



Inspiring4Biodiversity



Biodiversity in the city



Erasmus+

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Introduction

In addition to the climate crisis, experts are increasingly warning of a global biodiversity crisis. What is the background to this? Due to the growth of mankind - both in terms of population but also in terms of material consumption - nature is coming under increasing pressure. Observations and measurements of the last decades show that we are losing more and more animal and plant species at a rapid pace. Not only in the tropics, but also in Europe and also in Austria.

This extinction has reached dramatic proportions in recent decades. Scientists assume that the extinction rates and speeds we observe today are only comparable to the great geological events that triggered the disappearance of the dinosaurs, for example. The main causes of the biodiversity crisis are primarily habitat loss, pollution and invasive species.

At first glance, it seems contradictory to think of cities and conservation together. But cities not only provide diverse and varied habitats for humans, they can also provide homes for a considerable number of non-human creatures. For example, cities with their gardens and parks often provide more richly structured habitats that are less polluted with pesticides than intensive farmland. There are also many special sites in cities that can provide a home for endangered animals such as wild bees, lizards or bats. Vienna in particular is a good example here. For example, 61% of all grasshopper species in Austria and around 100 butterfly species occur in Vienna.

Green infrastructur¹

Not only animals and plants benefit from nature conservation in the city. Nature in the city also has many advantages for the inhabitants - on many different levels! A concept often used in the context of nature and the city that takes this into account is that of green infrastructure, which is briefly introduced below:

Green infrastructure (sometimes also blue-green infrastructure) is a technical term that describes a strategically planned network of natural and semi-natural areas and

¹ *Eine Grüne Infrastruktur für Europa:*
<https://ec.europa.eu/environment/nature/ecosystems/docs/GI-Brochure-210x210-DE-web.pdf>

green spaces that provides ecosystem services (e.g. cooling effects, health effects) for the benefit of humans and to ensure quality of life while protecting biodiversity.

One of the main advantages of green infrastructure is its ability to perform multiple functions on the same land area. Unlike most "gray" infrastructure, which typically has a single purpose, green infrastructure is multifunctional, meaning it can provide win-win solutions or promote small loss, big gain situations that benefit multiple stakeholders, as well as the general public.

Green infrastructure objective (nature in the city) ²

Health & Wellbeing

Green infrastructure, such as parks, forests and open spaces, has a positive impact on our health and well-being. It provides space for relaxation and exercise and has a positive impact on our physical and mental health (van den Berg 2015). Improved access to high-quality green space in areas with limited open space can reduce health inequalities between individual neighborhoods and their residents. In the United Kingdom, one study found a link between human health, in this case obesity, and access to green space. Where there was more green space, people had lower levels of obesity (Sakar 2017). Similarly, there has been shown to be a positive association between living on or near green space and cardiovascular mortality (Gascon et al. 2016). Access to green space for children has been shown to be associated with improved mental health, overall health, and cognitive development in children (McCormick 2017).

Reduce air pollution

Green infrastructure can also help reduce air pollution by absorbing, depositing, and dispersing air pollutants, thereby protecting human health. In Barcelona, it is estimated that approximately 305 tons of air pollution was removed by the city's trees in 2008 (Chaparro & Terradas 2009). Green walls, trees, and hedges (Al-Dabbous and Kumar 2014) can all help improve air quality and reduce noise pollution.

²Handbuch Grüne Infrastruktur – Konzeptioneller und theoretischer Hintergrund, Begriffe und Definitionen: <https://www.interreg-central.eu/Content.Node/MaGICLandscapes-Handbuch-Gruene-Infrastruktur-DEU.pdf>

Noise Control

„The use of vegetation can help impede sound propagation by absorbing or diffracting noise. There is also evidence that the presence of vegetation affects noise perception, regardless of its actual effectiveness in reducing noise.“ (Brink et al. 2016).

Community and interaction

Green spaces are also an important place for social interaction and community activities, which promotes community cohesion. Social cohesion and physical activity have been shown to positively impact people's mental health (Dzhambrov et al. 2018).

Protection during extreme precipitation

In urban and peri-urban areas with high levels of sealed surfaces, stormwater runoff can place high pressure on wastewater systems, often resulting in the discharge of untreated material into water bodies. Slowing and storing water in these areas can prevent this.

Green roofs, sustainable urban drainage systems, balancing ponds, and short-term wetlands can help reduce runoff rates.

Education & Environmental Education

Green infrastructure provides a place for learning, whether formal learning or the school curriculum or alternative learning and discovery in non-formal contexts. Experiencing and understanding nature is an essential part of protecting nature and the future use of our environment (Otto & Pensini 2017). Isolation from nature diminishes its value for those who do not experience it, while individual attachment to the natural environment promotes environmentally friendly behaviors (Scannell & Gifford 2010). In our modern era, technology, media, and safety thinking, as well as limited access to green space, have changed the way children play and learn with it.

