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Integrated guidelines for planning and management of nature- based solutions

LIFE LATESTadapt (LIFE21-CCA-EE-LIFE LATESTadapt/101074438)

Ministry of Smart Administration and Region Development
Republic of Latvia
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REPUBLIC OF ESTONIA
MINISTRY OF CLIMATE

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Guidelines for planning and managing nature-based solutions

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Terms and abbreviations used

Terms

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Abbreviations

BEF LV	Baltic Environment <i>Forum</i> Latvia
BEF EE	<i>Baltic</i> Environment Forum Estonia
DBR	Based Solutions (<i>NBS</i>)
TalTech	Tallinn University of Technology
RTU	Riga Technical University
NRA	Environmental Solutions Institute
IUCN	Union for Conservation <i>of</i> Nature
WP	Work Package
NEB	New European Bauhaus (<i>NEB</i>)

1 Introduction

1.1 Purpose and target groups of the guidelines

The main objective of the guidelines is to provide state and local government institutions with a practical roadmap for the planning, implementation and sustainable management of nature-based solutions (hereinafter - NBS). The guidelines are designed as a roadmap, which collects information on the tools necessary for the implementation of NBS - from the initial definition of the problem and data analysis to the development of technical specifications and monitoring the effectiveness of the solutions. In addition to the roadmap, the guidelines serve as a compass, providing indications where to look for more detailed information on these tools and related aspects.

The target group of the guidelines includes policy makers, planners and architects of local governments and state institutions, as well as landscape architects, project managers, territorial developers and other specialists involved in the implementation of DBR in Latvia and Estonia. For these target groups, the document not only helps to identify the most suitable solutions using the DBR catalogue and typology, but also provides methodological support for assessing the feasibility of investments and attracting funding.

The guidelines have been prepared in three languages - Latvian, English and Estonian, and are available both electronically (on the websites of LIFE LATESTadapt: <https://lifelatestadapt.viimsivald.ee/materials/> and VARAM: <https://www.varam.gov.lv/lv/rezultati-un-informativi-materiali-0>), and in printed form for distribution in municipalities, educational institutions and other institutions.

1.2 LIFE LATESTadapt project

Full title of the project: “Developing and demonstrating portfolio of nature-based and smart solutions for improving urban climate resilience in Latvia and Estonia”.

Implementation period: from September 1, 2022 to August 31, 2027 (60 months or 5 years).

Programme: LIFE sub-programme Climate Action, call LIFE-2021-SAP-CLIMA-CCA.

Project objective

The overall goal of LIFE LATESTadapt is to increase the resilience of urban areas in Estonia and Latvia to extreme weather conditions, focusing on four lines of action or “pillars”:

1. nature-based solutions;
2. digital changes (smart solutions and sensors);
3. planning quality;
4. involved communities and qualified support for further implementation of solutions.

Project partners

The project involves 17 partners from both countries, 8 of which are municipalities:

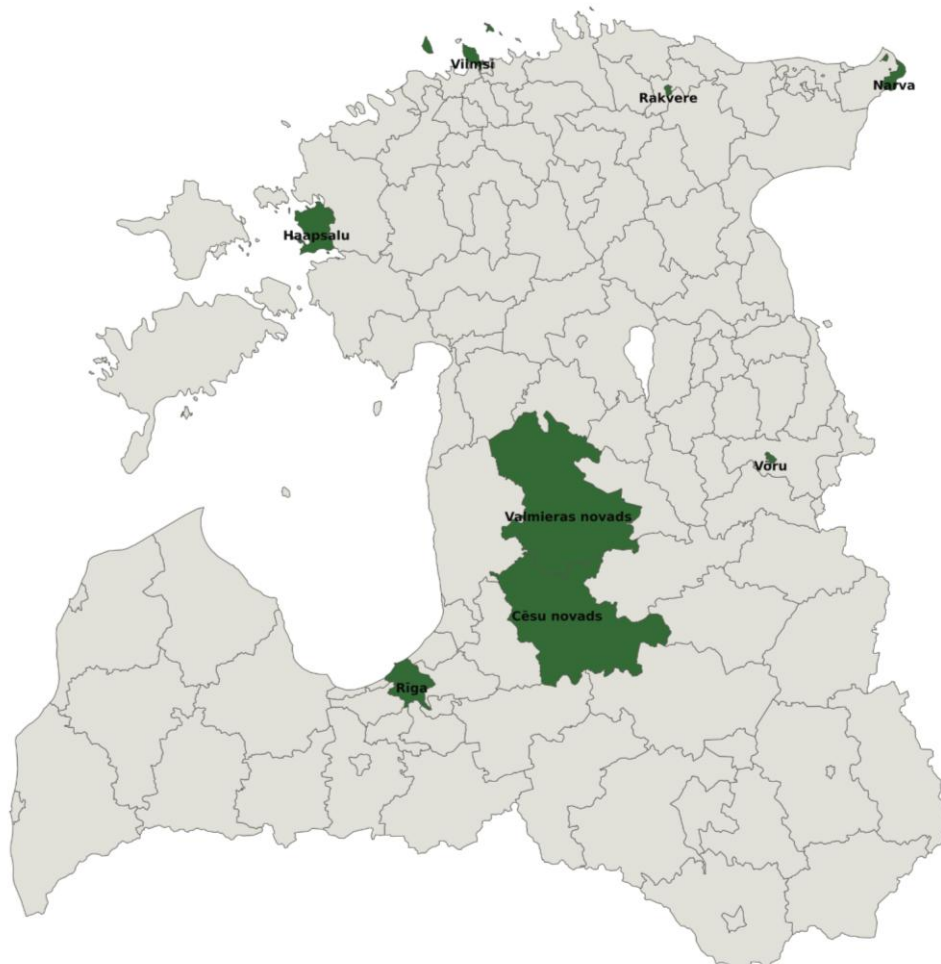
- Coordinating beneficiary: Viimsi Municipality (Estonia).
- Other beneficiaries:
 - Municipalities:
 - In Estonia - Haapsalu (Latvian Hāpsalu), Narva, Rakvere, Võru (Latvian Veru), Viimsi (Latvian Vimsi);
 - In Latvia - Cēsis, Riga, Valmiera;
 - Scientific and expert partners:
 - In Estonia - Tallinn University of Technology (*TalTech*), Nordic Botanical, Baltic Environmental Forum Estonia (BEF EE);
 - In Latvia - Riga Technical University (RTU), Baltic Environmental Forum Latvia (BEF LV), Baltic Natural Capital Institute - BNature (formerly Baltic Coasts), Environmental Solutions Institute (VRI);
 - Public administration partners: Ministry of Smart Administration and Regional Development of Latvia (MARAM).

Project work packages and their linkage to guidelines

The project is organized into 7 work packages (hereinafter referred to as WPs). The guidelines are developed within the framework of WP7 and integrate the results of WP2–WP6:

WP	Goal and leading partner	Contribution to guidelines
WP1	Project management, coordination, communication (Viimsi)	Project coordination guidelines, KPI monitoring
WP2	Science Transfer to Cities - DBR and Smart Solutions for Urban Flood Resilience (TalTech)	Native plant community guide for rain gardens; passive and active measures design for pilot sites; solutions catalog; sensor data methodology; hackathon materials
WP3	Smart and nature-based flood resilience solutions demonstration portfolio (Viimsi)	Technical solutions for pilot sites, implementation of constructive measures, portfolio of demo sites
WP4	Integrating DBR into climate-resilient urban planning (BEF LV)	Mapping and assessment of ecosystem services; DBR suitability analysis; cost-effectiveness tool; co-creation workshops; greening plans; DBR maintenance protocol
WP5	Monitoring and validation (RTU)	Monitoring program; measurements of water quality and flood prevention effectiveness; assessment of ecosystem services and socio-economic impacts
WP6	Public awareness and community engagement (BEF EE)	Stakeholder map; community engagement activities; booklets for private owners; educational materials for children
WP7	Sustainability, replication and exploitation of results (VARAM)	Integrated Guidelines (this document); training; digital platform and consultation forum; recommendations for EU funds criteria

Pilot projects in Latvia and Estonia



Rīga: The demonstration site is located on Tērbatas Street (between Matīsa and Ģertrūdes Streets) and the adjacent area (Natālijas Draudzības Secondary School, Rīga Orphanage and Secondary School No. 40 Primary School). DBR solutions include rain gardens, water-permeable pavements, green walls and rows of trees. Their aim is to improve rainwater management and reduce the heat island effect in the historical center of Rīga. The pilot site is included in the feasibility study for the development of public outdoor space in the center.

Ķēsis: The demonstration site is located in Vintergravas - an area of approximately 10 ha with a 258 ha (some estimates up to 521 ha) large stormwater runoff basin. By implementing DBR (wetland, restored ponds, stormwater slowing cascades), rapid stormwater and sediment runoff into the Gauja is reduced, infiltration and self-purification are ensured.

Valmiera: The demonstration site is located in the parking lot of Vidzeme University College and its surrounding area (from Vidzeme University College to the bus station), the total catchment area is ~2.2 ha. DBR solutions include tree plantations, rain gardens, water permeable pavements and bio-covers. Their goal is to reduce the heat island effect and improve rainwater management in the city.

Viimsi: The demonstration site is located in the Haabneeme area of the Viimsi peninsula. DBR solutions include a smart weirwall, backflow valves and a rain garden pond with native plant communities. They aim to link stormwater management to sea level dynamics and ensure rainwater reuse for public needs.

Haapsalu: The demonstration site is located in the Raudtee Street area, in the coastal area. The DBR solutions include backflow valves and a treatment pond (~3000 m²), connected to the sea through an overflow ditch, as well as a coastal meadow. Their aim is to improve the coastal environment and reduce the risk of flooding in the city.

Rakvere: The demonstration site is located in a city park with several ponds and a drainage ditch. DBR solutions include the reconstruction of the pond wastewater outlet and a retention pond with wood chip denitrification filters. Their goal is to reduce the nitrate content in the pond and ditch water and improve the city's resilience to floods.

Võru: The demonstration site is located along the Niidu ditch in the city of Võru, on cadastral units 85a and 85b of FR Kreutzwalda Street. DBR solutions include an artificially created wetland, a retention pond and smart sensors. Their goal is to create a rainwater management system close to nature – an open-type artificial wetland.

Narva: The demonstration site is located in the territory of the horticultural cooperatives in the Kudruküla area, where the stream water is diverted through a regulation node with a variable overflow height. The DBR solutions include a newly constructed treatment pond (~300 m²) with sedimentation, wood bark (chip) filters and water-purifying vegetation, as well as an irrigation water intake well and two fire tanks connected to dry hydrants. Their purpose is to ensure water management and availability of fire water for four horticultural cooperatives.

More information about pilot projects and their demonstration plans (e.g. construction project explanatory notes and situation plans) can be found at this link: [Demo sites - LIFE LATESTadapt](#)

Linking pilot projects to guidelines

The guidelines integrate WP2 technical descriptions (pilot site design, plant communities), WP3 demonstration portfolio, WP4 mapping and cost-effectiveness results (BEF LV, BNature tool), WP5 monitoring methodologies (RTU), WP6 stakeholder engagement and education materials (BEF EE), as well as WP7 training and policy recommendations insights.

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1.3 Climate change and urban greening

Climate change

Climate change has a significant impact on urban environments, increasing the frequency and intensity of various natural hazards. In cities, the impact of climate change is exacerbated by urbanization processes, dense construction and a high proportion of impervious surfaces, which affect local microclimates and hydrological processes. The combination of these factors contributes to risks such as floods, heat waves, droughts and other extreme weather events, which can cause economic losses and negatively affect the health and well-being of residents. Urban development often reduces the area of natural areas and fragments ecosystems, thus weakening natural mechanisms that help regulate water circulation, temperature and air quality.

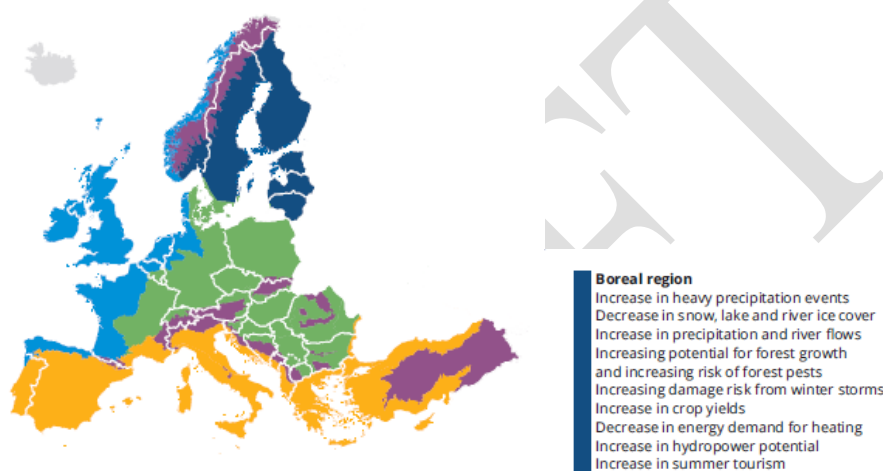


Figure X. Observed and projected climate change and its impacts in the main biogeographical regions of Europe.

source: Urban adaptation in Europe: how cities and towns respond to climate change

Main climate change risk factors in cities in Latvia and Estonia

As elsewhere in Europe, urban areas are also facing a number of interconnected challenges from climate change. The impact of climate hazards is exacerbated by the structure of the urban environment – dense construction, impervious surfaces, loss of natural areas and fragmentation of green infrastructure. The most significant challenges, in which nature-based solutions play a key role, are as follows.

1. Decline in ecosystem services

As natural areas in cities shrink, ecosystem functions such as water infiltration, temperature regulation, air purification and provision of recreational opportunities are weakened. Urbanization, loss of natural areas and fragmentation can weaken the ability of ecosystems to provide these services, thereby also reducing the resilience of urban environments to the impacts of climate change.

The IPBES Global Assessment on Biodiversity and Ecosystem Services highlights the impact of ecosystem degradation and biodiversity loss on the availability of nature's benefits, while the European Environment Agency highlights the importance of nature-based solutions in maintaining and restoring ecosystem functions.

Sources:

- IPBES (2019). Global Assessment Report on Biodiversity and Ecosystem Services.
<https://www.ipbes.net/global-assessment>
- EEA (2021). Nature-based solutions in Europe: Policy, knowledge and practice for climate change adaptation and disaster risk reduction.
<https://www.eea.europa.eu/en/analysis/publications/nature-based-solutions-in-europe>

2. More intense rainfall and flooding

As climate change increases the frequency and intensity of heavy rainfall events, so does the volume of stormwater runoff and the risk of flooding. In cities where asphalt and other impermeable surfaces predominate, stormwater infiltration into the soil is limited. During heavy rainfall, this can overload stormwater drainage systems and cause local flooding.

Latvia's Climate Change Adaptation Plan to 2030 identifies intense precipitation and related flooding as one of the risks posed by climate change that affect settlements and infrastructure. The IPCC Sixth Assessment Report also concluded that climate change is increasing the intensity of heavy precipitation and the associated flood risks in many parts of the world.

Sources:

- Latvia's Climate Change Adaptation Plan until 2030.
<https://likumi.lv/ta/id/308330-par-latvijas-pielagosanas-klimata-parmainam-planu-laika-posmam-lidz-2030-gadam>
- IPCC (2022). Climate Change 2022: Impacts, Adaptation and Vulnerability (AR6 WGII).
<https://www.ipcc.ch/report/ar6/wg2/>

3. Urban heat island effect

Dense buildings, impervious and heat-absorbing surfaces, and insufficient vegetation contribute to the urban heat island effect – elevated temperatures in urban areas compared to surrounding less built-up areas. During heat waves, this increases the exposure of residents to heat stress and related health risks.

The European Environment Agency identifies the urban heat island effect as a major challenge posed by climate change in European cities, while the IPCC indicates an increase in the frequency and intensity of heat extremes due to climate change. Vegetation, tree planting and other nature-based solutions can significantly contribute to reducing urban temperatures and heat impacts.

Sources:

- EEA (2020). Urban adaptation in Europe: how cities and towns respond to climate change.
<https://www.eea.europa.eu/en/analysis/publications/urban-adaptation-in-europe>
- IPCC (2022). Climate Change 2022: Impacts, Adaptation and Vulnerability (AR6 WGII)
<https://www.ipcc.ch/report/ar6/wg2/>

4. Biodiversity loss

Urbanization can reduce and fragment natural habitats and green spaces, reducing their connectivity and negatively affecting species diversity and ecosystem functionality. At the same time, biologically diverse and interconnected ecosystems are important for ensuring the sustainability of urban environments.

The EU Biodiversity Strategy for 2030 highlights the need to reduce ecosystem degradation and fragmentation, including by strengthening green infrastructure and creating ecological corridors. The IPBES Global Assessment, in turn, highlights the broad impacts of biodiversity loss and ecosystem degradation on the functioning of ecosystems and the benefits nature provides to people.

Sources:

- European Commission (2020). EU Biodiversity Strategy to 2030.
https://environment.ec.europa.eu/strategy/biodiversity-strategy-2030_en
- IPBES (2019). Global Assessment Report on Biodiversity and Ecosystem Services
<https://www.ipbes.net/global-assessment>

The importance of urban greening in the context of climate change

Urban greening is an essential tool to adapt to the impacts of climate change while improving the ecological quality of urban environments. Green and blue infrastructure – parks, urban forests, tree plantations, green corridors, water bodies and sustainable stormwater management solutions – can simultaneously provide several functions:

- reduce urban temperatures and provide shade;
- retain, store and infiltrate rainwater, reducing the risk of flooding;
- to promote the improvement of air quality and urban microclimate;
- provide habitats and promote biodiversity;

- to provide recreational opportunities and other social benefits for urban residents.

An interconnected network of green and blue infrastructure can simultaneously strengthen a city's ecological functioning and its ability to adapt to the challenges of climate change. Nature-based solutions allow these functions to be integrated into urban development, using natural processes not only to solve individual environmental problems, but also to create a more climate-resilient, biodiverse and high-quality urban environment.

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1.4 Nature-based solutions

According to the IUCN Global Standards for Nature-Based Solutions, nature-based solutions are:

“Actions for the protection, sustainable management and restoration of natural or modified ecosystems that effectively and adaptively address significant challenges to society, while ensuring human well-being and biodiversity.”



Fig. XX. Nature-based solutions approach.

Source: IUCN Global Standard for Nature-based Solutions.

Nature-based solutions are based on an ecosystem approach, which uses nature conservation, sustainable management and restoration as a tool to address societal challenges. This approach simultaneously delivers multiple mutually reinforcing benefits – improving human health and well-being, promoting biodiversity, strengthening climate resilience and supporting sustainable socio-economic development.

The importance of natural solutions

In order to mitigate the consequences and at the same time improve the quality of the urban environment, European Union policy is increasingly placing emphasis on nature-based solutions and the systematic development of green and blue infrastructure. This approach is also set out in the Nature Restoration Regulation of the European Parliament and of the Council (link), Article 8 of which sets out requirements for the conservation and improvement of urban ecosystems (see Chapter 6).

Similarly, the European Commission's New European Bauhaus (*NEB*) initiative complements the European Green Deal by emphasizing that sustainable development should not only be environmentally friendly, but also aesthetically appealing and socially inclusive. The initiative is based on three interrelated values – sustainability, aesthetics and inclusion, promoting an urban environment that simultaneously addresses the challenges of climate change and improves people's quality of life.

<https://www.km.gov.lv/lv/jaunais-eiropas-bauhaus>

https://new-european-bauhaus.europa.eu/index_en?prefLang=lv

Nature-based solutions are one of the most important tools in implementing the principles of the New European Bauhaus. They help create public outdoor spaces that are not only climate-resilient and biodiverse, but also functional, accessible and attractive to different groups of society. Thus, NBR simultaneously serves both climate change mitigation and adaptation measures, and the creation of a high-quality, healthy and human-friendly urban environment.

The New European Bauhaus emphasizes that successful nature-based solutions are not only technically efficient, but also create places where people want to stay, meet and live. Nature-based solutions are multifunctional infrastructure that uses natural processes to simultaneously address multiple urban challenges. Unlike traditional grey infrastructure, which is usually designed to solve one specific problem, NBS can simultaneously help reduce flood risk, mitigate the heat island effect, improve air and water quality, promote biodiversity and strengthen the resilience of ecosystems. In addition, they improve the quality of public outdoor space, create a more attractive living environment, promote opportunities for recreation and social interaction, and have a positive impact on the health and well-being of residents.

In the long term, nature-based solutions are often more cost-effective than traditional engineering solutions, as a single investment simultaneously creates multiple, interconnected long-term benefits. Properly planned and interconnected NBRs form a unified network of green and blue infrastructure that increases the climate resilience of cities, reduces maintenance costs in the long term and promotes sustainable development of territories. Therefore, NBRs today are not considered as separate greening elements, but as an essential tool for urban planning, climate adaptation and investment planning.

Basic principles of planning nature-based solutions

The DBR approach is based on a simple hierarchy consisting of three mutually complementary levels – protection, restoration and creation of new DBRs. The basic principle of the hierarchy is simple – primarily the preservation of existing nature, then its necessary restoration, and only then the creation of new solutions. The hierarchical approach helps to strategically plan urban development, prioritizing the preservation and restoration of nature, while integrating new solutions into urban infrastructure to strengthen the resilience of cities to climate change.



Fig. xx. DBR hierarchy *should be translated image*

Source: A CATALOG OF NATURE-BASED SOLUTIONS FOR URBAN RESILIENCE <https://openknowledge.worldbank.org/entities/publication/c33e226c-2fbb-5e11-8c21-7b711ecbc725>

1. Protection and sustainable management of existing ecosystems

The first and priority level is to preserve and protect existing natural areas, as they provide essential ecosystem services and biodiversity. In cities, this may include preserving wetlands, floodplains, grasslands, urban forests or other green areas and integrating them into spatial planning, preventing their degradation or development.

Examples:

- protect a natural wetland or floodplain as an area for rainwater storage during floods;
- preserve existing meadows and natural grasslands by adapting their management to promote biodiversity;
- determine the protection of green corridors in the spatial plan, preventing their fragmentation.

2. Restoration and improvement of degraded ecosystems

The second level involves the restoration and rehabilitation of degraded ecosystems, where natural areas have already lost some of their functions. The aim of restoration is to improve their ecological quality, restore ecosystem functions and increase the benefits they provide. This may include, for example, the renaturalisation of rivers or wetlands, the restoration of floodplains or the transformation of urban green areas to more effectively regulate water flow, temperature and provide habitats.

Examples:

- renaturalize a straightened river section by restoring the natural bed and floodplain;
- restore a degraded wetland or flooded area to improve water storage capacity;
- transform an intensively mowed lawn into a biodiverse urban meadow;
- to supplement an outdated park with local tree and shrub species, improving its ecological quality.

