

green infrastructure and biodiversity



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PERFECT project – Planning for Environment and Resource eEfficiency in European Cities and Towns

PERFECT Expert Paper 5: *Green Infrastructure and Biodiversity*

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About PERFECT



PERFECT (Planning for Environment and Resource eEfficiency in European Cities and Towns) is a five-year project, running from January 2017 to December 2021, co-funded by Interreg Europe. It aims to demonstrate how the multiple uses of green infrastructure can provide social, economic and environmental benefits. It will raise awareness of this potential, influence the policy-making process, and encourage greater investment in green infrastructure.

To find out more about PERFECT, visit <http://www.interregeurope.eu/perfect/>

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1 Background



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Lincoln Park, Chicago – the value of urban green infrastructure assets is now being recognised more widely

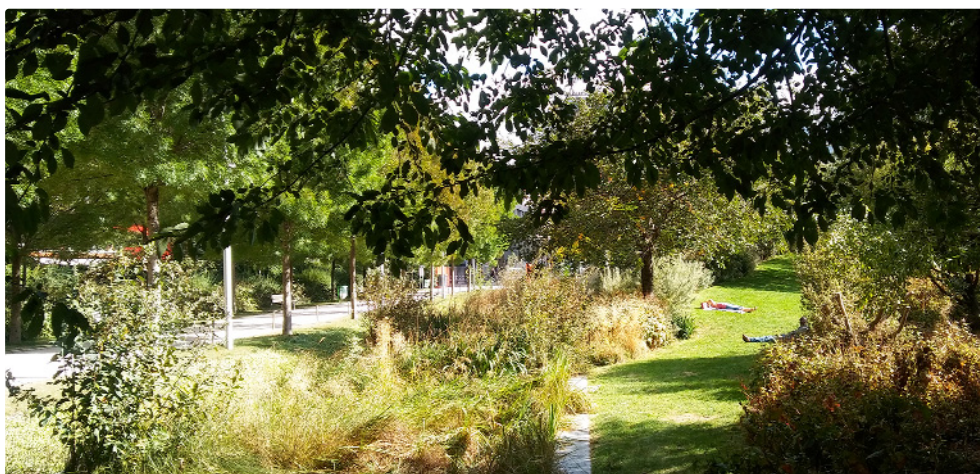
Policies and programmes for protecting biodiversity have long focused on maintaining valuable spaces and species in natural protected areas. The value of biodiversity in urban areas has often been underestimated, but nowadays urban green infrastructure assets such as urban wetlands, abandoned and naturalising industrial sites, vacant lots, ruins and derelict lands, roadside verges, allotment gardens and cemeteries are increasingly recognised as potential reservoirs of urban biodiversity, alongside residential gardens and villas, botanical gardens, green roofs, green walls and individual balconies.

The PERFECT project, funded by Interreg Europe, focuses on the multiple benefits of green infrastructure, including the protection and promotion of biodiversity, adaptation to climate change, and health, recreation, community cohesion and economic benefits. The PERFECT project partners aim to have a positive influence on the policy-making process in order to increase and improve investment in green infrastructure by raising awareness of the social, environmental and economic potential of such investment in urban areas.

This Expert Paper considers the importance of urban green infrastructure for the protection of biodiversity and in encouraging improved and more widespread planning for – and investment in – green infrastructure in our cities.

2 Preserving and promoting biodiversity

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The loss of biodiversity is a matter of the greatest concern. Biodiversity provides numerous ecosystem services that are crucial to human wellbeing, now and for the future. But a range of reports indicate that biodiversity has dramatically declined over the last 50 years.¹

Our daily life is dependent on biodiversity, in ways that are not always apparent or appreciated. We ultimately depend upon ecosystem products and services (such as the availability of fresh water, food and fuel sources) for the quality of life, wellbeing, and good human health. Biodiversity loss can leave ecosystem services no longer able to meet social needs, with significant direct impacts on human health, the climate, the depletion of natural resources, and poverty.²

Urban landscapes are the everyday environment of the majority (more than 51%) of the world's population, including nearly 80% of Europeans. Urban policy-makers in Europe are increasingly recognising the importance of green infrastructure in urban areas as an effective measure in mitigating the negative effects of climate change and in contributing to initiatives to improve the 'quality of life' across the board. The role of biodiversity in maintaining human wellbeing is less well known and often overlooked by local politicians, the administration, and the public.

