10 messages for 2010
Urban ecosystems

European Environment Agency

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This document is the 6th in a series of assessments under the title '10 messages for 2010'. Each message provides a short assessment focusing on a specific ecosystem or issue related to biodiversity in Europe. The remaining messages will be published at various intervals throughout 2010. More detailed information on the published and forthcoming messages can be found at www.eea.europa.eu/publications/10-messages-for-2010.

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Urban ecosystems

Key messages

- In Europe, where the overwhelming majority of people live in urban areas, tackling the interlinked challenges between biodiversity and its network of towns and cities is crucial to help halting biodiversity loss.
- Urban areas can be an opportunity or a threat for biodiversity. Seizing the opportunity demands that we mix high quality urban green areas with dense and compact built up zones.
- Quality of life in cities depends on the existence of sufficient attractive urban green areas for people and wildlife to thrive. But equally important for urban life are the ecosystem services delivered by biodiversity in green areas outside city boundaries.
- Although biodiversity and ecosystem services are global common goods, local and regional authorities have the legal power to designate conservation areas and to integrate biodiversity concerns into their urban and spatial planning. Public commitment is apparent in the numerous participatory Local Agenda 21 processes aimed at building sustainable communities that identify biodiversity as a precondition for resilient cities.
- Besides protecting areas, it is essential to integrate biodiversity into spatial planning at regional and local levels, including cities. Developing the European Green Infrastructure concept presents an opportunity to do this.

1 Mastering the challenge of urbanisation, maintaining biodiversity and quality of life

Cities are ecosystems: they are open and dynamic systems, which consume, transform and release material and energy; they develop and adapt; and they interact with other ecosystems. They are highly artificial and dominated by one species — humans — but can only survive and deliver quality of life by using basic services provided by nature and biodiversity. Such services, which originate both within and outside the urban area, include regulating the water cycle and the climate, purifying air, water and soil, producing food and other goods.

In Europe, 75 % of the population live in cities and 80 % is expected by the year 2020 (EEA, 2006; EEA, 2009). Although, small in area — accounting for around 4 % of Europe's surface — the sheer number of people causes an enormous ecological footprint, impacting resources and biodiversity far beyond city boundaries. Tackling the interaction of biodiversity and urban areas is therefore crucial for efforts to halt biodiversity loss beyond 2010 and to provide, at the same time, a high quality of life in cities.

Understanding the relationship of urban settlements and biodiversity and finding a concept that serves both needs requires that we consider the different urban dimensions:

- **Urbanity** refers to the quality and character of life in a city, the specific fabric of functional, structural, socio-economic and cultural interactions in urban areas. Many people enjoy these urban characteristics but, equally, when people choose where to live, proximity to nature plays an important role in their decision. Urban revitalisation therefore involves creative new

concepts of bringing nature back into the city and combining it with attractive public spaces.

- **Urbanisation** is the increase of urban population, combined with urban densification and/or expansion and fragmentation of urban area. It usually increases a city's ecological footprint and creates impacts on biodiversity and the environment in general. However, the extent of the footprint depends on the form and pattern of urbanisation.

