Good Practice Catalogue

November 2025

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Abbrevations

NBS   Nature-based solutions

SMSCTS   Small and medium-sized cities and towns

1   Introduction

The UrbanGreenLeap project Good Practice Catalogue was created to **inspire partner cities and other small and medium-sized cities and towns** (SMSCTS)[1] for the planning and implementation of their own NBS interventions.

Following the project goals and objectives and the EU Biodiversity Strategy 2030[2], these interventions should **increase biodiversity**, create **accessible spaces** for urban dwellers, **improve green space connections** and limit practices that are harmful to biodiversity. The Good Practice Catalogue is structured into four main chapters, focusing on good practices in the following areas: (1) enhancing biodiversity, (2) flood mitigation and (3) heat mitigation. The final chapter briefly presents cases on green space management as it is crucial for the longevity of NBS.

We truly believe that the collected good practices will inspire you to create greener and more resilient environments and communities in small and medium-sized cities and towns.

We would like to thank everyone who contributed their time and expertise to the preparation of the Good Practice Catalogue. The Catalogue was created as part of the UrbanGreenLeap project, which is part of Interreg Euro-MED programme in the Green living areas thematic community.

Nature is an integral part of our cities and towns and essential for our lives. With climate change leaving an irreversible impact on our environment and living conditions, it's time that we adapt our towns and cities to new circumstances and try to mitigate the climate change. Two of the key impacts of the climate change on the urban environment are **biodiversity loss** and extreme weather events, such as **heatwaves**, **floods** and **thunderstorms, both of which affects human health and life.**

In this framework, nature-based solutions (NBS) are carefully designed spatial interventions that use plants and natural ecosystems and engineering solutions to simultaneously contribute to the adaptation of urban environment and communities to climate change while protecting nature and preventing biodiversity loss. This way NBS are key actions in climate adaptation. By IUCN[3] definition, NBS are measures that address societal challenges through actions to protect, sustainably manage and restore natural and modified (urban or degraded) ecosystems, thereby simultaneously benefiting both people and the natural world,

With an increased need for NBS interventions, we must pay attention to understand and recognise them before we plan them. This will help us understand

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[1] Small and medium-sized towns are defined as every urban settlement with 5.000-50.000 inhabitants, with a population density of 300-1.500 inhabitants per km^2 (ESPON, 2024).
[2] https://environment.ec.europa.eu/strategy/biodiversity-strategy-2030_en
[3] https://iucn.org/our-work/nature-based-solutions

how they function and what are their benefits to local environment and community. Knowing the cases and locations in which NBS are already implemented, we can understand, study and discuss their benefits, and find out what to be careful about when transferring the practice to other local contexts. However, it is important to note that **not all NBS interventions are neccesserely a good practice.** Speaking of good practice means speaking of transferability, so it is important that we define criteria for good practice to discuss them and consider how they can be transfered and help improving local problems elsewhere. When we talk about good practices, we are referring to **promoting the implementation of NBS to solve problems** and to the possibilities of **transferring proven solutions to a new environment.** Since NBS are always locally conditioned and depend on the specific characteristics of the physical and social urban environment and the local climate, we must be **careful when transferring good practices**. The principles of NBS are universal, while solutions are always unique, tailored to local environment.

It's important to state that the **best of good practices** are the ones that are **based on data and specific needs of the local environment and community**. The idea is that NBS can solve environmental problems like urban floods, heat islands and biodiversity loss, as well as improve living conditions for people and other living beings.

2 Good Practice Criteria

A good practice in UrbanGreenLeap project is defined as one that demonstrates results of **well-informed and inclusive transformation** of urban green and open spaces and **long-lasting ecological and social impacts** on the local environment and community. A good practice of NBS is based on **specific physical conditions, problems, and needs of the local environment, community and nature. Besides comprehensively improving local conditions, good practice of NBS is also** meaningfully integrated into the wider neighbourhood, town or city climate resilience plan.

Each good practice of NBS is expected to demonstrate continuous impacts on all three fundamental components:

1) Resilience of the local environment to climate change (heat islands, urban floods),
2) The quality of the local environment, biodiversity and ecology (nature restoration),
3) Quality of life and social cohesion.

UrbanGreenLeap NBS good practice key characteristics

Local relevance and scalability
- addresses real local problems, based on data analysis, respecting local environment, nature and community – people's needs;
- tailored to the city's/neighbourhood's unique environmental and social context (improving quality of everyday life by proximity of public green and open space);
- scalable to match local resources, infrastructure, and land availability.

Nature and ecosystem-based designed solutions
- using natural processes, ecosystems and green infrastructure to solve problems instead of only engineered ones
- mitigates climate change effects: heat islands, urban floods, loss of biodiversity;
- protects, strengthens and restores natural ecosystems and the biodiversity of the local environment (e.g., wetlands or permeable spaces for flood control, urban forests for cooling);
- prioritizes native plant species and sustainable land management practices.

Community engagement
- involves the local community (local citizens, citizens groups and NGOs) in planning, implementation, management and maintenance;
- improves social equality, connectedness and inclusion;
- builds local stewardship and social cohesion.

Long-lasting practice
- has a long term and inclusive maintenance plan, designated authority and allocated budget.

Provision of multiple ecological and social benefits
- provides co-benefits such as flood reduction, air and water purification, improved proximity of recreational and regeneration spaces, improved public health and well-being, social cohesion as well as economic benefits.

3 Enhancing Biodiversity practices

3.1 Wildflower meadows in Veszprém, Hungary

Photo: Dr. Gabor Seress

Location: Veszprém, Hungary (HU): 57.000 inhabitants

Implementation period: 2015-2016 (introduction to new grassland management)

Description: Veszprém has a high green space coverage. With the increasing load of urban climate and biodiversity loss linked to climate change crisis, as well as high maintenance costs, were a major challenge for local actors in green space management. In collaboration with Hungarian University of Agriculture and Life Sciences (Szent István University) and local Public Utility Company Veszprémi Közüzemi Szolgáltató (VKSZ), the Municipality recognised the need to adapt its urban green space management to address these challenges. Traditional intensive mowing practices, carried out every 21 days, consumed significant resources, reduced habitat diversity, and contributed little to climate resilience.

In 2015, the municipality, through its public utility company VKSZ, launched a climate-adaptive grassland management programme to create semi-natural wildflower meadows across the city. The initiative aimed to enhance biodiversity, reduce maintenance costs, and improve climate resilience while engaging the local community.

The approach rests on 3 pillars:

- Political and expert commitment – municipal leadership supported the introduction of new, nature-based management techniques.
- Scientific collaboration – the Hungarian University of Agriculture and Life Sciences established and monitored pilot plots, refining techniques and tracking biodiversity.
- Community engagement – residents were informed and involved from the start, through information boards, leaflets, lectures, community festivals.

Key measures included reducing **mowing frequency** (tailored to each selected area), **timing cuts** to avoid peak flowering, **spreading grass cuttings** to enrich habitats, and **sowing wildflower seeds** from local sources.

Veszprém created a cost-effective, ecologically beneficial, and widely supported model for urban grassland management. The initiative saves up to 20 % in maintenance costs, supports local tourism and businesses, and has inspired replication in other cities, including Budapest.

Data analysis: The preparatory phase involved data collection and defining a goal for grassland maintenance. Then, 7 carefully selected green spaces and their habitat by their different characteristics were tested. Annual monitoring informed adjustments to mowing schedules, plant species selection, and maintenance techniques. Public feedback was also collected through awareness campaigns and events, helping to address initial resistance. Later 4 of the tested areas were chosen for the introduction of the new grassland management.

Co-benefits: Increased **biodiversity**, reduced **maintenance costs** (up to 20 %), strengthened **local identity and sense of ownership** of public spaces, enhanced **public awareness** of ecological benefits of wildflower meadows.

Reduced maintenance cost allows the Municipality and VKSZ to increase the budget for the examination and care of mature trees, which bring much greater benefits in the long run (Bálint and Pap, 2024).

Community engagement: Community involvement is central to the project's success. From the start, Veszprém engaged residents through targeted communication (information boards, leaflets, social media campaigns) and participatory activities such as the "wildflower hunt" game, guided school tours, and community festivals and educational events. Educational institutions and NGOs participate in educational and research programmes regarding the grassland management. The general public takes part in municipal events, such as planting, park renovation, and community gardening. The "For Flowering Hungary" contest further fosters ownership and pride in green spaces. Public engagement has shifted perceptions, with residents now requesting wildflower meadows in their neighbourhoods.

To encourage a better understanding and acceptance of the aesthetics of wildflower meadows, it is important to inform the public and raise awareness of their benefits.

Maintenance: The wildflower meadows are maintained by the VKSZ as part of Veszprém's green space management programme. Routine operations, such as adaptive mowing, reseeding, spreading grass cuttings, and habitat upkeep, are guided by ongoing collaboration with the local university, but executed by VKSZ.

Universities, including the Hungarian University of Agriculture and Life Sciences and the University of Pannonia, provide scientific monitoring, biodiversity assessments, and expert recommendations for adjusting maintenance practices. NGOs and community groups support public awareness, citizen participation, and volunteer involvement in planting and habitat care.

This partnership approach ensures that maintenance is both technically sound and socially supported, with municipal funding covering operational costs and community actors helping to safeguard and enhance the results over time.

Photo: Dr. Gabor Seress

Scalability and transferability: The practice is easily transferable to other cities, particularly in regions facing biodiversity loss or high grassland maintenance costs.

Key requirements include municipal commitment, suitable plant species selection, practitioner training, and early, consistent public engagement.

The model has already been replicated in Budapest and can be adapted to local climatic and soil conditions.