Cities, as 'created ecosystems', have their own wildlife of particular urban species – species that also occur in the wider countryside, but in different numbers and composition than in urban areas, and with differing genetic diversity. In contrast, biodiversity in rural landscapes is rapidly declining, due to intensive, mechanised and industrial-scale activities in the agricultural and forestry sectors. This means that in many cases urban areas are richer in biodiversity than the surrounding countryside. However, even for those cities that host a surprisingly rich and diverse wildlife, there is a major concern that the population's lived experiences of nature are becoming fewer in number and poorer in quality.

1 See the WWF's 'Living Planet Index' webpages, at http://www.panda.org/about_our_earth/biodiversity/threatsto_biodiversity/

2 See the World Health Organization's 'Biodiversity' webpage, at <https://www.who.int/globalchange/ecosystems/biodiversity/en/>

3 EU green infrastructure and biodiversity policies

Green infrastructure is promoted by the European Commission as a key instrument for the conservation of ecosystems in the EU Biodiversity Strategy to 2020,³ approved in 2011 under the name *Our Life Insurance, Our Natural Capital*. The strategy defines six principal targets that complement each other and focus on the root causes of biodiversity loss, as well as on mitigation of the main pressures on the environment and ecosystem services in the EU. Each target will be implemented through a set of specific time-limited measures and other related steps.

Target 2 aims to 'Maintain and restore ecosystems and their services. By 2020, ecosystems and their services are maintained and enhanced by establishing green infrastructure and restoring at least 15% of degraded ecosystems.' Action 6 within this target focuses especially on the promotion of green infrastructure, which is described in more detail through specific goals and tasks.

The EU Green Infrastructure Strategy⁴ highlights the importance of green infrastructure and biodiversity, especially in urban environments, since nearly 80% of the EU population currently live in an urban environment.⁵ Announcing the adoption of the Green Infrastructure Strategy in May 2013, the European Commission noted that 'Green infrastructure urban environmental features like green roofs, parks and greenways contribute to human health, help address social problems, save energy and ease water run-off. Better infrastructure planning also contributes to more efficient mobility and building-policy.'⁶

In general, EU nature conservation policy is based on two main pieces of legislation: the Birds Directive and the Habitats Directive. Both directives provide the basis for the Natura 2000 network, which has the aim of ensuring the long-term survival of Europe's most valuable and threatened species and habitats.

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- 3 *Our Life Insurance, Our Natural Capital: An EU Biodiversity Strategy to 2020*. COM(2011) 244 final. Communication from the Commission to the European Parliament, the Council, the Economic and Social Committee and the Committee of the Regions. European Commission, May 2011. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52011DC0244>; see also *EU Biodiversity Strategy to 2020*. European Union, Dec. 2011. https://ec.europa.eu/environment/pubs/pdf/factsheets/biodiversity_2020/2020%20Biodiversity%20Factsheet_EN.pdf (and https://ec.europa.eu/environment/pubs/pdf/factsheets/biodiversity_2020/2020%20Biodiversity%20Factsheet_SK.pdf)
 - 4 *Green Infrastructure (GI) – Enhancing Europe's Natural Capital*. COM/2013/0249 final. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. European Commission, May 2013. http://ec.europa.eu/environment/nature/ecosystems/strategy/index_en.htm
 - 5 *Thematic Strategy on the Urban Environment*. COM(2005) 718 final. Communication from the Commission of 11 January 2006 on a thematic strategy on the urban environment. (Not published in the Official Journal.) <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=LEGISSUM:l28171>
 - 6 'Environment: Investing in green infrastructure will bring multiple returns to nature, society and people'. Press Release. European Commission, 6 May 2013. https://ec.europa.eu/commission/presscorner/detail/en/IP_13_404

4 Urban green infrastructure and biodiversity promotion

Despite the great potential of green infrastructure to benefit biodiversity and to facilitate ecosystem functions and services, cities often do not sufficiently take the opportunities available in various sectors, especially in green space maintenance, sustainable construction, and rainwater management, as well as urban design and planning.