Cooling

The use of green infrastructure for cooling urban areas is well documented. In this regard, green spaces can have a tremendous cooling effect as a result of shading and evaporation from vegetation. As climate changes and extreme weather events become more frequent and adverse, cities must be prepared for higher temperatures. Human health is negatively impacted by increased temperatures. This can be through direct exposure to heat or through the effects of heat on air pollutants, such as increased ozone levels. These, in turn, have been identified as a cause of increased asthma symptoms (Goodman et al. 2018). Children and the elderly are more susceptible than other age groups. An increasingly aging population means that more attention should be paid to the positive effects of green infrastructure in reducing heat-related mortality.

Promoting sustainable mobility

Interconnected elements of green infrastructure, such as parks and greenways, can provide climate-friendly and sustainable transportation options while providing other functions important to people. Most importantly, they promote the most sustainable form of transportation - walking. Providing safer, nicer, and more sustainable transportation options can create incentives to increase walking and bicycling, with additional health benefits.

Energy Savings & Climate Protection

Green infrastructure can indirectly reduce CO₂ emissions by lowering energy consumption - which also has a positive impact on housing costs! One example is the reduced use of air conditioning in cities, where plantings such as street trees, green building walls, and green roofs help cool buildings by reducing solar radiation or creating cooling effects through water evaporation via leaves, among other things. Green roofs also protect against rapid cooling of building interiors in winter, further reducing energy demand.

Creating new fields of employment

From urban beekeeping to organizing continuing education in green spaces to improving the environment for cultural and historic offerings, green infrastructure promotes employment and creates opportunities for new businesses. The creation and sustainable management of green infrastructure also sustains jobs and creates new employment opportunities.

Green infrastructure is an important element in the redevelopment of neighborhoods and commercial areas. It has been shown that attractive, usable, and beneficial green infrastructure elements can contribute to the economic and environmental regeneration of disadvantaged areas.

Concrete goals for a city or a neighborhood/district

- More green for environment & citizens
- Open spaces for people, bees and butterflies
- Motivating people to care for nature in their neighborhoods
- Open spaces / green spaces design according to environmental criteria

The vision for a city or a district/borough

The inhabitants are proud of their district and of the nature that is part of it. Nature, like people, needs freedom and open spaces - in the city, open spaces for nature and open spaces for people are not contradictory. Green spaces are so-called multifunctional spaces that can be there for people as well as for rare animals and plants. It is important to ensure that green and natural spaces are not perceived as exclusive spaces. They should be equally available to all residents.

Mission for a city or neighborhood/district

Through the involvement of the population in the design, construction and maintenance of green spaces, design opportunities should be created, which should also lead to an increased sense of community (community building) and a shared sense of responsibility towards the public space.

Inclusion is of particular importance - since all residents have access to green spaces and natural areas, it is important to consider the different needs of various groups (young - old; social, cultural, economic).

Urbaner Naturschutz– die Naturschutz Pyramide



The conservation pyramid describes the reinforcing interaction between conservation, education, and engagement and forms the basis for implementing projects planned in the city.

Formalities for the implementation of project ideas

- Creation of an action plan for the preservation of the biodiversity of the settlement areas
- Recording of baseline values through targeted data collection of selected wild species and species groups, taking into account the natural landscape conditions.
- Survey of potentials & elaboration of different possibilities for implementation
 - Discussion with responsible institutions/departments
 - Inspection of possible implementation sites
- Implementation and involvement of stakeholders
- Promotion of networks of actors involved in the field of Citizen Science – also with the involvement of schools.

- Initiation of intergenerational activities in the design and maintenance of green spaces.
- Financing
- The listed projects contain examples of projects that can be carried out with a small investment of time and financial resources as well as those that require a longer-term implementation with a correspondingly more elaborate financial endowment. In concrete terms, therefore, a whole range of funding options are available:
 - National and international funding sources
 - Grants and programs of the City
- Communication
A uniform communication framework connects all projects on the topic of nature in the district/city. This creates a better visibility of individual measures and projects and allows their interaction to be recognized.

Green Network Project

The concept of stepping stones comes from ecology and describes how different, larger ecosystems are connected by a chain of smaller areas so that animals can migrate from one ecosystem to another. Stepping stones, as well as other linear elements such as river or road embankments, improve the permeability of the landscape. Animals can thus find shelter and food during their migrations.

It is also true for city people - if our way runs through trees, squares, benches, drinking fountains. then it is immediately easier and more enjoyable. These elements also make the city more permeable and encourage walking.

The projects or measures presented in the following are different ways of integrating areas into the Green Network. Prioritization in the selection of areas can be based on ecological criteria - e.g. creating connections between larger existing biotopes and green spaces - but also on social aspects such as visibility and fair availability of green spaces or the creation of green "city walkways".