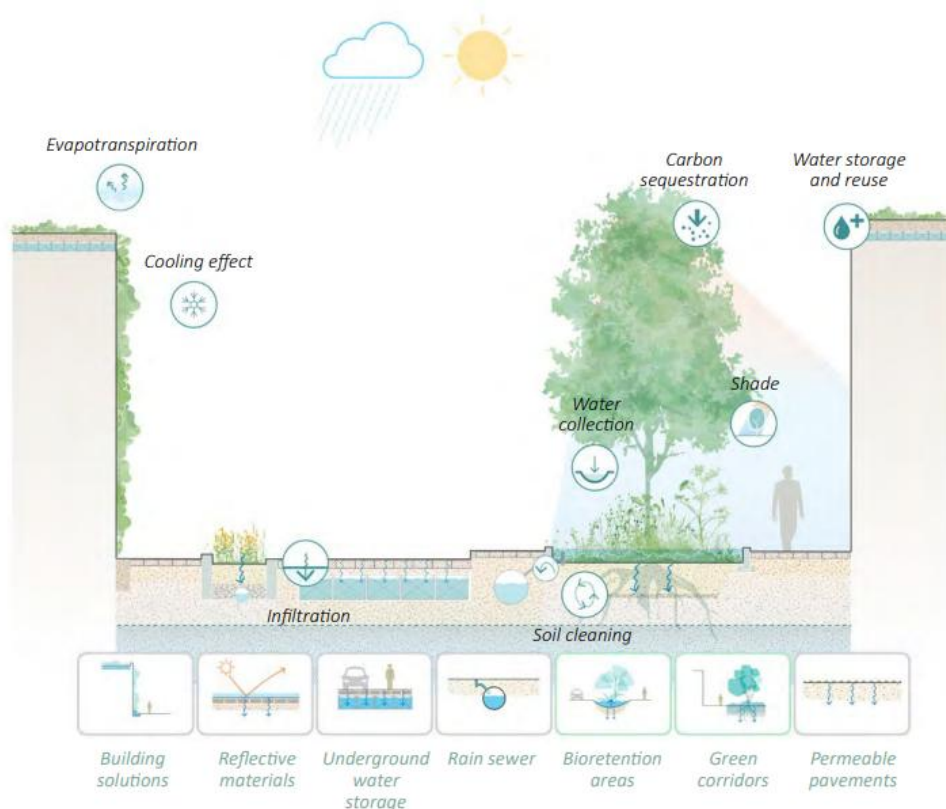
3. Creating new nature-based solutions

The third level involves the creation of new green infrastructure elements, especially in places where natural ecosystems have no longer survived. Examples include green roofs, green facades, rain gardens, bioretention zones or artificial wetlands, which help reduce climate risks while creating additional social and environmental benefits.

Examples:

- build a rain garden or bio-cover during street reconstruction;
- install a green roof on a municipal building or public transport stop;
- create a new park or community garden in a previously unused area;
- install green tram tracks or tree plantings in a new street project.

Application possibilities



Example of a hybrid solution integrating green and gray infrastructure
<https://documents1.worldbank.org/curated/en/502101636360985715/pdf/A-Catalogue-of-Nature-based-Solutions-for-Urban-Resilience.pdf>

Nature-based solutions can be used to address several key urban challenges:

- Flood risk reduction: rain gardens, bio-covers, wetlands and permeable pavements help manage rainwater effectively.
- Preventing the heat island effect: rows of trees, greenery, as well as green roofs and walls help cool the city.
- Improving air and water quality: this is provided by parks, green corridors and vertical plantings.
- Strengthening biodiversity: ecological corridors, urban meadows and community gardens attract natural diversity and enhance ecosystem services.
- Promoting social well-being: green areas serve as spaces for recreation, education, and social activities.

Chapter 4 of these guidelines compiles a catalogue of 16 key nature-based solutions based on the lessons learned from *the LIFE LATESTadapt project*.

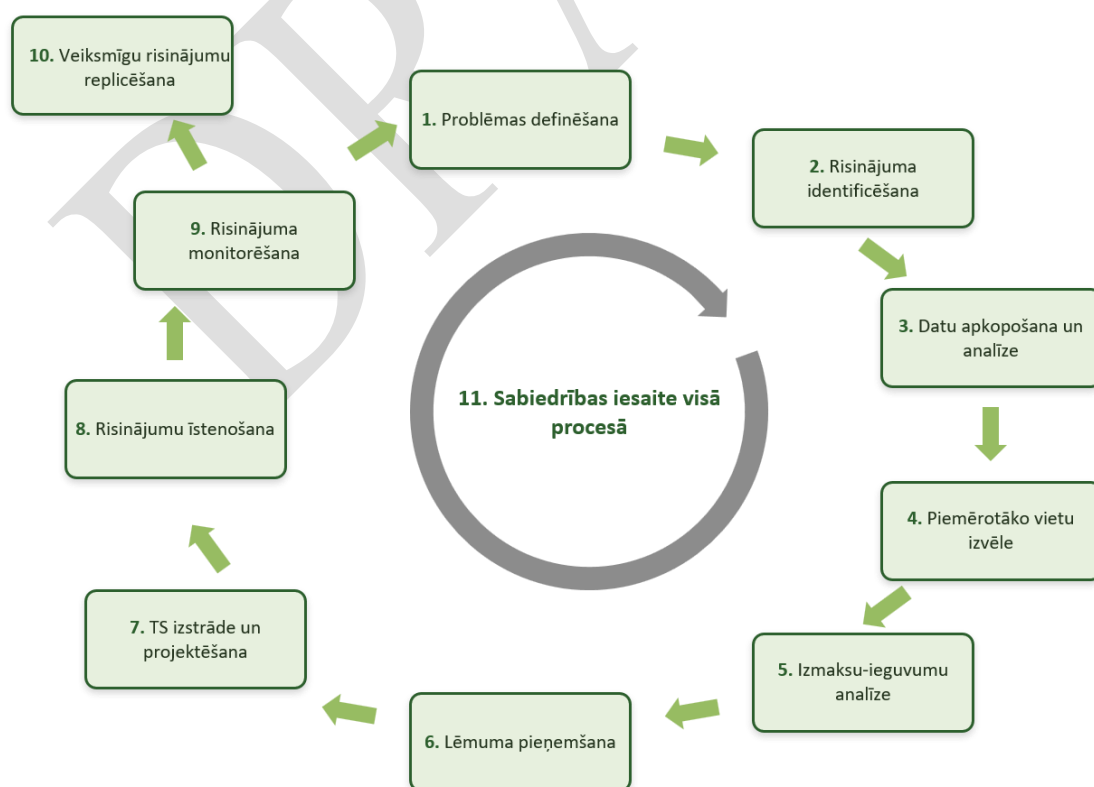
2 Lifecycle of nature-based solutions

The chapter describes a practical and sequential roadmap for local government representatives and professionals to turn a nature-based solution idea into a real, successfully implemented and sustainable project. The roadmap consists of 9 sequential steps and 1 parallel activity (public engagement) that runs through the entire process.

Each subsection corresponds to one stage of the roadmap and is structured according to a common principle: a short description of the stage, main steps or recommended workflow, practical examples from LIFE LATESTadapt pilot municipalities and references to additional sources or other sections of the guidelines.

The numbering of the stages reflects the typical workflow, but in practice they rarely proceed strictly one after the other. Solution selection, data collection and site selection (sections 2.2–2.4) usually occur iteratively, with several iterations refining both the solution and the site. Monitoring (section 2.8) actually begins before the solution is implemented - with baseline measurements against which the solution's performance can be compared later. Public participation (section 2.10) is a cross-cutting activity that applies to all stages.

The scope of the stages depends on the scale of the project: in a small project, several stages will merge and require only informal assessment, in a large project, each of them can become an independent work block. The chapter can be read sequentially as a complete description of the process or opened directly at the stage in which the project is currently located.



The scheme will be clarified

These stages are based on the structure of *the UNaLab Nature-Based Solutions Implementation Handbook* (2024) and supplemented with the experience and results of the *LIFE LATESTadapt* project.

2.1 Defining the problem

This is the initial planning stage, in which the municipality identifies specific climate change risks, such as floods, heat islands, biodiversity loss, or water quality degradation, and precisely defines the goals to be achieved.

Recommended workflow:

1. **Identifying climate risks:** first determine which climate risks affect the municipality's territory. This can be done using:
 - a. Latvia's Climate Change Adaptation Plan scenarios (<https://likumi.lv/ta/id/308330-par-latvijas-pielagosanas-klimata-parmainam-planu-laika-posmam-lidz-2030-gadam>);
 - b. LVGMC climate change analysis tool (https://klimats.meteo.lv/klimats_latvija/klimata_riks/);
 - c. LVGMC flood risk map (<https://videscentrs.lv/gmc.lv/iebuve/pludu-riska-un-pludu-draudu-kartes>);
 - d. Estonian Climate Atlas (<https://kliimaatlas.keskkonnaportaal.ee/>);
 - e. Estonia's Climate Change Adaptation Development Plan (<https://kliimaministerium.ee/rohereform-kliima/kliimapolitika/kliimamuutusetega-kohanemine>).
2. **Priority areas :** specify the areas where the identified risk is most significant. In this step, it is important to involve key stakeholders - residents, businesses and experts in the field.
3. **Problem formulation :** The situation should be defined at a system level so that it can be fully addressed with nature-based solutions. The description should include both environmental (water, heat, biodiversity) and social aspects (impact on population and territorial functions).
4. **Setting goals and KPIs:** define clearly measurable goals and key performance indicators (KPIs), for example: “*reduce stormwater runoff into the Gauja River by X%*” or “*increase tree canopy cover in the area by Y%*” .

A practical example from the Cēsis pilot project:

- **Risks:** LVGMC climate change analysis tool and flood risk map as a reference point + the municipality itself conducted a detailed local study on heat islands (with VRI) and a flood risk assessment (with RTU)
- **Priority:** Vintergrava (521 ha catchment area) priority; Old Town/Rīgas-Vaļņu Street additional (hot spot).
- **Problem:** insufficient green cover + intense rain runoff increases the risk of flooding and heat in the center and Wintergraubünden.
- **KPI:** runoff -25% by 2030; ≥ 2 DBR solutions by 2027; tree crowns +10%; DRYNESS -2°C by 2030.

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2.2 Identifying the solution

Once the problem is clearly defined, potential solution ideas are sought and selected. This step is performed before detailed engineering studies are initiated.

Recommended workflow:

1. **Select the most appropriate DBRs for the specified objectives:** study the catalogue (16 solutions) included in Chapter 4 of these guidelines and the international [LIFE LATESTadapt DBR catalog](#). Select the most appropriate solutions by filtering them by the required function (floods, heat, biodiversity) and scale (building, street, block or neighborhood).
2. **Prioritize selected DBRs by their classification:** use the classification available in the catalog - blue, green, hybrid or building infrastructure (see subsection 4.2) to specify the type of solution.
3. **Organize a co-creation workshop:** Organize a workshop (see section 2.10) with all stakeholders to discuss and refine ideas together.
4. **Create a shortlist:** As a result of the work process, select 3 to 5 priority solutions to be forwarded for further, detailed evaluation.

2.3 Data collection and analysis

During this stage, all available data is systematically compiled and, if necessary, new data collection is organized to accurately assess the situation before the project begins.

Before selecting the most appropriate nature-based solution, it is necessary to obtain sufficient information about the current situation of the territory. The aim of data analysis is to understand the causes of the problem, assess the potential of the territory for the implementation of DBR and identify possible limitations. The amount of data required will depend on the scale of the project and the problem to be solved, however, in most cases it is recommended to evaluate the following thematic data groups/sets.

Workflow/List of required data:

Climatic and hydrological data Helps assess climate risks and water cycle processes in the area.	It is possible to summarize: - precipitation intensity and frequency; - rainwater runoff models; - floodplain and flood risk maps; - the load on the rainwater drainage system.
Relief and hydrogeology The terrain and soil properties determine whether an area is suitable for infiltration solutions and how water moves through it.	It is possible to evaluate: - digital terrain model (LiDAR); - terrain slope; - catchment basins; - soil composition; - infiltration capacity; - groundwater level.
Land cover and urban structure The data characterizes the quality of existing green infrastructure and the potential of the territory for the implementation of DBR.	It is possible to analyze: - the proportion of impermeable surfaces; - the location of green areas; - tree crown projection; - existing greenery; - the structure of buildings and streets.
Engineering infrastructure Before designing solutions, it is necessary to evaluate existing communications and other technical limitations.	It is possible to summarize: - water supply and sewage networks; - rainwater drainage; - electricity supply networks; - gas pipelines; - heating networks; - other underground engineering networks.
Natural values In DBR planning, it is important to preserve and strengthen existing ecosystems.	It is possible to evaluate: - protected areas; - habitats; - protected species; - Natura 2000 areas; - ecological corridors.
Socioeconomic data In order for solutions to meet the needs of local residents and be feasible, social and economic aspects must also	It is possible to analyze: - population size and structure; - land ownership; - mobility habits; - accessibility of public transport;

be assessed.	- existing public infrastructure.
Microclimate data This data helps identify areas that need solutions to mitigate heat islands.	Possible to use: - satellite thermal data; - heat island maps; - temperature sensor measurements.

Recommended data sources

In Latvia, most of the necessary information is available in state and local government databases.

Latvian Environment, Geology and Meteorology Centre (LVĢMC)	https://videscentrs.lvģmc.lv
Geospatial data from the Latvian Geospatial Information Agency (LGIA)	https://www.lgia.gov.lv/lv/atvertie-dati
Latvian Geospatial Data Geoportal	https://www.vdaa.gov.lv/lv/geoportals
Cadastral information system	https://www.kadastrs.lv/
Nature Conservation Authority databases	https://www.daba.gov.lv/lv/dabas-datu-veidnes
Landscape Atlas and other thematic geoportals	https://www.varam.gov.lv/lv/jaunums/publicets-latvijas-digitalais-ainavu-atlants
Local government geographic information systems	For example, https://georiga.eu/

Practical recommendations:

- Mapping is preferably carried out in a GIS environment, combining different data layers into a single analysis.
- For heat island analysis, it is recommended to use satellite data or maps developed during the LIFE LATESTadapt project (if the project is implemented in Riga, Cēsis or Valmiera).
- Sensor data can supplement existing information with real-world measurements of water level, temperature, electrical conductivity, and other parameters.
- If the amount of available data is insufficient, it is recommended to conduct additional surveys and field measurements before design.

2.4 Data-driven location selection

The selection of locations is based on the data collected and mapped in the previous stage (see Section 2.3). The most appropriate DBRs are selected for each problem location. This data-driven approach ensures that limited resources are directed to locations where DBRs will provide the greatest return on climate risk mitigation.

The most suitable DBRs and their locations are selected for priority problem areas by evaluating three mutually complementary groups of criteria: expected benefits, site suitability, and cost-effectiveness.

To make the selection transparent and comparable, it is recommended to combine the three groups of criteria into a single evaluation matrix with a weighting system, assigning weight to each criterion according to the priorities of the municipality. The template for the matrix to be filled in is available in the appendix (to be supplemented), while a more detailed cost-benefit and investment selection methodology is provided in sections 2.5 and 5.4.

Evaluation of DBR by criteria groups

A. Benefits

Evaluates the extent to which the solution addresses the specific problem and provides additional benefits:

Benefit group	Aspects to be assessed
Improving environmental quality	Flood control, heat island mitigation, air and water quality improvement, noise reduction
Biodiversity	Protected habitats, habitats for species, pollination promotion, green infrastructure connectivity
Socio-economic benefits	Availability of green infrastructure (recreation, socialization), nature education, place identity, aesthetic value, health and well-being of residents, food production

B. Location suitability and practical implementation

Assess whether the solution is technically and legally feasible at the specific location. In addition to the general aspects of site accessibility (existing land cover, functional zoning, property structure and available space for the installation of the DBR), specific technical criteria should be assessed for each type of solution:

Criterion	Evaluation
-----------	------------

Required area	Minimum and optimal area depending on the solution (e.g., for a rain garden ~5% of the catchment area; for a bio-cover - linear next to the street; for a green roof - according to the load-bearing capacity of the building structures)
Terrain slope	Terrain slope that allows the solution to be implemented. (e.g. bio-covers: 1-5%; rain gardens: <5%; green roofs: 0-15%; wetlands: <2%)
Groundwater level	Groundwater level that allows the implementation of the solution. (e.g. for infiltration solutions (rain gardens, permeable pavement) - groundwater >1 m deep; for wetlands - a high level is suitable)
Soil infiltration capacity	Assessment of soil infiltration capacity. (e.g. sandy/loamy soil is suitable; clay soil - a drainage layer must be created or compost mixture must be added)
Connectivity with grey infrastructure	The ability of the solution to interact with gray infrastructure (e.g. the ability of a rain garden to store and drain a portion of water that the city's wastewater system cannot store and drain)
Zoning and property rights	Compliance with spatial planning and functional zoning; owner's consent; easements
Layout of utilities	Suitability of the solution for the location of engineering communications - map of underground cables and pipelines; protective zones
Cultural and historical heritage	Proximity to monuments, impact on archaeological layers

C. Cost-effectiveness

Evaluate the costs of the solution in relation to the expected benefits:

Aspect to be evaluated	Contents
Cost	Installation and maintenance costs (see section 2.6 for more details)
Cost savings	Avoided costs that would have arisen from solving the problem without DBR (e.g. construction of grey infrastructure or damage caused by flooding)
Socioeconomic benefits	Calculation of socio-economic benefits

2.5 Cost-benefit analysis of the solution

This stage justifies the feasibility of the investment by comparing direct and indirect costs with benefits.

Basic principles of analysis

Investment costs	Materials, labor, design, approvals, equipment
Cash flow estimates	Annual maintenance costs (mowing, watering, composting, sensor calibration, replacement);
Financial sustainability	Net present value (NPV) of total costs over a 20 - 30 year period
Socioeconomic analysis	Monetary assessment of socio-economic benefits - heat island mitigation, flood damage prevention, health benefits, increased real estate values, etc.
Financial analysis	Possible payback period, comparison with technical alternative
Sensitivity analysis	Variation of key assumptions (precipitation scenarios, maintenance costs)

Practical tools and examples:

5. NbS cost-effectiveness tool developed by the Baltic Natural Capital Institute ([https://baltijas Natural Capital Institute/blog/projekti/life-latestadapt/nature-based-solutions-cost-efficiency-tool/](https://baltijas-natural-capital-institute.blog/projekti/life-latestadapt/nature-based-solutions-cost-efficiency-tool/));
6. European Commission SAMP 2.1.3.1. Cost-benefit analysis methodology (<https://www.cfla.gov.lv/lv/2-1-3-1-k-1>);

2.6 Decision-making

After selecting the most suitable nature-based solution, the municipality needs to make a decision on its implementation and ensure coordinated project implementation. At this stage, not only the allocation of funding is important, but also the cooperation of various municipal departments, high-quality design, organization of procurement and planning of the solution's maintenance.

The most common risks in municipal decision-making:

Challenge	Recommendation
Many institutions involved Fragmented governance - the DBR project affects several municipal departments (development, properties, utilities, traffic, environmental department).	Inter-institutional coordination is needed Form a unified project working group
Different priorities Conflicts of political goals - for example, preserving parking spaces versus creating a DBR; cultural heritage versus greening;	Agree on common project goals from the beginning
Insufficient funding Compliance of budget allocation cases with the significant maintenance component of the DBR	Budget for not only design and construction, but also maintenance
Insufficient experience in DBR design	Attract specialists with DBR experience
Complex procurement	Clearly define technical requirements and quality criteria

Interinstitutional coordination

DBR projects almost always affect several municipal departments.

Usually, departments or competence implementers are involved:

- Development Department;
- Spatial planners;
- Construction Board;
- Municipal utilities;
- Traffic Department;
- Environmental specialists;
- Municipal property managers;
- Public participation and communication specialists.

Recommendations for effective inter-institutional cooperation to avoid coordination problems:

- establish an interdisciplinary working group;
- to appoint one project manager;
- organize regular coordination meetings.

2.7 Development and design of technical specifications

After selecting the most suitable area and DBR solution, the design process begins. At this stage, technical documentation is developed, in which the selected solution is described in detail and adapted to the conditions of the specific site. Unlike traditional gray infrastructure design, the use and integration of natural processes, the preservation of local ecosystems and the assessment of long-term maintenance requirements are of great importance in DBR design.

Recommended workflow:

1. Preparation of the design task

It is recommended to clearly define the project objectives, achievable results, and key technical requirements in the design brief.

It is recommended to include in the design task:

- project objectives and planned performance indicators (for example, rainwater retention volume, runoff reduction, infiltration volume, or plant diversity to be planted);
- mention specific analogs for solutions and technical elements so that they are definitely included and properly implemented;
- mention specific guidelines, regulations, rules according to which parameters to develop a construction project and design the construction itself, so that they correspond not to the usual solutions, but to the specific territory and DBR solution;
- description of the boundaries of the territory to be designed and the current situation;
- design constraints and conditions;
- requirements for the use of sustainable and climate-resilient solutions;
- monitoring and maintenance requirements after project implementation.

2. Main technical solutions

Depending on the type of DBR chosen, the project may need to develop:

- hydrological and hydraulic calculations for different precipitation scenarios;
- terrain and water flow solutions;
- soil and growing medium specifications;
- plant assortment and planting schemes suitable for local species;
- drainage, infiltration and overflow solutions;
- if necessary, the location of monitoring systems and sensors.

When designing DBR, it is preferable to use local plant species (see link) and solutions closer to natural ecosystems, which reduce maintenance costs and promote biodiversity.

https://lifelatestadapt.viimsivald.ee/wp-content/uploads/2024/07/T2.1_Guide-on-using-the-native-plant-communities-at-NBSs-for-urban-flood-resilience-ENG.pdf

Necessary approvals

Depending on the nature and location of the project, various approvals and permits may be required.

The most common are:

- approval from the building authority;
- technical regulations of utility operators;
- approvals of land owners or possessors;
- compliance with the requirements for the protection of cultural monuments (if applicable);
- environmental impact assessment or strategic environmental impact assessment procedures (if applicable).

It is recommended to identify all involved institutions early on at the beginning of the design process to reduce the risk that the coordination process will delay the implementation of the project.