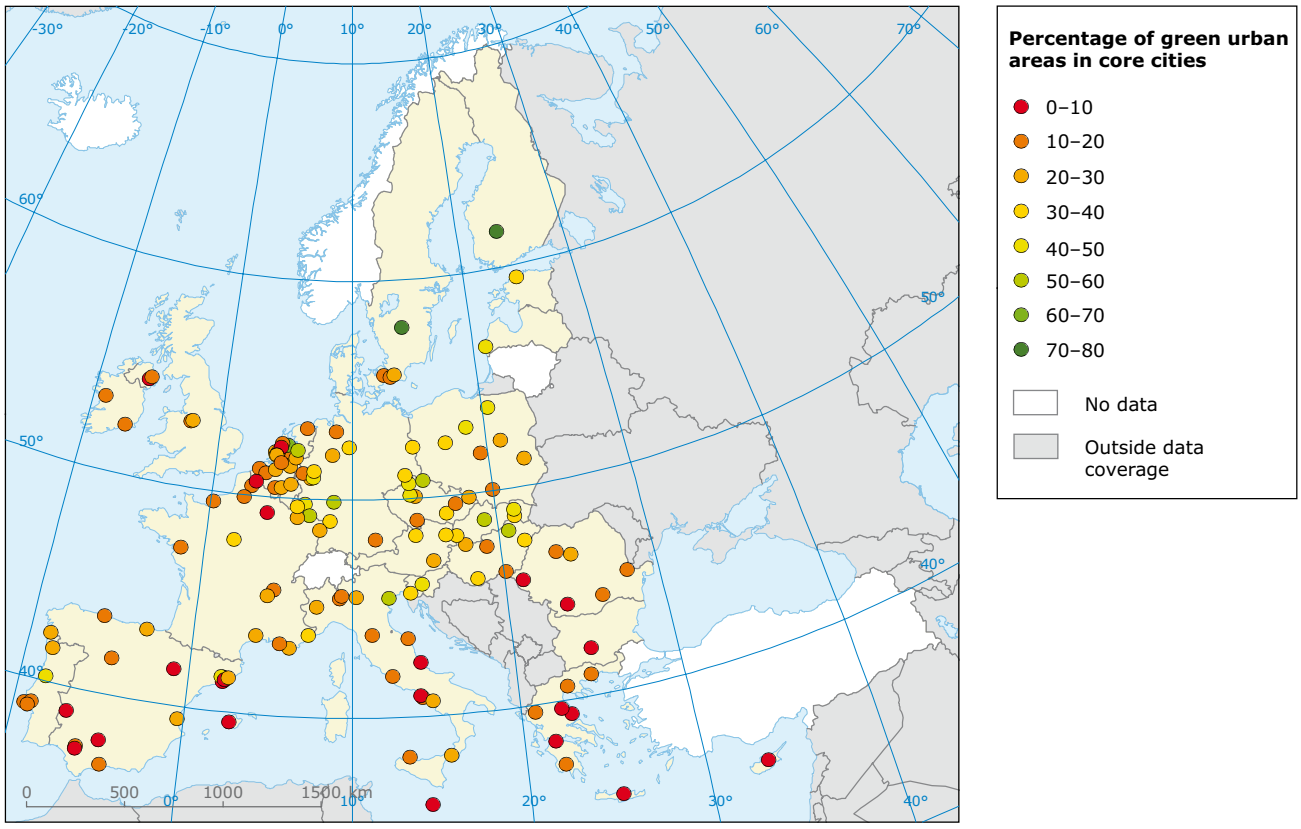
- **Urban design** describes the location, physical form and structures of our cities. It enables certain functionalities and lifestyles. Proper urban design can thus reduce the need for additional urban land-take and fragmentation. It can, at the same time, penetrate the city with greenery and promote biodiversity. Creating and improving green areas, revitalising brownfields, greening roofs and walls, at the same time as maintaining urban density and compactness, maximises the amount of ecosystem services delivered within cities and the ecological footprint.

With the right form and organisation, urban areas can provide opportunities, not merely threats, to biodiversity.

2 Green space and biodiversity in urban environments — an asset

Green space ([1]), tree-lined streets, and green walls and roofs are key means of bringing biodiversity and related ecosystem services into cities. It is important that areas are of sufficient size, diversity and distribution to support the wide variety of ecosystem services delivered to both wildlife and human populations. Green areas include intensively managed parks and gardens for recreation, as well

Map 1 Share of green urban areas in European cities, 2006



Note: The term 'core city' refers to the administrative city defined in the Urban Audit (http://epp.eurostat.ec.europa.eu/portal/page/portal/region_cities/city_urban/).

Source: EEA, 2010a.

([1]) Not every green space in a city contributes equally to biodiversity conservation. Given the focus of the 10 messages for 2010 on biodiversity, and because green space is essential for urban biodiversity to flourish, this message sometimes uses the terms interchangeably.

as extensively or unmanaged open space such as natural areas, wetlands or ruderal areas along railways or at old industrial sites.

For most urban dwellers, perceptions regarding the amount of 'greenery' in or near their cities is an integral part of quality of life (EEA, 2009). The presence, abundance and quality of green spaces and biodiversity are important differences between rural settings and cities. Equally, the extent, distribution and quality of green areas within cities varies widely across Europe (Map 1).

