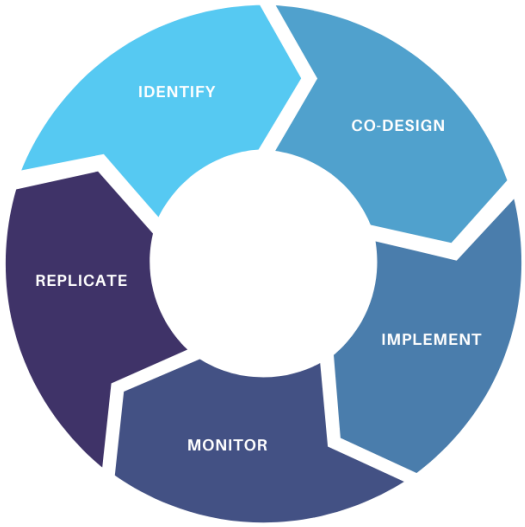
Systemic Integration of Transformative Technical and Nature-based Solutions to Improve Climate Neutrality of European Cities and Regions and tackle Climate Change: the URBreath Approach

URBREATH

Rethinking Urban Spaces: How Nature, Community, and Innovation Are Shaping Cluj's Green Transformation

By 2050, nearly 70% of the world's population will live in cities, making urban transformation an urgent priority. Rising temperatures, declining air quality, and shrinking green spaces are just some of the challenges cities must address to remain liveable. URBREATH, a Horizon Europe-funded project, tackles these issues head-on by combining Nature-Based Solutions (NBS), digital tools, and community-driven approaches to reshape urban environments.



A simplified approach to urban intervention follows five key steps: Identify, Co-Design, Implement, Monitor, and Replicate. In practice, this means diagnosing urban challenges, working closely with communities and stakeholders to develop solutions, implementing them, tracking their impact, and ensuring successful strategies can be scaled across other cities.

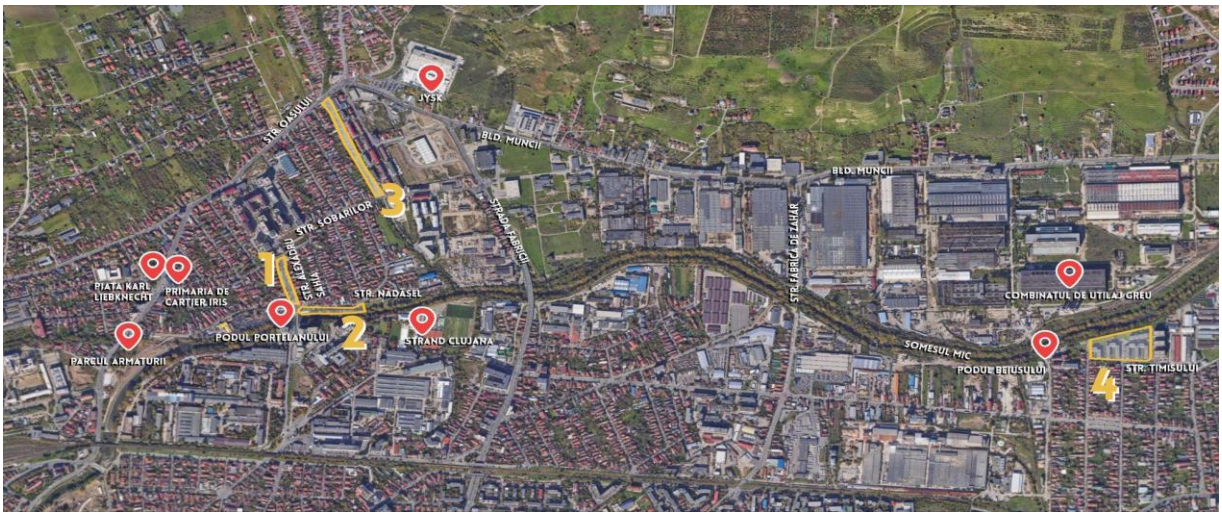
1.1 Cluj-Napoca: A Testing Ground for Scalable Solutions

As a front-runner city, Cluj-Napoca plays a key role in demonstrating how climate-adaptive solutions can be applied in continental climates. Its urban transformation efforts are designed with replication in mind, ensuring that cities facing similar environmental pressures can learn from and adapt their tested strategies.