Practical recommendations

It is recommended to use proven technical solutions and design samples in the design process. Within the framework of the LIFE LATESTadapt project, technical specifications and design solutions have been developed for various DBR pilot sites in Riga, Cēsis, Valmiera, Vīmsi, Rakvere, Haapsalu, Vēra and Narva, which can serve as practical examples in the development of similar projects (the appendix **will be supplemented**).

materials developed by the LIFE LATESTadapt project , including:

- *Guide on using the native plant communities at NBSs for urban flood resilience (2024)*, which provides recommendations for using native plant communities in the design of DBR; (https://lifelatestadapt.viimsivald.ee/wp-content/uploads/2024/07/T2.1_Guide-on-using-the-native-plant-communities-at-NBSs-for-urban-flood-resilience-ENG.pdf);
- *Maintenance protocol of Nature-based Solutions* , which describes the principles of maintaining DBR after their implementation. (**will be updated**).

Samples and technical descriptions: LIFE LATESTadapt WP2 technical descriptions as samples are available in the appendix **to be specified** .

2.8 Solution implementation

This stage includes the implementation of a municipal decision (for example, a council meeting decision or an executive director's order) and subsequent practical actions.

Will be updated

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2.9 Solution monitoring

Monitoring is essential for assessing the long-term effectiveness of DBR, as its results may differ from the initially expected results and adjustments may be necessary in maintaining the solution.

Examples of monitoring methodologies used in the LIFE LATESTadapt project:

Parameter	Measuring device/method	Monitoring frequency
Precipitation amount and intensity	Campbell Scientific rain gauge; Calyx-RG	Every 5 minutes
Flow speed and depth	MACE FloPro XCi	Every minute
Turbidity, temperature, electrical conductivity	Turbidity / temperature / EC sensors	Continuous, logged every 5 minutes
Water quality (totN, totP, TSS, COD, BOD)	Grab-sampling laboratory analyses	Before and after intervention, then seasonally
Soil moisture	Soil moisture sensor	Every hour
Heat island effect and green areas	Satellite thermal data (Landsat/Sentinel thermal bands)	Every year, during the summer period
Number of people (recreation)	People counters/cameras	Continuously

Interpretation of monitoring data:

7. Compare with pre-intervention status (baseline);
8. Evaluate seasonal variations (dry vs. wet years);
9. Assess the impact on the initially defined KPIs (see 2.1-2.4);
10. Communicate results to the public and decision-makers.

Project monitoring example:

Will be updated

2.10 Scaling and replicating successful solutions

Successfully implemented pilot projects can be used as a basis for replicating the solution in other areas of the city or municipality.

Mechanisms for knowledge transfer and replication:

11. Document the pilot project experience - both positive and risks and limitations;
12. Standardize technical solutions at the municipal level (e.g., a catalog of DBR elements for integration with street reconstruction projects);
13. Incorporate the requirements of the DBR into the municipal development program, investment plan and spatial plan (see Chapter 6), as well as identify potential sources of funding;
14. Organize training for municipal staff and implementers;
15. Replicate solutions in other municipal territories by identifying priority areas;
16. Share experiences through networks - invite municipalities to experience trips to their locations, and submit good practices to planning regions.

Example: The Cēsis Greening Plan (**to be specified**) includes at least 3 new DBR pilot projects by 2030 (budget 75,000 EUR for rain gardens, 90,000 EUR for green roof/facade pilot projects).

2.11 Public participation throughout the entire life cycle of the DBR

Public engagement is not one of the stages, but a parallel activity that takes place throughout the entire life cycle of the DBR - from idea to maintenance.

Public participation is one of the most important prerequisites for the successful planning and implementation of nature-based solutions. Unlike traditional infrastructure projects, NBS often affect public outdoor spaces and areas used on a daily basis, so the involvement of residents, landowners and other stakeholders helps to better understand local needs, identify potential risks and create solutions that are accepted and maintained in the long term. Public participation is not a separate stage of the project, but a continuous process throughout the NBS life cycle – from problem identification to monitoring and maintenance.

Public involvement in various stages of the DBR project life cycle

Project stage	Purpose of engagement	Possible methods
Defining the problem	Identify local problems and needs	Surveys, interviews, mapping workshops
Choosing a solution	Jointly assess possible DBRs	Co-creation workshops, focus groups
Designing	Refine the functionality and design of the solution	Public consultations, visualizations, demonstrations
Implementation	Inform and involve the local community	Information events, workshops
Maintenance and monitoring	Promote long-term engagement	Volunteer monitoring, community activities

Basic principles of public participation

Based on (LIFE LATESTadapt WP6 / National Principles of Public Engagement), it is recommended to follow the following 10 basic principles.

- Engagement is effectively planned to create real change.
- Encourage and enable the involvement of all those affected by the solution.
- Engagement is planned and implemented in a timely and appropriate manner.
- Work with partner organizations.
- Information without jargon, relevant and understandable.
- Facilitate citizen engagement (accessibility, language, time).
- To provide opportunities for citizens to engage effectively - by developing skills and knowledge.
- Adequate resources have been provided for engagement.
- Residents are told about the impact of their investment.
- Learn and share insights to improve the engagement process.

Recommended public engagement methods

Depending on the scale and purpose of the project, municipalities can use different forms of participation.

Method	Application
Co-creation workshops	Developing solutions together with residents

	22.04.2025 in Valmiera (56 participants, Pārgauja State Gymnasium); 08.05.2025 in Riga (18 participants, Secondary School No. 89, students aged 14–15); 06.05.2025 in Cēsis (Old Town, 24 participants);
Focus groups	Gathering the opinions of specific interest groups
Surveys	Seeking the opinion of the wider public
Interactive maps (digital tools)	Identification of problem areas and potential DBR sites, voting
Public consultations	Presenting the project and receiving comments
Participation budget	Funding of small community initiatives (e.g. flower beds, green corners)
Educational activities	Promoting knowledge about DBR and climate adaptation (green infrastructure tours, volunteer workshops)
Demonstration objects	Practical familiarization with solutions (empirical experience of good practice examples)
Information on the website of local governments, etc.	Informing about current events (social networks, infographics, thematic articles)

Common challenges and recommendations

Challenge	Recommendation
Low population activity	Use different communication channels and multiple engagement methods
Skepticism towards change	Explain the expected benefits with examples
Complex technical information	Use simple language and visualizations
Different interests	Organize discussions, allow different opinions to be expressed, and seek compromises together
Engagement results are not used	Inform the public about decisions made and their justification

LIFE LATESTadapt experience

During the LIFE LATESTadapt project, public participation was organized in several pilot municipalities in Latvia and Estonia. In Latvia, co-creation workshops were implemented in Cēsis, Valmiera and Riga, involving municipal specialists, residents, entrepreneurs, educational institutions and other stakeholders.

3 Examples of DBR planning and management

This chapter summarizes examples of good practice from both Latvia and Estonia, which illustrate in detail the application of all the planning and management stages described in Chapter 2, as well as examples of international practice.

3.1 Example in Latvia

Image: map/diagram

Image: object photo

Location: Vintergrava, central part of Cēsis city, area of approximately 10 ha.

Water catchment area (ha), % of impermeable and built-up area, % of permeable and green areas: 521 ha; in RTU technical analysis - up to 521 ha, where ~12% (63 ha) is dense built-up area, the rest - green and permeable areas in the upper part of the basin.

Problem: rapid runoff of rainwater and sediment into the Gauja River, which causes pollution and erosion; heat island effect in the squares of the old town (Rožu, Līvu, Pils streets); fragmentation of green infrastructure.

Solutions: renaturalized ponds and wetlands in Wintergrav for rainwater deceleration, infiltration and self-purification; water-permeable pavement with grass cover in Rose Square; new tree beds with perennial plant species; rain garden at Livu Square; ecological outdoor furniture; green balconies. Budget for 1st round ~114,000 EUR, 2nd round ~45,000 EUR (total 140,140 EUR).

Data analysis: RTU prepared a 2D hydrodynamic model; IES conducted heat island mapping from satellite data; BEF LV conducted a green infrastructure assessment and a survey of green areas important to residents.

Images: Data analysis for hydro mod and heat islands

Technical characteristics: ..

Decision-making: A meeting with the municipality on priorities was held on October 16, 2024;

Implementation: the results of co-creation are included in the Cēsis City Green Infrastructure Development Plan (*SAITE*), which contains 5 action lines and >15 specific actions with budget and responsible structural units until 2030. Methodically, it demonstrates the full application of the "roadmap" - from defining the problem to developing a strategic document.

Monitoring: RTU installs flow, precipitation, turbidity and temperature sensors; IES analyzes satellite data for heat island monitoring.

Public engagement: May 6, 2025 — scenario co-creation workshop in the Old Town with residents, NGOs, entrepreneurs, educational institutions and experts. In a survey

before the workshop, 80% of participants supported the implementation of DBR, 71% were aware of and understood the DBR concept.

Image: Community Engagement Workshop

Nuances in the Cēsis context: Risks of water pollution from a nearby slaughterhouse and meat processing plant.

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3.2 Example in Estonia

ADD TO CART

Location: ...

Water catchment area (ha), % of impermeable and built-up area, % of permeable and green areas

Problem: ...

Solutions: ...

Data analysis:

Technical characteristics: ..

Decision making:

Implementation:

Supervision:

Public engagement: ..

Nuances in the Estonian context: ...

3.3 World practice

Location: Oslo, Deichmans and Wisers streets

Water catchment area (ha), % of impermeable and built-up area, % of permeable and green areas

Problem: Flooding during heavy rain

Solutions: rain gardens and three-stage rainwater management solutions

Data analysis:

Technical characteristics: ..

Decision making:

Implementation: 2019

Supervision:

Public engagement: ..

Nuances in the context of Oslo: ...

<https://www.asplanviak.no/prosjekter/dyppykk-i-regnbedet/>

https://www.asplanviak.no/content/uploads/2024/11/urbane_regnbed_web.pdf

4 DBR catalog

The chapter explains the structure and content of the DBR catalogue to help navigate the different types of nature-based solutions and their application possibilities in the urban environment.

4.1 DBR catalog parameters

4-level structure of the DBR catalog

The catalogue describes each solution according to common parameters, which allows comparing different DBRs and choosing the most suitable solution for a specific location. Solutions are grouped by typology, indicating their main functions and benefits, scale of application, site selection criteria, as well as the approximate level of installation and maintenance costs. A common parameter system allows municipalities to more effectively assess the suitability of each solution, compare alternatives and justify decision-making.

What is this?	-	Typology
What does it solve?	-	Features and Benefits
Where can it be used?	-	Scale and Location Criteria
How expensive is it?	-	Cost

Typology

DBRs are summarized in typologies that describe different types of solutions:

Blue infrastructure	Solutions related to water features in urban environments, such as rivers, canals, wetlands, rain gardens or water storage areas. They help regulate stormwater flow, reduce flood risk and improve water quality.
Green infrastructure	Natural or vegetation-based areas, such as parks, tree plantations, meadows or green corridors, that provide ecosystem services and improve the quality of the urban environment.
Hybrid infrastructure (Green street solutions)	Solutions that combine grey infrastructure with natural elements, such as street greening, rainwater infiltration strips, or green tram tracks, help improve the microclimate and water management.
Green building solutions	Solutions integrated into the building structure, such as green roofs or green walls, that help reduce heat gain and improve energy efficiency.

Features and benefits

For each solution, the catalogue also describes the main functions and benefits, including environmental benefits (e.g. heat mitigation, flood risk reduction, water and air quality improvement, biodiversity promotion) and social benefits (recreation, socialisation, nature education, health and wellbeing, food production, economic activities and jobs).

Environmental benefits	DBR helps address various environmental challenges, such as mitigating the heat island effect, reducing flood risk, improving water and air quality, and promoting biodiversity.
Social benefits	In addition to environmental functions, DBR also creates social benefits, such as providing places for recreation and socialization opportunities, promoting nature education, improving health and well-being, and can create economic activities and new jobs.

Scale

Additionally, the catalog indicates the scale of application of solutions, which can vary – from a single building and street to a block or neighborhood.

Building	Solutions that are integrated into individual buildings or their structures, such as green roofs or facades.
Street	Solutions that are implemented in street space, such as street greening, rainwater infiltration lanes, or tree planting.
Quarter	Solutions that span multiple buildings or urban units, such as shared green areas or rainwater management systems.
Neighborhood	Larger-scale solutions covering a larger urban area, such as parks, green corridors or water systems.

Location criteria

Site selection criteria are also defined, which include environmental, technical and urban aspects.

Natural environment criteria	Natural conditions at a specific location, such as soil properties, water regime, terrain and existing biodiversity.
Technical criteria	Infrastructure and technical aspects, such as available space, utilities, drainage systems or structural load-bearing capacity.
Urban environment criteria	Spatial and social aspects, such as land use, accessibility, safety, visual quality and integration into the urban fabric.

Costs (installation and maintenance)

To support decision-making, a rough cost estimate is also provided for each solution, which includes both installation and maintenance costs, categorised as low, medium or high.

The cost estimate is based on 2025 price levels, and actual costs may change in future years depending on changes in construction costs, materials, labor, and other costs.

Installation costs

(The classification is based on the indicative installation costs summarized in the LIFE LATESTadapt DBR catalog. It is intended for mutual comparison of different solutions and cannot be used as an exact cost estimate for the development of a specific project.)

Low €	up to 75 EUR/m ²
Medium €€	76–150 EUR/m ²
High €€€	over 150 EUR/m ²

Maintenance costs

(The classification is based on the indicative installation costs summarized in the LIFE LATESTadapt DBR catalog. It is intended for mutual comparison of different solutions and cannot be used as an exact cost estimate for the development of a specific project.)

Low €	up to 0.75 EUR/m ² per year
Medium €€	0.76–2.00 EUR/m ² per year
High €€€	above 2.00 EUR/m ² per year

4.2 DBR descriptions

The catalogue summarizes **16 types of nature-based solutions** developed and tested within the LIFE LATESTadapt project, referring to the LIFE LATESTadapt DBR catalogue v.2 (November 2025) and the Nature4Cities NBS Implementation Handbook (2020). It should be emphasized that **the spectrum of DBR is significantly broader and is constantly evolving, also taking into account the climatic conditions and opportunities of specific locations, for example, micro-parks (*pocket parks*), green courtyards, rainwater harvesting ponds and other solutions can also be considered DBR .**

Links to materials:

- <https://www.labsimurb.polimi.it/nbs-catalogue/>



However, **to ensure a unified approach** and linkage to the project demonstrations, these guidelines specifically address in detail the 16 solutions included in the LIFE LATESTadapt project DBR catalogue.

The catalog includes **new nature-based solutions for creating examples** that are applicable in cities and villages, however, their planning should always follow the principle of the hierarchy of nature-based solutions – first protect existing ecosystems, then restore degraded areas, and only then create new DBRs if necessary.

(More in Chapter 1.4)

Npk	Nosaukums	Ieguvumi					Mērogs				Izmaksas	
		Karstuma mazināšana	Plūdu risku mazināšana	Ūdens kvalitātes uzlabošana	Gaisa kvalitātes uzlabošana	Dabas daudzveidība	Ēka	Iela	Kvartāls	Apkāme	Ierīkošana	Uzturēšana
1.	Zilā infrastruktūra											
1.1.	Biojēvalķas	xx	xxx	xx	x	x		x	x		€€	€
1.2.	Lietus dārzi	xx	xxx	xx	x	xx			x	x	€€	€
1.3.	Ūdens caurlaidīgs segums	xx	xxx	x	x	x	x	x	x		€	€
2.	Zaļā infrastruktūra											
2.1.	Koku rindas gar ielām	xxx	xx	x	xx	x		x	x		€€€	€
2.2.	Apstādījumi	xxx	xxx	xx	xxx	xxx		x	x		€	€€
2.3.	Pilsētas pļavas	xx	xxx	xx	x	xxx			x	x	€	€
2.4.	Kopienų dārzi, augstās dobes	xx	xx	x	x	x			x	x	€€	€
2.5.	Mākslīgās mitrzes	xx	xxx	xxx	x	xxx			x	x	€	€
2.6.	Mazie elementi faunai					xx	x	x	x		€€	€
3.	Zaļie ielu risinājumi											
3.1.	Zaļās autostāvvietas	xxx	xx	x	xx	x		x			€	€
3.2.	Zaļās sabiedriskā transporta pieturas	xxx	xx	x	xx	x		x			€€	€
3.3.	Zaļās tramvaju slīdes	x	x		xxx	x		x			€€	€
3.4.	Pilsētvides eko-labiekārtojuma elementi	xx	x		x			x			€€	€
4.	Zaļie ēku risinājumi											
4.1.	Zaļie jumti	xxx	xxx	x	x	xx	x				€€€	€
4.2.	Zaļās sienas	xxx	x	x	xx	xx	x				€€	€
4.3.	Zaļie balkoni	xxx			x	x	x				€€	€€€

1.1. Bio-wear

Bio-lined ditches are shallow, vegetated ditches or lined ditches with a water-permeable substrate that capture, retain, infiltrate, and treat rainwater, reducing surface runoff and the burden on the stormwater drainage system.

Fig.	Bioreservoirs are one of the most effective nature-based solutions for sustainable stormwater management in urban environments. They divert and temporarily store stormwater, promoting its infiltration into the soil and natural purification, while reducing the risk of flooding during heavy rainfall. In addition to their hydrological function, bioreservoirs improve the urban microclimate, promote biodiversity, and serve as a scenically attractive element of green infrastructure.
Reference	

Benefits

Heat relief	Flood risk reduction	Improving water quality	Improving air quality	Natural diversity
XX	XXX	XX	X	X

Scale Location criteria

Building	Natural environment criteria	Technical criteria	Urban environment criteria
Street	- It is recommended to install the bio-reservoir at least 0.6 m above the seasonally highest groundwater level. - The most suitable terrain slope is 1–5%. - Well-drained soils, such as loamy sand, are recommended. - If the natural infiltration capacity is insufficient, a connection to drainage systems must be provided .	- The bio-suit construction consists of: - top layer – improved fertile soil with suitable vegetation; - infiltration layer of gravel, crushed stone or expanded clay; - if necessary, a geotextile layer. - When designing a bioreservoir, rainwater inflow, storage, infiltration, and controlled drainage in the event of overflow must be ensured. - In areas with poor infiltration, a connection to a drainage or rainwater drainage system should be provided.	- Bio-clothing is suitable for: - along streets and boulevards; - at the edges of parking lots; - in the territories of residential and public buildings; - in parks and squares; - along pedestrian and bicycle infrastructure; - in places where it is necessary to reduce stormwater runoff and improve the quality of public outdoor space. - Bio-covers are particularly suitable in areas with a high proportion of impermeable surfaces, where it is necessary to reduce the load on the sewage system and at the same time create high-quality green infrastructure.
Quarter			
Neighborhood			

Cost

Installation: ~ 145 EUR/m2 - site selection and research; - planning and design; - earthworks, providing the necessary slope and substrate - installation of an infiltration system (infiltration material (gravel, crushed stone, expanded clay, geotextile); - plant selection and planting	Maintenance: ~ 0.67 EUR/m2 /year - regular watering during periods of drought; - weed control; - pruning and shaping plants; - inspection and cleaning of the infiltration system.
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Additional information

- Urban Green-blue Grids, Bioswales: <https://urbangreenbluegrids.com/measures/bioswales/>
- Baltic Natural Capital Institute, 2025. LIFE LATESTadapt Nature-based Solutions Cost-Efficiency Tool: <https://baltijaskrasti.lv/blog/projekti/life-latestadapt/nature-based-solutions-cost-efficiencytool/>
- World Bank, 2021. A Catalog of Nature-based Solutions for Urban Resilience, Pajamas: <https://documents1.worldbank.org/curated/en/502101636360985715/pdf/A-Catalogue-ofNature-based-Solutions-for-Urban-Resilience.pdf>
- Morello, E., Mahmoud, I., Colaninno, N., (eds.), 2020. Catalog of Nature-based solutions for urban regeneration, Pajamas: <https://www.labsimurb.polimi.it/nbs-catalogue>

1.2. Rain gardens

Rain gardens are depressions in the terrain planted with moisture-loving plants and a water-permeable substrate that capture, store and infiltrate rainwater, reducing surface runoff and slowing the flow of rainwater into the sewer system.

Fig.	Rain gardens are a nature-based rainwater management solution that temporarily stores rainwater and ensures its infiltration into the soil. They reduce the risk of flooding during intense rainfall, relieve the load on stormwater drainage systems and promote the natural purification of rainwater. At the same time, rain gardens improve the urban microclimate, increase biodiversity and create an aesthetically attractive element of green infrastructure in public outdoor spaces.
Reference	

Benefits

Heat relief	Flood risk reduction	Improving water quality	Improving air quality	Natural diversity
XX	XXX	XX	X	XX

Scale Location criteria

Building	Natural environment criteria	Technical criteria	Urban environment criteria
Street	- It is recommended to install the bio-reservoir at least 0.6 m above the seasonally highest groundwater level. - The most suitable terrain slope is 1–5%. - Well-drained soils, such as loamy sand, are recommended. - If the natural infiltration capacity is insufficient, a connection to a drainage or rainwater drainage system must be provided.	- A rain garden is formed by a depression in the terrain with a water-permeable soil substrate. - The design includes an infiltration layer of gravel, crushed stone, expanded clay or other suitable materials; geotextiles are used if necessary. - Controlled rainwater inflow, temporary storage, infiltration and safe overflow in the event of intense rainfall must be ensured. - When choosing plants, preference should be given to moisture-loving species that are suitable for periodic flooding and periods of drought.	- Rain gardens are suitable for: - along streets and boulevards; - in parks, squares and other public green areas; - in the territories of residential and public buildings; - at the edges of parking lots and squares; - near pedestrian and bicycle infrastructure; - in places where it is necessary to reduce stormwater runoff and improve the quality of public outdoor space. - Rain gardens are particularly suitable in areas with a high proportion of impermeable surfaces, where it is necessary to reduce the risk of flooding while simultaneously improving landscape quality and biodiversity.
Quarter			
Neighborhood			

Cost

Installation: ~ 145 EUR/m² - site selection and research; - planning and design; - earthworks, providing the necessary slope and substrate - installation of an infiltration system (infiltration	Maintenance: ~ 0.67 EUR/m² /year - regular watering during periods of drought; - weed control; - pruning and shaping plants; - inspection and cleaning of the infiltration system.
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- material (gravel, crushed stone, expanded clay, geotextile); - plant selection and planting	
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Additional information

- Baltic Natural Capital Institute, 2025. LIFE LATESTadapt Nature-based Solutions Cost-Efficiency Tool: https://baltijaskrasti.lv/blog/projekti/life-latestadapt/nature-based-solutions-cost-efficiencytool/ - World Bank, 2021. A Catalog of Nature-based Solutions for Urban Resilience, Pajamas: https://documents1.worldbank.org/curated/en/502101636360985715/pdf/A-Catalogue-of-Nature-based-Solutions-for-Urban-Resilience.pdf - Morello, E., Mahmoud, I., Colaninno, N., (eds.), 2020. Catalog of Nature-based solutions for urban regeneration, Pajamas: https://www.labsimurb.polimi.it/nbs-catalogue - Economic and ecological factors for sustainable rainwater management in populated areas. PHARE 2003 “Cross-border cooperation programme in the Baltic Sea region” funded project “Development of sustainable rainwater management system in Latvian municipalities” (LV2003/005-876/VAPF/0029) - Summary of scientific literature and international experience https://cleantechlatvia.com/lv/2022/02/01/zinatniska-literatura/ - Methodological instructions for stormwater treatment in typical situations https://cleantechlatvia.com/lv/2022/01/28/petijums-metodiskie-noradijumi/ - Design guidelines for the use of sustainable stormwater management solutions https://cleantechlatvia.com/lv/2022/02/01/projektesanas-vadlinijas/ - Overview of regulatory framework and proposals for its changes in the field of rainwater management http://cleantechlatvia.com/wp-content/uploads/2016/12/P%C4%93t%C4%ABjums_priek%C5%A1likumi_lietus%C5%ABde%C5%86u_apsaimn_CLEANTECH_LATVIA.pdf
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1.3. Water-permeable pavement

A permeable pavement is a pavement solution that allows rainwater to infiltrate through the pavement structure into the soil or storage layer, thereby reducing surface runoff and the load on the stormwater drainage system.

