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Ready4Heat

# D.3.1.1 Solutions recommended to improve sustainability of heat measures

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# Content

# EXECUTIVE SUMMARY AND CONTEXT

Cities across Europe are experiencing longer, hotter and more frequent heatwaves. Urban areas are particularly affected due to dense construction, limited greenery, and large sealed surfaces, all of which intensify the **urban heat island effect**. Heat stress is an environmental, **public health and social issue**, especially for vulnerable groups such as older people, children and those who spend time outdoors. As climate change accelerates, municipalities urgently need to implement **practical, affordable and socially acceptable solutions** to protect citizens and maintain urban comfort.

As part of the **Ready4Heat** project, the city of **Hajdúböszörmény in Hungary** tested a **nature-based approach to mitigating** the effects of heat, focusing on small-scale, distributed shading solutions in public and institutional spaces. The pilot introduced shaded 'green islands' combining vegetation, pergolas and seating in locations exposed to heat, identified through heat-stress analysis and local knowledge. These interventions demonstrated that relatively simple measures can significantly improve thermal comfort and the usability of public spaces, thereby enhancing overall urban resilience.

This policy brief builds on this experience, translating it into **recommendations** that can be adopted by other municipalities. The key conclusions are clear:

- **Nature-based shading is a cost-effective and feasible heat adaptation measure** that can be integrated into existing public spaces;
- **Early stakeholder involvement** improves site selection, public acceptance and long-term success;
- **Maintenance planning and clear responsibilities** are essential to secure lasting impact;
- Heat mitigation works best when treated as a **standard municipal service**, not a one-off pilot.

## Context and rationale

Heat protection measures are important because they address the **impacts of climate change, health risks and the quality of life** in cities directly. Rising temperatures lead to an increase in heat-related illnesses, a reduction in outdoor activity and put a strain on urban infrastructure. Nature-based solutions can counter these effects while providing additional benefits for biodiversity, social interaction and urban attractiveness.

The experience of Hajdúböszörmény shows how local heat measures can support wider policy goals, including **Sustainable Energy and Climate Action Plans (SECAPs)**, national climate adaptation strategies, and the **EU Mission on Adaptation to Climate Change**. It is important to note that urban heat is not a local problem limited to one city, but rather a **shared regional and transnational challenge**. The lessons presented in this policy brief are therefore relevant for municipalities across Central Europe and beyond, offering a practical way to **build healthier, cooler, more resilient cities**.

## Local context – Hajdúböszörmény

*The city of Hajdúböszörmény, located in eastern Hungary, is increasingly affected by extreme summer heat. Due to its flat terrain, dense built-up areas and limited shading in many public spaces, the city experiences a strong urban heat island effect, which particularly impacts vulnerable groups such as older people, children and those spending time outdoors. Climate data show a steady rise in the number of hot days, making heat stress a growing challenge for everyday life in the city.*

*Within the Ready4Heat project, Hajdúböszörmény tested a nature-based pilot measure to reduce heat stress and improve thermal comfort in public and institutional spaces. The pilot focused on the creation of 47 so-called*

*"green islands" at 23 carefully selected locations across the city. These green islands combine benches, pergolas, trees and diverse vegetation to provide shade, cooling and more comfortable places to rest during hot summer days.*

*The pilot aimed to demonstrate how relatively small, low-tech interventions can contribute to cooling the local microclimate, improving the usability of public spaces and increasing urban greenery and biodiversity. Locations were chosen based on a local heat-stress map and stakeholder input, ensuring that the measures respond to real needs in areas frequently used by residents and vulnerable groups.*

*This policy brief builds on the practical experience from Hajdúböszörmény's pilot action and highlights key lessons, challenges and recommendations for municipalities that want to use nature-based solutions as part of their heat adaptation strategies. The pilot shows that green shading solutions are not only an environmental measure, but also a social and health-oriented investment that can strengthen urban resilience to heatwaves.*

# HEAT MITIGATION MEASURE - SOLUTION OVERVIEW

*From a policy perspective, this solution demonstrates how heat adaptation can be integrated into everyday urban planning, not treated as a one-off pilot. The main lesson from transnational implementation is that success depends on strategic site selection, stakeholder involvement and long-term maintenance planning, rather than on technical complexity.*

This solution addresses urban heat stress through **nature-based shading interventions** that combine vegetation and simple urban furniture to cool public spaces and improve thermal comfort. The core concept is to create **small-scale, distributed green shading elements** in heat-exposed areas, such as streets, squares, public transport stops and courtyards of public institutions. These elements rely on trees, climbing plants and pergola structures to reduce surface and air temperatures through shade and evapotranspiration.

