

NBSINFRA



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European Union



City lab Booklet

Prague

Czechia

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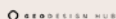
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
All the City Labs

The **NBSINFRA** project has **five city labs across Europe** that are assessing **how cities can handle different challenges and stay resilient through Nature-Based Solutions**. Each city lab aims to investigate how NBS can protect local infrastructure, preserve biodiversity, restore ecosystems and confront the challenges of climate change. The goal is to deliver tailored solutions and risk indicators for specific locations, contribute to city contingency plans and **increase the resilience and sustainability of NBS for future generations**.



Nature Based Solutions stages across City Labs

1	(Co-) Diagnosis and (Co-) Characterization Collaborative assessment of the current conditions and identification of key challenges and opportunities.
2	(Co-) Design and (Co-) Creation Co-designing and co-creating nature-based solutions with input from diverse stakeholders.
3	(Co-) Implementation Collaborative implementation of the solutions, ensuring active participation from all involved parties.
4	(Co-) Evaluation and (Co-) Monitoring Ongoing evaluation and monitoring of the solutions effectiveness through collective input and feedback.
5	(Co-) Amplification or (Co-) Replication Expanding or replicating the solutions collaboratively to ensure broader impact and scalability.




Ruse
Bulgaria

NBS stages: 1




Fingal
Ireland

NBS stages: 1-2



Aveiro
Portugal

NBS stages: 1-2



Prague
Czechia

NBS stages: 3-4



Cologne
Germany

NBS stages: 4

Visit our website
for a more accurate
insight on the
project's city labs

www.nbsinfra.eu





Prague

Czechia



Introduction

The City Lab of Prague includes three distinct locations where nature-based solutions (NBS) are tested and evaluated under real-world conditions.



These include the University Centre for Energy Efficient Buildings (UCEEB) of the Czech Technical University (CTU) in Buštěhrad, where green roofs with various layering and substrates, rooftop constructed wetlands, and bioretention cells are studied; the CTU University Campus where green roofs are implemented along with other urban greenery; and Českobrodská High School, featuring a green roof, green façade, and blue infrastructure for rainwater and greywater management. Historical data have identified

extreme heat and heat waves as primary hazards in Prague and its surroundings. Detailed simulations on the urban heat vulnerability are run to spot the most prone areas to potentially select the most suitable solutions to create a more balanced and sustainable urban landscape. For each site, a comprehensive stakeholder mapping analysis has been conducted to identify those who would be impacted by and benefit from the implementation of NBS, as well as those responsible for granting approval.

Implementation

Specific activities have been carried out to identify the most suitable NBS for each location, considering environmental conditions and urban challenges.

Ecosystem mapping

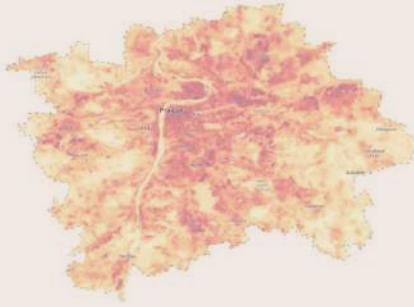
From May to September 2024, plant species monitoring was conducted at three City Lab Prague locations. The survey assessed biodiversity and ecological functions, identifying a mix of native species, ruderal plants, and invasive species. The findings highlight the role of green spaces in enhancing biodiversity, sustainability, and climate resilience.



Urban heat vulnerability

An urban heat vulnerability map was created using Earth observation data and Czech census information, covering the entire city of Prague. This includes all the City Lab sites, except for the UCEEB Building, which is located in Buštěhrad, outside Prague's administrative boundaries.

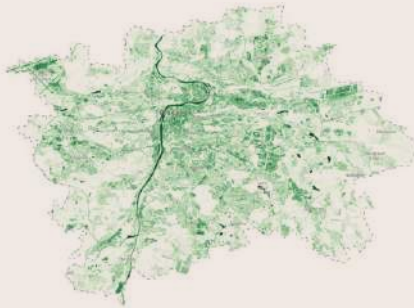
Exposure map:



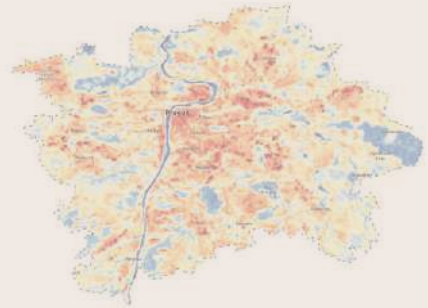
Sensitivity Map:



Adaptive Capacity Map:



Heat Vulnerability Map:



Assessing Prague's urban heat vulnerability using the IPCC framework involves three key components: exposure, sensitivity, and adaptive capacity.