Fig.	Permeable pavements are a nature-based solution for sustainable stormwater management that replaces traditional impermeable pavements. They allow stormwater to naturally infiltrate the soil, reduce the risk of flooding, and promote groundwater recharge. At the same time, they improve the urban microclimate, reduce the heat island effect, and promote sustainable stormwater management. Depending on the type of solution, the pavement can be made of permeable paving, porous asphalt, gravel, or other water-permeable materials.
Reference	

Benefits

Heat relief	Flood risk reduction	Improving water quality	Improving air quality	Natural diversity
XX	XXX	X	X	X

Scale Location criteria

Building	Natural environment criteria	Technical criteria	Urban environment criteria
Street	- The most suitable areas are those with good soil infiltration capacity. - It is desirable that the groundwater level is deep enough to provide infiltration opportunities. - In areas with clayey or poorly infiltrating soils, drainage solutions or an infiltration layer must be provided. - Not recommended in areas with consistently high groundwater levels or prolonged flooding.	- The pavement structure must include a water-permeable top layer and a water-accumulating base layer. - It is necessary to ensure the bearing capacity of the pavement according to the intended load (pedestrians, light or heavy transport). - Clogging of the pores of the pavement must be prevented regularly to maintain infiltration capacity. - In areas with insufficient infiltration, an overflow or drainage system should be provided.	- Water-permeable coverings are suitable for: - in parking lots; - on pedestrian paths and squares; - on bike paths; - on low-intensity streets; - in yards and residential area improvements; - in parks and recreation areas. - Permeable pavements are particularly suitable in areas with a high proportion of impermeable pavements, where it is necessary to reduce rainwater runoff and mitigate the risk of flooding, while maintaining full infrastructure functionality.
Quarter			
Neighborhood			

Cost

Installation: ~ 61 EUR/m² - Site evaluation and design; - removal of existing pavement; - installation of an infiltration system; - laying a permeable surface (a layer of gravel or drainage pipes to ensure rainwater absorption); - purchasing and sowing seeds (optional)	Maintenance: ~ 0.02 EUR/m²/year - regular cleaning of the pavement from dirt and leaves; - weed control, if necessary; - watering and caring for plants if the surface is greened; - periodic inspection of the coating and, if necessary, renewal.
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Additional information

- Urban Green-blue Grids, Water-permeable pavement:
<https://urbangreenbluegrids.com/measures/porous-paving-materials/>
- Baltic Natural Capital Institute, 2025. LIFE LATESTadapt Nature-based Solutions Cost-Efficiency Tool: <https://baltijaskrasti.lv/blog/projekti/life-latestadapt/nature-based-solutions-cost-efficiencytool/>
- World Bank, 2021. A Catalog of Nature-based Solutions for Urban Resilience, Pajamas:
<https://documents1.worldbank.org/curated/en/502101636360985715/pdf/A-Catalogue-ofNature-based-Solutions-for-Urban-Resilience.pdf>
- Morello, E., Mahmoud, I., Colaninno, N., (eds.), 2020. Catalog of Nature-based solutions for urban regeneration, Pajamas: <https://www.labsimurb.polimi.it/nbs-catalogue>

2.1. Rows of trees along the streets

Street tree lines are systematically planted trees along streets, boulevards, and other linear urban features that form a network of green infrastructure and provide ecosystem services such as shade, stormwater retention, air quality improvement, and biodiversity promotion.

Fig.	Tree rows are one of the most effective nature-based solutions in urban environments, as they provide multiple benefits at the same time. They reduce the heat island effect, improve the microclimate, retain precipitation in tree crowns, promote rainwater infiltration, and reduce air pollution and noise. Tree rows also improve the aesthetic quality of the urban environment, create a more comfortable environment for pedestrians and cyclists, and create ecological corridors that contribute to the preservation of biodiversity.
Reference	

Benefits

Heat relief	Flood risk reduction	Improving water quality	Improving air quality	Natural diversity
xxx	xx	xx	xxx	xx

Scale Location criteria

Building	Natural environment criteria	Technical criteria	Urban environment criteria
Street	- Suitable places with sufficient soil fertility and moisture regime. - Sufficient soil volume must be provided for the development of the root system. - It is preferable to choose long-lived tree species that are suitable for local climatic conditions. - When choosing species, the effects of drought, salt and urban pollution should be taken into account.	- Sufficient planting area and root development space must be provided. - Underground utilities, surface infrastructure, and traffic organization must be taken into account when designing. - It is necessary to provide protection for trees against mechanical damage and compacted soil. - In areas with limited space, it is recommended to use structural soil, root cells or other solutions that ensure root development under hard surfaces.	- Tree rows are suitable for: - on city streets and boulevards; - on the streets of residential areas; - near public buildings; - along pedestrian and bicycle infrastructure; - in squares and public outdoor space reconstruction projects; - in newly developed building areas. - Tree rows are particularly recommended in areas with a pronounced heat island effect, heavy traffic or insufficient greenery. They simultaneously improve climate resilience, air quality, stormwater management and the aesthetic quality of the urban environment.
Quarter			
Neighborhood			

Cost

Installation: ~ 252.5 EUR/m2 - engaging a landscape architect to select the number, species and location of trees; - purchase of seedlings; - territory preparation; - tree root management system (in places with limited root growth space); - tree root aeration and irrigation system; - planting;	Maintenance: ~0.75 EUR/m2/year - regular watering; - fertilization; - protection against pests and diseases; - pruning and crown shaping; - raking leaves
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- trunk and root protection measures	
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Additional information

- Urban Green-blue Grids, Street trees and tree-lined lanes: https://urbangreenbluegrids.com/measures/street-trees-and-tree-lined-lanes/ - Baltic Natural Capital Institute, 2025. LIFE LATESTadapt Nature-based Solutions Cost-Efficiency Tool: https://baltijaskrasti.lv/blog/projekti/life-latestadapt/nature-based-solutions-cost-efficiencytool/ - World Bank, 2021. A Catalog of Nature-based Solutions for Urban Resilience, Pajamas: https://documents1.worldbank.org/curated/en/502101636360985715/pdf/A-Catalogue-ofNature-based-Solutions-for-Urban-Resilience.pdf - Morello, E., Mahmoud, I., Colaninno, N., (eds.), 2020. Catalog of Nature-based solutions for urban regeneration, Pajamas: https://www.labsimurb.polimi.it/nbs-catalogue
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2.2. Greenery

Green spaces are purposefully designed and managed green areas with trees, shrubs, perennials, lawns and other plants that provide ecosystem services, improve the quality of the urban environment and contribute to mitigating the impact of climate change.

Fig.	Green spaces are one of the most widely used nature-based solutions in urban environments. They improve air quality, reduce the heat island effect, retain rainwater, reduce noise pollution and promote biodiversity. Well-planned green spaces create aesthetically attractive and functional public outdoor spaces, improve the well-being of residents and contribute to the development of a climate-resilient urban environment. Depending on the function of the area, green spaces can be made of trees, shrubs, perennials, ornamental grasses, lawns or combinations thereof.
Reference	

Benefits

Heat relief	Flood risk reduction	Improving water quality	Improving air quality	Natural diversity
xxx	xxx	xx	xxx	xxx

Scale Location criteria

Building	Natural environment criteria	Technical criteria	Urban environment criteria
Street	- Plant species suitable for the specific location should be selected, taking into account soil characteristics, moisture regime, and lighting. - It is recommended to use plants suitable for local climatic conditions that are resistant to drought, frost and urban pollution. - Sufficient soil fertility and the soil volume required for plants must be ensured. - Diverse plantings that promote biodiversity and pollinator populations are preferred.	- A suitable soil preparation and drainage solution must be provided for during design. - Sufficient space must be provided for plant growth and development above and below ground. - The location of utilities and possible operational restrictions must be taken into account. - Greenery solutions must be adapted to the intended management intensity and available maintenance resources.	- Greenery suitable for: - in parks and squares; - in street and boulevard greenery; - in the public outdoor space of residential areas; - near education, healthcare and other public facilities; - in squares and representative urban areas; - for integrating rainwater management solutions with other DBRs. - Greeneries are especially recommended in areas where it is necessary to improve the microclimate, reduce the heat island effect, increase biodiversity and create high-quality public outdoor space. The use of diverse plant communities allows for the simultaneous achievement of high landscape quality and the provision of important ecosystem services.
Quarter			
Neighborhood			

Cost

Installation: ~48 EUR/m2 - engaging a landscape architect to select species and develop a planting plan; - purchase of seedlings; - land preparation;	Maintenance: ~1.5 EUR/m2/year - regular watering; - fertilization; - protection against pests and diseases; - pruning old branches/plant parts;
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- planting.	- lawn mowing and edging.
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Additional information

- Urban Green-blue Grids, Shade provided by vegetation: https://urbangreenbluegrids.com/measures/shade-provided-by-vegetation/ - Baltic Natural Capital Institute, 2025. LIFE LATESTadapt Nature-based Solutions Cost-Efficiency Tool: https://baltijaskrasti.lv/blog/projekti/life-latestadapt/nature-based-solutions-cost-efficiencytool/ - World Bank, 2021. A Catalog of Nature-based Solutions for Urban Resilience, Pajamas: https://documents1.worldbank.org/curated/en/502101636360985715/pdf/A-Catalogue-ofNature-based-Solutions-for-Urban-Resilience.pdf
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2.3. Urban meadows

Urban meadows are specially created or restored grassland areas with a diverse composition of native forbs and grasses, which are managed extensively to promote biodiversity, improve the ecological quality of the urban environment, and provide ecosystem services.

Fig.	Urban grasslands are a nature-based solution that replaces intensively managed lawns with biodiverse plant communities. They provide habitat for pollinators and other groups of organisms, improve soil quality, reduce maintenance costs, and contribute to soil carbon storage. Urban grasslands also promote stormwater infiltration, reduce the heat island effect, and enrich the urban landscape quality as it changes with the seasons.
Reference	

Benefits

Heat relief	Flood risk reduction	Improving water quality	Improving air quality	Natural diversity
XX	XXX	XX	X	XXX

Scale Location criteria

Building	Natural environment criteria	Technical criteria	Urban environment criteria
Street			
Quarter			
Neighborhood	- Open, sunny areas where plants have sufficient light are most suitable. - A composition of local plant species suitable for local climatic conditions should be selected. - Moderately fertile or poorer soils are suitable; overly fertile soils may be dominated by certain aggressive species. - It is recommended to assess the existing vegetation and the distribution of invasive species before installation.	- Before sowing, proper preparation of the area is required, removing unwanted vegetation and preparing the soil. - Seed mixtures of local wild plants appropriate for the specific area should be used. - Management involves 1–2 mowings per year, depending on the type of meadow and the goals set. - It is recommended to collect the cut biomass after mowing to prevent nutrient enrichment of the soil.	- Urban meadows are suitable for: - in parks and squares; - roadsides and street green belts; - in green areas of residential areas; - in rainwater management areas; - in the restoration of degraded areas; - in large public green areas with lower recreational intensity. - Urban meadows are particularly suitable in areas where it is possible to reduce intensive lawn maintenance, while increasing biodiversity, improving rainwater infiltration and creating climate-resilient green infrastructure. When planning meadows, it is recommended to provide a clearly perceptible territorial structure (for example, regularly mowed edges or paths), which helps residents perceive the meadow as a deliberately designed element of the urban environment.

Cost

Installation: ~ 40 EUR/m² - site selection and research; - selection of seed mixture; - land preparation (removal of the existing vegetation layer, if necessary, enrichment of the soil with compost or other organic fertilizer); - sowing and light seeding	Maintenance: ~ 0.75 EUR/m²/year - mowing - more often in the first year (3-4 times) to limit weed growth, then twice a year - in the spring after the plants bloom and in the fall before frost; - removal of mowed grass from the meadow; - monitoring to control the spread of unwanted plants and, if necessary, to control them.
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Additional information

- Urban Green-blue Grids, Grass fields and flower meadows: https://urbangreenbluegrids.com/measures/grass-fields/ - Baltic Natural Capital Institute, 2025. LIFE LATESTadapt Nature-based Solutions Cost-Efficiency Tool: https://baltijaskrasti.lv/blog/projekti/life-latestadapt/nature-based-solutions-cost-efficiencytool/ - World Bank, 2021. A Catalog of Nature-based Solutions for Urban Resilience, Pajamas: https://documents1.worldbank.org/curated/en/502101636360985715/pdf/A-Catalogue-ofNature-based-Solutions-for-Urban-Resilience.pdf

2.4. Community gardens, raised beds

Community gardens and raised beds are jointly created and managed green spaces where residents grow vegetables, fruits, herbs, medicinal plants and ornamental plants. They simultaneously promote urban greening, biodiversity, sustainable food production and community involvement in shaping the environment.

Fig.	Community gardens and raised beds are a nature-based solution that combines environmental, social and educational benefits. They improve the urban microclimate, promote rainwater infiltration, increase biodiversity and create habitat for pollinators. At the same time, they strengthen local communities, promote cooperation, knowledge exchange and understanding of sustainable food production and natural processes. Raised beds allow gardening to be developed even in areas with unsuitable or contaminated soil, as well as improve the accessibility of the territory for different groups of society.
Reference	

Benefits

Heat relief	Flood risk reduction	Improving water quality	Improving air quality	Natural diversity
XX	XX	X	X	X

Scale Location criteria

Building	Natural environment criteria	Technical criteria	Urban environment criteria
Street			
Quarter			
Neighborhood	- The most suitable are sunny or partially shaded areas where the plants have sufficient light. - Fertile soil or a high-quality growing substrate is required in raised beds. - Water availability for irrigation must be ensured. - It is recommended to use plant species suitable for local climatic conditions and to promote plant diversity beneficial to pollinators.	- Adequate space for the beds, access and safe movement between them must be provided. - Long-lasting, environmentally safe materials and high-quality growing substrate should be used for raised beds. - It is necessary to provide a water supply or the possibility of using rainwater for irrigation. - It is recommended to provide a composting area, tool storage facilities, and other functions necessary for maintaining a community garden. - When planning a territory, the principles of universal design must be taken into account, ensuring accessibility for different user groups.	- Community gardens and raised beds are suitable for: - in the courtyards of residential areas; - in parks and public green areas; - at educational institutions; - in the territories of social care and healthcare institutions; - unused or degraded urban areas; - in the territories of multi-apartment residential buildings. - Community gardens are particularly suitable for areas where there is a need to promote citizen participation, strengthen local communities, improve the quality of public outdoor space and promote sustainable food growing practices. In addition to ecological benefits, they create significant social value by promoting collaboration, education and a sense of belonging to the surrounding environment.

Cost	
Installation: ~ 116 EUR/m² - site selection and research; - planning and design; - land preparation work and/or construction of raised beds; - creation of additional infrastructure (e.g. irrigation systems, paths, fences, compost piles, greenhouses, etc.); - purchase of seedlings and seeds; - planting plants and sowing seeds	Maintenance: ~ 0.75 EUR/m²/year Regular gardening: - watering, - weeding, - fertilization, - pest and disease control, - harvest - infrastructure renovation, etc.

Additional information

- Urban Green-blue Grids, Community gardens: https://urbangreenbluegrids.com/measures/private-or-communal-initiatives/community-gardens/ - Baltic Natural Capital Institute, 2025. LIFE LATESTadapt Nature-based Solutions Cost-Efficiency Tool: https://baltijaskrasti.lv/blog/projekti/life-latestadapt/nature-based-solutions-cost-efficiencytool/ - World Bank, 2021. A Catalog of Nature-based Solutions for Urban Resilience, Pajamas: https://documents1.worldbank.org/curated/en/502101636360985715/pdf/A-Catalogue-of-Nature-based-Solutions-for-Urban-Resilience.pdf - Morello, E., Mahmoud, I., Colaninno, N., (eds.), 2020. Catalog of Nature-based solutions for urban regeneration, Pajamas: https://www.labsimurb.polimi.it/nbs-catalogue
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2.5. Artificial wetlands

Constructed wetlands are man-made or adapted wet areas with aquatic plants and wetland vegetation, designed to collect, purify and gradually drain rainwater or other surface water, while ensuring the development of biodiversity and other ecosystem services.

Fig.	Constructed wetlands are a multifunctional nature-based solution that simultaneously provides stormwater management, water quality improvement, and natural habitat creation. They reduce surface runoff, retain suspended solids and pollution, promote water infiltration, and smooth out runoff peaks during intense rainfall events. At the same time, constructed wetlands create habitats for birds, amphibians, insects, and other organisms, improve landscape quality, and contribute to climate resilience in urban and peri-urban environments.
Reference	

Benefits

Heat relief	Flood risk reduction	Improving water quality	Improving air quality	Natural diversity
XX	XXX	XXX	X	XXX

Scale Location criteria

Building	Natural environment criteria	Technical criteria	Urban environment criteria
Street	- Suitable areas with potential or existing water inflow, such as rainwater runoff basins or low-lying areas. - Topography, groundwater level and hydrological conditions must be taken into account. - Sufficient area is required for the development of wetland and coastal vegetation. - It is recommended to use native wetland plant species that are adapted to periodic water level fluctuations.	- Controlled water intake, storage and discharge must be provided. - The design must ensure sufficient water residence time for the purification of pollution. - If necessary, a sediment collection area should be provided before the water enters the wetland. - Access must be provided for management, sediment removal and vegetation maintenance. - The design must be adapted to expected water level fluctuations and the impact of climate change.	- Constructed wetlands are suitable for: - in urban and populated areas of rainwater management; - in parks and recreation areas; - near water bodies and on the banks of watercourses; - in brownfield revitalization projects; - near industrial and commercial areas; - near large parking lots and other areas with significant rainwater runoff. - Constructed wetlands are particularly suitable for areas where there is a need to simultaneously reduce flood risk, improve stormwater quality, and create new natural areas. They effectively complement other nature-based stormwater management solutions, creating an interconnected network of green and blue infrastructure.
Quarter			
Neighborhood			

Cost

Installation: ~ 75 EUR/m² - Site selection and research; - planning and design;	Maintenance: ~ 0.75 EUR/m²/year - regular watering during periods of drought; - weed control;
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- earthworks - digging a depression, ensuring the required slope and depth; - installation of an infiltration system (infiltration materials (gravel, crushed stone, expanded clay, pipes for water drainage); - plant selection and purchase; - soil preparation and planting	- pruning and shaping plants; - inspection and cleaning of the infiltration system.
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Additional information

- Urban Green-blue Grids, Urban wetlands: https://urbangreenbluegrids.com/measures/urban-wetlands/ - Baltic Natural Capital Institute, 2025. LIFE LATESTadapt Nature-based Solutions Cost-Efficiency Tool: https://baltijaskrasti.lv/blog/projekti/life-latestadapt/nature-based-solutions-cost-efficiencytool/ - World Bank, 2021. A Catalog of Nature-based Solutions for Urban Resilience, Pajamas: https://documents1.worldbank.org/curated/en/502101636360985715/pdf/A-Catalogue-of-Nature-based-Solutions-for-Urban-Resilience.pdf - Morello, E., Mahmoud, I., Colaninno, N., (eds.), 2020. Catalog of Nature-based solutions for urban regeneration, Pajamas: https://www.labsimurb.polimi.it/nbs-catalogue

2.6. Small elements for fauna

Small faunal features are artificial or semi-natural features in the urban environment that provide habitat, feeding, nesting, shelter or wintering sites for various animal species, such as birds, bats, pollinators, insects, amphibians and small mammals. Such features complement green infrastructure and contribute to the conservation of biodiversity in urban environments.

Fig.	Small elements for fauna are relatively simple and cost-effective nature-based solutions that improve the ecological quality of urban environments. They include birdhouses, bat roosts, insect hotels, rock and gravel piles, amphibian hideouts, sand areas for solitary bees, as well as other elements that provide suitable living conditions for various species. These solutions help create ecologically connected environments, promote pollination, natural pest control, and public awareness of natural diversity.
Reference	

Benefits

Heat relief	Flood risk reduction	Improving water quality	Improving air quality	Natural diversity
				XXX

Scale Location criteria

Building	Natural environment criteria	Technical criteria	Urban environment criteria
Street	- Elements should be placed in locations that meet the biological requirements of the specific species. - Areas with existing trees, shrubs, meadows, water bodies or other natural habitats are preferred. - Long-lasting and environmentally friendly materials suitable for local climatic conditions should be used. - It is recommended to create combinations of different elements to provide habitats for multiple groups of organisms.	- Elements should be placed at a safe distance from intense human traffic and other sources of interference. - Nesting cages and bat roosts should be installed at an appropriate height and orientation, taking into account the requirements of the specific species. - Regular technical inspection and maintenance are required to ensure the functionality and safety of the elements. - The design should provide for long-term management and, if necessary, renovation or replacement of elements.	- Small elements suitable for fauna: - in parks and squares; - in urban meadows and natural grasslands; - in forest parks and green corridors; - in the territories of educational institutions; - in public gardens and community gardens; - near water bodies and other green infrastructure areas. - Small elements for fauna are particularly suitable for areas where there is a need to improve biodiversity and strengthen ecological connectivity between green areas. They can be easily integrated with other nature-based solutions, such as urban meadows, green spaces, rain gardens and community gardens, creating a diverse and functional urban ecosystem. In addition to the ecological benefits, these elements also serve as an important tool for environmental education and public engagement.
Quarter			
Neighborhood			

Cost

Installation: ~ 100 EUR/m² - choice of location; - selection of element design and material; - production or purchase of elements; - installation of elements; - placement of information boards	Maintenance: ~ 0.45 EUR/m²/year - Depending on the chosen solution, periodic inspection and renewal of materials, or watering and care of plantings (e.g. butterfly gardens) may be necessary.
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Additional information

- Urban Green-blue Grids, Facilities for birds and other fauna on and around buildings: https://urbangreenbluegrids.com/measures/facilities-for-birds-and-other-fauna-on-and-around-buildings/ - Baltic Natural Capital Institute, 2025. LIFE LATESTadapt Nature-based Solutions Cost-Efficiency Tool: https://baltijaskrasti.lv/blog/projekti/life-latestadapt/nature-based-solutions-cost-efficiencytool/ - Morello, E., Mahmoud, I., Colaninno, N., (eds.), 2020. Catalog of Nature-based solutions for urban regeneration, Pajamas: https://www.labsimurb.polimi.it/nbs-catalogue

3.1. Green parking lots

Green parking lots are parking lots with permeable pavement and integrated greenery that ensure rainwater infiltration, reduce surface runoff and the heat island effect, while maintaining the functional use of the parking lot.

