



QUICK TIPS

WORKING WITH NATURE IN CITIES: NATURE-BASED SOLUTIONS FOR URBAN DESIGN AND MANAGEMENT

 This document is part of the [“Working with Nature” Quick Tips series](#), comprising 7 sectoral Quick Tips on [Agriculture and Livestock](#), [Disaster Risk Reduction](#), [Forestry](#), [Renewable Energy](#), [Transport](#), and [Water](#).



Opportunities and risks for cities

Nature-based solutions can help cities cope with challenges from climate change and increased vulnerabilities. Enhancing nature/green-blue areas in cities may increase resilience and improve biodiversity in a cost efficient manner. We increasingly see cities deploy such nature-based solutions.

However, rapid expansion of urban populations, pressure on land and lack of adequate infrastructure leads to congestion, environmental degradation and unhealthy living conditions. Climate change is expected to lead to more frequent and intense heatwaves, droughts, floods, food shortages, blackouts and social inequality.

Research findings suggest ([The future we don't want, 2019](#)) that in a business as usual scenario, climate change would by 2050 result in:

- ▶ 1.6 billion people living in over 970 cities, will be regularly exposed to extreme high temperatures.
- ▶ Over 800 million people, living in 570 cities, will be vulnerable to sea level rise and coastal flooding.
- ▶ 650 million people, in over 500 cities, will be at risk of water shortages due to climate change.
- ▶ 2.5 billion people live in over 1,600 cities where national food supply is threatened by climate change.
- ▶ The power supply to 470 million people, in over 230 cities, will be vulnerable to sea level rise.
- ▶ 215 million poor urban residents, living in slum areas in over 490 cities, will face increasing climate risks.



Nature provides solutions

Target 12 of the 2022 [Global biodiversity framework](#) aims at a significant increase in the area and quality and connectivity of green and blue spaces in urban and densely populated areas, by mainstreaming the conservation and sustainable use of biodiversity, and ensuring biodiversity-inclusive urban planning. Nature-based solutions (NbS) can contribute to biodiversity enhancement and contribute to addressing a number of urban issues, some of these directly linked to climate change:



- ▶ **Increase resilience against disasters:** both the risks of drought and floods can be addressed through nature-based solutions for disaster risk reduction and climate adaptation. This includes restoration and management of watersheds within cities, wetlands and floodplains upstream of cities that supply freshwater and buffer floods, and those that protect the city against storm surge at sea (such as mangroves, dunes, coral reefs, tidal flats).
- ▶ **Adapt to extreme temperatures:** Urban temperatures are several degrees higher than surrounding countryside. This urban heat island effect occurs because the materials used to build cities absorb more of the sun's energy than natural surfaces. Urban green spaces reduce this effect by providing shade and by cooling through evapotranspiration. Furthermore, trees and plants store carbon dioxide from the atmosphere while there is also potential for significant carbon storage in urban soil, if well managed.
- ▶ **Improve air quality:** Urban air pollution consists of tiny particles and gases, mainly caused by vehicle, housing and industrial emissions. Poor air quality causes problems for the respiratory system and cardiovascular diseases (globally about 6.7 million annual deaths are related to poor air quality). Trees and shrubs contribute to remove both particles and gases from the air. Deciduous trees with complex, ridged or hairy leaves (e.g. silver birch), as well as some needle leafed trees (such as pines) capture most particles. However, in narrow street canyons trees may also reduce the ventilation of air. In such environment planting hedges or adding "green walls" is more beneficial. Furthermore, vegetation can also reduce noise levels.
- ▶ **Improve water quality and reduce sewerage overflow:** The impermeable materials used for roads and pavements mean that rain is not absorbed and remains on the surface. During periods of heavy rainfall drainage capacity is exceeded in very short time and sewerage and pollutants flood the streets, ending up in water courses. In contrast, vegetated surfaces are able to intercept and store water, reducing the volume of rainwater run-off and thus reducing the burden on sewage systems. Contrarily to unplanned sewerage overflows, the deliberate flushing of urban waste water through natural or [artificial wetlands](#) is a well-known way to (pre-)treat waste water, reducing suspended solids, nutrients, pathogens, organic pollutants and heavy metals.
- ▶ **Enhance health & wellbeing:** Apart from the above mentioned heat reducing effect, access to green space and nature also improves our mental wellbeing, reducing the need to treat for anxiety and other mental health conditions. Green areas encourage physical activity, whilst large sport parks encourage more formal physical activity. Green space is used by both rich and poor; making green space available to all may thus help to reduce socioeconomic health inequalities. Urban green spaces promote greater levels of social activity and stronger neighbourhood relationships.
- ▶ **Conserve and restore biodiversity and ecosystems:** For some species, urban areas can provide a more favourable habitat than intensively farmed countryside, suggesting that cities could make an important contribution to national conservation efforts. Large parks and woodland regions are able to support the widest range of species, but even small areas of vegetation such as roundabouts, roadside verges and green roofs can support a range of plants, insects and birds. Research suggests that people get more enjoyment from spending time in green space when they perceive there to be a high level of biodiversity. Urban green (and blue) spaces can act as wildlife corridors, linking together larger parks and rural areas, facilitating animal movement and preventing fragmentation and isolation of wildlife.
- ▶ **Benefit the economy:** In terms of direct financial benefits, case studies show that proximity to green space is positively linked to both commercial and residential property prices, and it contributes to reduce the cost of damage from flood events. Indirect benefits relate to the overall attractiveness of the city, job creation, social cost savings (e.g. reduced air pollution), and well-being benefits. To maximise the benefits, green space must be easily accessible, or at least viewable from homes or while travelling.