Rather than a single infrastructure project, the solution represents a **replicable urban design approach** that can be adapted to different city sizes and contexts. A pilot implementation in Hajdúböszörmény illustrates how such green shading elements can be placed in multiple locations across a city, responding to local heat hotspots and the needs of vulnerable groups. However, the key value lies in the concept itself, which can be scaled up or down depending on available space, budget and governance capacity.

## Key characteristics of the solution

- **Type of solution**: nature-based shading and microclimate regulation
- **Core elements**: vegetation (trees, climbers, shrubs), light structures (pergolas), seating
- **Application areas**: public spaces, institutional courtyards, mobility hubs, neighbourhood centres

## Expected co-benefits

- **Health**: reduced heat stress, improved thermal comfort, better air quality
- **Social inclusion**: accessible resting places that support interaction across age groups

- **Biodiversity**: increased urban greenery and habitats for pollinators and birds
- **Cost efficiency**: lower investment and operating costs compared to technical cooling systems

The approach is highly transferable. Municipalities can start with a small number of shaded elements as a pilot, then replicate and scale the model city-wide or integrate it into urban development standards and heat action plans. As such, nature-based shading solutions offer a robust, low-risk and socially accepted pathway to strengthen urban resilience to increasingly frequent heatwaves across Central Europe.

# PROCESS PATHWAY FOR NATURE-BASED HEAT MITIGATION MEASURES

*Key lesson:*

***For nature-based heat mitigation to be effective, it should be treated as a standard municipal process supported by political commitment, cross-departmental cooperation, and long-term maintenance planning, rather than a one-off pilot.***

## Set the political mandate and strategic frame

- Anchor heat mitigation within municipal climate, health or urban development strategies.
- Secure a formal political decision (e.g. municipal council resolution) confirming objectives, scope and responsibilities.
- Define whether the measure is a pilot, programme or permanent policy tool, with a clear scaling perspective.

## Assign governance and responsibilities

*Appoint one lead coordinating unit to manage the process across departments. Involve departments early and define clear roles:*

- **Urban planning / city operations**: site selection, spatial integration, maintenance planning
- **Environmental or climate unit**: heat analysis, alignment with adaptation goals
- **Finance department**: budget planning, liquidity, co-financing
- **Legal & procurement**: contracts, permits, procurement procedures
- **Grant management**: external funding, compliance and reporting

## Identify locations and design principles

- Use heat maps, vulnerability data and local knowledge to identify priority areas.

- Apply modular, flexible designs (e.g. shaded seating, pergolas, trees) that can be adapted to different sites.
- Involve landscape or horticultural expertise to select drought-resistant, low-maintenance plant species.

## Secure budget and funding

- Combine municipal budget, external funding (EU/national) and, where possible, advance payments.
- Clarify early whether installations are classified as construction or minor works, as this affects procurement.
- Plan long-term maintenance costs, not only initial investment.

## Start community engagement early

- Engage residents, institutions and vulnerable groups already in the planning phase.
- Use workshops, consultations or focus groups to validate locations and design.
- Encourage shared ownership (e.g. institutions helping with watering or monitoring).

## Implement and manage maintenance

- Procure implementation through transparent procedures.
- Ensure clear responsibility for irrigation, plant care and repairs, especially in public spaces.
- Anticipate risks such as vandalism or plant loss and plan mitigation measures.