Learn more about the project:

Website

- Balint K., Pap M.L. 2024. Climate-adaptive grassland management in urban environments, https://www.interregeurope.eu/sites/default/files/good_practices/Climate%20adaptive_Veszprem_booklet%202024.pdf
- Wildflower cities: Climate-adaptive urban grassland management creating wildflower meadows. 2024. Urbact, https://urbact.eu/good-practices/wildflower-cities

Contact Renata Kiss, project coordinator in Municipality of Veszprém, kiss.renata@gov.veszprem.hu

3.2 Miyawaki forest in Maribor, Slovenia

Location: Maribor, Slovenia (SI)

Photo: Urška Breznik

Implementation period: 2020

Description: The Miyawaki mini-forest project in Maribor addresses urban heat islands, biodiversity loss, and the lack of resilient green spaces in cities. Implemented on a degraded public green plot in the Magdalena district, the initiative applies the Miyawaki afforestation method (developed by Japanese botanist Akira Miyawaki) to create a dense, fast-growing forest with native plant species. The approach mimics local forest ecosystems, planting a variety of shrubs, understory plants, and trees in close proximity to stimulate competition and faster growth. The project planted 853 saplings on an area the size of a tennis court, enriched the surroundings with flowering meadow species, and fenced the site with an educational, community-built wooden barrier. The project has been upgraded by collaboration with Slovenian Bird Watching and Study Society (DOPPS) and the Slovenian Society for the Study and Protection of Bats (SDPVN) and installed bird houses and bat boxes for habitats within Miyawaki. Educational and awareness-raising events (e.g., the annual Bat Night) were also organized periodically at the site. In addition, two benches made as part of the Eko 9 Triennial of Art and Environment have been installed at the site.

The objectives included mitigating heat island effects, providing a carbon sink, increasing biodiversity, and creating educational and ecological value in urban space. Its impact will be shown over the years, when the plants in the Miyawaki forest reach maturity.

Data analysis: Site and soil analysis, reference Miyawaki forest studies, heat island mapping (the project is located in a heat-affected urban residential area).

Co-benefits: Environmental benefits include carbon sequestration, cooling the air through evapotranspiration, improved stormwater absorption, biodiversity corridors, habitat creation for insects, birds, and amphibians.

The social benefits include educational value (interpretation boards), raising community awareness of climate adaptation, improved aesthetics, and health and well-being benefits from greener surroundings. There are also stronger community bonds through collective action.

Community engagement: The project was based on a participatory approach. Volunteers helped plant, build the fence and sow meadows. Local residents were informed with flyers and engaged during implementation. Neighbouring institutions (Red cross, food kiosk) contributed resources, such as storage, electricity and water. Public visibility was enhanced through local media coverage, further engaging with the wider professional and general public community.

Maintenance: Maintenance is designed to be minimal and nature-based. The forest is left to develop naturally, with yearly mowing around its edges and within the meadow to control plant spread and maintain biodiversity. Volunteers coordinate and take care of the maintenance tasks. The surrounding lawn is mowed by the municipality. No financial compensation has been carried by the municipality – all shouldered by the volunteers. Even during drought, private citizens have been charged 150 euros for asking the municipality for help with watering the mini-forest, despite the municipality's land ownership.

Scalability and transferability: The Miyawaki method is scalable to other degraded or unused urban plots, residential or industrial zones, and can be adjusted to different sizes and local ecological conditions. Its low-maintenance nature and visible benefits make it highly transferable to other municipalities facing climate challenges. Miyawaki case in Maribor also serves as a model for combining mini-forests with flowering meadows, offering a replicable approach to enhance biodiversity and resilience in urban settings.

Learn more about the project:

Website http://www.imz-maribor.org/Mini-gozdicek-Miyawaki.html

Contact matic.primc@ipop.si

3.3 Hedgerow conservation in London, United Kingdom

Photo: Hedgelink.org.uk

Location: London, United Kingdom (UK)

Implementation period: 2023-present (annual applications)

Description: Hedgerows are a defining feature of many European landscapes and important for biodiversity, climate mitigation and adaptation. In the dense urban and peri-urban setting of London, hedgerows are often overlooked. The Hedgerow Heroes project by CPRE London engages local groups to plant new hedges and restore older ones across parks, green belt edges and amenity spaces around the city. The core aim is to increase hedgerow length, strengthen wildlife corridors, and embed hedges as living infrastructure in an urban context - helping to reduce air pollution, moderate temperatures at street level, support wildlife and reconnect fragmented green spaces. The project is positioned to support broader national targets (to increase hedgerow length by 40 % by the year 2050 as part of its ambitious climate and biodiversity commitments) and to adapt hedgerow practices for city edges, where space is constrained and the "edge" function (between built and green) is especially valuable.

The challenge addressed: urban development has reduced or fragmented hedgerows, many existing hedges in city zones are low-diversity or poorly managed, and their value for ecosystem services is under-realised.

The objective: engage communities + land managers to plant/restore hedges in appropriate locations around London, train volunteers in long-term maintenance,

and integrate hedgerow creation into green belt and neighbourhood greening strategies.

Data analysis: London's baseline habitat surveys (the "Hedgerows in Greater London – A Habitat Statement") estimate native-species hedgerow resources (around 705 km) and note gaps in data and management. This kind of audit gives a starting point for target-setting, allows comparison of restored vs neglected lengths, and points to under-represented boroughs. The project also uses community-volunteer data (planting events, training sessions) as a proxy for social engagement. For adaptation/mitigation metrics (for example carbon capture or microclimate effect) more detailed monitoring may still be needed, but the project links to research showing that hedges deliver multiple ecosystem services (Gosling et al., 2016).[4]

Co-benefits:

- Environmental: improved habitat linkage for wildlife (birds, invertebrates, small mammals) in urban fringe zones; increased carbon sequestration; improved micro-climate (shade, evapotranspiration) and potential air pollution interception along built edges; restoration of native hedgerow types in otherwise intensively managed or developed areas.

- Social: community engagement through volunteer planting and training builds local stewardship and awareness; hedgerows enhance neighbourhood landscapes, can strengthen sense of place and local identity (particularly where historic boundary hedges are conserved); potential for educational use (schools, youth groups) and social inclusion in green-space projects. The project emphasises sustainable community involvement for long-term maintenance.

Community engagement: The project actively recruits local volunteer groups, park "friends" organisations and corporate volunteering to carry out hedge planting and restoration. CPRE London provides training for local group leaders in long-term hedgerow maintenance and connects them with experienced "friends" groups for peer support. Applicants (friendly local green-space groups) are invited to apply to take part in planting campaigns, receive support and training, and thereby embed hedgerow stewardship locally. This approach ensures that the community is not just passive but actively co-responsible for the green infrastructure installed.

Maintenance: Training is provided in hedge management and local groups are encouraged to maintain hedgerows. The project's framing ("not just get hedges planted but help groups care for them in a sustainable way") shows maintenance is built into the design.

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[4] Gosling, L., Sparks, T. H., Araya, Y., Harvey, M. and Ansine, J. 2016. Differences between urban and rural hedges in England revealed by a citizen science project. BMC Ecology: 16,1. Accessible at: https://bmcecol.biomedcentral.com/articles/10.1186/s12898-016-0064-1

For project dissemination, they support groups with guidance, volunteer networks and hand-over of responsibility. The involvement of local "friends of parks" groups and corporate volunteers help reduce ongoing costs and embed care. A budget for planting events (materials, saplings) is evident; for maintenance the reliance is partly on volunteers' care with organisational support.

Scalability and transferability: This case is highly transferable, as hedgerows are relatively a simple measure that require modest space compared with large trees, which is why it can be integrated in many urban and peri-urban settings (parking edges, park boundaries, school grounds, footpaths). The project model — planting/restoring hedges, training local volunteers, embedding maintenance support — can be replicated in other cities or municipalities and reduced in size and scale to the local needs or goals.

Learn more about the project:

Website   https://www.cprelondon.org.uk/we-care-about/hedgerow-heroes/, https://parksforlondon.org.uk/hedgerow-cpre-london/, https://www.cprelondon.org.uk/resources/hedgerow-hero-progress-report/

Contact hedgerows@cprelondon.org.uk

3.4 Green city bus shelter roofs in Ljubljana, Slovenia

Location: Ljubljana, Slovenia (SI)

Photo: Maja Simoneti, IPoP

Implementation period: Ongoing since 2020

Description: Authentic concept of step-by-step roof greenings of bus station shelters demonstrating national biodiversity, restoring nature in the city and mitigating pressures of urban heat islands.

The project introduces green roofs on city bus station shelters as an innovative, small-scale, and spatially recurring nature-based solution. The Botanical Garden of the University of Ljubljana has developed and implemented this original solution to improve urban environment and to raise ecological awareness with a small but smart and sustainable intervention that demonstrates national biodiversity, supports nature conservation in the city, and mitigates urban heat through collaboration with the Municipality of Ljubljana. By the end of 2025, 41 locations in the City of Ljubljana will have 75 green bus shelter roofs, covering a total area of 300 square metres.

The original concept of greening the shelters is based on the expertise in native plants and plant habitats and mimicking the natural habitats the solution doesn't not require any specific maintenance. The planting substrate is carefully prepared considering the load-bearing capacity of the bus shelters and the characteristics of similarly shallow substrates are followed in natural landscapes for seed collection and seedling cultivation.

Context and Challenges

Urban areas face growing environmental pressures, including heat stress, loss of green spaces, declining biodiversity, and a disconnect between people and nature. Bus shelters, as widely distributed and highly used and visible elements of public space, offer an ideal opportunity to integrate plants and their ecosystems into the city's everyday landscape. The challenge is to develop a sustainable and nature-based solution that is practical and replicable way to introduce greenery in urban public space that would require minimal maintenance while delivering measurable ecological and social benefits.

Photo: Maja Simoneti, IPoP

Aims and Objectives

The main aim of the project is to enhance urban resilience and well-being through accessible nature-based solutions. Specific objectives include:

- Contributing to nature preservation and increasing urban biodiversity by planting native species that support pollinators and other wildlife in the city.
- Raising public awareness about the importance of biodiversity, plants and ecosystem services in cities.
- Improving the aesthetic and climatic quality of public spaces.
- Encouraging citizens and institutions into the greening of other own roofs and built structures in the city with native plant species and to participate in urban heat and biodiversity loss mitigation.