Buenos Aires Urban Ecosystem Regeneration Program, Argentina

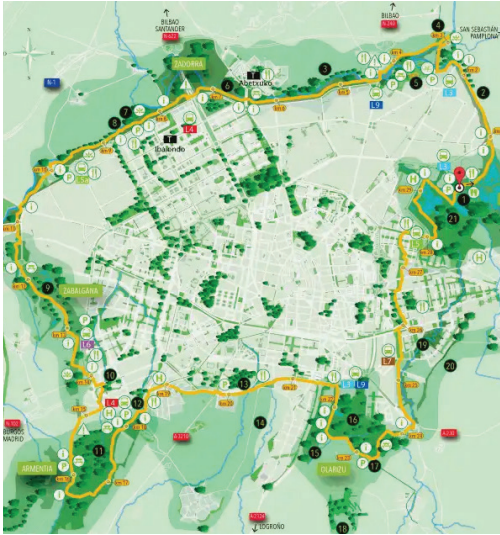
The Riachuelo river in Buenos Aires is Argentina's most contaminated river and serves as an outlet for effluents from a nearby livestock market and for waste water from some 1500 businesses and industries. Further lack of cleaning and maintenance of streams and overflow lakes cause the Riachuelo to get blocked with overflows affecting surrounding neighbourhoods. During the historic levels of flooding in 2013, Villa Soldati was one of the most affected neighbourhoods in the city. Considering this risk of flooding as well as factors related to social vulnerability, Villa Soldati is considered one of the most vulnerable areas of Buenos Aires. The government of Buenos Aires undertook urban ecosystem restoration to reduce pollution and its impacts. The restoration includes making use of native flora through artificial wetlands creation and phytoremediation to reduce flood risk and pollution, the creation of a natural park to help regulate water resources, increase water filtration, and control erosion and runoff.

Source: [IADB, 2020: Increasing infrastructure resilience with Nature-based Solutions \(NbS\)](#)



Priorities for action include

- ▶ **An integrated planning approach** is needed to harness the transformative potential of cities, moving away from sector-based policies towards a broad long-term urban vision (see case below).
- ▶ **Give space to (restored) nature.** Conservation or restoration of ecosystems in and around cities can reduce cities' vulnerabilities to shocks and enable adaptation to climate change in a cost-effective manner, as well as enhance local biodiversity.
- ▶ **Create green and blue areas and corridors** to accommodate floods, store water, treat wastewater, preserve biodiversity, combat heat stress, filter air, capture carbon, provide recreational space and wind breaks, etc. Avoid the use of invasive species and promote the use of local species with high potential to remove pollutants. Manage soils for increased organic carbon storage. Apply the principle of 'green where possible, grey where needed'.
- ▶ **Take surrounding areas into account:** connect green and blue corridors in the city with the wider surrounding landscape to maximise connectivity and its benefits.
- ▶ **Avoid urban development in vulnerable areas** such as natural ecosystems or flood-prone riverine, coastal and subsiding areas.
- ▶ **Combat urban sprawl and limit the conversion of natural ecosystems:** create compact (build up, not out) polycentric settlements with optimal connections, reducing traffic and mobility needs and avoiding unnecessary loss of productive land or natural ecosystems.
- ▶ **Quantify the benefits of biodiversity** such as health gains, jobs created, avoided climate adaptation costs, carbon capture, water quality improvements by wetlands, insurance savings and increased property value, to make the business case for biodiversity.