## Review, learn and scale

- Monitor use, maintenance effort and perceived cooling effects.
- Use lessons learned to replicate the approach in other districts or integrate it into planning standards.
- Move from isolated interventions to a city-wide nature-based cooling programme.

# ACTORS AND STAKEHOLDER ENGAGEMENT

*Key lesson for replication:*
*Early and inclusive stakeholder engagement is not an additional task, but a core success factor. It improves solution quality, reduces implementation risks and creates shared ownership—making nature-based heat mitigation measures easier to replicate and scale across municipalities and regions.*

The effectiveness and long-term sustainability of nature-based measures for mitigating heat depends on the early, broad and structured involvement of key stakeholders. As urban heat affects health, public space, social inclusion and urban management, no single department or stakeholder can address it alone.

## Core actor groups and their roles

- **Citizens and local users:**

Residents experience heat stress directly and provide crucial knowledge about where and when heat is most problematic. Their involvement helps identify real hotspots, ensures that measures are placed where they are needed most, and increases public acceptance and care for green infrastructure.

- **Public institutions and local services (schools, kindergartens, elderly homes, health and social services, community organisations)**

These actors represent vulnerable groups and help translate heat mitigation into concrete protection measures. Their involvement supports both location selection and awareness-raising among children, older people and families.

- **Municipal departments**
    - Urban planning and development: ensure alignment with spatial plans and avoid conflicts with traffic or underground infrastructure
    - City operations and maintenance: responsible for irrigation, pruning and long-term upkeep
    - Environmental or climate units: link measures to climate adaptation and heat action plans
    - Finance and grant management: secure funding, manage co-financing and long-term maintenance budgets
- **Utilities and infrastructure providers**

Early involvement is essential when planting vegetation in the ground, to prevent conflicts with pipes, cables and drainage systems and avoid costly redesigns later.

- **Professional experts (landscape architects, arborists, horticultural specialists, urban gardeners)**

These actors ensure the selection of climate-resilient, drought-tolerant and low-maintenance plant species and help design solutions that are effective and durable.

- **Civil society organisations and NGOs**

NGOs can support community engagement, awareness campaigns and, in some cases, shared maintenance or monitoring activities.

- **Local and municipal media**

Continuous communication builds transparency and trust and helps explain why heat mitigation measures are needed, how they work and what benefits they bring.

## Engagement approach and methods

Stakeholder engagement should start before design decisions are finalised and continue throughout implementation. Effective methods include:

- participatory workshops and consultations,
- interdisciplinary working groups,
- public forums and targeted meetings with institutions,
- regular communication through local media and municipal channels.

# MAKING HEAT ADAPTATION VISIBLE AND UNDERSTANDABLE

*Key lesson:*
*Visible, positive and continuous communication is a low-cost but high-impact tool that transforms technical or nature-based measures into solutions people understand, use and support.*

Effective heat mitigation measures depend on more than just design and implementation; clear, visible and positive communication is also essential. Municipalities need to explain why heat adaptation is necessary and how nature-based and technical measures work and benefit everyday life. Effective communication builds trust, encourages the adoption of new measures, and strengthens long-term public acceptance.

## How municipalities should communicate heat mitigation measures

Communication should start early, already during planning, and continue through implementation and operation. Key principles include:

- focusing on benefits for well-being, health and comfort, not on climate risks alone;
- using simple, positive and practical messages;
- combining digital and face-to-face channels to reach different age groups.

## Key actors involved in communication

- **Municipal leadership and administration**: provide official messaging, political backing and visibility
- **Communication or PR units**: manage content, press relations and social media
- **Public institutions** (schools, care facilities, community centres): act as multipliers for vulnerable groups
- **Civil society organisations and NGOs**: support outreach and tailor messages to specific audiences
- **Local media** (press, radio, TV, municipal apps): ensure broad reach and transparency

## Communication tools and channels

Municipalities should use a mix of channels, adapted to local context:

- municipal websites and newsletters for structured information,
- social media for short, visual updates and event promotion,
- local press and radio to reach broader audiences,
- printed materials and signage in public spaces,
- public events, workshops and school or community programmes.

