

ENGRAVE

Green infrastructure of lowland
rivers for safeguarding nature and
human well-being





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**ZEMGALE
PLANNING
REGION**



Introduction

Lowland landscape in the border regions of Latvia and Lithuania (including Zemgale plain and Joniškis lowland) are characterized by a flat terrain and a dense river network providing ecological corridors essential for biodiversity as well as recreational opportunities for people. At the same time, thanks to its fertile soils, this area has developed into an intensive agriculture land – the large-scale farming covers ca. 40% of the area. This has led to severe decrease of biodiversity as well as pollution of water bodies, increasing flood risks and other environmental problems.

Green infrastructure is a novel concept for Latvia and Lithuania, which can support the maintenance of biodiversity as well as address various environmental challenges and ensure human well-being.

The aim of the ENGRAVE project is to enhance the river-based green infrastructure by integrating ecosystem and landscape concepts into the planning and management of the lowland rivers at local and regional scale. This has been achieved through active collaboration between planning authorities, researchers and local stakeholders. The project results include four planning cases as well as practical measures for green infrastructure improvement. This brochure introduces the green infrastructure concept and its potential for lowland river landscapes as well as presents the experience gained by the project.



What is green infrastructure?

Green infrastructure is defined as *“strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services. It incorporates green spaces (or blue if aquatic ecosystems are concerned) and other physical features in terrestrial (including coastal) and marine areas.”*¹

This definition underlines the three main aspects of the green infrastructure concept:

- ➔ Maintaining the network of natural and semi-natural areas
- ➔ Multifunctionality – delivery of a wide range of ecosystem services essential for human well-being
- ➔ Strategic and integrative planning at different levels

The green infrastructure is an emerging concept, which supports integration of ecological principles in land-use planning and governance. Establishment of green infrastructure for enhancing maintenance of ecosystems and their services has been set as one of the targets of the EU Biodiversity Strategy 2020. However, the roots of the concept come from the theories of landscape ecology and ecological networks. The main components of ecological networks include core areas, ecological corridors (i.e. continuous connections between the core areas), steppingstones (i.e. non-continuous corridors), buffer zones (i.e. barriers between natural and anthropogenic areas), and restoration areas. The concept of ecological networks is targeted at preserving biological diversity through the interconnectivity of its physical elements within the landscape. The protected areas (e.g. Natura 2000 sites) usually form the core areas of the network, while river valleys often function as ecological corridors.

The green infrastructure expands the concept of ecological networks by adding a new aspect – multifunctionality. Besides maintaining the biological diversity its purpose is also to ensure a wide range of ecosystem services essential for human well-being.

¹ European Commission (2013). Green infrastructure (GI) – Enhancing Europe’s Natural Capital. COM(2013)249.

Enhancement of green infrastructure can be achieved through strategic spatial planning. The strategic approach allows to scale up or cumulate local initiatives for green infrastructure improvement to a higher planning level, contributing to the coherence and functionality of the network. At the same time national, regional or pan-European scale green infrastructure mapping can indicate areas where actions will be taken at local level.

The practical actions for improving green infrastructure can include the restoration of natural or semi-natural habitats or introduction of new nature-based solutions for addressing environmental problems or societal challenges. The European Commission defines the **nature-based solutions** as *“actions which are inspired by, supported by or copied from nature”*. This can include management, restoration or creation of ecosystems in a way that enhances those ecosystem services which in turn minimize the challenge in focus. For example, construction of artificial wetland can enhance carbon sequestration, thus helping to mitigate the climate change, at the same time supporting maintenance of biodiversity, flood regulation or improvement of water quality. Restoration of floodplains along the river would improve the water retention capacity thus reducing the flood risk as well as improving conditions for biodiversity and recreation.



Green Infrastructure in Lowland River Landscape

Green infrastructure within intensively used agriculture land, like Zemgale plain and Joniškis lowland, is made up by fragmented patches and corridors of natural and semi-natural areas formed by rivers, floodplains, woodlands, wetlands, and semi-natural grasslands. Considering the high demand of the use of fertile agriculture soils, the green areas there are mostly limited to narrow belts along the river valleys, which form the carcass of the green infrastructure of the lowlands. These corridors and patches ensure the habitats for wildlife, support species migration as well as provide various ecosystem services.

