Interreg

Co-funded by the European Union

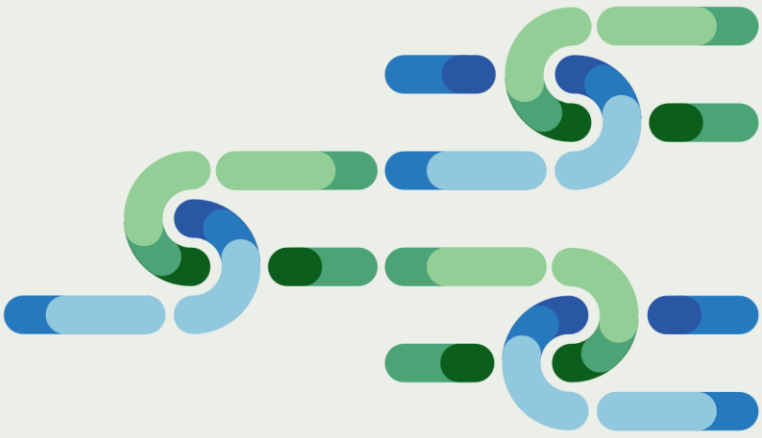
Alpine Space

PlanToConnect

GBI-network: Land use conflicts for renewable energy production and other threats

Goriška Statistical Region, Slovenia

Mapping report outlining GBI network elements and areas of land use conflicts for renewable energy production and other major developments that may threaten GBI connectivity function



This project is co-funded by the European Union through the Interreg Alpine Space programme.

Interreg Co-funded by the European Union

Alpine Space

PlanToConnect

GBI-network Land use conflicts

Mapping report outlining GBI network elements and areas of land use conflicts for renewable energy production and other major developments

Activity 2.4 Case Studies 3rd step: Identify unsuitable locations/mitigation measures for impact assessment of renewable energy systems and other major developments that may threaten GBI connectivity function

Tim Gerdin, Andrej Gulič, Sergeja Praper, Damjana Gantar
Urban Planning Institute of the Republic of Slovenia (SI)

Ljubljana, February 2025

Reference in AF: D.2.4.1

This project is co-funded by the European Union through the Interreg Alpine Space programme.

Table of Contents

List of Tables

List of Figures

GLOSSARY

Connectivity (structural and functional)

Connectivity comprises two components, structural and functional connectivity. It expresses how landscapes are configurated, allowing species to move. Structural connectivity, equal to habitat continuity, is measured by analysing landscape structure, independent of any attributes of organisms. […]. Functional connectivity is the response of the organism to the landscape elements other than its habitats (i.e. the non-habitat matrix). This definition is often used in the context of landscape ecology. A high degree of connectivity is generally linked to low fragmentation." (EUROPEAN COMMISSION - Technical information on Green Infrastructure (GI), 6.5.2013, Glossary)

(Definition of connectivity see also Deliverable 1.1.1, chapter 1.1 and chapter 8)

G(B)I – Green (and blue) infrastructure

Green infrastructure (GI) on the European level is defined as a "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. On land, GI is present in rural and urban settings." (EUROPEAN COMMISSION - Green Infrastructure (GI) — Enhancing Europe's Natural Capital, 6.5.2013)

GI is also present at the state level in Slovenia and is defined in the Resolution of the spatial development strategy of Slovenia 2050 (ReSPR50) (Official Gazette of the Republic of Slovenia [Uradni list RS], No. 72/23 of 3 July 2023) as a strategically designed and managed network of natural and semi-natural areas and the links between them. On land, it includes green and waterscape features and green spaces in settlements. In the coastal zone, it includes the sea and parts of the coast. GI ensures the conservation of biodiversity and the achievement of nature conservation objectives, increasing the resilience of space to climate change, improving the functioning of ecosystems, providing benefits to the population, especially in terms of health, safety, quality of life, and strengthening spatial identity. GI also provides benefits for the economy, particularly in the conservation and restoration of natural resources. It links urban and rural areas, the sea and coast to the hinterland. GI is planned at regional level through regional green systems and at local level through green systems for settlements.

(Definition of GI see also Deliverable 1.1.1, chapter 6)

Ecological Conservation Areas (SACA1)

SACA1 areas were the basis for ecological connectivity modelling in the PlanToConnect project. The term was developed in the ALPBIONET2030 project and is defined as “areas, that still have considerable space for connectivity with non-fragmented surfaces and where connectivity should be conserved”. According to Plassmann et al. (2019), currently 61% of the Ecological Conservation Areas within the Alpine Convention perimeter are located in protected areas, which means there is a big potential for protection of these areas.

Ecological Intervention Areas (SACA2)

The main focus in the PlanToConnect project lies on areas for possible interventions to improve ecological connectivity. The ALPBIONET 2030 project simulated such areas with very large extension and developed the term “Ecological Intervention Areas”. These are areas “with a high potential for connectivity in which larger, more or less natural non-fragmented zones could be created, especially by connecting protected areas, Natura2000 sites or other precious biotopes. Ecological connectivity is currently working to some extent in these areas but would benefit from enhancements” (Plassmann et al. 2019).

Connectivity Restoration Areas (SACA3)

“They are areas where fragmentation has already progressed so far that realizing (sic!) interlinked habitats and a permeable (sic!) landscape matrix is no longer a realistic option using reasonable, viable interventions, and solutions would entail extreme financial and political effort. They represent important barriers between Ecological Conservation Areas” (Plassmann et al. 2019). The realization of punctual interventions at very targeted locations to mitigate negative barrier impacts is recommended (ibid.).

Priority connectivity areas for spatial planning

“Priority connectivity areas” for spatial planning are areas important for the overall Alpine ecological network, where specific provisions aimed at preserving or re-establishing ecological connectivity should be included in national and regional spatial plans.

It is possible to define different types of priority connectivity areas from large-scale level to small-scale level:

Table 1: Types of priority connectivity areas at various scales

Macro - regional	1) Large scale “connectivity areas” (for the definition see ALPBIONET), where measures are still needed
Transregional to regional	2) SACA1 areas not protected and outside the Natura2000 Network
	3) Potential ecological linkages
Local	4) “Potential corridors” <5km of the Alpine Parks 2030 project*, which are currently not protected or managed. *The Alpine Parks 2030 project defined potential corridors through intersecting buffer zones of 2,5km around SACA1 areas, if they are within an SACA2 area (Ecological Intervention Area) defined by the ALPBIONET2030 project. Within SACA2 areas there is a high potential for connectivity.

Spatial planning

Spatial planning is a continuous interdisciplinary process that encompasses strategic-level and implementation-level spatial planning, and the regulation of space at the operational level. Spatial planning is implemented through the elaboration and preparation of spatial planning acts and through national spatial planning procedures.

(For definitions of other spatial terms see D2.1.2)

Pressures and Threats

Definition by the European Environment Agency 2020 (State of nature in the EU - Results from reporting under the nature directives 2013-2018):

“Pressures are considered to be factors that have affected habitats and species within the current reporting period, while threats are factors that are anticipated to be likely to have an impact during the subsequent two reporting periods.”

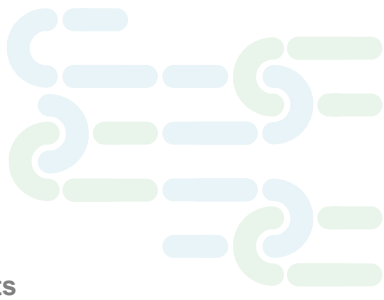
EXECUTIVE SUMMARY

The report focuses on the pilot area Goriška Statistical Region in Slovenia. It outlines the elements of the green and blue infrastructure (GBI) network and identifies areas where land use conflicts could arise due to renewable energy production and other major developments that may threaten structural ecological connectivity.