Data analysis: The Botanical Garden of University of Ljubljana subsequently managed to green 76 bus station shelter roofs since 2020.

The planting substrate consists of 1:1 mixture of sand and soil in maximum 7 cm high plant bed. The planting design is site specific, open to sun and shade conditions and the inspiration of the team tending to create memorable interventions in public space. After the plants are spaced sparsely (around 10 seedlings per square meter) a layer of crushed stone is spread over the entire surface. This way the roof garden becomes sustainable, doesn't need any watering or maintenance.

The project uses native Slovenian plant species adapted to demanding growing conditions on bus shelters, such as shallow and poor soils, heat and drought.

The Botanical Garden continuously collects the seeds round the diverse set of Slovenian landscapes and cultivates native plant seedlings for three years before planting them on the roofs, while the Municipality of Ljubljana defines the number and position of new installations each year. The Botanical Garden implements the whole installation and planting as well as supervision of the occasional removal of plants that have been planted randomly and are invasive.

Co-benefits: The green roofs on bus shelters are working as small improvements of urban environment, they offer food and habitat for pollinators and urban birds, cool the bus stop shelters and are visually attractive novelty in urban landscape. By integrating vegetation on existing and new bus stop shelters, a network is created that spreads NBS across the city, enhancing biodiversity, resilience, and urban sustainability. They raise people's interest while they are waiting for the bus or spending time in public spaces, making them feel better and cared for by the city. They are also an interesting learning tool and can help sharing knowledge about native botany, nature protection, biodiversity and mitigation of urban heat and climate change and resilience.

Community engagement: Citizens are mainly engaged in a project passively - they get informed about the greening trough media and are daily inspired by the green roofs of bus stations. Also, there is an open option to visit the Botanical garden and get information about the instalment and buy the seedlings of native plants to design and implement their own green roofs.

Maintenance: The green roofs are self-sustaining, no watering needed and only randomly observed all over the year by the Botanical garden staff and if necessary invasive plants are removed.

Scalability and transferability: The concept of greening the existing roofs with light layer of native – indigenous plants is easily transferable to different cities and geographical areas if follows the same rules and routine:

- study the roofs load bearing capacity and water insulation;
- find existing habitats with similar growing conditions (soil and climate) as the one you are going to plant green roof in;
- collect the seeds in nature and grow the seedlings or go buy specially grown seedlings of native plants;
- prepare the growing substrate and buy if necessary, the protection cloth;
- install the protection, spread the growing substrate, plant the seedlings, and arrange the surface according to natural conditions you are following.

Learn more about the project:

Website https://www.botanic-gardens-ljubljana.com/en/nadstresnice

Contact Dr. Jože Bavcon, Head of Botanical Garden, University of Ljubljana

Dr. Blanka Ravnjak, Assistant to Head of Botanical Garden, University of Ljubljana

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3.5 Park Te regeneration in Mantua, Italy

Location: Mantua, Italy (IT)

Photo: Municipality of Mantua

Implementation period: 2019-2023

2019-2021: Executive design phase

2021-2022: public discussions with citizens and stakeholders to discuss the renovation works and the needs of the community and park's wider social community purposes. The municipality has invited citizens to actively participate in the design process by sharing their opinions and suggestions for improving the park.

March 2022-August 2023: Start and completion of works

Description: Park Te by the Palazzo del Te, Mantua

The park regeneration project has combined the concept of traditional European-style urban park with the need to respect and enhance the monumental historical buildings around it to create a new, admirable and useful green public space.

Where once was a large, disordered and little-used area, on the southern edge of Mantua's historic centre, next to the famous "Palazzo Te", today, a new large public park has already become a reference point in the daily life of the different souls that make up the social fabric of Mantua. The project sought first and foremost to protect and enhance the identity of this monument, partially compensating it for

the 'traumas' that have radically transformed the area over the last century. The great challenge was to reconcile the park's vocation as a truly urban space, a large common facility, with the need to structure the open space in a manner consistent with the presence of the monument.

80.000 square meters of green space mean well-being, sustainability, and contact with nature. Trees help reduce carbon dioxide emissions in the air and produce chlorophyll photosynthesis. A tree can block half a kilo of particulate matter per year, and its leaves directly absorb ozone, the gaseous pollutant that forms nitrogen oxides. On average, trees release 700 kilograms of oxygen for every thousand kilograms of carbon dioxide fixed, and one hectare of trees can produce oxygen for 30-35 people.

The trees in Parco Te will join the more than 24.000 trees that live in the city, which remove 242 tons of carbon dioxide from the air each year, absorb 3.681 kilograms of PM, intercept 1.773 cubic meters of rain, and generate €741.621 in natural benefits each year.

Data analysis: The main data analysed during the executive design phase were as follows:

- Environmental data: climate, microclimate, soil type, existing vegetation.
- Topographical and geological data: terrain morphology, geological stability.
- Traffic and mobility data: pedestrian and cycle traffic, accessibility by public and private transport.
- Socio-cultural and demographic data: population composition, use of public spaces.
- Air quality and pollution data: air pollution monitoring.
- Historical and archaeological data: analysis of the site's historical and cultural heritage.
- Economic data: construction and management costs, financing plans.

This comprehensive data analysis enabled the design of a Parco Te that is environmentally sustainable, culturally respectful, socially inclusive and tailored to the needs of the local community.

Palazzo Te park before and after the restoration. *Photo: Google Earth (screen capture), Municipality of Mantua*

The Te Park physically and symbolically connects Palazzo Te to the city, screening less attractive urban elements (such as the stadium and the railway) with tall vegetation and a formal design that echoes the motifs of the palace and its frescoed "green rooms" (Camera degli sposi, Sala dei Giganti). A perfect balance between monumental preservation and new urban usability.

The Te Park is an extraordinary green infrastructure that combines environment and community: it regenerates the urban fabric, increases public green space, and restores a place of encounter, beauty, and life to the area. It is a virtuous example of how green space can serve as a tool for cohesion, sustainability, and collective pride.

Community engagement:

The design of the new Parco Te in Mantua was characterized by a participatory approach, in which citizens and local stakeholders were involved from the preliminary stages of the project to ensure that the park would meet the needs of the community and respect the historical and cultural identity of the place.

1. Public consultations and citizen involvement

The Municipality of Mantua, together with architects and designers, promoted public meetings and consultations with citizens to gather suggestions and expectations. During these participatory moments, residents had the opportunity to express their opinions on various aspects of the project, such as the management of green spaces, safety, usability, and the social functions of the park.

Active listening to local needs: For example, citizens requested more space for outdoor activities, adequate lighting for safety, children's play areas, and pet-friendly areas.

Online surveys and feedback: To broaden participation, online tools such as surveys and platforms were also used to gather the opinions of those who could not attend the physical meetings.

2. Involvement of local experts and stakeholders

The project involved the collaboration of various professionals and stakeholders to ensure the quality and sustainability of the intervention:

Architecture and landscaping experts: Architects and green space designers worked closely with the municipality to integrate the historical identity of the Palazzo Te into the park, respecting its cultural value.

Sustainability and biodiversity: Biologists and ecosystem specialists contributed to the choice of plant species to improve the biodiversity and sustainability of the area.

Local associations and groups: Citizen groups and environmental and cultural associations were also involved, suggesting the inclusion of cultural events and educational activities. For example, schools were invited to participate in the design of educational spaces and outdoor activities.

3. Working in synergy with the Superintendency of Cultural Heritage

Given that Parco Te is located in the area of great historical and cultural value, the Superintendency of Cultural Heritage (Ministry of Culture) has been a key figure in the process, ensuring that the works comply with regulations for the protection of monumental heritage.

Landscape restoration: It was necessary to work together to preserve the integrity of the monumental context, designing the park so that it would be complementary and non-invasive to Palazzo Te and the surrounding areas, maintaining a clear distinction between the historical heritage and the new structures.

4. An inclusive project for all generations

The park was designed to be inclusive and accessible to all: not only in terms of physical accessibility (ramps, pedestrian and cycle paths), but also in terms of functionality, with dedicated areas for children, the elderly, families, sports enthusiasts, and even pets.

Accessibility and mobility: Mobility and accessibility requirements were a priority, as the park is a key link between the city center and Palazzo Te. For this reason, safe routes for pedestrians and cyclists have been designed, as well as easy access points.

Spaces for play and sport: Citizens played an important role in indicating which sports and recreational facilities were most useful for their daily lives.

5. Creation of a 'green setting' for events and culture

Te Park is not only a place of nature, but also a place for socialising and culture. Local stakeholders (cultural associations, tourist boards and schools) were involved in the design of spaces for events such as concerts, theatre performances, festivals and cultural activities. In addition, the Festivaletteratura Foundation collaborated to integrate the park into literary events and public meetings.

Co-creation project with the community: 'Co-creation' events have been organized, such as gardening workshops, botanical walks, and artistic activities, where citizens have actively contributed to the creation of the park.

6. Continuous monitoring and post-inauguration feedback

Even after the park's inauguration (August 2023), citizen involvement continues: the municipality and other entities involved maintain channels of active listening, gathering feedback on any improvements or new needs that emerge with the daily use of the park. In particular, regular meetings with residents are planned to assess the effectiveness of services and maintenance of the green area.

Parco Te has been a concrete example of participatory design, where citizens, experts, public bodies, and associations have worked together to create a space that reflects the needs of the community, while enriching the city from an environmental, cultural, and social point of view.

Maintenance: The Parco Te project is largely funded by the Italian Ministry of Culture (€5.2 million). For the first two years, park maintenance will be handled by the consortium responsible for construction; afterward, the municipality will take over at the same cost per square meter as other public parks. Designed with long-term economic sustainability in mind, the park requires scheduled, low-cost maintenance, focusing on pruning, weed control, and irrigation. Annual management costs are estimated at around €90,000 (or about €2 per square meter, which is significantly lower than those of more complex parks) ensuring the park remains both visually appealing and financially sustainable over time.