The value of biodiversity in cities is very closely related to the cultural and social choices of human societies. Biodiversity provides a significant volume of ecosystem services to urban residents and helps buffer against nuisances generated by the cities themselves (Celecia, 2000).

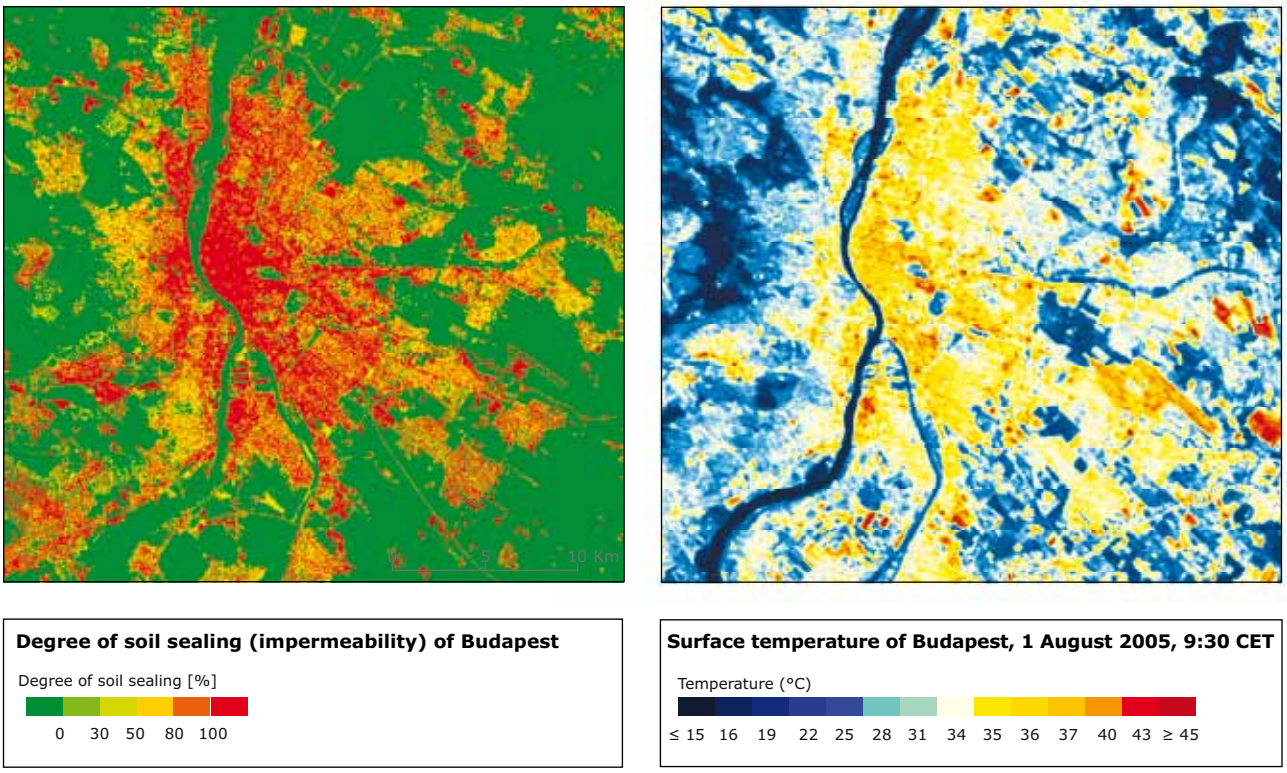
Green areas of different types provide space for recreation, social contacts, experiencing nature and education. People benefit emotionally and physically from interpersonal relationships, and the quality of a neighbourhood, including good quality green zones. The importance of these green zones and their contribution differ between countries but evidence shows that exposure to nature can provide relief and recovery: it can reduce blood pressure, improve cognitive abilities, and increase feelings of happiness (Putnam, 2000; Gidlöf-Gunnarsson and Öhrström, 2007). However, the perception of a good quality of green areas might vary in Europe due to a differing geographical and cultural contexts.

Green urban areas and biodiversity can provide basic ecosystem services, such as filtering particles, purifying water, reducing noise, and buffering climate extremes like heatwaves. For example, the map of Budapest below (Map 2) shows that the areas of the city that are greener and less sealed by impermeable surfaces are cooler than built up areas. This feature is of particular importance for adapting to future climate change in areas where increased temperature and heatwaves are projected.