After a brief presentation of the pilot area the methodological approach used for this report is presented. First, an overview and analysis of relevant data and legislation to identify spatial pressures and threats for renewable energy (RE) production. At national level documents set guidelines for integrating RE development while preserving ecological connectivity. At regional and local scales the Regional Development Programme and various municipal spatial plans and energy concepts promote small-scale solar projects and energy self-sufficiency while protecting ecologically sensitive areas. The document overview is followed by cartographic analysis using QGIS to create thematic maps depicting energy infrastructure, national spatial plans, and important climate data.

Exclusion zones for unsuitable locations and buffers from relevant (solar, hydro, wind and traffic) infrastructure are compiled. General mitigation measures for threats are then proposed to maintain ecological connectivity at the regional level. Finally, key conclusions are drawn, and recommendations for the next steps in determining RE and transport infrastructure development at municipal scale are suggested.

REPORT



1 Introduction

This document presents the findings on major threats posed by the development of renewable energy infrastructure and other (mainly transport) infrastructure projects in the pilot area Goriška Statistical Region, Slovenia. The results of the D.2.4.1 serves as a comprehensive assessment of the potential impacts of renewable energy infrastructures and other major developments on the Green and Blue Infrastructure (GBI) network for connectivity in the pilot area. This report will identify spatial conflicts for these infrastructures and suggest possible mitigation measures where necessary to ensure the preservation and enhancement of ecological connectivity. By doing so, it aims to support informed spatial planning decisions that balance development needs with environmental conservation.

Renewable energies being considered in the region exist mostly at a strategic level in the Regional development programme of the Goriška developmental region 2021-2027 (2022) and various communal energy concept documents. They are primarily focusing on small solar and to a lesser degree small wind power production plants, with the highest potential of their implementation being in the south of the region where conditions for their use are favourable.

The analysis compiles executed, future and potential infrastructure development relevant at regional scale in relation to the Alpine Wide Structural Connectivity Model and least-cost-path (LCP) method prepared by EURAC (D1.1.1). This method is grounded on the results of the AlpBioNet2030 project (2020) in which an integrative concept for the protection of ecosystems and biodiversity in the Alps was prepared. The AlpBioNet2030 project defined three types of Strategic Alpine Connectivity Areas (SACA). SACA1- Ecological conservation areas where ecological connectivity already works quite well and where the ecological connectivity should be conserved. SACA2 - Ecological Intervention areas that represent important links between SACA1 areas (ecological conservation areas). Connectivity is currently working to some extent but would benefit from enhancements. In these areas, improvement / restoration measurements are needed. SACA3 - Connectivity restoration areas represent important barriers between SACA1 areas (ecological conservation areas). More information about SACA areas can be found on the website jecami.eu (Joint Ecological Continuum Analysing and Mapping Initiative 2.0 on ecological connectivity).

The structure of the report is as follows:

- Chapter 2 describes the region's geography, land use, and ecological connectivity challenges.
- Chapter 3 explains the methods used and steps taken, including legislative review, spatial analysis, and mapping.
- Chapter 4 presents an overview of national, regional, and local policies influencing RE and transport infrastructure development.
- Chapter 5 identifies areas where infrastructure is restricted to protect ecological connectivity.

- Chapter 6 proposes measures to reduce negative effects of infrastructure development on structural ecological connectivity.
- Chapter 7 summarizes key findings and suggests next steps for infrastructure development at local scale.

2 Pilot area – Goriška Statistical Region

The Goriška Statistical Region covers an area of 2,325 km2 in Western Slovenia. In 2022, it accounted for around 6% of Slovenia's population and it is one of the most sparsely populated regions, with an average of 51 inhabitants per km2 of its surface.

The land cover in the pilot area mostly includes broadleaf, coniferous and mixed forests. This is especially evident on the Trnovo Forest Plateau where the forest matrix is barely interrupted by other more intensive land uses. There are some exceptions to this general state, notably in the southernmost and largest valley in the region called the Vipava Valley. The valley bottom is wide and has the highest concentration of intensive agriculture in the region. It also includes linear elements like the Vipava River and the most prominent barriers in the pilot area. A part of the region similarly used for intensive agriculture purposes is the viticulture landscape of the Goriška Brda. Areas used extensively are the Soča River Valley, Banjšice Plateau and the ridge of Mount Stol. There are areas of naturally preserved alpine habitats in the Triglav National Park in the north of the region. The eastern part of the region covers a pre-alpine area of forested hills where smaller settlements and farms have carved out agricultural land in their vicinity. There are numerous ravines carved by the rivers that flow in that part of the region. There we can also find a railway line which is a smaller linear barrier in the landscape.