Scalability and transferability: The project could serve as a model for other cities confronting similar challenges of regeneration of large public green spaces in their city centres. Below are some key points to consider when replicating the project:

1. Citizen participation: Actively involve citizens in the site evaluation, design and management of the park.
2. Local context: Adapt the project to the historical heritage, local community and site specific biodiversity.
3. Sustainability and management: Develop sustainable economic and maintenance models with a strong ecological component.
4. Accessibility and mobility: Integrate the park into the urban mobility network, ensuring universal accessibility.
5. Inter-institutional partnerships: Create public-private partnerships for financing and management.
6. Education and culture: Integrate the park into educational and cultural activities that involve the community.

The success of a project such as Parco Te can be replicated in many cities, provided that the balance between innovation, sustainability, and community involvement is maintained.

Learn more about the project:

Website https://www.mantovaambiente.it/parco-te#costruire

Contact Mayor of Mantova: Mr Mattia Palazzi, segreteria.sindaco@comune.mantova.it

3.6 Public park restoration in Pegognaga, Italy

Location: Pegognaga, Italy (IT)

Photo: Municipality of Pegognaga

Implementation period: Main restoration works: 2015-2016
Expansion of the park area: 2021-2022
The park is subject to ongoing rehabilitation process, including the planting of new trees and shrubs and maintenance of playground equipment and infrastructure.

Description: The San Lorenzo Park was established in 1990 as the first Local Park of Supra-Municipal Interest (PLIS) in the province of Mantua by the municipal administration strongly supported by local environmental associations. The main goal was to reconvert an area previously dedicated to the clay extraction by the 'Cà Rossa' furnace into a large park area.

In collaboration with LIPU (Italian Bird Protection League), a multi-phase restoration plan was developed, leading to the creation of:

- Nature trails (including botanical, ornithological, sensory and archaeological trails)
- Rest areas, wildlife observation huts, visitor centre
- Bird ringing station for scientific purposes (active and recognised by ISPRA)

Vegetation barriers have also been created, thousands of native trees and shrubs have been planted, and the southern quarry has been remodelled to become the "Falconiera Oasis", reserved for the protection of wildlife, particularly birds.

In 2021, the park restoration work went on, with a new expansion plan by planting numerous new trees, some 4.700 native trees and shrubs covering approximately

5 hectares, financed with €500.000 (€400.000 from the Lombardy Region and the rest from local sources).

Photo: Municipality of Pegognaga

Data analysis: For the environmental restoration of Parco San Lorenzo in Pegognaga, various data and parameters were analysed with the aim of transforming a former quarry area into a multifunctional ecological park. Here are the main environmental and territorial data that were taken into consideration:

1. Geological and geomorphological data

- Extraction history: the area was a clay quarry, exploited until the 1970s and 1980s. The following were analysed:
- Depth and conformation of the quarry basins
- Slope stability and soil characteristics (to assess the safety and feasibility of renaturalisation)
- Presence of residual water or surface water (for the subsequent development of ponds and wetlands)

2. Botanical and vegetation data

- Analysis of residual spontaneous vegetation and potential local habitats
- Study of the native flora of the Po Valley (to define the species to be reintroduced)
- Mapping of areas of natural resurgence or already colonised by pioneer species (plant species that are the first to settle on degraded soils)

3. Fauna data (especially ornithological)

- Monitoring of animal species already present in the area (amphibians, reptiles, small mammals, birds)
- Identification of nesting or migratory birds (to assess suitability as a migratory stopover area)
- Installation of stations for the scientific ringing of birds (with data collected in collaboration with LIPU and validated by ISPRA)

4. Hydrological data

- Study of the water dynamics within the area:
- Presence of artificial basins resulting from quarries
- Potential for the creation of wetlands or permanent ponds
- Water quality and oxygenation, depth and local rainfall

5. Archaeological and cultural data

- Survey and excavations in the area around the Pieve Matildica di San Lorenzo (and Roman archaeological site)
- Study of the integration between nature and culture to ensure environmental restoration that also enhances the historical heritage

6. Landscape and perceptual analysis

- Assessment of the visual and sensory usability of the site
- Study of the reconfiguration of the landscape according to ecological and functional criteria
- Planning of trails, viewpoints and huts for wildlife observation

7. Urban and territorial data

- Inclusion of the park in the PLIS (Local Park of Supra-Municipal Interest) system
- Connection to the cycle and pedestrian network of the Oltrepò Mantovano
- Assessment of accessibility, parking and routes for disabled people

8. Socio-educational and participatory data

- Involvement of schools, environmental associations and citizens in the project
- Analysis of the training, educational and recreational needs of the area

The restoration was based on an in-depth multidisciplinary analysis that took into account ecological, landscape, cultural and social aspects. This integrated approach ensured not only the renaturalisation of the area, but also its enhancement as an educational and sustainable public space.

Co-benefits: Environmental benefits: The former clay extractive area "Ca Rossa" has been restored to create a public park with a total area of approximately 56 hectares, of which:

- 37 hectares are designated as public green space
- 12 hectares are reserved for the Falconiera Nature Reserve
- 7 hectares are occupied by a Roman archaeological site with the Matildic parish church of San Lorenzo at its centre

The small lakes in the park were created from old clay pits. Thanks to renaturalisation, the area has attracted 180 species of birds, including ardeidae and great crested grebes, becoming one of the most important wildlife areas in the province.

Social benefits: The park also supports educational and teaching initiatives: schools and groups can take advantage of courses on botany, ornithology, archaeology, sport fishing and audiovisual activities.

Community engagement: In addition to visitor centres, trails, rest areas and quarries for sport fishing, there is a botanical trail, a bird ringing station and huts for wildlife observation. The municipality collaborates with local associations active in various fields such as environmental education (Laboratorio Ambiente e Gram), ornithological research (Gruppo Ricerche Avifauna Mantovano), sport fishing (Pado Patri) and hunting (ArciCaccia and Federcaccia).

Maintenance: San Lorenzo Park is managed by the Municipality of Pegognaga (with its own offices and internal staff, using municipal funds and regional/national grants), which is responsible for the advanced maintenance – of trees, plants and new plantings, lakes, as well as outdoor furniture (benches, bins, etc.). The Padano Forestry Consortium is also involved in the maintenance of the park. Regular maintenance (cutting the lawn, the banks and cleaning the bins) is entrusted by agreement to a local volunteer association which also takes care of the laboratory activities and the reception of the schools.

Scalability and transferability: The San Lorenzo Park is a good example of the regeneration of a former quarry site, which has been transformed into a green space for the use of and benefits of the local community, nature protection and has also been recognised by the Lombardy Region as a Local Park of Supra-Municipal Interest (PLIS). What has been done in Pegognaga can certainly be replicated in other municipalities in the Euro-MED area, where there are many former clay, gravel and similar mining areas be redeveloped into vital public green areas for the benefit of the local community, nature restoration and diverse set of other ecosystem like services like education, sport and else. .
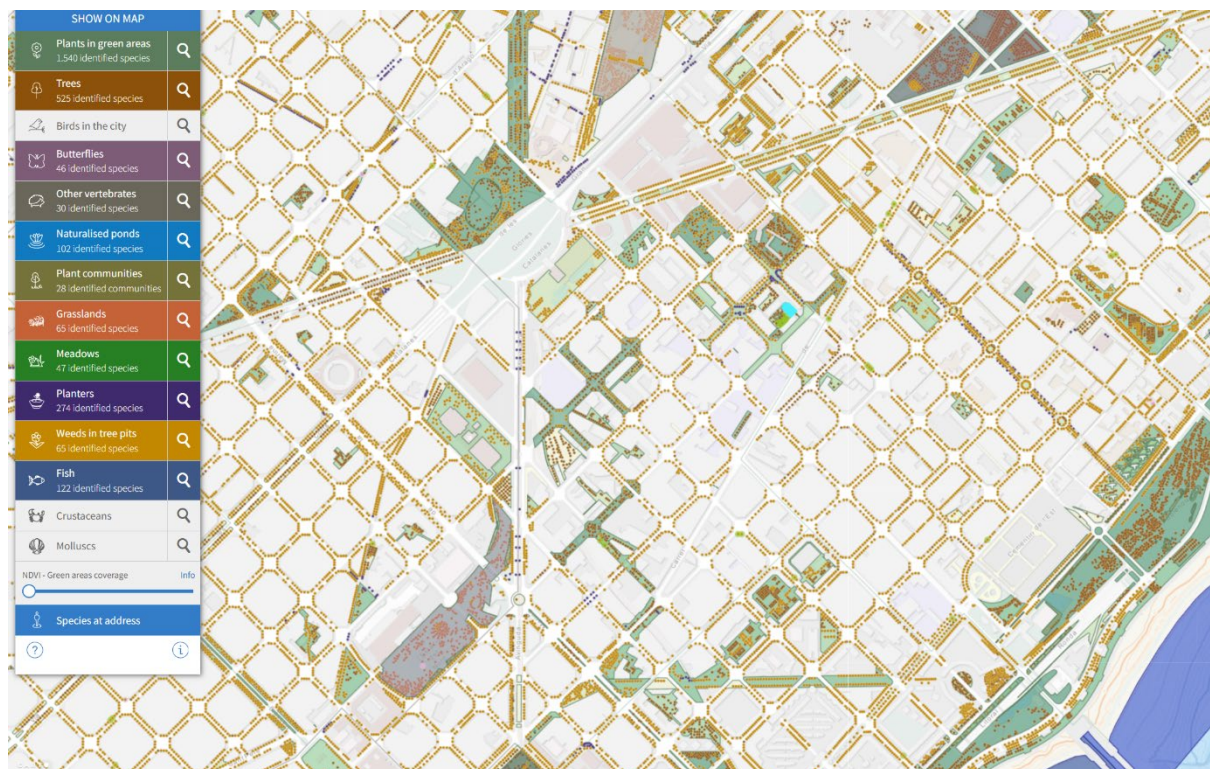
Learn more about the project:

Website https://www.centroculturalepegognaga.it/turismo/parco-san-lorenzo/

Contact Jacopo Benatti, Municipality of Pegognaga, jbenatti@comune.pegognaga.mn.it

3.7 Digital Biodiversity Atlas of the City of Barcelona, Spain

Location: Barcelona, Spain (ES)

Implementation period: This digital tool was implemented in 2019 by the City Council, to provide information on city's flora and fauna. In 2024, 450 new species were added to the data base.

