Transforming cities' relationship with nature

10+10 lessons for cities to understand why and how to plan urban biodiversity actions and nature-based solutions

URBACT

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BiodiverCity: Measuring urban biodiversity and accounting related ecosystem-services to verify, design and scale up nature-based solutions

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Photos: BiodiverCity partnership

Renaturalisation of trees on Avenue Juan XXIII, Cieza (same place in 2015 and 2022)

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How not to manage urban biodiversity....

1.1. "Vitamin N" for everyone – the rise of nature-based solutions to tackle the ecological crisis

Bestseller author Richard Louv defined nature-deficit disorder in his book (*Vitamin N: The Essential Guide to a Nature, 2016 – where "N" is for "nature"*) and launched an international movement to get humans' connection back to nature, especially in urban areas where this connection has been dramatically lost over the last centuries as it was painfully, but perfectly showcased during the COVID-19 pandemic.

But the story of urban biodiversity and nature-based solutions (NbS) is not only about recreation as halting biodiversity loss is not about protecting cute animals. Biodiversity loss threatens the life support on our planet, and it is a leading threat to humanity's safe. In the shadow of inevitable climate change and rapid urbanism, our connection to nature, deeply rooted in cultural values, attitudes, and norms, plays a key role when we intend to increase the size and quality of urban green spaces as well as natural habitats and protected areas in and outside of the cities - in line with the EU Biodiversity Strategy for 2030 and the historic Nature Restoration Law.

Due to our impact on the planet, we are facing never seen challenges. We have the above, rightfully criticised, but still revolutionary regulation, and we have solutions in our hands. Nature not only provides unbelievable benefits for our physical and mental health, but cheap and aesthetic solutions to develop our cities and reshape our landscapes, to make the long-desired paradigm shift in all areas of economic life.

It is always better to talk about solutions - and the issue is that according to the International Union for Conservation of Nature (IUCN), one-third of climate mitigation needed to meet the goals of the Paris Agreement can be provided by NbS, while the World Economic Forum states (BiodiverCities by 2030) that NbS are 50% cheaper in urban infrastructure than grey infrastructure, yet they received just 0.3% of overall spending on urban infrastructure in 2021. So, what are we waiting for? We need to raise awareness of all actors to the effectiveness of NbS and lead by example.

There are several definitions concerning NbS. The most useful one comes from the initiator organisation (IUCN): nature-based solutions "*are actions to protect, sustainably manage, and restore natural and modified ecosystems that address societal challenges effectively and adaptively, simultaneously benefiting people and nature*". Conservationists have been restoring habitats for decades, but now, in the shadow of the ecological crisis, there is a huge emphasis on the other side of the coin, the unbelievable ecosystem services natural and modified ecosystems can provide (besides providing habitats for species) and what we have forgotten. What is good for nature, is good for society and the economy.

Since most parts of Europe are facing increased frequency of meteorological drought, heavy winter (and partly summer) precipitation, and many parts of the old continent suffer extreme heatwaves shortly as well, we need to restore our forests, grasslands, wetlands and other habitats, we need a massive spread and use of NbS in cities as well as in landscapes, we need to install water retention measures in all territorial levels and we need to improve the quality of our urban green infrastructure – and we need to halt biodiversity loss.

The problem is that because we have dramatically lost our connection with nature, we still prefer unsustainable and biologically poor English mown, we do not know what the difference is between a primeval forest and a tree plantation, we do not understand the importance of wetlands and peatlands in terms of carbon sequestration, and we do not realise how forests create rain. Therefore we need to reestablish our connection

with nature, especially in Europe, since here 81% of EU protected habitats and 63% of EU protected species are in “poor” or “bad” conservation status (2020 ‘State of Nature in the EU’ report). As the EU Biodiversity Strategy 2030 says: “*Europe’s protected habitats and species continue to decline at an alarming rate because the multiple pressures they face are simply too great to enable their recovery”. In line with the global goals, the strategy aims to “stop and reverse this trend by promoting the systematic integration of healthy ecosystems, green infrastructure, and NbS into all forms of urban planning*”. The strategy also emphasises that 1€ invested into habitat restoration generates 8–38 € profit in Europe.

Cities have a special role in this story. On the one hand, they offer unique opportunities for learning and education about a resilient and sustainable future and have a large potential to boost innovations and governance tools, but on the other hand, billions of urban dwellers are at high or extreme risk of environmental disaster too.

Efficient, cheap, aesthetic, and good for nature - so, what are we waiting for in connection with nature-based solutions?

What does beautiful mean for us (urban wildflower meadow, Veszprém)?

1.2. Understanding ecosystem services: “egosystems”, ecosystems and the benefits of nature-based solutions

According to IUCN, the most important impact regarding climate change mitigation through NbS could be achieved by using regenerative agricultural methods (agriculture is the number one driver of biodiversity loss). From this aspect the approval of the Nature Restoration Law is a “bittersweet victory” (BirdLife International), since the “*European Parliament deleted Article 9 on the restoration of agricultural ecosystems, including the target to rewet 30% of the EU’s drained peatlands by 2030*”. To understand the volume of this question: peatlands cover only 3% of the world’s land area, but store twice as much carbon as all the trees on Earth combined!

Applying NbS in all fields of life, but especially in cities is also a great opportunity to raise awareness of ecosystem services, those direct or indirect goods and services that are provided by the natural or modified ecosystems. While scientists and environmentalists have discussed ecosystem services implicitly for decades, the Millennium Ecosystem Assessment in the early 2000s popularized this concept. According to this, these services can be grouped into the following four categories (examples linked to forests):

- Provisioning services: providing timber, mushrooms, fruits, and honey.
- Supporting services: they form the basis of all other services (nutrient cycles, soil development, photosynthesis, water circle).
- Regulating services: evaporation, absorption of pollution, cleaning water, carbon sequestration.
- Cultural: recreation, landscape, environmental education, research, art.

Do not forget: the life and work of billions of people directly depend on nature. Just a few examples to highlight the importance of nature, biodiversity, and ecosystem services: 1/3 of our medicine is still from nature, while this rate is 60-80% in the case of antibiotics and medicine tackling cancers. Most likely the sentence is true: the cancer medicine is somewhere in the rainforest we are still destroying. We all would like to give food to our children from places where rich biodiversity exists. Biodiversity is about pollination, clothes (50% still from cotton), air quality, climate adaptation, oxygen, and many others.

In line with the New European Bauhaus, bringing together sustainability and community aspects with aesthetics, when planning NbS it is also time to ask ourselves: what beauty is? A wildflower meadow in our hardly used garden or a perfectly mown lawn (“egosystem”)? An ancient, primeval, but chaotic forest or the “cathedral” of beech forest (plantation)? A channelised stream flowing between concrete banks, or a more natural, restored stream?

The categorisation of nature-based solutions typically focuses on either the ecosystem/setting in which the NbS is implemented, or on the type of NbS intervention/action. Based on the review of existing practices (Dóra Almássy), the below chart provides a categorisation for the ecosystem/setting in which NbS might be implemented

Blue areas (inland)	Lakes, ponds, rivers, streams, canals, deltas, wetlands, bogs, fens, marshes, and peatlands (restored)
Coastal and marine ecosystems	Coastlines, mangroves, sand dunes, seagrass, coral reefs
Water management solutions	Rain gardens, swales and filter strips, sustainable urban drainage systems
Agricultural and food production areas	Horticulture, pasture, community gardens and allotments, aquatic structures, agroforestry
Forests and urban parks	Forested areas, urban parks, semi-natural forests, sustainable forestry methods, green belts and corridors
Shrub- and grasslands	Shrubs, grasslands, wildflower meadows, urban lawns
Grey infrastructures with green features	Alley and street greens, railroad bank and track greens, riverbank greens, green squares and parking lots, green playgrounds and school grounds
Nature on and in buildings	Green roofs, green facades, balcony greens, green walls and ceilings

Another way of categorising NbS is whether they primarily contribute to climate change mitigation or adaptation. Since in urban areas climate adaptation features of NbS are more relevant, let's see some examples related to ecosystem services of nature-based solutions in urban areas:

- Urban trees as cost-efficient solutions provide lots of services for urban dwellers. Most importantly, while absorbing carbon dioxide, a hectare of mature trees can provide enough oxygen for ca. 30-35 people yearly.
- Trees play a vital role in reducing the impacts of pollution generated by common human activities. The physical processes of plants that help improve air quality include intercepting particulate matter on leaf surfaces and absorbing pollutants (ozone, sulfur dioxide, nitrogen dioxide, carbon monoxide, and particulate matter less than 10 microns). This can be valued at millions of € in a bigger city per year!
- Trees cool the city by up to 3-5 °C by shading our homes and streets, mitigating the urban heat island effect, and releasing water vapour into the air through their leaves. This can translate to reduced energy costs for homeowners. Trees placed strategically around a single-family home can cut summer air conditioning needs by up to 50 per cent. By reducing the energy demand for cooling our houses, we reduce carbon dioxide and other pollution emissions from power plants.
- Urban tree canopies are a nature-based approach to ever-worsening floods. Tree canopies increase the surface area where stormwater falls, decreasing the amount of runoff from reaching the ground. Root systems serve as water catchment areas that promote infiltration.
- But it is not only about urban trees. Urban wildflower meadows and hedges provide similar services, perhaps with less volume.
- The summer cooling effect of a green wall is also amazing. Based on the calculation regarding Vienna's famous green wall (headquarters of the Municipal Department for Waste Management) this effect is equal to 8 hours of operation of 80 air conditioners (3000 W), while during the winter it mitigates the heat waste of the building with 50%.
- Green roofs might retain 70-90% of the rainwater, while they provide habitats for many pollinators. Green roofs are also efficient in the insulation of buildings.
- NbS can efficiently minimise the impact of stormwater through the implementation of sustainable urban drainage infrastructure, and renaturalisation of rivers and other water bodies.

» Regarding socio-economic challenges, analysis of practice to date has proven that effective realisation of NbS in and around communities has the potential to provide citizens with health and well-being benefits.

According to the definition of nature-based solutions, besides ecosystem services, they also provide solutions for societal challenges. These can be categorised as follows (based on the above-mentioned article):

Health and Well-being	The creation or enhancement of forests and urban parks can improve physical and mental health through improved air quality and the provision of opportunities for recreation and physical exercise.
	The creation of community gardens can provide access to healthy food and opportunities for recreation.
	Installation of green roofs or walls can improve working conditions in office buildings and schools and support individuals' recovery in health institutions.
Social Cohesion and Justice	Encouragement of sustainable agriculture practices can improve local food production and communal self-reliance.
	Tree planting, riverbank greening, and community gardening can improve the sense of community and identity.
	Urban green areas can provide opportunities for social interaction and improve social cohesion through the involvement of marginalised groups.
Inclusive and Effective Governance	Involvement of local communities in the creation/management of green or blue areas can increase ownership and ensure long-term maintenance of the NbS.
	Introduction of market mechanisms (e.g. water funds or forest bonds) can encourage improved management and use of natural resources.
Cultural and Natural Heritage Preservation	Promotion of traditional conservation or agricultural practices can encourage the safeguarding or restoration of natural ecosystems.
	The connection of historic areas to nature can facilitate their reinterpretation as community centres, recreational spaces, and tourist destinations.

What does nature provide us in a city (urban renewal, Vratsa)?

1.3. Nature-based solutions in cities: from disaster risk management to unlocked potentials

In urban areas, the story of nature-based solutions is primarily about climate adaptation and awareness raising. These should include measures to create further biodiverse and accessible spaces for urban dwellers, improve connections between green and blue spaces, and limit biodiversity harmful practices. No doubt, we need more green rooftops, green walls, better-managed urban trees, and urban wildflower meadows (instead of properly mown lawns), we need water retention methods and biodiversity-driven park maintenance. We also need these measures as cities offer unique opportunities for learning and education about a resilient and sustainable future and have a large potential to boost innovations and governance tools. Building on the significant awareness-raising and innovation potential of cities, they also need to nurture citizens and communities to understand, valorise and measure biodiversity and related ecosystem services, enabling them to plan powerful nature-based solutions and foster pro-environmental behaviours.

Green spaces still very often lose in the competition for land as the share of the population living in urban areas continues to rise (cities will account for 80% of global GDP and host 75% of the world's population by 2050). Therefore, successful management of urban biodiversity and ecosystem services must be based on multi-scale, multi-sectoral, and multi-stakeholder involvement. Nature-based solutions provide a realistic vision for cities where the built environment, social structure, and natural capital can co-exist in harmony.

Less known that 44% of global GDP in cities is estimated to be at risk of disruption from nature loss, according to the World Economic Forum's 2022 Global Risks Report. "*More than 1.4 billion people living in the world's largest urban centres are at high or extreme risk of environmental disaster. Flooding has been identified as the most common natural risk across more than 1,600 cities, each with over 300,000 inhabitants. Accounting for all potential disruptions to economic activities, 44% of GDP in cities is currently estimated to be at risk from biodiversity and nature loss*."

While nature conservationists raise their voices to protect species and ecologists talk about ecosystem services, economists should talk about how business as usual is no longer an option, cities must act now to rebalance their relationship with nature. Expanding nature in the built environment creates significant economic and social value. By shifting investment to NbS, cities can build a climate-resilient environment while lessening their impact on biodiversity. In line with the World Economic Forum's report, biodiverse cities can restore balance between cities and nature by:

- Increasing nature in their infrastructure and built environment.
- Improving urban governance models to support nature-based solutions for cities' challenges.
- Nurturing nature-positive values in citizens for health and wellbeing.
- Forging positive links between urban and rural settings and helping to safeguard global biodiversity.
- Prioritizing bio-circular economy and bio-inspired innovations for economic competitiveness.

Despite the clear benefits of using nature-based solutions in cities, climate action in cities remains insufficient. As the BiodiverCities by 2030 reports says: "*The 2021 State of Cities Climate Finance Report, from the Cities Climate Finance Leadership Alliance, the Climate Policy Initiative and the World Bank, estimates that a total of $384 billion was invested in urban climate finance globally in 2017 and 2018—an amount far below the*

estimated $5 trillion needed. This gulf between targets and actual progress in limiting carbon emissions is leading to devastating climatic changes, as underscored by the IPCC at COP26".

There are plenty of nature-based solutions city planners can work with and online inventories are helping this work. However, applying nature-based solutions in municipalities might need new expertise (nature conservationists, ecologists, landscape architects) as the next chapter highlights.

- NetworkNature is a resource for the nature-based solutions community, creating opportunities for local, regional, and international cooperation to maximise the impact and spread of nature-based solutions. The project was funded by the European Commission under the Horizon 2020 programme, while its continuation, the NetworkNature+, funded by the Horizon Europe programme, is just starting up. Six NbS hubs have been established (Hungarian, Nordic, Portuguese, Polish, Ukrainian and Italian hubs have been created so far, and BiodiverCity partner Siena is one of the initiators of the Italian Hub).
- Oppla is the EU Repository of nature-based solutions. It provides a knowledge marketplace, where the latest thinking on natural capital, ecosystem services, and nature-based solutions is brought together.
- Urban Green UP H2020 project published a comprehensive catalogue of nature-based solutions that include all the possible characteristics (technical, economic, environmental, and social) of each one of them.
- The Urban Nature Atlas, developed as part of the NATURVATION project, is the most comprehensive database of nature-based solutions for cities created to date. The Urban Nature Atlas has been produced as the result of a systematic survey of nature-based solutions interventions in 100 European cities and provides the basis for the analysis of socio-economic and innovation patterns associated with urban nature-based solutions in Europe. Furthermore, the Urban Nature Atlas is going global and now includes content from outside of Europe.

Irrigation pond in Guimarães

1.4. Let's have a nature conservationist next to the chief architects! Why biodiversity and especially urban biodiversity is so important?

We want nature back in cities and landscapes, but do we know what nature is and how to get it back? We all know that biodiversity supports everything in nature essential to survive: food, clean water, medicine, clothes, climate and economic growth. According to the World Bank, over half of the global GDP is dependent on nature directly. Biodiversity is the incredible variety of organisms that work together in ecosystems, to maintain balance and support life. Ecosystems are biological communities of interacting organisms and their physical environment. The key word here is habitat, where species are highly interconnected. It is not completely possible to model changes in ecosystems due to their complexity, but ecosystems also have a high potential for resilience.

If we want to get nature back, restore habitats and halt biodiversity loss, we must know what nature is. It seems easy, but it is worth learning a more scientific expression. According to Wikipedia, the shifting baseline syndrome is the "*gradual change in the accepted norms for the condition of the natural environment due to a lack of human experience, memory and/or knowledge of its past condition*". If we lose (have already lost) our knowledge about the original conditions of nature, how can we restore it? Just ask a simple question from yourself as a European: have you been in an untouched (primeval) forest, a real wilderness? Do you know what is the difference between a "plantation" and a primeval forest and their relevant ecosystem services? Or another example: have you ever wondered that why big herbivores live mainly in Africa? Do you know that only a few thousand years ago 50 big (over tons) herbivores used to live on Earth and now only 9 still exist? Do you know that scientists named 1,5 million species, but they assume that ca. 10 million species exist?

Biodiversity loss is a decrease in biodiversity within a species, an ecosystem, a given geographic area, or Earth as a whole. It is well known that due to many humankind-driven threads, biodiversity loss is dramatic. According to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) Global Assessment Report, up to one million species are threatened with extinction, many within decades.

Decision-makers have finally understood that the different elements of ecological crisis, as the most pressing issue facing humanity today, have to be tackled together if we are to advance the Sustainable Development Goals and secure a viable future on this planet. United Nations calls it the triple planetary crisis, having pollution as the third factor besides climate change and biodiversity loss, but actually, degradation of soil is also a global threat. Having a focus on biodiversity, let's see the most significant drivers of biodiversity loss:

1. Changes in land and sea use (e.g. deforestation, intensive agriculture, urbanisation). Reconsidering the way people grow and consume food is one way of reducing the pressure on ecosystems, but NbS might play a crucial role here (e.g. use of continuous cover forestry instead of clearcutting and other rotational forest management systems, use of agroforestry and regenerative methods in the agriculture), while cities have direct responsibility with regards changing urban sprawl for example.

2. Climate change: as we all know, greenhouse gas emissions have doubled since 1980, raising average global temperatures by at least 0.7 °C, affecting species and ecosystems around the world, particularly the most vulnerable ecosystems such as coral reefs, mountains and polar ecosystems. Cities as hotspots of emissions have a direct role in promoting pro-environmental behaviours and minimising footprints.

3. Pollution is also a major driver of biodiversity and ecosystem change with especially devastating direct effects on freshwater and marine habitats. The most well-known phenomena are marine plastic pollution and micro-plastic pollution, but cities as habitats might have a significant role in protecting pollinators since their populations and numbers are decreasing in most parts of Europe due to the persistent usage of highly dangerous, non-selective insecticides.

4. Direct exploitation of natural resources: the IPBES report on the sustainable use of wild species reveals that the unsustainable use of plants and animals is not just threatening the survival of one million species around the world but the livelihoods of billions of people who rely on wild species for food, fuel and income.

5. Invasive alien species (IAS - species entering and establishing themselves in the environment outside their natural habitat). IAS are direct drivers of biodiversity loss by having devastating impacts on native species and causing the decline or even extinction of them. According to scientists, IAS have contributed to nearly 40 per cent of all animal extinctions since the 17th century, where the cause is known.

Finally, a few words about urban biodiversity as a category. It refers to the variety of living organisms as well as the multiplicity of habitats in and around dense human settlements. However, the following sub-topics make the urban aspects important regarding biodiversity: awareness-raising potential, mitigating the heat-island effects, renewal of the built environment, mitigating disaster risks, urban greening, and mitigating pollution (incl. invasive species).

Experimenting with a new method to control invasive alien species in Guimarães

1.5. From biodiversity-inclusive urban planning to blue and green corridors - what is in the policy arena?

Governments globally deal with climate change and biodiversity through two different international agreements – the UN Framework Convention on Climate Change (UNFCCC) and the UN Convention on Biological Diversity (CBD), both established at the 1992 Rio Earth Summit. Similar to the historic Paris Agreement made in 2015 under the UNFCCC, parties to the Biodiversity Convention in December 2022 adopted an agreement for nature, known as the Kunming-Montreal Global Biodiversity Framework, including four goals and 23 targets to halt and reverse nature loss by 2030. The European Commission signed the Kunming-Montreal agreement. With over 80% of European habitats being deteriorated and 38% of Europe's 546 bird species being of conservation concern, it is crystal clear: nature is not doing well in Europe and action is urgently needed to bring it back and fight the climate crises.

Target 12. of the Kunming-Montreal Global Biodiversity Framework refers to urban green areas (Enhance Green Spaces and Urban Planning for Human Well-Being and Biodiversity) as follows: "*significantly increase the area and quality and connectivity of, access to, and benefits from green and blue spaces in urban and densely populated areas sustainably, by mainstreaming the conservation and sustainable use of biodiversity, and ensure biodiversity-inclusive urban planning, enhancing native biodiversity, ecological connectivity and integrity, and improving human health and well-being and connection to nature and contributing to inclusive and sustainable urbanization and the provision of ecosystem functions and services*". The framework (target 19) also "encourages the private sector to invest in biodiversity" utilising, amongst others biodiversity credits. This novel approach can be a strong inspiration for the BiodiverCity network to think about city-wide compensation schemes for example, similar to the Biodiversity Net Gain legislation in England (a universal requirement introduced to increase biodiversity by 10% in every development project) or establishing a City Biodiversity Fund.

With its overarching target to restore 20% of land, river, and sea areas by 2030, and other ambitious targets, the EU Nature Restoration Law and the EU Biodiversity Strategy for 2030, as parts of the European Green Deal foster cities and member states to meet these ambitious global goals. However, regarding urban areas, the draft of the Biodiversity Strategy consisted of an important target: no net loss of green urban space by 2030, and an increase in the total area covered by green urban space by 2040 and 2050. The approved strategy and law cancelled these indicators and states "only" that the increase of urban green space should apply on the national level: "*Member States shall ensure that there is no net loss in the total national area of urban green space, and of urban tree canopy cover in urban ecosystem areas*".

The strategy also promotes the systematic integration of healthy ecosystems, green infrastructure, and nature-based solutions into all forms of urban planning. To do that, and reward community action, "*the Commission has called (will call) on all European cities of 20,000 inhabitants or more to develop ambitious Urban Greening Plans*" (by the end of 2021 – as it was planned, but the guidance and the toolkit linked to those plans are not published yet at the end of 2023).

Due to its focus, the BiodiverCity network is deeply embedded in the European urban policy context 2021-2027, contributing to several policy objectives of the EU 2021-2027 Cohesion Policy as well as to the Green Infrastructure Strategy, the Climate Adaptation Strategy, a new Thematic Partnership of the Urban Agenda for the European Union (Greening Cities – BiodiverCity's partner 's-Hertogenbosch provides a direct link to it) and it is in line with the New Leipzig Charter.

Strengthening the efforts in protecting and preserving urban nature, but also promoting climate change adaptation and resilience, policy objective 2 (‘a greener, low-carbon transitioning towards a net zero carbon economy and resilient Europe’) is the most direct link for BiodiverCity. Policy objective 4 (‘a more social and inclusive Europe’) is also of particular importance for the BiodiverCity network, due to the close and widely recognized link between biodiversity and citizens’ physical and mental health, social inclusion and cohesion. Additionally, the BiodiverCity network promotes skills and training for the green transition and promotes pro-environmental behaviour. Last, but not least policy objective 5 (‘Europe closer to citizens’) is also relevant because the network emphasises community-based approaches concerning green and blue infrastructure.

Following the goal of expanding the number of green and biologically diverse, accessible and inclusive, beautiful and recreational areas, the network is also harmonious with the core values of New European Bauhaus.

Beautiful might mean different things in different contexts
(university park, Dunaújváros)

1.6. Park 2.0 – The future of urban green spaces (through city examples)

In line with the European Green Deal and the EU Biodiversity Strategy for 2030, the European Commission emphasizes strategic planning of quality urban green and blue infrastructure at different spatial scales (from neighbourhood to city-wide), promoting ecosystem services and protection of biodiversity, and developing interconnected and multifunctional networks of blue and green spaces that potentially provide a wide range of environmental, social and economic benefits and simultaneously enhance the climate resilience of cities.

According to the literature urban green infrastructure includes different types of blue-green spaces, including single green elements such as street trees and green roofs, but also forests, agricultural land, public parks, private gardens, and even ponds and streams. These play a crucial role in enhancing climate adaptation and mitigation capacities and reducing negative impacts of climate change hazards such as heatwaves, flooding and drought in cities. In line with the EU Biodiversity Strategy for 2030, many European cities are transforming their urban parks and other green areas to climate-proof areas, and NbS are systematically integrated into urban planning. Ecological, biodiversity-driven and pollinator-friendly park maintenance and natural water retention (as NbS) play a crucial role here.

By using EU funds via the European Urban Initiative Turku is to establish Europe's first biodiversity park in the Skanssi neighbourhood. The Skanssi Biodiversity Park will develop and test the fostering of biodiversity in urban conditions through active measures. A biodiversity park is a new approach to responding to biodiversity loss, fostering rare species and increasing biodiversity in urban green areas. A biodiversity park differs from traditional parks or nature conservation areas. Nature is not only conserved or protected here but also actively increased. The biodiversity park fosters nature in different ways in different places, and the cultural significance of nature is also recognised. The park will become an attractive area for the city's residents: an area where they can learn about nature and where they are involved in nature management measures.

Also financed by the European Urban Initiative Latina in Italy is developing the first urban 'Productive Parks' devoted to research, development and self-production of NbS to tackle the identified environmental, socio-economic and governance challenges.