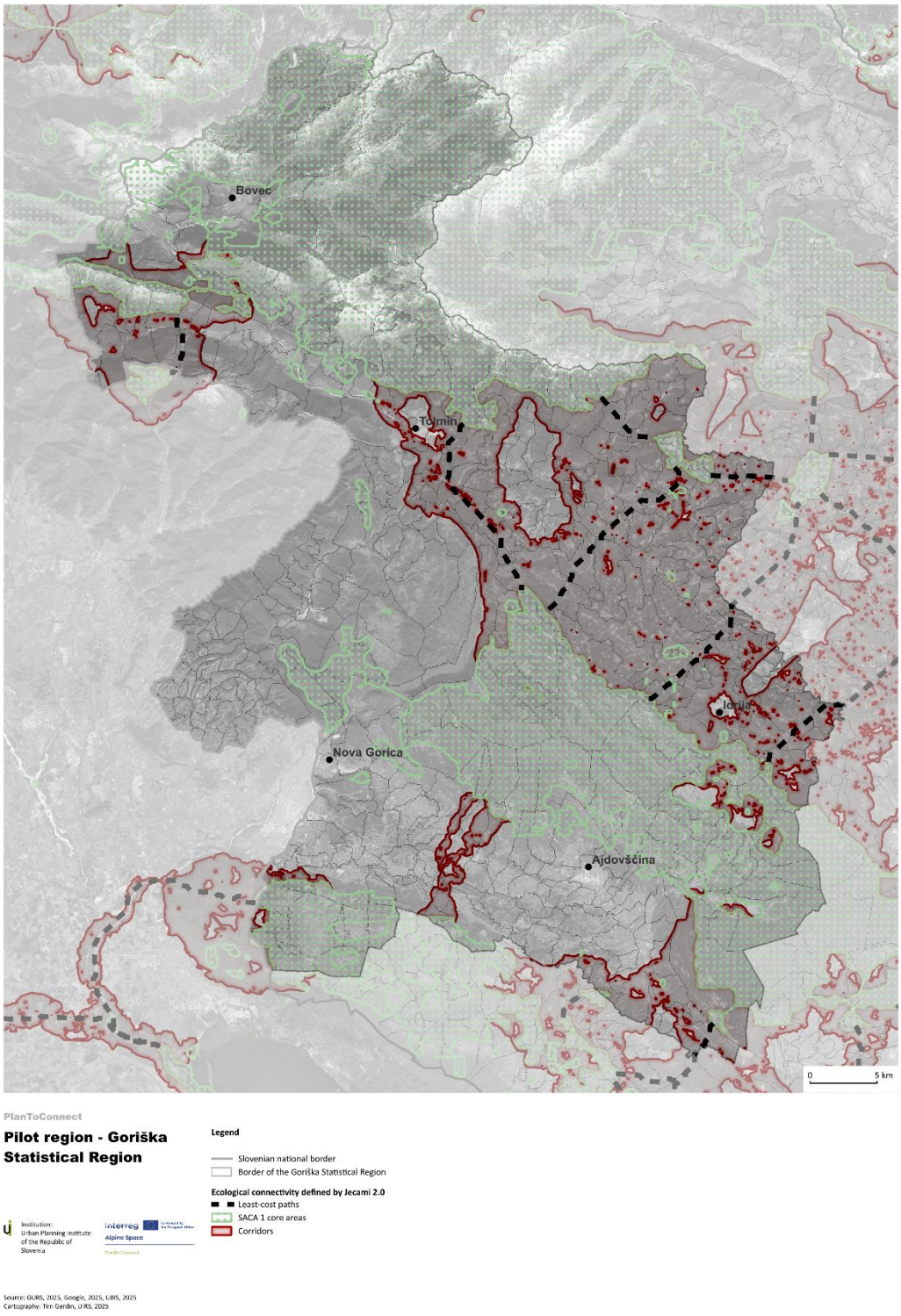


Figure 1: Pilot area – Goriška Statistical Region

3 Methodological approach

Methodological steps taken include a review of the legislation at the state, regional and local level as well as relevant developmental plans, local energy concepts (LEC) and national spatial plans. Relevant data was then verified in QGIS, resulting in cartographic material. Based on the overview of textual documents and the produced maps possible mitigation measures are proposed for crucial parts of the pilot area.

3.1 Data used

Textual documents reviewed:

1. **National level**: Spatial Development Strategy of Slovenia 2050 (ReSPR50), Spatial Management Act (ZUreP-3), Resolution on the National Environmental Protection Program for the Period 2020–2030 (RENPVO20-30), Act on the Introduction of Devices for the Production of Electricity from Renewable Energy Sources (ZUNPEOVE), national spatial plans in the Goriška Statistical Region, Renovation of the Regional Distribution of Landscape Types and Outstanding Landscapes in Slovenia and Their Digitalization: Final Report of the Research Project: CRP V5-2135.
2. **Regional level**: Regional Development Program of the Northern Primorska (Goriška) Development Region 2021–2027, Resolution on the National Energy Programme (ReNEP).
3. **Local level**: Municipal spatial plans of the (12) municipalities in the pilot area, local energy concepts of the municipalities in the pilot area.

The data used for the cartographic overview and analysis:

1. **GURS (Surveying and Mapping Authority of the Republic of Slovenia)**: national, regional and municipal borders (2024), roads, railways and energy infrastructure (2024), hydrology (2024).
2. **MNVP (Ministry of Natural Resources and Spatial Planning)**: national spatial plans (2024).
3. **Eurac Research**: Alpine Wide Structural Connectivity Model (2024).
4. **ARSO (Slovenian Environment Agency)**: average duration of solar irradiance - meteorological summer 1981 - 2010 (2024).
5. **Google:** Google Satellite (2025).

3.2 Working steps

Table 2: Description of working steps

Working Step	Description
1	**Overview and analysis of national, regional and local data and legislation**
	First, all relevant documents at various scales are compiled and overviewed. Key suitable areas for and types of RE production are identified. Existing and future pressures are presented. The overview is done at regional level, not focusing on smaller interventions at local scale. These findings are used to determine necessary spatial data for the preparation of cartographic material.
2	**Cartography: illustrating energy infrastructure, national spatial plan and climate data**
	The second step involves the creation of key thematic maps with spatial data in QGIS. It is important to emphasise that only data impacting the regional level is shown. Smaller infrastructure development will be shown at local scale where needed. The data shown by the maps: • national spatial plans in force and national spatial plans in preparation, • existing energy grid • average duration of solar irradiance - meteorological summer 1981 - 2010
3	**Compilation of general criteria for unsuitable locations for envisioned RE**
	Relevant criteria from D.1.3.1 and exclusion zones are compiled.
4	**Definition of possible mitigation measures**
	Possible mitigation measures are presented for maintaining structural ecological connectivity at regional scale
5	**Conclusions and next steps**
	Key conclusions are drawn and possible next steps for determining use RE infrastructure at local (municipal) level are suggested.

4 Summary of documents on RE and traffic infrastructure

4.1 National level

4.1.1 Spatial Development Strategy of Slovenia 2050 (ReSPR50) and Spatial Management Act (ZUreP-3)

ReSPR50 is a national strategic document that defines the long-term vision for spatial development in Slovenia. It aims to ensure balanced, sustainable, and resilient spatial planning, for which it provides guidelines dedicated to local and national planning authorities, aligning with EU strategies and international sustainability goals. It serves as a framework for future regional and municipal spatial plans and is therefore useful in determining the overarching strategy of spatial development in Slovenia. It envisions how different RE and other infrastructure will develop.

For hydropower infrastructure the strategy does not foresee major development in the Goriška Statistical Region. It notes that small hydropower plants can support the sustainable use of renewable energy as part of regional energy supply. The potential for hydropower utilization of specific watercourses or their sections for local and regional needs is thoroughly assessed within regional or municipal spatial plans. This evaluation considers exploitable hydropower potential, spatial possibilities for using existing dams, water and riparian habitat protection, water conservation, ecological connectivity, and landscape identity preservation. It emphasises that hydropower use should be multi-functional. Optimization of hydropower exploitation should also support other functions, including tourism, agriculture, transportation, mineral resource extraction, natural disaster prevention, climate change adaptation, habitat conservation, ecological connectivity, and cultural heritage preservation.

Wind farms should be installed after spatial possibilities are examined taking into account natural, environmental and social constraints. The best available technology for harnessing wind energy with minimal environmental and landscape impacts shall be used. ZUreP-3 states that wind farms with a rated electrical output of at least 10 MW are a development of national importance and are planned with national spatial plans.

Priority areas for solar energy use are existing and new buildings on building land and degraded areas. Planning shall consider the protection of cultural heritage, architectural and landscape distinctiveness and compatibility with other activities (Figure 2).

