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This report is part of a series of reports on the topic Climate Action in which our experts highlight specific data, facts and science that are needed to plan and build safe and resilient future urban environments.

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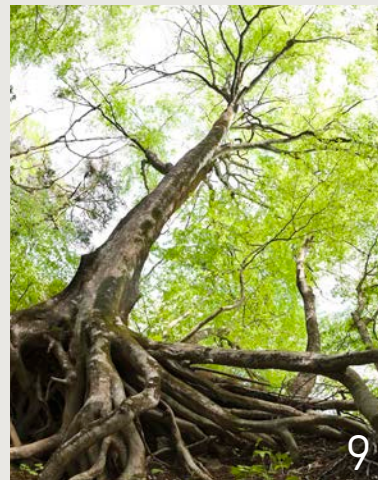
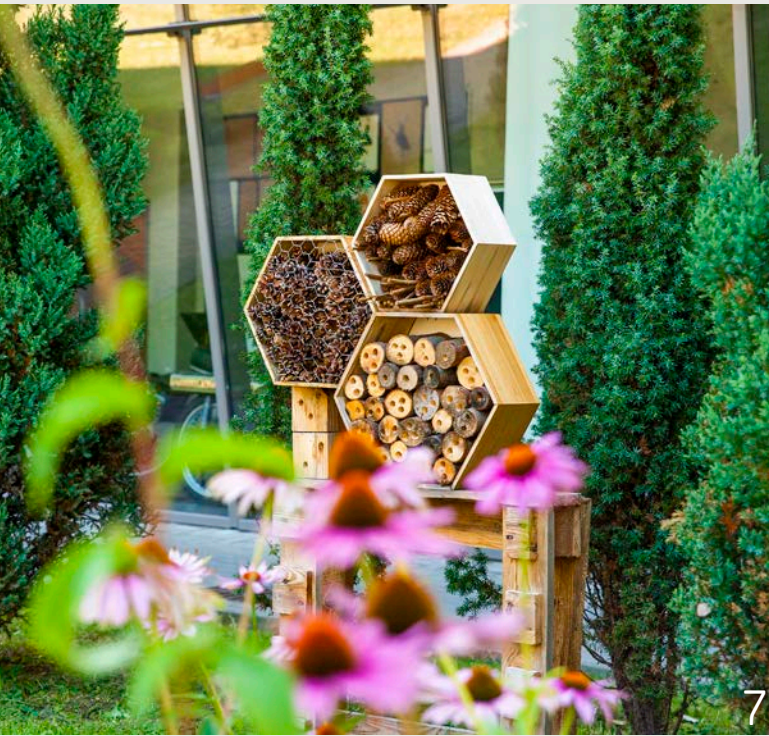
Urban Insight



Building in biodiversity
For climate, for health

How can we best use the built
environment as part of the
ecological system?

Urban Insight



Building in biodiversity For climate, for health

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Which ecosystems do we want our cities to be a part of?

Almost 75% of the human population in Europe lives in an urban area. Continuing loss of biodiversity, the variety of plants, animals and other organisms, represents a direct threat to people's health and well-being

Introduction

Scientists have recognised, studied and acknowledged climate change since the early 20th-century. Now, as the United Nations Decade on Biodiversity (2011–2020) ends, many studies are emerging showing the precarious nature of our climate and ecosystems. These studies highlight the vital importance of biodiversity in our day-to-day lives and our future.

In 2020, according to a major report by the conservation group WWF, wildlife populations have fallen by more than two-thirds in less than 50 years. According to the 2019 Global Assessment Report on Biodiversity and Ecosystem Services, we now see that around 1 million animal and plant species are threatened with extinction – many within decades. The report, created by the United Nations' Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, found that the health of ecosystems is deteriorating more rapidly than ever. This deterioration affects the very foundations of our economies, livelihoods, food security, health and quality of life worldwide.

The loss of biodiversity, deforestation and desertification pose major challenges to sustainable development and have affected the lives and livelihoods of millions of people. The way we are accustomed to designing our cities, with paved streets and grand buildings, has proven to be less resilient to the effects of climate change. Removing trees and other vegetation and using impervious materials in urban areas have impaired normal ecosystem functions like the circulation of carbon, water and nutrients.

The lack of vegetation exposes us to pollutants, heat waves, vector-borne diseases and other negative effects of climate change. Rich and healthy ecosystems provide us with many commodities and are vital to our survival. With increasing urbanisation, cities can either have a negative impact or can contribute positively by increasing biodiversity.

How are biodiversity and health connected to each other, and what role do ecosystem services play in this? This report addresses the challenges we face due to the loss of biodiversity and the benefits we gain from more a diverse natural urban environment.