The most essential ecosystem services provided by the lowland river green infrastructure include regulating of water flows and reducing the flood risk, buffering nutrient run-offs, control of soil erosion, providing habitats for pollinators, regulation of local as well as global climate etc., which helps to improve the environmental quality of the intensively used agriculture lands. Furthermore, these areas are essential for recreation, access to nature and forming of the landscape identity and aesthetic value. Therefore, maintaining of buffer stripes of semi-natural vegetation (e.g. permanent grasslands) along water bodies and streams is one of the most important measures for enhancing lowland green infrastructure.



The character and capacity of the lowland river green infrastructure, including its potential of ecosystem service supply, strongly depends on the level of naturalness of the rivers and streams.

Unregulated watercourses usually have preserved floodplains (like the river Svête in the picture on the right), which have a high potential of providing various ecosystem services. Flooding enriches soil fertility in floodplains and contributes to the formation of permanent grasslands. At the same time the floodplains reduce the flood risk in the surrounding areas and help to reduce nutrient run-off to the river. During the dry season they can be used for grazing or hay production.

Partly regulated water courses (like the river Têrvete on the right) usually have only fragmented elements of floodplains, which form patches of the green infrastructure. While flooding risks might be reduced as the result of deepening of the watercourse, the provision of other ecosystem services is decreasing.

Regulated watercourses (like the river Platone on the right) do not have floodplains thus their function as ecological corridors and potential of ecosystem service supply are very low. Due to the lack of the buffering function provided by the floodplains, the excess nutrients from intensively used agriculture fields run-off into the watercourses, thus reducing their chemical quality and contributing to the eutrophication. The nature-based solutions in such watercourses could include the renaturalisation of the water flow by meandering and forming of rapids as well as the creation of wetlands and permanent grasslands for reducing the nutrient run-off.



Not regulated river Svête



Partly regulated river Têrvete



Regulated river Platone

A way toward to green infrastructure enhancement

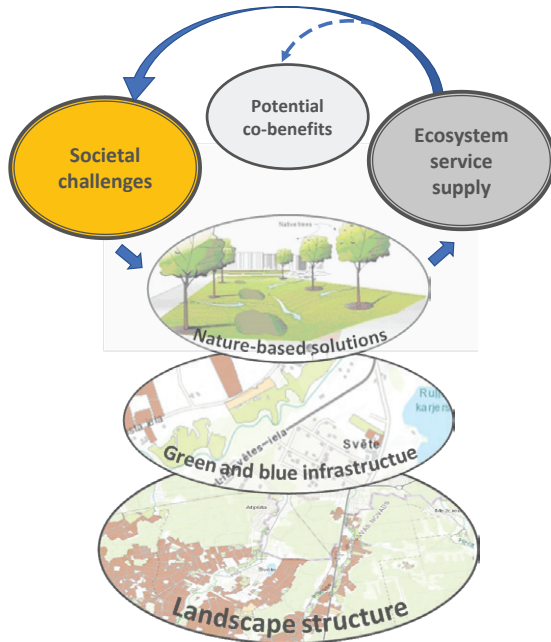
As noted before the enhancement of green infrastructure can be achieved through strategic and integrative planning process. Green infrastructure plans allow to identify areas of high ecological value and their role in maintaining the ecosystem and service supply for human well-being, to select best locations for habitat restoration actions as well as to guide potentially harmful development away from valuable or sensitive areas.

Following the uptake of the green infrastructure concept by the EU environmental policy (e.g. EU Biodiversity Strategy 2020 and related policy documents), several initiatives of green infrastructure assessment and strategic planning have been launched all over Europe, ranging from local scale projects to EU level studies. This includes various procedures and methods, though the main steps towards the strategic green infrastructure planning could be summarised as follows:

- ➔ mapping of existing green infrastructure;
- ➔ assessment of the green infrastructure condition and identification of problem areas;
- ➔ development of scenarios and/or practical solutions for green infrastructure improvement.