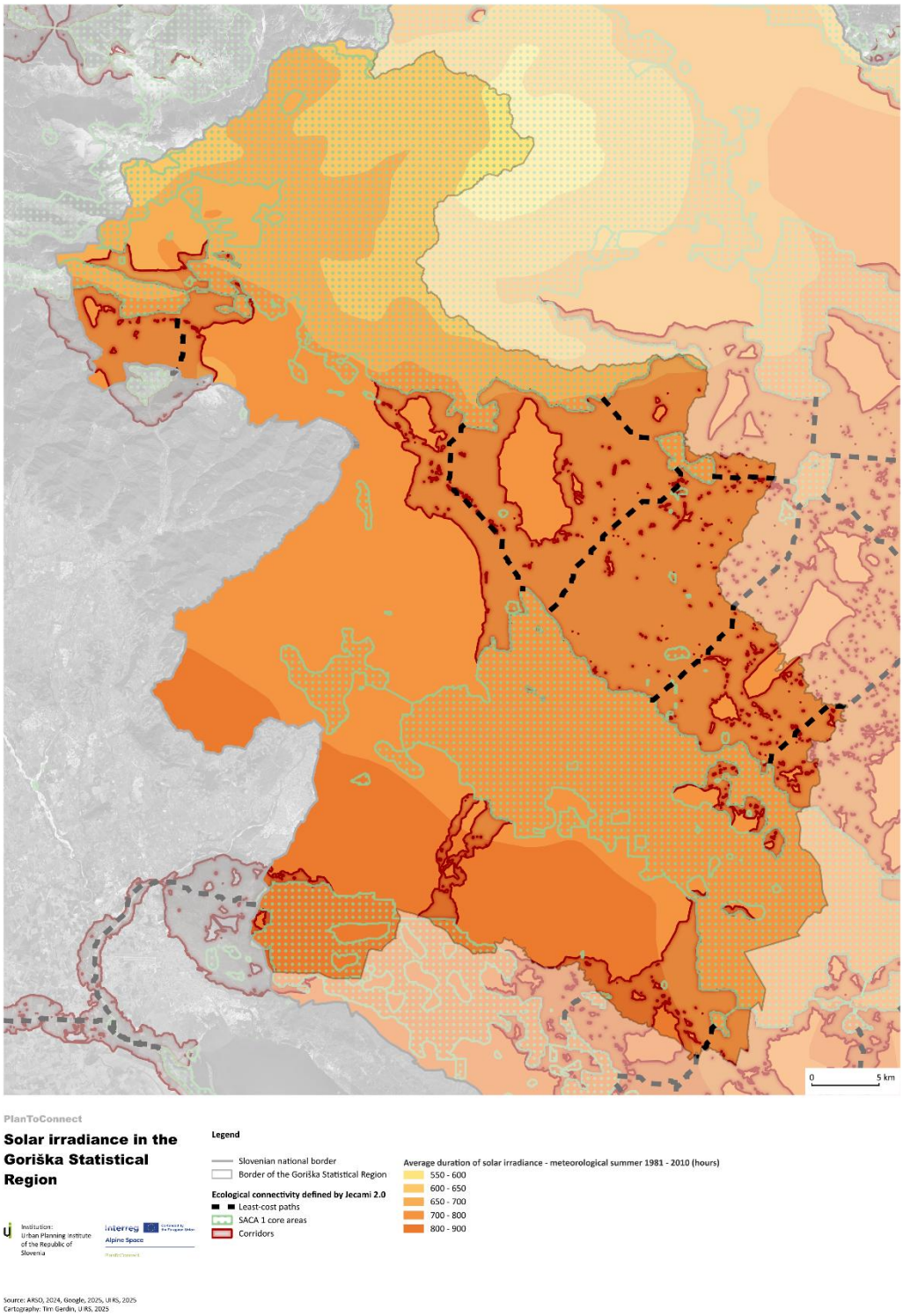


Figure 2: Average duration of solar irradiance in the Goriška Statistical Region

4.1.2 Resolution on the National Energy Programme (ReNEP)

The National Energy Programme guides the future work of energy institutions and sets targets for a reliable, competitive and environmentally friendly energy supply. It represents the Slovenian vision for energy management and involves expert cooperation despite methodological differences.

It describes wind power plants be built in locations where there is suitable wind potential which is found primarily in the Goriška and Costal-Karst Statistical Regions. However the strategy foresees these locations will be determined in such a way as to minimise constraints on other users of the area. The possibility of exploiting the wind potential must be carefully considered in terms of economics, space constraints and weather phenomena.

In terms of solar energy, it is interesting to note that currently the largest use of this type of energy is utilised for water heating systems. An estimated 80,000 to 100,000 m² of solar thermal collectors have been installed, ranking Slovenia 6th in Europe for the prevalence of solar thermal systems. The document does not mention larger solar energy power plants only several small-scale photovoltaic systems projects for island self-powering.

In year 2000 28% of generated electricity was done by hydropower of which 10% was generated by small and medium-sized hydropower plants. On the Soča river (completely in the Goriška Statistical Region), the Plave and Doblar hydro power plants were partially renovated in 2000, bringing their installed capacity, together with the Solkan power plant, to 78 MW. The new Plave II and Doblar II power plants, which have been in operation since 2001 and 2002 respectively, have increased the installed capacity of the power plants on the Soča river to 130 MW. Hydropower is already well utilised in the Soča river system, as such only locations for smaller hydro power plant are being considered.

4.1.3 Resolution on the National Environmental Protection Programme for 2020-2030 (RENPVO20-30)

The National Environmental Protection Programme represents a social consensus on the future of environmental protection or the environmental boundary conditions for Slovenia's development.

When developing energy infrastructure priority is given to sustainable mobility, public transport development, and optimizing transit traffic. Green corridors and wildlife bridges will be established, with up to two new bridges planned. Critical road sections will have infrastructure to protect amphibians, and measures will be implemented to reduce transport emissions.

In energy production emphasis is placed on energy efficiency and transitioning to renewable sources such as solar, wind, and hydro energy. The plan includes digitalizing the power system with smart grids and facilitating the integration of renewable energy facilities into the spatial framework.

4.1.4 Act on the introduction of installations for the production of electricity from renewable energy sources (ZUNPEOVE)

ZUNPEOVE details the creation of a specific, thematic action programme for potential RE priority areas which will be the implementation plan of the ReSPR50. This document currently in preparation will identify areas which, on the basis of a preliminary study carried out using the best available data and expert basis relevant for the implementation level of spatial planning, are suitable for development of solar power plants, wind power plants and their connection to the electricity grid, both in terms of solar and wind potential, and in terms of spatial constraints or buffer regimes. The programme will be updated every six years.

4.1.4.1 General developmental priority areas for the implementation of solar power plants

In addition to the potential priority areas that will be listed in the action programme, the following areas are also considered as priority areas for the implementation of solar power plants, on which photovoltaics can be introduced irrespective of the local energy concept of a municipality (described in chapter 4.3.1):

1. Roofs of buildings and paved areas of car parks on building land with a floor area of 1,000 m2 or more and located in settlement areas, in particular in towns and other urban settlements;
2. Road land, road structures, service stations of public roads and service traffic areas;
3. Railway areas as defined by the law governing railway safety;
4. Areas of electricity generation facilities and areas of substations and switchyards extending no more than 5 m from the edge of the outermost energy facility;
5. Areas of closed landfill sites;
6. Areas of abandoned and former surface mineral mines which are not covered by water, provided that the siting of these facilities does not conflict with the spatial implementation act;
7. Existing inactive landfills and abandoned landfills, provided that the siting of these facilities does not conflict with the spatial implementation act.

4.1.4.2 Solar and wind farms outside developmental priority areas

In addition to the areas that will be defined by the action programme and prioritized by ZUNPEOVE, the installation of solar and wind RE will also be possible in other areas according to the spatial planning procedures under the ZUreP-3, but with some adjustments specifically for these types of RE. In general, development of RE outside the developmental priority areas is a more complex process with stricter conditions, as it involves unforeseen

locations and a potentially greater negative impact on the environment. The RE installations of national importance will (like all spatial projects of national importance) be planned by means of a national spatial plan. The specificities regarding the other spatial planning (provisions of the ZUreP-3) are as follows:

1. ZUNPEOVE provides for the mandatory planning of SE in cases where transport infrastructure or installations for electricity generation and electricity supply facilities and directly related installations are planned by a national spatial implementation act;
2. If a national spatial plan has already been adopted or the national spatial plan procedure has already started for certain areas before the entry into force of ZUNPEOVE (before the 3rd of August 2023), the implementation of solar energy infrastructure, which was not previously planned, is also permissible, provided that the national spatial plan is planning transport infrastructure or facilities for the production or supply of electricity and related installations;
3. The amendment of the (detailed) municipal spatial plan for the implementation of RE may also be carried out under the so-called short procedure (defined in ZUNPEOVE) if their maximum permissible height is changed by a maximum of 15%.

4.2 Regional level

4.2.1 National Spatial Plans (NSP) in the pilot area

Even though NSP are lead at national level and in some cases include other statistical regions the scale of these projects in the pilot area essentially operates at municipal and in two cases intermunicipal level (Figure 3).

The NSP are categorized in two classes. The first showing plans that are in force and the other showing plans at various stages of development.