Four global sustainable development goals (SDGs) are in focus in this report:



Biodiversity – lost and found well-being from nature






Biodiversity – the variety of plants, animals and other organisms – is the foundation of human health.¹ The continuing loss of biodiversity therefore represents a direct threat to our health and well-being.

Genetic, habitat and species richness has long been associated exclusively with rural areas and has even been isolated from the discussion on urban structures. Nevertheless, the natural environment can also exist and thrive in an urban environment. Biodiversity in cities has long been undervalued.²

Citizens need the diversity of a built green environment, and we who lead Helsinki City must pay attention to it in holistic way: more meadows instead of homogenous grass fields, green roofs for pollinators, more biodiversity and a richer variety of species in parks. We must ensure that the city also offers places for bumblebees and birds. The urban structures and built environment have a remarkable possibility to preserve biodiversity.

Anni Sinnemäki, Deputy Mayor, Helsinki

CLIMATE CHANGE, HEALTHY URBAN LIVING AND BIODIVERSITY ARE OFTEN INTERRELATED:³

	Climate change poses a threat to biodiversity and health through the adverse effects of extreme heat, health issues related to poor water quality and flooding after heavy rainfall.
	Carbon sequestration in soil is disturbed in urban areas where impervious surfaces impair natural cycles of nutrients, water and carbon, further accelerating climate change.
	The deterioration of soil is another invisible consequence of climate change, that also poses a threat to human health. Healthy soil is maintained by microbes, and microbiota influence the human intestine microbiome via direct contact with soil as well as via food. Improving urban biodiversity exposes us to richer environmental microbiota developing our resistance to diseases.
	Mental health is also supported by nature. Urban environments can be noisy and have low air quality due to heavy traffic and dense population. Ecosystem services and nearby nature reduce stress and anxiety and provide benefits for both physical and mental health, when well designed.
	Rich soil and root microbiomes have several advantages for terrestrial ecosystems and biodiversity through increased efficiency of nutrient use and uptake, which can improve plant resistance and resilience to global climatic change and biotic stressors. Healthy soils are also able to store carbon in roots and organic matter and prevent flooding.



DID YOU KNOW...?

Almost 1,700 species in Europe are threatened by extinction and 36 species have already become extinct since 2015.⁷ All these species have fundamental value in themselves, but they also benefit human life in many ways. One that has suffered a lot in recent decades is the bumblebee, which also plays a critical role in global food production; 45.6% of bumblebee species show a declining population trend.⁸

Biodiversity and nature are more present in our cities and urban spaces than is generally understood. The cities create multiple microclimates that can be used by generalist flora and fauna due to the variation of building structures and their facades. There is much more opportunity for flora and fauna to thrive in urban areas than in many rural areas which often are subject to mainstream monocultural arable farming, where often these landscapes offer very little protection. The key to ensuring that cities can thrive as ecosystems lies in ensuring that specialist species are also benefited through a targeted approach to habitat design.⁹

Despite this, at the moment cities attract mostly generalist species, which means that urban planning should support natural diversity in cities providing a place for more original, indigenous species.

Many cities in Europe have succeeded in protecting biodiversity. For example, Berlin has a higher number of flora and fauna species compared to the rural surroundings. Berlin has the highest number of breeding birds in the temperate zone and hosts more than 17 different species of bats.⁴ More than 50 percent of the flora of Belgium can be found in Brussels and more than 1,000 species of vascular plants have been recorded in Stockholm.⁵

BUILT ENVIRONMENT CHALLENGES BIODIVERSITY

Urbanisation in its current form is one of the greatest challenges to biodiversity. Urbanisation alters the natural environment so it becomes an artificial one containing buildings and other impervious surfaces. The fact that urban settlements are concentrated in biodiversity hotspots, like along coastal areas, river deltas and rivers, increases this threat.⁶

The highest biodiversity was found in transition zones in the city where urban structures are closely interlinked with larger open spaces and waste or derelict lands⁴

Over the past decades, urban settlements were developed and designed to provide safe and healthy living conditions for their residents. The recent understanding is, however, that modern urban development is threatening our natural capital, biodiversity, air quality, and quality and availability of clean water.