To maximise impact, Cluj has focused on three key urban environments, each chosen for its potential to improve both local resilience and broader urban planning models:

1. Green Pockets in Residential Neighbourhoods
    - Converting neglected green spaces into active community areas.
        - *Str. Timișului* – Enhancing public green space for social and environmental benefits.(4)
2. Green Spaces Along Blue-Green Corridors
    - Strengthening natural ecosystems and integrating them into the urban landscape.
        - *Str. Nădașel* – Expanding a blue-green corridor to boost biodiversity and flood resilience.(2)
3. Green Spaces Along Transport Corridors
    - Using greenery to reduce heat, improve air quality, and enhance pedestrian comfort.
        - *Str. Alexandru Sahia* – Greening a heavily motorised corridor.(1)
        - *Str. Sobarilor* – Integrating urban greenery with alternative mobility solutions.(3)

To shape these interventions, we engaged the local community in a series of workshops, consisting of two key parts. First, we presented nature-based solutions proposed within the project to gather feedback from citizens and then participants were encouraged to share their needs, priorities, experiences and suggest their own solutions. In parallel, we organised discussions with key actors from academia, the public sector, and the private sector to explore how policy, research, and investment can support long-term urban resilience.



1.2 INSIGHTS FROM WORKSHOP IRIS: PROTECTING BIODIVERSITY

1.2.1 A Surprising Urban Resident: Beavers Along the Someș River

Biodiversity is often thought to be shrinking in cities, yet nature finds ways to adapt—even in the most unexpected places. Along the Someș River, participants identified a thriving beaver population, a clear sign of an improving ecosystem. But with their return comes a challenge: beavers are master engineers, and their natural tree-cutting behaviour can disrupt urban green spaces. Without intervention, this could lead to conflicts between conservation efforts and urban management.

The workshop discussions made one thing clear—protection efforts must balance preserving these keystone species and maintaining urban green spaces. Participants proposed targeted education and awareness campaigns to help residents understand the ecological benefits of beavers while also implementing strategies to prevent tree loss.

1.2.2 Planting for Resilience: Beyond Aesthetic Greenery

A city's green spaces should do more than beautifying the urban landscape—they must actively support biodiversity. Workshop participants emphasised the need for planting strategies that enhance ecological functions rather than just fill space with generic greenery.

One key solution proposed was the integration of pollinator-friendly plants, which play a vital role in supporting bees, butterflies, and other essential species. Strategic plant selection can turn every green space into a functioning ecosystem, improving urban biodiversity while serving as an educational tool for the community.

1.2.3 Rewilding the City: Guerilla Planting for Urban Biodiversity

Traditional parks serve an essential purpose, but in a city where green space is limited, new approaches are needed. Instead of neatly landscaped parks, workshop participants proposed a guerilla-style planting strategy—introducing resilient, native plant species into underutilised spaces to create biodiversity pockets with minimal maintenance.

This approach allows nature to reclaim parts of the city in a strategic and self-sustaining way. Carefully selected species will be introduced in neglected areas, enhancing ecological resilience without interfering with urban infrastructure. These interventions could transform overlooked patches of land into thriving micro-habitats, proving that even the smallest spaces can contribute to urban biodiversity.

1.3 INSIGHTS FROM WORKSHOP SOMEȘENI: EXPANDING URBAN GREEN NETWORKS

1.3.1 A Continuous Green Corridor: Bridging the Gaps

Urban resilience isn't built in isolated patches—it thrives when green spaces are connected, forming a continuous network that enhances biodiversity and climate adaptation. A key revelation from the workshop was that what planners saw as separate intervention areas, the community saw as one unified space.

Participants stressed that expanding the intervention area should not be seen as an add-on, but as a natural extension of the existing ecosystem. This perspective shift challenged the initial site analysis, which fragmented the space into distinct plots. The green corridor is already a single, connected entity for those who live there, and interventions should reflect that reality. This insight is a powerful reminder that on-the-ground community knowledge is essential for effective urban planning.

