the URBES project

Biodiversity and ecosystem services: the foundation for human health and well-being

Human beings are an integral and inseparable part of the natural world. Our existence and health ultimately depends on the integrity and functioning of ecosystems. This URBES factsheet presents research findings and policy recommendations which underline the value of biodiversity and ecosystem services in building and protecting physical and mental health. Within and around cities, green infrastructure is the network of green spaces and other environmental features, which sustains biodiversity and brings benefits to human health and well-being.

factsheet 2

Biodiversity and health

Biodiversity is one of the primary foundations for human physical and psychological health and well-being. The benefits which biodiversity and ecosystem services can bring to people are numerous and occur at many levels. Not only are biodiversity and ecosystem services fundamental to life with the provision of air, water and other essential resources, they also contribute to climate regulation and thus provide people with a favourable living environment. The services supported by biodiversity and ecosystems also include the provision of resources for curing and preventing human health problems, such as allergies and asthma. Not least, nature is a source of inspiration and relaxation for people with positive impact on mental health.

A wide range of benefits

A study by UNESCO, SCOPE and UNEP states that biodiversity supports health and well-being by:

- providing food, clean air, water and other essential resources for life;
- preventing the emergence and spread of pests and disease agents;
- supplying medical and genetic resources to prevent illness and provide suitable cures;
- maintaining psychological health by providing opportunities for recreation, creative outlets, therapeutic spiritual retreats, and cognitive development.

Other frequently mentioned benefits are: improved air quality and reduction of pollution, asthma reduction, allergy prevention and immunity increase, regulation of air temperature and reduction of the urban heat island effect, regulation of the water cycle, stress and crime reduction thanks to positive effects of nature on the human mind.

Natural solutions

Trees, parks, gardens, ponds, and other natural areas are the green infrastructure of cities and towns. This infrastructure hosts and protects biodiversity and is the source of much needed ecosystem services. The following selection of research findings shows how urban ecosystems can significantly contribute to improved human health and well-being.

Improvement of air quality

There is some evidence that trees in urban areas help remove air pollution and improve urban air quality. A study in 55 U.S. cities and the entire nation, showed that air quality improvement due to trees is relatively low (< 1 %), but that the actual magnitude of pollution removal can be significant (typically hundreds to thousands of metric tons of pollutants per city per year) (Nowak et al, 2006).

Urban forest and green space management can provide a viable means to naturally ensure good air quality and help meet clean air standards as required by legislation. For instance, for many cities in the European Union, the accepted levels of exposure to particulate matter included in the European Union Ambient Air Quality Directive have proven extremely difficult to comply with. Improved green infrastructure can contribute to lower exposure levels and help meet the standards.

Reduction of allergy risk and asthma

Rapidly declining biodiversity may be a contributing factor to the rapidly increasing prevalence of allergies and other chronic inflammatory diseases among urban populations worldwide. A recent study in Finland (Hanski et al, 2012) suggests that contact with the natural environment could protect people from becoming sensitised to allergens, by building up the human immune system. If contact with biodiversity-rich environments, especially certain kinds of bacteria, can help reduce sensitivity to allergens and boost immunological tolerance in general, this could have significant implications for urban planning, environmental protection and health policies.