Curridabat (Costa Rica) created the "Ciudad Dulce" (Sweet City) concept, a series of Urban Natural Parks, a new protected area category issued in February 2021. "*Despite having significant environment protection afforded for nine other protected area categories (Costa Rica is a global biodiversity hotspot), urban forests have not historically been protected by the country's National System of Conservation Areas. Driven by Curridabat's municipality, this development model is based on five dimensions: biodiversity, habitat, infrastructure, coexistence and productivity. Curridabat promotes green spaces as places where all forms of life can co-exist and productivity is constantly ensured. Pollinators, diverse plant species and people thrive in urban gardens and parks, producing fruits and vegetables, and promoting soil regeneration, leisure, tourism and cleaner air. New green areas are also being created to meet the needs of vulnerable plant and animal species through improved connectivity and habitat restoration*". This biophilic approach has earned several awards, including "Best City Plan" from the Congress of New Urbanism (CNU), and the "Wellbeing Cities Award" from New Cities (BiodiverCities, World Economic Forum).

Besides the above complex approaches, many cities are experimenting with some key components of this approach. Lots of cities are interested in bee-friendly or pollinator-friendly initiatives for example, and using this approach often runs together with climate-adaptive grassland management (see the partner profile of

Veszprém). These initiatives are successful, but due to cultural attitudes, cities have to carefully prepare them. The Vadvirágos Budapest (creation of ecological green areas in public parks) programme for example reached a significant increase of new plant species and pollinators in urban areas within only two years after the start, however, there were lots of cultural and even political criticism in the beginning of the initiative.

Rewilding is also an existing approach. The project "Städte wagen Wildnis" (Cities Dare Wilderness) is a concerted effort to provide opportunities for natural succession processes to take place in various urban green spaces aimed at improving species and habitat diversity as well as the quality of life for the inhabitants of the three German cities: Hannover, Frankfurt am Main and Dessau-Roßlau.

Despite the clear benefits of using nature-based solutions in cities, climate action in cities remains insufficient. It would be a clear and realistic added value of the BiodiverCity network to plan demonstration areas, or “landscape laboratories” in cities to showcase different nature-based solutions and explain their ecosystem services (natural water retention, benefits of wetlands and peatlands, use of continuous cover forestry, use of agroforestry and regenerative methods in agriculture, highlight the importance of native tree species, ecosystem services of grasslands, promoting soil biodiversity functions, etc).

A public park, which can function as a water retention basin during heavy rainfalls (Augustenborg, Malmö)

1.7. Blue is the new green – why the sponge city concept is so important?

The sponge city concept can be perfectly explained based on the case of Berlin, where a Rainwater Agency coordinates blue aspects of urban development and where complete residential areas (e.g. Rummelsburger Bucht) are born without having grey infrastructure (channelisation) for rainwater. How is it possible?

Regulation and integrated urban development play a crucial role in the case of Berlin. In Germany, there is a separate taxing system for the collection of rainwater and sewage water. In Berlin, the volume of a local tax related to rainwater collection is a key driver of building green rooftops, green walls, rain gardens, and other types of sustainable urban drainage systems (SUD) and using permeable surfaces instead of building grey infrastructure to channelise rainwater. Paying attention to climate adaptation in due time led the municipality to rethink values and customs decades ago. This resulted for example in the fact that it is now possible in Berlin to lead rainwater away from roads up to 10.000 cars per day to neighbouring raingardens located next to the roads. However, a core question remains open in Berlin too: how to establish urban water retention measures in existing, especially historic urban fabric?

Related to this question, one famous example is Ecocity Augustenborg, which won the UN's World Habitat Award in 2010 for its urban sustainability and was highlighted by the URBACT Summer University as well. This neighbourhood became a testbed of Malmö city in 2001 because heavy rainfalls caused serious damages (in 2014 one of them caused 60 million € damage) and this area with its ca. 1800 apartments is 97% owned by the municipality. This is an important factor enabling the municipality to prepare the district's unique open stormwater management and green infrastructure system, strongly based on community engagement. Now 6 km of local canals, green rooftops, raingardens and 11 ponds collect, delay or store rainwater, while the communal park becomes a water irrigation basin in times of heavy rainfalls, and even the greywater of washing machines is purified in natural ponds too. In addition, trees have been “restored”, having more space and air at their roots, and on the rooftop of the communal utility company, one of the biggest green rooftops operates as an experimental place of different techniques (Botanical Roof Garden).

In the last two decades, Copenhagen has also experienced major rainfall events. The largest, in 2011, caused damage totalling more than 6 billion DKK (not including direct costs of repairing municipal infrastructure or indirect costs such as loss of earnings, loss of business operation, rising insurance premiums or companies choosing to move away from the city). The Cloudburst Management Plan (2012) is one of the greatest European examples of managing heavy rainfalls in the city. As a part of it, Copenhagen has been working on transforming its green areas into climate-proof green spaces, highlighted as one of the key directions of future architecture by the Copenhagen in Common exhibition at the Danish Architecture Centre.

Sankt Kjelds Plads for example, as a new green area opened in 2019 can handle large volumes of rainwater by a network of raingardens and SUDs, while 9000 m2 asphalt has been replaced with 586 trees, perennials and grassland. This project was the first among the approximately 300 projects to protect the city against flash floods in the future. Enghaveparken, built in 1928, was redesigned in 2014 and the public park now can retain 22.600 cubic metres of rainwater. Regarding the question of existing urban fabric, it is worth mentioning Tåsinge Square, setting the standards in Denmark, which was transformed from a plain grass area and parking spaces to a green oasis. Excellent example of the integrative aspect of green infrastructure planning, but it is important to mention that while green areas have increased across all of Denmark in the last decade, they have only declined in Copenhagen, despite the above successful projects.

One thing is for sure: climate change is changing precipitation patterns across Europe, and due to urbanisation, there are more and more paved surfaces - thus rainwater retention will be an important question in most of the old continent. The basic issue is that old pipelines (in bigger European cities there are typically mixed sewage systems, meaning that the same pipeline absorbs rainwater and sewage water) simply cannot absorb the large volume of rainwater of a big thunderstorm. However, nature-based and other water retention solutions (e.g. using barrels by residents) usually cannot absorb all rainwater at heavy rainfall, traditional, grey solutions, smart technologies and residential programs are also needed.

Leading cities made urban rainwater collection an integral part of urban planning and enabled different professionals to sit at the same table to solve this challenge. Each year, rainstorms and flooding events are increasing in both frequency and severity and Europeans have been witnessing such dramatic examples of extreme weather events with very large social and economic impacts, including high mortality. According to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (2022) - Impacts, Adaptation, and Vulnerability, changes in extreme short-duration rainfall events may have significant impacts on urban drainage systems and pluvial flooding. Results so far indicate more problems with sewer sub-charging, sewer flooding, and more frequent combined sewer overflow spills. With municipal water utilities already strained by decades of underinvestment and aging infrastructure, they now face a whole new spectrum of challenges, due to climate change, growing urban populations and legacy drainage and sewer systems which are inadequate for handling the rainfall levels we see today. Yet many communities are still failing to take these factors into account when planning for the future, and government policies are not always being crafted with these risks in mind. The report also emphasizes some pioneer city interventions (e.g. Philadelphia) that suggest supporting private stormwater infrastructure tools to reduce stormwater at a much lower cost than increasing stormwater storage capacity interventions.

Since the BiodiverCity partnership covers rural areas as well (especially in the case of Bulgaria and Slovenia), it is important to briefly highlight natural water retention methods hundreds of smaller settlements are working on now. In Hungary Püspökszilágy is a model for the adaptation of hilly settlements exposed to the risks of heavy rainfall events. Püspökszilágy built 7 log dams in the upper watershed (to slow down water and stop sediment) and a water retention basin in the lower watershed to collect water in the landscape, implementing an integrated natural water retention system (NWRM). This demonstrates how upland municipalities can effectively respond to climate change vulnerability through integrated, basin-scale, cheap NWRM implementation.

The big “blue” question: how to retain rainwater in dense urban fabric (photo: István Kissimon)?

1.8. How much does a tree cost? – measure and valorise urban biodiversity

Mapping and Assessment of Ecosystems and their Services (MAES) allows an understanding of the causal chain of connections from human actions to impacts on the environment. This method consists of the following stages:

- Developing a suitable typology (classification) of broad ecosystem types to be used as the basis of the analysis, following the MAES approach and based on EUNIS (European Nature Information System) habitat classes and Corine (Coordination of Information on the Environment) land cover data.
- Mapping the physical extent of these ecosystems across Europe.
- Assessing the pressures acting on ecosystems, classified into five main groups — habitat change, climate change, overexploitation of resources, invasive alien species, and pollution or nutrient enrichment.
- Assessing the current condition of ecosystems using data from the Habitats Directive, the Birds Directive, the Water Framework Directive, the Marine Strategy Framework Directive (EC, 2008a) and other sources (e.g. soil quality).
- Investigating how to use available information on the relationship between pressures and biodiversity to map potential impacts of individual pressures on ecosystems, and exploring methods of weighting and summing multiple pressures onto a single map to assess their combined effect on biodiversity, environmental quality and ecosystem service delivery.

EMAS does not deal with urban areas as such. The City Biodiversity Index prepared by the Secretariat of the Convention on Biological Diversity thus can be an interesting tool for cities planning to measure urban biodiversity and the efforts to protect it. This is a self-assessment tool for cities to benchmark and monitor the progress of their biodiversity conservation efforts against their baselines. It comprises two parts: first, the "Profile of the City" provides background information on the city; and second, 28 indicators that measure native biodiversity, ecosystem services and governance and management of biodiversity in the city. Each indicator is assigned a scoring range between zero and four points, with a maximum score of 112 points. "*Cities will have to conduct a baseline scoring in the first application of the index and conduct subsequent application every 3-5 years to allow sufficient time between applications for the results of biodiversity conservation efforts to materialise*".

Cities use lots of methods to detect and evaluate urban green spaces (for instance to create tree inventories). These can be supported by GIS (e.g. NDVI - normalized difference vegetation index to measure the quantity of existing greenery; surface temperature to identify load areas and support areas in Urban Zoning Plans; green space supply to evaluate recreational potential; connectivity to identify the lack of network elements or LAI – leaf area index to measure vertical diversity) or field surveys (to measure age diversity of plants, diversity of taxa, validating the data collected by GIS).

In an URBACT network, more emphasis will be put on community-based approaches like community valorisation of urban green spaces. Scientific measurement can be and shall be supported by engagement tools. The goal is to raise awareness of local inhabitants, engage them to do things differently and nurture them towards a more pro-environmental behaviour. Green space stimulates identity and community spirit efficiently, but we need to raise awareness as people care and value public spaces better when they have knowledge, emotional connection and responsibility. Ownership of public places creates responsible citizens and responsible citizens take care of their environment. Taking care of our environment transforms cities.

Three simple, but very efficient actions can be proposed to each city working on urban biodiversity.

1. Community mapping can be a powerful tool to be used, especially as monetising the value of nature is possible, but it cannot completely describe the complex value map of local people, the holistic values of nature as such. For example, the action research made by the Environmental Social Science Research Group (ESSRG) in Western Hungary about the value of forests is a good example. Between 2001-2002 and 2010-2011, in-depth interviews were made with local forest managers in the frame of local walks, asking for opinions on the spot about the correct and incorrect ways of using the forest. Solution-oriented focus groups were organised, with deliberative techniques and snowball stakeholder mapping. Participants identified values such as:

- *"The forest traditionally acted as a bank, and we do not often go to the bank - only if you have to pay something unexpected or a bigger investment. One generation cannot destroy the bank.."*
- *"Traditionally forest was the gold reserve of the family. They cut more trees only in case of emergency or hard economic situation".*
- *„Actually, the forest is better than saved money or gold, as it does not lose its value, even if it is increasing year by year".*

Market value (price) is only one of many values linked to forests (safety, heritage, recreation, possibility of constant use), the value map showed multi-dimensional values and as a result of the action research local forest managers sit down to talk about how to do things differently.

2. However, monetarising the value of nature can be a strong awareness-raising tool, especially in the city, where there is a huge competition for land. Tree wood value calculation software can be found in many countries, some of them, such as the Hungarian application based on the benefits of the trees, i.e. how much shade the tree provides, how much dust it binds, what is the binding of CO2, what is its evaporation rate. Since all this happens in the tree's canopy, it is based on the canopy unit. The HUF-denominated value means how much money would have to be spent in a nursery if we wanted to buy a tree of a given species, age, and size in a nursery, or more precisely, how much leaf area of a small tree would replace the leaf area of the given individual. It seems shocking for residents to get to know how much a tree in front of their house costs...

3. Using citizen science can be also powerful and the organisation of local bioblitz events have high dissemination potential as well. Within the City Nature Challenge cities around the world collaborate to share observations of nature. Started in 2016 as a competition between Los Angeles and San Francisco, the City Nature Challenge has grown into an international event, motivating people around the world to find and document wildlife in their cities. "*Run by the Community Science teams at the California Academy of Sciences and the Natural History Museum of Los Angeles County, the City Nature Challenge is an annual four-day global bioblitz at the end of April, where cities are in a collaboration-meets-friendly-competition to see what can be accomplished when we all work toward a common goal*".

1.9. Engagement of communities in urban green spaces to boost pro-environmental behaviour

Green space stimulates identity and community spirit efficiently, they are great tools to mobilise citizens. This is important as cities can address the impacts of an ecological crisis 1. by changing their physical infrastructures and service systems and 2. as the most local forms of governance, by changing the attitudes of their residents. New, biodiversity-driven green spaces might be advocates of the mindset change required.

Many cities around the world are experimenting with how to communicate about the benefits of trees. These campaigns vary from simple actions such as placing meaningful messages on trees about their benefits incl. monetising them, to more complex projects. Cities often use their tree registries to highlight the ecosystem services urban trees provide. They create a dedicated website or app not only to describe the species, genus and family of the given tree but to share myths, cultural and historical values as well as to highlight benefits, for example yearly (e.g. oxygen produces, carbon dioxide reduced, stormwater intercepted, energy conserved, air pollutants removed, total value of the tree).

Melbourne is a global frontrunner regarding green infrastructure development and climate adaptation. The city intends to increase canopy cover from 22 per cent to 40 per cent by 2040. Melbourne is divided into ten districts and each of them has a ten-year planting plan, which will increase canopy cover and make urban forests more diverse by keeping the 5-10-20 rules (no more than five per cent of one tree species, no more than ten per cent of one genus, and no more than 20 per cent of any one family). At the beginning of this process, the Urban Forest and Ecology Team created an interactive map that allows locals to find out about any tree in the council area. Besides providing information about genus and age, each tree has its own ID number and email address. The purpose of the email was for residents to inform the council of any trees that needed attention, however, since its launch in 2013, people have used the emails to send love letters and fan mail instead. Some other potential communication/engagement tools BiodiverCity partners can test and plan within the project:

- Based on the example of Siena (within the network they intend to make a biodiversity menu): make a biodiversity menu in a restaurant providing sustainable cuisine and organise a dinner party with the mayor and volunteers to put together the first menu! Cooking and eating might provide a neutral space that encourages residents to participate.

- We are witnessing the renaissance of thematic and urban walks. This can be led by experts talking about the values of urban green areas, this can be a forest bathing exercise or community-led walks such as the Jane Jacobs Walk, experienced by Cieza or urban trekking, initiated by Siena in 2006. Before organising such a walk, it could be powerful to introduce the event with a marketing campaign, placing messages on trees week by week, and marketising the launch of the walks.

- Use placemaking to redesign urban green spaces! "*Placemaking inspires people to collectively reimagine and reinvent public spaces as the heart of every community*" – says Project for Public Spaces, the initiator of placemaking. According to the European Placemaking Network, placemaking is about "*turning spaces into places that increase the presence of people in public spaces through the participation of users, the collaboration of stakeholders and by signalling shared ownership of the common urban spheres*".

- Community picnic to highlight the importance of grasslands. Dramatic loss of grasslands in Europe has occurred due to the use of intensive agriculture replacing extensive grazing, increasing urbanisation, forestation, neglect of grasslands in mountains, large-scale canalization and drainage, dramatic changes in water governance, etc. We have lost our knowledge regarding the exceptional role of natural and urban grasslands in biodiversity restoration and climate change adaptation and the ecosystem services they provide. Very few people know that for example, carbon sequestration of wet grasslands might be equal to a tree plantation. What about having a specific picnic organised at an accurate time, when participants can scythe their small spot for a picnic, providing privacy space for participants as well as an opportunity to talk about climate adaptive urban grassland management?

- Use storytelling and oral history as a tool. Residents and communities have great stories about urban greenery too – compile them into online collections and galleries. Australian cities are creating "soundtrails", the stories of greenery collected can be a part of a tree festival or urban stories festival focusing (partly) on greenery. Oral history was used for example in the Netherlands: learning about how locals used to live together with flooding is key to investigating how nature-based solutions can be implemented to retain water in the landscape. The Dutch partner city, Den Bosch has plenty of different guided audio tours that have been developed by volunteers and enthusiasts. These guided walks can be linked to natural heritage too.

- Establish tree boards and committees! These are citizen-led groups that work with public officials to improve the health of the urban forest through tree plantings, advocacy, education, management, and maintenance activities.

- Use community art for community actions in greenery. Copenhagen-based Thomas Dambo is a great source of inspiration. Since 2006 he has made and installed more than 3500 birdhouses, in different shapes and colours, all over the world. This is the Happy City Birds project. All birdhouses are made from recycled materials and scrap wood. But Thomas is more famous for his "giants", huge wooden sculptures created based on legends and made from recycled materials and trash. These are great tools to generate local tourism, but the main goal is to raise awareness of recycling and reuse, thus such a project can be linked to urban greenery as well.

- Organise competitions! Tallinn as the European Green Capital in 2023 invited its residents to actively participate in different green capital competitions regarding Tallinn's nature, urban space or any other green aspect. Besides widely known garden competitions, they organised environmental research competitions, environmental video competitions, creative projects competitions and speech competitions.

Tallinn's Green Twins: Bringing together public space, greenery and people through digital twins

Since the modelling of the natural environment in the digital twins has so far been underdeveloped compared to the built environment modelling, the Green Twins project deals with the issue of urban greening and how to better take the urban natural environment into account in urban planning processes. The Green Twins project develops a dynamic layer of green infrastructure in the digital twins of the cities of Helsinki and Tallinn. The focus is on the interaction between the built and natural environment, and plants' seasonal and overtime changes. The impact of vegetation on our neighbourhood and cityscape, urban space and microclimate, as well as our well-being, is visualised. Visualization and engagement can reduce the complexity of urban planning and enable and encourage more democratic participation and citizen science.

1.10. Making BiodiverCity powerful: nature-based solutions are always local

Due to human activity, the extension of natural habitats is decreasing all over the world. Due to the human presence lasting for thousands of years, this process is in Europe even graver. Habitat restoration is an old practice. The concept of ecological restoration was defined by the management of the Society of Ecological Restoration (SER) in 1996. According to that, ecological restoration is „*an activity during which the properties of an area are changed consciously with the aim of creating an ecosystem similar to the original, indigenous one*" (SER 1991). Restoration is meant not only in the sense of restoring biodiversity but also typical ecological processes and structures as well as sustainable traditional routine are included. While it is an old practice for nature conservation, the other side of the coin, the environmental and societal benefits are more in the spotlight today.

Nature-based solutions must be always local, simply because habitats are based on geographic conditions. Geographic regions around the world have similar environmental conditions and are capable of harbouring the same type of biota. Ecological communities of a given biome and habitat have the same climatic conditions and geologic features and support species with similar life strategies and adaptations.

Decision-makers have finally understood: that the fight against climate change and biodiversity loss must go hand in hand. For decades, nature conservationists have carried out innovative conservation initiatives that have simultaneously helped protect, manage and restore the environment while delivering tangible and sustainable benefits for people. Today, NbS are considered by a wide range of stakeholders as an essential mechanism for achieving sustainable development. "*The IUCN Global Standard on Nature-based Solutions aims to ensure the application of this approach is credible, and its uptake tracked and measured for adaptive management so that its contributions can inspire others*". This is a user-friendly framework for the verification, design and scaling up of NbS. This checklist running through 8 criteria is a simple tool enabling planners and communities to keep the focus and can be used in case of all types of nature-based solutions, but it is mainly dedicated to landscape-level interventions. Using the standard the planning process can reflect on the below criteria:

- NbS effectively address societal challenges.
- The design of NbS is informed by scale.
- NbS result in a net gain to biodiversity and ecosystem integrity.
- NbS are economically viable.
- NbS are based on inclusive, transparent and empowering governance processes.
- NbS equitably balance trade-offs between the achievement of their primary goal(s) and the continued provision of multiple benefits.
- NbS are managed adaptively, based on evidence.
- NbS are sustainable and mainstreamed within an appropriate jurisdictional context.

Last, but not least, it is also key to make everyone, and especially decision makers aware that ecological crisis is a "wicked problem" (difficult or even impossible to solve because of the highly interdependent components). This needs us to go beyond internally coherent approaches and adopt the so-called "Clumsy Solutions" that "use the skills of bricoleurs to pragmatically engage whatever comes to hand to address these most complex problems". Put it simply: start, act, experiment and engage – now!

In the mirror of the EU and global policy context, a clear added value of the BiodiverCity partnership could be:

- Test the City Biodiversity Index, using more indicators to measure cities' biodiversity conservation efforts against their baselines, with regards to native biodiversity, governance and management of biodiversity, contributing to preparatory work of the European Commission related to Urban Greening Plans.
- Measure and valorise urban biodiversity through community-based approaches.
- Plan powerful nature-based solutions by using the Global Standard.
- Advocate the theme on a European level by creating a standard for a European prize "Nature Based Capital".
- Analysing and working out operational schemes of urban Biodiversity Credits and other new financing schemes.
- Creating the concept of demonstration areas or "landscape laboratories" to showcase different nature-based solutions and explain their ecosystem services.
- Strengthening local actions through joining existing networks (Green City Accord, Tree Cities of the World, represented in Spain, France, Italy, Slovenia, UK and Sweden at the moment in Europe, Cities of Service) and keep the momentum stimulated by the BiodiverCity network.

2. CITY PROFILES

Corbally Meadow, Limerick

2.1. Cieza: the secrets of climate-adaptive management of urban trees

URBACT features

Most important local theme: New and climate-adaptive ways of planting and managing urban trees.

How green is it? Although the county is relatively green (30%), only less than 10% of Cieza's territory is covered by greenery.

Most innovative local action within a European context: Renaturalisation of schoolyards.

IAP Coordinator: Miguel Ángel Piñera Salmerón, an environmental technician with 25 years of experience, including 18 years in public administration, coordinator of the EDUSI office and responsible for parks and gardens.

Potential IAP focus: The city intends to improve the green infrastructure in four ways: 1. increase the canopy cover on streets; 2. improve biodiversity in parks and gardens; 3. renaturalisation of schoolyards; and 4. restoration of the riparian forest along the riverbank. The IAP will focus on these issues (all or some of them). Aspects concerning biodiversity, SUDs and awareness-raising will be important elements of the IAP.

Potential resourcing of the IAP: Besides the municipal budget and ERDF funds, the municipality is active in getting other funds too (e.g. LIFE).

Potential themes for testing actions: Various directions are open at this stage, but most likely collaborative creation of pocket gardens will be tested, most likely by using AI-supported tools like in this Dutch example.

Key ULG members: Edusi office, schools (e.g. José Marín, San José Obrero, Los Albares) AFEMCE Cieza (see below), OJE Cieza (youth association), Avennatura (outdoor association), ASCOPAS (association working with disabled people and their families).

Relevance of cross-cutting themes: Using digital tools to support the new green infrastructure management and especially the related awareness-raising actions.

Cieza, the "City of Trees"

"It is more important in Cieza to have air-conditioning in a flat than a heating system" – says Miguel Ángel Piñera Salmerón, one of the - perhaps the most important – initiators and coordinators of the Cieza Biofílica initiative aiming to transform urban green infrastructure into a complex green corridor as the backbone of the city.

Cieza (population ca. 35.000) is a small Spanish city in the region of Murcia, located 42 kilometres from the regional capital and 100 km from the sea, and at first sight, it does not look like a "city of trees" at all. The natural vegetation is typical of the Mediterranean climate, the bank of the Segura River that picturesquely crosses the town is massively occupied by an invasive alien species, Arundo donax, and the urban fabric looks typical - more bricks and asphalt than green. What is not typical is the surroundings of the town: Cieza is a European leader in peach production, thus in springtime, the entire area looks like heaven as it is covered by pink blossoms. Although there are significant tourist attractions nearby (e.g. the UNESCO-listed Cave of the Serreta with unique prehistoric paintings in the protected Almadenes Canyon), Cieza is not a tourist city - tourists appear only in springtime to take pictures of the otherworldy beautiful blossoming valley for Instagram. *"However, professionals from major Spanish cities like Murcia, Valencia or Alicante visited Cieza in the last years to understand how the town has become a national frontrunner of climate adaptive management of urban trees"* – says Miguel Ángel proudly. And this great story - like almost all stories of green transition - started with a cultural issue: traditional pruning of the trees...

Every journey starts with the first step...

Suffering from more and more serious heatwaves and drought periods, the Municipality of Cieza has understood that urban trees provide inevitable services and cost-efficient solutions for urban dwellers, and it built up its comprehensive climate action 10 years ago. Yes, trees are our best allies in climate adaptation: besides absorbing carbon dioxide and producing oxygen, they improve air quality by intercepting particulate matter on leaf surfaces and absorbing pollutants, they efficiently cool the city by up to 3-5 °C, mitigating the urban heat island effect, and releasing water vapour into the air through their leaves. In addition, tree canopies increase the surface area where stormwater falls, decreasing the amount of runoff from reaching the ground, and root systems serve as water catchment areas that promote infiltration – this helps mitigate the effects of flash floods too.