Trudy Maria Tertilt, Researcher (Centre for Urban Greenery & Ecology, Research)

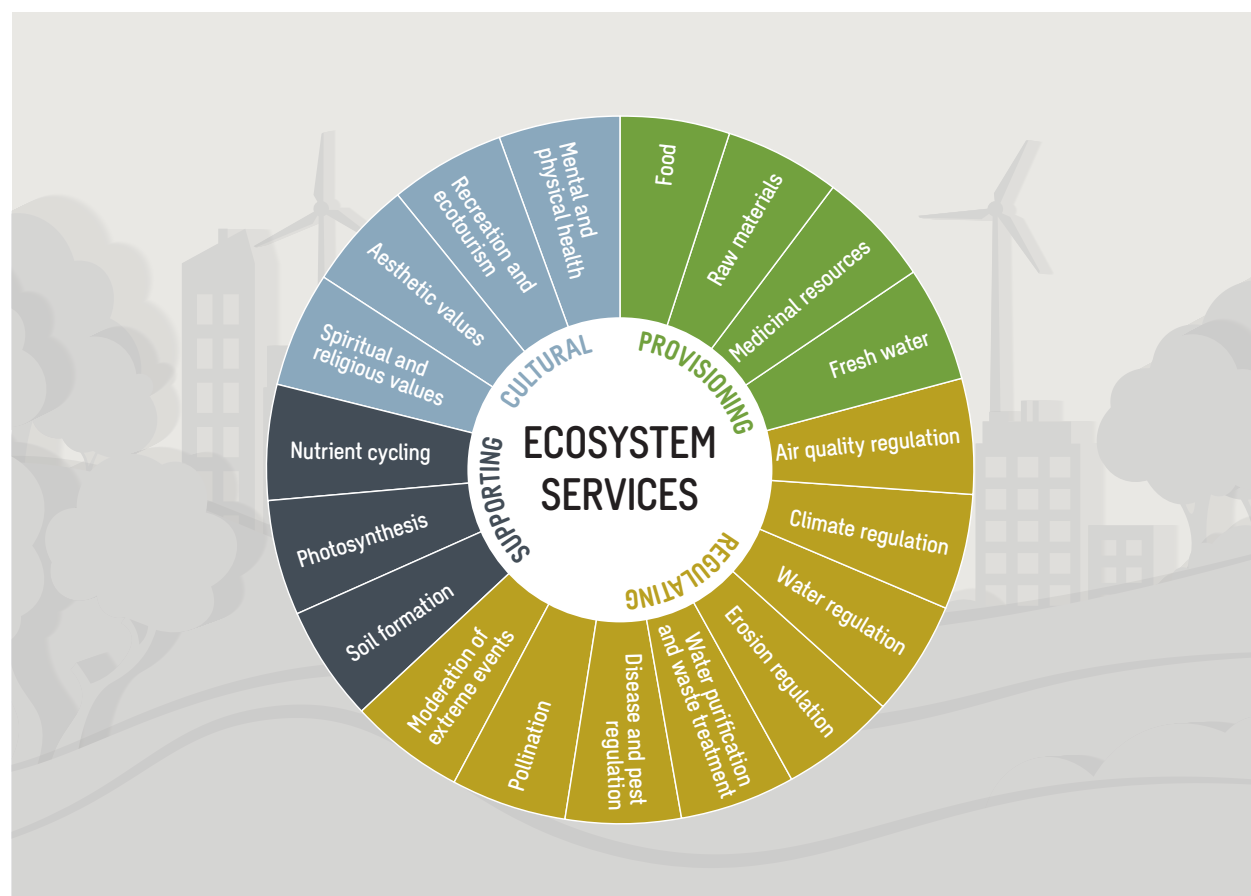
Ecosystem services – providing health and resilience

Ecosystem services are the benefits we depend on that flow from nature to people. They can be provisioning (supply of food, clean air and water and materials), regulating and

supporting (water and climate regulation, nutrient cycling, pollination, or the formation of fertile soils), or cultural (recreation opportunities or the inspiration we draw from nature).¹⁰

ECOSYSTEM SERVICES ARE CATEGORISED INTO PROVISIONING, REGULATING, SUPPORTING AND CULTURAL¹¹

The resilience capacity of cities increases if their infrastructure is integrated with natural systems, services and resources.¹² For example permeable surfaces, tree canopies and wetlands regulate water flow much more efficiently than artificial structures. This will also reduce the relative probability of infrastructure, such as roads, railroads, buildings and waterways, suffering significant negative impacts from the increasing environmental shocks and stresses associated with climate change.



WWF Living Planet Report (2016)

Trees – an ecosystem service

A mature leafy tree produces as much oxygen in a season as 10 people inhale in a year.

City trees play an important and sometimes unexpected role supporting human health and well-being as well as in climate change mitigation and adaptation. Increasing carbon storage in urban areas with ecosystem services need not be difficult. By taking care of the individual trees, parks and forests in urban areas, we also take care of biodiversity, ecosystem services and our everyday living conditions.