Enhancement of natural processes by maintaining greenery in a manner close to nature, with pesticide-free management, is of great importance and can help to expand and enhance the biodiversity and natural value of green infrastructure areas. For example, the re-naturation and protection of watercourses with functional or shoreline vegetation, diversification of the land cover structure, planting of non-forest solitary trees or groups of trees, and the use of 'alleys', increasing the area of permanent grasslands and the greening of agricultural land boundaries (the edges of the plots and the boundary between arable land and the road) can contribute to the positive structural character of green infrastructure.

Lawns, turf and grasslands

Differentiated management of green spaces has the aim of optimising maintenance by taking into consideration the prevailing function of individual spaces (recreational use, for example), while at the same time considering the territory's diversity. These principles are applied especially in lawnmowing, where, for example, mosaic or altered (reduced) mowing regimes can significantly contribute to protecting biodiversity, providing shelter, the provision of a movement corridor and food for a variety of animals, including pollinators, and increasing the visual attractiveness of the area for its users. Maintaining short lawns is often promoted as a means of reducing the prevalence of ticks, but new research shows that this is determined much more by vegetation type. The abundance of host-seeking tick larvae and nymphs in vegetation has been reported as near zero in hayfields and grasslands in comparison with shrublands or woodlands.⁷

More cities in Europe have begun to use grazing to maintain public parks in urban areas, even in densely populated downtown areas, and it is recognised that city grazing can also provide an environmentally friendly solution to invasive species control. There are a lot of positive examples of where this has been used effectively in large cities, including in Paris in France, where 6 hectares of lawn are grazed,⁸ and in Hannover in Germany.⁹

The cultivation of flowering meadows instead of grass lawns also has a positive effect on biodiversity. Mowing with motorised lawnmowers produces carbon dioxide emissions and thereby increases the carbon footprint. Many lawns also need to be irrigated and fed with synthetic fertilisers and herbicides, causing additional problems to the environment. Different kinds of flowering meadows can be created by sowing particular types of seeds,

7 CJ Watson, L Carignan-Guillemette, C Turcotte, V Marie and R Proulx: 'Ecological and economic benefits of low-intensity urban lawn management'. *Journal of Applied Ecology*, 2020, Vol. 57(2), 436-46. <https://besjournals.onlinelibrary.wiley.com/doi/abs/10.1111/1365-2664.13542>

8 Y Cardoze: 'Cancer, pollution, bruit... Faut-il s'inquiéter pour les moutons du périphérique de Paris?'. *20 Minutes*, 18 Dec. 2017. <https://www.20minutes.fr/paris/2177751-20171218-cancer-pollution-bruit-faut-inquieter-moutons-peripherique-paris>

9 M Klein: 'Lebende Rasenmäher: Diese Schafe helfen Naturschützern'. *Hannoversche Allgemeine*, 3 May 2018. <https://www.haz.de/Hannover/Aus-der-Stadt/UEbersicht/Naturprojekt-in-Hannover-Schafe-helfen-der-Stadt>

and these can be selected based on the conditions and can reduce mowing regimes. Bratislava Karlova Ves municipality became the first 'bee-friendly' Slovak municipality when it planted flowering meadows in 2016.