Fig.	Green parking lots are a nature-based solution that combines transport infrastructure with green infrastructure elements. They use water-permeable pavements, grass grids, green islands, trees and stormwater infiltration solutions to reduce stormwater runoff and improve the urban microclimate. In addition, green parking lots reduce pavement overheating, improve landscape quality, increase biodiversity and reduce the load on stormwater drainage systems.
Reference	

Benefits

Heat relief	Flood risk reduction	Improving water quality	Improving air quality	Natural diversity
xxx	xx	x	xx	x

Scale Location criteria

Building	Natural environment criteria	Technical criteria	Urban environment criteria
Street	- The most suitable areas are those with good soil infiltration capacity and sufficient distance to groundwater. - It is recommended to preserve the existing trees and integrate new greenery into the parking area. - The selection of trees and other plants should take into account the effects of drought, salt and urban pollution. - In areas with limited infiltration capacity, alternative rainwater drainage solutions must be provided.	- Water-permeable surfaces or lawn grid systems that provide the necessary load-bearing capacity should be used. - An infiltration or water storage layer must be provided in the structure. - Effective rainwater drainage and overflow solutions must be provided in the event of intense rainfall. - It is recommended to integrate tree plantations, green islands, bio-covers or rain gardens for rainwater management. - Vehicle traffic loads and regular maintenance options must be taken into account when designing.	- Green parking spaces are suitable for: - near public buildings; - commercial and service facilities; - in office and business areas; - in the territories of multi-apartment residential buildings; - in parks and near recreation areas; - at transfer points and other intensively used public areas. - Green parking lots are particularly suitable for areas with extensive hard surfaces, where it is necessary to reduce stormwater runoff, reduce surface overheating and improve the aesthetic quality of the urban environment. They effectively complement other nature-based solutions, such as rain gardens, bio-covers and tree plantations, creating an integrated system of green and blue infrastructure.
Quarter			
Neighborhood			

Cost

Installation: ~66 EUR/m2 - Site evaluation and design; - removal of existing pavement; - installation of an infiltration system; - laying of permeable pavement; - purchase of seedlings/seeds; - planting.	Maintenance: ~ 0.75 EUR/m2/year - regular watering; - weed control; - pruning and fertilizing plants; - pruning old branches/plant parts; - pavement cleaning and maintenance
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Additional information

- Urban Green-blue Grids, Car parks with green areas: https://urbangreenbluegrids.com/measures/car-parks-with-green-areas/ - Baltic Natural Capital Institute, 2025. LIFE LATESTadapt Nature-based Solutions Cost-Efficiency Tool: https://baltijaskrasti.lv/blog/projekti/life-latestadapt/nature-based-solutions-cost-efficiencytool/

3.2. Green public transport stops

Green public transport stops are public transport stops that integrate nature-based solutions, such as greenery, green roofs, trees, rain gardens or water-permeable surfaces, to improve the microclimate, mitigate the impact of climate change and increase the quality of public outdoor space.

Fig.	Green public transport stops combine mobility infrastructure with green infrastructure elements. They provide shade and heat protection, reduce surface runoff, improve stormwater management and promote biodiversity. Depending on the specifics of the site, green roofs, trees, rain gardens, vegetation and water-permeable surfaces can be integrated into stops. Such solutions improve passenger comfort, the aesthetic quality of the urban environment and climate resilience.
Reference	

Benefits

Heat relief	Flood risk reduction	Improving water quality	Improving air quality	Natural diversity
xxx	xx	x	xx	x

Scale Location criteria

Building	Natural environment criteria	Technical criteria	Urban environment criteria
Street	- Areas with high insolation and a pronounced heat island effect are preferred. - Plant species suitable for local climatic conditions and resistant to drought, pollution and the effects of road maintenance should be selected. - It is recommended to preserve the existing trees and integrate them into the park's landscaping.	- Green elements must not restrict visibility, traffic safety or the movement of public transport. - Sufficient space must be provided for the plants and their root system, as well as effective rainwater drainage or infiltration. - Green roof and other structural solutions must meet the load-bearing capacity and operational requirements of the stop. - Regular maintenance of greenery and infrastructure must be ensured.	- Green public transport stops are suitable for: - on city main and local streets; - at public transport hubs and transfer points; - in areas with intense pedestrian traffic; - at educational, healthcare and public institutions; - in residential and commercial areas; - in public outdoor space renovation projects. - Green public transport stops are particularly recommended in areas with high summer overheating risk and high public transport passenger intensity. By integrating them with tree plantations, rain gardens, bio-covers and water-permeable pavements, it is possible to significantly improve stormwater management, passenger comfort and overall urban climate resilience.
Quarter			
Neighborhood			

Cost

Installation: ~85 EUR/m² - site evaluation and design; - selection and purchase of green elements; - preparation of the parking lot (strengthening the roof structure, improving waterproofing, etc.); - installation of green elements; - if necessary - irrigation system, lighting and other additional elements	Maintenance: ~ 0.45 EUR/m²/year - regular watering, fertilizing and care of plants; - cleaning and maintenance of green elements; - replacement and replenishment of damaged plants.
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Additional information

- Baltic Natural Capital Institute, 2025. LIFE LATESTadapt Nature-based Solutions Cost-Efficiency Tool: https://baltijaskrasti.lv/blog/projekti/life-latestadapt/nature-based-solutions-cost-efficiencytool/ - Morello, E., Mahmoud, I., Colaninno, N., (eds.), 2020. Catalog of Nature-based solutions for urban regeneration, Pajamas: https://www.labsimurb.polimi.it/nbs-catalogue
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3.3. Green tram tracks

Green tram tracks are a tram infrastructure solution in which the track is greened with lawn, ground cover plants or other suitable vegetation, creating a functional green infrastructure element that simultaneously ensures public transport operations and ecosystem services.

Fig.	Green tram tracks are a multifunctional nature-based solution that reduces the urban heat island effect, improves stormwater management, reduces dust and noise levels, and improves the aesthetic quality of the urban environment. Vegetation between the tracks traps precipitation, promotes water evaporation and infiltration, while creating additional habitat for plants and invertebrates. Green tram tracks are an important element of green infrastructure in densely built-up urban areas.
Reference	

Benefits

Heat relief	Flood risk reduction	Improving water quality	Improving air quality	Natural diversity
X	X		XXX	X

Scale Location criteria

Building	Natural environment criteria	Technical criteria	Urban environment criteria
Street	- Suitable areas with sufficient sunlight and opportunities to ensure the development of vegetation. - Plant species that are drought-resistant and suitable for intensive urban environments should be selected. - The amount of precipitation and the ability to provide plant moisture during periods of prolonged drought must be taken into account. - It is recommended to use vegetation suitable for local climatic conditions with low maintenance requirements.	- The design of the green tracks must ensure safe operation of tram traffic and the necessary load-bearing capacity. - A suitable growing medium, drainage system and rainwater drainage must be provided. - Vegetation must not interfere with the operation of the track or reduce traffic safety. - The design must provide for access for track maintenance and necessary technical work. - The structure must be resistant to vibrations, mechanical stress and winter maintenance conditions.	- Green tram tracks are suitable for: - on city tram lines; - on boulevards and in wide areas of street cross-sections; - new public transport infrastructure projects; - street reconstruction and revitalization projects; - in areas with a pronounced heat island effect; - in places where it is necessary to improve the quality of the urban landscape and reduce noise levels. - Green tram tracks are particularly suitable for densely built-up urban areas where there is a need to increase the proportion of green infrastructure without taking up additional land. They effectively complement tree rows, rain gardens and other nature-based solutions, creating an interconnected network of green and blue infrastructure and improving the climate resilience of the urban environment.
Quarter			
Neighborhood			

Cost

Installation: ~130 EUR/m² - removal of existing pavement; - installation of a drainage system; - preparation of the rail base; - laying of permeable pavement; - purchase and sowing of seeds; - installation of an irrigation system	Maintenance: ~ 0.75 EUR/m²/year - watering, - weed control, - mowing, - cleaning tracks from debris and leaves.
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Additional information

- Urban Green-blue Grids, Green verges and traffic lines: https://urbangreenbluegrids.com/measures/green-verges-and-traffic-lines/ - Baltic Natural Capital Institute, 2025. LIFE LATESTadapt Nature-based Solutions Cost-Efficiency Tool: https://baltijaskrasti.lv/blog/projekti/life-latestadapt/nature-based-solutions-cost-efficiencytool/
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3.4. Elements of urban eco-improvement

Urban eco-improvement elements are sustainable solutions for the improvement of public outdoor spaces that use natural, recycled or environmentally friendly materials and integrate nature-based elements to improve the ecological quality of the urban environment, climate resilience and well-being of residents.

Fig.	Urban eco-improvement elements complement green infrastructure and promote sustainable development of public outdoor spaces. They can include benches, waste bins, bicycle racks, pergolas, canopies, water intakes, information stands, natural play elements and other improvement objects, the design of which uses environmentally friendly materials and sustainable solutions. Such elements can be integrated together with greenery, rain gardens, trees and other nature-based solutions, improving the functionality, microclimate and biodiversity of public outdoor spaces.
Reference	

Benefits

Heat relief	Flood risk reduction	Improving water quality	Improving air quality	Natural diversity
xx	x		x	

Scale Location criteria

Building	Natural environment criteria	Technical criteria	Urban environment criteria
Street	- It is recommended to use long-lasting, environmentally friendly and, if possible, locally sourced materials. - Preference is given to solutions that preserve existing vegetation and complement the green infrastructure network. - Solutions that increase the area of impermeable surfaces or negatively affect natural processes should be avoided. - It is recommended to integrate elements that promote biodiversity, such as plantings suitable for pollinators or rainwater management solutions.	- Landscaping elements must be resistant to climatic conditions, vandalism and intensive use. - The design must follow the principles of universal design, ensuring accessibility for all groups of society. - Structures must be easy to maintain and repair. - Where possible, integration of stormwater management solutions should be considered, such as permeable pavements or rainwater drainage to greenery. - The possibility of using recycled or reusable materials should be considered.	- Urban eco-improvement elements are suitable for: - in parks and squares; - on streets and boulevards; - pedestrian and bicycle infrastructure routes; - at public transport stops; - in the public outdoor space of residential areas; - educational, cultural and recreational areas. - Eco-improvement elements are particularly suitable for public outdoor space renovation and revitalization projects, where it is necessary to simultaneously improve the functionality, aesthetic quality and sustainability of the territory. By integrating them with greenery, rain gardens, water-permeable surfaces and other nature-based solutions, it is possible to create a climate-resilient, multifunctional and environmentally friendly urban environment.
Quarter			
Neighborhood			

Cost

Installation: ~140 EUR/m² - site selection and concept development; - planning and design; - selection and procurement of materials; - manufacturing and installation; - purchase of seedlings and seeds; - planting plants	Maintenance: ~ 0.10 EUR/m²/year - regular maintenance of furniture or upholstery, such as cleaning, painting, replacing damaged parts, etc.; - Supervision, ensuring that furniture or parklets are used for their intended purpose and are not damaged.
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Additional information

- Baltic Natural Capital Institute, 2025. LIFE LATESTadapt Nature-based Solutions Cost-Efficiency Tool: https://baltijaskrasti.lv/blog/projekti/life-latestadapt/nature-based-solutions-cost-efficiencytool/ - Morello, E., Mahmoud, I., Colaninno, N., (eds.), 2020. Catalog of Nature-based solutions for urban regeneration, Pajamas: https://www.labsimurb.polimi.it/nbs-catalogue
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4.1. Green roofs

Green roofs are vegetated roofs of buildings, where a special structure with layers of drainage, growing medium and plants is installed above the waterproofing. They provide rainwater retention, improve the energy efficiency of buildings, reduce the heat island effect and promote biodiversity in the urban environment.

Fig.	Green roofs are one of the most effective nature-based solutions in densely built-up areas, where the possibilities for creating green areas on the ground are limited. They retain and gradually drain rainwater, reducing the load on the stormwater drainage system and the risk of flooding. Vegetation improves the thermal insulation of buildings, reduces summer overheating and winter heat loss, while improving air quality and creating habitats for insects and birds. Depending on the design, green roofs can be extensive (with minimal maintenance requirements) or intensive (with more diverse plantings and wider use options).
Reference	

Benefits

Heat relief	Flood risk reduction	Improving water quality	Improving air quality	Natural diversity
xxx	xxx	x	x	xx

Scale Location criteria

Building	Natural environment criteria	Technical criteria	Urban environment criteria
Street	- Plant species suitable for local climatic conditions and able to withstand drought, wind and temperature fluctuations should be selected. - Drought-tolerant plants, such as various sedum species, mosses, and low grasses, are recommended for extensive roofs. - Intensive roofs can use perennials, grasses, shrubs, and in some cases, small trees, if the structure allows it. - Plant selection should take into account the expected maintenance level and biodiversity objectives.	- Before installation, the load-bearing capacity of the building's structures and the suitability of the roof for the construction of a green roof must be assessed. - High-quality waterproofing, a root barrier, a drainage layer, a filtration layer, and a growing medium are required. - Effective water drainage and, if necessary, an irrigation system must be provided. - Safe access for roof management and maintenance must be ensured during design. - Fire safety, occupational safety and operational requirements must be taken into account.	- Green roofs are suitable for: - public buildings; - office buildings; - multi-apartment residential buildings; - commercial buildings; - for coverings of parking lots and other structures; - for new construction and building renovation projects. - Green roofs are particularly recommended in densely built-up areas with limited opportunities for new greenery at ground level. They effectively complement other nature-based solutions, such as green walls, rain gardens and tree plantations, creating an integrated system of green and blue infrastructure and improving urban climate resilience.
Quarter			
Neighborhood			

Cost

Installation: ~210 EUR/m² - Evaluation of the technical parameters of the roof and selection of the appropriate roof type; - purchase of materials; - installation of waterproofing and drainage layer; - placement of substrate and plants; - installation of an irrigation system.	Maintenance: ~ 0.45 EUR/m²/year - regular watering; - fertilization; - weeding and plant care
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Additional information

- Urban Green-blue Grids, Green roofs: https://urbangreenbluegrids.com/measures/green-roofs/ - Baltic Natural Capital Institute, 2025. LIFE LATESTadapt Nature-based Solutions Cost-Efficiency Tool: https://baltijaskrasti.lv/blog/projekti/life-latestadapt/nature-based-solutions-cost-efficiencytool/ - World Bank, 2021. A Catalog of Nature-based Solutions for Urban Resilience, Pajamas: https://documents1.worldbank.org/curated/en/502101636360985715/pdf/A-Catalogue-of-Nature-based-Solutions-for-Urban-Resilience.pdf - Morello, E., Mahmoud, I., Colaninno, N., (eds.), 2020. Catalog of Nature-based solutions for urban regeneration, Pajamas: https://www.labsimurb.polimi.it/nbs-catalogue
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4.2. Green walls

Green walls are green building facades or other vertical structures where vegetation grows directly on the wall or in specially designed support and planting systems. They improve the urban microclimate, reduce building overheating, promote biodiversity, and enhance the quality of public outdoor space.

Fig.	Green walls are a nature-based solution that allows to increase the area of green surfaces in areas with limited free land area. They reduce the heating of facades in summer, improve the energy efficiency of buildings, reduce the concentration of dust and air pollution, dampen noise and improve the aesthetic quality of the urban environment. Depending on the type of solution, green walls can be designed as facade greenery with climbing plants or as vertical planting systems with integrated substrate and irrigation. In addition to the climate adaptation benefits, they create habitats for insects and other organisms, promoting biodiversity.
Reference	

Benefits

Heat relief	Flood risk reduction	Improving water quality	Improving air quality	Natural diversity
xxx	x	x	xx	xx

Scale Location criteria

Building	Natural environment criteria	Technical criteria	Urban environment criteria
Street	- Plant species suitable for local climatic conditions should be selected, taking into account the orientation of the facade, insolation and wind effects. - Plants must be suitable for the specific growing conditions (shade, partial shade or full sun). - It is recommended to choose species that are long-lived and resistant to urban pollution. - Where possible, preference should be given to species that provide additional habitat for pollinators and other organisms.	- Before installation, the technical condition of the building's structures and the suitability of the facade for greening must be assessed. - A secure support structure or vertical planting system must be provided according to the chosen solution. - High-quality waterproofing is required in places where the structure requires it, as well as effective rainwater drainage. - Intensive vertical systems should have an automatic irrigation and fertilization system. - Design should ensure access for regular maintenance and plant care.	- Green walls are suitable for: - public buildings; - office and administrative buildings; - multi-apartment residential buildings; - facades of parking lots and technical buildings; - transport infrastructure facilities; - for densely built-up areas with limited opportunities to install greenery at ground level. - Green walls are particularly recommended for use in areas with pronounced heat island effects and high building density, where there is a need to increase the proportion of green infrastructure. They effectively complement green roofs, tree plantations, rain gardens and other nature-based solutions, creating a multi-layered green infrastructure system and improving the climate resilience of the urban environment.
Quarter			
Neighborhood			

Cost	
Installation: ~130 EUR/m² - Evaluation of the technical parameters of the walls and selection of appropriate structures and plants; - purchase of materials; - installation of the structure; - planting plants; - installation of an irrigation and fertilization system.	Maintenance: ~ 0.45 EUR/m²/year - regular watering; - fertilization; - plant pruning and care;

Additional information

- Urban Green-blue Grids, Green facades: https://urbangreenbluegrids.com/measures/green-facades/ - Baltic Natural Capital Institute, 2025. LIFE LATESTadapt Nature-based Solutions Cost-Efficiency Tool: https://baltijaskrasti.lv/blog/projekti/life-latestadapt/nature-based-solutions-cost-efficiencytool/ - World Bank, 2021. A Catalog of Nature-based Solutions for Urban Resilience, Pajamas: https://documents1.worldbank.org/curated/en/502101636360985715/pdf/A-Catalogue-of-Nature-based-Solutions-for-Urban-Resilience.pdf - Morello, E., Mahmoud, I., Colaninno, N., (eds.), 2020. Catalog of Nature-based solutions for urban regeneration, Pajamas: https://www.labsimurb.polimi.it/nbs-catalogue
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4.3. Green balconies

Green balconies are balconies, loggias or terraces that integrate plants in pots, boxes or other planting systems, creating additional green infrastructure on building facades. They improve the microclimate, promote biodiversity and increase the quality of the living environment in densely built-up areas.

Fig.	Green balconies are a simple and easy-to-implement nature-based solution that allows you to increase the green area even in places where it is not possible to create greenery at ground level. Plants on balconies reduce the overheating of facades and balconies, improve air quality, retain dust and promote the evaporation of rainwater. They create a more favorable microclimate for building residents and provide additional habitat for pollinators and other organisms. At the same time, green balconies improve the aesthetic quality of buildings and strengthen residents' connection with nature in their everyday environment.
Reference	

Benefits

Heat relief	Flood risk reduction	Improving water quality	Improving air quality	Natural diversity
xxx			x	x

Scale Location criteria

Building	Natural environment criteria	Technical criteria	Urban environment criteria
Street	- The choice of plants should be adapted to the orientation of the balcony (sun, partial shade or shade) and local climatic conditions. - It is recommended to use species that are drought-resistant and suitable for urban conditions. - Plants that attract pollinators and promote biodiversity are preferred. - The effect of wind on the upper floors must be taken into account and appropriate plant species must be selected.	- The load-bearing capacity of the balcony or loggia must be assessed before installation. - Safe and durable planting containers with drainage capabilities should be used. - It is necessary to ensure regular watering, especially during the summer season; it is preferable to use rainwater or automatic irrigation systems. - Secure securing of plants and containers should be provided in areas exposed to strong winds. - The placement of plants must not interfere with the operation of the building or create safety risks.	- Green balconies are suitable for: - multi-apartment residential buildings; - office and administrative buildings; - hotels and other public buildings; - new construction and building renovation projects; - densely built-up urban areas; - streets with limited opportunities to create greenery at ground level. - Green balconies are particularly suitable for areas with high building density, where it is necessary to increase the proportion of green infrastructure without additional land use. They are recommended to be combined with green roofs, green walls and other nature-based solutions, creating a multi-layered greening system that improves the urban microclimate, biodiversity and quality of life of residents.
Quarter			
Neighborhood			

Cost

Installation: ~115 EUR/m² - Evaluation of the balcony's location and construction, selection of appropriate plants; - purchase of materials and equipment; - planting plants	Maintenance: ~ 5.00 EUR/m²/year - regular watering; - fertilization; - protection against pests; - pruning and caring for plants.
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Additional information

- Baltic Natural Capital Institute, 2025. LIFE LATESTadapt Nature-based Solutions Cost-Efficiency Tool: https://baltijaskrasti.lv/blog/projekti/life-latestadapt/nature-based-solutions-cost-efficiencytool/ - Morello, E., Mahmoud, I., Colaninno, N., (eds.), 2020. Catalog of Nature-based solutions for urban regeneration, Pajamas: https://www.labsimurb.polimi.it/nbs-catalogue

5 Investment planning and justification

5.1 DBR solutions suitable for different budget types

DBR funding can be attracted from various sources. Below is a recommended list of solutions and budget types.