Green infrastructure mapping can include two complimentary approaches: i) physical mapping of existing green infrastructure components (e.g. protected areas, ecological networks and other nature assets); and ii) ecosystem service-based mapping, identifying areas essential for the supply of different services.² Ecosystem service approach also helps to assess the green infrastructure condition: 'hot spot' and 'cold spot' analysis highlights the areas with very high or very low ecosystem service supply, where certain actions would have to be taken. Scenario development preferably shall include the stakeholder involvement, which allows the incorporation of local knowledge and interests in the decision-making process.

² Estreguil et al., 2019. Strategic Green Infrastructure and Ecosystem Restoration: eospatal methods, data and tools EUR 29449 EN, Publications Office of the European Union, Luxembourg, JRC113815.



Role of landscape planning in mapping of green infrastructure and designing of nature-based solutions (based on Albert et al., 2019) ³

One of the ways to achieve green infrastructure planning can be through the integration with existing or developing landscape planning practices. According to the European Landscape Convention landscape planning is defined as “a strong forward-looking action to design, enhance or restore landscapes”. Landscape planning can provide a suitable framework to assess the existing green infrastructure as well as to design measures for its improvement. The analysis of landscape structure, connectivity and ecosystem service supply can support green infrastructure mapping and identification of risk areas, where nature-based solutions could be applied.

³ Albert C., et al.2019. Addressing societal challenges through nature-based solutions: How can landscape planning and governance research contribute? *Landscape and Urban Planning* 182: 12–21

ENGRAVE Approach to Enhancing Green Infrastructure in Lowlands of Lithuania and Latvia

The ENGRAVE project involved an integrated approach to landscape and green infrastructure planning and enhancement. This approach entails that landscape and its forming elements such as rivers and their valleys, as well as the use of the surrounding land and cultural heritage form the basis for the green infrastructure and ecosystem service supply and related benefits to society, including good environmental quality and healthy living conditions, possibilities for tourism and recreation and related income and economic viability of the area. To demonstrate this approach in practice the project has performed various capacity building activities as well as planning cases and practical measures to enhance the green infrastructure of the lowlands in the cross-border area.

The integrated landscape and green infrastructure planning was tested by the project at different levels – from regional to local, including the assessment of landscape, existing green infrastructure and ecosystem service supply as well as the development of solutions for the green infrastructure improvement.



Capacity building

To increase the know-how of local authorities on measures and practices for enhancing the river-based green infrastructure, the project organised a study visit to the UK, a training course in Biržai and a cross border workshop in Bauska&Rundāle as well as developed a methodology for landscape and green infrastructure planning.

Planning cases

The thematic plans were developed for the landscape and green infrastructure improvement in the Zemgale planning region, confluence area of the Mūsa&Mēmele Rivers in Bauska Town, the Rivers of Apašča&Agluona in Biržai Town, Lake Širvena in Biržai District as well as for the revitalisation of the Svēte River in Jelgava Municipality.



Practical cases

Practical measures and investments for enhancement of green infrastructure were implemented along the Apašča River banks in the town of Biržai, nearby sinkholes and caves in Biržai Regional Park, in the cherry garden in Žagarē, Vīnakalns in Rundāle Municipality, as well as in the Mūsa and Mēmele Rivers in Bauska Town.



Stakeholder panel

To support collaboration and involvement of local municipalities, planning & nature conservation authorities and researchers, a stakeholder panel was established, which contributed to the planning cases as well as engaged in the discussion on development and application of the green infrastructure concept.



Green Infrastructure Planning

Zemgale plain

A novel approach for assessment of green infrastructure and landscape quality was demonstrated at regional level within the Zemgale planning region. The thematic plan includes landscape characterisation and ecosystem service mapping for the whole region, including the 'hot&cold' spot analysis, identifying the Zemgale plain as region with lowest ecosystem service supply and insufficient green infrastructure.

The plan defines the landscape quality objectives and priority actions for the Zemgale plain landscape region as well as recommends a set of actions to reach these objectives. Furthermore, the plan includes detailed mapping of the existing green infrastructure in Zemgale plain and defines priority areas and three scenarios for the enhancement of the river based green infrastructure by restoration of permanent grasslands along the watercourse. The plan also highlights the link between landscape quality objectives and improvement of green infrastructure.