The new management system of urban trees became the driving force in Cieza. The municipality set up a coordination system to ensure that the new green infrastructure policies are implemented correctly, a team has been set up consisting of qualified technicians coordinating external companies, and since it is a joint venture, a discussion started among different municipal departments involved in actions. Political leadership is given, even after municipal elections in 2023, meaning that the new policies are deeply embedded into everyday life by now.

As for planning, the systematic approach started with the creation of a catalogue of unique trees (2011), followed by a Management Plan for Urban Trees and Green Areas (2016), a Strategic Plan for Urban Ecology and Biodiversity 2017-2032 and a Green Infrastructure Maintenance Management Plan for the municipality of Cieza (2021). The process was financed not only by local sources and the European Regional Development Fund, but as a partner Cieza successfully participated in many LIFE projects too (LIFE Ripisilvanatura was about mapping invasive alien species along the Segura River and restoration of natural habitats, while LIFE Greenme5 is linked to the successful implementation of the Green City Accord).

The municipality received the 'Tree Cities of the World' 2021 and 2022 recognition; and multiple awards such as the SBN of the Spanish Network of Cities for Climate, and the H2020 Compete4SECAP Project, as well as a special mention from the jury in the Árbol 22 Award. Through the Green City Accord, the city moves forward in the implementation of measures that will enable it to further advance its sustainability objectives. International learning is not "only" about discussing objectives and plans, it might be full of

life – Cieza even organised Jane Jacobs Walk in connection with trees!

Over the last few years, Cieza became a member of Tree Cities of the World, a network initiated by FAO (Food and Agricultural Organisation of the United Nations) and the Arbor Day Foundation, providing further impetus for Cieza. This network works along 5 standards:

1. Establish Responsibility: the city has a written statement by city leaders delegating responsibility for the care of trees within the municipal boundary to a staff member, a city department, or a group of citizens—called a Tree Board.

2. Set the Rules: the city has in place a law or an official policy that governs the management of forests and trees. These rules describe how work must be performed, where and when they apply, and penalties for noncompliance.

3. Know What You Have: the city has an updated inventory or assessment of the local tree resource so that an effective long-term plan for planting, care, and removal of city trees can be established.

4. Allocate the Resources: the city has a dedicated annual budget for the routine implementation of the tree management plan.

5. Celebrate Achievements: the city holds an annual celebration of trees to raise awareness among residents and to acknowledge citizens and staff members who carry out the city tree programme.

International networking might be an important factor in getting innovation to town and reinforcing novel policies both within the public and among decision-makers.

From the “placebo trees” to “medicine trees” – principles of the new tree management system

The ‘before and after’ pictures in the cover of the study make the change as the result of the new pruning system visible. Because fruit trees are usually pruned each year and in Cieza everyone has a connection to fruit trees somehow, the agricultural practice influenced green infrastructure management in the city and urban trees were thus seriously pruned back each year. This way urban trees were more “bio-sceneries” than living organisms providing ecosystem services for the city, as pictures clearly show.

In the beginning, the municipality mapped all urban trees (Cieza was among the first Spanish cities to have local protection for important trees) and found that 84% of them corresponded to only 10 species, 50% of them to only 3 species, and more importantly, many of them (ca. 60%) were in bad condition and thus they should be replaced. The question was that despite the relatively high municipal budget dedicated to the maintenance of parks and gardens, is there a benefit of the old pattern of tree planting and maintenance for the inhabitants and the city, especially during climate emergencies? *“Can we improve the city's climate action by bringing aesthetic, economic, environmental and health improvements at the same time to the city? The previous maintenance practice was a waste of money – and it is proved now by the new planting system which allows trees to grow in three years as big as within 10 years in the previous system”* – Miguel Ángel highlights the scientific and economic results of Cieza Biofílica. Very important: when the new policy was set up, training for technical staff and internal coordination meetings at the municipality to explain the new standards (e.g. new ways of pruning, planting, use of the chainsaw, use of bushes and perennials) was also organised.

The new pruning system had significant results relatively quickly. But there are so many other cornerstones of this new standard: increasing the diversity of species (using the 10:20:30 rule - no more than 10% of one tree species, no more than 20% of one genus, and no more than 30% of one family in the city), planting native species if possible, but avoid using invasive species, using

Sustainable Urban Drainage Systems (SUDS) at new plantations, designing the surroundings of the tree and root control, recycling green waste as mulch to improve soil quality.

Ramón y Cajal Avenue and the pedestrian area of Rambla del Realejo Tramo are great examples of how the municipality removed asphalt and planted trees in a new way, or simply enlarged the soil around the trees by using so-called structural cells in the ground to provide more space and air for the roots, while between trees perennials have been planted. In other places, like Park Bola, the municipality changed the soil and used perennials to improve the dried-out green surface. And last, but not least, informing and nudging the public to understand and accept the new norms was also a key element of the new standard. Although the municipality puts emphasis on proper communication about the change and organised dozens of awareness-raising activities (e.g. stimulating irrigation with a bicycle pump during environmental education games, awarded at the regional level, Tree Day has been held since 2006, info day and video for residents), it is an "evergreen" task and challenge.

Besides the urban area, the riverside also has priority for the municipality, partly because most of it was completely invaded by the giant Arundo donax. Since 2006 the municipality has been implementing a complex environmental education program involving schools and other institutions (e.g. stewardship program, organising nature classrooms), and since 2017 a volunteer programme, including schools and all kinds of NGOs have been also working with clean up areas, improve the riverside promenade by providing space for riparian forest. *"I love my city and the river, and I love this landscape around my city – I simply want to do something good for it"* – says José Manuel Ayala, a local volunteer.

It is obvious that local people love to use the riverbank for leisure – we bump into many runners and cyclists on a Wednesday morning, but many civic initiatives are also running at the riverside. For instance, AFEMCE, an association dealing with families with mental illnesses, adopted a section of the riverbank, carrying out a biodiversity project (removing invasive species to create a natural habitat), and collaborating with the environmental education program. The same association has set up a plant nursery in collaboration with Aguas de Cieza (a public utility company responsible for the maintenance of greenery).

Blue is the new green - challenges for Cieza

It was a long road to achieve these great successes, but this road is even longer to continue the policy and the green transition of the town. By increasing the canopy cover in the urban fabric and rehabilitation of riparian forests along the river, the main challenge of the city is to create a network of green corridors that link the city centre with the surrounding natural area and the riverbank. This includes the increase of the overall biodiversity of parks, gardens and streets, and even to creation of a green oasis of some schoolyards (the first one will be piloted within a LIFE project). However, many unexpected questions are raised when letting trees grow. Some residents complain about the lighting that has been weakened due to the enlarged canopies. While creating an urban forest of fruit trees to cool streets in the third-fastest warming city in the US (Tucson) became a model for climate action, in Cieza fruit trees will be replaced with other trees based on residential requests.

The social challenge is to keep the momentum with the public and to raise awareness of the importance of trees, their ecosystem services, and especially health-related benefits. Tackling the required change in mindset, initiatives like residential programs to involve private areas, planting Miyawaki-forests and using other innovative planting practices, building nature playgrounds, elaborating pollinator-friendly actions and policies, and organisation of bioblitz and forest bathing events can be important learnings for Cieza.

Due to changing weather patterns (having torrential rains), an additional important goal of the city is to improve existing strategies and policies with "blue" aspects. To some extent, this is already part of the story, for instance through floodable flowerbeds created at the river and by using structural cells at new tree plantations improving

root development as well as the infiltration capabilities of the soil. But Cieza needs a comprehensive strategy on blue-green infrastructure promoting urban rainwater harvesting as much as possible (through building green roofs and walls, installation of rain gardens, etc). Perhaps the blue is the new green in Cieza?

Restored greenspace in Cieza

2.2. Dunaújváros: the role of green spaces to raise awareness and change the mindsets of residents

URBACT features

Did you know? Dunaújváros as a "red" (industrial city built during the Socialism) city actually has the highest rate of green areas among major Hungarian cities.

Most important local theme: communication and engagement to raise awareness and change the mindsets of residents.

Most innovative local action(s) within a European context: communication, engagement and placemaking tools linked to urban greening.

IAP Coordinator: firstly, Ms Ildikó Petrovickijné Dr. Angerer, Senior Environmental Administrator of the Municipality of Dunaújváros, Associate Professor of the Dunaújváros University was selected. She will support the project, but due to internal capacity reasons Ms Kata Dr Molnárné Szieben, international project coordinator of the Municipality of Dunaújváros has been finally selected.

Potential IAP focus: 1. planting climate resilient plants, 2. awareness-raising of residents; 3. creation of a tree registry; 4. biodiversity-driven biomass and park management.

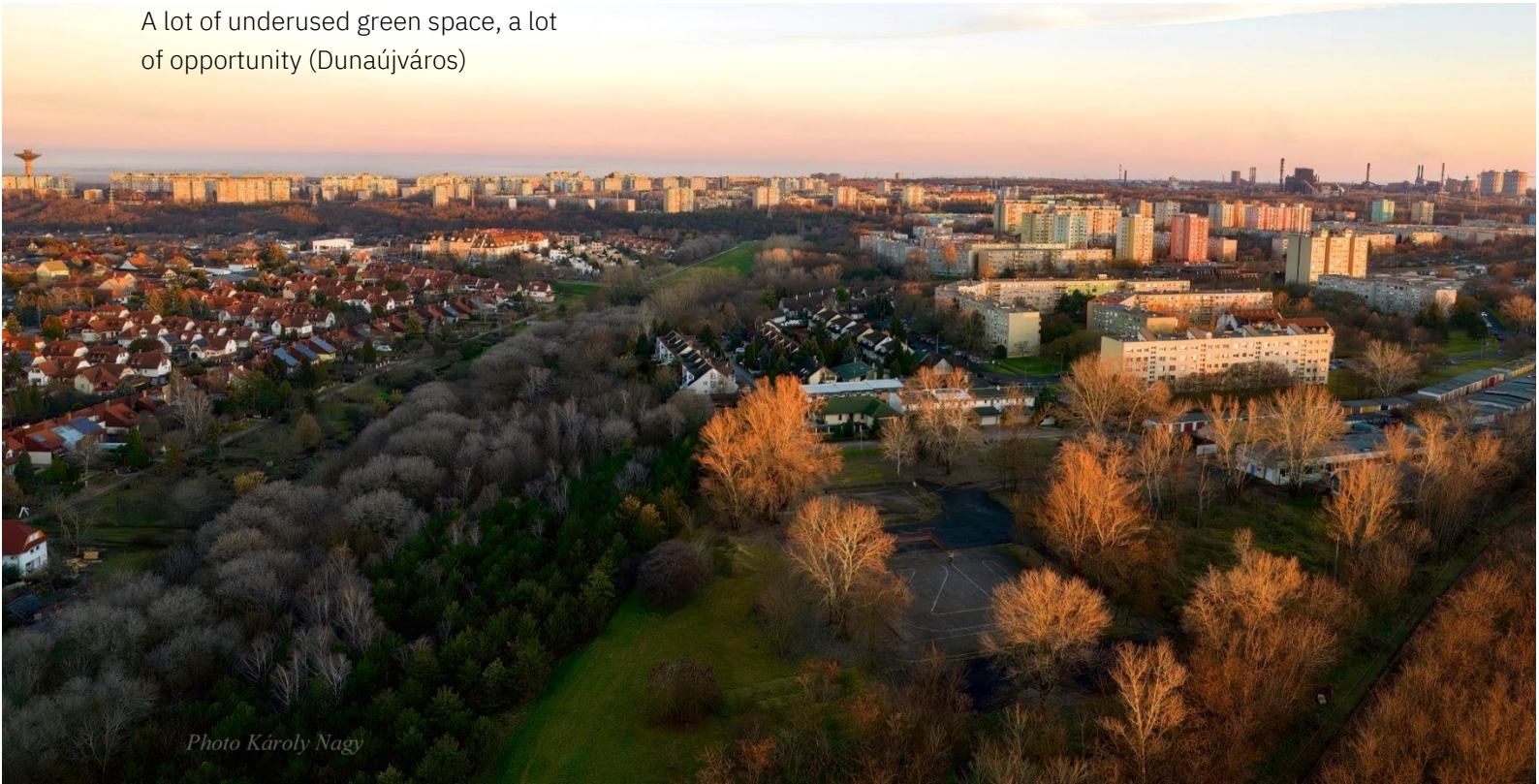
Potential resourcing of the IAP: besides the municipal budget and ERDF funds, the municipality is also active in getting other funds (e.g. LIFE).

Potential themes for testing actions: most likely it will be an unusual awareness-raising action (e.g. community picnic to highlight the importance of grasslands, community action inspired by Thomas Dambo's Happy City Birds, community walk with professionals to measure the benefits of trees). They can also linked to city branding (a similar new town in Hungary, Kazincbarcika has a great reputation how they changed the image of a "red" city by using city branding – and there are many more good examples across Europe).

Key ULG members besides the municipality: Duna-Ipoly National Park Directorate, local branch of the state forestry, public utility company responsible for the maintenance of green areas, University of Dunaújváros, local water directorate, chamber of commerce, housing cooperatives, major companies, local schools, residents' NGOs (e.g Városvédők Újtelepért Egyesület).

Relevance of cross-cutting themes: digitalisation seems the most appropriate theme, for example, online tools to measure green areas and ecosystem services.

A lot of underused green space, a lot of opportunity (Dunaújváros)



Green challenges in the "oldest" new town of Hungary

Dunaújváros (ca. 42.000 inhabitants) is a typical and well-known example of the newly built and consciously planned industrial cities in Central and Eastern Europe. It was built in the 1950s on the site of a former village, Dunapentele, along with an enormous steel factory, and the city was originally called Sztálinváros (the City of Stalin), before acquiring its current name in 1961, after the Hungarian revolution of 1956 (Dunaújváros means 'Danube New City', so new city at the Danube). Among Hungarians, Dunaújváros is known as the "red" city, but interestingly, very few people, including locals know that the green area per capita in the city (112 m2) is twice as high as the average amount of major Hungarian cities.

This great asset is under threat. While locals are not aware of their green 'treasure', climate change, manifested in increased frequency of meteorological drought, heavy winter precipitation, more intensive rainfalls in summer, and extreme heatwaves pose a challenge for the maintenance of the green areas (the population of urban trees is getting old by now), especially since the city is located on a loess plateau that makes the situation even more complex since this sediment that is formed by the accumulation of wind-blown dust in the ice-age, is critically posed for erosion when it is humid. Thus, there is a drainage system below the city and watering of public parks is forbidden.

Dunaújváros, an attractive place to live

Although city officials always talk about locals' strange relations to nature that create lots of complaints when for example leaves start to fall and the municipality cannot clean it up immediately, the city has actually already made many key initial steps to change the mindsets of residents and promote pro-environmental behaviour. The local municipal system was the first in Hungary officially certified by EMAS environmental monitoring and assessment in 2007, and the municipality has been able to keep this status until today. Perhaps not independently from this, the city mapped its natural assets and biodiversity, and locally protected some areas and significant trees (a local arboretum, a nesting area of Merops apiaster, 22 trees, while along the Danube there are nationally protected Natura 2000 sites).

"The municipality follows the strategic directions laid down in key policy papers (the climate strategy, the integrated urban development strategy, the local environmental programme, SECAP), but urban biodiversity and nature-based solutions are new expressions for us" – says Mr Zsolt Szabó, vice mayor. "Since we need new answers to the emerging challenges, we are open to learning. We try to be involved in knowledge transfer projects, for example, we hope that we can transform one of the 10-storey prefabricated buildings into a "green oasis" by using green walls and roofs and installing a community garden, to be hopefully financed by the LIFE Programme".

"Our city has two lungs: the restored recreational area and beach around the Szalki Island at the Danube, and the green terraces at the Danube bank created decades ago after a huge landslide" – says Ms Réka Beéry, head of the department. These places are symbolic in Dunaújváros. Szalki Island is indeed a good example of restoration, but beyond the summer season is hardly used. The grasslands on the terraces provide a great opportunity to transform them into more natural habitats, creating a showcase for the city to be followed by climate-adaptive grassland management across the entire city. "Due to climate change, we have to rethink the management methods of urban green spaces, we must enlarge and intensify the green surfaces and their biodiversity, we need to use new, more resilient species, while at the same time, we have to remove invasive alien species, and most importantly, we must invite residents to this process, enabling them to understand the climate actions needed" – says Mr László Szabó, administrator for green areas of the Municipality of Dunaújváros.

Although professionals need to deal with practical daily issues like stopping illegal parking that destroys urban green spaces or removal of the huge amount of biomass from public green areas (which should not be necessary everywhere) and improving the water quality of local streams (Alsófoki-patak, Felsőfoki-patak, Lebuki-patak), they are open for a paradigm shift in daily practices, and despite the regular waves of residential complaints, they are open to share ownership and responsibility.

"Green placemaking" is needed: invitation is stronger than interventions

Many cities around the world are experimenting with how to engage residents in park maintenance and at the same time, communicate about the benefits of nature, nudging them to a more pro-environmental behaviour. These campaigns vary from simple actions such as placing meaningful messages on trees about their benefits incl. monetising them, to more complex projects. Cities often use their tree registries to highlight the ecosystem services urban trees provide. They create a dedicated website or app not only to describe the species, genus and family of the given tree but to share myths, cultural and historical values as well as to highlight benefits (e.g. oxygen produced, carbon dioxide reduced, stormwater intercepted, energy conserved, air pollutants removed, total value of the tree).

This has great potential in Dunaújváros as the creation of a tree inventory is one of the most important goals of the municipality, which also can learn some communication and engagement practices from partners (e.g. community-led Jane Jacobs Walks, experienced by Cieza, urban trekking from Siena, organisation of Bioblitz events). The use of placemaking to redesign urban green spaces indeed seems important in Dunaújváros ("*placemaking inspires people to collectively reimagine and reinvent public spaces as the heart of every community*". Local NGOs and enthusiastic teachers of local eco-schools seem to be partners in this process, especially as many of them are experienced in greening projects (designing community gardens or bird-friendly gardens in school yards).

"The municipality organises lots of events dedicated to environmental protection, and there is a lot of information available on the website of the municipality, but climate actions are fragmented, we should need a joint platform for awareness-raising" - says Ms Nóra Deák, director of a contemporary art gallery. The same applies to the involvement of companies, underlining many business actors during the first stakeholder meeting. CSR activities could be boosted by the municipality, and coordinated by a joint platform (like the famous example in Nantes, France).

Using public spaces in a more environmentally conscious way and doing something for the public was the standard decades ago. Dunaújváros for example was famous for the high number of residents using bicycles daily and there were legends about the flowers placed on the streets. To tackle the most pressing issue, awareness raising, the arboretum in the city centre has a huge potential, but the

popular Flowering Dunaújváros Competition is also a great asset (creating new categories reflecting on biodiversity and community actions), to explain the need for more biodiversity-driven approaches. No need to go back to the past, but it is worth rethinking the ways we use our public spaces, and this might help create a new identity for the "red" city too.

2.3. Guimarães: how to put biodiversity first (even in a city)?

URBACT features

Did you know? Founded in the 10th Century, Guimarães is well known by all Portuguese as the birthplace of the nation. Its historic centre has been part of the UNESCO World Heritage List since 2001 (the area was extended in 2023). “An exceptionally well-preserved and authentic example of the evolution of a medieval settlement into a modern town, its rich building typology exemplifies the specific development of Portuguese architecture from the 15th to 19th century through the consistent use of traditional building materials and techniques”. Guimarães was the European Capital of Culture in 2012 and the European City of Sports in 2013.

Most important local theme: 1. development of residential programs to involve privately owned green areas; 2. development of an integrated water management (retention) plan; 3. development of the urban Greening Plan recommended by the EU Biodiversity Strategy.

Most innovative local action(s) within a European context: 1. having an action plan specifically dedicated to (urban) biodiversity; 2. Engagement and citizen science related to urban biodiversity (BiodiversityGO!, bioblitz, City Nature Challenge); 3. working with companies on biodiversity conservation goals..

IAP Coordinator: MSc Daniel Machado Ferreira, a sustainability education technician with 20 years of experience in education and science communication, including 2 years as part of the sustainability education team at the Guimarães Landscape Laboratory, contributing to the implementation of the Municipal Environmental Education Program.

Potential IAP focus: several directions have been identified: 1. improving the connectivity of biologically significant areas; 2. an action plan focusing on integrated water management (retention) or residential programs.

Potential resourcing of the IAP: besides the municipal budget and ERDF funds, the municipality is very active in getting other funds (e.g. LIFE, Horizont, Interreg).

Potential themes for testing actions: the most important issue in Guimarães is to increase the connectivity between green areas, particularly in the urban space, to promote biodiversity, enhance the sponge-city potential and reduce the impacts of climate change events. Guimarães will test this approach on a small scale, but enhancing urban biodiversity and biodiversity monitoring in urban areas can also be great at this point.

Key ULG members besides the Landscape Laboratory: the Environment and Sustainability Department of the municipality of Guimarães, University of Minho, University of Trás-os Montes e Alto Douro, Green Brigades, Irmandade da Penha (religious organization owner and manager of around 60 hectares at the Penha Mountain), Vitrus – Guarda Rios, Vimágua (water services), AVE – Ecology Association from Guimarães (ENGO), ICNF (Nature and Forests Conservation Institute), SEPNA, Centro Ciência Viva Association (Science Interpretation Centre).

Relevance of cross-cutting theme: since the scientific background is very strong, a potential theme could be related to how to use digitalisation to support the elaboration of an integrated water management (retention) plan (and/or biodiversity conservation efforts). Together with the creation of the green buffer, Guimarães plans to include new technological monitoring tools that will not only increase the available data on species occurrence but also contribute to the creation of biodiversity real-time related data that will in the future be available for citizens throughout an open platform.

The huge community garden plays an important role in the local biodiversity-driven policies

Guimarães, the green city

Guimarães (156.830 inhabitants) is located in the northern part of Portugal, where the Atlantic and the Mediterranean biogeographical regions meet, and where the forests of iconic Penha mountain, riparian habitats, wetlands and agricultural landscape frame the relatively densely built-in and industrialised urban area, creating favourable conditions for diverse flora and fauna. This fact in itself does not explain the high reputation of the municipality as a green city across Europe. The relatively unique (bio)geographical contexts, where urban life is intertwined with a green, biodiverse environment indeed promote opportunities for sustainable coexistence and urban biodiversity initiatives, which is also recognised as a European-level good practice, but many other European cities have similar or even better natural conditions, and they do not use biodiversity as a core organising principle within urban development and they do not have such a reputation.

Guimarães was among the 3 finalists of the European Green Capital 2025 competition (while it achieved 5th place in the European Green Capital 2020 ranking in 2017). Besides being one of the leading Portuguese municipalities in manufacturing and exports, Guimarães has been recognised three times as the most sustainable city in Portugal, and it coordinates the Working Group Green Areas and Biodiversity at Eurocities. So, how can biodiversity be such a strong driving force in Guimarães?

The story started with a vision of the current mayor back at the beginning of the 2010s after the city was recognized as the European Capital of Culture in 2012 and the European City of Sports in 2013. Green issues and biodiversity became an integral approach and core organising principle in city development and are systematically built in all relevant urban planning documents.

In 2014 Guimarães created a strategic plan which protects and promotes biodiversity in urban areas. The plan emphasizes the importance of native species and fosters environmental education, citizen science and engagement through strong leadership. In 2014 Guimarães City Council, the University of Minho and the University of Trás-os-Montes and Alto Douro established the Landscape Laboratory (which formally represents the city in the BiodiverCity network), a centre for environmental research and education, focusing on three main areas of intervention: research and education, project management and communication and environmental training. In 2015 the PEGADAS project, a city-wide environmental education initiative started. In 2017 the city won the URBACT good practice label. In 2017 (2020 cycle) and 2023 (2025 cycle) the city applied for the European Green Capital award, while in 2022 it became one of the NetZeroCities. Today, the city development follows the principles laid down in the Biodiversity Action Plan (2023) as well as in the integrative, multidisciplinary, and participatory Guimarães 2030 Governance Ecosystem (GGE), a dynamic framework with the potential to impact local urban biodiversity conservation efforts.

Guimarães, the city of biodiversity

The Biodiversity Action Plan and the work of the Landscape Laboratory describe the various topics linked to urban biodiversity: mapping biodiversity including the use of citizen science, environmental education, fight against alien species, creation of a green corridor, valorisation of natural routes, promotion of species observation, improvement of nature tourism, awareness raising, helping companies, individuals, and the public sector to minimise the ecological impact. The Landscape Laboratory has 5 focuses: 1. biodiversity and water resources, 2. green areas and land use, 3. circular economy, 4. climate, and 5. health and wellbeing.

The high level of engagement of citizens in data collection and other biodiversity-related actions is clearly at the heart of the entire process of boosting biodiversity conservation. To engage the local community in conservation efforts and expand data collection capabilities, Landscape Laboratory developed a dedicated app in 2016 (Biodiversity GO!) that allows citizens to participate in surveys and contribute valuable information about species and their locations in the city. Most importantly, this collaborative approach not only improves the assessment of biodiversity but also fosters a sense of stewardship among residents. The city is also very active in organising bioblitz events to activate

residents and participated in the global City Nature Challenge.