3 Urban areas can be an opportunity ...

The traditional model of a compact European city with efficient land use protects open space elsewhere for biodiversity. High population

Map 2 Comparing the degree of soil sealing and the surface temperatures in Budapest, Hungary



Source: EEA, 2010b; Ongjerth *et al.*, 2007; Gábor *et al.*, 2008.

densities imply a low amount of ground area per capita — much lower than for people living in suburban or rural areas. On the other hand, highly concentrated people and infrastructure put stress on biodiversity inside cities. A balance between urban green and built up areas is therefore necessary. This can be achieved by implementing the concept of 'double inner city development', which combines densifying existing built up areas with a mixture of conservation, boosting the presence, quality and usability of green and open spaces (BfN, 2008), and enhancing other green infrastructure such as trees on streets, and green walls and roofs. This improves the accessibility of green areas inside and outside the city.

The value of wildlife in cities is often underestimated. Nowadays, urban wetlands, abandoned industrial sites, roadside verges, vacant lots and derelict lands, ruins, allotment gardens and cemeteries are increasingly recognised as potential reservoirs of urban biodiversity — together with arboreta, residential gardens and villas, botanic gardens and individual balconies (Heywood, 1996).

As created ecosystems, cities have their own wildlife of particular urban species, which also occur in the wider countryside but in different numbers and composition than in urban areas, and with a differing genetic diversity. This results from the complexity of urban ecosystems, with human activities at the centre of it (Gilbert, 1989; Sukopp and Wittig, 1998; Sukopp, 2003; Lizet *et al.*, 1999).

There exist various documented examples of genetic changes and the evolution of new taxa, which occur especially on man-made sites within and outside settlements (Zerbe *et al.*, 2003). Many species (mammals, birds, invertebrates and plants) have followed human settlers into towns and adapted to the many ecological niches that urban areas support (Erz and Klausnitzer, 1998; Wittig, 2005; Werner and Zahner, 2009).

A recent survey of sightings and indicators of mammals in urban green space in the United Kingdom found that in addition to bats and foxes, otters are also starting to occur in cities (PTES, 2009). The presence of wild fauna in cities can be a positive indicator of the quality of green space, but in some cases can also give rise to nuisance (e.g. foxes or seagulls).

Cities can play an important role in hosting certain rare and endangered species and habitat types of European importance. A survey published by Sundseth and Raeymaekers (2006) shows that in total 97 Natura 2000 sites exist in 32 major cities in Europe. Sixteen of those are capital cities (for example, London, Paris, Prague, Rome and Tallinn). As such, more than half of the EU's capitals harbour one or more Natura 2000 sites. Berlin has 15 Natura 2000 sites but most cities have one or two sites.

Under the auspices of the Convention on Biological Diversity (CBD) and with contributions from Local Governments for Sustainability (ICLEI), a new City Biodiversity Index (CBI) is being developed. It will be presented at the tenth meeting of the Conference of the Parties to CBD in October 2010 (CBD, 2010) ([2]). The CBI is based on a set of biodiversity indicators developed specifically for cities. The Index will make it possible for cities and local governments to measure the status of biodiversity and the effect of their biodiversity policies according to an internationally streamlined system (ICLEI, 2010a).