- **Exposure** measures the intensity of urban heat using satellite data and historical temperature records, mapping areas with extreme heat over multiple years.
- **Sensitivity** identifies vulnerable populations (children, elderly, and health-compromised individuals) based on census and demographic data.
- **Adaptive Capacity** evaluates green and blue infrastructure (vegetation, water bodies) using satellite indices and GIS data to assess heat mitigation potential.

These indices are combined to calculate the Urban Heat Vulnerability Index. Higher UHVI values indicate greater vulnerability, helping to pinpoint priority areas for intervention in Prague.

Evaluation and Monitoring

The City Lab focuses on various sites where NBS have already been implemented, aiming to assess their impacts and benefits on buildings and their surroundings, particularly in terms of thermal performance, as well as air quality and water retention. In particular, the primary NBS and associated technologies installed at CTU UCEEB have been monitored since the project's start.

Green roof

The monitoring activity revealed that green roofs with dense vegetation and finer substrate exhibited superior water retention and maintained lower temperatures compared to those with sparse vegetation and coarser substrates, thereby creating a more favourable environment.

Hybrid roof

The monitoring activity showed that hybrid green roofs, which integrate constructed wetlands and green roofs, effectively treat greywater and regulate temperatures. These systems significantly reduce surface temperatures, manage stormwater, and enhance urban thermal comfort through evapotranspiration.

Infiltration swales

The monitoring activity demonstrated that the Bioretention Cell, constructed to manage stormwater runoff from a roof, has the potential to mitigate peak stormwater flows, reducing runoff by up to 97%. This highlights their effectiveness in controlling stormwater.



Key activities

Completed activities

- Ecosystem mapping and botanical survey
- Collecting data for green roof substrate LCA
- Monitoring of water and thermal conditions at CL sites
- Stakeholders mapping
- Creating the urban heat vulnerability map
- Preparing 3D models for microclimate simulation

Future activities

- Conducting LCA of green roof substrate
- Run micro-climate simulations on CL sites
- Continuous monitoring of NBS
- Dissemination of results and lessons learnt

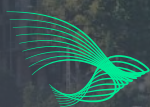
Best practices



→ The **AFI Karlin Butterfly building in Prague (2018)** is a BREEAM-certified, energy-efficient structure with green infrastructure, including vertical gardens, a glass facade covered with more than 1,400 m² of living plants selected with regard to the local, and natural ventilation. It features extensive green roofs and terraces for stormwater management and biodiversity enhancement, as well as seasonal plantings and flowerbeds surrounding the building. These elements improve air quality, reduce the urban heat island effect, and provide aesthetic and environmental and biodiversity benefits, contributing to sustainability and user comfort.



→ The revitalized **Českokobrodská School in Prague (2019–2022)** incorporates NBS to enhance climate resilience. Extensive green (area 810 m²) and biosolar roofs, a green facade, extensive vegetation (1,600 m² in total), and a retention tank help mitigate the impacts of droughts and heavy rainfall by improving water retention and reducing surface runoff. Surplus rainwater goes to the accumulation tank (used for watering greenery) and to the retention tanks (controlled outflow to the adjacent Malá Rokytká stream). In the case of a lack of water, the tank is topped up from a well. Grey water from showers and sinks is purified and then used to flush toilets, saving 19% of the school's total drinking water consumption. These features, along with smart design strategies, contribute to cooling the urban environment, enhancing biodiversity, and supporting long-term climate adaptation.



NBSINFRA

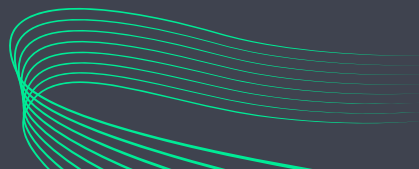
“Nature-based Solutions address societal challenges through actions to protect, sustainably manage, and restore natural and modified ecosystems, benefiting people and nature at the same time.

They target major challenges like climate change, disaster risk reduction, food and water security, biodiversity loss and human health, and are critical to sustainable development.”

International Union for Conservation of Nature

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