Description: This is a georeferenced data base of urban species in the city of Barcelona, divided into its 73 neighbourhoods and 10 beaches, enabling to access some of the most significant data on city's biodiversity separately or together, by selecting various information layers.

The atlas includes the following layers:

- The parks, gardens, squares and green plots of land managed by Barcelona City Council, with the species of plants that live there.
- The trees.
- The birds.
- The butterflies.
- Other vertebrates (small mammals, amphibians, reptiles).
- The fish found on beaches.
- The crustaceans found on beaches.
- The molluscs found on beaches.
- The fauna (vertebrates and invertebrates) inhabiting greened ponds.
- All the natural and semi-natural plant communities.

- The spontaneous vegetation found in tree pits.
- The plant species found in meadows.
- The plant species found in grasslands.
- The plant species found in those planters managed by the Institut Municipal de Parcs i Jardins de Barcelona.
- The extent of the city's plant cover, seen from the air.

Besides going deeper into each of these layers, we can also explore how they all interrelate and find out the total number of species found in each neighbourhood or per address.

Data analysis:

- Vascular plants in urban green areas: more than 1.400 species of plants that can be found in parks, gardens, squares and municipal-owned areas. This catalogue also contains details of shrubs, climbing and cover plants and some herbaceous plants (except for lawn grass and seasonal plants).
- Urban trees: includes geo-referred data of more than 200.000 trees; more than 400 species found in the city's streets and parks. They can be selected individually and also include trees that have been listed as trees of local interest.
- Spontaneous vegetation from tree pits: includes data on plants that grow around the base of trees planted in the street. There are 65 species of spontaneous plants with ornamental flowers that form attractive microhabitats for pollinators, auxiliary fauna and birds.
- Birds: 85 species.
- Other vertebrates: More than 30 species of mammals, amphibians and reptiles commonly found in green spaces.
- Butterflies: 46 species. The data has been collected annually since 2018, thanks to a citizen science project called **The urban butterfly monitor scheme** (uBMS; https://ubms.creaf.cat/en/).

Co-benefits: The Biodiversity Atlas of Barcelona has multiple co-benefits:

- Supports democratization of data (and FAIR access, according to FAIR data principles - Findability, Accessibility, Interoperability, and Reuse of digital assets) and open data: everyone can have access and explore Barcelona's urban nature in an easy and interactive way.
- Provides a complete and updated data and evidence-base for both research and urban planning.
- Apart of georeferenced data, it offers detailed information on species ecology, flowering period and uses (i.e. in case of plants).
- Allows integration with other data from citizen science projects (data interoperability) and enables collaboration with research institutions (i.e. CREAF, ICM-CSIC etc).
- Offers a user's-friendly interface, raising awareness on the "biodiversity on your doorstep".
- Supports ongoing or future conservation strategies.

Community engagement: In this specific good practice example, community engagement is especially integrated in data collected from citizens science projects.

Maintenance: This data base is maintained and periodically updated by Barcelona City Council.

Scalability and transferability: The Biodiversity Atlas of Barcelona is a good transferable example of publicly available data, with GIS support. However, as a first step, the cities should introduce all species inventories (including their location), in a unique data base and then combine it with various cartographic layers (including Open Street Maps), already available within a GIS or Green cadastre in the City Councils.

Learn more about the project:

Website https://ajuntament.barcelona.cat/atlesbiodiversitat/en/

Contact Area of Ecology, Urban Planning and Mobility, Barcelona City Council, general contact.

4 Flood mitigation practices

4.1 Rain Gardens in Pula, Croatia

Photo: katastarpulaherculanea.pipgis.hr (above), Tatjana Uzelac, GRAD PULA+ (right)

Location: Pula, Croatia (HR)

Implementation period:

2007-2025

Description: Rain gardens were carefully technically planned, designed and implemented in Pula at locations that are prone to flooding during heavy rainfall due to insufficient sewage capacity. Rain gardens are usually designed as open ditches in low-lying areas, using and enforcing the natural flow of the rainwater and additionally planted with plants that are resistant to varying moisture and drought conditions. The rain gardens in Pula collect water from roads, other paved surfaces, and large building areas. The structure of a rain garden consists of several parts. The first is the surface layer, where plants and trees are grown. Below this is a fertile soil layer that purifies the water together with the plants. Finally, there is a drainage layer that retains the water and slowly releases it underground. As part of the sewage system, rain gardens are not just

hydrotechnical structures for water retention and flood protection but also part of climate change adaptation plans and solutions, protecting from heath islands, preserving biodiversity, and protecting entire local ecosystems and local community. The rain gardens also improve the image and health of urban environment and people as well. These systems have been constructed in around a dozen locations in Pula in a manner that mitigates the impact on the entire catchment area.

Data analysis: Spatial analysis (Cadastre).

Co-benefits: Self-sustaining, mitigating the heat island, reducing the water runoff, contribution to urban biodiversity, contribution to well-being of the wider community, new gathering spaces.

Community engagement: The rain gardens are located in the immediate vicinity of residential buildings, schools, kindergartens, and offices, and allow residents to play, socialize or rest there without restrictions.

Maintenance: Rain gardens are constructed for minimal maintenance and low resource consumption, easy to maintain. They are maintained by the municipal utility company Pula Herculanea d.o.o., and the funding is provided from the City of Pula's budget.

Scalability and transferability: There are no more urban floods in areas where rain gardens have been built. Due to positive effects and benefits, more rain gardens (retentions basins) are planned in new areas around the city of Pula. The concept is highly transferable, every local community that has problems with sewage when areasavy storms should think about how to retain and drain the rainwater away from the sewage system.

Learn more about the project:

Website https://katastarpulaherculanea.pipgis.hr/thematic-map/pano?sh=

Contact tatjana.mandicb@herculanea.hr

SURFACE RETENTION
fertile soil, d=30cm
liner 250g/m2
drainage layers 16-32 mm, d= 30 cm
liner 250g/m2
drain cells
liner 250g/m2
base layer 16-32 mm, d= 20 cm
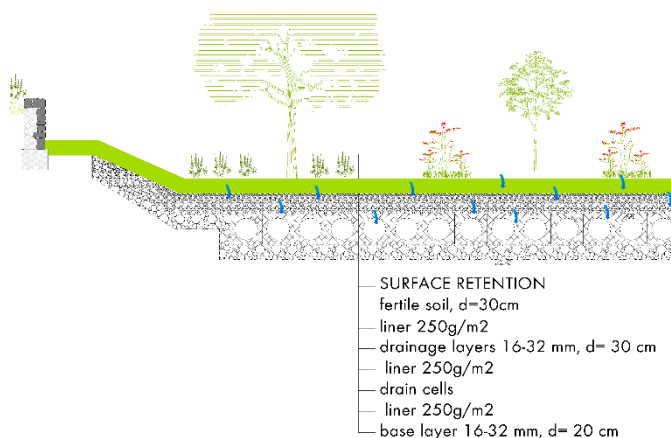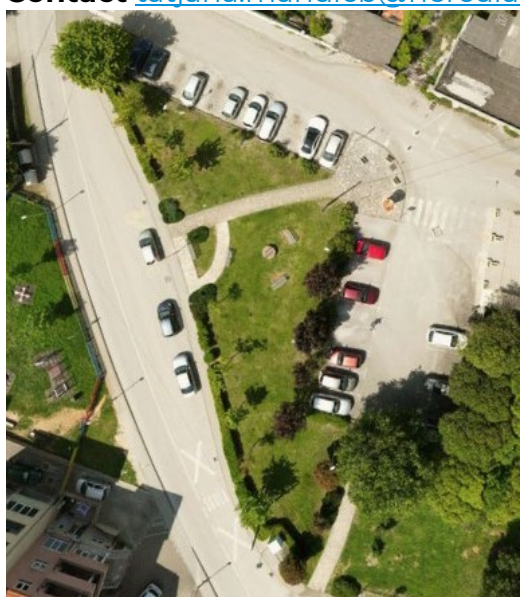
Photo: katastarpulaherculanea.pipgis.hr (left), Tatjana Uzelac, GRAD PULA+ (right)

4.2 Garden Streets in Antwerp, Belgium

Photo: Maja Simoneti, IPoP

Location: Antwerp, Belgium (BE), streets of Bloemstraat, Aziëlaan, Lange Riddersstraat and in the Berchem neighbourhood (Wasstraat. Woeringenstraat, Berthoutstraat and De Brouwersstraat).

Implementation period: 2017–2023 (7 garden streets)

Description: Antwerp's 'Garden Streets' initiative redefines urban planning by combining co-creation, climate adaptation, and social cohesion. The Garden Streets initiative originated from Antwerp's Climate Adaptation Strategy and Waterplan, aiming to enhance urban resilience through co-creative, nature-based solutions. Between 2017-2023, 7 streets in different parts of the city were completed. The concept of garden streets aims to replace existing paved streets and squares with as much greenery as possible and permeable materials to reduce runoff, relieve pressure on ageing sewer systems, and promote water infiltration in the area the runoff happens, embodying the Waterplan's

Photo: Maja Simoneti, IPoP

vision of a "natural water city". The green features of Antwerp's garden streets include wall greenery (created using climbing plants), vegetable gardens, trees, mixed planting areas, and lawns. The concept can be compared to the "Sponge city" concept, which focuses on large-scale, top-down urban water infrastructure, whereas garden streets emphasize small-scale, community-driven green interventions integrated into existing neighbourhoods.