"Following this recognition, Guimarães seriously works together with parishes to embrace sustainability at the local level, and to share the green commitment with every citizen" – says Francisco Carvalho, General and Innovation Coordinator of the institute. *"You have to be able to create an inspirational atmosphere in which collaboration works, top-down and bottom-up initiatives can mutually reinforce each other"*. The so-called Green Brigades have been operating since 2015. Now they are active in 38 parishes (out of 48 parishes in total), covering 70% of the territory of the municipality. This initiative, unique in Portugal, can efficiently stimulate local identity, make the participants proud and satisfied, and provide visibility and training opportunities for participants. *"Education plays a pivotal role in increasing awareness among residents about the significance of protected areas and green infrastructure"*. One of the major actions developed in the city was the creation of the environmental education program "PEGADAS" in 2015.

This program includes multiple activities related to urban biodiversity as such, enhancing awareness mostly with younger generations (reaching 83 schools and 20.000 students across 48 parishes through more than 900 activities organised per year, including the training of teachers). It also targets the general public through the organisation of bioblitz events, workshops, and festivals like the Green Week where young influencers help the work of the Landscape Laboratory. Since 2008 the city also has had a growing community garden, now it is operating on 3 hectares, and it is a great asset to raise awareness.

During our visit to the community garden residents kindly, but actively paid our attention to the presence of the Asian hornet (Vespa velutina), a hornet species from Asia, that appeared in France 20 years ago, and is now spread almost everywhere in Western Europe. It is obvious that by using the Biodiversity GO! app and citizen science in general, residents are more alert to invasive alien species, a major threat to biodiversity. Landscape Laboratory also does experiments with new methods to push back these species. On Penha Mountain for example there is a pilot area where they removed not only the local population of Japanese knotweed (Fallopia japonica) but the sediments too, then they laid down a biodegradable mesh and planted native vegetation on it to stop the presence of Fallopia japonica in an oak forest.

The Landscape Laboratory developed the "Poliniza-te" (pollinate yourself) project to promote awareness towards the importance of pollinators and increase the habitats suitable for those species. But this is not only an urban topic in Guimarães, this is not only about planting pollinator-friendly flower beds and awareness raising through organising events dedicated to this theme, just like the Spring Festival in 2022. As the extinction of pollinators is largely linked to the use of pesticides in agriculture, the Landscape Laboratory also operates the so-called Rural Based Incubator to nurture innovation among farmers. Since 2021 the city has been a member of 'Polli.net' (Collaborative Network for the Assessment, Conservation, and Valorisation of Pollinators and Pollination) and actively supports the national "Municipalities Without Glyphosate/Herbicides" campaign.

Being a tourist destination, Guimarães also promotes nature tourism by developing "Biodiversity Routes" and the future "Guimarães Ornithological Centre", which will help to connect to Portugal's entire natural heritage. The city is also working on creating green corridors. The project aims to create a total of 60 kilometres of green and blue corridors along the Ave, Selho and Vizela rivers. This initiative focuses on improving riparian forests and, if carefully planned and managed for resilience, could provide great opportunities for socio-ecological change and transformation towards sustainability.

Guimarães, the city of nature-based solutions

But the story of urban biodiversity is not only about halting biodiversity loss and awareness raising. It is also about making the city more resilient to the negative effects of climate change. One of them is the increased precipitation, thus the city has established 3 natural irrigation basins as nature-based solutions.

The most important future challenge of Guimarães is to involve private green areas in its great

conservation efforts (and the engagement process run in the last years provides a great entry point for that). In line with this, and building on the activities tackling private companies, elaborating innovative financing schemes related to biodiversity (e.g. biodiversity credits) seems important in Guimarães. Besides residential programs and the further development of awareness-raising activities (for example with actions highlighting ecosystem services), the development and regulation of nature-based solutions seem the next step, most likely in line with the elaboration of the urban Greening Plan, the city intends to prepare in line with the EU Biodiversity Strategy and the Green City Accord.

Based on the climate models the region of Guimarães, together with the entire Iberian Peninsula will face significant change in meteorological drought frequency, thus water retention will be most likely a key topic regarding nature-based solutions. Guimarães does not have a specific policy for example to regulate the use of green walls and roofs, that are efficient in water retention, and the need for an integrated water management (retention) plan to embed blue aspects into urban planning as efficiently as it did in connection with biodiversity seems crucial. However, these strategies are now included in the most recent Local Plan for Climate Action 2030.

The Biodiversity Action Plan strategically aims to restore forests, control the spread of eucalyptus plantations and invasive species, reduce the risk of bushfires and protect natural habitats. Through the Urban Tree Management Office to be established it will oversee species selection, planting locations, and management practices to enhance biodiversity and ecosystem services. Along with the implementation of these actions, more attention should be paid to making the city climate resilient. It is time to put nature-based solutions first! There are few other cities in Europe, that have such great potential to become a frontrunner of nature-based solutions than Guimarães...

A unique organisation dedicated to urban biodiversity (the entrance of the Landscape Laboratory)

2.4. Limerick: How much does a tree cost? How to valorise ecosystem services?

URBACT features

Did you know? Limerick is really "green". The city has 73m2 of urban green space per capita, which is above the ideal WHO value (50 m²) and exceeds by far the European average (18.2 m²). The city's main areas of natural habitats are based around the large network of rivers with associated wetlands, as well as grasslands and established woodlands. The Lower River Shannon Natura 2000 site contains many important habitats, including the most extensive area of estuarine habitat in Ireland.

Most important local theme: 1. Community-based approaches to valorise/measure ecosystem services; 2. In-house training related to nature-based solutions.

Most innovative local action(s) within a European context: having a comprehensive, city-wide strategy tackling blue and green infrastructure (BGI).

IAP Coordinator: Mr Cathal Brodie, Senior Executive Scientist with over 27 years of working in the environmental area of local government. Is a chartered scientist and a full member of the Institute of Environmental Management and Assessment. Has worked on numerous projects in the environmental field with a specific emphasis on sustainability and future-proofing. Is currently head of the Environmental Strategy unit in Limerick City & County Council.

Potential IAP focus: demonstrating the importance of different habitats in an urban setting for biodiversity by using community-based approaches to valorise ecosystem services. It is also foreseen to measure/document species on site and develop actions to enhance the areas further as habitat.

Potential resourcing of the IAP: in line with the implementation of the BGI strategy, mainly internal budgets apply. Previous URBACT actions were funded by Slaintecare, a healthy communities fund, but national funds like the Local Biodiversity Action Fund and the Climate Action Fund also mean possibilities. The municipality is active in getting other funds too (e.g. LIFE, Horizont).

Potential themes for testing actions: how to encourage and involve stakeholders in recording data.

Key ULG members besides Environment Strategy Team of Limerick City and County Council (LCCC): LCCC Ecologist, LCCC Archaeologist, LCCC Parks and Recreation, LCCC Public Realm, Limerick City Tidy Towns, Limerick Civic Trust, Public Participation Network covering all relevant civic actors. Based on the Local Government Reform Act 2014 Irish local authorities are required to establish a Public Participation Network to mobilise community engagement along three pillars: social inclusion, community development and volunteering, and environmental issues. When a local authority in Ireland requires community, voluntary, social inclusion or environmental representation on a board or committee, they must source that via the PPN.

Relevance of cross-cutting theme: tackling anti-social behaviour and inappropriate use of green space is an important goal while implementing the BGI Strategy, thus safety of urban (green) spaces can be an important horizontal factor regarding green infrastructure planning, in line with the Gender Equal Cities Guidebook. Digitalisation might also play a role in community-based approaches to valorise ecosystem services as well as in awareness-raising actions.

Can a cemetery be used as an urban green space?

Limerick, the Green Leaf city

Having such great natural assets in terms of urban green and blue spaces as well as protected areas, Limerick, the third largest city in the Republic of Ireland (ca. 95.000 inhabitants), located 200 kilometres from the capital on the West of the island, has already recognised the importance of nature-based solutions and urban biodiversity, and made lots of actions to protect, enlarge and intensify its green and blue infrastructure and to make it more resilient to climate change. The city's commitment to better environmental outcomes has been awarded by the European Green Leaf in 2020 (a competition aimed at cities and towns across Europe, with populations between 20,000 and 100,000 inhabitants).

Limerick, which is among the 120 world-leading ICT cities with its large number of enterprises, 3 universities and fast-growing population, has high ambitions: it intends to be Ireland's greenest region for renewable energy. Preparing for the 2020 Green Leaf Award inspired LCCC to make a Green and Blue Infrastructure Strategy (GBI, 2023), which includes a range of actions to work with communities to contribute towards opportunities to conserve and enhance biodiversity and inform policy. This comprehensive GBI strategy will be analysed in detail by all partner cities, simply because all of them expressed their interest in understanding the details of such a strategy.

The GBI strategy aims to guide the urban planning and management process of multi-functional green and blue spaces, helping drive the transition to a low-carbon society and forming a cornerstone of sustainable development. It is not a 'must have' paper - it tackles local and global scale challenges, offering multiple economic, social and environmental benefits. It is not limited to traditional green spaces such as parks, it targets all types of green and blue areas. The GBI Strategy explains the benefits or ecosystem services natural assets can deliver to residents, visitors and the entire ecosystem (linked to both physical and mental well-being). It aims to make a corridor connecting green and blue areas (this Blue Green Ring' around Limerick is Ireland's first city-scale planning and ecosystems enhancement programme) and besides the creation of high-quality, attractive, and functional places, it targets the negative impact of habitat loss and climate change at the same time. The evidence base for the multi-functional benefits of GBI is constantly evolving, thus besides the benefits for biodiversity, climate change and health, the GBI Strategy targets benefits for the economy as well. In line with this, Limerick's GBI strategy focuses on four key challenges and identifies four spaces (overlapping each other):

- Health Challenge: Improving health and well-being outcomes – creation of 'Healthy Spaces'
- Climate Challenge: Climate adaptation – creation of 'Resilient Spaces'
- Biodiversity Challenge: Ecological improvements –creation of 'Wilder Spaces'
- Economic Challenge: Recreation, income generation and regeneration – the creation of 'Destination Spaces'.

By aiming to increase the use of nature-based solutions throughout Limerick, including urban greening interventions such as green roofs/walls and sustainable drainage systems, the GBI strategy will be incorporated into the Local Authority Climate Action Plan and in line with the Development Plan 2022-2028.

Limerick is a strong proponent of participation in European projects. After elaborating the URBACT Health and Greenspace action plan focusing on the wellbeing aspects of urban green areas, has been recently successful in securing funding through URBACT IV for two biodiversity and nature-based projects, BiodiverCity and GreenPlace. Both projects will support the development of the City & County Biodiversity Plan and existing plans and strategies for the protection and enhancement of biodiversity throughout the City and County. Under the Horizon 2020 Programme LCCC was involved in the Go Green Routes, a European project focusing on green, accessible and multi-functional routes to link natural habitats.

In addition, LCCC has a Tree Strategy, it has a council member in the "All Ireland Pollinator Plan", it has implemented a pollinator-friendly (Let it BEE) campaign including delayed/reduced grass cutting, it is actively involved in the national Tidy Town competition, it has made a survey related to the use of hedgerows and has started to change planting schemes (fewer annuals, more perennials).

Limerick has a great vision ("By 2030, Limerick will become a Green City Region on the Shannon Estuary connected through people and places") and this vision is pretty much linked to urban green areas and the better use of nature-based solutions. This will be *"achieved through engagement, innovation and resilient urban development and self-sustaining rural communities"*. Despite the strong political commitment, more political buy-in, a set baseline regarding biodiversity and community-based approaches to valorise the city's great natural assets and their ecosystem services are the most important actions to support the successful implementation of the GBI Strategy.

What does a Biodiversity Officer do?

"What is the value of this urban woodland locals "explored" during the pandemic?" – asks Cathal Brodie, Senior Executive Scientist. We are in the outskirts of Limerick, where between a motorway and a housing estate one of the last remaining urban forests of Limerick is located. This area was rather abandoned before, known only to local residents, but the lockdowns resulted in greater footfall and more members of the public valuing this urban woodland. *"We need more education on the value of green space. Related to urban biodiversity, the main policy challenge of Limerick along the implementation of the GBI strategy is to measure and valorise biodiversity and give it economic value"*.

The goal of the GBI Strategy is to integrate a strategic approach to green and blue infrastructure across all operational corridors. In line with this, a biodiversity officer has been just appointed. This person will be responsible for the preparation, management and implementation of the Limerick City and County Biodiversity Action Plan, in parallel with the County Heritage Plan and the Climate Action Plan. S(he) will establish and operate a County Biodiversity forum, facilitate the implementation of government initiatives concerning biodiversity and national plans and programmes that are developed to support the implementation of the National Biodiversity Plan, such as the "All Ireland Pollinator Plan", and advise the local authority on biodiversity related issues and the authority's obligations concerning protecting biodiversity.

The biodiversity officer needs to put Limerick's great, but rather fragmented initiatives into the same platform and systematically embed the new concept of nature-based solutions into planning and designing processes. There are so many opportunities in Limerick: reestablishing the connection with the most important river of the island crossing the city, making the Tidy Town movement more biodiverse, promoting natural shrubs in public spaces, training for operational staff, organising bioblitz events systematically to collect data, embedding nature-based solutions into park maintenance, continue the spread of natural play areas.

There is also a need to improve legislation enabling local actors to systematically use nature-based solutions. Based on the survey linked to hedgerows, planning restrictions would be needed for example to protect that, rather typical natural and cultural heritage. Residential programs are to be launched to further sensitise residents (composting, water retention, pollinator-friendly gardens, etc.). Low-maintenance and biodiversity-driven management techniques should be standardised in the management of public green areas. A legislation would be needed regarding the use of green roofs and walls in newly built areas. The community garden at the Hunt Museum is a good example, but the awareness-raising potential of community gardens should be further capitalised in different areas and aspects (e.g. social).

Within the BiodiverCity network, assigning value to biodiversity and ecosystem services is the most important question in Limerick, especially in three target areas: the urban

woodland (Baggot Estate), the historically active St. Lawrence cemetery and the Corbally Meadow at the riverbank. The question of how to effectively measure and valorise biodiversity and value ecosystem services that will highlight the importance of urban biodiversity can be efficiently boosted by experimenting with the use of biodiversity credits in such an economically active city, and also by using placemaking tools since in Limerick there is a dedicated officer to placemaking as well. And just like in placemaking, ownership and shared responsibilities are also keywords in urban biodiversity. Other BiodiverCity partners can largely support Limerick, for instance by sharing their experience related to the organisation of bioblitz events (e.g. participation in the City Nature Challenge), how to use citizen science to collect biodiversity data or simply the use of application to calculate the benefit of trees together with local communities.

2.5. Poljčane: Use permaculture to strengthen the use of nature-based solutions!

URBACT features

Did you know? Nature is everywhere in and around Poljčane: approximately 60% of its territory is protected by Natura 2000 and national regulations. There are two Natura 2000 sites under the Habitats Directive: 1. the riverside of the still freely meandering Dravinja River and 2. wet meadows mixed with a cultural landscape with a relatively high proportion of beech and oak/hornbeam forest (Ličenca pri Poljcanah). Mountain Boc above the town is also a protected area; it even hides a remnant of primaeval forest.

Most important local theme: having an Urban Greening Plan focusing on NbS both in town and the rural area, especially at the protected riverside.

Most innovative local practice within a European context: using permaculture as a driver to strengthen NbS and as a tool for raising awareness.

IAP Coordinator: Ms Kim Mezga, PhD, from the Institute SeMe. It is an organisation dealing with environmental education and sustainable development (e.g. school programs related to biodiversity, ecosystem services, green infrastructure).

Potential IAP focus: the planned IAP will focus on 1. implementing NbS in the town centre; 2. converting grasslands into pollinator-friendly areas; 3. implementing NbS along the Dravinja river, mainly to prevent landslide; 4. preparation of an Urban Greening Plan.

Potential resourcing of the IAP: the action plan will mainly tackle ERDF funds.

Potential themes for testing actions: in line with the potential themes of the IAP, planting a green belt between the road and children's playground, setting bee-friendly areas, and increasing the number of plants in the town centre.

Key ULG members besides the municipality: Institute SeMe as ULG coordinator; RIC Slovenska Bistrica – an institution promoting economic development and tourism in the area of Slovenska Bistrica; PRIZMA Foundation for Improvement of Employment Possibilities - focusing on training and upskilling of different interest groups and having broad experience on environment-related topics; Deltaplan d.o.o. - a consulting company focusing on circular economy and nature-based solutions; Municipality of Majsperk and the Municipality of Makole, neighbouring Poljčane; RRA Podravje Maribor (The Regional Development Agency for Podravje – Maribor); The Institute for the Promotion of Environmental Protection (IPVO) managing the Dole Self-Reliance Training Ground; Mikrova - a local SME specialised in research and development of electronics; Primary School Kajetan Kovič Poljčane.

Relevance of cross-cutting theme: focusing on other, related areas of green transition, mostly greening agriculture.

The odd-one-out in the BiodiverCity partnership

With its 4490 inhabitants and primarily rural landscape, Poljčane seems an odd one out in the BiodiverCity network in which mainly medium-sized (ca. 50.000 – 150.000 inhabitants) cities participate. But do not forget that the URBACT Programme welcomes small and medium size cities and the potential and impact of nature-based solutions in climate change mitigation is much higher in rural areas than in urban context – so, the rural aspects of nature-based solutions are useful in cities too...

Poljčane is in the North-Eastern part of Slovenia, approx. 30 km from Maribor and Celje, while the capital is approx. 100 km. The town is surrounded by the typical Alpine landscape: steep, forested mountains, Alpine meadows and pastures, and a dispersed settlement structure with groups of houses on the hillsides. Here definitely not air pollution and the urban heat island effect is the main risk of climate change, but flooding (just like the entire country, Poljčane also suffered from the historic flood of 2023), wind and land erosion.

From this aspect, the riverbanks are the most important location in Poljčane as they are intensively and regularly eroded by the more and more regular floods caused by more and more extreme rainfalls, "eating up" important agricultural land along the freely meandering river.

"Sometimes it is hard for inhabitants to understand why different rules regarding land use need to be considered, while the municipality needs to cope with bureaucratic processes on the national level when it wants to develop something in protected areas. Therefore, education and awareness raising is essential in Poljčane. Our question is how we can speed up this process enabling residents that nature is not a burden, but something they can be proud of and benefit from" - says Petra Vrhovnik, the mayoress elected in 2022, leaving her career as a researcher in Ljubljana, and who is – by the way - also a farmer.

Due to the strict environmental regulations (e.g. Natura 2000), it is not possible to develop strong industries in Poljčane. The municipality also wants to take advantage of this situation by building on the so-called "intellectual industry" – attracting white-collar workers who work mostly from home or in co-working offices but prioritise living close to nature. So how to explain and promote nature-based solutions and the importance of biodiversity for more conservative farmers and hipster newcomers at the same time?

When and how can we give some space back to nature (the freely meandering Dravinja River)?

People care and value their environment better when they have knowledge, emotional connection and responsibility

"It might sound strange, but some inhabitants do not know their local environment... This is key because people care and value their environment better when they have knowledge, emotional connection and responsibility. Education about climate change on the local level is very important, especially when working on solutions together" – says Kim Mezga from Institute SeMe, a local organisation dealing with environmental education and sustainable development. The new leadership of the municipality indeed tries to boost ownership, because it helps residents to become more responsible, taking care of their environment and transforming Poljčane's environment. But it is not so easy...

An education garden and a Miyawaki forest have been already built in and next to the primary school, and pupils happily take care of them. They can also exchange related knowledge with other European schools within a running Erasmus+ project, one of the first projects the new leadership initiated. Furthermore, there are many regular activities for kids and the public: "hands-on" workshops and outdoor classes with kids, and events with residents related to the Natura 2000 areas. Therefore, the action planning process will tackle awareness-raising as a priority. *"This is one of the few municipalities in our region that has no strategies, roadmaps or action plans"* – says Petra. "Thus, URBACT with its clear method of action planning came into the right moment".

The municipality has four goals within the BiodiverCity network. Implementing nature-based solutions in the town is one of them. The intention is to remove as much asphalt as possible, increase the green area, plant trees and bushes, and install green roofs and walls, especially on the infrastructure owned by the municipality. *"We also need to rethink some public spaces, like the relatively new playground behind the Nature Development Centre on Bistriska road since young families do not often visit this "garden" with rubberised surface, and its function is neither clear enough"* – explains Kim that failure is also a part of the transition sometimes, there is nothing to be afraid of.

Second, restoring some meadows used by intensive farming is also a local goal. The municipality wants to increase the number of pollinator-friendly grasslands and strengthen local identity. Regarding the use of nature-based solutions, the most important issue is to stop regular land erosion along the Dravinja River. It is a sensitive topic: locals have already tried many solutions, for example, initiated the use of willow and woven fences, but due to the strict protection of the natural landscape, they have not got permission from national authorities so far. Perhaps using the opportunities provided by the new common agricultural policy plays a role here, as it, under country-specific conditions, may enable farmers to get compensations when their land is given to non-productive landscape elements, for example providing space for floods temporally. Last, but not least, as an umbrella of all the above activities, in line with the EU Biodiversity Strategy, the municipality would like to create an Urban Greening Plan to systematically integrate urban green infrastructures in urban planning.

Let's have a permaculture garden in all cities helping locals with reconnecting nature

According to the International Union for the Conservation of Nature right now agriculture is the no. 1 threat to biodiversity on the planet – thus using nature-based solutions in agriculture is a high priority to tackle the climate and biodiversity crises.

There is an extraordinary place in the outskirts of Poljčane to support all these plans: at the Dole Self-Reliance Training Ground, visitors can learn about the potential collaboration between humans and nature, based on the principles of permaculture. It is a fantastic place, led by a fantastic university teacher, dr. Ana Vovk. Like all permaculture gardens, it is not (only) about producing food: it is about restoring soil diversity, giving back pride to biodiversity, using water carefully, building the resilience of local economies, and nurturing people's social existence.

According to the Permaculture Research Institute, "*permaculture is the conscious design and maintenance of agriculturally productive*

ecosystems which have the diversity, stability, and resilience of natural ecosystems. It is the harmonious integration of landscape and people — providing their food, energy, shelter, and other material and non-material needs sustainably. Without permanent agriculture, there is no possibility of a stable social order". If our connection to nature, deeply rooted in cultural values, attitudes and norms is key to using nature-based solutions more efficiently to restore habitats and tackle the climate and biodiversity crises, participatory learning in a permaculture garden should be the driver to boost community resilience and increase the adaptive capacity of rural areas.

According to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC, 2014) focusing on rural areas, food security and thus agricultural incomes are also endangered due to the ecological crisis, and it potentially has a significant impact in rural areas. While the climate adaptation efforts of rural settlements are induced by climate change, the need for better adaptation also derives from their loss of resilience factors, such as the so-called traditional knowledge and networks of mutual support, making the population more vulnerable to climate change impacts. Parallelly, the ageing local population having traditional knowledge is often being complemented by newcomer settlers, open to ecological ways of living, yet with less knowledge about natural resources.

The above IPCC report clearly states that traditional knowledge of agriculture and natural resources (the so-called indigenous knowledge), as well as informal institutions for risk-, cost- and benefit sharing, can be an important resilience factor. If something, this should be learnt in Poljčane during the lifetime of the project: referring to soil and food is a great opportunity to nudge people towards a more pro-environmental behaviour.

Education is an upmost priority regarding nature-based solutions (vegetable garden in the local school)

2.6. Sarajevo: Why should all cities have a strategy on blue and green infrastructure?

URBACT features

Did you know? Trees are emblematic in Bosnia and Hercegovina as well as in Sarajevo. Although Perućica in the South of the country is often called "Europe's largest rain forest", officially it is "just" one of the last remaining primeval forests of Europe. As for the capital, although almost all trees were cut down during the Sarajevo Siege, in one park trees were not touched.

Most important local theme: having an overall strategy on blue and green infrastructure (GBI).

Most innovative (potential) local action(s) within a European context: 1. having green infrastructure tools to specifically tackle air pollution; 2. using storytelling about nature to engage citizens to help co-create nature-based solutions).

IAP Coordinator: Mr. Amar Popara, a multi-disciplinary consultant working for the municipality.

Potential IAP focus: nothing decided yet, but a GBI strategy would have the biggest added value for the city. An IAP (or a specific section of an overall strategy) specifically focusing on tools protecting people from air pollution would be also powerful.

Potential resourcing of the IAP: besides the EU through IPA funds, most likely other international development and finance institutions can potentially provide funds for the action plan (e.g. World Bank, EBRD, USAID, UNDP, UNEP, UNIDO or SIDA).

Potential themes for testing actions: transforming the garden of the National Museum with innovative elements such as a therapy garden and using nature-based solutions (e.g. rain garden), made as a community action. Perhaps another garden should be created in parallel in an abandoned green space.

Key ULG members besides the municipality: University of Sarajevo - Faculty of Forestry; ENOVA - a leading multi-disciplinary development consulting company; local representative of the United Nations Development Programme; Green Style Solutions; Municipality of Novo Sarajevo; Centre for Healthy Ageing; SERDA (Sarajevo Economic Region Development Agency); Cantonal Institute for Planning.

Relevance of cross-cutting theme: through rethinking an existing green space accessible to the public, gender equality issues linked to green spaces will be taken into consideration.

The green paradise of the Balkans just
starts next to Sarajevo

A melting pot of cultures and a city of contradictions in terms of nature

Sarajevo (ca. 275.000 inhabitants) is the capital and largest city of Bosnia and Herzegovina, located on the Balkan Peninsula. It is situated in the dramatic valley of the Miljacka River, surrounded by the magnificent Dinaric Alps. Due to its geographical location, Sarajevo historically served as an important cultural and commercial centre, attracting diverse influences from the East and West. This cultural blend is reflected in the architecture, cuisine, and traditions of the city.