ABOVE GROUND

- One tree can absorb up to 150 kg CO₂ per year^{13,14}
- Forests remove around 430 million tons of atmospheric carbon dioxide and store 13% of Europe's greenhouse gas emissions¹⁵
- Trees properly placed around buildings can reduce air conditioning needs by 30% and save energy used for heating by 20–50%^{13,14}
- Trees reduce stormwater runoff by capturing and storing rainfall in the canopy and releasing water into the atmosphere through evapotranspiration¹⁶

BELOW GROUND

- Soil has the potential to offset 5–15% of global fossil fuel emissions¹⁷
- One third of a tree's biomass is below ground in the roots¹⁸
- Carbon is stored in the soil: approximately 75 billion tons of carbon in EU soils alone in the form of plant and animal material are in various stages of decay¹⁹

BIODIVERSITY

- Parks and urban forests maintain and increase biodiversity in cities
- The diversity of tree species and presence of dead wood are the key elements for diversified flora and fauna
- There are 454 native tree species in Europe, of which over 58% are native to continental Europe, and of these 42% of the species are threatened by extinction²⁰
- Almost a fifth (18%) of European dead wood beetle species assessed so far are at risk of extinction due to the ongoing decline in large old-growth trees across Europe²¹

HEALTH AND WELL-BEING

- The strategic placement of trees in urban areas can cool the air 2–8°C, reducing the urban heat island effect^{13,14}
- Spending time near trees improves physical and mental health increasing energy levels and speed of recovery, while decreasing blood pressure and stress
- A mature leafy tree produces as much oxygen in a season as 10 people inhale in a year²²

The integration of nature in towns and cities brings benefits that contribute to better health and more sustainable societies. A natural environment improves human well-being in many ways, and access to recreation areas provides the strength to thrive in this complicated world. In addition, enhanced biodiversity inside cities will ease the conservation pressure in rural areas and make cities more liveable.

Exposure to natural environments has a significant impact both on our physical and our mental health, and contacts with diverse natural habitats and many different species increase these health-supporting impacts.

VITAL BODY – BENEFITS FOR PHYSICAL HEALTH

Exposure to microorganisms in soil, especially at an early stage, benefits the human immune system and can protect us from diseases like asthma and atopy (the tendency to develop allergic diseases).²³ Biodiversity plays a role in the regulation and control of infectious diseases and provides important resources for medical research, for both traditional and modern medicine.

Ecosystem services and richer biodiversity also support food security. In addition, richer vegetation offers shade and shelter on a sunny day, purifies air and buffers noise. For example, a green roof with a 12 cm substrate layer can reduce sound by 40 dB and one of 20 cm by 46-50 dB.^{24, 25}

In everyday life, natural environments are places for recreation and exercising and thus vital for fitness. Contact with nature benefits people of all ages, income groups and abilities.

The important question in our urban planning is how to find those places and housing construction opportunities that allow nature to remain diverse and the city to maintain a good network of recreational areas and green spaces.

In terms of urban planning, experts predict an increase in heavy rainfall and winter temperatures. Stormwater management will be an important issue both on individual plots and in larger areas. This is already being strongly considered in urban planning. The number of green roofs and parks is increasing; the ability of the urban environment to absorb water is a big issue in the adaptation strategy.

Anni Sinnemäki, Deputy Mayor, Helsinki

BALANCED MIND – BENEFITS FOR MENTAL HEALTH

There is a growing body of evidence showing that time spent interacting with natural habitats increases mental well-being and decreases the effects of stress. According to a study by Keninger et al. in 2013, these benefits include:²⁶

- Better self-esteem and mood
- Improved general psychological well-being
- Positive effects on emotions and behaviour
- Positive effects on cognitive function
- Increased ability to perform mentally challenging tasks
- Less stress
- Lower mortality rates
- Facilitated social interaction

The Office of National Statistics in the UK published results showing that work-related stress, depression or anxiety accounts for 44% of work-related ill-health and 54% of working days lost in 2018/19.²⁷ Ecosystem services have plenty to offer for human well-being.

Biodiversity and ecosystem services should be an essential part of our land use and infrastructure planning. The leading principle here should be maintaining existing biodiversity values, restoring those in less favourable condition and creating of new biodiverse habitats.

Future cities – design inspired by nature

How can we best use the built environment as part of the ecological system?

Urbanisation has contributed to biodiversity loss around the world as habitats have become more fragmented and spaces for nature have become too small to support complex ecological networks. In the United Kingdom, population density has increased steadily during the 20th century, with populations concentrated in and around urban areas. The State of Nature (2019) paper shows how low and intermediate levels of urbanisation have the potential to increase species' richness for some groups, which has been associated with the variety of different habitats available.^{5, 28}

By adopting tried-and-tested methods to enhance biodiversity on all scales, we can ensure that cities provide benefits from climate adaptation to human health, as well as contribute to vital ecosystem services which underpin the prosperity of all levels of society.