4 … or a threat for biodiversity

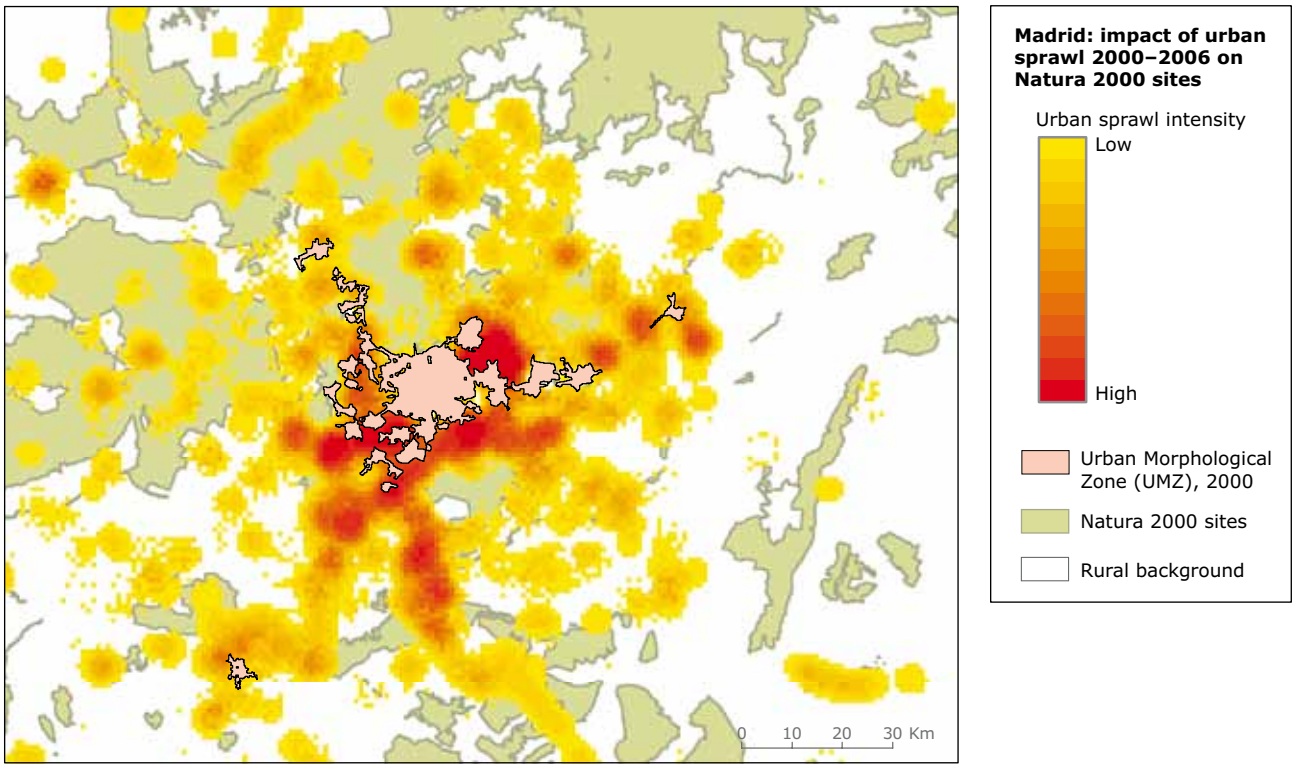
Although urbanisation can deliver more efficient land use, urban growth, particularly in the form of urban sprawl, is a major threat to biodiversity. Artificial land cover increased by 3.4 % in Europe between 2000 and 2006 — by far the largest increase in all land use categories (CLC, 2006). Unfortunately, urban sprawl is currently the overall trend in Europe despite some regional exceptions.

Urban growth often encroaches on the best types of soil and destroys natural and semi-natural habitats, together with their species communities. The low density and wide coverage of urban sprawl affects biodiversity further by fragmenting habitats and bringing urban areas and activities closer to valuable natural areas. Such proximity increases indirect human impacts, such as disturbance, noise and pollution (see the example of Madrid, Map 3). Also, it reduces the accessibility of large open space for inner city residents.

Urban sprawl is driven by a variety of interacting factors. These include demand for new physical infrastructure due to population growth, the demand for more living area per person driven by

([2]) A draft manual for the calculation of the index is available at www.cbd.int/doc/groups/cities/user-manual-singapore-index-2009-11-21-en.pdf.

Map 3 Madrid: impact of urban sprawl 2000–2006 on Natura 2000 sites



Note: UMZ denotes 'urban morphological zone', i.e. built-up areas of Madrid situated no more than 200 m apart from each other (see EEA, 2006).

income, lifestyle changes and an increasing number of smaller households. Perceptions that life in cities is low quality (for example due to a lack of green spaces) in combination with the improved accessibility of remote areas with lower land prices and weak implementation of sustainable planning principles can lead to inner city abandonment and building of new commercial and residential estates in suburban areas (EEA, 2006). Clearly, locations close to natural and protected areas outside cities are particularly valued and attract urban sprawl, especially if easily accessible. The example of Madrid presented in Map 3 shows this impressively. There is clear monetary value added to those urban areas close to green areas such as Natura 2000 sites.

