



Barcelona Park © van Ort

Green Infrastructure, a wealth for cities

The need for maintaining and restoring nature within and near urban areas is stronger than ever before. Nature provides ecosystem services, which are crucial for our well-being, have the potential to improve the quality of life of urban citizens, and offer cost-effective solutions to global challenges. Green Infrastructure, within and around cities, plays a vital role in protecting biodiversity and enhancing nature's ability to provide important ecosystem services.

This URBES factsheet outlines the key components of Green Infrastructure and explores the linkages between the EU Green Infrastructure Strategy and the urban context. Using examples from Barcelona, it presents how cities can use Green Infrastructure to tackle environmental, social and economic challenges, while also becoming more resilient to climate change, improving quality of life, saving money, and strengthening the local economy.

What is Green Infrastructure?

The EU Green Infrastructure Strategy, which was adopted in 2013, aims to create a robust policy framework in order to promote and facilitate Green Infrastructure projects utilizing existing legal, policy and financial instruments. The European Commission defines Green Infrastructure as “a strategically planned network of high quality natural and semi-natural areas, which is designed and managed to deliver a wide range of ecosystem services and protect biodiversity”. Green Infrastructure aims to enhance nature’s ability to provide people with a wide range of important goods and ecosystem services, such as clean air and water, food and space for recreation. Interconnected high quality green spaces in urban areas offer habitats and corridors that help conserve biodiversity and provide ecosystem services, while improving quality of life and supporting a green economy.

Green Infrastructure exists in both urban and rural environments, and can be made up of many different man-made and natural elements, ranging from green roofs and walls, parks and allotment gardens, to forests, rivers and wetlands, restored forest landscapes or regenerated brownfield sites. Importantly, these features only qualify as Green Infrastructure if they are part of a broader, interconnected Green Infrastructure network that provides multiple ecosystem services. Urban planners, decision-makers and citizens need to take into

account the benefits of urban natural capital, and provide incentives for protecting and restoring ecosystems, recognising their multiple functions and values.

Green Infrastructure plays a vital role in supporting the ecological connectivity between urban and rural areas. The fragmentation of habitats, for example due to roads cutting across natural areas, is one of the main causes of habitat degradation and biodiversity loss that can reduce the provision of ecosystem goods and services. Green Infrastructure – be it naturally grown or designed – helps to reconnect animal and plant populations and habitats, thereby protecting ecosystem functions.

Other than traditional ‘grey’ infrastructure solutions, which are usually designed as single-purpose, Green Infrastructure is multifunctional, addressing a variety of challenges at the same time. A good example would be a spatially connected system of green spaces that mitigates the urban heat island effect, while simultaneously providing habitat for species and intercepting excess water run-off. Similarly, an urban forest which fosters a diversity of plant and animal species, while also providing a space for recreation and reducing air pollution, demonstrates the multifunctionality of Green Infrastructure. In this way, the limited space in cities can be used more effectively to perform several functions and increase urban resilience.

Benefits of Green Infrastructure in urban areas

Cities depend on green spaces for many services. Wetlands, forests, flood plains and other natural systems absorb and store water and reduce the risk of floods and storms. These ecosystems are also critical for reducing and offsetting carbon emissions, increasing resilience to climate change, and creating healthier communities. URBES research indicates that access to green spaces, such as parks, can lead to improved mental health and contribute to stress reduction and general well-being. Urban trees and green roofs can provide multiple

benefits in cities, by reducing the local temperature and energy demand, retaining excessive rainfall and through their insulative properties, reduce energy demand while offering habitats for urban wildlife and storing CO₂. It should be noted that not all ecosystem functions have a positive impact. For example, urban trees generate pollen, which can lead to increased allergy sensitivity and asthma rates among affected urban residents. These trade-offs have to be taken into account : when planning for Green Infrastructure.