CITY SCALE

Advice:

A key question that planners and decision-makers should ask: which ecosystems do we want the city to be a part of? Urban planners should work to connect their urban areas with the local ecosystems that add the most value for biodiversity and human well-being, which in turn will aid in climate adaptation. This can be done by incorporating local species in landscaping plans for developments on all scales and simultaneously ensuring that soil structure and water quality are a focal point in the creation of urban areas as ecosystems. The ecosystems that will be chosen as part of urban design will differ on a case-by-case basis. When urban planners are able to choose measures that both support biodiversity and increase resilience, this will benefit citizens as well.

NEW OPEN-AIR BATHING RESORTS DESIGNED TO PROTECT NATURE

New sea resorts in Silkeborg – constructed in local wood and designed to protect biodiversity, nature and the lake's biodiversity. Lake Almindsø in Silkeborg is part of an international protection area and the two bathing resorts have been developed in close cooperation with the Danish Nature Agency.



Design by Årstiderne Arkitekter (part of Sweco Architects)

Connect the city to local ecosystems. This means:

- Connecting to nature outside the city
- Relate to local soil and water conditions
- Choose local species in development on all scales

Example: In Scotland on the edge of a town called Falkirk, the Forth Valley Royal Hospital has gained wide recognition for being Scotland's largest National Health Service construction project whilst protecting and enhancing local biodiversity from the early stages of design. The development managed to create high-quality green infrastructure by applying the wider landscape features of woodland belts, large growing specimen trees, hedgerows and water into the contemporary design of the development. The aim was to use green infrastructure as a preventative measure for those recipients in the hospital at risk of mental and physical health conditions, including staff and visitors to the facility. Planners in the UK are able to create a success story such as this through the implementation of a new framework of principles called Building with Nature. This initiative is designed to ensure that biodiversity, human well-being and sustainable water management are planned in conjunction with one another, at the beginning of the design process.

Advice:

The creation of blue-green networks and green infrastructure in cities are important to support urban populations including for amphibians and invertebrates. Green structures, parks and water networks connect and can serve as stepping-stones, on a landscape scale and connect urban and rural areas. These networks can deliver ecosystem services such as water purification, air quality, climate mitigation and adaptation and provide space for recreation when combined with recreational infrastructure. Green infrastructure is among the most widely applicable, economically viable and effective tools to combat the impacts of climate change and help people adapt to or mitigate the adverse effects of extreme weather conditions.

If the Ministry of Defence estates aren't being used optimally, then what could they be used for, to be more effectively and efficiently sustainable? Do we use our estates to regenerate, reforest and sequester? We do, but the amount depends on the area in question. We could and should make better sustainable use of that land in a way that is an advantage to us and the state, and the by-product will be enhanced biodiversity.

Lt. Gen R E Nugee CB CVO CBE Climate Change and Sustainability Strategy Lead for the British Ministry of Defence

Example: When Sustainable Urban Drainage Systems (SUDS) are created as blue-green infrastructure and part of a network, they are known to improve our water quality through means such as filtration, adsorption and pollution particle degradation and have the potential to reduce pollution from surface water runoff by up to 90%³⁰. A case study in London's Broomfield Park Wetlands saw the delivery of multiple benefits of combining blue and green infrastructure. The existing surface water sewer running through the park drained an urban area of approximately 40 hectares. It was diverted to create a wetland which now captures surface water from this area and removes pollutants before discharging to a tributary of one of the most polluted river catchments in the UK. The benefits from the implemented measures include:

- Mitigation of the harmful urban pollution and the resulting improved water quality.
- Creation of amenity space, which improved recreation and physical exercise opportunities for the local community.
- Increased human-nature interaction and enhanced education and community involvement.
- Creation of new natural habitats that improved the local biodiversity.
- Implementation of a planting and maintenance plan, which includes involvement of local groups and organisations and increased volunteering.

Advice:

Additionally, many restoration possibilities for biodiversity and ecosystem services exist in urban and suburban areas, from urban-industrial landscapes to abandoned properties and fields and military training grounds. These could be used more efficiently to maintain and restore biodiversity by re-connecting remnant habitats of native plant communities in meadows and arable land.³¹

Example: As an example of opportunity for areas away from city centres, the British Ministry of Defence owns and has rights to 431,300 hectares in the UK - about 1.8% of the entire

UK land mass - which is managed both by land managers and ecological conservationists. Enhancing carbon sequestration in peatlands through careful management of their soil structure and biodiversity could aid in climate adaptation through soil formation and nutrient cycling in these local areas.