1.3.2 Beyond Trees: Rethinking Public Spaces with Smart Design

Green spaces are more than just areas with trees—they are places where people gather, interact, and create shared experiences. The workshop discussions emphasised that planting should go hand in hand with strategic urban furniture design to make public spaces more inviting and functional.

- Native plant species were a priority, chosen for their ability to thrive in local conditions, support biodiversity, and reduce long-term maintenance costs.
- Urban furniture was envisioned as more than just benches—modular, adaptable seating areas and shaded spots that encourage social interaction while blending into the natural environment.
- Community gardens emerged as a strong focus, as participants identified existing ad hoc gardens already in use. Rather than replacing them, the goal is to integrate and formalise these spaces, reinforcing community-led greening efforts.

1.3.3 Child-Friendly Green Spaces: Nature as an Extension of Home

For many residents, especially families with young children, parks are more than recreational spaces—they are essential extensions of their homes. The workshop highlighted the urgent need for child-friendly green areas where nature becomes an interactive playground.

Rather than conventional playgrounds with fixed structures, participants envisioned dynamic, nature-integrated spaces where children can explore, climb, and interact with their surroundings. By designing these spaces with safety, accessibility, and engagement in mind, the goal is to encourage outdoor activity while fostering a deep connection with nature.

1.4 Designing a City Where Nature and Mobility Move Together

1.4.1 A Walkable, Green City: Aligning with Pedestrian Pathways

Green spaces should enhance, not hinder, urban mobility. A key takeaway from the discussion was the need to synchronise green interventions with planned pedestrian pathways, ensuring that newly introduced vegetation supports rather than disrupts the city's evolving mobility infrastructure.

Planned pathways along the Someș and its adjacent affluents are designed to promote walkability and accessibility, creating a seamless network of pedestrian-friendly routes. Any planting efforts must complement these corridors, providing shade and microclimate benefits while avoiding obstructions that could limit ease of movement. The challenge lies in striking the right balance—integrating greenery without compromising usability.

1.4.2 Cycling Through Green Corridors: A Careful Balancing Act

As cycling becomes an integral part of Cluj's urban mobility strategy, the conversation turned to how green infrastructure can improve—not interfere with—cycling networks. The benefits are clear: properly placed vegetation can create cooler, more comfortable routes, filtering pollutants and improving air quality in areas with high traffic emissions. But without careful planning, trees and shrubs could obstruct sightlines, encroach on bike lanes, or force cyclists into unsafe detours.

To avoid these pitfalls, greening efforts must be strategically positioned—providing shade without reducing visibility, offering environmental benefits without creating physical barriers. The challenge is to design streets that make cycling not just feasible, but appealing. A well-planned green network doesn't just accommodate cyclists—it encourages more people to leave their cars behind, making Cluj a city where cycling is not just an option, but the obvious choice.

1.4.3 Keeping the Water Accessible: Greening the River Without Closing It Off

The regeneration of the Someș River and its affluents presents a unique challenge: how to restore natural ecosystems without cutting people off from the very spaces that make the river a social and recreational asset. Green corridors can strengthen flood resilience, enhance biodiversity, and improve air quality, but if vegetation is placed without considering accessibility, it risks creating barriers rather than connections.

The discussion underscored the importance of keeping access points open, preserving visual connections to the water, and designing interventions that enhance the riverfront experience rather than isolate it. Plantings must be carefully placed to offer shade and cooling effects for those using the space, while maintaining clear paths to the water's edge. The goal is not just to green the riverbanks, but to create a more accessible, inviting public space where nature and city life coexist seamlessly.

1.5 BRIDGING KNOWLEDGE AND POLICY: ACADEMIA'S ROLE IN URBAN TRANSFORMATION (emerging partnerships with USAMV)

1.5.1 Turning Research into Action: A Collaboration Framework

Cities are complex, ever-changing systems, and tackling their environmental challenges requires more than isolated interventions. A key takeaway from the discussion was the urgent need for a formalised partnership between universities and local public institutions, ensuring that research-driven insights translate into real-world solutions.