Fostering connectivity

An interconnected green infrastructure network will enable the continuous movement of species – and residents – but the proper functioning of the system can face many challenges. Fragmentation of habitats, such as the routing of traffic through natural areas, is one of the main causes of habitat degradation and the loss of biodiversity – which can reduce functionality and the provision of ecosystem services. Valuable ecosystem services may be lost if the natural ecosystems become too small or isolated, because the isolated 'islands' of nature, including species, do not allow for genetic exchange between populations of the same species.

However, interconnection can be secured by means of bio-corridors and eco-ducts to provide connectivity in a fragmented urban landscape. When designing the different elements of a green infrastructure network it is appropriate to take into account interconnections and the various needs of differing species. An example would be the creation of 'highways for pollinators', such as the example in Oslo, Norway,¹⁰ where the planting of nectar-giving species and green roofs created conditions for the overpass of the bees (i.e. their flight over the whole city). Another example is the project to facilitate the migration of hedgehogs in London, promoting 'Hedgehog Highways'.¹¹ In urban environments it is necessary to use several linear elements of green infrastructure, such as alleys, hedges, waterways and altered (reduced) mowing regimes, to allow smaller species of wildlife to migrate.

Trees and plans

In order to attract bees, butterflies and other pollinators it is necessary to choose appropriate flora as a key factor. There are some basic principles; for example, it is essential to encourage greater diversity of vegetation so as to stagger flowering periods to favour native plants. Native plants are the most closely adapted to the local fauna. For instance, the common lime tree (*Tilia x europaea*) is a highly valuable food source for bees, whereas the white lime tree (*Tilia tomentosa*) produces nectar that is poisonous to some bees, such as bumblebees.

Wild bees are not generally attracted to flowerbeds full of horticultural annual plants that have highly modified flowers (indeed, double- or triple-flowered varieties produce very little pollen or nectar). There are numerous lists of nectariferous plants that are adapted to the specific pedoclimatic conditions of the relevant city. However, invasive or potentially invasive species, such as American goldenrods (*Solidago canadensis* and *Solidago gigantea*) or the black locust tree (*Robinia pseudoacacia*), should be avoided.¹²

A woodland with ground flora, dead wood and a small tree layer provides significantly more habitat for different species. A survey of Westminster parks and squares in London

10 'Oslo creates world's first 'highway' to protect endangered bees'. *The Guardian*, 25 Jun. 2015. <https://www.theguardian.com/environment/2015/jun/25/oslo-creates-worlds-first-highway-to-protect-endangered-bees>

11 'Link your garden'. Webpage. British Hedgehog Preservation Society. <https://www.hedgehogstreet.org/help-hedgehogs/link-your-garden/>

12 C Coupey, H Mouret, L Fortel, et al.: *Guide de gestion écologique pour favoriser les abeilles sauvages et la nature en ville*. URBANBEES project (Life+ programme), 2104. http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=home.showFile&rep=file&fil=URBANBEES_Guide_gestion_ecologique.pdf



Insect hotels can readily be created in public spaces and private gardens

demonstrated a strong correlation between structural diversity and the number of breeding birds present.¹³

One of the ways of encouraging greater biodiversity is to encourage this natural recycling by, for example, leaving dead wood on the ground in woodland areas.¹⁴

Insect hotels, herb spirals, water surfaces and other structures

Building dedicated structures can provide food and nesting for bees and insect pollinators. For example, nesting walls (wooden structures filled with logs with holes drilled into them, with varying kinds of stems, cut cane, vine branches and dry earth) are meant to welcome a wide variety of wild bees, and the creation of herb and insect spirals (a wall of dry stones built in a spiral shape) helps to warm and dry light soil.