*Experience shows that in-person formats and visible on-site communication (e.g. information boards, guided walks, public presentations) are especially effective in building understanding and trust.*

## What works best – transferable lessons

- **Positive framing**: highlighting shade, comfort, social interaction and green spaces increases acceptance.
- **Visibility**: clearly marking measures and explaining their purpose makes benefits tangible.
- **Targeted messaging**: different groups (young people, families, older adults) need different channels.
- **Regular updates**: showing progress and results keeps interest and credibility high.

## Replication and scaling

For wider uptake, municipalities should treat communication as a standard part of heat adaptation, not as an add-on to pilots. Reusable templates, signage concepts, social media formats and school programmes can be scaled across districts or cities. Consistent communication helps turn individual measures into widely supported, long-term policies for urban heat resilience.

# SCALING UP NATURE-BASED SOLUTIONS FOR URBAN HEAT RESILIENCE

*Key message for policymakers:*
*Nature-based shading solutions are not just one-off trials, but are building blocks that can be used to adapt cities to rising temperatures. If they are introduced step by step and supported by policy, funding and planning frameworks, they can become a normal part of climate-resilient cities all over the world.*

Nature-based shading solutions, such as pergolas, green islands and shaded seating areas, can be adopted in many urban contexts if certain conditions are met. These measures are particularly well-suited to cities and towns that are experiencing rising summer temperatures and have limited options for large-scale cooling infrastructure.

## Conditions for success

Successful replication depends on a combination of spatial, political and financial factors:

- **Available space**: public squares, streets, institutional courtyards or transport hubs exposed to heat
- **Political commitment**: clear support from municipal leadership to prioritise heat mitigation
- **Stable funding**: municipal budgets complemented by regional, national or EU funding schemes
- **Administrative capacity**: ability to plan, procure and maintain green infrastructure over time

Where these conditions are met, nature-based shading can be implemented incrementally and at relatively low risk.

## Barriers and how to overcome them

Common barriers are well known and manageable:

- **Upfront investment costs** can be reduced by starting small, using modular designs and combining funding sources.
- **Maintenance requirements** (watering, pruning, replacement) can be addressed by assigning clear responsibilities and sharing tasks between municipal services, public institutions and local partners.
- **Delayed visible results** (as vegetation needs time to grow) should be managed through transparent communication and temporary shading solutions.

Experience shows that these barriers are best overcome when maintenance and financing are planned from the outset, not as an afterthought.

## Adapting the solution to different urban contexts

The approach is highly flexible:

- **Small towns** can concentrate measures in a few high-impact locations (main square, playground, municipal building), keeping costs and logistics simple.
- **Larger cities** can develop a network of shaded elements across districts, prioritising dense neighbourhoods and heat hotspots.

## Scaling pathway: from pilot to policy

A typical and transferable scaling pathway includes:

- **Start small**: pilot a pergola, green island or shaded seating area in one visible location.
- **Expand gradually**: replicate the measure in additional spaces based on user feedback and observed benefits.
- **Complement the core measure**: integrate tree planting, shaded bus stops, pocket parks or cooling corridors.
- **Institutionalise the approach**: embed nature-based shading into spatial planning rules, design standards and heat action plans.

Regional and national support instruments e.g. funding programmes, technical guidelines and planning frameworks play a key role in accelerating this process.

# MAKING HEAT ADAPTATION A STANDARD POLICY PRACTICE

### *At the municipal level*

Reducing urban heat requires moving from isolated projects to clear, repeatable decisions embedded in everyday governance. Local authorities should explicitly include shading and cooling measures e.g. nature-based shading structures and green infrastructure within their Heat Action Plans and broader climate adaptation strategies. Municipal councils are encouraged to establish a dedicated annual budget line for the installation and maintenance of shading elements, ensuring continuity beyond short-term projects. Assigning a clearly responsible municipal unit to coordinate planning, implementation and long-term maintenance is essential for effectiveness. Urban planning offices should integrate cooling and shading requirements into the design rules for new public spaces, so that green and shaded areas become a standard feature of streets, squares and public facilities. In addition, municipalities can actively stimulate uptake by supporting shading and greening initiatives on institutional and residential grounds through regular local grant schemes.