The approach uses participatory design to co-create multifunctional, climate-adaptive and socially inclusive streets. Each street is somewhat unique, shaped by the design and tailored to the residents' needs.

Photo: Maja Simoneti, IPoP

Data analysis: Monitoring included rainwater capture in pilot streets (e.g., Lange Riddersstraat had zero runoff for two years), vegetation coverage, social participation, and qualitative community feedback. Research-by-design guided materials and environmental integration. No detailed economic datasets were yet available, but maintenance and investment costs are tracked and comparable to regular streets.

Co-benefits:

- Enhanced social cohesion through community gardening, events, and participatory design.
- Increased biodiversity via native and insect-friendly vegetation.
- Improved stormwater management.
- Improved urban cooling, better thermal comfort and reduced heat island effects.
- Empowerment through co-maintenance and shared ownership.
- Promotion of local identity and neighbourhood well-being.

Community engagement: Community involvement began in the concept phase with co-creation workshops, which citizens participated in. Residents contributed to the designs, initiated the greening process and now maintain up to 80 % of the green infrastructure (e.g. Bloemstraat). Public events such as brunches and collective planting activities have reinforced social cohesion. The city recognised street users as key experts in local liveability.

Maintenance: Garden streets rely on shared maintenance. Residents are responsible for maintaining the greenery directly in front of their homes, while the

city council provides support in the form tree maintenance and technical infrastructure. Permeable surfaces can be easily removed for restoration. Agreements with the sewage partner reduce costs and improve investment efficiency.

Scalability and transferability: Following the initial five pilot schemes, Antwerp is designing more garden streets every year. The model has attracted national attention in Belgium and inspired replication in other cities of different sizes. Knowledge is shared through site visits, public events, talks and technical guides. This approach can be scaled up to cover dense urban environments across Europe, whether that be one street or an entire neighbourhood.

Learn more about the project:

Website https://www.antwerpenmorgen.be/nl/projecten/tuinstraten/over

https://www.antwerpen.be/info/59c10b91ca69bc4b16578078/tuinstraten-berchem

https://degroteverbouwing.eu/en/future+places/climate+streets/

Contact Ir. Ronny Van Looveren, City of Antwerp, Ronny.vanlooveren@antwerpen.be

4.3 Retention Lake and Urban Park in the Brno-Nový Liskovec, Czech Republic

Photo: Vojta Herout

Location: Brno-Nový Liskovec, Czech Republic (CZ)

Implementation period: 2011-2013

Description: Park Pod Plachtami in the neighbourhood of Nový Lískovec, in Brno, was created in response to urban floods that were often caused by heavy rainfall because of the overloaded sewage system. The 32,000 m² park consists of meadows, trees, a lake and a nature trail. The primary task of the new park layout was to collect and retain water from the roofs of three residential buildings, preventing it from flowing into the overloaded sewage system and causing flooding. The draining rainwater is now diverted into a central lake within the newly developed park. This lake is also used for recreation, relaxation, socialising, and education. This solution addresses the flood risks and supports preserving and enhancing biodiversity, lowers local high temperatures and enhances urban liveability. The project was developed through a long-term planning process and citizen engagement, offering a replicable model for climate adaptation in urban areas.

Data analysis: The park construction was chosen as a flood mitigation measure based on a long-term evaluation of rainwater infrastructure capacity and the recognition that expanding sewage systems would be cost-prohibitive. Local

hydrological and spatial analyses supported the feasibility of implementing a rainwater-fed lake as a nature-based adaptation measure.

Co-benefits:

– Flood mitigation and reduced pressure on sewer systems

– Local heat / high temperature regulation

– Improved biodiversity and ecological value of the environment (aquatic and terrestrial)

– Educational opportunities

– Enhanced recreational and aesthetic value of the park area and the neighnourhood
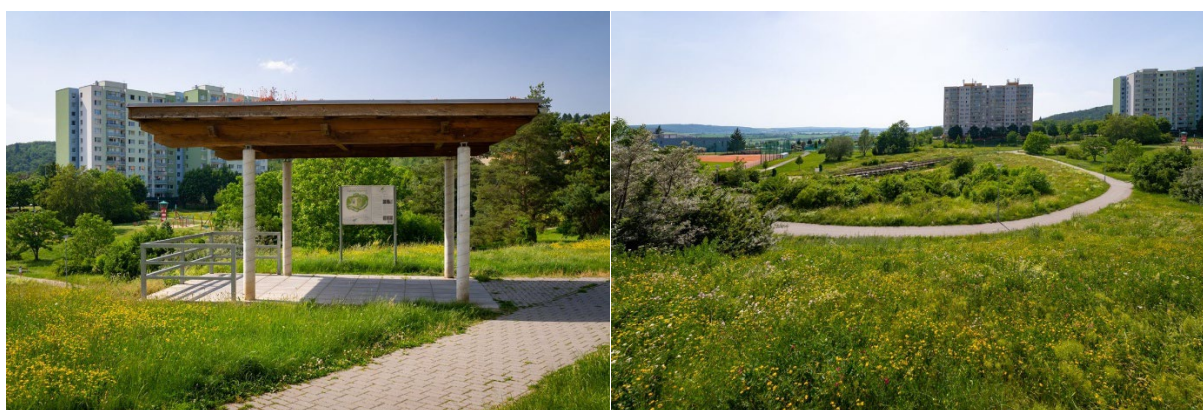
Photo: Vojta Herout

Community engagement: From 2005 to 2011, the concept was developed through extensive public discussions. Despite initial opposition concerning safety and hygiene, the project gained support and disproved public concerns after implementation.

Maintenance: The park is maintained by the Brno district of Nový Lískovec. Annual maintenance costs are not over 300,000 CZK (12,000 EUR). Issues such as invasive fish and technical failures (e.g., sluice repair) have been resolved through adaptive management.

Scalability and transferability: The solution is highly transferable to other residential urban areas facing rainwater management challenges and limited sewer infrastructure. Its strong public amenity value makes it a replicable model across Europe and beyond. A project like this can however be costly and require specific expertise in the fields of nature conservation and construction.

Learn more about the project:

Website https://www.adapterraawards.cz/databaze/2019/park-pod-plachtami
**Contact** Ing. Jana Drápalová, the Mayor, drapalova@nliskovec.brno.cz

5   Heat mitigation practices

5.1   Green Corridors in Stuttgart, Germany

Location: Stuttgart, Germany (DE)

Implementation period: The Climate Atlas, which underpins the green corridor strategy, was published in 2008, and the land use plan for integrating green corridors was developed in 2010. This Climate Atlas was based on their first attempt on the topic, a climate atlas from 1992. The plan from 2010 removed more than 60 ha of greenfield land from urban development. Otherwise, the first climate change mitigation strategy was adopted in 1997, followed by an adaptation strategy in 2012 that integrated green and blue infrastructure in urban planning. Already since 1986, the City of Stuttgart has provided financial support to citizens for green roofs, remarking that in the strongly overheated and poorly ventilated valley areas, the potential for green roofs should be used as extensively as possible. In 2016, a municipal greening program (courtyard, roof and facade greening) was resumed to accelerate greening measures in the existing buildings.

Description: Stuttgart's geography—a valley basin with low wind speeds—combined with industrial activity and traffic, contributes to poor air quality and urban heat stress. The city developed a Climate Atlas to guide zoning and land-use
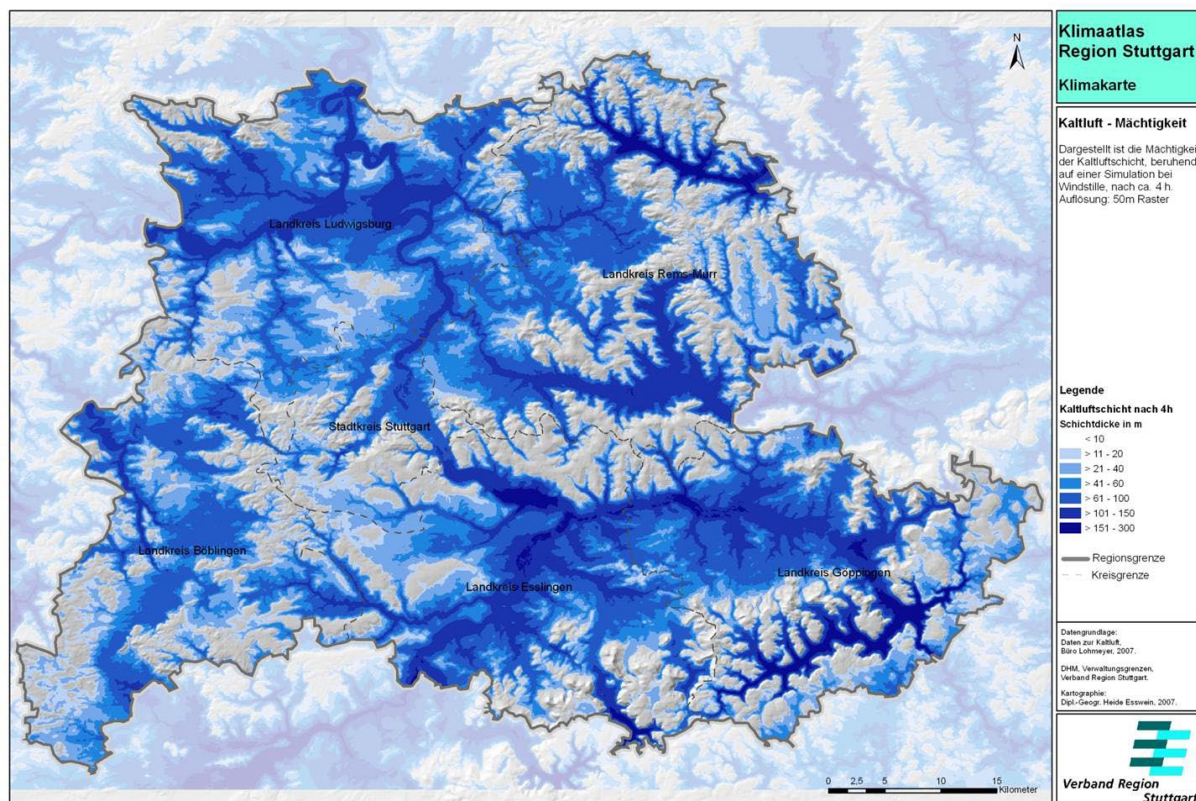
Map of fresh air in Stuttgart, courtesy of the Section of Urban Climatology, Office for Environmental Protection

planning, preserving open spaces and creating green corridors that allow cool air to flow from surrounding hills into the city. The strategy integrates green belts, urban forests, and green-blue infrastructure to reduce heat stress, improve air quality, and enhance resilience to climate change. As such Stuttgart is a very good example on how to plan sustainable and long-term on data obtained and how to use nature-given qualities of the land. We also see that in projects with nature-based solutions the duration until the desired result can take a longer time, since nature does not hurry. It is also a good case to see how many layers and systems in the city can or must be connected to present a sustainable and functional solution that is well welcomed by the citizens and participants.