Insect hotels and spirals could be created in public open spaces, parks, private gardens and allotments. There should be special emphasis on creating such structures in schoolyards and kindergartens, due to their educational potential. This has been done as part of the Amsterdam Schoolyard Incentive.¹⁵

Water surfaces and wetlands are considered to be some of the richest biotopes in general: 100% of amphibians, 50% of birds and 30% of rare and endangered flower species rely on wetlands to survive. Sustainable rainwater management that consists of the collection of rainwater from buildings and other impervious areas, with the rainwater fed into a natural pond, provides a habitat in itself, a source of food and water, and a

¹³ *Making Contracts Work for Wildlife: How to Encourage Biodiversity in Urban Parks*. CABE Space, 2006. http://www.fingalbiodiversity.ie/resources/biodiversity_guidelines/Encourage%20Park%20Biodiversity.pdf

¹⁴ *Ibid.*

¹⁵ 'Good practice: The Amsterdam Schoolyard Incentive'. Webpage. Interreg Europe. <https://www.interregeurope.eu/policylearning/good-practices/item/1758/the-amsterdam-schoolyard-incentive/>

breeding ground for numerous species. There are excellent examples in the Augustenborg neighbourhood of Malmö, Sweden, and in Rieselfeld in Freiburg, Germany.

Invasive species

Invasive species are a major threat to our environment because they change natural habitats and alter ecosystem services, replace native species, and damage human activities. It is essential to keep pace with the spread of invasive species and introduce appropriate techniques to remove them. It can be possible to limit their growth using physicochemical or organic treatment, grazing, or manual removal techniques.

Abandoning the use of pesticides

The use of pesticides and artificial fertilisers results in massive disturbance to ecosystems, causing soil exhaustion and poisoning environments and people. New approaches combining alternative methods with a transformation in aesthetic standards can lead to a green infrastructure maintenance regime that is more ecological and healthier for nature, as well as for humans.

5 Conclusion



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Overall, it is clear that municipalities, along with local residents, companies, schools and many other bodies, have an important role to play in safeguarding biodiversity. Investment in green infrastructure can open up a range of possibilities for realising that role. Every positive step – from installing a bee hotel to bringing the use of pesticides to an end or adopting nature-based management regimes for green spaces – brings us a step closer to restoring biodiversity levels. All actions, from the smallest gesture to radical systemic change, would be significant and positive steps towards preserving biodiversity.

Annex

Sources of funding

States can support green infrastructure and biodiversity through a number of EU funds and programmes. Co-financing opportunities currently available include:

- Structural Funds (the European Regional Development Fund and the European Social Fund);^{A1}
- the Cohesion Fund;^{A2}
- the European Maritime and Fisheries Fund;^{A3}
- the European Agricultural Fund for Rural Development;^{A4}
- LIFE+;^{A5}
- the European Fund for Strategic Investments;^{A6} and
- Horizon 2020.^{A7}

Additionally, there are various EU research funding programmes.^{A8}

Operational programmes

National level allocation is possible based only on the inclusion of green infrastructure in a member state's operational programme.

LIFE 2014-2020 programme

The LIFE programme is a specialised funding programme, under the authority of the European Commission.^{A9} Projects that improve the functional interconnectedness of green infrastructure and facilitate the movement of species between protected areas, such as Natura 2000, can be co-financed under this financial instrument. The LIFE programme also offers funding opportunities for the construction of green infrastructure elements in urban areas and their outskirts, as well as funding for projects that promote an ecosystems approach to fragmentation, multi-purpose soil use, and other action.

Horizon 2020

The Horizon 2020 programme is the EU funding programme for research and innovation, running from 2014 to 2020, with an €80 billion budget. It provides research and innovation

A1 See the European Commission's Regional Policy funding webpages, at https://ec.europa.eu/regional_policy/EN/funding/

A2 See the European Commission's Cohesion Fund webpages, at https://ec.europa.eu/regional_policy/en/funding/cohesion-fund/

A3 See the European Commission's European Maritime and Fisheries Fund webpages, at https://ec.europa.eu/fisheries/cfp/emff_en

A4 See the European Commission's European Agricultural Fund for Rural Development webpages, at <https://www.fi-compass.eu/esif/eafrd>

A5 See the LIFE programme website, at <https://ec.europa.eu/easme/en/life>

A6 See the European Fund for Strategic Investments website, at https://ec.europa.eu/growth/industry/innovation/funding/efsi_en

A7 See the 'How to get funding?' page on the Horizon 2020 website, at <https://ec.europa.eu/programmes/horizon2020/en/how-get-funding>

A8 See the 'EU funding' webpage, at https://europa.eu/european-union/about-eu/funding-grants_en

A9 See the LIFE programme website, at <https://ec.europa.eu/easme/en/life>

funding for multinational collaboration projects, as well as for individual researchers, and supports small and medium-sized enterprises with a special funding instrument.