If we disregard what would be considered projects with minor ecological pressure such as power lines, underground gas pipelines and landslide remediation projects we are left with two NSPs that upgraded the road network (creation of expressway) in the Vipava Valley. These two projects include numerous underpasses and tunnels, thanks to which the construction did not have any major impact on structural ecological connectivity. It is plausible that construction of solar energy collection will be constructed along these corridors deemed as priority areas by national strategies, resulting in the strengthening of their influence on connectivity. The possibility of this is further enhanced by the fact that these areas receive some of the highest number of hours exposed to the sun and are a productive and logical choice when developing photovoltaic plants.

Similarly, in the second class of NSPs, ignoring one landslide remediation project we are left with the project for the 4th development axis on the section Cerkno – Hotavlje which stretches into the neighboring statistical region on the east. As the NSP is currently in the study-of-options phase the polygon represented on the map shows the possible location of the project and is not to be viewed as an area that will be entirely dedicated to development. Detailed data for this project is currently not available, but since it lies in the middle of two corridors (SACA2), although not crossing their least-cost paths in the pilot area, it is prudent to anticipate some change to structural connectivity in this area and recommend possible mitigation measures.

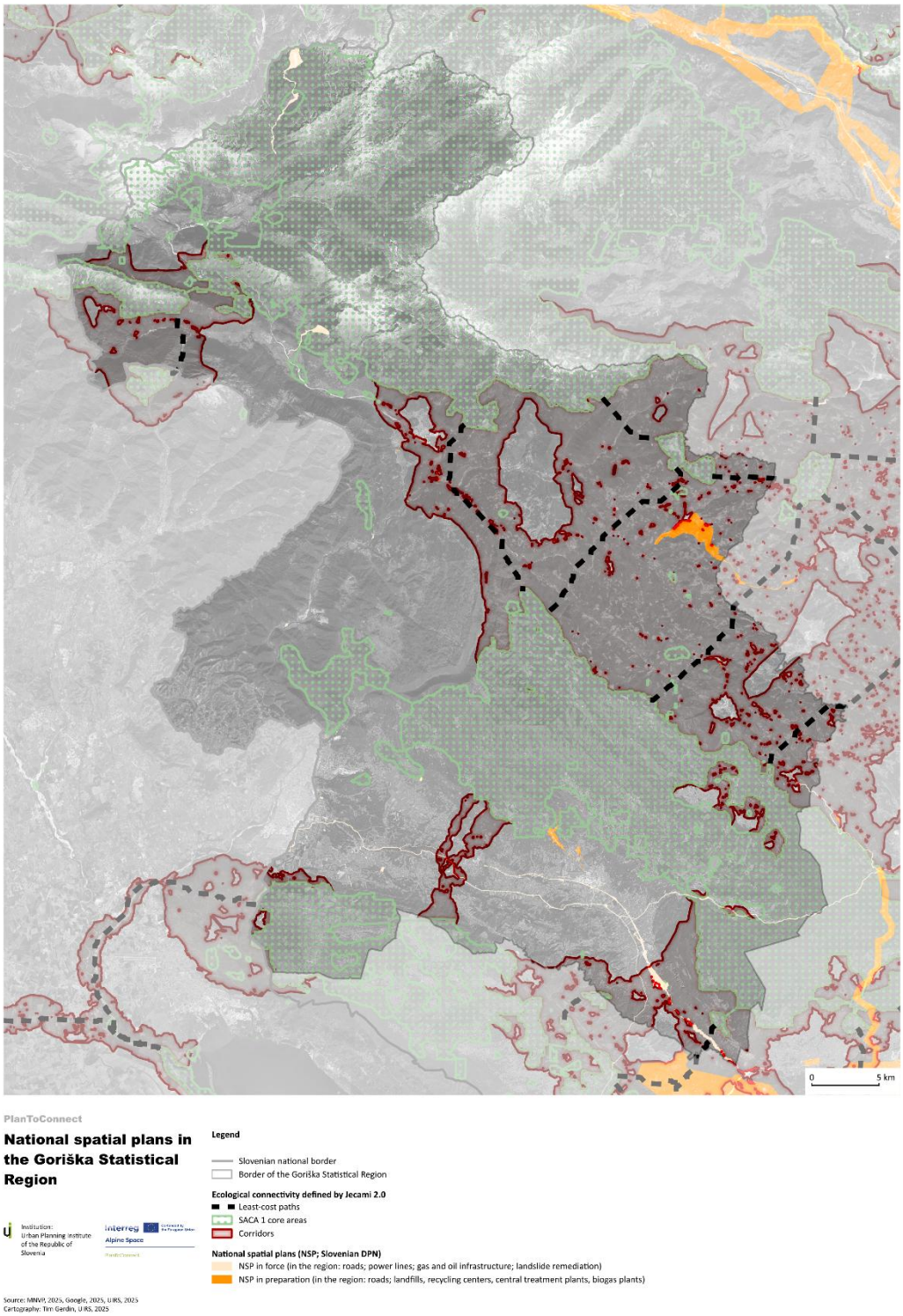


Figure 3: National Spatial Plans in the Goriška Statistical Region

4.2.2 Regional Development Programme of the North Primorska (Goriška) Development Region 2021-2027

The regional development programme details the future vision of the region and lists actions needed to be taken to achieve the set goals. It recognises that despite its natural-geographical diversity, the North Primorska (Goriška) development region is well strategically located. In addition to its border with neighbouring Italy, which is an advantage in developmental terms, its integration into transport flows is also important. The region's spatial potential gives it the possibility of being included in the 5th infrastructure development corridor, which is intercepted or complemented by the Nova Gorica-Ajdovščina-Ljubljana axis, where, in addition to the motorway infrastructure already in place, the development potential of the railway link on this axis is also important, as its comprehensive development would determine the region's rail infrastructure coverage with the already existing Bohinj line. Another key issue for the region is the comprehensive development of the 4th development axis, which is of strategic importance especially for the northern part of the region (Idrija - Cerkljansko and Zgornje Posočje) and enables the region to be connected to the centres, while at the same time allowing the entry of tourist flows from central and western Europe.

The development of RE infrastructure is not mentioned as a key regional development project but activities for RE are foreseen and are aimed at further reconstruction of existing and design/installation of new infrastructure for renewable energy production.

4.3 Local level

4.3.1 Local Energy Concepts (LEC)

The LEC is the mandatory technical basis for the preparation of spatial plans of local communities and all municipalities in the region have adopted a Local Energy Concepts. Most also have a designated energy manager to implement the LEC action plans.

A large part of the municipalities in the pilot area do not plan on introducing larger renewable energy projects. These are Bovec, Brda, Renče-Vogrsko, Šempeter-Vrtojba, Kobarid, Miren-Kostanjevica and Nov Gorica. For the most part their LEC set goals of developing small or micro hydropower plants and encouraging the use of solar power in smaller power plants that aim for local energy self-sufficiency or the installation of photovoltaic panels on roofs of buildings such as schools and sports centres. Harnessing wind power is in general not feasible or not seen as suitable for development at regional scale. This conclusion is shared by all but one of the municipalities in the pilot area as their LEC state that for any future development of small wind power plants it is necessary to study and determine possible micro locations for their construction. The LEC of Ajdovščina being an exception here, because it deems that the municipality is ecologically and economically suitable for larger scale wind power installations. Apart from this type of RE, Ajdovščina belongs in the same group of municipalities not foreseeing major RE infrastructure development.