The country is often called "the green paradise of the Balkans", where huge mountains are covered by untouched forests, and where otherworldly beautiful rivers make unbelievable canyons and gorges. Indeed, the country is at the crossroads of different biogeographical regions (Mediterranean, Alpine and Continental) and the local flora and fauna are also influenced by the varying altitudes – creating one of the highest biodiversity rates in Europe.

On the one hand, this extraordinarily rich biodiversity is just in the outskirts of Sarajevo, but on the other hand, the early 1990s war in former Yugoslavia led to severe damage to the urban and peri-urban forests of Sarajevo. During the Siege of Sarajevo (April 1992–March 1996), after the energy supplies to the city had been cut off, over three-quarters of all urban trees and nearly all peri-urban trees within the siege line were cut down for firewood by the desperate residents.

"Dear Mimmy! The winter and the power saws have condemned the old trees, shaded walks and parks that made Sarajevo so pretty. I was sad today. I couldn't bear the thought of the trees disappearing from my park. They've been condemned. God, all the things my park has had to go through! The children have left it, Nina, forever, and now the linden, birch and plane trees are leaving it forever too. Sad. I couldn't watch, and I can't write any more" – wrote painfully Zlata Filipović on 25 November 1992 (*Urbicide-Sarajevo: Sarajevo, Une Ville Blessée; Centre Georges Pompidou 1994, pp. 104–105, Association des Architectes*). After the war, the city trees were quickly and effectively replanted.

Today Sarajevo is a vibrant economic and tourist centre, but during wintertime, people often escape from the dense smog by the renovated funicular to the top of the Trebević mountain (where mines were removed years ago), because the city is often on the top of the most polluted cities' world list in terms of air quality, especially in winter. There are still bullet marks on some buildings, and the trauma caused by the war hit everyone, but a lot of developments financed by various international actors occurred in the last decades. In recent years, fast urbanisation and population growth have posed challenges to preserving the amazing natural environment within and around the city, while increased precipitation often causes huge damage in the old town. The wider territory of Sarajevo indeed has great natural assets (e.g. unique karst formations and ecosystems in the Bijambare Nature Park, alpine and subalpine ecosystems in the Jahorina Protected Landscape and Trebević Mountain, unique geological formations and riparian ecosystems in the Rakitnica Canyon, at the Skakavac Waterfall or along the Bosna River), but intensive construction is also happening on the famous "Olympic" mountains at the cost of destroying green areas.

Balancing urbanization with conservation efforts is a crucial topic in Sarajevo, where the city needs to demonstrate that the well-being of both its residents and the surrounding natural habitats can be achieved at the same time. If somewhere in Europe, the connection to nature should be reframed here, in the capital of the "green paradise", where the international atmosphere most likely can support this process efficiently as well as the use of novel approaches such as nature-based solutions.

Great assets and opportunities in Sarajevo to plan powerful nature-based solutions

Besides the magnificent mountains and forests as extraordinary assets in and around Sarajevo providing important habitats for the wildlife and ecosystem services for residents, there are

so many other important factors and strengths in the city paving the way for developing powerful nature-based solutions.

- There is a high-level discussion about green transformation: a group of representatives from all levels of government in Bosnia and Herzegovina, in cooperation with the School of Political Studies of the Council of Europe in Bosnia and Herzegovina (SPS BiH), with the support of the German Society for International Cooperation (GIZ), has established the "Green Club." In addition, Sarajevo is one of the NetZeroCities.
- The municipality has already realised the importance of nature-based solutions and made different initial steps. Sarajevo is for example a partner of the Connecting Nature project, financed by the H2020 Programme. This project provides help for municipalities implementing NbS in terms of measuring the impact of these initiatives on climate change adaptation, health and well-being, social cohesion and sustainable economic development. It also develops a diversity of innovative actions to nurture the start-up and growth of commercial and social enterprises active in producing nature-based solutions and products. The so-called Sarajevo Process, a co-creative arts-based engagement approach was (partly) developed in the city by the Trinity College Dublin and the University of East London.
- The municipality also pays lots of attention to public awareness and engagement in biodiversity conservation and green infrastructure. Educating the public about the importance of protected areas, green spaces, and their role in supporting life can foster a sense of ownership and stewardship. Within a community action, the city established an urban garden with sensory elements (video about the process and the results). Urban farming is also a hot topic in Sarajevo, the 1st one has been already established, providing activities for schools, and there are more ongoing initiatives to create community gardens. Specific events related to biodiversity (bioblitz) have already been organised in Sarajevo.
- Another interesting feature in Sarajevo is the use of the CONSUL DEMOCRACY platform, the "*most complete citizen participation tool for an open, transparent and democratic government*". This can be used during the implementation of the BiodiverCity network as well, for example, to plan an urban green space.
- The Centre for Healthy Ageing is a very active NGO in Sarajevo, providing different outdoor activities for local seniors. One of its great initiatives is the "Doctor of Dead Plants" which can be also beneficial within the BiodiverCity network.
- There is a local plan targeting the cleaning of River Miljacka and improving the urban blue-green infrastructure. The project involves the development and enhancement of blue-green infrastructure elements, such as urban green spaces, riverbank restoration, and sustainable stormwater management. It also includes measures to mitigate flood risks and improve resilience to extreme weather events.
- Tourism is an important sector in Sarajevo, and more and more visitors are also interested in exploring natural areas near the city. This is an important factor in raising not only the awareness of locals but their pride as well.

It is the right moment in Sarajevo to create a powerful GBI strategy

Since the use of nature-based solutions is still an unknown concept in Sarajevo (like many other cities in Europe), but there are a lot of opportunities and potentials for its use, it is high time to systematically plan blue- and green infrastructure and raise awareness. A comprehensive GBI strategy can help the municipality to tackle the already identified needs and weaknesses such as:

- Air pollution is a hot topic in Sarajevo and the use of nature-based solutions can partly solve the issue, or, at least, mitigate its effects. Car-centric traffic planning and large paved surfaces decrease the ratio of biologically active vegetation cover, reducing the natural absorption of pollutants by plants. Air pollution is the largest environmental public health risk globally, causing thousands of premature deaths yearly. Due to its complexity, it needs integrated actions to efficiently reduce air pollution (especially in a city like Sarajevo where one of the components of air pollution is energy poverty), but green screens, hedges and trees along roads can play a role in reducing exposure to poor air quality by creating a barrier between the source of pollution and where pedestrians walk. Research has shown that these types of barriers "can as much as halve the levels of pollutants just behind the barrier".
- The need to develop management plans to fight against invasive species and promote the use of native plants in urban landscaping.
- The need to develop land-use plans that prioritise the protection of remaining natural areas and promote green infrastructure.
- The need to improve the understanding of how to integrate NbS and blue-green infrastructure into urban planning processes, including zoning, development regulations, and infrastructure projects.
- The need to efficiently reduce the damages caused by urban flooding.
- Due to the complex governance structure in Sarajevo, and because many decision-making and jurisdiction for biodiversity lies on the cantonal level, URBACT can provide a "safe place" for planning.
- The need to understand that the maintenance of nature-based solutions is often cheaper than the related costs of grey infrastructure.
- Learn how to engage communities in the planning and implementation of NbS, blue-green infrastructure and urban biodiversity projects (e.g. continuing the community garden project in schools and other neighbourhoods, residential programs to foster the use of NbS in private gardens, organisation of broader bioblitz events, thematic walks organised for locals to raise their attention to natural values).
- Develop skills to design, implement, and manage blue-green infrastructure projects that contribute to urban biodiversity while also addressing stormwater management and climate resilience.

What does a powerful GBI strategy look like?

Within the BiodiverCity network, Limerick (IE) has a comprehensive GBI strategy that will be analysed in detail by all partner cities, because all of them expressed their interest to understand what such a strategy looks like. This is indeed a very well-structured paper to guide the planning and management process of multi-functional green and blue spaces, helping drive the transition to a low-carbon society and forming a cornerstone of sustainable development. It is not a 'must have' paper - it tackles local and global scale challenges, offering multiple economic, social and environmental benefits. It is not limited to traditional green spaces such as parks, it targets all types of green and blue areas such as linear structures, elements of the built environment, privately owned green areas, managed and natural green spaces, as well as aspects of landscaping.

A good GBI strategy explains the benefits or ecosystem services GBI assets can deliver to residents, visitors and the entire ecosystem (linked to both physical and mental well-being). A good GBI strategy always intends to make a corridor connecting green and blue areas and besides the creation of high-quality, attractive, and functional places, it targets the negative impact of habitat loss and climate change at the same time. The evidence base for the multi-functional benefits of GBI is constantly evolving, thus besides the benefits for biodiversity, climate change and health a good GBI strategy always targets benefits for the economy as well. In line with this,

Limerick's GBI strategy focuses on four key challenges and identifies four spaces (overlapping each other):

1. Health Challenge - Improving health and well-being outcomes – creation of 'Healthy Spaces'
2. Climate Challenge - Climate adaptation – creation of 'Resilient Spaces'
3. Biodiversity Challenge - Ecological improvements –creation of 'Wilder Spaces'
4. Economic Challenge - Recreation, income generation and regeneration – the creation of 'Destination Spaces'.

Its 10 priority actions highlight well the core themes behind green and blue infrastructure or nature-based solutions.

- Embed GBI in the implementation of public and private projects.
- Enhance existing open space provision within the area.
- Create new formal parks and natural & seminatural parks to improve accessibility for a growing population.
- Protect, value and enhance amenity green space by applying an appropriate management approach.
- Enhance, protect and develop the network of blue-ways.
- Integrate GBI in the delivery of the network of active travel routes.
- Enhance recreational access to the local river and tributaries.
- Develop Tree and Biodiversity Strategies for the area.
- Promote community engagement and raise public awareness in the development of GBI.
- Incorporate smart mechanisms of connecting GBI initiatives with the public.

"Biodiversity is indeed incredibly rich in Sarajevo, but local people simply do not know it" - says Senada Dizdar, the head of the Department for Communal and Housing Affairs at the City of Sarajevo. But it is not only about awareness-raising, nature is also our best ally to combat climate change and biodiversity loss. For this understanding, a city-level strategy is needed.

2.7. Siena: Using Renaissance Ecology to transform local identity and boost eco-localism

URBACT features

Did you know? The Province of Siena is the first, ISO (14064-1) certified carbon-neutral province in Europe.

How green is it? The urban area within the medieval walls is 60% built with ancient and refurbished buildings, while 40% is covered by green areas.

Most important local theme: creating a green corridor and planning nature-based solutions.

Most innovative local action(s) within a European context: organisation of bioblitz events and systematic support for community gardens.

IAP Coordinator: Mr Iuri Bruni, head of the culture and tourism department at the municipality. His long experience in project management, expertise in social issues and sensitivity to sustainability allows him to implement this network by using innovative participative processes including pioneering legal assets.

Potential IAP focus: having a new document focusing on nature-based solutions, perhaps restricted in some areas, or an action plan focusing on awareness raising related to ecosystem services including a new local regulation related to the maintenance of green areas with an approach on biodiversity.

Potential resourcing of the IAP: besides the municipal budget and ERDF funds, the very active municipality might attract other, transnational funds too (e.g. LIFE, EUI), also through the Italian NbS Hub.

Potential themes for testing actions: most likely a community action continuing the biodiversity-related work started years ago, or perhaps a promotion event linked to the biodiversity menu.

Key ULG members besides the municipality: WWF Siena, Association Le Mura, Association La Diana, Legambiente Siena, Orto de' Pecci, MUSNAF, Magistrato Contrade, Università di Siena, Museo della Biodiversità, URBiNAT.

Relevance of cross-cutting theme: due to its strong scientific connections, using digital tools to create indicators, for example, linked to the City Biodiversity Index.

Siena: full of history, full of nature

The city of Renaissance ecology

Siena's (approx. 52.000 inhabitants) UNESCO-protected city centre is a globally known embodiment of a medieval city. „*The whole city of Siena, built around the Piazza del Campo, was devised as a work of art that blends into the surrounding landscape*" – says the UNESCO website and indeed, thousands of tourists roll along the medieval streets most of the year. Yet, few of them recognise the five green valleys radially approaching, almost touching the very dense historic centre built on a plateau. These valleys bring countryside just next to the main square.

The world-famous Palio is the clear symbol of Sienese identity: during this unbelievable horse race at the Piazza del Campo, the various Sienese "Contrade", areas in which the city is divided, challenge each other. Originally, there were about fifty-nine "Contrade", now only seventeen remain, ten of which take part in the historical pageant and the race at each Palio. The Palio is much more than a simple event for the Sienese, it is a large part of their lives since the time of their birth. Each person belongs to a Contrada and participates actively in its life (meetings, community actions, joint dinners), therefore many families still live in the historic city centre suffering from over-tourism.

There is a world-famous fresco in the iconic building of Piazza del Campo, in the Palazzo Pubblico: The Allegory of Good Government was painted by Lorenzetti in 1338 and it draws attention to the interactions between climate, biodiversity, land use, social sciences and economic models, describing for example how urban and rural areas should live together in harmony. Nowadays there is a huge literature about the so-called Renaissance Ecology. A French expert, Julien Dossier even prepared a contemporary version of the fresco and designed 24 projects exploring this knowledge hidden in the fresco. The trendy expression of Renaissance Ecology refers to eco-localism, described by ecologists decades ago, and indeed, looking around from Piazza Mercato, just behind Palazzo Pubblico, the view is unique: one of the five valleys, the Orto dei Pecci (Pecci's Garden) with its natural assets starts right there. It is like a memento of the history: the medieval town is still connected to the countryside.

From valley to valley: extraordinary natural assets within the world-famous city walls

Due to the city's special heritage status, the urban plan of the city forbids any new construction within the historic walls, thus preservation of the existing green areas (including the five valleys) is given. When Siena was a city-state, self-reliance was essential for inhabitants, therefore food production was also provided (partly) within the walls. Centuries later, typically small gardens operated in the valleys and miraculously, the city has never been built in these 5 valleys during history, especially after WWII. A hospital dedicated to mental illness used the Pecci's Garden for decades and when in 1983 it moved out, a social co-operative started to operate here, providing nature therapy. Today this organisation cultivates the garden (incl. a medieval one) located in the valley, partly because it also operates a local restaurant, providing job opportunities for disadvantaged people.

One part of the next valley, the Ravacciano Valley gives home to the Busseto Woods: a secondary vegetation that grew when locals stopped agriculture here in the 1960's. A few years ago local volunteers coordinated by WWF Siena and Legambiente Siena cleaned the forest up and the plan is to make Busseto Woods into an open-air classroom, with local greenways, a nursery of endemic species, etc. It is an ongoing process, and many other activities are running here. In 2022 for example, the city joined the global City Nature Challenge and local activity was organised in this valley (bioblitz events were also organised in other areas). One of Siena's core strengths regarding urban biodiversity, and green and blue infrastructure is its broad experience in organising bioblitz events.

The Ravacciano neighbourhood including the bottom of the valley is the target area of the H2020 project URBiNAT. The whole neighbourhood was (and still is) involved in co-design nature-based solutions in the area, therefore the valley is (will be) the home of several projects focusing on nature. Some

pioneer initiatives have already taken place such as the small wooden house with a separate beehive, providing apitherapy and an urban community garden. One of the main goals of the municipality is to connect neighbourhoods through the creation of pedestrian and cycling routes, forming a basis for a wider green corridor in the future.

As for community gardens: having 5 within the city and 80 (!) in the Province of Siena, this is also a clear strength of the city (which was among the first Italian cities to adopt the Cities of Commons approach from Bologna). It is also worth mentioning that due to its experience with URBiNAT, Siena is one of the founding partners of the Italian Hub for Nature-Based Solutions led by the National Council for Research. This clearly shows the political commitment of the city towards the use of nature-based solutions, however, the municipality has not created a local strategy dedicated to this theme yet.

Another - very visible - strength of Siena regarding urban biodiversity is its broad cooperation with stakeholders. One of the key actors is Museo di Storia Naturale (Accademia dei Fisiocritici). It hosts an important collection regarding nature and natural history, and it is very active in organising several educational initiatives. Another core player is the University of Siena which has different departments engaged in biodiversity and one of these maintains the beautiful Orto Botanico (Botanical Garden), located in another valley. Museo di Storia Naturale is monitoring the urban biodiversity of Siena through citizen science projects, bioblitz and other events: so far, it has collected more than 5000 observations and documented the presence of more than 1300 different species, including rare and protected ones.

Last, but not least, we must talk about another unbelievable, partly invisible natural asset of Siena: the "Bottini" water. Bottini is a net of tunnels under the historic city channelling water from the mountains under the ground to provide water for the city (contributing to self-reliance in medieval times). In modern times the drinking water supply is based on other sources, and the Bottini water feeds historical fountains, and then leaves the city silently, for example in the green valleys. Although there is a relatively new museum dedicated to the Bottini, the Association La Diana organises visits, there are school programs and some community gardens, as well as the botanical garden, use this resource, the general use of the Bottini is under debate, because it is underused or even wasted, and there are much more potentials to use it, especially in times of climate emergency (e.g. cleaning streets).

In other valleys there are some, small-scale agriculture, mainly operated by contrade, some of them are abandoned, but one thing is sure: based on this great asset, more and more activities were born in the last years and the municipality is also very active. For example, Association Le Mura organises visits to the green valleys around the city walls, regularly organises cleaning actions, and has launched several interesting projects (e. "the beer of the walls"). The idea of urban trekking – that is to bring people to walk itineraries designed by guides, on the same day and throughout Italy – was born in 2006 in Siena. And for 17 years it has been renewed with a program created in a participatory way throughout Italy. URBACT C-Change project was dedicated to raising awareness on climate change adaptation and mitigation, while ConVerSi is about the regeneration of the green valleys, accompanied by a participatory process.

Having a strong and positive narrative of green transition including urban biodiversity, green- and blue infrastructure and nature-based solutions, one crucial question has come out: how to capitalise more or better on Siena's great green assets and how to move forward?

Creating a Biodiversity Menu - challenges for Siena

"Yes, we have a strategic focus on urban biodiversity, we work a lot together with the Museum Museo di Storia Naturale and other stakeholders, but perhaps we should better build on the very strong local identity provided by the famous "Contrade" since self-reliance and localism were significant parts of this famous Siena identity" – says Marcello Sacco, local project coordinator.

Like many other cities across Europe, a contemporary challenge is to have a complex strategy related to nature-based solutions

including blue and green infrastructure, since nature-based solutions mean a new concept in this way, and secondly, the consolidation of the concept among technicians and across municipal departments is also a key step. This is fully in line with the other, already set goals of the city, like the creation of green corridors crossing the green valleys and thus connecting neighbourhoods to the centre.

Despite broad communication and awareness-raising activities organised by the municipality or stakeholders, the lack of communication is still a weakness, underlines Barbara Magi, the vice mayor responsible for environmental issues, mentioning for example adults or elderly, or more positive communication about the green transformation. *"As far as ecosystem services are concerned, for example, several initiatives touched them, but perhaps we need a coordinated plan, especially regarding community-based approaches to valorise/measure ecosystem services, and regarding this BiodiverCity might be a driving force. And do not forget food, we are in Italy: for example, creating a biodiversity menu in Pecci's Garden would be a great attraction, not only for tourists. However, there is a big question: can we serve coffee on such a menu? – this is already commented on by Marcello, underlying core questions to further work on this "localism menu".*

Even though the museum had various initiatives (e.g. creating seed bombs during educational events, building insect hotels) regarding pollinators, the elaboration of a pollinator-friendly concept - many cities across Europe experimenting with – is still an ongoing process in Siena, which also takes part in the national network of bee-friendly municipalities. Even Ljubljana's dedicated pollinator track can be realistic in such a touristic city. Siena is also the city of walls, and although there are strict regulations regarding cultural heritage, clearly there is a potential to promote green walls. And last, but not least, having such a great movement on community gardens, the biodiversity of soil can be something to focus on in the future.

The ultimate goal is green transition, and nudging residents to be greener. Siena's green assets provide an excellent learning facility to do that. Just focusing on the green valleys, novel nature-based solutions and awareness-raising activities highlighting ecosystem services, and also building on Siena' innovative character, the key question is how to promote eco-localism, how to empower the local identity through Renaissance ecology and reactivate self-sustainability?

The Pecci's Garden starts a few steps from the main square

2.8. 's-Hertogenbosch: Create a stage to tell the story of climate action through rewilding an area!

URBACT features

Did you know? The city's name is a contraction of the Dutch “des Hertogenbosch”, meaning "the duke’s forest. Nomen est omen....

Most important local theme: creating a community along an (urban) rewilding process.

Most innovative potential action(s) within a European context: the creation of a place demonstrating all kinds of nature-based solutions (“landscape laboratories”).

IAP Coordinator: Raven Valentijn, an environmental policy employee with an MSc in urban environmental management, supported by Rob Brinkhof, city ecologist with 32 years of experience, an ambassador of green and healthy city/ environment.

Potential IAP focus: creating a community along a rewilding process.

Potential resourcing of the IAP: besides the funds already available with the Water Board, the action plan will tackle mainly the municipal budget, and perhaps some actions might attract transnational funds too (e.g. LIFE

Potential themes for testing actions: different methods for engaging communities within the local context.

Key ULG members besides the environmental department of the Municipality of 's-Hertogenbosch: Water Board Aa and Maas, the Ministry of Defence (because of the cultural heritage of Fort Crèvecoeur) and the national agency responsible for taking care of motorways and waterways (Rijkswaterstaat) as national organisations, groups of residents from the neighbouring areas, representatives of local schools and universities, local and national NGOs like Free Nature Foundation, Natuurmonumenten (managing Defence Crevecoeur) and The Weather Makers (restoring water cycles).

Relevance of cross-cutting theme: using digital tools to support the engagement and awareness-raising actions.

Water was used as a weapon in Den Bosch – what about using nature-based solutions the same way?

Nature as a weapon

Water always had a special role in the history of 's-Hertogenbosch (ca. 159.000 inhabitants). Well, it is perhaps not a surprise in the Netherlands and North Brabant, but Den Bosch – as often called - was founded as a fortified city and its defence was based on the use of water as a weapon. Den Bosch, where river Aa and Dommel meet in the city centre, and they jointly continue as De Dieze ending up in Maas just at the outskirts of the city, is a member of the Zuiderwaterlinie, a unique chain of historic fortified towns and their surroundings, connected by the typical Dutch story of defending with water. It is the oldest, longest, and most used waterline in the Netherlands.

By filling in the canals, removing or modifying some of the ramparts and redeveloping historic neighbourhoods, plans were made after WWII to modernise the old city, but finally, the central government declared the city as a protected townscape. In 2004 Den Bosch was awarded the European Fortress City of the Year, and it indeed hides some cultural-architectural gems, like the oldest remaining brick house in the Netherlands or the hexagonal gunpowder armoury, the Kruithuis.

But south of the old town, just a few hundred meters from the main square, the scenery tells a story not only about Den Bosch's unique history but about all cities' future. The old city of 's-Hertogenbosch is still almost surrounded by ramparts and on the south side, the wall directly meets an old polder. This is the wetland of Bossche Broek, a restored nature reserve providing habitats for many important species, and ecosystem services for urban dwellers. Once it was artificially flooded by the city governors when enemies appeared, now you can enjoy the unique view of the Brabantine Gothic design of the magnificent Saint John's Cathedral in the middle of a wildflower meadow. It does look like a time travel back to the years of Hieronymus Bosch when nature was used as a weapon – something we should urgently use again to combat the ecological crisis,

Rewilding an area in the city?

In line with the Nature Restoration Law and the EU Biodiversity Strategy for 2030, Member States are to ensure that there is no net loss in the total national area of urban green space, and in general, there is a strong emphasis on enlarging protected areas and restoring habitats. The city of Den Bosch takes this requirement seriously and intends to rewild and transform an area, the so-called Diezemonding River Park. The goal is to create a coherent, contiguous and integrally managed nature area.
This rugged, swampy area - traditionally known as the Ertveld polder - can be found near the city centre, between Orthen and the A59 motorway. This is a mosaic of open water bodies, marshes, forests, grasslands, and dykes. Originally the area was used as an inner-dike overflow area that prevented the dikes from overflowing. Until 2008 it was a public space without any obligations, even plans for industry could be realistic at that time. The area had no identity, but now, in line with the Green Delta Strategy (a key urban strategy aiming to connect green areas to create a corridor, including 500 ha of new nature around the city), the municipality has a clear ambition: through rewilding the area this will be a coherent part of the "green lung" of the city. In 2015 a crossing side channel was constructed, and smaller, less active farms were bought by the municipality. The area is accessible to visitors, but mainly some dykes are used frequently by walkers.

At the start of the rewilding process, Free Nature, a local branch of Rewilding Europe graze 36 hectares with cattle and horses (usually about 15-20 animals in total). Low-intensity grazing by herbivorous animals is critical to the functionality and resilience of grasslands, enhancing biodiversity and preventing encroachment by shrubs. Grazers are the architects of the area, but this story is not only about grazing, experiencing nature and environmental education activities often taking place here. The permanent staff of the organisation and the volunteers keep contact with residents who are the "ears and eyes" of

the area, and their control increases ownership and helps keep the area clean.

A joint project between Water Board Aa and Maas and the Municipality of Den Bosch will be realised to create an “island structure” in Ertveld polder, strengthening its water retention capacities (while the dykes will be and must be heightened, in line with the national rules). Although education is not among the core tasks of the water board, its leadership, together with the municipality share the vision that awareness-raising about water safety, water quality, and historical and ecological values should play a key role during the interventions targeting water retention.