Academia holds the expertise to study, model, and predict the impact of interventions, while public authorities control the urban spaces where these theories can be tested. The discussion underscored that without structured collaboration, valuable research remains confined to academic papers instead of shaping the city itself. A partnership agreement would bridge this gap, creating a continuous exchange of knowledge and resources—where universities contribute scientific expertise, and public institutions facilitate access to spaces for experimentation and implementation. The result? A smarter, more adaptable city built on evidence-based urban policies.

1.5.2 Experimental Plots: The City as a Living Lab

To move beyond theory, the discussion explored the potential of turning designated urban plots into real-life research spaces, where students and researchers can test innovative environmental solutions. The idea is simple but transformative: instead of relying solely on theoretical models, Cluj-Napoca could become a working laboratory for urban sustainability.

Students would have the opportunity to experiment with nature-based solutions, test materials, and monitor ecological responses in real-time, gaining invaluable hands-on experience while generating data that directly inform urban planning. These experimental plots would not only support academic learning but also help refine urban greening strategies before full-scale implementation, reducing risks and improving long-term success. With Cluj positioning itself as a Living Lab, integrating academic research into the city's development isn't just an opportunity—it's a necessity.

1.5.3 Empowering the Next Generation: A Student Design Challenge

If cities are to become more sustainable, the next generation of urban planners, architects, and environmental experts must be at the forefront of designing solutions. A proposal emerged to launch a solution design competition for students, challenging them to develop practical, scalable interventions for nature-based solutions in Cluj.

More than just an academic exercise, this initiative would foster interdisciplinary collaboration, encouraging students from diverse fields—urban planning, environmental science, engineering, and social sciences—to work together on real-world challenges. By bringing fresh perspectives into the urban regeneration process, the competition wouldn't just benefit students—it would generate innovative, implementable ideas that could shape future policies and investments.

1.6 How Do We Achieve Synergic Effort with Minimal Resources?

Urban transformation requires more than just visionary planning—it demands efficient use of existing resources and strategic partnerships that maximise impact while minimising costs. In Cluj-Napoca, the challenge is not only implementing nature-based solutions (NBS) but also doing so smartly, leveraging current infrastructure, and activating local resources. The discussions revealed two key approaches: integrating sensor technology into existing municipal infrastructure where possible and stimulating co-financing and public-private partnerships (PPP) through the Digital Twin platform.

1.6.1 Maximising Existing Infrastructure: Smart Sensor Integration and Multi-Use Community Panels

Monitoring urban transformation requires real-time environmental data, but deploying an entirely new sensor network can be costly and complex. A key strategy identified was to embed sensors into Cluj's existing municipal infrastructure, utilising structures already in place—such as streetlights or public buildings—to collect crucial data on air quality, noise levels, and microclimate conditions without major additional costs.

Where this integration isn't feasible, the project will introduce dedicated community information panels that serve multiple functions beyond data collection. These panels will not only house environmental sensors but also provide public information on urban ecology, such as awareness campaigns about beaver populations along the Someș and ongoing green interventions. By positioning these panels strategically, they become both a technological asset and a public engagement tool, ensuring that environmental monitoring is not just a scientific endeavour but an inclusive community resource.

1.6.2 Activating Local Resources: Co-Financing and Public-Private Partnerships

Beyond smart technology, the discussion also focused on how to finance urban greening efforts with minimal additional public spending. One of the most practical solutions identified was leveraging municipal co-financing for dendrological materials, ensuring that public funds directly support tree planting and green infrastructure. This shared investment model increases project feasibility and community buy-in, reinforcing the idea that urban resilience is a collective responsibility.

At the same time, the potential of public-private partnerships (PPP) facilitated through the Digital Twin platform was explored as a game-changing tool for engaging private sector contributions. By using Digital Twin technology, private investors and businesses can visualise and assess the impact of their financial or material contributions before committing resources. More than just funding isolated projects, private actors could "adopt" green spaces, directly financing their transformation and long-term maintenance. This model not only secures additional investment for urban greening but also creates long-term commitments that ensure sustainability beyond the initial implementation phase.

Disclaimer

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