related to droughts and floods, and its four dimensions should be considered as guiding the planning of supply and use of water in a country

- **Protection and recovery of natural vegetation areas of river basins**, with actions that can adapt and regulate environmentally the properties located around the springs. This regularization, among other benefits, will provide the municipality a greater guarantee of the maintenance of the levels of the springs and reduction of the costs with treatment and distribution of water to the population.
- **Implement projects in partnership with the private sector and academia.** The concept of NBS is relatively recent, and its implementation in urban areas is even more incipient. Research on the integration of NBS in urban areas as part of infrastructure can bring important arguments and results regarding this multifunctional approach to ecosystem services. It is necessary to evaluate the cost-benefit of NBS, indicators for monitoring results, mapping and identification of additional benefits and other aspects. These factors can be known and disseminated through the implementation of pioneering projects, based on scientific evidence and constant monitoring of the evolution of the results.

Private Sector

- **Companies need to consider internal eco-efficiency actions**, such as water reuse and clean energy, for example. All companies that want to impact this new generation of more attentive consumers need to be aware of their role in the world.
- **Nature-based Solutions (NBS) bring additional benefits.** Companies that implemented NBS actions could perceive benefits beyond those for which NBS was used, such as the treatment of effluents. NBS reduces costs, provides integrated vision between different areas in the company and even enables international recognition.
- **In addition, companies should also look outside their gates.** A population at risk of water shortages or vulnerable to the impacts of extreme weather events has its purchasing potential reduced, in addition to becoming priority users of scarce resources, especially water. This situation can create conflicts of use that, if foreseen in advance, place the company in a supporting role for society, rather than a user who compromises or competes for resources.

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