Budget type	Suitable DBR types	Key considerations	Examples (will be added)
Participatory budgeting in local government	Small tree rows, flower beds, community gardens, eco-furniture, urban meadows	Small amount (5–30 thousand EUR); citizen initiative; rapid implementation; importance of public support	
Municipal basic budget	Street greening, rain gardens, bio-covers, heat island mitigation measures, park development, green corridors	Medium size (30–500 thousand EUR); must be integrated into the annual budget of the municipality; coordination of work with other infrastructure projects	
State funds (e.g. Latvian Environmental Protection Fund)	Demonstrations, pilot projects, research, methodology	Co-financing for national priorities; usually smaller amounts, but faster allocation	
EU Cohesion Funds / ERDF (SO 2.1.3.1. and other programmes)	Large-scale projects — wetlands, green corridors, urban transformation initiatives	Large amount (from 200 thousand to several million EUR); must meet specific support objectives; DNSH principle must be observed	
EU LIFE programme	Demonstrations, integrated projects, climate adaptation, biodiversity	Partnerships between countries; exchange of experience; innovative solutions; replication component	
EU Horizon Europe	Research and innovation projects in the field of DBR	Scientific-practical partnerships; pilot demonstrations	
Interreg programmes (Baltic Sea Region, Central Baltic, Europe)	Cross-border cooperation, knowledge transfer, pilots	Partners from several countries; medium size (~1–3 million EUR)	
Private sector, CSR, owner co-financing	Green roofs, green walls, balconies, cloud services for buildings	Close work with real estate developers; long-term payback (energy efficiency, property value)	
Private-public partnership (to be added)			

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5.2 Criteria for attracting EU funds

The section summarizes the criteria that local governments and state administrations should consider when creating DBR project applications for EU funds.

Mandatory principles to be observed:

17. Do No Significant Harm (DNSH) principle - the project must not significantly harm any of the 6 environmental objectives of the EU Taxonomy (climate change mitigation, adaptation, water protection, circular economy, pollution prevention, biodiversity);
18. Taxonomy technical screening criteria for climate adaptation actions;
19. Research/innovation component (if applicable to the specific support measure);
20. Integration with the municipal development program and spatial planning.

Criteria matrix for selecting DBR projects (starting point for reflection - will be implemented as a fillable matrix):

Criteria group	Specific criterion	Example of an indicator
Climate adaptation	The solution mitigates at least one climate risk	Rainwater runoff reduction (%), heat island reduction (°C)
Climate change mitigation	CO ₂ capture or reduction	Number of trees, canopy cover, soil carbon sequestration
Biodiversity	Proportion of native species, habitat connectivity	Proportion of native species >70%; habitat connection with existing green areas
Water	Improvement of water quality, reduction of runoff	TSS, totN, totP reduction; infiltration volume m ³
Circular economy and pollution	Use of sustainable materials, prevention of pollution	% recycled materials; chemical treatment excluded
Social criteria	Accessibility, inclusion, community involvement, environmental accessibility	Number of co-creation workshops, representation of different population groups, improved environmental accessibility in X locations
Economic criteria	Cost-effectiveness, long-term maintenance costs	NPV, cost-effectiveness indicator (€/m ² /benefits)
Multifunctionality	The solution solves several problems at once	Number of relevant functions (floods + heat + biodiversity + recreation)
Replication potential	Solution standardization and portability scaling	A technical specification and maintenance protocol have been developed

Source: SAM 2.1.3.1. - <https://www.cfla.gov.lv/lv/2-1-3-1-k-0>; EU Taxonomy Regulation; EC DNSH - https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:C_202300111.

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5.3 Cost-benefit assessment methodology

Basic principles of cost-benefit analysis for DBR projects.

Analysis steps:

1. Define scenarios with DBR and without DBR

Source: EC DG REGIO "Guide to Cost-Benefit Analysis of Investment Projects"
https://ec.europa.eu/regional_policy/sources/studies/cba_guide.pdf

1. Describe the baseline scenario (without DBR) - continuation of the current situation, including projected climate risks without intervention.
2. Describe the project scenario (with DBR) - technical parameters of the solution and expected operational/life cycle.
3. Determine the analysis period (usually 20-30 years for environmental/green infrastructure projects).
4. Define the spatial and institutional boundaries of both scenarios.
5. Identify key assumptions that differ between scenarios (maintenance frequency, probability of risk occurrence, etc.).

2. Calculate investment costs (CAPEX)

Resource: CFLA Cost-Benefit Calculation Model and Methodology (2024) - [model \(xlsx\)](#), [filling methodology \(docx\)](#)

1. Prepare a detailed estimate by item - design, materials, labor, sensors/technology, installation.
2. Add VAT and a margin for unforeseen expenses (usually 10-15%).
3. If implementation takes place in stages/several years, divide CAPEX by year.
4. Use the CFLA calculation model to ensure that the cost structure meets the requirements of EU funds.
5. Compare with the actual costs of already implemented DBR pilot projects (e.g. LATESTadapt) for reliability testing.

3. Calculate maintenance costs (OPEX)

1. Divide maintenance into 3 categories - regular, episodic, restorative.
2. Calculate annual costs by item - labor/equipment, materials/plant renewal, sensor replacement, sediment/waste management.
3. Take into account increased costs in the first 1–2 years (rooting period, more frequent watering).
4. Plan for periodic (non-annual) costs - e.g., filter/substrate replacement every 10–25 years.
5. Compare with "gray" infrastructure maintenance costs for long-term justification.

4. Calculate the monetary value generated by DBR.

1. For each benefit, choose an appropriate valuation method - market/replacement cost method, revealed preference method or stated preference method (surveys).

2. For heat island health benefits - use the "value of a statistical life" (VSL) or "value of a life year" (VOLY), multiplied by the morbidity/mortality avoided during heat waves.
3. To prevent flood losses - calculate the difference in "average annual losses" between scenarios, based on the flood risk model (RTU model, already used in Cēsis).
4. For real estate value increase - hedonic price analysis (cadastral data around the object before/after) or a cautious % markup based on international research.

5. Socio-economic analysis

1. Convert financial values into economic prices, excluding transfers (VAT, subsidies).
2. Assess the impact on employment (jobs created/maintained in greening and maintenance works).
3. Assess the impact on local businesses near green areas.
4. Identify risks to social cohesion, including potential "green gentrification", and provide mitigating measures.
5. Summarize findings in a socio-economic impact summary for decision-makers.

6. Financial analysis

1. Determine the discount rate in accordance with EC/CFLA guidelines (typically a realistic 4% for public projects in EU cohesion countries).
2. Prepare a cash flow table by year (CAPEX + OPEX and monetized benefits).
3. Calculate NPV - the project is economically justified if $NPV > 0$.
4. Calculate the IRR and payback period by comparing the IRR with the discount rate.
5. Use the Excel model prepared by CFLA to ensure compliance with EU fund requirements .

7. Sensitivity analysis

1. Identify critical variables with the greatest impact on NPV/IRR (rainfall intensity, maintenance costs, discount rate, benefit value).
2. Vary each variable separately (e.g., $\pm 10-20\%$) and record the changes in NPV/IRR.
3. Calculate "breakpoint values" - how much the variable must change for the NPV to become negative.
4. Develop an optimistic, pessimistic and baseline scenario.

8. Integration of the DNSH principle

Resource: EC *"Technical guidance on the application of 'do no significant harm' under the RRF Regulation"* , C/2023/111 ([EUR-Lex](#))

1. Document the assessment as a separate section of the DNSH self-assessment in the technical documentation.

Tools and references:

The Baltic Natural Capital Institute's NbS cost-effectiveness tool
(<https://baltijaskrasti.lv/blog/projekti/life-latestadapt/nature-based-solutions-cost-efficiency-tool/>);

SAMP 2.1.3.1. Cost-benefit analysis methodology (<https://www.cfla.gov.lv/lv/2-1-3-1-k-1>).

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5.4 Criteria for including DBR in the selection of investment projects

This section summarizes a fillable matrix that helps municipalities evaluate the inclusion of DBR in the selection of investment projects (especially within the framework of participatory budgeting), taking into account the autonomous functions of the Local Government Law.

No .	Criterion			
1				
2				
3				
4				
5				
6				
7				
8				
9				

Will be updated

Using the matrix: rate each criterion on a scale of 1-5 (1 - insufficient, 5 - excellent); multiply by weight, add up.

6 Recommendations for integrating DBR into development planning documents

The chapter provides recommendations on how to systematically integrate nature-based solutions into local government development planning documents to promote climate change risk mitigation, biodiversity conservation, and the development of a high-quality urban environment.

The recommendations are based on the experience of the pilot municipalities of the LIFE LATESTadapt project – Cēsis, Riga, Valmiera, Viimsi, Haapsalu, Rakvere, Narva and Vēra – as well as the current regulatory framework of Latvia and the European Union.

6.1 Strategic and regulatory framework

Planning nature-based solutions is not a separate task for local governments – it is closely related to territorial development planning, climate policy, environmental protection, and the quality of public outdoor space.

Nature-based solutions planning is based on a multi-level planning system – from European Union policy and regulatory framework to national and local development documents that set specific directions and requirements for action. This hierarchy ensures that local governments' NBS projects are aligned with broader climate change, nature restoration and sustainable development goals.

International level

Sets common climate, biodiversity and nature restoration targets that Member States must implement.

Name (link)	Description
UN Sustainable Development Goals https://sdgs.un.org/goals?utm	- A global framework for action with 17 sustainable development goals that promote social well-being, environmental protection, and economic development. - The SDGs specifically contribute to the achievement of Goal 11 "Sustainable cities and communities", Goal 13 "Climate action" and Goal 15 "Life on land". - These goals provide a unified international framework for sustainable urban development and strengthening climate resilience. Importance for local governments: A balance must be ensured between environmental, social and economic goals.

European Green Deal https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_lv	- The European Union's long-term development strategy, which aims to achieve climate neutrality by 2050. - Covers climate policy, circular economy, biodiversity, energy and sustainable urban development. - DBR is one of the key tools for achieving the goals of the Green Deal in urban environments, while improving climate resilience and quality of life. Importance for municipalities: Sustainable and climate-resilient urban development must be promoted.
EU Nature Restoration Regulation https://eur-lex.europa.eu/eli/reg/2024/1991/oj?utm	- An EU regulation that sets legally binding nature restoration targets for all member states by 2050. - Article 8 provides requirements for the development of urban ecosystems, establishing the need to preserve and increase urban green areas and tree canopy projection. - The requirements of the regulation will have to be integrated into national and local development planning documents, therefore the DBR becomes one of the main instruments for achieving these goals. Significance for municipalities: The growth of green areas and tree canopy in cities must be planned.
EU Biodiversity Strategy 2030 https://environment.ec.europa.eu/strategy/biodiversity-strategy-2030_en?utm=&prefLang=lv	- European Union strategy for the conservation of biodiversity and the restoration of degraded ecosystems. - Promotes the development of green infrastructure, urban greening, and the creation of ecological corridors. - DBR helps to simultaneously improve biodiversity, ecosystem resilience, and the quality of life of residents. Significance for municipalities: Green infrastructure and ecological corridors must be developed.
EU Climate Adaptation Strategy https://climate.ec.europa.eu/eu-action/adaptation-and-resilience-climate-change/eu-adaptation-strategy_en	- Sets out the European Union's approach to reducing the risks of climate change and strengthening adaptive capacity. - Emphasizes the use of nature-based solutions as one of the most effective and sustainable adaptation tools. - Calls on municipalities to integrate climate risks into territorial development planning and investment projects. Importance for municipalities: DBR should be integrated into climate adaptation measures.
EU Soil Strategy 2030 https://environment.ec.europa.eu/topics/soil-health/soil-strategy-2030_en	- For soil health protection and restoration of degraded areas. - The strategy emphasizes the importance of soil in mitigating climate change, preserving biodiversity, the water cycle, and food security. - Promotes sustainable land use, reduction of soil sealing and preservation of natural infiltration processes in cities. Significance for municipalities: When planning buildings and public outdoor spaces, the proportion of impermeable surfaces should be reduced, rainwater infiltration should be promoted, and solutions should be provided for the preservation and restoration of healthy soil.
EU Water Sustainability Strategy	- The aim is to strengthen Europe's resilience to water scarcity, droughts, floods and water quality degradation.

https://commission.europa.eu/topics/environment/water-resilience-strategy_en	- The importance of nature-based solutions in stormwater management, increasing water retention capacity, and restoring natural water cycles is emphasized. Significance for municipalities: Promote sustainable stormwater management, integrate DBR into territorial planning, and reduce flood risks, while improving water quality and efficient use of resources.
EU Urban Agenda (<i>Urban Agenda</i>) https://www.urbanagenda.urban-initiative.eu/	- The European Union's cooperation framework for sustainable urban development, which promotes cooperation between EU institutions, member states, local governments and experts. - The aim is to improve regulation, access to finance and knowledge exchange on urban development issues, including climate adaptation, green infrastructure and nature-based solutions. Significance for local governments: Provides a methodological framework and examples of good practice for integrating DBR into the urban environment, promotes international cooperation and supports the attraction of funding for sustainable urban development.

National, regional and municipal planning levels in Latvia and Estonia

The climate, biodiversity and nature restoration goals set at the European Union and international levels are being transferred to the national, regional and local development planning documents of Latvia and Estonia. The planning systems of the two countries differ in structure and types of documents, however, their operating principle is similar – higher-level strategic goals are specified in lower-level documents, gradually linking the long-term development vision with spatial planning, actions and investments.

At the national level, both Latvia and Estonia set national long-term development goals and sectoral policy directions in the areas of climate, environment, biodiversity, water management and regional development. In Latvia, this framework is formed by the Latvian Sustainable Development Strategy, the National Development Plan and sectoral policy documents, while in Estonia – the national long-term development strategy *Estonia 2035*, national sectoral development documents and national spatial planning documents. In both countries, this level determines the overall direction towards climate resilience, ecosystem preservation and restoration and sustainable territorial development, thus creating the basis for integrating the SDGs into lower-level planning and funding programmes.

At the regional level, national objectives are linked to the spatial structure and development needs of specific territories. In Latvia, this function is mainly implemented by planning regions with sustainable development strategies and

development programmes. In Estonia, regional issues are addressed through county *development* strategies and state-developed county -wide *spatial plans* . In both countries, this level can be important for DBR issues that go beyond the administrative borders of one municipality, for example, in the planning of green and blue infrastructure networks, ecological corridors, water systems, flood risk areas and other functionally related natural areas.

At the municipal level, strategic objectives are translated into specific territorial development priorities, spatial solutions, actions and investments. In Latvia, municipal sustainable development strategies determine the long-term vision and spatial development perspective, development programs – medium-term priorities, actions and investments, while spatial plans and other spatial development planning documents determine the conditions for the use and construction of territories. In Estonia, a similar function is performed by municipal development plans (*development plans / arengukava*) and comprehensive spatial plans (*comprehensive plans / üldplaneering*), which can be supplemented by sectoral and thematic documents. In both countries, it is the municipal level that is most important for the practical integration of the SDGs, as it makes it possible to link climate and environmental objectives with specific territories, requirements, projects and financing.

For the effective implementation of the DBR, both **vertical linkages** between the European Union, national, regional and local government levels and **horizontal linkages** between different documents at the same planning level are essential. The objectives of climate adaptation, biodiversity, stormwater management and green infrastructure should not remain only in sectoral strategies or thematic plans – they should also be reflected in spatial development principles, land use conditions, action plans and investment priorities. This creates a sequential DBR integration chain – **from strategic objective to spatial solution, specific action, financing and implementation** .

The most important development and spatial planning documents of the national, regional and municipal levels of Latvia and Estonia, their role and connection with the National Development Plan are summarized in more detail in Appendix 7.4.

Specific projects

The goals set in the planning documents are implemented through specific projects and investments. This may include the reconstruction of public outdoor spaces, the installation of rain gardens, the creation of green streets, tree planting, the creation of urban meadows, green roofs or other DBR solutions. To ensure a long-term effect, it

is recommended that municipalities also include DBR requirements in design tasks, procurement documentation and infrastructure maintenance plans.

DRAFT

6.2. National Nature Restoration Plan

The EU Nature Restoration Regulation (Regulation (EU) 2024/1991) sets legally binding nature restoration targets, to achieve which each Member State of the European Union must develop a **National Nature Restoration Plan**. It must define the necessary ecosystem restoration measures and the areas in which they are to be implemented, the indicators to be achieved and their deadlines, as well as the monitoring and financing approach. The plan covers the period until 2050, taking into account the interim targets set in the regulation.

Member States must submit a draft National Recovery Plan to the European Commission by **1 September 2026**. The European Commission will assess the draft plan and may provide its observations, which the Member State will have to take into account when preparing the final version of the plan.

Although the National Nature Restoration Plan is being developed by the state, its implementation will be closely linked to local government territories and their development planning. The data and knowledge of local conditions available to local governments can help identify areas to be restored and the most appropriate measures, while the goals and measures set out in the plan will need to be taken into account in future planning for the development of territories and implementing specific projects.

Restoring urban ecosystems

In the context of municipalities and the DBR, Article 8 of the Nature Restoration Regulation on the restoration of urban ecosystems is particularly important. It links urban green areas and tree canopy cover to measurable nature restoration goals and provides for their preservation and enhancement in the long term.

By the end of 2030, Member States must ensure that there is no net loss compared to 2024:

- the total area of urban green areas;
- for the total area of urban tree canopy cover.

This requirement is assessed at national level in relation to the urban ecosystem areas defined in the Regulation, and not as a requirement to maintain a constant area of green areas in each individual municipality or territory. As part of the development of the national restoration plan, Member States must identify and map the urban ecosystem areas to which the objectives of the Regulation apply.

From 2031, an increasing trend should be ensured:

- the total area of urban green areas at the national level, including by integrating greenery into buildings and infrastructure;
- urban tree canopy cover in each urban ecosystem area,

until a satisfactory level is reached.

What does this mean for municipalities?

The introduction of the Nature Restoration Regulation reinforces the need to perceive urban green infrastructure not only as an element of improvement, but as a functional part of urban infrastructure that simultaneously ensures the preservation of biodiversity, climate adaptation, rainwater management, mitigation of heat impacts, and creation of a high-quality living environment.

For municipalities, this means the need to identify existing green areas and tree canopy cover during the development planning process, identify areas that require their preservation, restoration or expansion, and link these goals to spatial planning, development programs, sectoral plans and investment projects.

Nature-based solutions in this context are one of the practical tools for achieving the objectives of the Nature Restoration Regulation. Tree plantations, rain gardens, green streets, urban meadows, green roofs, sustainable rainwater management systems and other NBRs allow the integration of nature restoration objectives also in densely built-up areas, where traditional creation of new green areas is not always possible.

6.3. Integrating DBR into municipal documents

In order for nature-based solutions to become a systematic approach to municipal development, they need to be consistently integrated into planning documents at different levels and municipal operational instruments. Integrating NBS is not a separate activity, but a continuous process in which strategic goals are linked to specific requirements, projects and funding. The process of integrating NBS involves several interrelated steps.

1. Inclusion of DBR objectives in municipal strategic documents

The first step is to strengthen the DBR as one of the tools for achieving the goals of climate change adaptation, biodiversity conservation, and the development of a high-quality living environment.

Sustainable development strategy

What should the Sustainable Development Strategy envisage regarding DBR?

Vision, long-term goals for climate resilience and green infrastructure.

Recommended:

- to establish the development of a climate-resilient and green urban environment as a long-term priority;
- to provide for the preservation and development of green and blue infrastructure;
- include goals for conserving natural capital and enhancing ecosystem services.

For example:

- Define urban greening and climate resilience as one of the long-term development priorities.
- Set a goal to maintain and develop a unified network of green and blue infrastructure.
- Plan to increase tree canopy cover and green areas.
- Aim to reduce the heat island effect and flood risks through DBR.
- Integrate DBR as one of the tools in climate change adaptation and biodiversity conservation policies.

Development program

What should the Development Program provide for regarding DBR?

Specific actions, projects, investments and performance indicators .

Recommended:

- define specific directions of action for the DBR;
- determine responsible institutions and implementation mechanisms;
- to provide performance indicators for achieving climate and environmental goals.

For example:

- Plan specific DBR projects (rain gardens, green stops, bio-covers, green roofs, etc.).
- Determine implementation deadlines, responsible institutions and funding sources.
- Propose measurable indicators (number of trees planted, number of newly created rain gardens, area of green areas, volume of infiltrated rainwater, etc.).
- Provide pilot projects and demonstration areas.
- Include community engagement and education activities.

2. Development and updating of thematic plans

In order to translate strategic goals into spatially specific actions, it is recommended that the municipality develop or update thematic plans, such as an urban greening plan.

What should be envisaged in the Greening Plan regarding DBR?

Detailed DBR network, priority areas, implementation sequence and demonstration projects.

Such a layout allows:

- identify priority areas for the implementation of DBR;
- determine the necessary measures and the sequence of their implementation;
- link planned activities with funding opportunities.

(A detailed thematic planning approach and examples of urban greening plans are discussed in the next chapter.)

3. Integrating DBR requirements into spatial planning

To ensure the implementation of DBR not only in municipal projects, but also in private development processes, it is necessary to include appropriate requirements in land use and building regulations.

What should be envisaged in the Spatial Plan regarding the DBR?

Requirements for green infrastructure, stormwater management, greenery and territory reservation in the DBR .

Recommended

- Reserve areas for green and blue infrastructure, ecological corridors, and stormwater management.
- Determine requirements for the minimum proportion of greenery.
- To provide for stormwater management solutions in new development areas;
- Preserve valuable tree rows, urban forests, meadows and water bodies.
- Promote the use of permeable pavement, green parking lots, and other DBR in public outdoor space.

For example:

- If the hard surface of a newly constructed building or development exceeds a certain area (for example, 500 m²), rainwater infiltration or retention solutions should be considered.

4. Inclusion of DBR criteria in municipal procurement

To ensure the practical implementation of DBR, its principles must be integrated into the municipality's procurement and design documentation.

Recommended:

- include DBR requirements in technical specifications;
- evaluate solutions according to their long-term impact and maintenance costs;
- to include green infrastructure elements in public outdoor space and infrastructure projects.

Examples:

- rain gardens in street redevelopment projects;
- trees and greenery in public outdoor projects;
- permeable surfaces in parking lots;
- green roofs on municipal buildings.

Ensuring the maintenance of the DBR in the municipal budget

The effectiveness of DBRs depends not only on their construction, but also on appropriate long-term management. Therefore, the annual budget of the municipality should include funding for:

- for the maintenance of green infrastructure;
- for tree and landscaping care;
- maintenance of rainwater management systems;
- monitoring and evaluation measures.

6.4 Greening plan

The Urban Greening Plan is a thematic development planning tool that helps a municipality systematically plan the development of green and blue infrastructure, identify priority areas and define specific nature-based solutions for mitigating climate change risks, preserving biodiversity and creating a high-quality urban environment. It creates a link between the municipality's strategic development goals, spatial planning and the implementation of specific projects, ensuring coordinated and spatially justified development of green infrastructure.

The European Union's approach to urban greening planning

At the European Union level, urban greening planning is being developed using the Urban Nature Plan *approach*. The European Commission's 2024 *Urban Nature Plans – Guidance for cities to help prepare an urban nature plan* provides a framework to help cities develop and successfully implement urban nature plans. The guidelines are complemented by a practical toolkit with more detailed information on the individual stages of plan development, tools to be used and examples of good practice.