### *At the regional and national level*

Wider deployment of nature-based heat mitigation measures depends on supportive regulatory and financial frameworks. Funding programmes should be adjusted to explicitly recognise urban green infrastructure and cooling measures as eligible climate adaptation investments. National and regional authorities can accelerate implementation by providing practical technical guidance, model designs and cost benchmarks, and by integrating cooling and shading requirements into building codes and urban development standards. Clear policy signals at these levels help municipalities act with confidence and reduce administrative barriers.

### *At the European level*

Nature-based solutions for heat mitigation directly contribute to the objectives of the European Green Deal, Cohesion Policy and the EU Mission on Adaptation to Climate Change. These frameworks already offer funding opportunities that can support the scaling of urban shading and cooling measures across regions. Ensuring that local interventions are aligned with EU eligibility criteria enables cities and towns to access cohesion funds, climate adaptation instruments and mission-oriented financing. Strengthening links between local action and EU policy priorities will help transform proven approaches into widely adopted solutions for climate-resilient urban development across Europe.

# LESSONS LEARNED FROM IMPLEMENTING NATURE-BASED HEAT MITIGATION

*Key message:*
*Nature-based heat solutions work best when cities plan not only for installation, but for growth, care and communication over time.*

Although implementing nature-based shading and green infrastructure measures provides significant benefits, it also reveals recurring challenges that municipalities should anticipate. Experience shows that many of these difficulties are organisational and procedural, and can be avoided with better preparation.

## Key challenges to anticipate (and what to avoid)

- **Site selection is often more complex than expected.**
  Locations that appear suitable may be constrained by underground utilities or ownership issues. Avoid finalising sites without early coordination between urban planners, utility providers and maintenance services.
- **Procurement procedures can delay implementation.**
  Lengthy or rigid public procurement processes may slow down delivery. Avoid underestimating timelines—procurement should start as early as possible.
- **Plant availability is not guaranteed.**
  Heat- and drought-resilient species may not always be readily available. Avoid last-minute plant selection and work with experts to identify alternatives.
- **Maintenance is frequently underestimated.**
  Watering, pruning and replacement require time, equipment and staff. Avoid treating maintenance as a secondary issue—plan it from the start.

## What works well and what does not

**What works**

- Early involvement of **qualified experts** (landscape architects, horticulturists, arborists)
- Using **drought-resistant, climate-adapted species**
- Planting trees **directly into the ground** rather than containers
- Simple irrigation solutions (e.g. drip systems, watering bags)
- Continuous, positive communication with the public

**What does not work**

- Expecting immediate cooling effects from newly planted vegetation
- Relying solely on temporary or volunteer-based maintenance
- Implementing measures without explaining their purpose and timeline

- Treating green infrastructure as a one-off installation instead of a living system

## What should be done differently next time

Municipalities would benefit from:

- Planning **maintenance budgets and responsibilities** before installation
- Integrating **temporary shading solutions** for the first years until vegetation matures
- Setting **realistic expectations** about growth and cooling effects
- Involving communication specialists to support public understanding and acceptance

## Practical takeaways for municipalities

*For successful replication and scaling, municipalities should treat nature-based heat mitigation as a long-term urban service, not a short-term project. This means combining expert design, early stakeholder involvement, clear maintenance planning and continuous communication. When these elements are in place, green shading measures become more robust, publicly supported and easier to upscale across neighbourhoods and cities.*

# KEY INSIGHTS FOR SUSTAINABLE HEAT ADAPTATION

*Overall conclusion:*
*Nature-based shading works, not as a single pilot, but as a long-term urban service. When supported by political commitment, adequate funding and consistent management, it becomes a reliable building block of heat-resilient cities that can be replicated and scaled across regions.*

Nature-based shading measures have proven to be a **practical, effective and scalable response** to increasing urban heat. Across different urban contexts, three messages are particularly relevant for decision-makers.