NEIGHBOURHOOD AND STREET

Advice:

Connecting to the larger scale urban green structures, many opportunities exist on the neighbourhood and street scale. Almost 75% of the human population in Europe lives in an urban area³² and so it is likely that urban areas are where most people make a connection with nature. There is a need to enhance this interaction within local communities by creating natural play areas, garden walks and schoolyards around this requirement to reconnect with nature.

Example: In Amsterdam, a massive community project is underway that was launched in 2015 by the Amsterdam University of Applied Sciences. It is engaging the local community by involving the collaboration of 100 companies, 30,000 residents and 60,000 students. 'The Knowledge Mile'^{33, 34} is a mile-long park which is being constructed along a highly polluted street in Amsterdam, incorporating multiple nature-based solutions including blue, green and blue-green infrastructure: two parks, 1600 square metres of green roof, and green walls and vegetated areas designed for improving water drainage. Companies are also acting: the Amsterdam Fashion Institute is growing natural dyes in a rooftop garden, whilst a blue roof is installed on an office block to collect rainwater for brewing beer. 'Smart beehives' have been installed by students on rooftops for pollination and to provide honey. Overall, these initiatives will work in conjunction with one another to provide ecosystem services such as reduced air pollution, and food and water provisioning.



Advice:

A key way of enhancing biodiversity in our cities is through nature-sensitive management to ensure that biodiversity is at its optimum health. Landscape and habitat management contributes to high levels of biodiversity when ecological disturbances are kept to a minimum.

Example: A study carried out by Watson et al. (2019)³⁵ shows that urban lawns that are mowed continuously have adverse ecological effects on plants and invertebrates. Some pollinator species, such as the cinnabar moth, require one host plant – in this case, ragwort – and reducing the

mowing frequency to allow lawn plant biodiversity to thrive is a simple and effective measure.

A Swedish project, "Lawn alternatives in Sweden - From theory to practice,"³⁶ did experimental trials with lawns on the SLU Uppsala Campus in 2014 and 2016. One of the established sites was grass-free/tapestry lawn with 30 herbaceous plants native to Sweden. Plant species for the site were chosen to enhance biodiversity and return to nature. Low-growing flowering species make it possible to use the site for recreation. Before the project, the lawn was cut 16 times per season and 2-3 times after the meadow was established.

GREEN RESIDENTIAL NEIGHBOURHOOD

Architects and engineers are working together to design a brand-new urban district in Horsens, Denmark, called Rantzausbakke. Sweco Architects, together with the client have worked very intensively with biodiversity in the landscape architecture, local rainwater management as a recreational element and different outdoor activities for the future residents.



Design by Sweco Architects

Advice:

Trees are known for providing a wide range of ecosystem services, all of which are widely beneficial in an urban setting.

Example: London's trees are estimated to provide at least £133m of benefits to Londoners every year, and in January 2020, the Mayor of London announced the planting of thousand of new trees across London, resulting in a total of 280,000 trees funded and planted since May 2016.³⁷ This pledge is part of his commitment to increase London's existing canopy by 10 percent by 2050, thereby providing the services of climate and air quality regulation which in turn aid in the moderation of extreme events.

But more needs to be done: there must be a mix of tree species in our contemporary landscaping designs to increase diversity, which will contribute to the climate resilience of our cities. These trees must be able to reach full maturity in order to provide these services, and development must strive to retain older trees rather than felling semi-mature trees.

The policies, such as those set out in policy G5 ('Urban greening') in the London Plan and the concept of the Urban Greening Factor (UGF), will be applied more widely throughout Greater London, although the policies will be adjusted as necessary for less urban environments³⁸. The UGF is a development of the original Green Space Factor that has been implemented in several cities throughout the world. The UGF is designed to work alongside other industry initiatives, such as BREEAM and the WELL accreditations, in a bid to enhance the natural capital of cities from the perspectives of all beneficiaries of healthy ecosystems.

Example: Since 1994, the City of Berlin has operated a similar Green Space Factor scheme, known as the Biotope Area Factor (BAF) in a number of inner-city neighbourhoods.³⁹ By working with the Landscape Plans, the spatial constraints and opportunities can be identified so that adequate green space can be provided within each development site. As this tool is simple and flexible, the BAF is viewed positively by city planners, architects and developers and has been an inspiration for other cities to determine their own schemes⁴⁰.

BUILDING/GARDEN SCALE**Advice:**

In the inclusive design of houses and new developments, nature-based solutions should be adopted where appropriate and possible. This is one key action that will create a hierarchy of green infrastructure from larger, more distant places to smaller and more local ones depending on the density of the urban area.