The big question for the municipality is how to involve local communities in this process, and how to create long-lasting communities along these goals while rewilding the area. Especially here, where the neighbourhoods are fragmented from each other by a motorway and various water bodies. Some civic initiatives have already appeared, like the flower-picking garden, but is it the municipality's role to organise and create collective ownership around the landscape park? Can it be only one organisation responsible for the preservation and development of the natural, cultural-historical, social and cultural qualities, developments and activities of the landscape park or can ownership be somehow shared?

It is an excellent place to raise awareness towards climate actions

„Create a stage to tell the story of climate actions” – says Frank Bouwens from Water Board Aa and Maas, and it seems a core sentence regarding the future of the area, since in general, there is a huge need to demonstrate unknown and undervalued nature-based solutions that – according to the International Union for the Conservation of Nature - might achieve one-third of climate mitigation goals of the Paris Agreement, they are often cheaper in urban infrastructure than grey infrastructure, but yet, they received just 0.3% of overall spending on urban infrastructure in 2021 globally – as World Economic Forum stated.

Ertveld Polder is an important area for water management because more and more floods on the Maas swells water up into Dieze, thus extra natural water retention capacity is needed (helping also to meet the goals of the Water Framework Directive and providing enough water for the fish ladder next to the dam, which struggles these years with the lack of water capacity in summertime).

Imke Mulders from the Department of Spatial Planning highlights that water retention is so important that every aspect of the sponge city concept should be highlighted, and when she is talking about the national importance of soil quality and water management, and that farms should use more ecological ways of cultivation, the idea came up in my mind that besides water retention, it also could be demonstrated in Diezemonding River Park how farms could use nature-based solutions in the Netherlands, addressing new target groups potentially interested in the maintenance of the area.

In connection with the municipality’s main idea and core questions regarding how to build communities, Jur Jacobs from the department responsible for art and communities recommends focusing on smaller communities instead of one big community, having a clear purpose per each community. He also emphasises that rewarding these local communities might be crucial: ownership, reflection on the connection to nature and ethnoecology (“green-place-making”) will be key to targeting and keeping artistic groups. “*It is important to include an educational component from the very start of the process”*.

Many more actors already exist in and around the area and their interests can be activated – this fact also underlines the possibility to create a community along the rewilding process and share ownership and maintenance with smaller groups instead of creating a single organisation responsible for the area.

For example, as cultural heritage is an important factor in the city and there are abandoned fortifications in the target area, archaeology might play a role in the future of the area as well. This can be through the involvement of university students to do their research here (e.g. integrating local data into 3D models), or exploring “natural history” linked to the area (oral history), which is, by the way, also strong in Den Bosch (plenty of different guided audio tours operate in the city, developed by volunteers and enthusiasts). And some businesses can also be interested in the area. Heineken for example uses the water from the area and a lunch walk is a popular custom in the Netherlands – for example, a local company built a small, muscle-powered

ferry next to the cathedral, enabling officers to have a walk in nature during lunch break. Something similar can be created here as well. Companies can be involved to do something in return and test new ways to raise income or reduce costs for public areas (see for instance how maintenance of public parks was rethought after the COVID-19 pandemic in the UK).

Last, but not least, Carine van Bost, the "Bestuursraad" of Engelen and Bokhoven neighbourhoods (a local representative elected by the residents of the neighbourhoods, being responsible for creating a bridge between residents and the municipal council and identifying problems and resolving conflicts) dreams for example about a food forest (it is a popular theme in the Netherlands), and there is also enthusiasm from the Haverleij residential area to become active in the Diezemonding River Park.

Landscape Laboratories: demonstration area(s) of nature-based solutions

If natural water retention is needed here, if it is an excellent place to raise awareness towards climate actions, and there are common interests in jointly shaping the future of the area, it is perhaps useful to create a "landscape laboratory" and demonstrate all kinds of nature-based solutions. Once upon a time, there was a mosaic alluvial landscape in the Netherlands where people used to live together with nature in harmony. This landscape as well as the harmony has been almost completely changed and lost, and the ecological crisis pushes our civilisation to give some nature back now and utilise ecosystem services nature provides. Therefore, there is a huge potential for nature-based solutions and there is a strong need to raise awareness towards NbS and change the mindsets of residents.

Since there are forests in Ertveld Polder, through rewilding the area the city perhaps should tell the story of and showcase how natural forests work: explain how wilderness looked like in the past, how ecological forestry (e.g. continuous tree cover) as a nature-based solution works and what ecosystem services such a forest provide in comparison with plantations. Such an area can also highlight the benefits of urban trees, the importance of endemic species and the risk of the expansion of invasive species. Grazing already exists in the area too, so the city perhaps should tell the story of and showcase often undervalued grasslands as well, explain their ecosystem services and the benefits of natural grazing as well as urban wildflower meadows. Increased water retention should be a part of the story too, so the city perhaps should also tell the story of and showcase natural water retention and explain ecosystem services wetlands provide here and on national and global levels.

Since agriculture was part of the history of the area and it is an important topic on the national level too, why not tell the story of and showcase agroforestry as a nature-based solution (hedgerows, riparian buffer strips, silvoarable and silvopastoral agroforestry), why not to explain the importance of soil biodiversity? Last, but not least, besides these natural or semi-natural habitats, other „artificial" ecosystems to be maintained by different groups of locals such as orchards, permaculture gardens, natural playgrounds, orientation forests, therapy forests and community gardens could tell the story of co-production...

In addition, strengthening the educational character of the area, a small building made of hempcrete or hay could function as a local "green office" or educational centre, helping visitors to move forward towards pro-environmental behaviour in all aspects of everyday life and use nature-based solutions as weapons.

2.9. Veszprém: It is not neglected, it is biodiverse - the shift to climate-adaptive management of urban grasslands

URBACT features

Did you know? Veszprém was the European Capital of Culture in 2023 together with its hinterland (Veszprém-Balaton-Bakony region), highlighting the city's integral connection to surrounding landscapes.

Most important local theme: having an integrated water management (retention) plan.

Most innovative local action within a European context: climate-adaptive management of urban grasslands.

IAP Coordinator: Ms Anna Knauer and Ms Renata Kiss, project coordinators of the municipal strategy department. Anna is a former colleague of the Balaton Upland National Park Directorate, Renata has background in natural sciences and worked for various environmental NGOs in the past.

Potential IAP focus: most likely it will be related to blue infrastructure and awareness-raising.

Potential resourcing of the IAP: besides the municipal budget and ERDF funds, the municipality is also active in getting other funds (e.g. LIFE).

Potential themes for testing actions: establishment of a Miyawaki forest.

Key ULG members besides the municipality: University of Pannonia, Hungarian University of Agriculture and Life Sciences, Public Utility Company (VKSz), Balaton Upland National Park Directorate, Bakony-Balaton UNESCO Geopark, Veszprem 2030 Development Ltd, environmental (e.g. Csalán Association, Bakony-Balaton Environmental Educational Centre) and residential NGOs (e.g. local zero-waste shop), local water directorate, a local landscape architect, local forestry, Chamber of Agriculture.

Relevance of cross-cutting theme: the University of Pannonia is very strong in geoinformatics, thus a potential theme is how to use digitalisation to support the elaboration of an integrated water management (retention) plan.

Great view, great opportunities (Veszprém Castle)

The City of Arboretums

Located on the hills and valleys surrounding the Séd stream, the "City of Queens" (ca. 56.000 inhabitants), as it is often called due to its role in Hungarian history, is *"also known as the 'City of Arboretums' since high number of rare tree species have been planted in public areas, species that are usually found only in arboretums, and we are also very proud of the fact that the city has undergone very significant park renovations in the last decades. Not only in prominent places like here, just next to the castle, but also in a huge, prefabricated housing estate for example"* - says Ms Mária Brányi, vice mayor and landscape architect, when showing the results of the award-winning Monasteries and Gardens project (a nature-oriented recreational space in the valley of Séd behind the castle).

Veszprém is located between the famous Lake Balaton and the karst area of Bakony Hills, its territory is both part of the Bakony-Balaton UNESCO Geopark and the Balaton-upland National Park. It is thus not a surprise that we can find significant NATURA 2000 sites (e.g. Csatár-hegy és Miklós Pál-hegy, Kádártai dolomitmezők, Papod and Miklád) within its territory, home of important habitats such as beech forests, mixed karstic woods, dolomite rock grasslands and rock grass slope steppes, while other, in some cases not protected urban green areas have cultural, townscape and historical value. The green spaces are relatively well-dense and fragment in the city, a public park or garden is within walking distance of 500 metres from any residential area.

The municipality has systematically embedded the development of these unique assets into the key strategic documents of the city and it has been working on increasing its own knowledge regarding the development of blue- and green infrastructure through the participation of knowledge transfer networks. The Sustainable Urban Development Strategy 2021-2027 for example promotes biodiversity conservation projects that promote climate-adaptive urban development (protect or restore natural ecosystems by greening brownfield sites in the city, increasing the proportion of green spaces in general, creating small-scale nature reserves), thus contributing to atmospheric carbon sequestration, mitigating the impact of heat islands and maintaining the presence of important local species such as birds and pollinators. It also highlights the importance of awareness-raising and states that citizen science can also be achieved through playful data collection activities. The city also has a specific Green Surface Strategy and participated in the URBACT network Global Goals for Cities. Both promote activities being in line with the goals of the BiodiverCity network, such as the establishment of (Miyawaki) micro-forests, which can effectively increase both local climatic conditions and biodiversity, at suitable locations - e.g. inside roundabouts - throughout Veszprém, awareness raising among the employees and citizens, and climate-adaptive grassland management and promotion of water retention and sustainable water management.

This latter is an especially important aspect as the city has no dedicated blue-green infrastructure strategy and existing strategies neither tackle nature-based solutions as such, while these themes are crucial due to the city's geographical conditions (steep surfaces and location on open karst) as well as the climate change. Increasing sustainability, biodiversity and climate protection while retaining rainfall (prioritising water-sensitive design and maintenance, using permeable pavements) and the protection of Veszprém's unique and sensitive water resources are among of the city's well-described priorities. It is foreseen that the main challenge for the future due to climate change will be the duality of flash floods and lack of rainfalls. According to the Global Goals for Cities strategic missions: *"By 2030, Veszprém, while preserving its natural and built heritage, will significantly increase its water retention capacity, and further improve the quality and functions of green spaces, involving urban communities in planning, decision-making, implementation and maintenance to improve the sense of belonging and quality of life of its inhabitants"*.

Wow, do you really live here? - climate-adaptive management of urban grasslands

The municipality and its public utility company (VKSz) responsible for the management of green areas (among others) take sustainability as a key organising principle in general, but climate-adaptive management of urban grasslands seems a flagship project on the

national level. It started in 2015 when the company was lagging behind the set plans regarding lawing the mown in the city due to heavy precipitation in springtime. Even though the municipality received lots of complaints because of the "abandoned" mown, it was an opportunity to rethink the way how they maintain urban grasslands, especially those huge green areas between houses that are simply not used by residents.

The city cooperated with the Hungarian University of Agriculture and Life Sciences and established pilot areas to measure the vegetation growth without lawing it, and it was also a great opportunity to raise awareness and explain that these areas are not neglected, but good for the city because it attracts pollinators and temperate the microclimate.

Today the municipality cultivates ca. 5000 nm2 across the city in this way, having special attention to prefabricated housing estates. The new management method consists of other biodiversity-driven maintenance techniques like leaving leaves in dedicated spots to provide a wintering area for hedgehogs and insects. The success of the initiative is proven by the fact that now residents themselves ask the municipality to establish wildflower meadows in their neighbourhood too...

This is a big issue, as in Hungary, the so-called English mown (which is not sustainable without daily watering in the country's continental climate) is a strong status symbol. Although communication was a key aspect from the very beginning of the initiative and there is a puffer line next to the pedestrian area communicating that the area was not neglected and they always place information boards too, the municipality received lots of complaints in the beginning. After 2-3 years of massive communication (incl. educational activities during events like the Fenntarthatóság MindenKOR - Sustainability Always, the Wildflower Picnic, or activities directly organised in schools) public aversion has disappeared. Now it is not necessary to place signboards at all. *"There was a public Facebook post from a non-resident, next to a picture about a local urban wildflower meadow, asking locals whether they really live in such a cool place, such a great city. That post was unexpectedly popular, it went viral in Hungary, and it was a clear tipping point locally"* – says Tamás Köller, a project manager of the public utility company.

The emerging initiative has some important cornerstones. Some seeds of native species can be easily collected from a local biologist for example. The seed are also harvested in the neighbouring meadows of Bakony Hills from where not only the seeds but the whole cutting is spread out in the urban parks. Without such opportunities, the rewilding process is obviously slower. The planned internal training for technical workers is also crucial and the company must constantly update its reaping plans according to the weather conditions of the given year. Nevertheless, the company calculates ca. 20% savings by using this sustainable method. Besides enlarging the area and using other biodiversity-driven park management methods (bird-friendly parks, keeping biomass on the spot as mulch, etc.), the main goal of the municipality now is to create a light infrastructure for an environmental education point.

"The public green area is the garden of prefabricated housing estates"

Said by Mr Balázs Temesvári, the director of VKSz. According to him, it is also about tactical urbanism. Great policies can be built on those small actions that can have a cascading effect. *"We built for example on the Virágos Veszprém (flowering Veszprém) movement running very successfully from 2002. This is a **European-wide initiative**, and it is a great asset to include biodiversity aspects".* The above motto explains very well the role of ownership when bringing nature back to the city. This approach is a key organising principle among the strategic goals of the city:

- Change the thinking of inhabitants about public and private green areas (tapping on tactical urbanism like a contest of climate-adaptive balcony plants).
- Support the presence of pollinators in the city.
- Creating ecological corridors.
- Keep planting in green areas in a climate-adaptive way (e.g. Gyárkert, Cholnoky Park, incl. community planning and planting).

- Embedding private funds to support small-scale green areas and community gardens.
- Development of the edible forest concept (e.g. drafting a feasibility study, preparation of a model site) and in line with this, exploring and testing the microforest concept.
- Having a new regulation on tree planting.
- Creating new types of biodiverse green spaces (e.g. green walls, roofs, schoolyards, industrial, private and institutional premises, community gardens).
- Enhancing sustainable management of urban water use for green and blue spaces.
- Revitalisation of the banks of the Séd brook: a channelised watercourse could be transformed into a wetland and seasonal floodplains.
- Planting climate-resistant species (e.g. the conifer population is to be replaced as it is not able to adapt to the effects of climate change).
- Revision of the existing Green Surface Strategy.
- Strengthening green thinking and SDG-based planning, implementing and monitoring - within our staff and our stakeholders.
- Measuring urban biodiversity.
- Fighting against invasive alien species.
- Having awareness-raising actions, especially linked to existing assets like the 3 deep-mulch gardens (permaculture) of the city, operated by a local NGO.
- Having targeted residential programs to increase the biodiversity of the privately owned green areas (from community composting to water retention).
- Having an integrated water management plan, reflecting on e.g. awareness raising on stormwater retention, encouraging rainwater harvesting, flash flood hazard prevention, rain gardens, outdoor erosion control, and soil conservation.
- Establishing a light infrastructure (i.e. a “Green Point”) in public areas to raise awareness.

If residents feel that the public green area is their garden, that stimulates identity and community spirit. People care and value public spaces better when they have knowledge, emotional connection and responsibility. Ownership of public places creates responsible citizens and responsible citizens take care of their environment. Taking care of our environment transforms cities. Hopefully the European Capital of Culture 2023 created a great momentum to follow this track!

Few cities have deep mulch gardens in Hungary...

2.10. Vratsa: Nature-based solutions as financially viable opportunities for infrastructure development

URBACT features

Did you know? Vratsa is the gate to the Vrachanski Balkan Nature Park, a less-known mountainous, protected area of the country. Vratsata Pass, a magnificent gorge with amazing cliffs is just next to the main square. Vrachanski Balkan includes very important and biodiversity-rich habitats, with lots of endemic species.

Most innovative local theme within a European context: NbS as financially viable opportunities for infrastructure development.

IAP Coordinator: Nikolina Tsenova, Junior Expert, Program and Projects Department in the Municipality of Vratsa. She is ambitious, expressive, demanding, communicative and a team worker with a great social network. She is good at engaging and motivating people.

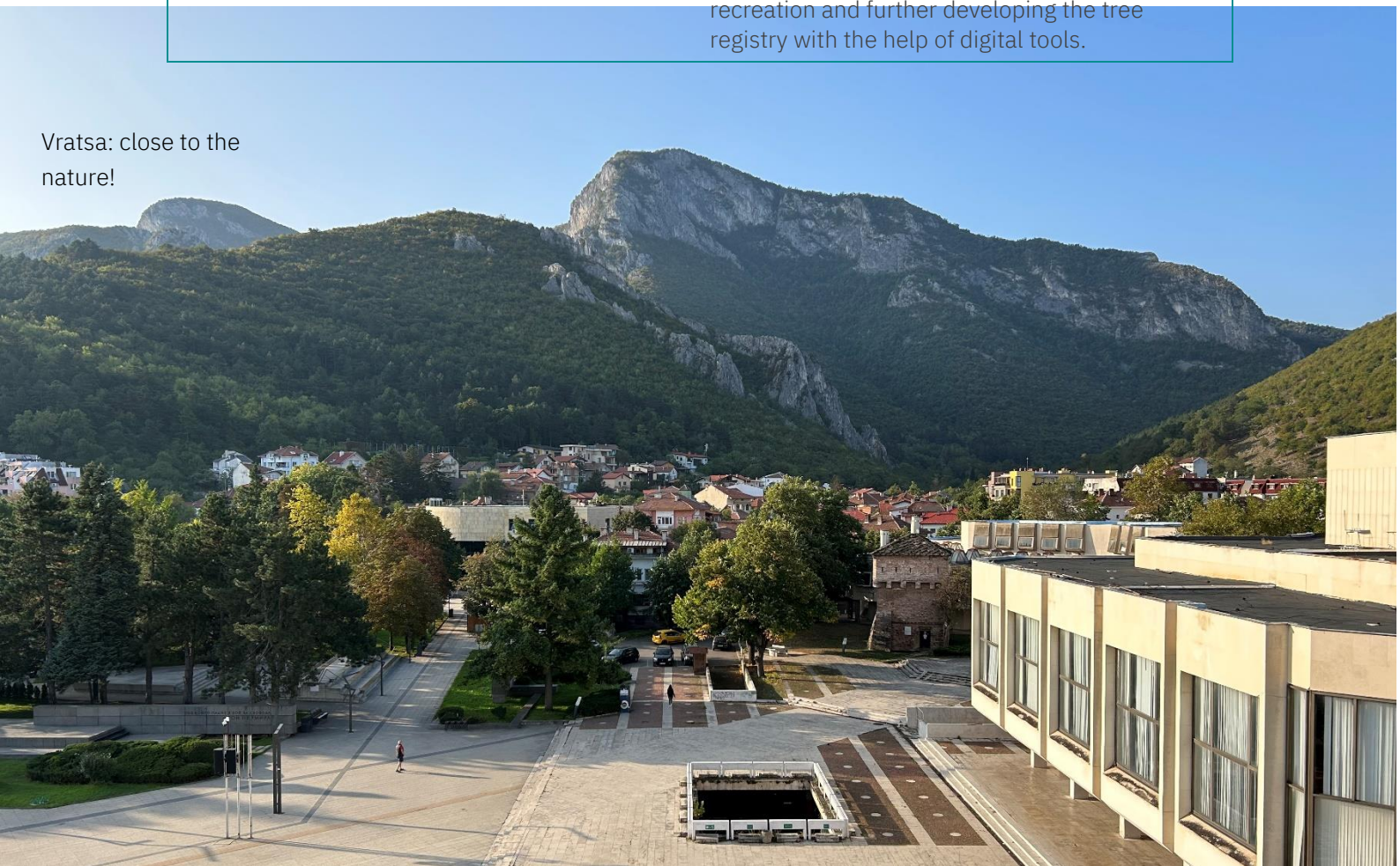
Potential IAP focus: it has not been decided yet, but focusing on NbS in planned investments would have an added value.

Potential resourcing of the IAP: mostly EU funding through the Environment Programme 2021-2027, the Regional Development Programme 2021-2027, the Recovery Plan, and partly relevant CBC programmes. As the municipality made steps to activate business organizations through CSR, private funds might apply too.

Potential themes for testing actions: installing green roofs or walls; organisation of a bioblitz event; plantation of native saplings.

Key ULG members besides the municipality: Vrachanski Balkan National Park, Ekoproekt, the public utility company (BKS), NGOs in the field of environment protection, education, entrepreneurship and social innovation, the Youth Center, the regional economic development agency, local businesses, the local branch of chamber of commerce.

Relevance of cross-cutting theme: security in public spaces through the construction and development of urban areas for leisure and recreation and further developing the tree registry with the help of digital tools.



Vratsa: close to the nature!

A hidden gem of the Balkans

It is not easy to mind your steps when walking in the pedestrian area (Nikola Voyvodov Street) of the Bulgarian city of Vratsa (approx. 75 000 inhabitants, covering the city and 22 settlements nearby), because the magnificent rock formations of the Vrachanski Balkan Nature Park attract our eyes almost everywhere. This – let's say - average Bulgarian city is rightfully proud of its extraordinary natural assets outside of the urbanised area as well as of its (partly) rehabilitated city centre. Residents, sitting on the new benches or walking on the new surface indeed enjoy the renewed area, where nice trees stand separately, surrounded by clean mown, and more importantly, my impression is that there are no abandoned shops. A few hundred metres away the scenery suddenly changes: the first phase of the renewal stopped here, and from that point until the train station everything (pavement, street furniture, shop design, green infrastructure) is the legacy of Socialist times.

Vratsa is located in one of the poorest regions of the EU, the Northwestern Region of Bulgaria, 109 km north of Sofia airport. Being one of the less developed European regions, the proactive and progressive city leadership has already started to implement big infrastructural developments, just like the continuation of the renewal of the city centre along the main pedestrian street and many more (e.g. construction of an adrenaline park, renovation of the chairlift, creation of an industrial park, creation of a multifunctional sports hall, establishment of the Stadium Park, a huge, new green area).

Most likely hundreds of square meters of green areas will be installed and lots of buildings will be built as part of the development projects. It is an ideal situation to efficiently install dozens of green walls and green rooftops, use biodiverse park maintenance and climate adaptive grassland management widely, and create lots of urban wildflower meadows, rain gardens and other Sustainable Drainage Systems.

Although the concept of nature-based solutions is new in Vratsa (like everywhere else), and like many other municipalities across Europe, Vratsa also reports "lack of funding" as one of the main barriers to the implementation of nature-based solutions, yet, due to various factors Vratsa seems an ideal place to showcase and demonstrate nature-based solutions. We explain why.

It is estimated that NbS working as infrastructure are 50% cheaper than grey infrastructure

This is stated by the World Economic Forum in its BiodiverCities by 2030 report, which also highlights the fact that nevertheless, NbS received just 0.3% of overall spending on urban infrastructure in 2021. What's more, current studies underline the need for NbS based on other aspects too:

- Future climate projections suggest that the frequency and severity of extreme climate events will increase in the coming years, almost everywhere in Europe, including Bulgaria. The World Economic Forum also calculated that *"nature loss puts an estimated 44% of global GDP in urban areas at risk of disruption"*.
- According to a recent study (ILO-UNEP-IUCN, 2022) *"the potential role of NbS for employment in urban areas is significant, and impacts are likely to be concentrated in specific sectors and activities with a strong link to NbS such as water and flood management, development of urban public spaces, green buildings, and use of natural and hybrid infrastructure."*
- The Global Standard on Nature-based Solutions published by the International Union for the Conservation of Nature (IUCN) says that "*the return on investment, the efficiency and effectiveness of the intervention, and equity in the distribution of benefits and costs are key determinants of success for an NbS. This (Criterion) requires that sufficient consideration is given to the economic viability of the intervention, both at the design stage and through monitoring the implementation*."
- According to another recent report made by the European Investment Bank, EU

funds represent the most common investor in NbS. In the future, the demand for urban NbS can be expected to rise exponentially.

Therefore, nature-based solutions offer opportunities for outstanding direct monetizable economic benefits to the Municipality of Vratsa, especially in the city centre, where demonstrating not only the economic viability of NbS interventions but also their ecosystem services and public acceptance is crucial. Of course, systematically implementing NbS approaches needs a coordinated approach in practice (from research and planning through financing and policy-making to public procurement).

Scientific literature and practice underline the economic benefits of nature-based solutions. One of the most striking cases is in green surface management. According to the REGREEN project, switching from conventional management towards more nature-based management with higher ecological integrity and delivering a more extended range of ecosystem services clearly outlines its economic advantages. BiodiverCity project partner Veszprém calculates ca. 20% less costs when using climate-adaptive urban grassland management. A case study from Aarhus, published by the REGREEN project in the above study, states that an ecosystem-based approach (retention pond) aiming to retain or infiltrate 2145 m3 of runoff water costs 146 €/m3, while the grey, conventional solution (closed basin) was 1 394 €/m3. Based on this and other case studies, the REGREEN project highlights that the costs of establishment, maintenance and the cost-effectiveness ratios evaluated were significantly lower in ecosystem-based approaches than in conventional infrastructure.

In other cases, the initial investment (with using NbS) is often higher (e.g. planting trees with the Stockholm Plantation Method, installation of an extensive green rooftop), however, the maintenance is cheaper in these cases and the investment is more sustainable!