The Case of Green Infrastructure in Vitoria-Gasteiz (Spain)

Case highlights

The Green Belt of Vitoria-Gasteiz is the result of an ambitious project to restore and recover the peripheral areas around the city with both biodiversity and recreational benefits. The belt now has one official Ramsar wetland site and two Natura 2000 sites, winning international recognition for their high environmental value. Green infrastructure within the city contributes to climate adaptation (reducing heat stress and improving flood management), mitigation (carbon sequestration), and a clean and healthy living environment.

Case history

Vitoria-Gasteiz is a city of more than 200,000 inhabitants facing an increase in temperature and subsequent heatwaves, and an increase in extreme rainfall events and higher flood risk. Furthermore, in the early nineties, biodiversity in the landscapes surrounding the city was seriously degraded.

In 1993, the city started with the initiative to create a Green Belt around the city. After 18 years a surface area of 727 ha (with an ultimate plan for 993 ha) with 79 km of foot and bike paths exists. In 2012 the new Green Urban Infrastructure Strategy aimed at improving connectivity and functionality of the different urban and peri-urban green spaces. Work is ongoing on the strengthening of ecological corridors between the parks.

Interventions in different parts of the city included connecting urban parks by ecological corridors (e.g. by tree-lined streams and streets); the transformation of vacant plots into new green spaces; the increase of biomass and number of trees and shrubs in parks and gardens; the enhancement of existing green areas to improve the conservation of native species; improvement of water management; the promotion of ecological agriculture in free and peri-urban spaces; the promotion of green building facades. Fifty neighbourhood projects worked on greening of the immediate living environment with the aim of improving the ecological and environmental functionality of existing green spaces and vacant plots, as well as reducing the costs incurred in their management and maintenance.

Interventions have resulted in improved water management and reduced flood risk, reduction of air pollution, improvement of temperature regulation and a reduction of the heat-island effect. The landmark vertical garden at the Congress Palace Europa is done with native species and has contributed to thermal and acoustic insulation of the building and the enhancement of the aesthetic quality. Public use of green spaces increases with the increase in recreational opportunities.

Best practice lessons

Such success doesn't come overnight but is the result of a clear vision, adaptive capacity and stakeholder involvement. An overall strategy with clear goals provided an overarching framework, guiding the design and implementation of many different interventions over a longer period of time. Planned interventions have multiple objectives and produce co-benefits for biodiversity, climate change adaptation and mitigation and quality of life for city inhabitants.

The involvement of citizens and local private sector stakeholders is considered a success factor, as they have helped to create a consensus on the needs as well as the benefits of the implementation of the Green Urban Infrastructure Strategy. Interventions were tested in one neighbourhood and adapted where needed, before being implemented in other neighbourhoods.

Blue-green corridors in Belgrade, Serbia

Belgrade, the capital of Serbia with 2,000,000 inhabitants faces serious erosion problems and torrential floods caused by loss of forest surface, urbanization and inadequate agricultural practices. Belgrade authorities have defined a new holistic strategy backed by research and models in ecological engineering and landscape planning. It recommends changes in land use (agricultural) practices, reforestation, and the restoration of 'blue-green' corridors, making use of residuals of open streams and fragments of forest vegetation. In an experimental watershed forest, the surface increased by 18%, river discharge decreased by about 50% and erosive material by about 40%. Ten km of sealed walking and cycling paths, 1.7 km of unsealed forest paths, six open gyms and seven rest areas will strengthen the potential for sports and recreation. The final goal is the creation of a network of 'blue-green' corridors in the city, providing both effective erosion and stream control and environmental and social services.

Source: *'Blue-green' corridors as a tool for mitigation of natural hazards and restoration of urbanized areas: A case study of Belgrade city*



Further information and support

- ▶ [Quick Tips for Green Cities: Integrating Environment and Climate Change Ambitions in Urban Development](#)
- ▶ Case: Vitoria-Gasteiz Case: [Victoria-Gasteiz: Green Capital](#) and [Climate-Adapt case information](#)
- ▶ [Green Cities Europe](#)
- ▶ [The C40 Knowledge Hub. Cutting-edge insights and practical resources from leading climate cities](#)
- ▶ [Urban Nature-based Solutions | WWF \(panda.org\)](#)
- ▶ [Making Cities Resilient 2030 \(undrr.org\)](#)
- ▶ [How to increase the use of nature-based solutions in urban areas? \(europa.eu\)](#)
- ▶ [Nature-Based Solutions for Urban Challenges | UNEP - UN Environment Programme](#)

All documents are available on capacity4dev (public group: [Environment, Climate Change and Green Economy](#)).

Contact INTPA and NEAR Environment & Climate Change Mainstreaming Facility:

INTPA-GREENING-FACILITY@ec.europa.eu | NEAR-GREENING-FACILITY@ec.europa.eu