Green infrastructure features such as green walls and bio-diverse roofs are usually good options, as are smaller features such as bird and bat boxes for target species efforts in conjunction with one another to help turn our cities from living spaces into ecosystems.

Example and method: The UK Green Buildings Council (UK-GBC) and other partners launched the IGNITION initiative in Greater Manchester, which aims to uplift the amount of functional green and blue infrastructure in the city through investment of both private and public sector funding mechanisms⁴¹. For example, a green roof on a building

may decrease energy costs by 6.7%. The IGNITION report has gathered an evidence base which aims to provide an in-depth view of the performance of certain blue and green infrastructure features. This may help to employ a hierarchy of green infrastructure from larger, more distant places to smaller and more local ones which will, in turn, aid in the creation of habitat mosaics in urban areas.

However, it is not just planners and businesses who can help. It is vital to engage people and their communities to take action in their own gardens or to act together in local green space projects.²⁸

WHAT CAN YOU DO AS AN INDIVIDUAL?

Advice:

By mimicking natural processes and favouring species that are native to a biogeographical area, we can create more diverse habitats for animal and plant species and create places for recreation.

Most cities also have local nature conservation associations where citizens can do voluntary work to preserve an area's natural values. The perfect way to help biodiversity thrive in cities is in private backyards or community gardens.

Method: The four basic needs for wildlife include food, water, shelter, and nesting. There are certain methods that one can adopt, such as:

- Implement suitable horticulture practices by getting rid of invasive species and cultivating species native to the area.
- Adjust cultivation to prevent carbon loss from the soil.
- Prevent and manage the use of chemical pesticides.
- Plant trees and shrubs to sequester carbon, and wildflowers to provide sources of food and shelter for bees, butterflies and other pollinating insects.
- Bird and bat houses offer shelter and nesting places for these species, alongside insect hotels, green roofs and walls, urban beehives and wetlands, which are good examples of mimicking ecosystems in the urban landscape.

If green space is not available to directly improve local biodiversity, there are community programmes you can get involved in, such as Naturehood. Naturehood was launched in March 2019 by Earthwatch Europe and aims to transform urban green spaces into wildlife havens by connecting people with both their local nature and their wider community. This works on an organisation and individual level with people being supported to help and monitor local wildlife in their gardens, or from their balconies or window boxes. Meanwhile, communities are supported by Naturehood's engagement officers in order to support local biodiversity by creating connected networks of habitat, the effects of which will be seen on a landscape scale.²⁸



Design by Sweco Architects

FUTURE RESIDENTIAL NEIGHBOURHOOD WITH ACCESS TO NATURE

How can design inspired by nature look like in future neighbourhoods? A good example is the housing development on Rantzausbakke, a new urban district in Horsens, Denmark. The landscape architecture actively integrates the surrounding meadowy landscape. Here residents are invited to engage in various recreational activities.

AN INTERCONNECTED SYSTEM OF WATERWAYS

The outdoor areas are also characterised by visible Local Rainwater Drainage solutions in the form of rainwater beds, ponds and ditches, which lead precipitation away from the residential area and down to the lake. The main waterway is designed to carry the water from roads and residential areas via roadside ditches and through the meadow landscape, on its path encountering dips in the terrain which will retain and percolate the water before it can continue along the network of channels. This makes the most of the site, while the landscape is enhanced by being modified to create interesting spaces through variation in the terrain and vegetation.

Conclusion and recommendations

Urbanisation and climate change have put our health to the test in growing cities. We have seen how urban structures with paved streets lack resilience to changing weather conditions such as heavy rainfalls and extreme heat, and these structures also challenge our well-being by creating air quality issues, noise and stressful environments.

One of the consequences of climate change is the loss of biodiversity, which has effects on human health and well-being as well. However, we need rich natural environments and ecological services to support well-being on many levels. Healthy ecosystems with healthy soils bring resilience to cities, maintain normal carbon, nutrient and water cycles, and maintain diversified microbiota.

Traditionally, nature conservation has been put into practice outside cities. But cities are actually part of the answer. Once we pay more attention to connecting the rural biodiversity hotspots to urban ones and mimic the natural environments in urban areas, cities can be the key to increasing biodiversity and bring many opportunities to support well-being.

Our land use and infrastructure planning and execution should take a more holistic approach to urban design. On our way to carbon-neutral and citizen-friendly urbanisation, we should try to save vegetation and soil when and wherever possible, create new habitats inside our cities that are maintained in optimum condition through a series of nature-sensitive maintenance techniques, restore habitats where needed, use permeable surfaces in construction, and get citizens involved in planning and taking care of their environment.