Natural Capital Financing Facility (NCFF)

The Commission and the European Investment Bank (EIB) has established a Natural Capital Financing Facility.^{A10} The NCFF finances investments in natural capital projects, including green infrastructure, which generate revenues or save costs and contribute to nature, biodiversity and climate change adaptation objectives. The NCFF is open to public and private entities, including partnerships where appropriate. Investments could, for example, focus on ecosystem restoration projects as insurance against floods or droughts, or measures to improve water quality.

Cross-border and transnational co-operation programmes for 2014-2020

European Territorial Co-operation (ETC), better known as Interreg, is one of the two goals of EU Cohesion Policy in the 2014-2020 period and is funded by the European Regional Development Fund (ERDF). It has a budget of €10.1 billion, invested in several co-operation programmes responsible for managing project funding. Interreg has three types of programmes:

- cross-border (60 programmes);
- transnational (15 programmes); and
- inter-regional (four programmes).

BiodivERSa

Research on biodiversity is also supported through the BiodivERSa network, funded under the Horizon 2020 ERA-NET co-fund scheme,^{A11} which works to co-ordinate national research programmes on biodiversity across Europe and to organise international funding for research projects in the field on a competitive basis.

Global Environment Facility

The most important single source of funding for biodiversity-related activities is the financial mechanism of the Convention on Biological Diversity (CBD), the Global Environment Facility (GEF).^{A12} The GEF supports implementation of the Global Taxonomy Initiative (GTI) in several ways. For detailed information about the GEF's funding of taxonomic activities, see Chapter 5 of the *Guide to the Global Taxonomy Initiative*.^{A13}

A10 See the European Investment Bank's Natural Capital Financing Facility website, at <https://www.eib.org/en/products/blending/ncff/index.htm>

A11 See the BiodivERSa website, at <https://www.biodiversa.org/>

A12 See the Global Environment Facility website, at <http://www.thegef.org/>

A13 *Guide to the Global Taxonomy Initiative*. Secretariat of the Convention on Biological Diversity. United Nations Environment Programme, Mar. 2007. <https://www.cbd.int/doc/publications/cbd-ts-30.pdf>

PERFECT

a European partnership...

The PERFECT project will demonstrate how the multiple uses of green infrastructure can provide social, economic and environmental benefits; and it will raise awareness of this potential, to influence the policy-making process and to encourage greater investment in green infrastructure.

PERFECT aims to:

- spread awareness of the value of green infrastructure for the jobs and growth agenda among a wider audience;
- identify transferable good practice;
- improve investment and stewardship by engaging managing authorities and increasing the professional capacity of key stakeholders in delivering new projects; and
- help make places more economically, socially and environmentally viable by developing action plans to take advantage of the multiple benefits of strategic investment in green infrastructure.

The PERFECT project will work to identify the multiple benefits of green infrastructure investment through EU Structural Funds Operational Programmes and other policy instruments, in order to help formulate holistic and integrated approaches to the protection and development of the natural heritage.

The PERFECT partners are: Provincial Government of Styria, Department for Environment and Spatial Planning (Austria); Social Ascention of Somogy Development, Communication and Education Nonprofit Ltd (Hungary); Municipality of Ferrara (Italy); City of Amsterdam (Netherlands); Bratislava Karlova Ves Municipality (Slovakia); Regional Development Agency of the Ljubljana Urban Region (Slovenia); Cornwall Council (UK); the Town and Country Planning Association (UK).