The essence of an urban nature plan is to create a long-term, systematic and integrated approach to the development of urban nature, rather than implementing unrelated greening projects. In the planning process, the current situation of the city's nature and biodiversity is linked to a long-term vision, measurable goals, specific actions, funding and further monitoring of results. Political support, cross-sectoral cooperation and public involvement also play an important role.

This approach can also be used in the development of municipal greening plans in Latvia and Estonia. A greening plan can serve as a tool to spatially specify broader climate adaptation, biodiversity and nature restoration goals in the territory of a municipality, determining where green and blue infrastructure should be preserved, strengthened or newly created and which DBRs are most appropriate in specific territories.

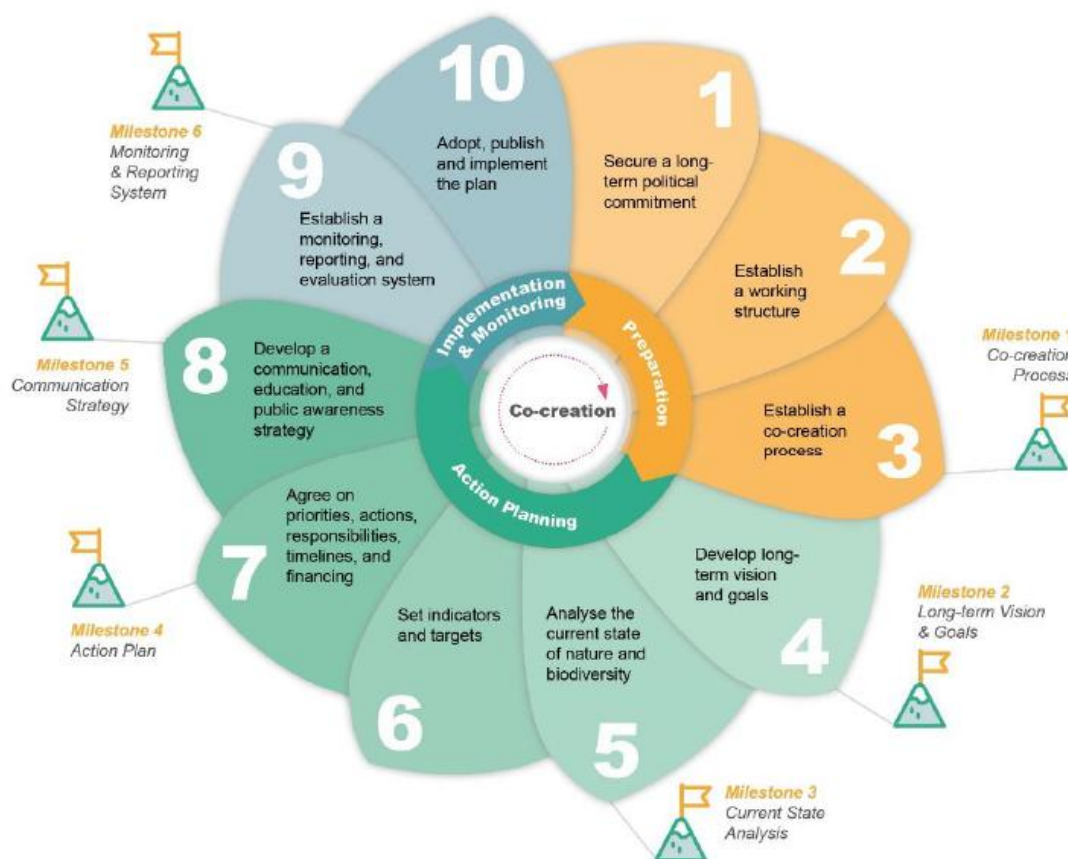
Greening plan development process

The European Commission's urban nature planning methodology emphasises that planning is not just about spatial analysis and identifying solutions. It is a process that encompasses both the creation of preconditions, the development of the plan, its implementation and subsequent evaluation of results.

The main steps in developing an urban nature plan:

1. Ensuring political support;
2. Creation of a work structure;
3. Establishing a co-creative process;
4. Developing long-term vision and goals;
5. Analysis of the existing nature and biodiversity situation;
6. Determining indicators and achievable target values;
7. Action and funding planning;

8. Communication and public information;
9. Monitoring, reporting and evaluation;
10. Approval and implementation of the plan.



translate Source: Steps for establishing an Urban Nature Plan
<https://op.europa.eu/en/publication-detail/-/publication/bdb452c0-901c-11ef-a130-01aa75ed71a1/language-en>

These steps form a cyclical process – approval of the plan is not the end of greening planning. During implementation, it is necessary to regularly assess the results achieved, update data and, as climate risks, urban development or available solutions change, review the established priorities and actions.

The greening plan approach developed in the LIFE LATESTadapt project concretizes this European-level framework for the planning needs of municipalities, paying particular attention to spatial analysis of climate risks, identification of priority areas and selection of appropriate nature-based solutions.

Pilot municipalities' experience

The recommendations provided in this chapter are based on the experience of pilot municipal greening plans developed during the LIFE LATESTadapt project. Three thematic development planning documents were developed within the project – **the Cēsis City Green Infrastructure Development Plan**, **the Valmiera City Green Infrastructure Development Plan** and **the Riga Urban Greening Plan**. Although each plan is adapted to the nature, scale and development challenges of the specific municipal territory, all three documents demonstrate a unified approach to integrating nature-based solutions into municipal development planning and urban management. They cover the assessment of the current situation, climate risk analysis, spatial planning of green and blue infrastructure, identification of priority areas, action plans and implementation mechanisms. The experience of the pilot projects allows for the development of recommendations that are also applicable to other Latvian municipalities.

1. **The Cēsis City Green Infrastructure Development Plan** has been developed as a thematic plan, paying special attention to the development of the green infrastructure network, the quality of public outdoor space, the preservation of biodiversity, as well as the mitigation of climate risks – heat islands and flooding. The plan also attaches significant importance to public participation and a governance model that ensures the implementation of the plan.
2. **The Valmiera City Green Infrastructure Development Plan** has been developed with a strong emphasis on the blue-green infrastructure system, integrating green areas and stormwater management solutions into a unified spatial structure. The plan analyzes various urban areas and neighborhoods in detail, develops spatial solutions for different building types, and defines priorities for mitigating the impact of climate change and adaptation measures.
3. **The Riga Urban Greening Plan** covers a wide range of issues – from the development of green infrastructure and the implementation of nature-based solutions to the improvement of institutional governance, public participation and the establishment of a monitoring system. Taking into account the scale and complex governance structure of Riga, the plan pays special attention to the coordinated management of green infrastructure, the use of data in decision-making and the integration of greening into the daily operations of the municipality.

Structure of the greening plan

To ensure systematic and data-based planning of green infrastructure development, it is recommended to create a greening plan as a set of interconnected sections. The experience of pilot municipalities shows that an effective greening plan encompasses not only an assessment of the current situation, but also a spatial analysis, a strategic vision, specific nature-based solutions, implementation mechanisms and a governance model.

Npk	Section	Contents
1.	Analysis of the current situation	Green infrastructure, blue infrastructure, climate risks, biodiversity
2.	Spatial analysis	Heat islands, flooding, access to green spaces, connectivity
3.	Strategic part	Goal, vision, priorities
4.	Solutions section	DBR solutions for different territories
5.	Action plan	Projects, deadlines, responsible parties
6.	Management	Funding, monitoring, public engagement

1. Analysis of the current situation

Objective - To create a comprehensive picture of the current state of green and blue infrastructure, identifying the potential of the territory, key problems and development opportunities.

Result - Problems clearly identified, development opportunities defined, database prepared for further spatial analysis.

Section content	Good practice
It is recommended to analyze: - existing green and blue infrastructure; - the location of natural areas and greenery; - protected natural areas and habitats; - tree structure and the most important alleys; - water bodies, watercourses and rainwater systems; - biodiversity; - land use; - demographic indicators; - the quality of public outdoor space; - valid planning documents; - the challenges posed by climate change.	In pilot municipalities, the analysis is not limited to the inventory of green areas. It also includes: - climate change impact assessment; - the importance of ecosystem services; - functionality of green infrastructure; - people's access to green areas; - the interconnection of territories. Special attention is paid to ensuring that the analysis serves as a basis for further prioritization.

2. Spatial analysis

Objective - To identify areas where the implementation of DBR will provide the greatest benefits for improving climate resilience, biodiversity and quality of life.

Result - Maps of priority areas, mapping of the green infrastructure network, maps of the potential for implementing DBR.

Section content	Good practice
A spatial analysis is performed on: - location of heat islands; - flood risks; - rainwater accumulation areas; - availability of green infrastructure; - continuity of green corridors; - the quality of public outdoor space; - biologically valuable areas; - degraded areas; - potential DBR implementation sites. It is recommended to use: - GIS analysis; - orthophoto maps; - LiDAR data; - satellite data; - climate models; - field surveys.	Pilot projects have widely used overlay analysis of different data layers, for example: heat islands + population density + availability of green infrastructure + flood risks. This allows for objective identification of priority areas.

3. Strategic part

Goal - To define the municipality's long-term vision for the development of green infrastructure and the implementation of DBR.

Result - A unified development vision that sets the municipality's priorities for future investments

Section content	Good practice
Determines: - vision; - overarching goals; - strategic objectives; - priorities; - courses of action; - the results to be achieved; - performance indicators. The strategic part should be closely linked to: - sustainable development strategy; - development program; - climate policy; - spatial planning.	The pilot projects have formulated goals not only to increase green infrastructure, but also: - strengthening climate resilience; - for the preservation of biological diversity; - improving human health; - for the provision of ecosystem services.

4. Solutions section

Goal - To define specific nature-based solutions for different territories and development situations.

Result - A specific set of DBR measures adapted to the territory of the municipality.

Section content	Good practice
It is recommended to identify: - tree plantations; - rows of trees; - parks; - squares; - pocket parks; - urban meadows; - rain gardens; - artificial wetlands; - green parking lots; - green stops; - green roofs; - green walls; - community gardens; - permeable pavements; - other DBRs. For each solution, it is desirable to indicate: - application; - benefits; - implementation prerequisites; - maintenance requirements; - possible risks.	In pilot municipalities, solutions are not viewed in isolation. They are combined in one area, for example: - street tree plantings; - rain gardens; - permeable pavements; - cycling infrastructure; - lighting. Such an approach significantly increases the efficiency of DBR.

5. Action plan

Goal - To ensure the transition from planning to practical implementation.

Result - A practical implementation plan with clear responsibilities and implementation priorities.

Section content	Good practice
For each event, it is desirable to determine: - description; - priority; - implementation deadline; - the responsible institution; - cooperation partners; - sources of funding; - performance indicators. It is recommended to group projects: - short-term; - medium-term; - long-term.	In pilot projects, action plans cover not only infrastructure projects, but also: - improvement of regulatory enactments; - development of guidelines; - data improvement; - specialist training; - public involvement. This promotes systemic change, not just the construction of individual objects.

6. Management

Objective - To ensure the implementation, coordination and monitoring of a long-term greening plan.

Result - An effective management system that ensures continuity of greening plan implementation, regular evaluation and adaptation to changing climate and development conditions.

Section content	Good practice
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It is recommended to determine: - institutions involved; - division of responsibilities; - collaboration model; - monitoring system; - performance indicators; - data restoration procedures; - the periodicity of updating the plan; - public participation mechanisms.	The experience of pilot municipalities shows that investments in infrastructure alone are not enough for successful implementation. Equally important are: - interdisciplinary cooperation between local government departments; - unified data management; - regular monitoring; - participation of citizens and other stakeholders; - clearly defined responsibility for implementing and updating the plan.
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From plan to implementation

The value of a greening plan lies in its ability to create a clear link between data, spatial analysis, strategic objectives and practical action. The analysis of the current situation and climate risks allows for the reasonable identification of areas requiring priority action, while the strategic and solutions part helps to select the most suitable nature-based solutions for the specific location. The action plan, financing, division of responsibilities and monitoring, in turn, ensure that the identified priorities can be translated into implementable projects and long-term management practices.

Therefore, the greening plan should not be considered an isolated sectoral document. It should act as a connecting tool between municipal development planning, spatial planning, climate adaptation, nature and biodiversity protection, infrastructure development and investment planning. It is essential that the priorities and principles set out in the plan are also transferred to other municipal planning documents, design tasks, investment projects and daily territory management.

The experience of pilot municipalities shows that the structure of a single greening plan can be adapted to territories of different scale and nature. What is crucial is not a single document form, but a sequential process – from understanding the territory and identifying problems to setting priorities, choosing solutions, implementing them and evaluating results. Such an approach allows nature-based solutions to be used not as separate greening elements, but as part of a systematic, climate-resilient and sustainable territorial development.

7 Attachments

7.1 Descriptions of sensor data and monitoring methodology

The appendix summarizes the technical descriptions and methodology for collecting sensor data and conducting monitoring, developed within the framework of the project WP2.4 and WP5: monitoring protocols for flow, water quality, meteorological parameters, heat islands, ecosystem services and socio-economic impacts.

Sources: T2.4 NBS remote monitoring summary (RTU, 2024); WP5 monitoring program (MS21); IES satellite data methodology for heat island assessment.

7.2 Podcast compilation

The appendix includes summaries of all podcasts created within the project (topics, experts, available links to YouTube and the materials section of the project website). The materials are provided by the customer, the Ministry of Regional Development and Regional Development (WP7). <https://lifelatestadap.viimsivald.ee/lv/materiali/>

NPK	Name, link	Topic	Brief summary/key findings	Experts?
1	Nature-based solutions - our tool for climate change https://lifelatestadap.viimsivald.ee/lv/materiali/ https://youtu.be/jO7xtjWVJNk?si=Gbh03nKLa8FzFpxP <i>References in chapters: 1.3 1.4</i>	What are nature-based solutions in the context of climate change, how can they help adapt to climate change, how much do they cost and whether they differ in Latvia and Estonia. - Defining the “Why” and the “What” - Project management and practical reality - Science and “smart” validation - Politics, obstacles and integration - Economic considerations - Community and future prospects	ADD TO CART	Tanel Mätlik, Võimsi Municipality in Estonia, Merle Kuris, Baltic Environmental Forum in Estonia, Anda Ruskule, Baltic Environmental Forum in Latvia, Aija Vanaga, “Baltic Natural Capital Institute”, Krišs Smildzers, Riga City Municipality Public Infrastructure Project Development

				Department. The discussion is moderated by Luīze Eglīte, Ministry of Smart Administration and Regional Development.
2.	Rain gardens – from science to your backyard https://lifelatestadapt.viimsivald.ee/lv/materiali/ https://youtu.be/vxvr712-fPY?si=Pos9cyVrmK-GAtNO <i>References in chapters: 4.2 /p.1.2</i>	Rain gardens. What is a rain garden, how it works and how it differs from other rainwater management solutions. How rain gardens help manage stormwater in cities, reduce the burden on storm sewer systems, and how rain gardens can reduce the risk of flooding during intense rainfall events.	The talk will cover both biological and technical aspects – the use of native plants , biodiversity , water infiltration into the soil, as well as sensors , monitoring and modeling in urban stormwater management. The practical challenges faced by municipalities, architects and engineers when implementing green infrastructure in urban environments – design, construction, maintenance and cost comparison with traditional engineering solutions – will also be discussed .	The episode features experts from Latvia and Estonia – researchers, landscape architects and urban planners: Ivar Annus (TalTech) – urban water systems expert; Jurijs Kondratenko (Riga Technical University) – sensors and digital solutions in the urban environment; Mart Meriste (Nordic Botanical) – biodiversity and native plant communities; Mārīte Sprudzāne (ALPS Landscape Studio) – landscape architecture in

				Latvia; Gen Mandre (4people, Estonia) – landscape architecture and sustainable rainwater systems
3.	Can everyone create nature-based solutions? The power of an engaged community https://lifelatestadapt.viimsivald.ee/lv/materiali/ https://youtu.be/ewBQ1ecoBj4?si=da-1yB93LQzat0Ys <i>References in chapters: 2.11</i>	Public engagement in the implementation of nature-based solutions in the urban environment. How well do citizens understand nature-based solutions and what are the most common perceptions about them? How to improve communication and explain climate adaptation solutions to different target audiences? How do municipalities integrate green infrastructure into urban planning and development? How can citizens, communities and city activists participate in shaping the urban environment and how to resolve conflicts between different urban needs, such as parking and green spaces?	The conversation explores both public awareness-raising and practical participatory mechanisms - co-creation workshops, volunteer initiatives, youth involvement, digital tools and integrating local knowledge into urban planning. The development of the Riga urban greening plan , Tallinn's experience in engaging residents , as well as the experience of smaller municipalities in implementing nature-based solutions are also discussed . The episode	Anda Ruskule (Baltic Environmental Forum Latvia) - nature-based solutions expert Merle Kuris (Baltic Environmental Forum Estonia) - engagement of municipalities and communities Jānis Ušča (Riga City Municipality) - urban planning and green infrastructure Mārtiņš Eņģelis (Riga city activist, Riga City Council member) - public participation and urban development Esme Kassak (City of Tallinn) - environmental education and public

			emphasizes that <u>sustainable and climate-resilient cities are only possible with active public participation.</u>	engagement
4.	From conceptual plan to soil - a tour of 8 Baltic demo sites https://lifelatestadapt.viimsivald.ee/lv/materiali/ https://youtu.be/Q2_4yb1wlUk?si=ILyVaFtqEP_lzPQa <i>References in chapters: 3.</i>	Eight demo cities in Latvia and Estonia, where nature-based solutions for strengthening the resilience of urban environments against floods and the impacts of climate change are being implemented and tested in practice. How nature-based solutions for stormwater management and flood risk reduction are being implemented in various municipalities, · how cooperation between scientists, municipalities and local communities takes place, · what challenges arise when creating a demonstration area in an urban environment, · how sensors and digital data help assess the effectiveness of nature-based solutions, · how to ensure the maintenance and development of these solutions in the long term after the project is completed.	The discussion focuses on how to replace “grey” infrastructure with climate-resilient and environmentally friendly solutions – rain gardens, green spaces, water storage systems and other nature-based approaches. Experts share their experience in planning demo sites, using sensors and data analysis, which helps municipalities make informed decisions in urban development. The episode reveals how Baltic municipalities are becoming "living laboratories" where solutions are developed for future climate-resilient	The episode features experts from Latvia and Estonia: · Arnita Verza (Riga City Municipality) – implementation of nature-based solutions in Riga · Zanda Lapsa (Valmiera Municipality) – development of demo sites and greening of the urban environment · Kaie Enno (Narva Municipality) – experience with completed demos · Kerli Kõue (Rakvere Municipality) – climate adaptation solutions in the urban environment · Kerta Kõiv (TalTech) – sensor systems and

			cities.	monitoring in Estonian territories · Jurijs Kondratenko (Riga Technical University) – sensor technologies and data analysis in Latvia
5.	Urban greening plans - how cities are preparing for a climate future https://lifelatestadapt.viimsivald.ee/lv/materiali/ https://youtu.be/1SSOODOUHSM?si=DWS9duRHBqteGuv2 <i>References in sections: 6.4</i>	The fifth episode of the LIFE LATESTadapt podcast is dedicated to Urban Greening Plans – strategic documents that help municipalities plan for a climate-resilient, healthy and sustainable urban environment. The episode covers: how urban greening plans help identify “problem areas” – heat islands, flooded areas and lack of biodiversity; how Riga, Valmiera and Cēsis integrate nature-based solutions into municipal planning; How the city of Tartu is developing a “green circle” to strengthen biodiversity how scientific data and monitoring help	The discussion focuses on how nature-based solutions are becoming an integral part of urban planning, replacing traditional “grey” infrastructure with more climate-resilient and environmentally friendly solutions. Experts share their experiences on developing urban greening plans, challenges and visions for the future in Baltic cities. The episode reveals how Baltic cities are creating long-term strategies to create a	The episode features experts from Latvia and Estonia: Liene Griķe (Riga City Municipality) – development of an urban greening plan in Riga; Zanda Lapsa (Valmiera County Municipality) – climate adaptation and mapping of problematic areas in Valmiera; Ance Ludborža (Cēsis Municipality) – balancing cultural and historical heritage and greening solutions in Cēsis;

		make sustainable decisions in urban development; How urban greening plans help attract funding and implement long-term climate adaptation solutions how citizen engagement and private green spaces become an important part of urban resilience.	healthier, safer, and greener urban environment for future generations in the face of climate change.	Anna-Liisa Unt (City of Tartu / urbanLIFEcircles project) – biodiversity monitoring and “green circle” development in Tartu.
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7.3 Seminar summary

Information on seminars and workshops organized during the project — at local, regional, national and international levels (at least 8 training events for local governments and 2 international training events on remote sensing data; international conference) is compiled. Presentations, recording links and key findings are included.

Source: <https://lifelatestadapt.viimsivald.ee/materials/>

NPK/Name	1.“Planning nature-based solutions for climate resilience – from local to regional levels”
Date	05.-06.06.2025.
Topic	Exchange of knowledge and experience in implementing DBR from local to regional levels. Nature-based solutions (NBS) and urban green infrastructure planning approaches - experience of the LATESTadapt project. Development of the Riga Greening Plan. Development of the Valmiera Greening Plan. Development of the Cēsis Greening Plan. Planning climate change adaptation measures at the regional level: approach and experience of the IMPETUS project. Adaptation options for reducing the risk of flooding caused by flash floods and heavy rainfall. Climate impact and adaptation measures. The most effective policy and spatial planning tools for ensuring climate resilience. IMPETUS project platform for informational support on opportunities to increase climate change resilience. Consultation Forum on Nature-Based Solutions established by the LIFE LATESTadapt project. A decade of implementing sustainable stormwater management solutions in Riga. Riga City Municipality plans regarding the installation of nature-based solutions in the urban environment (Elizabetes Street and Tērbatas Street pilot projects).
Brief summary/key findings	1. Nature-based solutions (BBS) are a practical and flexible tool. 2. DBR Integration into planning documents is essential. 3. Mapping and prioritizing enables strategic action. 4. Public engagement and co-creation contribute to the implementation of successful solutions. 5. Cross-sectoral collaboration enhances the impact of the project.

	6. Pilot projects promote and accelerate knowledge transfer 7. Policy coordination and investment planning are crucial.
Links	https://lifelatestadapt.viimsivald.ee/wp-content/uploads/2025/05/T.7.1.-seminars_05_06062025_ENG_2.pdf https://lifelatestadapt.viimsivald.ee/lv/materiali/

References in chapters: 3. 6. 6.4 ?