The high concentration of people necessitates that cities depend on biodiversity and ecosystem services from elsewhere. Services such as production of food and biomass, flood protection and regulation of the water balance and the climate are largely delivered by ecosystems outside city boundaries. Through their demand for ecosystem goods and services, cities create impacts on the environment and biodiversity on a much bigger scale than their actual area. London alone is thought to have an ecological footprint that exceeds its geographical area by a factor of almost 300 — an area nearly twice the size of the United Kingdom (Best Foot Forward, 2002). However, cities vary in terms of their footprint and biodiversity impacts depending on how they are built and managed.

5 Ensuring urban biodiversity is crucial for quality of life in European cities

The urban setting provides a good example of how much the quality of life of European citizens depends on ecosystem services provided by biodiversity. Urban dwellers benefit significantly from the recreational, social and inspirational services provided by wildlife both within and outside cities. But ecosystem services are also crucial for our basic living conditions in cities. Regarding the impacts of climate change, which will intensify or alter the specific urban climatic conditions, urban greenery will play an important role in adaptation strategies due to its beneficial climatic effects.

Urban greenery makes living in the city more attractive, helps to prevent urban sprawl and thereby saves space for biodiversity. Furthermore, when more services are provided within the city, it reduces the city's footprint and, thus, diminishes potential negative impacts both on biodiversity and on the environment in general.

Local and regional authorities have the legal power to designate conservation areas, support the EU Natura 2000 networks and integrate biodiversity concerns into urban and spatial planning. Cities are contributing to the designation of Natura 2000 sites (as outlined above). The extent of public commitment is also apparent in the numerous participatory Local Agenda 21 processes aimed at building sustainable communities that identify biodiversity as a precondition for resilient cities.

In May 2010, 1 100 participants at the sixth European Sustainable Cities and Towns Conference in Dunkerque (France) discussed the potential sustainable local action throughout Europe (ESCT, 2010). In the same month, participants at the first world congress on Resilient Cities 2010 in Bonn (Germany) included biodiversity and related ecosystem services in their talks as a cornerstone for climate change adaptation (ICLEI, 2010b). The Local Government Biodiversity Roadmap and ICLEI's Local Action for Biodiversity (LAB) activities assemble local voices and push for a recognition of urban biodiversity and cities' actions in the CBD process (ICLEI, 2010c).

The EU supports such further commitment and awareness raising, for example by honouring the most sustainable cities with the European Green Capital Award (see the box below), and establishing the legal framework to protect biodiversity through instruments such as the Natura 2000 network under the EU Habitats and Birds Directives, Air Quality Directives, the Water Framework Directive and the development of a Soil Directive.

The EU will also develop a strategy on green infrastructure after 2010 to protect biodiversity and ecosystem services in the 83 % of the EU territory falling outside the Natura 2000 network, including its cities (EC, 2010a). The green infrastructure concept brings considerations for biodiversity and ecosystem services to the heart of wider spatial planning. It will be key to further strengthening sustainable urban development and related EU-wide spatial policies and actions like the urban dimension in regional policy (EC, 2010b), the EU Territorial Agenda (EC, 2010c) and the Leipzig Charter on Sustainable European Cities (EC, 2007).

The European Green Capital Award

The European Commission has long recognised the important role that local authorities play in improving the environment and their significant commitment to genuine progress. As one of the latest initiatives, the European Green Capital Award was conceived to promote and reward these efforts.

The Award recognises cities that have developed measures and a comprehensive concept of city development by balancing urban land use, green urban areas, biodiversity, related ecosystem services and other environmental categories. Among the 11 categories, cities have to demonstrate a high level of achievement and short- and long-term planned measures in relation to:

- areas designated for nature protection and biodiversity;
- protection of nature in other open space;
- promotion of knowledge and understanding of nature and biodiversity.

Starting in 2010, one European city is selected each year as the European Green Capital. Stockholm and Hamburg have been selected as the European Green Capitals for 2010 and 2011. Finalists competing for the title in 2012 and 2013 are Barcelona and Vitoria-Gasteiz (Spain), Malmö (Sweden), Nantes (France), Nuremberg (Germany) and Reykjavik (Iceland).

For more information, see: http://ec.europa.eu/environment/europeangreencapital/index_en.htm.

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