Despite the above, potential benefits of using NbS both in urban and rural areas, the Municipality of Vratsa reports the following challenges regarding the use of NbS (just like many other municipalities in Europe):

- Limited funding: implementation of NbS projects may require significant financial resources for planning, development and maintenance. Limited funding may hinder a municipality's ability to initiate and sustain such projects.
- Lack of awareness and education: community awareness and understanding of the benefits of NbS is still low at this stage. Educating residents and stakeholders about the importance and potential of NbS is essential for successful implementation.
- Regulatory and policy barriers: not all existing regulations and policies are well developed in this area and sometimes hinder the adoption of NbS. There are cases where a municipality has to deal with bureaucratic challenges to integrate NbS into its planning and development processes.
- Technical expertise: designing and implementing NbS requires specialist technical knowledge, such as ecology, landscape architecture and engineering. The lack of such experience in the municipality can prevent the successful implementation of the projects.
- Resistance to change: some stakeholders may resist adopting NbS due to a preference for traditional approaches or concerns about potential disruption.

Vratsa, the “attractive place to live” could also be a showcase of nature-based solutions

The city has already invested a lot in green transition. The most important actions and projects, with special, but not exclusive attention to green infrastructure and awareness-raising are the following:

- Renovation of several public parks.
- Organization of urban picnics to promote urban green spaces and outdoor activities.
- Implementation of underground waste bins and waste bins for separate waste collection.

- Implementation of composting installations.
- Awareness-raising campaigns to promote home composting by providing free composts.
- Modernization of public transport.
- Environmental education activities.
- Regular organisation of “Let’s clean Bulgaria in one day”.
- Planting trees with volunteers.
- Distribution of flowers to citizens to beautify spaces between buildings.
- Organisation of volunteer actions to clean the riverbank.
- Small-scale grants to civic initiatives that protect and restore the environment.
- Operation of a tree inventory.
- "Eco champions" Campaign to promote recycling (together with ECOPACK Bulgaria).
- Vratsa is one of the first municipalities in Bulgaria to join the CEMIS platform (Circular Economy Management Information System).

Although the concept of nature-based solutions is indeed new in Vratsa, yet, due to the following factors, Vratsa seems an ideal place to showcase and demonstrate nature-based solutions:

- Nature is just the next door in Vratsa. Besides being proud of the natural values of Vrachanski Balkan, it also provides demonstration areas not specifically linked to urban challenges. For instance, to mitigate the damage of flash floods, willow or woven fences might be effective solutions, also in protected areas. As the municipality is also responsible for surrounding rural areas, many other challenges are relevant in Vratsa, for example, illegal deforestation, invasive species, especially along local streams, unregulated waste disposal, and significant air pollution partly because of the use of wood and coal. But the urban area also has great potential, like the hardly used green spaces between buildings (already activated to some extent) or the old public greenhouses, which need renovation.
- Urban strategies create a great framework. The Environmental Protection Program 2021-2028 for example gives priority to the construction and protection of the green system on the territory of the municipality. The Plan for Integrated Development 2021-2027, among others, fosters the preservation of the environment, adaptation and mitigation of climate change, improvement of air quality and green urban infrastructure, and development of green spaces including green infrastructure for buildings in the context of the New European Bauhaus. In line with the National Climate Change Action Plan, the city intends to increase the area of urban and suburban parks.
- The municipality is proactive – this is proven for instance by the fact that it participated in several transnational projects: e.g Restart4Danube (Boosting cREative induSTries in urbAn Regeneration for a stronger Danube region), FIESTA (funded by Intelligent Energy Europe, focusing on cutting the energy consumption of young families), working together with Dolj County (Romania) and Inspectorate for Emergency Situations Oltenia (Romania) on disaster risk management in the Interreg Romania-Bulgaria 2014-2020 Programme, participation in the Intelligent Cities Challenge initiated by the European Commission, and more importantly, the Cities4CSR URBACT Action Planning Network.
- Regarding this latter, Vratsa implemented actions to raise awareness on green topics, creating a basic network of companies and engaged residents to be used in the future.

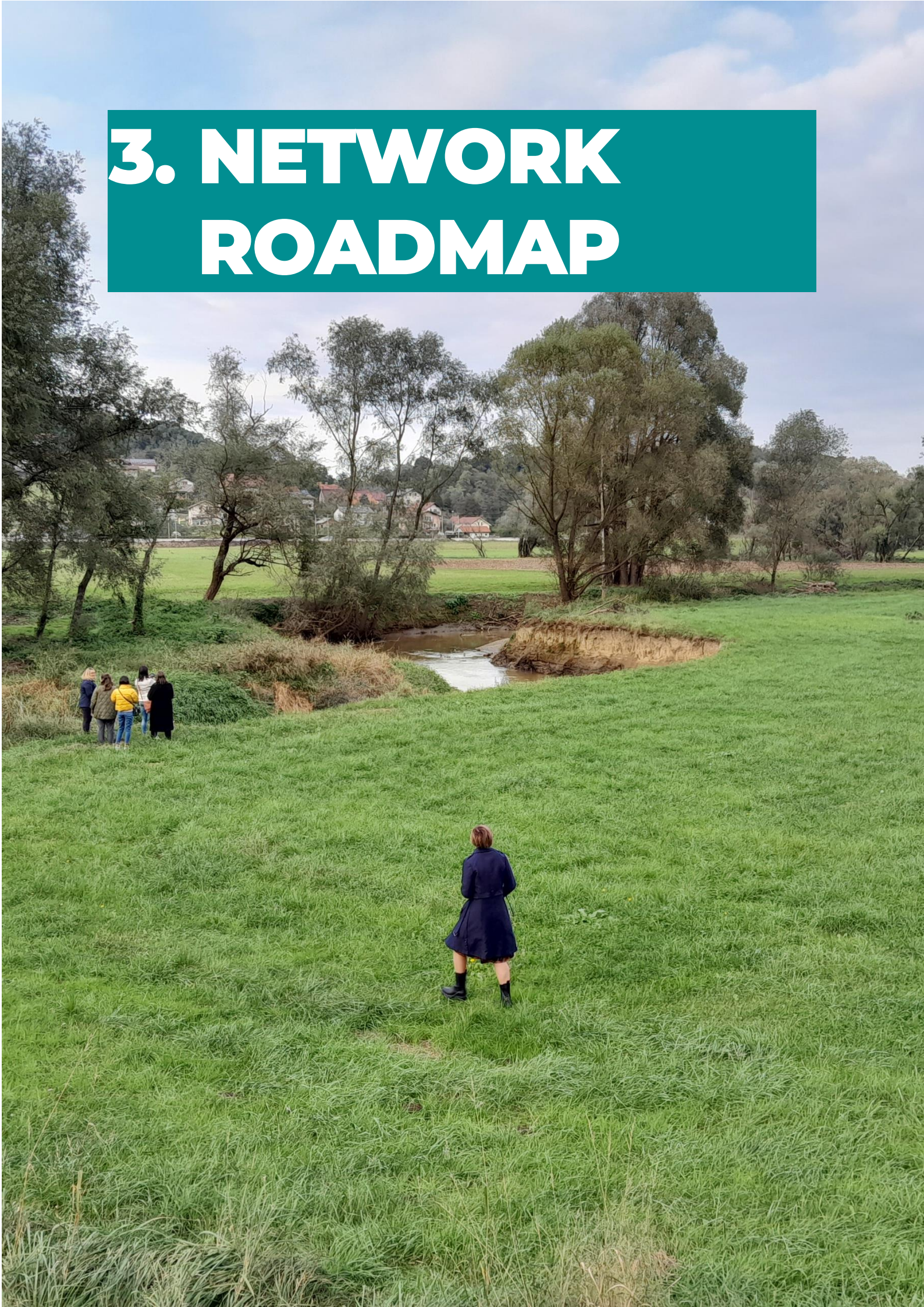
Besides planning how to embed nature-based solutions into future infrastructure projects, increasing environmental awareness, preservation of the environment at tourist areas, creating conditions for the inclusion of the citizens in environmental protection initiatives and carrying out information campaigns and training for the younger

generation on environment protection are the main challenges for the municipality within the BiodiverCity network.

Green walls and rooftops, green shadowing solutions, biodiverse park maintenance, climate adaptive grassland management, urban wildflower meadows, rain gardens and other Sustainable Drainage Systems, new ways of planting trees, new solutions against invasive species, bioblitz events, community-driven approaches to valorise ecosystem services, the concept of the pollinator-friendly city, plantation of native saplings instead of ones bought from a nursery, green infrastructure effectively absorbing air pollutions. Among others (e.g willow or woven fences to stop flash floods and many other NbS work in rural areas), these are the initiatives the BiodiverCity partnership can stimulate the local action planning process, and Municipality of Vratsa might find useful to make the city more “attractive place to live”...

How embed nature-based solutions into urban planning effectively?

3. NETWORK ROADMAP



3.1. Synthesis

Biodiversity loss is a leading threat to humanity's safe operating space on Earth and more than 50% of global GDP is dependent on nature. Since the approval of the Kunming-Montreal Global Biodiversity Framework (GBF) in 2022, and the adoption of its key targets within the EU Biodiversity Strategy for 2030 and the Nature Restoration Law there has been massive attention to biodiversity loss and finally there is a broad consensus that the biodiversity crisis and the climate crisis (as part of the ecological crisis) are intrinsically linked. Today, when these ambitious frameworks have been adopted, accelerating action across different sectors and society toward the realization of their goals and targets is urgent. Among the twenty-three targets of the GBF to be achieved by 2030 include 30 per cent conservation of land, sea and inland waters, 30 per cent restoration of degraded ecosystems, and halving the introduction of invasive species.

As the motto of the EU Biodiversity Strategy for 2030 says *"Bringing nature back into our lives"* is essential.

Partner cities of the BiodiverCity network intend to 1. measure urban biodiversity and 2. valorise ecosystem services together with local communities enabling them to 3. verify, design and scale up nature-based solutions. Based on the interviews made during the city visits, we put the question of how to transform cities' relationship with nature into the focus of the network. This is important, because:

- We have dramatically lost our connection with nature and this fact is manifested in cities. We simply cannot understand that nature provides not only unbelievable benefits for our physical and mental health but also cheap and aesthetic solutions to develop our cities and reshape our landscapes, to make the long-desired paradigm shift in all areas of economic life.
- Cities, as knots of the physical space offer unique opportunities for learning and education about a resilient and sustainable future and have a significant potential to boost innovations and governance tools. But we also need change in cities because billions of urban dwellers are at high or extreme risk of environmental disaster.
- The recalled concept of nature-based solutions has huge potential: while one-third of climate mitigation needed to meet the goals of the Paris Agreement can be provided by NbS, and they are 50% cheaper in urban infrastructure than grey infrastructure, they received just 0.3% of overall spending on urban infrastructure in 2021. What's more, investing in nature-based solutions also has economic benefits since 1€ invested into habitat restoration generates 8–38 € profit in Europe.
- So, cities need to raise awareness of all actors to the effectiveness of NbS and lead by example.
- This is clearly in line with the European strategies and policies. According to the Nature Restoration Law, Member States shall ensure that there is no net loss in the total national area of urban green space, and of urban tree canopy cover in urban ecosystem areas. The EU Biodiversity Strategy for 2030 also promotes the systematic integration of healthy ecosystems, green infrastructure, and nature-based solutions into all forms of urban planning. To do that, and reward community action, "*the Commission has called (will call) on all European cities of 20,000 inhabitants or more to develop ambitious Urban Greening Plans.*

In line with this, the BiodiverCity partnership, firstly tackling this theme in the history of the URBACT Programme as a network, will build on the awareness-raising potential biodiversity conservation provides in terms of communication and engagement of residents. Some partner cities have European-level good practices in this field (e.g. Guimarães, Siena). This process will be improved with the use of community-based approaches to valorise and measure biodiversity and related ecosystem services. Focusing on the communication about ecosystem services as such, it seems a new concept for almost all partner cities. All this work will enable communities to understand and thus plan robust nature-based solutions (also to feed Greening Plans, if appropriate), while the action planning process and related dissemination and pilot activities will foster pro-environmental behaviours. On a strategic level, nature-based solutions are also a novel theme in partner cities, only a few of them have already tackled this issue in city-level urban strategies.

The 10 BiodiverCity partner cities will study and work on – among others - new and climate-adaptive ways of planting and managing urban trees, organisation of bioblitz events, the job description of a biodiversity officer, establishment of nature playgrounds, elaboration of the sponge city concept, installation of green roofs and walls, transformation of schoolyards to green oasis, biodiversity-driven park management and elaboration of forest bathing walks. Among the several and varied themes partner cities find relevant locally, the scanning process behind the Baseline Study resulted in the following core themes relevant in each partner city:

- Communication and engagement to raise awareness and change the mindsets of residents. Green space stimulates identity and community spirit efficiently - they are great tools to mobilise citizens. New, biodiversity-driven green spaces might be advocates of the mindset change required. As one of the BiodiverCity colleagues said: *„In a nutshell, the most important issue is transforming green spaces from being 'just there' to being 'ours' – integral, loved, and actively cared for parts of our urban fabric. It's about making the love for these spaces personal because that's when we'll truly value and protect them."* A separate chapter of the state-of-the-art of the Baseline Study explains good practices in this field, while some partners have also made initial steps. As an overarching theme, it will be referred to during all Core Network Meetings, especially the second one in Dunaújváros and Veszprém, but there was a masterclass organised during the first Core Network Meeting as well to introduce some good practices.
- The same applies to community-based approaches to valorise/measure ecosystem services, since it is pretty much interrelated to the previous theme. Monetarising the value of nature can be a strong awareness-raising tool and citizen science can be also powerful, while the organisation of local bioblitz events can be a strong basis to refer to ecosystem services. *„When we talk about measuring ecosystem services, which are the benefits we get from nature, the biggest challenge is trying to measure the value of something priceless. It's a bit like trying to measure love or happiness — it's not easy, but it is worth the effort! For this reason, for us, the most important thing is to be able to convey in very plain language the benefits that ecosystem services have for society, in such a way that citizens can understand and internalise."* As an overarching theme, it will be referred to during all Core Network Meetings.
- Integrated strategy on green and blue infrastructure. In line with the EU recommendations, cities should work on integrating nature-based solutions into urban planning. One way to do that is to create an integrated strategy on green and blue infrastructure. Among the partner cities, Limerick has a new and great example

in this field, thus it will be analysed during the 3rd Core Network Meeting. It is worth mentioning that blue aspects of urban planning are less known within the partnership than green infrastructure.

- Urban Greening Plan: based on the Nature Restoration Law, the EU Commission has called (will call) on all European cities of 20,000 inhabitants or more to develop ambitious Urban Greening Plans. Once available, partners will get more information about how to draft such a plan since the elaboration of the IAP and the Greening Plan can mutually reinforce each other. Core Network Meeting 3 is targeted to explore this area.
- Residential programmes. Most of the urban green space is often owned privately. Therefore, it is crucial to launch local programmes specifically targeting residents to transform their green areas more biodiverse and resilient. This is a joint interest of the partner cities, and there is a strong need for external good practices. One of the BiodiverCity Café events will target this thematic area, most likely with the help of an URBACT city, district 12 of Budapest.
- The pollinator-friendly city concept. Many of the partner cities are interested in this topic, and many of them have already started to implement such a concept. It is foreseen that a European-level good practice will be shared with the partnership, most likely with the help of an URBACT city, district 12 of Budapest.
- Green roofs, green walls, shadowing green. They are core elements of the urban green infrastructure with a high potential in terms of water retention. The question for the partnership is not dedicated to technical issues but related to how to use local regulations as a driver of building green rooftops, green walls, rain gardens, and other types of sustainable urban drainage systems (SUD). This question will be analysed during a BiodiverCity Café session.

It is foreseen that the above core themes will be explored at the beginning of the action planning process to efficiently feed that. In addition to the above, overarching core themes, during the Core Network Meeting 1 partner cities had the possibility to understand and connect to three novel, global initiatives they might join within the framework of the BiodiverCity network:

- The City Biodiversity Index: the most comprehensive index related to urban biodiversity, prepared by the Secretariat of the Convention on Biological Diversity is a self-assessment tool for cities to benchmark and monitor the progress of their biodiversity conservation efforts against their baselines (further info can be found in the state-of-the-art). Only 39 cities have already joined this relatively new network, and the door is open. In Spring 2024 the Secretariat of the Convention on Biological Diversity will organise a series of webinars that will be shared with partner cities. However, most BiodiverCity partners expressed that joining this global network and preparing the index as such seems too complex for the URBACT project. URBACT Local Groups will analyse this opportunity, but only Limerick seems relatively sure about using this framework locally.
- Participating in the City Nature Challenge (further info can be found in the state-of-the-art). Two partner cities (Guimarães and Siena) have experience in participating in this annual four-day global bioblitz at the end of April (while some other partners organised local bioblitz events). Since the organisation of bioblitz events fits very well with the goals and activities of the BiodiverCity network, partner cities are encouraged

to participate in this event in 2025 (the application deadline for the 2024 event was over before the Core Network Meeting 1). This activity seemed indeed attractive for BiodiverCity partners, most of them plan to enter this global challenge in 2025.

» The UN Kunming–Montreal Global Biodiversity Framework (2022) encourages the private sector to invest in financial schemes regarding biodiversity, amongst others, the so-called biodiversity credits. This is a globally emerging theme and since many partners intend to activate the private sector locally during the action planning process, it seems a crucial topic. According to the UN's Global Biodiversity Framework, 20+ trillion euros in assets are under management by signatories of the Finance for Biodiversity Pledge. While $598-824 billion additional funding is needed annually to reverse the biodiversity crisis by 2030, 18-43 billion USD is the estimated annual biodiversity credit market revenue in 2050. It is highly recommended to partner cities to find local actors and at least get to know how this emerging market works, and how can we use this globally innovative theme in our work.

The below table sums up partner cities' initial commitment and thinking about embedding these three topics into the action-planning process:

	Working on the City Biodiversity Index	Participating in the City Nature Challenge in 2025	Discussing the possibilities linked to biodiversity credits
Cieza	No, because they work on the elaboration of the Green City Accord.	Yes, Cieza intends to participate in this global action in 2025.	The ULG will discuss this issue and analyse the local context.
Den Bosch	No, because they do not see any added value since the methodology is complex, and in the Netherlands, there are many similar indexes. The use of such an index raises more questions that need justification. They need to put all efforts into urban greening projects.	They will discuss the opportunity because they are more open to using it related to the target area. The other issue is that linked to the International Biodiversity Day in May, many similar activities are organised throughout the Netherlands by governmental organisations, schools and NGOs. Experts, volunteers and residents use apps like the digital observation platform waarneming.nl. The competition with other initiatives should be considered.	The ULG will discuss this issue and analyse the local context. but according to Den Bosch, this approach of financing should be developed on the national level. There is an existing national certificate system (Nationale Koolstof Markt) that adds financial value to reducing greenhouse gas emissions, and they plan to make use of this in the target area. Last, but not least, a ULG member organisation, 'The weather makers' is developing an ecocredit. The municipality is involved in translating this to the area de Diezemonding.
Dunaújváros	No, because there are other preferences, like	Yes, Cieza intends to participate in this global action in 2025.	The ULG will discuss this issue and analyse the local context.

	the preparation for the Urban Greening Plan.		
Guimarães	No, because they work on the elaboration of the Green City Accord.	They actively participated in this event in the last years.	The ULG will discuss this issue and analyse the local context.
Limerick	Most likely yes, the ULG will analyse the possibility of joining this initiative.	Yes, Limerick intends to participate in this global action in 2025.	The ULG will discuss this issue and analyse the local context.
Poljčane	They intend to focus on their work with the local primary school, they will use a basic City Biodiversity Index with the pupils, but officially they do not participate.	Most likely not, because of the size of the town.	The ULG will discuss this issue and analyse the local context.
Sarajevo	The ULG will analyse the possibility of joining this initiative.	Most likely yes, Sarajevo intends to participate in this global action in 2025.	The ULG will discuss this issue and analyse the local context.
Siena	Most likely yes, the ULG will analyse the possibility of joining this initiative.	They actively participated in this event in the last years.	The ULG will discuss this issue and analyse the local context.
Veszprém	The ULG will analyse the possibility and most likely they will use it since there is previous experience at the University of Pannonia: a few years ago, there was a pilot summer trainee program, where the biodiversity of the campus was assessed.	Probably not, but Veszprém is keen on using other partner cities' experience on bioblitz events.	There is already a discussion with the ULG about the engagement of the business of Veszprém into the sustainability attempts of the city through the dissemination of the idea. In May 2023 there was a discussion organised within the LifeClimcoop project about a possible "climate pact".
Vratsa	The ULG will analyse the possibility of joining this initiative.	Most likely yes, Vratsa intends to participate in this global action in 2025	The ULG will discuss this issue and analyse the local context.

URBACT is about exchange and learning, and the Activation Stage provided a unique opportunity to explore all the good practices and experiences as well as learning needs linked to urban biodiversity and nature-based solutions. The most important features are summed up in the partner profiles, the below table – prepared based on the city visits and the outcomes of the 1st Core Network Meeting - shows all topics partner cities are potentially interested in. This table is the basis of the network's learning journey, as explained later.

	Experience to be shared	Good practice to be shared	Thematic knowledge to be developed (learning needs)
Cieza	- Changing attitude of residents - Education of technical staff - Engagement of residents in habitat restoration (environmental volunteer plan) - Planning a green oasis in a schoolyard - Working on the Green City Accord	- BiofílicaCieza: new and climate adaptive ways of planting and managing urban trees - Biological control of trees (and bushes) - Registry of significant trees - Jane Jacobs Walk for trees	- Communication about the benefits of trees - Calculator of tree benefits (HU) - Miyawaki-forests (SI) - Nature playgrounds (IE) - Integrated strategy on Blue and Green Infrastructure (IE) - Pollinator-friendly city - Urban rainwater harvesting - Green roofs, walls, shadowing green - Transforming schoolyards to green oasis - Biodiversity-driven park management (HU-Veszprém) - Climate adaptive urban grassland management (HU-Veszprém) - Planting native saplings - Forest bathing walks - Using permaculture as an awareness-raising tool (SI, HU-Veszprém) - Workshops with private companies (PT) - Green Brigades (PT) - Community garden (PT, IT) - Engagement of the elderly (BIH) - Benefits of working together with a nature conservation organisation on the spot (NL) - Grazing in the city (NL) - CSR platform to boost private funds (BG) - Cities of Commons to boost the development of green areas (IT)

	Experience to be shared	Good practice to be shared	Thematic knowledge to be developed (learning needs)
Dunaújváros	- Having the first EMAS certification in Hungary - Flowering Dunaújváros Competition	- Development of a recreational area - Management of an arboretum as a green oasis - Protection of rare birds in the city - Creating a balance between community programmes and biodiversity aspects	- Solving the conflicts between illegal parking and green surfaces - Climate adaptive grassland management (HU-Veszprém) - Climate adaptive tree management (ES) - Tree registry (perhaps as community action with elderly and youth) (ES) - Biodiversity-driven park management (HU-Veszprém) - Plantation of native saplings instead of ones bought from a nursery - Community composting - Education garden at schools (SI) - Residential programs to sensitise residents - Natural play areas (IE) - Measuring the carbon footprint of the municipality (PT) - Environmental education (PT) - BiodiversityGO! (bioblitz) and City Nature Challenge (PT) - Green Brigades (PT) - Biological control of trees (ES) - Registry of significant trees (ES) - Experiences and challenges as Climate Neutral City (Sarajevo) - Engagement of the elderly (BIH) - Benefits of working together with a nature conservation organisation on the spot (NL) - Food forest movement (NL) - CSR platform - Branding biodiversity IT

	Experience to be shared	Good practice to be shared	Thematic knowledge to be developed (learning needs)
Guimarães	- Workshops with private companies - Measuring the carbon footprint of the municipality - Environmental education - Fight against invasive alien species	- Biodiversity Strategy - BiodiversityGO! (bioblitz) - City Nature Challenge - Green Brigades (incl. data providers) - Irrigation ponds - Community garden (3 ha) - Green Week	- Improving biodiversity in private areas (residential programs) - Urban Greening Plan - Integrated strategy on Blue and Green Infrastructure (IE) - Biodiversity Credits and other financing methods - Development of Green Corridor - Dedicated platform open for people - Regulation on green roofs (walls) - Sponge City concept - Bee-friendly city concept - Protection of rare birds in the city (HU-Dunaújváros) - Biological control of trees (ES) - Jane Jacobs Walk for trees (ES) - Using participatory democracy (Consul) linked to urban biodiversity (BIH) - Sensory Garden (BIH) - CSR platform (BG)

	Experience to be shared	Good practice to be shared	Thematic knowledge to be developed (learning needs)
Limerick	- Job description of the biodiversity officer - Tree nursery - Placemaking	- Natural play areas (regulation) - Community Garden at the Hunt Museum - Sharon Garden - Tidy Town competition - Integrated strategy on green and blue infrastructure	- Climate-friendly grassland management (HU-Veszprém) - Natural shrubs in roundabouts - Community-based approaches to valorise/measure ecosystem services - Residential programs to sensitise residents (composting, water retention, etc.) - Low maintenance management techniques - Keeping (historical) hedgerows - Biodiversity Credits and other tools to involve businesses - Green roofs and walls - Using permaculture as an awareness-raising tool (SI, HU-Veszprém) - Having the first EMAS certification in Hungary (HU-Dunaújváros) - Development of recreational area (HU-Dunaújváros) - Management of an arboretum as a green oasis (HU-Dunaújváros) - Workshops with private companies (PT) - Fight against invasive alien species (PT) - BiodiversityGO! (bioblitz) and City Nature Challenge (PT) - Green Brigades (PT) - BiofílicaCieza: new and climate adaptive ways of planting and managing urban trees (ES) - Registry of significant trees (ES) - Jane Jacobs Walk for trees (ES) - Your CO2 (BIH) - Using participatory democracy (Consul) linked to urban biodiversity (BIH) - Visioning rewilding process in a city (NL) - Dutch Championship of Tile Flipping (NL) - Food forest movement (NL)