NPK/Name	2. “Heat risk challenges and solutions in urban environments”
Date	16.-17.10.2025.
Topic	Heat risks in urban environments. Why it matters, how we can map and calculate them, and what solutions exist to mitigate them. Climate change and its forecasts in Latvia. heat waves, their modeling and analysis. Mapping of hot spots. Nature-based solutions and heat risk. Urban design solutions against heat.
Brief summary/key findings	1. Heat is an imminent threat. 2. Heat can affect health. 3. Data, mapping and public engagement can help prioritize activities and conduct strategic planning. 4. DBR and urban design can be very flexible. 5. <u>Practical DBR solutions from object inspection:</u> Use of parklets in densely built-up urban areas; Collecting rainwater from buildings into reservoirs for irrigation; Small-scale solutions, such as bus shelters with green roofs, to increase green space and reduce overheating; Planting trees in containers, in cases where it is not possible to plant them in the ground.
Links	https://lifelatestadapt.viimsivald.ee/wp-content/uploads/2025/05/T.7.1.-seminars_16_17102025_ENG_2.pdf

References in chapters: 1.3

NPK/Name	3. "Climate proof and nature based stormwater solutions"
Date	25.11.2025.

Topic	An overview of potential DBR risks and related failures that may occur during the life cycle , as well as practical examples that have been implemented or will be implemented in the Baltic region. Introduction, possible solutions for sustainable rainwater management, risks and pitfalls.
Brief summary/key findings	The seminar draws on the results of several international projects, such as “Interreg BSR NOAH”, “Interreg BSR CityBlues”, “Interreg CB MUSTBE”, “LIFE IP BuildEST” and “LIFE LATESTadapt”, to illustrate the risks and opportunities associated with the implementation of nature-based stormwater management solutions. Factors hindering the implementation of DBR, as well as uncertainties that need to be considered in this process. Risk and failure analysis, which indicated the main reasons why NBS solutions may fail and examined the consequences of such failures.
Links	https://lifelatestadapt.viimsivald.ee/wp-content/uploads/2026/01/Climate-proof-solutions.pdf https://lifelatestadapt.viimsivald.ee/lv/materiali/

References in the chapters:

NPK/Name	4. "Catchment-based planning and nature-based stormwater solutions to increase climate resilience in cities"
Date	24.-25.03.2026.
Topic	The aim of the event is to exchange knowledge and practical experience on stormwater management planning at the river basin level and nature-based solutions for strengthening urban climate resilience, using the experience gained by the municipalities of Aarhus and Estonia to exchange information on tools, resources and pilot project experiences that promote the introduction and integration of nature-based solutions in urban planning and implementation; the event will be complemented by an excursion to the pilot sites of the *Interreg* Central Baltic Sea Region Programme project "MUSTBE" in Tallinn and Viimsi, as well as to the demonstration site of the LIFE project "LATESTadapt" in Viimsi.
Brief summary/key findings	<i>ADD TO CART</i>
Links	https://lifelatestadapt.viimsivald.ee/wp-content/uploads/2026/04/T.7.1.-seminar_24032026_meeting25032026_ENG.pdf

<https://lifelatestadapt.viimsivald.ee/lv/materiali/>

References in the chapters:

NPK/Name	5. "Child-friendly environment and natural solutions: theory and practice"
Date	11.-12.06.2026.
Topic	Climate change forecasts in Latvia, nature-based solutions (NBS) and the principles of the "New European Bauhaus" (NEB) in creating a sustainable and child-friendly urban environment.
Brief summary/key findings	1. Rapid changes in climate norms are causing more frequent tropical nights and intense rainfall, creating a need for infrastructure that can withstand both extreme heat and large amounts of water. 2. Educational institutions as significant "heat islands": Mapping results show that schools and kindergartens often act as urban "heat islands" due to the extensive use of asphalt and rubber surfaces. Children are disproportionately exposed to heat and particles emitted from synthetic materials. The transition from these "hard" surfaces to natural shade and greenery is essential for children's health and development. 3. Holistic design using NEB and DBR approaches requires moving away from standard procurement procedures in favour of professional competitions and meaningful public engagement. DBRs are not just decorative elements, they are multifunctional tools that address environmental concerns (e.g. flood and heat risks) while promoting social inclusion and creating "climate classrooms" for future generations. 4. The importance of controlled risk and natural materials. Modern play environments are often "too safe," which creates boredom and hinders the development of physical endurance. By introducing controlled risks through the use of natural elements such as fallen trees, boulders, and varied terrain, children are encouraged to actively take care of their safety while promoting cognitive development. Moving from synthetic play equipment to natural environments reduces the carbon footprint and provides a richer sensory experience. 5. Practical implementation and insights from site visits: integration of topography, rainwater gardens and all-wood structures to stimulate the "six senses"; the use of artistic, non-standard wooden elements and various coverings (stone, gravel, sand), creating a regional destination that has gained widespread popularity;

	By involving more than 100 parents in "Big Help" events, it is possible to create and maintain sustainable and biodiverse environments, such as "meadow corners" and greenhouses; the importance of local entrepreneurship in providing the community with unique, aesthetically appealing and multifunctional spaces (for parkour, sports).
Links	https://lifelatestadapt.viimsivald.ee/wp-content/uploads/2026/05/T.7.1.-seminars_11-12062026_ENG_report.pdf https://lifelatestadapt.viimsivald.ee/lv/materiali/

References in the chapters:

NPK/Name	6. "Nature-based solutions for marine and water protection: theory and practice"
Date	23.-24.07.2026.
Topic	Climate change and its relationship to water quality, rising water levels NEB's connection to nature-based solutions LIFE LATESTadapt project and opportunities to learn about dbr Nature-based solutions related to the coast and water bodies History, processes, risk areas of coastal erosion Solutions for reducing coastal erosion Flooding and protection of water basins, water quality
Brief summary/key findings	<i>ADD TO CART</i>
Links	https://lifelatestadapt.viimsivald.ee/wp-content/uploads/2026/07/T.7.1.-seminars_23-24072026_ENG_report.pdf https://lifelatestadapt.viimsivald.ee/lv/materiali/

References in the chapters:

NPK/Name	7. "Nature-based solutions for stormwater management: theory and practice"
Date	6.-7.08.2026.
Topic	Climate change and the relationship with temperature and precipitation. NEB's connection to nature-based solutions. Nature-based solutions that directly address stormwater drainage in the city. Data, rainwater harvesting and technical standards

	Creating sustainable land reclamation, rainwater reuse.
Brief summary/key findings	<i>ADD TO CART</i>
Links	https://lifelatestadapt.viimsivald.ee/wp-content/uploads/2026/08/T.7.1.-seminars_6-7082026_ENG_report.pdf

References in the chapters:

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7.4 Development planning documents

Latvian policy and development planning documents

Latvia's climate and development planning documents set national priorities for climate change mitigation, adaptation measures and sustainable territorial development. They serve as the basis for the development of local government development documents and set directions in which nature-based solutions are an essential tool for improving climate resilience, biodiversity and quality of life.

Name (link)	Description
Latvia's Climate Change Adaptation Plan for the period up to 2030 https://likumi.lv/ta/id/308330-par-latvijas-pielagosanas-klimata-parmainam-planu-laika-posmam-lidz-2030-gadam	- Determines Latvia's climate change adaptation policy and priority areas of action until 2030. - Identifies the main climate risks in Latvia, including heat waves, floods, droughts and biodiversity loss. - Action line RV.3.1 envisages greening cities and the use of nature-based solutions as one of the main adaptation tools. Importance for local governments: Local governments should plan and implement measures that mitigate climate risks by integrating DBR into development planning documents and investment projects.
Latvian National Energy and Climate Plan 2021–2030 https://www.kem.gov.lv/lv/nacionalais-energetikas-un-klimata-plans-2021-2030-gadam	- Determines Latvia's climate and energy actions until 2030. - Covers greenhouse gas emission reduction, climate change adaptation, energy efficiency and the use of renewable energy resources. - Emphasizes the importance of green infrastructure and sustainable territorial development in promoting climate resilience. Importance for municipalities: DBR helps reduce climate risks, improve urban microclimates, and complements other climate and energy measures at the local level.
National Development Plan of Latvia for 2021 - 2027 (NDP 2027) https://www.mk.gov.lv/lv/latvijas-nacionalais-attistibas-plans	- A national medium-term development planning document that sets priorities for the development of the economy, society and territories. - Promotes a sustainable, safe and climate-resilient living environment, as well as the preservation of natural capital. - Emphasizes the need to develop high-quality public outdoor space and improve the quality of life of residents. Significance for local governments: DBR helps achieve the goals of the NAP2027 by creating a climate-resilient, healthy and attractive living environment, as well as attracting investments for sustainable development.
Latvia's Sustainable Development Strategy until 2030 (Latvia 2030) https://www.mk.gov.lv/lv/lat	- Latvia's long-term development strategy, which sets out the country's development vision until 2030. - Emphasizes the preservation of natural capital, mitigation of climate change risks, and balanced territorial development.

vijas-ilgtspējīgas-attīstības-stratēģija	- Promotes an integrated approach to spatial planning, where economic, social and environmental aspects are considered in a unified system. Significance for local governments: DBR is one of the practical tools for implementing the principles of sustainable development, helping to simultaneously improve environmental quality, the well-being of residents, and the resilience of the urban environment to climate change.
Latvian Nature Restoration Plan (<i>in development</i>) https://www.varam.gov.lv/lv/dabas-atjaunosanas-regula	- National goals, priorities, measures and courses of action will be determined for the restoration of degraded ecosystems, including the development of urban ecosystems. - The draft plan must be submitted to the European Commission by September 1, 2026, while the final plan will be developed after the European Commission's assessment. Significance for local governments: The plan will become one of the key documents for the implementation of nature-based solutions in local governments. It will determine the national approach to the development of urban ecosystems, help plan investments in green and blue infrastructure, and serve as a basis for the implementation of the requirements of Article 8 of the Nature Restoration Regulation at the local level. Note: The Latvian Nature Restoration Plan is currently under development. Its significance in these guidelines is discussed in more detail in Chapter 6.2. "National Restoration Plan".

Latvian regulatory framework

Latvian regulatory framework sets requirements for municipal development planning, public participation and environmental impact assessment. Although regulatory acts do not always directly mention DBR, they provide a legal framework that allows and in many cases also promotes the integration of DBR into municipal planning documents and development projects.

Name (link)	Description
Laws	
Local Government Law https://likumi.lv/ta/id/336956-pasvaldibu-likums	- Determines the autonomous functions, duties and competences of local governments. - Defines the responsibility of the municipality for the development of the territory, environmental protection and the quality of life of its residents. Significance for municipalities: Forms the legal basis for the implementation of the DBR in the territory of the municipality, justifies investments in urban greening, climate adaptation measures, and the development of public outdoor space.
About environmental impact assessment https://likumi.lv/ta/id/51522-par-ietekmes-uz-vidi-novertejumu	- Establishes the procedure for assessing the environmental impact of planned activities. - Provides for strategic environmental impact assessment (SEIA) for planning documents and EIA for projects. Significance for municipalities: Promotes the choice of environmentally friendly planning solutions, DBR can serve as an effective solution for reducing negative impacts and strengthening climate resilience.
Cabinet regulations	
Cabinet of Ministers Regulation No. 628 “Regulations on Local Government Territorial Development Planning Documents” https://likumi.lv/ta/id/269842-noteikumi-par-pasvaldibu-teritorijas-attistibas-planosanas-dokumentiem	- Determines the types, content and development procedure of local government territorial development planning documents. - It also regulates the development of thematic plans. Significance for municipalities: Provides an opportunity to develop urban greening plans and other thematic plans, promotes the systematic integration of DBR into spatial planning.
Cabinet of Ministers Regulation No. 737 “Regulations on the Development of Development Planning Documents and Impact Assessment”	- Determines the procedure for preparing, evaluating and updating development planning documents. - Defines requirements for the development of goals, actions, and performance indicators.

https://likumi.lv/ta/id/270934-attistibas-planosanas-dokumentu-izstrades-un-ietekmes-izvertesanas-noteikumi	Significance for local governments: Provides the opportunity to include DBR as a specific line of action in development programs. Promotes the setting of measurable climate and environmental goals.
Cabinet of Ministers Regulation No. 970 “Procedure for Public Participation in the Development Planning Process” https://likumi.lv/ta/id/355632-sabiedribas-lidzdalibas-kartiba-attistibas-planosanas-procesa	- Determines the principles and procedures for public involvement in the development of development planning documents. - Consultations, public discussions and participatory measures are foreseen. Importance for local governments: The involvement of residents, businesses, and other stakeholders is essential in planning the DBR, helping to select the solutions most appropriate for local conditions and promoting public support for their implementation.
Cabinet of Ministers No. Regulations No. 157 “Procedures for conducting strategic environmental impact assessment” https://likumi.lv/ta/id/86512-kartiba-kada-veicams-ietekmes-uz-vidi-strategiskais-novertejums	- Determines the procedure for conducting a strategic environmental impact assessment (SEIA) for development planning documents. - Evaluates the potential impact of planning documents on the environment, human health and natural resources. - In addition, for certain DBR projects, depending on their nature and scale, an environmental impact assessment (EIA) of the intended activity may also be applicable in accordance with the Law "On Environmental Impact Assessment". Importance for local governments: SEA helps to assess the impact of development plans on the environment and climate sustainability already at the planning stage, while EIA, if necessary, provides a detailed assessment of specific projects before their implementation. Timely integration of DBR into planning documents and project development helps to reduce negative environmental impacts and promotes sustainable development of territories.

Regional level planning documents

Planning regions form a link between national and local development planning, ensuring a coordinated development vision for a wider territory. Regional-level documents help identify common priorities, plan green and blue infrastructure networks, as well as coordinate cross-border and inter-municipal projects, the implementation of which goes beyond the administrative borders of one municipality.

Name (link)	Description
Sustainable development strategy	- Determines the long-term development vision and strategic goals of the planning region. - Defines development priorities that are important for the region. - Promotes balanced territorial development between cities and rural areas. Significance for the municipality: Sets a common vision for climate adaptation and green infrastructure development, promotes the creation of interconnected green and blue infrastructure networks in several municipalities, serves as a basis for the development of joint investment projects.
Development program	- Medium-term development planning document. - Determines priority projects and directions of action for the development of the region. - Identifies funding opportunities and collaboration projects. Significance for the municipality: Promotes the development of joint DBR projects and attraction of funding, helps coordinate investments in green infrastructure between several municipalities, supports the preparation of EU funds and Interreg projects.
Thematic planning (Planning regions may develop thematic documents in accordance with development priorities, for example, for the development of mobility, climate change adaptation, coastal development, green infrastructure, landscapes or other sectors.)	- Documents that address in detail a specific territorial development or sectoral issue. - They are developed by planning regions in accordance with current development priorities, in cooperation with local governments and state institutions. - These can cover mobility, climate change adaptation, coastal development, green infrastructure, landscape planning, tourism, energy, etc. Significance for the municipality: Ensures a unified approach in the territories of several municipalities, identifies common investment priorities, serves as a basis for inter-municipal and EU-funded projects.

Municipal development planning documents

The climate, environmental and biodiversity objectives set out in European Union and Latvian legislation are implemented at the municipal level through development planning documents. They define long-term development priorities, land use

conditions and specific actions that can systematically integrate nature-based solutions.

Name (link)	Description
Strategic municipal development planning documents	
Sustainable development strategy	- Long-term development vision of the municipality (up to 25 years). - Determines strategic goals and the desired direction of development of the territory. Significance for local governments: Defines urban greening and climate resilience as a long-term development priority. Forms the basis for future planning documents and investments.
Development program	- Medium-term development planning document (usually 7 years). - Determines specific courses of action, investment projects and achievable results. Significance for local governments: DBR can be included as specific action and investment projects, determines funding priorities, responsible institutions, and performance indicators.
Thematic planning (e.g. urban greening plan)	- A detailed planning document for the development of a specific area. - Specifies territories, priorities and measures to be implemented. Significance for the municipality: Serves as the main tool for planning and prioritizing DBR, includes an assessment of the current situation, mapping of green infrastructure, potential DBR territories and an implementation plan.
Investment plan	- Determines priority projects, their implementation sequence, funding sources and investment volume over a specified period of time. Significance for the municipality: Allows DBR projects to be included in the municipality's investment portfolio, ensures linkage with EU fund financing, determines priority projects for the coming years.
Spatial planning documents	

Territory planning	- Determines the functional zoning of the territory, land use conditions and building principles. Significance for the municipality: Provides space for the implementation of the DBR and protects existing green and blue infrastructure, can provide requirements for stormwater management, greenery, green areas and tree preservation.
Local planning	- Details or amends spatial planning solutions for a specific territory. Significance for the municipality: Specifies DBR solutions in the territories to be developed, can determine green corridors, public green areas and rainwater management requirements, allows for the integration of DBR already at the stage of territorial development planning.
Detailed planning	- Details the spatial organization of the territory and building solutions in a specific plot of land or territory. Significance for the municipality: Determines the location of specific greenery, preservation or planting of trees, integrates rain gardens, bio-covers, permeable pavements and other DBR elements, ensures the implementation of DBR requirements before construction begins.
Municipal binding regulations	
Territory Use and Development Regulations (TIAN)	- Determines the requirements for the use and development of territory in the entire municipality or part thereof. Significance for the municipality: Determines minimum green areas, provides for stormwater management requirements, determines conditions for tree preservation and planting, and may provide for requirements for permeable pavement or green roofs.
Other binding regulations of the municipality	For example: - tree felling procedures; - protection of greenery; - rainwater management; - maintenance of territories; - participatory budget; - public outdoor space improvement. Significance for the municipality: Details the daily requirements and maintenance procedures necessary for the long-term functioning of the DBR.

Estonian policy and development planning documents

A general structure of planning system in Estonia:



Name (link)	Description
Estonia 2035 – national development strategy link	- A long-term national development strategy that sets out Estonia's strategic goals and necessary changes. It provides a common framework for sectoral development plans and public investments. - Importance for local governments: DBR can be linked to strategy goals related to quality living environment, climate resilience, environment and biodiversity
Climate Change Adaptation Development Plan until 2030 link	- Estonia's National Climate Change Adaptation Policy Framework until 2030. It sets out adaptation goals and priority areas for climate risk reduction. - Importance for local governments: Provides a rationale for integrating climate risks, such as heat, flooding, and extreme weather, into local government planning and using DBR in adaptation efforts.
Looduskaitse haringakava 2030 – Nature Conservation Development Plan 2030	- National nature conservation development framework, aimed at preserving and enhancing biodiversity, ecosystems and natural values. - Significance for local governments: forms the basis for protecting natural areas, strengthening ecological connectivity, and using nature-based solutions to improve biodiversity and ecosystem functions.
Water Management Plans 2022-2027 link	- Estonian water management plans are developed for six years for each of the three river basin districts – East Estonia, West Estonia and the Gauja (Koiva) basin. Their aim is to achieve or maintain good status of surface and groundwater. - Importance for municipalities : essential basis for planning stormwater, rivers, wetlands and other aquatic ecosystems;

	DBR can be used as a tool for improving water quality and water regime.
Estonia 2050 – National Spatial Plan (in development)	- The long-term spatial development framework of Estonia. The National Spatial Plan sets the principles and directions of spatial development and forms the basis for lower-level spatial plans. - Significance for local governments: provides a national spatial development framework that must take into account the balance between the built environment, green areas, infrastructure and natural values.

EST region

County Development Strategy .

The law stipulates that a county must have a development strategy that serves as the basis for joint development, cross-border investments, and joint functions among municipalities.

Importance of DBR: It is particularly important for solutions that go beyond the borders of a single municipality — for example, **green corridors, river basins, ecological networks, mobility and green infrastructure connections** .

EST Municipality

Name (link)	Description
Development Plan – municipal development plan <i>(Arengukava)</i> link	- Local governments are required to have a development plan and budget strategy. The development plan defines long-term development directions and needs, current problems and opportunities, strategic goals and necessary actions. - Importance in implementing the DBR : define climate resilience and urban greening as a development priority, determine the goals and performance indicators for implementing the DBR, include specific actions and projects, and link the DBR with the municipal budget strategy.
Budget Strategy <i>(Budget strategy)</i> link	- A budget strategy is a financial planning tool linked to a development plan. Together with the development plan, it forms the basis for a municipality's budget, investment planning, and funding attraction. - Importance in implementing DBR : predicting DBR investments and their financing sources, linking projects to the municipal budget, also predicting DBR maintenance costs, determining priority projects and the sequence of their implementation.

Comprehensive Plan – comprehensive spatial planning <i>(General planning)</i>	- It is the main spatial development document of the municipality, which determines the principles and directions of spatial development of the territory. It can also be used to determine land use and building conditions. - Importance in implementing DBR: identify and protect green and blue infrastructure areas, plan green corridors and ecological connectivity, integrate stormwater management principles, identify areas where DBR should be developed as a priority.
Thematic Spatial Plan <i>(Thematic planning)</i>	- Thematic spatial planning allows for the elaboration or modification of comprehensive planning solutions on a specific thematic issue or territory. The Estonian Planning Act provides for the possibility of addressing broader spatial development issues in this way as well. - Importance in the implementation of DBR: develop a thematic green infrastructure or urban greening plan, map existing green and blue infrastructure, identify priority areas for DBR implementation, develop a set of specific measures and projects.
Detailed Plan <i>(Detail planning)</i>	- Details the spatial development of a specific territory and determines the land use and building conditions necessary for construction. - Importance in implementing DBR: to plan the placement of specific DBR elements, preserve existing trees and green areas, plan for rain gardens, bio-covers, permeable surfaces, etc., integrate DBR already at the initial stage of the territory's development and construction plan.

7.5 Maps, charts, infographics and photos from demonstration sites

The appendix contains visual materials — high-quality photographs from 8 pilot sites, explanatory infographics (4-pillar diagrams, DBR hierarchy, climate risk map), GIS maps (WP4 mapping browser), diagrams and visualizations of project results that illustrate the processes and solutions described in the guidelines.

7.6 Updating of the 2022 guidelines "Methodological recommendations for municipalities in the field of climate change"

- as a separate document

Proposals for updating the existing methodological recommendations of the Ministry of Environment, Rural Development and Rural Development (<https://www.varam.gov.lv/lv/metodiskie-ieteikumi-attistibas-programmu-izstradei>) have been compiled, taking into account:

2. Requirements for urban ecosystems under Article 8 of the EU Nature Restoration Regulation (2024/1991);
3. Lessons learned from the LIFE LATESTadapt project on DBR planning and management;
4. Updated data sources and tools (IES heat island mapping, “Baltic Natural Capital Institute” tool, WP4 mapping browser);
5. Pilot municipalities' experience in developing greening plans;
6. Updated EU funds framework (SO 2.1.3.1. and subsequent support measures).

The goal is to ensure coherence between different methodological materials and promote a modern approach to climate adaptation planning.

7.7 Other attachments

Useful resources included:

7. Fillable worksheets (problem definition template, data inventory table);
8. Preparation of matrices for evaluating criteria (matrices of sections 5.2, 5.4);
9. Procurement of technical specifications for DBR elements.