The second group of LEC from the municipalities of Cerkno, Idrija, Tolmin and Kanal focus more on the development of several small hydropower plants, the renovation of existing ones or already pose significant pressure on waterways. The developmentally inclined LEC are those of Cerkno and Tolmin which together plan to introduce 5 new small hydropower plants. Meanwhile the LEC of Idrija plans to renovate the existing hydropower plants. In the municipality of Kanal the highest pressure on waterways is noted. This group does not plan on developing major solar or wind power infrastructure.

A summary of each municipality's concept is summarised in more detail in Table 3.

Table 3: Summary of Local Energy Concepts

Municipality and Year	Hydropower (8.3.1)	Solar power (8.3.3)	Windpower (8.3.4)
Bovec, 2024	The placement of small hydroelectric power plants in the municipality area is questionable due to high environmental risks, so detailed spatial and landscape analyses are needed to determine suitable locations.	The potential for solar energy lies in self-sufficient power plants, community projects, and the use of degraded areas, but expansion requires an upgrade of the electrical grid at the national level.	There are no designated locations for wind power plants in the municipality area, but there is potential at micro-locations where detailed analyses are needed for larger projects, while smaller power plants can be assessed with basic measurements.
Brda, 2024	There are no hydroelectric power plants in the municipality of Brda due to low	The potential for solar energy lies in self-sufficiency, community projects, and the	There are no designated locations for wind power plants in the municipality area, but

Municipality and Year	Hydropower (8.3.1)	Solar power (8.3.3)	Windpower (8.3.4)
	potential and fluctuating water flow, and any potential exploitation of water energy should be considered only on the Idrijca River.	use of degraded areas, but expansion requires an upgrade of the electrical grid at the national level.	there is potential for exploitation at micro-locations, mainly for small wind power plants, with the main challenges being noise, protected areas, and legislation.
Cerkno, 2011	Within the OPN, three new areas for small hydroelectric power plants are planned: - DN-09 E - A small hydroelectric power plant is planned on the Cerknica stream above the confluence with the Črna stream in Dolenji Novaki (Cerknica basin). - DN-12 E - A small hydroelectric power plant is planned on the Črna stream (Cerknica basin). - JG-03 E - A small hydroelectric power plant is planned on the Otuška stream, a left tributary of the Idrijca River, where there was once a small hydroelectric power plant. The intake is existing, and a new pipeline and powerhouse would be built.	The utilization of solar energy in the municipality of Cerkno is low due to a lack of information, so the municipality should actively promote opportunities and subsidies, while the potential for solar power plants is mainly on the roofs of buildings and as a supplementary activity on farms.	The draft municipal spatial plan (OPN) does not designate areas for wind power plants, but two locations for small wind turbines have been proposed by residents, where wind conditions and investor interest need to be checked.
Idrija, 2022	The municipality plans to renovate old hydroelectric power plants, not build new ones. Analyses show untapped potential of watercourses outside protected areas.	There is potential for the use of solar collectors for water heating and solar power plants for self-sufficiency, with an emphasis on community projects to involve multiple stakeholders. Limitations on the connection of new power plants require an upgrade of the electrical grid, which is being addressed at the national level.	According to professional bases for the placement of small wind power plants in the area of the Municipality of Idrija, LUZ d.d. (2016), it is not expected that this renewable energy source would be exploited to a greater extent in the considered area.
Nova Gorica, 2016	Suitable watercourses or sections suitable for the utilization of hydro energy are exploited. Other watercourses for the construction of hydroelectric power plants are not suitable, so measures in this area are not foreseen.	The potential for solar energy is extremely high, as it allows for the efficient utilization of sunlight for heat production, which is crucial for heating and cooling. The installation of solar power plants for self-sufficiency is sensible mainly in areas with sufficiently high solar radiation, where the use of solar collectors is most economical.	Based on the known information, it would be sensible to consider the possibility of installing solar collectors in the vicinity of the municipality for heating sanitary water, but it should be noted that this is mainly in the context of self-sufficiency and not entirely as a primary source for heating. If it proves feasible, it would also be sensible to consider the installation of solar power

Municipality and Year	Hydropower (8.3.1)	Solar power (8.3.3)	Windpower (8.3.4)
			plants for electricity production.
Renče-Vogrsko, 2023	There are no significant water potentials for electricity production in the municipality, except for the possibility of small hydroelectric power plants of local importance.	The roofs of public buildings in the municipality are still unused and should be considered as potential for mitigating climate change.	Considering the data on wind speed, distance from settlement areas, and the conservation status of the area, it can be concluded that the wind potential in the municipality area is generally low, so it is probably not sensible to consider the possibility of installing wind power plants.
Šempeter-Vrtojba, 2012	The municipality of Šempeter-Vrtojba is characterized by a sparse river network, as the only watercourse in the municipality is the Vrtojbica stream. Given the low flow of the Vrtojbica stream, the municipality of Šempeter-Vrtojba does not have a real potential for the utilization of hydro energy.	There are several suitable surfaces in the municipality: OŠ Ivana Roba in Šempeter, HIT Sports Center, Iskra Avtoelektrika, Hospital, and others.	Based on the known data on wind strength and direction in the vicinity of the municipality, it does not appear that it is sensible to exploit this renewable energy source in the considered area. However, we still suggest that this renewable energy source be exploited if a suitable micro-location for the installation of a wind power plant is found in the municipality area.
Tolmin, 2011	New projects on the Soča River are mostly in the idea phase. Hydroelectric power plants on the Idrijca River are in the study phase. The facilities are supposed to utilize the available potential of the Idrijca River, which flows into the Soča River at Most na Soči. Suitable locations for the construction of small hydroelectric power plants in the municipality of Tolmin are: on the Kneža, Trebuščica, and Tolminka watercourses.	In the municipality, suitable surfaces for the installation of solar power plants are the roofs of public buildings (schools, library, health center, residential blocks), the Poljubinj industrial zone (without shading by the Bučenica hill), the Log craft-business zone, and other locations where receivers can be integrated into the roof, set up as canopies, or in other suitable places.	Based on the known data on wind strength and direction in the vicinity of the municipality, it does not appear that it is sensible to exploit this renewable energy source in the considered area.
Ajdovščina, 2022	Existing hydroelectric power plants are on the Hubelj, Vipava, and Lokavšček watercourses. There are no significant new water potentials for electricity production in the municipality, except for the possibility of small hydroelectric power plants of local importance.	The potential is shown in the use of solar collectors for heating sanitary water and the installation of solar power plants, mainly for self-sufficiency. A unique challenge is the establishment of community projects that can involve various stakeholders, including those who otherwise do not have the possibility to	Wind potential measurements are mainly carried out by ARSO and also by Elektro Primorska d.d. Research shows that there are possibilities in the field of wind energy. The windiness in the coastal part of Slovenia is particularly suitable, where the economic, technological, and environmentally sensible