Flowering bees willows

Nature-friendly design of public spaces

Existing (or newly created) green spaces are redesigned to be nature-friendly, providing food and habitat for wild bees and butterflies.

Edible city

Generally accessible vegetable and herb beds as well as berry orchards and also fruit trees are established or planted. These areas are becoming meeting places for all

residents and are very popular. However, further support is required when the initial euphoria has waned or the residents' structures change. A kind of "fruit street worker" who provides targeted advice and support would be one way to avoid conflicts of interests.

Initiatives to support citizens in gardening already exist in some municipalities. This can range from making land available to planting fruit trees in public areas that are open for harvesting. Street plantings with fruit trees in residential areas, carried out in coordination with the residents, are also a possibility. In the immediate residential area, for example, the new wall planting possibilities can be used to grow edible plants here as well.

The following is a list of criteria to assist in the selection of suitable fruit trees and other edible plants. In addition, the selection of old cultivars can protect them. If enough space is available, fruit trees can also be planted in the form of a meadow orchard.

Fruit trees :

- Varieties adapted to the climatic region and therefore easy to care for (no exotics).
- Fruits easily accessible (no high trunks)
- Fruits easily and raw edible
- Little dirt
- No thorns and spines on children's playgrounds

herbs, vegetables, strawberries:

- Selection of uncomplicated varieties
- Planted in areas that exclude soiling by dogs or vandalism as far as possible
- More often bearing varieties (e.g. strawberries)

Wild mini-habitats

They are a so-called "urban wilderness" the - albeit usually short-lived - counterpart to pristine habitats such as virgin forests. They essentially develop without any management measures. If maintenance measures are taken, they are usually minimal and serve, for example, to make characteristic features visible or to keep the areas accessible.

Fallow areas and wild mini-habitats can be specifically promoted. They can be marked where appropriate. Their role as valuable natural assets should be pointed out.

Wild corners can be established in suitable places in parks or in appropriate public areas. This should be accompanied by information signs on site - also to avoid littering.

In order to implement this measure, it is necessary to identify suitable areas and to design an appropriate information board.

Since the areas do not require any further regular maintenance (perhaps it is appropriate to mow them once a year), these measures can be implemented very cost-effectively.

Implementation Wild Mini Habitats:

- The first step is to map potential and document existing urban wildlife and nature development sites.
- Owners of potential areas (e.g. in gaps between buildings after demolition) often have nothing against an interim use. However, this use must be legally secured. Here, the city has the possibility to take over other people's land for some time and to insure it as if it were its own land, if a land management department takes over the technical supervision.
- Wild corners can be used in the most diverse ways and by the most diverse groups. However, their value for nature conservation should always be considered and a multifunctional use should be strived for.

Biodiversity on and in the building

- Nature and building
Thinking about biodiversity in planning
- Nature in community building
Workshops & area design
- Nature on the windowsill (balcony)
Do it yourself facade greening
Goal: Mini habitats on the windowsill/ balcony for bees, butterflies and other insects.

Implementation of biodiversity on and in the building:

- Preparation of instructions and compilation of planting list such as.
 - Native flowering plants such as chives and grape hyacinth attract bees.
 - These can be combined with vegetables, culinary herbs, berry bushes and fruit trees in pots.
 - Use peat-free potting soil! Our love of nature should not destroy peatlands.
 - A prerequisite for the colonization of insect nests is the proximity to nectar-rich, flowering plants.
 - Ornamental plants and common balcony flowers, such as geraniums and petunias, provide colorful flowers but no nectar and pollen. Therefore, they are useless for most species.
 - Avoid chemical fertilizers and pesticides! It is better to use natural fertilizers.
- Compile info brochure, organise events and workshops.
- Examples of target species:
 - Horned mason bee
 - Large wood bee
 - Lesser fox
 - Chives
 - Steppe sage
 - Grape hyacinth
 - Instructions & Examples:

Plant exchanges - implementation

- Plant exchanges for natural balcony, yard and garden design
- Workshops and information events

The school garden - the green laboratory - implementation

- Compilation of teaching material
- Identify plots -> garden communities, urban development area
- Concept for organization and implementation

Trees in troughs - implementation

- Planters made of clay or plastic are equally well suited (although plastic containers are less well ventilated - waterlogging can lead to rotting)
- Tubs made of copper and zinc are only suitable to a limited extent - they can release toxic substances
- Generally pay attention to the optimal shape and size of the bucket
- Cylindrical or conical pots can easily tip over in windy conditions
- Pot should be large enough but not too large
- Too big pots result in excessive root growth
- Roots should not be bent
- Spacing between root ball and pot rim of approx. 10 cm is optimal
- Pots of non-hardy specimens should be easy to transport to winter quarters
- Repot trees in pots about every 3 - 5 years; the new pot should be no more than 2 - 4 cm larger than the old one.

Impressum

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