	Experience to be shared	Good practice to be shared	Thematic knowledge to be developed (learning needs)
Poljčane	- Education garden and Miyawaki forest in schools	- Dole Self-Reliance Training Ground (permaculture as an awareness-raising tool) - Plantation of Miyawaki forest	- How to draft an Urban Greening Plan - Effective management techniques to stop riverbank erosion - Creation of a traditional (pollinator-friendly) meadow (Ljubljana) - Bee-friendly city concept - NbS in the town
	Experience to be shared	Good practice to be shared	Thematic knowledge to be developed (learning needs)
Sarajevo	- Your CO2 - Experiences and challenges as Climate Neutral City	- Using participatory democracy (Consul) linked to urban biodiversity - The Sarajevo Process (to use storytelling) - Engagement of elderly: Centres for Healthy Ageing and Doctor of Dead Plants - Sensory Garden	- NbS tackling air pollution - Gardens in schools - Community Garden (IT, PT) - Planning blue infrastructure and NbS (IE) - Engagement of citizens (rainwater harvesting) - Integrated strategy on Blue and Green Infrastructure (IE) - Fight against invasive species (PT) - residential programs - Tackling tourism related to biodiversity (organisation of walks for visitors, students and locals) - Food forest movement (NL)
	Experience to be shared	Good practice to be shared	Thematic knowledge to be developed (learning needs)
's-Hertogenbosch	- Benefits of working together with a nature conservation organisation on the spot - Building landscape through grazing - Visioning rewilding process in a city	- Dutch Championship of Tile Flipping - Grazing in the city - Food forest movement	- Working together with communities - Communication and engagement to raise awareness and change the mindsets of residents - Community-based approaches to valorise/measure ecosystem services - Flowering Dunaújváros Competition - Development of a recreational area and finding a balance between community programmes and biodiversity aspects (Dunaújváros) - Environmental education (PT) - BiodiversityGO! (bioblitz) (PT) - Green Brigades (PT) - Experiences and challenges as Climate Neutral City (BIH, IT) - Using art as a narrative of green transition (IT) - Branding biodiversity (IT)

	Experience to be shared	Good practice to be shared	Thematic knowledge to be developed (learning needs)
Siena	- Experiences and challenges as Climate Neutral City - Using art as a narrative of green transition - How to communicate a threat positively? - Urban biodiversity - Branding biodiversity	- Organising bioblitz events - City Nature Challenge - Community Garden - Cities of Commons to boost the development of green areas	- Pollinator-friendly city concept - Community-based approaches to valorise/measure ecosystem services - Green walls - Involvement of adults and elderly (BIH) - Integrated strategy on green and blue infrastructure (IE) - Integrated strategy on NbS - Job description of the Biodiversity Officer (IE) - Green Brigades (PT) - Community garden (PT) - Using participatory democracy (Consul) linked to urban biodiversity (BIH) - Engagement of the elderly (BIH) - Organisation of Urban Picnics (BG) - CSR platform (BG)

	Experience to be shared	Good practice to be shared	Thematic knowledge to be developed (learning needs)
Veszprém	- Internal capacity building - Regulation on tree removal	- Climate adaptive urban grassland management - Using deep-mulch garden (permaculture) as awareness-raising	- Restoration of a stream - Transforming school yards (ES) - Biodiversity-driven park management - Light infrastructure (Green Points) in public areas to raise awareness - Community composting with compost masters - Edible forest, Miyawaki forest (NL, SI) - Residential programs - Professional platform for blue development - Job description of a Biodiversity Officer (IE) - Using placemaking on green areas (IE) - Education gardens at schools (IE) - Development of the recreational area (Dunaújváros) - Workshops with private companies (PT) - Environmental education (PT, ES) - Fight against invasive alien species (PT) - BiodiversityGO! (bioblitz) and City Nature Challenge (PT, IT) - Irrigation ponds (PT) - Education of technical staff (ES) - Renaturalising school yards (ES) - BiofílicaCieza: new and climate adaptive ways of planting and managing urban trees (ES) - Biological control of trees (ES) - Registry of significant trees (ES) - Experiences and challenges as Climate Neutral City (BIH, IT) - Using participatory democracy (Consul) linked to urban biodiversity (BIH) - Sensory Garden (BIH) - Benefits of working together with a nature conservation organisation on the spot (NL) - Food forest movement (NL) - Eco-champions Campaign (BG) - CSR platform (BG, PT) - Using art as a narrative of green transition (IT) - Branding biodiversity (IT)

	Experience to be shared	Good practice to be shared	Thematic knowledge to be developed (learning needs)
Vratsa	- Organisation of urban picnics - Eco-champions Campaign	- Interactive maps to nurture people - CSR platform	- Tree registry (PT) - Green roofs and walls - NbS tackling air pollution - Plantation of native saplings instead of ones bought from a nursery - NbS to prevent floods in villages - Pollinator-friendly city - Fight against invasive species (PT) - Edible forest, Miyawaki forest (NL, SI) - Community garden (IT, PT)

It is not easy to specify skills to be developed, because most of the below points collected as skills can be good practices as well. However, the below issues are less important as "projects" (nothing to see on the spot), but the educational, learning and process-related elements behind them are more important and transferable. These will be discussed in detail during BiodiverCity Café events (see below).

- Biodiversity officer: Limerick nominated such a position at the beginning of 2024, which interests most partner cities. What and how does s(he) do exactly?
- Education of technical staff: this is a very important aspect of the change required in green infrastructure management since biodiversity-driven approaches supported by city leaders should be the everyday practice on the ground. To achieve that, efficient training of the technical staff is needed. Cieza has experience in this field.
- Engagement of residents in habitat restoration (letting them go responsibly, ownerships, sharing power): the network will provide space for more advanced partners to explain their approach.
- Organisation of bioblitz events: many partner cities intend to organise such events; experienced partners will prepare the relevant staff online.
- Organisation of "flowering the city" events and improving them with biodiversity categories: many partner cities have a long history of organising such events, they will work together on how to improve them with biodiversity-related actions.
- Measuring the carbon footprint of the municipality: this theme does not link strongly to biodiversity, but as cities should lead as examples, experienced partners will make a lesson on how to do that.

3.2. Methodology to achieve good results

The proposed framework for network-level activities aligns with the Action Planning Networks 2023-2025 Guide for Applicants. The planned meetings are explained below, complying with the Guide and ensuring that planned activities fit the tight budget. The methodology is built up of the following building blocks:

1. Following the WWF's One Planet City Challenge during Core Network Meetings (CNM): in line with the URBACT recommendations, 6 bigger (personal) meetings are organised (Core Network Meetings). The 6-stage meeting structure follows the thematic blocks of the WWF's One Planet City Challenge -an approach that was recommended by the LP. The City Challenge was prepared by WWF Cities, based on a review of best-performing cities, to identify what they are doing well that enables them to successfully handle the climate crisis facing cities around the globe. The 6 steps (secrets of success) are the following:

- 1. Measure what matters: calculating data based on individual baselines is an essential step in formulating an action plan.
- 2. Show political leadership: demonstrating a high level of political commitment and leadership.
- 3. Lead by example: all leading cities are taking strong action and have set strong targets in those areas where they have the most control – their operations, enabling them to influence local communities by setting an example.
- 4. Utilising inspiring networks: the importance of local, national and international networks of peers in helping to achieve the goals.
- 5. Form university partnerships: universities and similar research centres can be valuable resources for cities. Many successful cities have developed strong partnerships with local universities and have utilised their expertise for many different purposes.
- 6. Highlight the co-benefits: ambitious actions on biodiversity provide a wide range of additional benefits, whether it be from the mitigation of GHG emissions or the identification and mitigation of climate risks.

2. Opening the stage and capitalising on the knowledge of partners during CNMs. Local challenges will be explored in the frame of BiodiverCity Walkshops during CNMs. It is a learning adventure (a walk in smaller and mixed groups) to explore the given urban green area and collect personal observations by using a place-analysis questionnaire. Not only partner city representatives, but host and participant ULG members also take part in these exercises. Observations gained during the Walkshops will feed the collaborative work to jointly model solutions regarding the challenges observed on the spot by using an open event, where foreigners can present their recommendations to a wider audience. This open event might have any formats (e.g. Pecha Kucha event) but should tackle as many locals as possible. The most important feature of the event is that the observations gained during the walkshop, made by locals and visitors, will be collected, ranked and further elaborated. These specified local ideas will feed powerful pilot actions working as "urban acupuncture (smaller symbolic projects having an effect in creating points of energy and initiating a snowball effect) as well as the action planning process.

3. Peer Learning meetings are smaller, personal meetings, where interested partners will discuss some specific issues, while at the same time, they will also share their experiences

related to those fields. In Vratsa the focus is on 1. cost benefits of nature-based solutions and 2. green roofs and walls. In Sarajevo the focus is on 1. the engagement of the elderly; 2. NbS tackling air pollution and 3. NbS tackling tourism. In Poljčane the focus is on permaculture as an awareness-raising tool and landscaping.

4. To involve as many stakeholders as possible, BiodiverCity Café online sessions will link up personal meetings. The below themes (next chapter) have been selected for feeding these sessions to be organised by the Lead Expert, supported by each partner city and external actors (e.g. ad-hoc experts). Besides feeding the action planning process, these online sessions help the preparation for the upcoming transnational activity too. BiodiverCity Cafés are planned to be organised on Thursday afternoons between 14.00-16.00, starting in February (every second week).

5. Learning needs, learning grids to link up local and transnational activities. BiodiverCity Café events are linked to the themes to be explored in the upcoming CNM, this provides a great opportunity to collect learning needs, enabling the organisers to reflect on those needs while preparing the meeting agenda. At the end of each Core Network Meeting, each partner city will capture the learning process and formulate takeaways in the frame of a Photo Safari presentation. Photo Safari is a tool in which participants of a study visit take photos and through the pictures, they express their observations, sum up key learning points, explain their relevance related to the directions of the Integrated Action Plan, and along the photos, they can describe actions to be carried out until the next transnational event to achieve the set goals. These photos help visitors formulate messages and share them with other ULG members at home, during the following ULG meeting. It also provides an opportunity for the owner of the picture, for the given ULG and for the Lead Expert to review the progress made at the local level between two transnational meetings (during the following transnational meeting the review can be analysed together). In addition, a WORD format of the same "learning grid" will be used.

6. All the lessons learnt will be channelised to the Network Results Product, drafted by the Lead Expert, most likely as a handbook for municipalities to plan nature-based solutions.

7. The Action Planning Process: in line with the URBACT recommendations, led by the Lead Expert and supported by the URBACT Toolbox, a specific workshop will be dedicated to the preparation of action plans during each CNM as follows:

- *Preparation of the Integrated Action Plans (CNM2)*
- *Planning pilot actions as urban acupuncture (CNM3)*
- *Focus on the peer review of draft Action Plans (CNM4)*
- *Peer review linked to the implementation of pilot actions (CNM5)*
- *Introduction of the action plans and workshop related to funding (CNM6)*

As for the potential focus of the action plans and related testing actions, this is summed up in the below table:

	IAP thematic and geographical scope	Plans for testing actions
Cieza	No specific target area. The city intends to improve the green infrastructure in four ways: 1. increase the canopy cover on streets; 2. improve biodiversity in parks and gardens; 3. renaturalisation of schoolyards; and 4. restoration of the riparian forest along the riverbank. The IAP will focus on these issues regarding the entire territory of the city. Aspects concerning biodiversity, SUDs and awareness-raising will be important elements of the IAP.	Various directions are open at this stage, but most likely collaborative creation of pocket gardens will be tested in public spaces, by using AI-supported tools like in this Dutch example.
Den Bosch	There is a specific target area, and the IAP will be about creating a community along the rewilding process of the area.	Different methods for engaging communities will be tested.
Dunaújváros	There are four main directions: 1. planting climate resilient plants, 2. awareness-raising of residents regarding urban greenery; 3. creation of a tree registry; 4. biodiversity-driven biomass and park management.	Most likely it will be an unusual awareness-raising action (or more) to highlight the importance of urban greenery. The other possibility is to link city branding with the topics of the IAP.
Guimarães	Several directions have been realised: 1. improving the connectivity of biologically significant areas; 2. an action plan focusing on integrated water management (retention) and 3. residential programs.	
Limerick	Demonstrating the importance of different habitats in an urban setting for biodiversity by using community-based approaches to valorise ecosystem services. Assigning value to biodiversity and ecosystem services is the most important question in Limerick, especially in three target areas: an urban woodland (Baggot Estate), the historically active St. Lawrence cemetery and the Corbally Meadow at the riverbank.	How to encourage and involve stakeholders in recording data.
Poljčane	The planned IAP will focus on 1. implementing NbS in the town centre; 2. converting grasslands into pollinator-friendly areas; 3. implementing NbS along the Dravinja river, mainly to prevent landslide; 4. preparation of an Urban Greening Plan.	In line with the potential themes of the IAP, planting a green belt between the road and children's playground, setting bee-friendly areas, and increasing the number of plants in the town centre.
Sarajevo	Nothing decided yet, but a GBI strategy would have the biggest added value for the city. An IAP (or a specific section of an overall strategy) specifically focusing on tools protecting people from air pollution would be also powerful.	Transforming the garden of the National Museum with innovative elements such as a therapy garden and using nature-based solutions (e.g. rain garden), made as a community action. Perhaps another garden should be created in parallel in an abandoned green space.

Siena	A new document focusing on nature-based solutions, perhaps restricted in some areas, or an action plan focusing on awareness raising related to ecosystem services including a new local regulation related to the maintenance of green areas with an approach on biodiversity.	Most likely a community action continuing the biodiversity-related work started years ago, or perhaps a promotion event linked to the biodiversity menu.
Veszprém	Most likely it will be related to blue infrastructure and awareness-raising.	Establishment of a Miyawaki forest.
Vratsa	It has not been decided yet, but focusing on NbS in planned investments would have added value.	Installing green roofs or walls; organisation of a bioblitz event; plantation of native saplings.

During their work and action planning process, BiodiverCity partners will be more successful if they apply horizontal themes as well. In line with the European Commission's Gender Equality Strategy (2020-2025), integration of the gender perspective into all other policies is as important as direct integration of the theme. Although the so-called "eco gender gap" (women are more likely than men to care for green issues) seems to be disappearing as the effects of climate change hit us dramatically, the safety of urban (green) spaces is an important factor regarding green infrastructure planning, as highlighted by the Gender Equal Cities Guidebook as well. Digitalisation also can be directly used concerning green issues: in mapping biodiversity and green areas for example, or fostering participation of residents through the use of participative platforms just like Sarajevo does.

The entire work of the network supports green transition (biodiversity, NbS, the economic impact of NbS, climate adaptation, green- and blue infrastructure), meaning a shift towards economically sustainable growth and an economy that is not based on fossil fuels and overconsumption of natural resources. In addition, due to the geographical context of some partners (e.g. Poljčane), broader, crucial questions of biodiversity and nature-based solutions will be tackled as well (e.g. role and impact of agriculture).

Learning Grids will be used to capture knowledge related to horizontal themes during specific meetings, summed up by the following table.

Green Transition	Digital Transition	Gender Equality
Agriculture: it will be specifically discussed in BiodiverCity Café sessions and during the Slovenian Peer Learning event.	Using digital tools to 1. support the new green infrastructure management (e.g. indicators), 2. the engagement, community-based approaches to valorise ecosystem services and awareness-raising actions, 3. the elaboration of an integrated water management (retention) plan (and/or biodiversity conservation efforts). These themes are tackled during CNM1, 2 and 5.	Tackling anti-social behaviour and inappropriate use of green space is an important goal while implementing green-blue infrastructure interventions, thus safety of urban (green) spaces can be an important horizontal factor regarding green infrastructure planning, in line with the Gender Equal Cities Guidebook. This theme is tackled during CNM3.

3.3. Network Roadmap

The previous chapter described the steps and events for exchanging experience and knowledge transfer between cities, specifying the location and expected date of each meeting, the detailed themes, the tools and methodologies used and the expected outcomes. This chapter, therefore, presents the information presented in the previous chapters from a different perspective: it is the narrative of transnational and local activities (dates and themes of Café events are indicative).

Network Calendar

	Transnational Meeting	Local Meeting/Activity
2024 February	BiodiverCity Café 1. (8 February 2024): Soil biodiversity and permaculture: less known, but very important sub-theme of nature-based solutions will be explored by watching a documentary about agroecology. This is to feed partners who are interested in dealing with permaculture in the urban context (e.g. Poljčane, Veszprém). BiodiverCity Café 2. (22 February 2024): The pollinator-friendly city concept: this core topic will be explained based on the URBACT good practice of Ljubljana and its adaptation in Budapest (invited speakers) (preparation for CNM2).	
March	BiodiverCity Café 3. (21 March 2024): Planting native saplings instead of buying trees from nurseries: this experiment of the Municipality of Hegyvidék will be explained with external speakers from the International Dendrology Foundation.	*ULG2* to express learning needs to CNM2 and discuss Café topics 1, 2 and 3.
April	BiodiverCity Café 4. (4 April 2024): Residential programs tackling privately owned green areas: this core theme will be explored with the help of Municipality of Hegyvidék (composting, water retention, bench chopping, biodiversity in our garden). Core Network Meeting 2. (Dunaújváros & Veszprém, 15-19 April 2024) - Action Planning: A workshop dedicated to the preparation of the Integrated Action Plans (problem tree, stakeholder mapping, newspaper of tomorrow, action canvas). - WWF methodology: Show political leadership (mayors's discussion + KTSZ) - Walkshop + local event to share observations - Main theme: Climate adaptive grassland management (Veszprém) - Awareness raising, communication, ecosystem services (Dunaújváros) - Capacity Building: organisation of a community festival, working with volunteers (ad-hoc expertise) - Horizontal theme: digitalisation – BiodiverCity Academy: biodiversity-driven park management: this topic is crucial in all cities, but none of them has a specific good practice in this field + Sponge City. BiodiverCity Café 5. (9 May 2024): Regulation on green roofs and green walls: this core theme will be explored based on European good practices (preparation for CNM3).	*ULG3* to transfer learning grids from CNM2 and work on action planning process: problem tree, stakeholder mapping, visioning.

May	BiodiverCity Café 6 (16 May 2024): Placemaking: since this method can be used in any kind of public space including green spaces, the details will be explained by the LE and external speakers (preparation for CNM3). BiodiverCity Café 7. (30 May 2024): Biodiversity officer: it will be explained by Limerick, which city has just nominated such a position (preparation for CNM3).	*ULG4* to express learning needs to CNM3 and discuss Café topics 4-5-6.
June	Core Network Meeting 3. (Limerick, 11-14 June, 2024): - Workshop dedicated to the preparation of the Small-Scale Actions - WWF Methodology: lead by example. Limerick GBI Strategy. - Walkshop in target area + local event to share observations - Horizontal theme: Integrating Equal Opportunities to green infrastructure planning – BiodiverCity Academy: Urban Greening Plans (lecturer from EU). BiodiverCity Café 8 (27 June 2024): Reporting the results of the City Biodiversity Index webinars (2024 Spring, depending on the – still unknown - timing of the webinars). To be led by the Lead Expert and partners participating in the webinars.	*ULG5* to transfer learning grids from CNM3 and continue with the action planning process locally: ideating actions; designing a testing action, defining actions, and refining actions.
September	BiodiverCity Café 9 (5 September 2024): Food forest movement: Den Bosch will share its good practice. BiodiverCity Café 10. (12 September, 2024). Case studies related to economic benefits of using NbS. Peer Learning Meeting in Poljčane (recommendation: week 38): permaculture as an awareness-raising tool and landscaping. BiodiverCity Café 11. (26 September, 2024): workshops with private companies and a dedicated CSR platform to boost private funds: Guimarães and Vratsa will share their good practices, focusing on concrete methods.	*ULG6* to express learning needs to Peer Learning Meeting 1 and discuss Café topics 7-8-9. Continue with the action planning process locally: ideating actions; designing a testing action, defining actions, and refining actions. Testing action.
October	Peer Learning Meeting in Vratsa (recommendation: week 40): 1. cost benefits of nature-based solutions and 2. green roofs and walls. BiodiverCity Café 12. (10 October, 2024): Green Week or similar, city-wide events focusing on biodiversity: Guimarães and Vratsa will share their good practices, focusing on concrete methods.	*ULG7* to transfer learning grids from Peer Learning Meeting 1, express learning needs to Peer Learning Meeting 2 and discuss Café topics 10-11-12. Continue with the action planning process locally: ideating actions; designing a testing action, defining actions, and refining actions. Testing action.
November	BiodiverCity Café 13. (17 October, 2024): Engagement of the elderly: since most often children and young people are visible in environmental volunteering, the involvement of specific groups in biodiversity actions is very useful. Sarajevo will share its good practices, focusing on practicalities (incl. the use of participatory democracy tools).	*ULG8* to transfer learning grids from Peer Learning Meeting 2, express learning needs to Peer Learning Meeting 3 and discuss Café topics 13. Continue with the

	Peer Learning Meeting in Sarajevo (week 43): 1. the engagement of the elderly; 2. NbS tackling air pollution and 3. NbS tackling tourism. BiodiverCity Café 14. (14 November, 2024): How to organise the City Nature Challenge and other bioblitz events (focusing on practicalities): since most partners will organise such an event or join the global competition, Guimarães and Siena will share their experiences.	action planning process locally: ideating actions; designing a testing action, defining actions, and refining actions. Testing action.
December	BiodiverCity Café 15. (28 November, 2024): Experiences and challenges as Climate Neutral City: Guimarães, Siena and Sarajevo will share their good practices.	
January 2025	BiodiverCity Café 16. (TBC): Engagement of residents in habitat restoration (letting them go responsibly, ownerships, sharing power): relevant partners will share their thoughts during an open discussion BiodiverCity Café 17. (TBC): Schoolyards as green oasis: since some partners are interested in this theme, we will invite an external speaker (most likely from Paris) to talk about the experiences. A short presentation about the Iskolakert Alapítvány (SchoolGarden Foundation, Hungary) will be also added.	
February	BiodiverCity Café 18. (TBC): Environmental volunteer plan. The engagement of residents is an utmost priority in each partner city. Cieza and Guimarães will share their good practices in this field. BiodiverCity Café 19. (TBC): Education of technical staff. Cieza will share its good practice, focusing on practicalities.	*ULG9* express learning needs to CNM4, discuss Café topics 14-17. Continue with the action planning process locally: ideating actions; designing a testing action, defining actions, and refining actions. Draft IAP to be ready.
March	BiodiverCity Café 20. (TBC): Fight against invasive alien species: Guimarães will share its good practice, focusing on concrete methods. Core Network Meeting 4 (Cieza/Guimaraes, March, 2025) - Peer review of draft Action Plans - WWF Methodology: Utilising inspiring networks. - Walkshop + local event to share observations - Main theme: climate-proof urban greenery, community involvement, urban biodiversity - BiodiverCity Academy: Green City Accords, Tree Cities, NbS Hub, Eurocities	Testing action.
April	BiodiverCity Café 21. (TBC): Measuring the carbon footprint of the municipality: Guimarães will explain its method and experiences BiodiverCity Café 22. (TBC): Tackling tourism related to biodiversity: how the tourism sector can reflect on local biodiversity actions? Together with relevant partners (e.g. Siena, Guimarães, Sarajevo), the partnership will discuss the possibilities around this theme.	*ULG10* to transfer learning grids from CNM4, express learning needs to CNM5 and discuss Café topics 18-22. Continue with the action planning process locally: ideating actions; designing a testing action, defining actions, and refining actions. Testing action.
May	BiodiverCity Café 23. (TBC): Branding biodiversity: how biodiversity-related issues can boost city branding? Together with relevant partners (e.g. Dunaújváros), the partnership will discuss the possibilities around this theme.	

June	BiodiverCity Café 24. (TBC): Using art as a narrative of green transition: together with relevant partners (e.g. Siena) the partnership will discuss the possibilities around this theme. Core Network Meeting 5 (Siena, June 2025) - Peer review linked to the implementation of pilot actions - WWF Methodology: Form university partnerships. - Walkshop + local event to share observations - Main theme: green corridor - Horizontal theme: digitalisation - BiodiverCity Academy: nature-based solutions	*ULG11* to transfer learning grids from CNM5, and discuss related Café topics. Finalisation of testing actions and the IAPs.
September	BiodiverCity Café 25. (TBC): Organisation of flowering the city events: relevant partners (e.g. Dunaújváros, Veszprém) will share their thoughts during an open discussion BiodiverCity Café 26. (TBC): Grazing in the city: a local nature conservationist will explain the ecological values of grazing. Den Bosch will share its practice.	*ULG12* to discuss the final IAP, organisation of local dissemination event, and discuss related Café topics.
October	Core Network Meeting 6 (Dunaújváros, October 2025) - Introduction of the action plans and funding opportunities - WWF Methodology: Highlighting co-benefits. - Walkshop + local event to share observations - Final Dissemination Event	
November	BiodiverCity Café 27. (TBC): Dutch Championship of Tile Flipping: colleagues from Den Bosch will present this Dutch good practice. BiodiverCity Café 28. (TBC): Cinema afternoon: watching the film "Tomorrow".	