Data analysis: The city Stuttgart developed a Climate Atlas that maps: temperature distribution, cold air flows, air pollution concentrations, topography and land use. This data was basis for zoning regulations and planning decisions, such as banning development on hillsides and preserving valleys as air corridors. Subsequently this information has helped develop specific zones and plans to both protect open spaces and incorporate new ones into dense, urban areas.

Co-benefits: Next to main benefits, such as improved air quality, reduced heat stress, enhanced biodiversity and soil erosion prevention we can mention other obvious – social impact. We can „measure" it in better public health, increased thermal comfort and improved quality of life because of easier access to nature and more confortable moving through the city. In the Stuttgart case there are also economic benefits, such as reduced energy demand for cooling, increased property values directly next to the project site and city-wide and enhanced urban attractiveness with more people regurally using green public spaces in their free time and not escaping the city.

Community engagement: The city engaged stakeholders through public workshops, including one attended by 250 participants in 2016. During the preparation of the strategy, local councils, environmental departments, and citizens have been involved in the process. Educational campaigns and participatory planning have been key to public support.

Maintenance: Maintenance is managed by the Office for Environmental Protection - the Department of Urban Climatology and others such as The Garden, Cemetery and Forestry Office and The City Planning and Renewal Team for further development. Green areas are protected under nature conservation orders and the German Federal Building Law, which mandates environmental protection in urban planning. Budget allocations are included in municipal planning and supported by national and EU frameworks, such as nature conservation orders and building regulations.

Scalability and transferability: The strategy process can be scalable and transferable due to use of standardized climate data that was measured long-term, systematic integration of data into land-use planning, legal support from German building codes which made the efforts smoother and modular tools like the

Climate Atlas. Other cities, such as Erfurt, have already adopted similar systems. The approach is adaptable to cities with similar topographic and climatic challenges.

Learn more about the project:

Contact: Rainer Kapp, Municipality of Stuttgart, rainer.kapp@stuttgart.de

Website: Green ventilation corridors: Stuttgart, Germany – EBRD
Green aeration corridors in Stuttgart City | PANORAMA
Stuttgart: combating the heat island effect and poor air quality with
ventilation corridors and green-blue infrastructure | Discover the key
services, thematic features and tools of Climate-ADAPT
Green corridors: Ventilation corridors network, Stuttgart | Oppla
Green ventilation corridors - Energy Cities

Photo: Florian Fischer

5.2 Green roof park in Zagreb, Croatia

Photo: Green Gold Center Archive

Location: Zagreb, Croatia (HR)

Implementation period: 2011

Description: The investor's vision was to create an urban oasis—a place where citizens could find a corner of nature to enjoy, return to often, and truly feel at ease. An urban oasis is a public open space, a park, or a square nestled between buildings or shaped by the surrounding architecture within the city. Its rich diversity of plant species provides shade and a natural barrier from urban noise, while ponds and fountains soften and transform the city's sounds into the gentle murmur of water. This oasis serves residents, employees, and visitors alike, supporting their everyday activities. It offers the community countless benefits by inviting people to pause, sit, and relax. Such green spaces are essential for the sustainable development of cities. They embody the intersection of ecological, social, and economic values— places where the benefits of sustainability come together to enhance urban life.

Data analysis:

- Urban heat-island (UHI) maps & indices (LST, NDVI, NDBI): City-level UHI analyses for Zagreb (2013–2024) helped identify hotter, highly built-up zones along major corridors near Radnička/Vukovarska. We used these layers to justify a vegetated rooftop/park concept that increases canopy and evapotranspiration where UHI hotspots are common.

- Site & context data (location, land-use, access): The center sits at Radnička–Vukovarska, within a dense new business district. Location and land-use information guided pedestrian access, shading priorities, and acoustic buffering needs for an open public space between buildings.
- Microclimate & noise exposure assumptions: Proximity to high-traffic streets informed the selection of multi-layer planting (trees/shrubs/groundcovers) and water features to diffuse traffic noise and reduce radiant temperatures on hard surfaces (a standard mitigation pairing in UHI-exposed sites). (Inference from UHI and transport context above.)
- Stormwater management design inputs: Green-roof practice relies on rainfall intensity–duration–frequency (IDF) data and retention coefficients to size substrate depth, drainage, and overflow. We used IDF methodology to design detention/slow release on the roof so peak runoff to municipal drains is reduced. (City-specific IDF tables aren't published in the project's public docs; approach follows standard hydrology/IDF practice.) https://en.wikipedia.org/wiki/Intensity-duration-frequency_curve?utm_source=chatgpt.com
- User behaviour & programming (qualitative): Observed use patterns of office workers/visitors in a mixed-use complex (shopping, hospitality, hotel, park) informed seating, shade nodes, and routes—aiming to create an "urban oasis" that invites people to pause and relax.
- Project identity & amenity brief (owner/operator data): Developer/operator materials confirmed the mixed-use program (offices, shopping, hospitality, hotel, park) and operating profile, which we used to align planting durability, maintenance windows, and wayfinding.

Co-benefits: The Green Gold Center rooftop garden reduces the urban heat island effect, manages stormwater, improves air quality, and buffers traffic noise, while also supporting biodiversity in the city.

Socially, it offers citizens an accessible green oasis for relaxation and everyday use, enhancing well-being, community interaction, and the overall attractiveness of the business district, while serving as a model of sustainable urban development.

Community engagement: The community has been engaged primarily through the public accessibility and daily use of the rooftop garden as an urban oasis. Office workers, hotel guests, local residents, and visitors are invited to enjoy the space for relaxation, meetings, and events. By integrating a mix of seating, shaded areas, and water features, the design responds to observed user needs and encourages people to return regularly.

This open access makes the community not only beneficiaries but also active participants, as their presence and activities give life and value to the space. Over time, the garden has become a recognizable meeting point in the district, strengthening the sense of community in a dense business environment.

Maintenance: Maintenance was considered from the very start of the project. The rooftop garden was designed with durable plant species, irrigation infrastructure, and accessible service zones to ensure long-term viability.

The responsibility for care lies with the facility management of the Green Gold Center, in cooperation with contracted horticultural specialists. Tasks include irrigation, seasonal planting care, pruning, lawn management, and upkeep of water features.

Yes, a dedicated budget is allocated as part of the operational costs of the mixed-use complex. This ensures that the garden remains attractive, functional, and safe for public use while preserving its environmental and social benefits over time.

Scalability and transferability: The Green Gold Center rooftop garden demonstrates solutions—diverse planting, water features, noise buffering, and stormwater retention—that are modular and adaptable to different building sizes, climates, and urban contexts. The concept can be scaled down to smaller courtyards or terraces, or expanded to larger business districts and public facilities.

It is transferable because it relies on widely available techniques in landscape architecture and green-roof engineering, combined with flexible plant palettes adapted to local conditions. The model shows how to integrate ecological, social, and economic benefits into dense urban areas, making it replicable in other cities seeking sustainable, climate-resilient design.

Learn more about the project:

Website https://www.greengold.hr/hr/o_nama/park/

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5.3 Green bus stop shelters in Pula, Croatia

Photo: Pula Herculanea d.o.o.

Location: Pula, Croatia (HR)

Implementation period: 2025

Photo: Pula Herculanea d.o.o.

Description: A series of concrete planters have been placed at ten locations in Pula along the back of existing bus shelters, and where the situation allows, on the sides - depending on the direction of arrival of the buses. Climbing plants have been planted inside the planters, such as *Partenocissus quinquefolia*, *Campsis radicans*, *Clematis jackmanii, Lonicera henryii,* etc. The climbing plants will cling to the built-in stainless steel cable system and spread over the sides and roof of the shelters, thus creating "green shelters" that will provide protection from the sun, rain and wind and contribute to cooling urban heat islands and creating a

more pleasant microclimate. The first climbing plants have already reached the heights.

Data analysis: The first significant benefits are expected during the summer season of 2026.

Co-benefits: Expected benefits on heat mitigation and thermal stress on passengers, as well as visual benefits and encouragement of urban greenery.

Community engagement: Positive reactions from bus users, especially the elderly, children and pregnant women, have already been noted.

Maintenance: Watering during dry periods.

Scalability and transferability: The project can be easily transferred to other towns and cities.

Learn more about the project:

Website https://www.pula.hr/hr/novosti/detail/28703/Grad-Pula-krenuo-s-ozelenjivanjem-autobusnih-nadstresnica/

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6 Green space Management

6.1 Urban Forest Management in Celje, Slovenia

Location: Celje, Slovenia (SI)

Photo: Slovenian Forest Service

Implementation period: since 1990's The municipality is today the owner of approximately 350 hectares of the forest.