Urban planners need to quantify their goals through local policy, such as carbon neutrality targets and an increase in biodiversity, especially those target species which are locally in decline. In addition to existing solutions, green infrastructure and ecological services, new approaches are needed that are even more holistic.

Urban planning on all scales can influence how people and communities experience and understand biodiversity and ecosystem services. That is, local communities are more likely to be involved with protecting and enhancing the biodiversity when their neighbourhoods are designed to enhance human-nature interactions. The key point is that everyone is responsible, on an individual, community, business, local government and government level for ensuring that biodiversity thrives in our cities so that it may contribute to climate adaptation and human well-being, now and for our future generations.

If we choose to design our cities to be more like ecosystems for modern-day generations, we can invite the children and youth of our urban generations to participate in activities such as gardening, visiting parks and taking environmental classes. For this we need strong willingness from our decision-makers, new guidance from the authorities and the involvement of civil society. Urban planners also need the inspiration to create green and biodiverse cities, where humans can live with optimum health and well-being.

Expert Recommendations

Scale	Key Advice for Helping Ecosystems Services (for Health and Climate)	Who Should be Involved?
City scale	<ol style="list-style-type: none"> Mental and Physical Health. Connect nature in cities with local ecosystems in suburban and rural areas to create blue-green corridors. Save natural areas for recreation. Water Regulation, Water Purification and Waste Treatment. Create blue-green backbones / structure in the city consisting of parks and connecting green structures. Connect urban and rural areas using forests, rivers and by creating green wedges and corridors. Protect natural waterways. Soil Formation. Nutrient Cycling. Use permeable materials and native species, save biogeographical characteristics like plant and animal species and habitats typical for the area. Compensate for the damages. 	<ul style="list-style-type: none"> - Local planning authorities - Town planners - Transport planners - Engineers - Landscape architects - Ecologists
Neighbourhood and street	<ol style="list-style-type: none"> Pollination, Disease and Pest Regulation. Structural and species variation in green space design. Favour pollinator-friendly species in gardens and public areas. Avoid monocultures and pesticides. Recreation and Tourism. Integrate natural habitats into play areas, garden walks and schoolyards for recreation and connect to local ecosystems within the wider landscape. Easy access routes for recreation. Climate Regulation. Air Quality Regulation. Moderation of Extreme Events. Age and species variation of urban trees – protecting semi-mature and mature trees. Permeable surfaces and wetlands for water regulation. 	<ul style="list-style-type: none"> - Local planning authorities - Town planners - Engineers - Architects - Landscape architects - Ecologists - Local conservation groups - Local businesses - Constructors
Building/garden	<ol style="list-style-type: none"> Air Quality Regulation. Food and Water Provisioning. Nature-based solutions included within design of buildings (include bird and bat houses, green facades etc). Use roof tops as available spaces to enhance nature and produce food. Save and plant trees and bushes. Mental and Physical Health. Adopt nature-friendly garden management techniques. Community gardens. Volunteer work. Soil Formation. Nutrient Cycling. Pollination. Use native and pollinator-friendly species and connect to the local ecosystems. Use natural fertilizers. Avoid excess soil preparation. Transform lawns into meadows. Avoid alien species and pesticides. 	<ul style="list-style-type: none"> - Architects - Landscape architects - Local conservation groups - Local businesses - Community-led groups - Individuals - Ecologists



Design by Sweco Architects

POSSIBILITIES TO LIVE WITH NATURE ON YOUR DOORSTEP

The Rantzausbakke housing development, a new urban district in Horsens, Denmark, will be offering easy access for residents to lakes, woods and meadows.

The entire area will be linked by a network of footpaths and bicycle paths, which will provide easy access to the nearby nature, surrounding meadowy landscape that increases biodiversity.

About the Authors

TARJA OJALA is a biologist and forest engineer based in Lahti, Finland. She has 22 years of experience in urban ecology, and a broad understanding of ecosystem services and ecological corridors. Her passion is to spread ecological information to people and communities to increase our understanding of how our everyday choices impact on our environment and how these impacts can be diminished.



ISHBEL CAMPBELL is an ecologist based in London, UK, with a passion for urban greening as part of building sustainability. Ishbel has 6 years experience in urban ecology and she aims to grow urban greening within urban design by working with clients and colleagues around the UK and Europe.



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Environmental and nature reviews

Taking the built environment and living nature into account as appropriate is nowadays a basic requirement for carrying out sustainable business operations. Climate change, overuse of natural resources and other mega trends require up-to-date, in-depth expertise.

Sweco helps its customers with environmental questions and other problems related to sustainable development, starting from the projects' preliminary planning. Sweco has the necessary expertise for finding solutions that are sustainable for the environment and also fulfill the financial and technical demands during the different stages of project planning and implementation.

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