*First, nature-based shading is cost-effective and feasible for municipalities.*

Compared to technical cooling or large infrastructure projects, green shading elements require **moderate investment**, can be implemented relatively quickly and fit well into existing public spaces. They deliver multiple benefits at once: reduced heat stress, improved air quality, more attractive streets and squares, and increased use of public space. From a municipal perspective, this makes them a realistic entry point for heat adaptation, even for cities with limited budgets.

*Second, success depends on early and continuous stakeholder involvement.*

Measures perform best when urban planners, maintenance services, institutions and local communities are involved from the start. Early engagement helps identify suitable locations, anticipate practical constraints and build shared ownership. This increases public acceptance and reduces the risk of conflict or underuse.

*Third, long-term maintenance determines long-term impact.*

Green infrastructure is a living system. Its effectiveness depends on regular irrigation, plant care and replacement. Municipalities must therefore secure **stable maintenance budgets, clear responsibilities and access to expertise**. Without this, even well-designed measures lose effectiveness over time.

## Effectiveness and limitations

Nature-based shading delivers **clear health, social and environmental benefits** and strengthens urban resilience to heatwaves. It is adaptable to both small towns and large cities and can be scaled gradually. However, decision-makers should be aware of limitations: maintenance needs, delayed full effects as vegetation grows, and the requirement for available space and political commitment.

## Follow-up actions for long-term sustainability

To maximise impact and ensure durability, municipalities should:

- integrate shading and green infrastructure into long-term urban and climate adaptation plans;
- establish permanent maintenance routines and budget lines;
- adapt designs and plant selection based on experience and climate trends;
- monitor use and performance and communicate results to the public to support wider replication.

# DATA-DRIVEN INSIGHTS FOR SCALING HEAT SOLUTIONS

*Key message for decision-makers:*
*KPIs below demonstrate that green shading islands function as a proof of concept. The numbers show not only that the measure works locally, but also what it can achieve at scale. With moderate costs, measurable cooling effects and high public use, nature-based shading can move from isolated pilots to city-wide or regional heat adaptation strategies.*
*If it works here, with these numbers, it can work anywhere and at much larger impact when scaled.*

To demonstrate that nature-based shading is not just a “nice pilot” but a **solution worth scaling**, the project combined visual tools (maps, before/after images) with **clear, measurable KPIs**. Together, these indicators show both **direct local impact** and **potential benefits if replicated city-wide or across regions**.

## Pilot scale and basic figures

The pilot targeted heat-exposed public spaces in Hajdúböszörmény, a city with approximately 131.000 residents affected by increasing heat stress.

In spring 2024, the city installed 47 green shading islands at 23 locations, each combining pergolas, benches and heat-tolerant vegetation.

- **Average size per green island:** 4 m² (incl. 1,5 m² seating area)
- **Total investment cost:** 79.853 EUR
- **Average cost per unit:** approx. 1.700 EUR

These figures provide a realistic benchmark for other municipalities considering similar interventions.

## Key performance indicators (KPIs)

**Cooling and thermal comfort**

Measurements during summers 2024–2025 show that shaded areas experienced:

- **Lower surface temperature peaks**, with extreme values reduced compared to unshaded areas
- **More stable average temperatures** in 2025 as vegetation matured: In 2024, surface temperatures peaked at up to 43.8 °C, while in 2025 temperature curves became noticeably flatter due to combined shade and evapotranspiration.

## Scalability insight I:

If one green island reduces peak surface temperature by several degrees and improves comfort for 20–30 users at a time, **100 similar installations could directly protect 2,000–3,000 people during heatwaves**.

**Use and social impact**

At two monitored locations alone, green islands served:

- **39.812 users (Fürdőkert, 2024) and 36.429 users (2025)**
- **30.855 users (Strand, 2024) and 22.670 users (2025)**

Surveys confirmed that users perceived the shaded areas as **significantly more comfortable**, especially during peak heat.

## Scalability insight II:

If one cooling location serves roughly **200 daily users in summer**, replicating the measure at 20 additional sites could improve daily comfort for **4.000 residents**.