Municipality and Year	Hydropower (8.3.1)	Solar power (8.3.3)	Windpower (8.3.4)
		install their own solar power plant.	placement of wind power plants is possible.
Kanal, 2024	The operating larger hydroelectric power plants in the municipality of Kanal ob Soči are HE Plave I, HE Plave II, HE Dolar I, HE Doblar II. According to the study "Possibilities of exploiting the energy potential in Slovenia" (A. Kryžanowski et al., 2008), the estimated utilization of the energy potential of the Soča River with the Idrijca River is 34%. Additional large hydroelectric power plants are not to be expected.	The potential is shown in the use of solar collectors for heating sanitary water and the installation of solar power plants, mainly for self-sufficiency. A unique challenge is the establishment of community projects that can involve various stakeholders, including those who otherwise do not have the possibility to install their own solar power plant.	Based on the known data on wind strength and direction in the vicinity of the municipality, it does not appear that it is sensible to exploit this renewable energy source in the considered area.
Kobarid, 2023	The largest and most important watercourse in the municipality is the Soča River, followed by the Nadiža and Idrijca watercourses. The water energy potential is utilized in small hydroelectric power plants on the Bela, Tresilo, and Ročica watercourses. The placement of new hydroelectric power plants is questionable from the perspective of environmental and landscape vulnerability.	The potential is shown in the use of solar collectors for heating sanitary water and the installation of solar power plants, mainly for self-sufficiency. A unique challenge is the establishment of community projects that can involve various stakeholders, including those who otherwise do not have the possibility to install their own solar power plant.	Based on the known data on wind strength and direction in the vicinity of the municipality, it does not appear that it is sensible to exploit this renewable energy source in the considered area to a greater extent.
Miren-Kostan-jevica, 2023	The only larger watercourse in the municipality of Miren-Kostanjevica is the Vipava River. On the Vipava River, four water rights for water extraction for small hydroelectric power plants have been granted in the municipality area. In addition to the existing small hydroelectric power plants in Orehovlje and Bilje, the construction of two more small hydroelectric power plants is planned in Miren – at the dam in Grapci and at the dam near Šeli.	The potential is shown in the use of solar collectors for heating sanitary water and the installation of solar power plants, mainly for self-sufficiency. A unique challenge is the establishment of community projects that can involve various stakeholders, including those who otherwise do not have the possibility to install their own solar power plant.	Based on the known data on wind strength and direction in the vicinity of the municipality, it does not appear that it is sensible to exploit this renewable energy source in the considered area to a greater extent.

4.3.2 Municipal Spatial Plans

Municipal spatial plans of the municipalities in the Goriška statistical region define priority areas for the construction of renewable energy sources and transport infrastructure. For the former, they also envisage the most suitable forms that would make the best use of spatial and climatic conditions. This mainly involves the use of solar energy in the south, where solar radiation is the highest and has great potential for self-sufficiency and community projects. Some municipalities are striving to modernize and increase the use of water potential, which is already being utilized on suitable watercourses, through the placement of new small hydroelectric power plants. Transport infrastructure focuses on improving road and rail connections, particularly on upgrading expressways to motorways and addressing traffic issues through settlements with bypasses. The digitalization of the power system with smart grids and the easier placement of renewable energy facilities in space is also planned.

Overall, the majority of municipal spatial plans only plan projects of local significance. These are the municipalities of Bovec, Brda, Idrija, Renče-Vogrsko, Šempeter-Vrtojba, Kanal, Kobarid and Miren-Kostanjevica. The spatial municipal plan of Ajdovščina advocates for stronger implementation of solar collectors especially on larger roof surfaces. Cerkno also plans to implement new RE in the for of new small power plants on streams and rivers in accordance with the cultural heritage and blending into the landscape as much as possible. It also mentions the Idrijca River Valley as being a nationally important transport corridor. The largest project mentioned in all of the municipal plans is found in the plan of Nova Gorica. It envisages the upgrading of H4 Podnanos-Vrtojba expressway into a highway, which poses the largest threat to the structural ecological connectivity in the pilot area.

Table 4: Summary of Local Energy Concepts

Municipality and Year	Energy	Traffic
Bovec, 2024	Only projects of local significance.	Only projects of local significance.
Brda, 2024	Only projects of local significance.	Only projects of local significance.
Cerkno, 2011	Water potential has not yet been fully utilized. Therefore, the construction of new plants on the Otuška, Cerknica, and Pasica streams is planned, with the placement being in accordance with nature and cultural heritage protection and as inconspicuous as possible.	The foundation of the transport infrastructure is the Idrijca River Valley, which is a connection of national importance.
Idrija, 2022	Only projects of local significance.	Only projects of local significance.
Nova Gorica, 2016	Only projects of local significance.	The most important municipal vision is found in Nova Gorica and is the upgrade of the H4 Podnanos-Vrtojba expressway into a highway. This would include building a new lane on both sides and raising the speed limit to 130 km/h.
Renče-Vogrsko, 2023	Only projects of local significance.	Only projects of local significance.
Šempeter-Vrtojba, 2012	Only projects of local significance.	Only projects of local significance.
Tolmin, 2011	Only projects of local significance.	Bypasses in Tolmin, Volče in Čiginj.

Municipality and Year	Energy	Traffic
Ajdovščina, 2022	The municipality will advocate for the use of larger roof surfaces for solar energy collectors, especially in areas of production activities and on economic buildings, except in areas of cultural heritage protection. In areas with sparse settlement, local renewable energy sources are being implemented.	Only projects of local significance.
Kanal, 2024	Only projects of local significance.	Only projects of local significance.
Kobarid, 2023	Only projects of local significance.	Only projects of local significance.
Miren-Kostanjevica, 2023	Only projects of local significance.	Only projects of local significance.

5 Exclusion zones and buffers for relevant infrastructure

5.1 Exclusion zones

Exclusion zones are areas where specific infrastructures cannot be built or operated. They are the most widely used planning tool to reduce the environmental impacts of human land use, including the development of renewable energy projects.

The general criteria for unsuitable sites are compiled in Table 5. They are based on the corresponding chapters of the report D1.3.1.

Table 5: General criteria for unsuitable sites (D1.3.1)

Type of infrastructure	Unsuitable locations
Hydropower	• protected areas (e.g. Natura 2000 areas, nature reserves, …) • natural or semi-natural rivers
Windpower	• protected areas (e.g. Natura 2000 areas, nature reserves, core areas of national parks and biosphere reserves) • European bird protection areas with occurrences of wind energy-sensitive bird species • designated bird migration routes • density centers of collision-sensitive bird species • old natural or semi-natural forests • forested ridgelines because of high collision rates of birds and bats • areas with high perceived scenic quality (landscape quality)
Solar power	• protected areas (e.g. Nature 2000 areas, nature reserves, water protection areas) • areas of high nature conservation value • riparian buffer zones, floodplains • natural watercourses and lakes • soil with very high significance for natural soil functions • agricultural soil with high degree of productivity
Roads/highways	• protected areas (e.g. Nature 2000 areas, nature reserves, core zones of national parks and biosphere reserves, water protection areas) • areas of high nature conservation value like old-growth forests or wet- and peatland • soil with very high significance for natural soil functions

5.2 Buffers

In Table 6 buffer zones where other construction is prohibited are described for each of the relevant types of infrastructure. In general, though specific buffer zones for larger infrastructure projects are defined on a case by case basis during their preparation.

Table 6: Buffer zones

Type of infrastructure	Buffers
Hydropower	Determined for each power plant specifically by the municipal spatial plan.
Windpower	**1. For larger wind turbines and wind farms** No minimum distance between wind turbines and residential buildings is defined by regulations or act; individual construction/project proposal is subjected to an environmental impact assessment, spatial plans and safety requirements. The typical distance is between 300 and 500 meters, but it can be longer in the case of particularly sensitive environments or larger wind turbines. **2. For wind turbines up to including 50 KW** If the installation is carried out adjacent to the installation and the furthest point that the installation can reach is less than 1.5 metres from the boundary of adjacent land, the investor must have the consent of the owners of the adjacent land.
Solar power	**1. Photovoltaic panels /installations intended for the operation of the building - individual supply installations** Placed directly on the building (e.g. on the roof, facades or fencing). **2. Smaller photovoltaic installations not intended for self-supply** Placed directly on the building (e.g. on the roof, facades or fencing). **3. Stand-alone photovoltaic power plants installed on land (up to 1 MW)** Photovoltaic plant up to 1MW is installed on existing building or structure constructed in accordance with the rules governing the construction of buildings (hereinafter referred to as 'the structure'), or is installed adjacent to the structure, and its floor area on the site does not exceed 20% of the built-up area of the site. If the installation is carried out adjacent to the installation and the furthest point that the installation can reach is less than 1.5 metres from the boundary of adjacent land, the investor must have the consent of the owners of the adjacent land.
Transport infrastruc-ture	**1. Motorways** 40 meters (from the outer edge) **2. Expressways** 35 meters **3. Main /trunk road** 25 meters **4. Regional roads (state roads)** 15 meters **5. Local roads (municipal roads)** 7 meters **6. Public paths (municipal)** 5 meters **7. Cycling paths (state)** 2 meters **8. Cycling paths (municipal)** 1 meters