Barcelona’s Vision for 2020 – demonstrating the multifunctionality and connectivity of Green Infrastructure

Barcelona’s Green Infrastructure and Biodiversity Plan 2020 envisages a city in which nature permeates urban life and Green Infrastructure is fully integrated into city planning and management. The plan, launched by the Barcelona City Council, presents a vision of Barcelona in 2020 where Green Infrastructure is an essential element of a healthy and productive urban environment. Green corridors - strips of urban land covered in vegetation -

help to connect green areas and enhance biodiversity within the city while also linking urban areas with the surrounding environment such as the coastline and the Collserola Natural Park. Filling built up spaces spaces such as courtyards, roofs and walls with greenery - a process known as naturalisation - helps to absorb pollutants from the air, reduce noise, balance the water cycle, reduce energy consumption and hence CO₂

emissions, and foster biodiversity. These strategies create a more appealing environment for people to live in, while at the same time improving the health of urban citizens.

Barcelona is working to achieve its vision for 2020 through a set of targeted actions that maximise green

space in the city and raise awareness for the importance of integrating Green Infrastructure into the urban landscape. These actions will help to increase Green Infrastructure spaces in the city, and the supply of valuable ecosystem services to citizens.



Medi Ambient i Serveis Urbans - Habitat Urbà (Environment and Urban services - Urban Habitat department)
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Source: Barcelona Green Infrastructure and Biodiversity Plan 2020, depiction of existing green corridors in the eastern area of the city

Barcelona's trees – natural air purifiers

Barcelona is one of the most densely populated cities in Europe, with 1.62 million inhabitants living in an area of just 101.21 km². While Barcelona has a relatively low ratio of green space per inhabitant, it has more street trees than most other European cities – currently there are around 161.423 trees of 150 different species lining the streets of Barcelona.

The Barcelona Green Infrastructure and Biodiversity Plan 2020 highlights that the city's trees (including street trees, trees in parks, shrubs and natural areas) play an important role in filtering harmful substances from the air. It is estimated that in 2008, they

offset around 19,000 net tonnes of CO₂ from the atmosphere, and eliminated slightly more than 305 tonnes of air pollutants. By reducing the amount of pollutants in the air, these urban trees are providing an invaluable ecosystem service, particularly given that air pollution is a major environmental challenge for the city. Barcelona has, over the past decades, regularly exceeded the EU limits for annual concentrations of nitrogen dioxide and particulate matter. Importantly, however, if green infrastructure is to effectively curb pollution levels in the city, a broader metropolitan scale and more integrated approach to Green Infrastructure in urban planning and management is needed.

Recommendations for implementing green infrastructure in urban areas

A framework for action is required to strengthen the deployment of Green Infrastructure in and around cities and make ecosystems a source of sustainable urban development. Due to its multifunctionality, investment in Green Infrastructure can provide a valuable return and contribute to addressing a range of policy objectives, such as biodiversity, climate change, energy, health and well-being, and social cohesion.

It is important to assess the full scope of benefits provided by Green Infrastructure and to increase public awareness to help promote and prioritize urban green space development and ecological restoration. Elements that contribute to this are stakeholder involvement in policy processes and the creation of platforms that enable capacity building, as well as the exchange of knowledge and best practices.

Increasing knowledge through environmental education can help to integrate nature's solutions into urban planning and practice, and support cities in strengthening their capacity to adapt to social, environmental and economic changes in a sustainable manner.

Investing in wetlands, urban forests and parks, green walls and roofs, and creating green corridors to

connect cities with surrounding rural areas has great potential to bring substantial benefits to all urban citizens. Practitioners from different disciplines and city departments therefore have a vested interest in coming together and recognizing that ecosystems must be valued in a way that reflects the indispensable services they provide.

GREEN SURGE

The collaborative project "Green Infrastructure and Urban Biodiversity for Sustainable Urban Development and the Green Economy" (GREEN SURGE - www.greensurge.eu), funded under the European Commission's Seventh Framework programme, involves 24 partners in 11 countries and is coordinated by the University of Copenhagen. GREEN SURGE will identify, develop and test ways of linking green spaces, biodiversity, people and the green economy in order to meet the major urban challenges related to land use conflicts, climate change adaptation, demographic changes, and human health and well-being. The project will build on the results of other projects such as URBES. It will provide a sound evidence base for urban green infrastructure planning and implementation, exploring the potential for innovation in better linking environmental, social and economic ecosystem services with local communities. For this purpose, the project will set up Urban Learning Labs in the cities of Bari, Berlin, Edinburgh, Ljubljana and Malmö where researchers, decision makers and local communities will work in close collaboration.

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