**Maintenance effort**

- Annual maintenance workload peaked at **160 hours (2024)** and **170 hours (2025)**
- Increased workload reflects growing vegetation rather than inefficiency

This shows maintenance is **manageable and predictable**, a key concern for municipalities.

## Visual tools recommended for replication

To support decision-making and communication, municipalities should use:

- **Before/after images** of shaded vs. unshaded spaces

- **Heat maps** showing priority areas
- **Simple infographics** linking cost, cooling effect and number of users
- **Cost-impact tables** (€/unit vs. people protected)

# REFERENCE

*Using established technical references and species lists lowers implementation risks, supports long-term maintenance and helps transform heat mitigation from isolated projects into standard, scalable urban practice.*

The policy recommendations and implementation pathways presented in this brief are supported by a set of **practical planning guides, technical manuals and applied tools** that help municipalities design, implement and scale nature-based heat mitigation measures. These sources are not limited to a single pilot context, but provide **transferable knowledge** relevant for cities and towns facing similar climate challenges across Central Europe.

Several **Hungarian-language reference documents** offer concrete guidance for green infrastructure planning in dense urban environments. While developed in a national context, their principles are broadly applicable elsewhere.

Key reference materials include:

- **Relationship between urban trees and utilities – design guide**

  Provides guidance on coordinating tree planting with underground utilities, helping municipalities avoid conflicts and reduce implementation risks.

  https://archiv.budapest.hu/Documents/V%C3%A1ros%C3%A9p%C3%ADt%C3%A9si%20F%C5%91oszt%C3%A1ly/ZI_FUZETEK_fak_online.pdf

- **Revitalisation of inner-city courtyards**

  A practical guide for transforming courtyards into cooler, greener and more liveable spaces, particularly relevant for dense urban areas.

  https://archiv.budapest.hu/Documents/ZOLDINFRASTRUKTURA_FUZETEK_belsoudvarok_20191018_online.pdf

- **Protection of tree locations and green verges along urban roads**

  Supports the protection and integration of greenery in transport corridors, where heat stress is often high and space limited.

  https://archiv.budapest.hu/Documents/V%C3%A1ros%C3%A9p%C3%ADt%C3%A9si%20F%C5%91oszt%C3%A1ly/ZOLDINFRASTRUKTURA_FUZETEK_6_online%20verzio.pdf

- **Green facades – technical and horticultural guide**

  Offers design, construction and maintenance guidance for vertical green surfaces as a complementary cooling solution where ground space is scarce.

  https://archiv.budapest.hu/Documents/V%C3%A1ros%C3%A9p%C3%ADt%C3%A9si%20F%C5%91oszt%C3%A1ly/Zoldhomlokzatok_2017.pdf

- **Urban street tree list – Hungarian association of ornamental gardeners**

An updated list of tree species suitable for urban environments and changing climatic conditions, supporting resilient and low-risk plant selection.

https://www.diszkerteszek.hu/files/kozteruleti_sorfak_jegyzeke_2024.pdf

*These sources demonstrate how technical guidance, plant selection tools and planning manuals can support municipalities in moving beyond individual pilot actions. They provide a solid knowledge base for replicating and scaling nature-based heat mitigation measures, reducing uncertainty and enabling faster, more confident implementation.*

# ANNEXES

**Stakeholder list of Hajdúböszörmény city**

- Csillagvár Nursery and Nursery School
- Efic Nordic Club Hajdúböszörmény
- Fazekas Gábor Retirement Home
- Field Guard of the municipality of Hajdúböszörmény
- Green Circle NGO
- Hajdúsági Waste Management KHT.
- Hajdúböszörmény Health Visitor Service
- Hajdúböszörmény István Bocskai Primary School
- Hajdúböszörmény Pedagogical Service
- Kálvin Reformed Social Service Center
- Margaréta Gardening
- MBE Emmaus Retirement Home
- Municipal Nursery
- Napsugár Kindergarten
- Public Works Employee
- Public Works Supervisor
- Reflex Environmental Association
- Retirees
- University of Debrecen
- University of Debrecen Training Kindergarten
- Walking Club