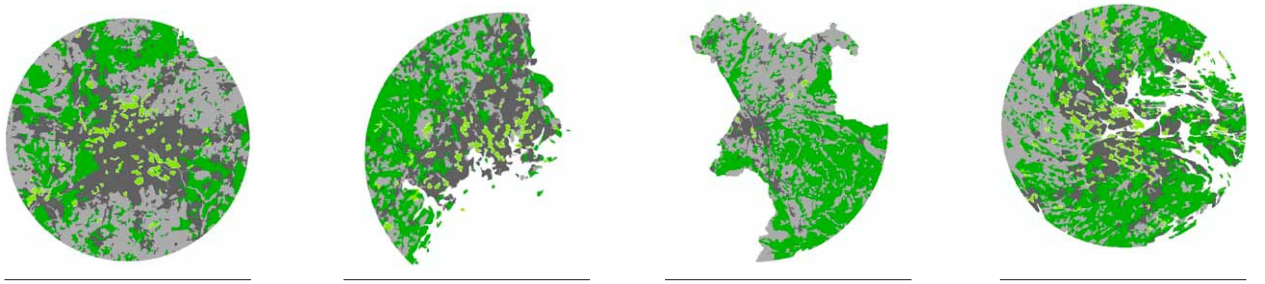
To investigate the impact of urban nature on childhood asthma in New York City, researchers at Columbia University conducted a study on the correlation between the number of neighbourhood street trees and incidence of the disease (Lovasi et al, 2008). The study indicates that adding an additional 343 trees per square kilometer decreased the asthma rate by as much as 24-29 percent among children aged 4 and 5.

Reduction of urban heat island effect

The European Union Health Strategy 2008-2013 acknowledges the need for action to tackle climate impacts on health. The impact of heat waves is particularly strong in cities and towns. The so-called 'urban heat island effect' describes the increased temperature of the urban atmosphere compared to its rural surroundings. The temperature difference can be up to 10 °C or more (Oke, 1982). This significant increase in temperature can cause a growing risk of death from heat stress, in particular for elderly people in our ageing urban societies.

The modelling of surface temperatures in Manchester (Cavan et al, 2011) has shown that green infrastructure can significantly buffer some of the predicted warming due to climate change impacts.

The URBES project has analysed the climate regulation function of green infrastructure in four case study cities (Larondelle and Haase, 2012). The results of this study confirm that green infrastructure can significantly reduce the urban heat island effect.



Berlin | Helsinki | Salzburg | Stockholm

Based on Corine Land Cover Data, 2006. A 30km radius was used to delineate the area for assessment in order to have a standard size of the NUTS3 regions. Local climate regulation was determined using indicators such as latent heat and evapotranspiration flows, land surface emissivity and tree shade.

- settlements and infrastructure
- - 0.5 °C (least affected areas)
- -1 °C (urban green space)
- -3.5 °C (forest)
- not assessed

The local climate regulation and cooling functions of urban green infrastructure are among the most important urban ecosystem services for human health.

Berlin and Salzburg show lower cooling potential in their core parts compared to Helsinki and Stockholm. This is due to their compact form, the high degree of impervious cover and lower share of urban forests.

Stockholm has the highest number of green spaces in its urban area among the four cities. Helsinki and Salzburg have a high share of peri-urban forest cover.

Improving urban policies

The importance of biodiversity and ecosystems for human health needs to be recognized when developing urban policies. Informed urban planning has the potential to support physical, mental and social well-being. It can also contribute to decreasing health inequalities and improving the health conditions of urban citizens by conserving nature. Local and regional authorities have the power to protect, restore and maintain nature and green infrastructure, taking the following into account:

- Strengthen research on the linkages between biodiversity, functioning ecosystems and human health;
- Develop management policies which connect biodiversity and green spaces to human health and well-being;
- Use existing and new research findings to raise awareness of the benefits of green areas for the health of citizens and encourage initiatives for bringing urban communities in contact with nature
- Support the development of sustainable urban land use policies;
- Encourage the development of urban green infrastructure and support inhabitants' initiatives for green space development;
- Strengthen the connection between green infrastructure within cities and surrounding peri-urban and rural areas; and
- Be inclusive and involve all stakeholders: urban planners, public and environmental health professionals, other relevant sectors, administration at different levels and citizens.

More information on biodiversity and health can be found on www.urbesproject.org

The URBES project

The URBES project aims to bridge the knowledge gap on the role of urban biodiversity and ecosystem services for human well-being. It further aims to inform urban management and decision-makers on how to best integrate the natural environment and human needs. The URBES partnership of academic institutions and international organisations translates science into action for cities.

Project donor

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Project partners

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