Description: The Celje's City Forest is the largest public park in the city that serves as recreational area, air cleaner and water purifier. The wooded area, covering 400 hectares of hilly south edges of city's centre is an example of a sustainable practice of protection and development of urban forest in the near proximity of city. The management practice goes way back in history and has traditionally prioritised public and ecological functions of forest to economic ones. This way the forest has been managed for decades in public interest and in strong partnership between the municipality and the regional office of the Slovenian Forest Service. In the last 30 years the development vision and strategy enabled the municipality to step by step gradually bought up the forest and become the owner of whole area and extensively improved conditions for forest management in favour of local public interests.

The forest area was formally recognized and protected from simple commercial tree felling in 1997 through a municipal decree and designated as a "forest with special purpose". This decree enabled public funds to be allocated to buying out the private owners and sustainably manage the forest regarding its ecological and social functions. Forest area development and maintenance, including the reinvestment of income from wood sales into forest infrastructure now goes on for thirty years. The area is systematically managed to become a most interesting,

healthy and well maintained recreational and educational forest in the city and around.

Aside to 14 kilometres of well-maintained hiking trails in the woody area, one of very popular attractions in the forest is the tree house, built from local wood (Douglas fir) in 2015. The forest house regularly hosts educational and cultural events and has been constantly maintained and renovated to sustain the number and intensity of visits. Another upgrade are so called "Castle trails", new hiking and walking paths that were established in 2024.

Data analysis: The City Forest management is based on a long-term strategy, adopted in 1996 and on excellent cooperation between the forest service that prepares the forest management plan, the municipality that leads, coordinates and pays for the development strategy and operational maintenance and investment and local public park service Zelenice that takes care for the area regular and investment maintenance and also for the tree feeling. All discussions and decisions about development and maintenance are discussed collaboratively among the three parties cooperating in the practice with mutual responsibility and interest.

Co-benefits: The City Forest provides a wide range of ecological, social and economic benefits, it works as largest public park in the city, and it is partially managed for economic benefits meaning that its wood from felled trees is used for park equipment in the forest and other public green space. Professional maintenance and care of forest trees and habitats provide natural regeneration and biodiversity. While paths, fences, handrails and sitting areas are maintained by the public park service so that diverse space for relaxation, cultural and educational activities is created and knowledge on different topics can easily be exchanged. It protects local nature, helps the city to mitigate climate change and to adapt to climate change and enables physical activity and mental well-being through outdoor recreation in urban green space, right next to historical city centre. It offers citizens a safe and cool environment in the times of summer heat and affects the areas microclimate with help of city park and Savinja river next to it.

Community engagement: An important feature is the strong involvement of the local public. Citizens participate in maintenance, report damage to paths or illegal dumps through an online municipality portal for reporting damage (Servis48), urban equipment, or trees and participating in organized clean-up campaigns, besides that they are regular walkers and users of the tree house for events and lectures.

Photo: Boštjan Hren (Robi Valenti)

Maintenance: The maintenance of the recreational part of the forest and its paths, benches, and fences is carried out by the public company Zelenice, as well as forest clean-up, in close cooperation with the Slovenian Forest Service and public administration of the municipality.

The tree house is managed by the municipality. The municipality finances all maintenance work in the forest and on the tree house. The budget for maintenance is filled through the market sale of timber from the forest.

Scalability and transferability: Celje's City Forest demonstrates a case of urban green space, forests in this case, that has been continuously responsibly managed and maintained in public interests for decades. It is a showcase of priorities and good practice of revitalization with modest investment, long-term vision and strong community involvement. Its success makes it a replicable model for other cities seeking to enhance social, ecological and economic benefits of their urban forests.

Learn more about the project:

Website https://www.visitcelje.eu/product/urban-forest-and-its-tree-house/, https://www.facebook.com/mestnigozdcelje/

https://urbact.eu/good-practices/city-forest

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6.2 Varaždin Model of Sustainable Urban Tree Management, Croatia

Location: Varaždin, Croatia (HR)

Photo: Alenka Klaneček (Parkovi d.o.o.)

Implementation period: since 2024

Description: Sustainable urban tree management requires an interdisciplinary approach that integrates ecological, technical, and social dimensions. The Varaždin model of sustainable tree management, developed by the municipal company Parkovi d.o.o., introduced public relations as the fourth pillar—alongside species selection and planting techniques, the tree inventory, and professional maintenance. This innovation makes communication an integral part of management, fostering transparency, citizen participation, and informed decision-making.

Data analysis: An evaluation framework must be developed for measuring effectiveness of the model that would allow monitoring and measurement of the effects of communication activities. Indicators such as levels of citizen trust, degree of involvement in participatory activities, and the extent of understanding and acceptance of professional decisions would be useful for future optimizing of the model.

Co-benefits: Through this model, citizens' ecological literacy is strengthened. The public develops a deeper understanding of ecological processes and the importance of sustainable green space management. Furthermore, a bridge is built between professionals and the community, reinforcing social connections and cooperation, while enabling expert knowledge to serve as the foundation for decision-making and practical implementation.

Community engagement:

Managing urban greenery in the era of climate change requires interdisciplinary, data-driven, and socially responsive approaches. Parkovi d.o.o., the municipal company responsible for maintaining green spaces in Varaždin—a city with a rich cultural and horticultural heritage—has developed a four-pillar model aimed at addressing changing habitat conditions, increasing climatic extremes, and the growing expectations of citizens. Each pillar of this model has a clearly defined role, with public relations—often an overlooked component in similar frameworks—ensuring transparency, education, and active citizen engagement.

The Parkovi team consists of employees with diverse professional backgrounds, ranging from gardeners, mechanics, agronomists, and arborists to graduate engineers of urban forestry, nature and environmental protection, and experts in marketing and public relations. In addition to internal capacities, Parkovi collaborates with external experts—certified arborists as well as scientists and institutions from relevant fields.

Public relations within the Varaždin Model encompass timely, professional, and inclusive communication, education, crisis communication, citizen participation, proactive media relations, and international cooperation. In this model, every team member has a communication role—each within their own field of expertise and scope of work.

At Parkovi, public relations are not merely an addition to the technical management of trees, but an integrated system of two-way, participatory, and deliberative communication. Its uniqueness lies in combining transparency, education, crisis communication, and participation into a single, effective framework.

Public relations in Parkovi are used to strengthen transparency and public trust. Citizens are regularly informed about planned plantings, removals, and tree maintenance, with professional explanations provided for the reasons and background of individual decisions.

Public education is carried out through blogs written by Parkovi employees, public forums where important topics are openly discussed, workshops, and projects such as Tree of the Year and the Tree Festival, which promote environmental awareness and encourage active community participation.

Two-way communication is achieved through various channels – social media, telephone, e-mail, post, the City of Varaždin's GRIC tool (which enables citizens to communicate more easily with city services and city businesses, report problems and make complaints), as well as through daily personal interactions in the field and on Parkovi's premises. Most

Photo: Siniša Sović (Foto agencija Sjever)

often, communication arises in situations where citizens find themselves in some form of "conflict" with urban trees – leaf fall, overhanging branches extending over private property or public areas, roots encroaching into gardens or drains, trees touching private property, shading, obstructed views, insects or birds in trees, or perceptions that a tree is dangerous, "too tall" or "too large." Other typical situations include minor seasonal inconveniences or citizens' requests for tree removal, pruning, or planting in public spaces. Through direct communication with citizens, misunderstandings are clarified in a timely manner, and community trust is strengthened. In most of these cases, the professional services of Parkovi provide written responses to citizens' requests, substantiating their statements with photographs and expert assessments.

Crisis communication and conflict management are based on timeliness, openness, professional reasoning, and empathy. All complaints and inquiries are answered with explanations regarding the tree's health condition, planned interventions, and, when necessary, with the results of expert evaluations and diagnostics. This approach demonstrates that all decisions are grounded in professional analysis rather than arbitrary choices.

Special attention is given to timely informing the public about sensitive topics, such as the removal of valuable trees or threats to the survival of certain green areas. In such cases, communication is conducted openly, using all available channels, and citizens are offered the opportunity for direct dialogue.

Public relations at Parkovi are not managed by a single department or individual, but through a team-based approach — jointly shaped by experts from various fields depending on the topic and type of activity. For example, municipal engineers, horticultural specialists, landscape architects, and field workers communicate daily with citizens, the media, and partners, thereby directly shaping the public image of the company through their work. This approach ensures authenticity and

credibility in communication, as information comes directly from professionals who understand local needs.

Parkovi does not have a formally developed communication strategy, since communication is naturally integrated into everyday operations and represents an inherent part of the organizational culture. Given the company's size and its close relationship with citizens, flexibility and direct communication have proven to be more effective than formal procedures. This approach enables continuous two-way information exchange with the public, quick responses to citizens' needs, and the ongoing strengthening of public trust in the company's work.

The City of Varaždin, as the owner of Parkovi and the public green spaces, benefits greatly from this model — with more satisfied citizens, fewer complaints, increased trust in professional expertise, and stronger recognition of the city as a community that actively promotes sustainability and quality of life. This model of cooperation demonstrates that effective communication does not always have to stem from complex strategies, but can emerge from shared responsibility, professional competence, and genuine dedication to the public good.

Maintenance: Parkovi finances the fourth pillar of the Varaždin Model of Sustainable Tree Management – Public Relations – from its own funds, while the remaining three pillars are financed through the city budget and available national sources.

Scalability and transferability: The further development of the Varaždin Model will move towards development of digital tools for citizen participation and improved communication.

The Varaždin Model of sustainable tree management demonstrates that public relations can become an active and strategic tool in public sector work and can serve as an inspiration for other cities striving for sustainable and inclusive urban green space management, where the community is not a passive observer but an equal partner in shaping a healthier and more pleasant urban environment. The further expansion of the model is also possible through strengthened collaboration with the academic community. Scientific evaluation of existing practices and joint research projects would allow for the validation of the model and its broader promotion within the scientific and professional community.

Learn more about the project:

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