The plan was adopted by the Council of Zemgale Planning Region on 21.01.2020.

Green infrastructure mapping in Zemgale plain

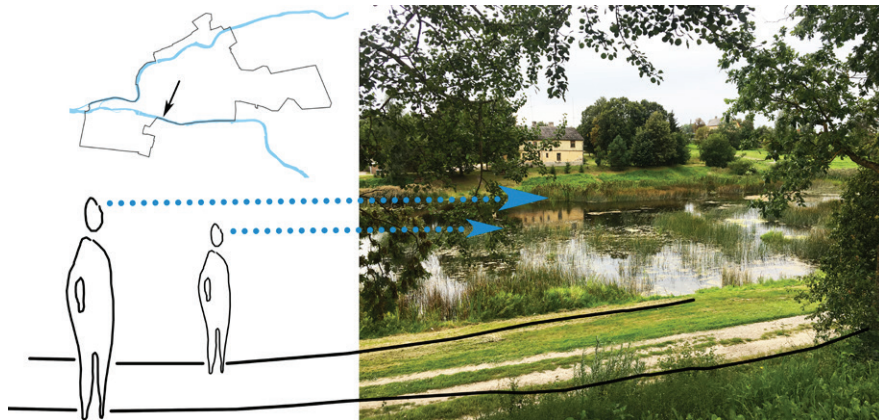
overlaid with previously identified areas of ecological network



Bauska Town

The thematic plan for the river valley landscape and green infrastructure in Bauska town focuses on planning locally. The planning area includes the rivers within the administrative area of the Bauska town: Mūsu (3,2 km), Mēmeli (3,8 km) and their confluence forming the Lielupe River as well as the coastal area along these rivers. The plan assesses aesthetic and ecological quality as well as the functionality of the existing green infrastructure and river landscape in Bauska Town. It offers solutions for preserving nature and cultural heritage, improving public access to riverbanks and diversification of recreational opportunities as well as provides a clear vision for the development potential of the river-based resources and guidelines for landscape and green infrastructure governance and management. Having local character, the plan contains recommendations on the formation of visual identification as well as detailed solutions on landscaping elements in Bauska Town.

River landscape assessment in Bauska Town



Green Infrastructure Improvement

Biržai



Practical measures to improve the recreational possibilities and public access to green infrastructure were demonstrated in Biržai Regional Park. With the help of ENGRAVE project the barriers at the sinkholes, resulting from the karst processes, were restored, also building the stairs and barriers at the most popular site, the Cow Cave.



The urban green infrastructure was improved in Biržai town through the construction of pedestrian footpaths and cycling routes as well as improving the greenery along the banks of the Apaščia river.

Žagarė

To demonstrate the interconnection between local cultural heritage and green infrastructure, the ENGRAVE project has restored 2800 m² of the cherry garden in Žagarė, along the river Švėtė. 1000 new cherry trees and other species were planted, involving also project partners in planting activities. The cherry garden of Žagarė serves as a symbol of local traditions and cherry festival, at the same time providing various ecosystem services (cherry products, habitats for species and pollinators, recreational opportunities, etc.) and forming an essential component of the landscape and green infrastructure.



Project partners

- Zemgale Planning Region (LV), www.zemgale.lv – Lead Partner
- Baltic Environmental Forum-Latvia (LV), www.bef.lv
- Jelgava Local Municipality (LV), www.jelgavasnovads.lv
- Bauska Local Municipality Council (LV), www.bauska.lv
- Biržai District Municipality Administration (LT), www.birzai.lt
- Directorate of Biržai Regional Park (LT), www.birzuparkas.lt
- Directorate of Žagarė Regional Park (LT), zagarisrp.am.lt

More information about the project and its results is available at <https://latlit.eu/Ili-291-enhancement-of-green-infrastructure-in-the-landscape-of-lowland-rivers-engrave-2/>

Methodology for Regional and Local Landscape and Green Infrastructure Planning in Lowland Areas is available at:

<http://lielupe.balticrivers.eu/en/engrave-project>