6 Possible mitigation and compensation measures

The following paragraphs describe general mitigation and compensation measures, firstly because the pilot area does not include future projects that pose major risk to structural ecological connectivity at regional scale. Secondly, each major project would require being evaluated by a comprehensive environmental impact assessment, which proposes specific mitigation measures for different environmental elements, such as waterways, forests, prairies, marshes etc. When determining suitable areas for potential future RE development listed exclusion zones should be considered and followed.

For solar energy infrastructure, maintaining ecological connectivity involves careful site selection to avoid disrupting wildlife corridors and natural habitats. Large solar farms should be placed on already degraded lands or rooftops to minimize land-use conflicts. If solar installations are built on open land, measures like preserving vegetation strips, creating wildlife crossings, and using elevated solar panels can help maintain movement routes for animals. Fencing should be designed to allow small animals to pass through, and artificial lighting should be minimized to reduce its impact on nocturnal species.

For wind energy infrastructure, it is crucial to avoid placing wind farms in key migration corridors or near breeding sites of sensitive species. Bird and bat mortality can be reduced by strategic turbine placement, curtailment measures during peak migration periods, and technologies like radar-based detection systems that temporarily shut down turbines when flocks are approaching. Maintaining buffer zones around natural habitats and ensuring that roads and transmission lines do not create barriers for wildlife movement also support ecological connectivity.

For hydropower infrastructure, maintaining river connectivity is essential for aquatic species. Fish passages, such as fish ladders or bypass channels, should be incorporated into dam designs to allow migration. Maintaining adequate water flow and sediment transport helps sustain downstream ecosystems. Where possible, small-scale hydropower solutions that do not require large dams can minimize habitat fragmentation. Riparian buffer zones should be preserved along riverbanks to maintain connectivity between aquatic and terrestrial ecosystems.

For road infrastructure, ecological connectivity can be preserved through green bridges, underpasses, and culverts that allow animals to cross safely. Roads should be designed to follow natural landscape features rather than cutting through key habitats, and existing ecological corridors should be maintained. Wildlife fencing can help guide animals toward safe crossing points while reducing roadkill. Vegetation along roadsides should be managed to support biodiversity, and noise and light pollution should be minimized to avoid disrupting animal behaviour.

7 Conclusions

The pilot area features only one confirmed planned major regional project (4th developmental axis) that acts as a threat to structural ecological connectivity in the region's corridors. Mitigation measures should be determined during the preparation of this project's documentation. Measures should also be employed and further studied in the Vipava Valley if a plan to promote the expressway into a highway would materialise. On the other hand, most of the pressures of the existing major road projects are mitigated by use of bridges and tunnels which preserve connectivity in or near corridors linking SACA1 areas.

Existing RE infrastructure poses little pressure to the connectivity of GBI elements in the pilot area as it is non-existing apart from the hydropower plants, which include mitigation measures that permit the connectivity of aquatic and riparian ecosystems. The threats posed by RE is also minimal, as only minor projects like small hydropower plants or small solar power plants mostly on existing buildings are envisioned in the future.

However, these installations have the possibility of impacting connectivity at local scale. Proceeding to the analysis of a corridor at local level, the possible locations of threats should be investigated further and more detailed mitigation measures for types of infrastructure present will be proposed. This should also be verified for other infrastructure such as rail and the aforementioned road network impacting connectivity at local scale.

8 References

Act on the Introduction of Installations for the Production of Electricity from Renewable Energy Sources (ZUNPEOVE), Official Gazette of the Republic of Slovenia [Uradni list RS], No. 78/23 of 19 July 2023.

Decree on the Municipal Spatial Plan of the Municipality of Ajdovščina, Official Gazette of the Republic of Slovenia [Uradni list RS], No. 5/22 of 2 January 2022.

Decree on the Municipal Spatial Plan of the Municipality of Bovec, Official Gazette of the Republic of Slovenia [Uradni list RS], No. 119/08 of 19 December 2008.

Decree on the Municipal Spatial Plan of the Municipality of Brda, Official Gazette of Slovenian Municipalities [Uradno glasilo slovenskih občin], No. 46/22 of 14 October 2022.

Decree on the Municipal Spatial Plan of the Municipality of Cerkno, Official Gazette of the Republic of Slovenia [Uradni list RS], No. 28/13 of 2 April 2013.

Decree on the Municipal Spatial Plan of the Municipality of Idrija, Official Gazette of the Republic of Slovenia [Uradni list RS], No. 38/11 of 24 May 2011.

Decree on the Municipal Spatial Plan of the Municipality of Kanal ob Soči (OPN Kanal), Official Gazette of the Republic of Slovenia [Uradni list RS], No. 98/12 of 17 December 2012.

Decree on the Municipal Spatial Plan of the Municipality of Kobarid, Official Gazette of the Republic of Slovenia [Uradni list RS], No. 99/13 of 3 December 2013.

Decree on the Municipal Spatial Plan of the Municipality of Miren – Kostanjevica, Official Gazette of the Republic of Slovenia [Uradni list RS], No. 85/13 of 18 October 2013.

Decree on the Municipal Spatial Plan of the Municipality of Nova Gorica, Official Gazette of the Republic of Slovenia [Uradni list RS], No. 13/18 of 28 February 2018.

Decree on the Municipal Spatial Plan of the Municipality of Renče – Vogrsko, Official Gazette of the Municipality of Renče-Vogrsko [Občinski list], No 10/2014 of 28 July 2014.

Decree on the Municipal Spatial Plan of the Municipality of Šempeter – Vrtojba, Official Gazette of the Republic of Slovenia [Uradni list RS], No. 7/14 of 31 January 2014.

Decree on the Municipal Spatial Plan of the Municipality of Tolmin, Official Gazette of the Republic of Slovenia [Uradni list RS], No. 78/12 of 15 October 2012.

Decree on the Municipal Spatial Plan of the Municipality of Vipava, Official Gazette of the Republic of Slovenia [Uradni list RS], No. 9/14 of 5 February 2014.

Golobič, M., Penko Seidl, N., Bevk, T., Pipan, T., Kostanjšek, B., Ažman, T., Kržič, K., Hudoklin, J., Hočevar, I., Simič, S., Kokalj, Ž., Gabrič, A., & Kladnik, D. Redevelopment of the Regional Distribution of Landscape Types and Outstanding Landscapes in Slovenia and their Digitisation: final report of the research project CRP V5-2135, 2024.

Local Energy Concept of the Municipality of Ajdovščina – Final Report, Goriška local energy agency, 2022

Local Energy Concept of the Municipality of Bovec – Final Report, Goriška local energy agency, 2024

Local Energy Concept of the Municipality of Brda – Final Report, Goriška local energy agency, 2024

Local Energy Concept of the Municipality of Cerkno – Final Report, Goriška local energy agency, 2011

Local Energy Concept of the Municipality of Idrija – Final Report, Goriška local energy agency, 2022

Local Energy Concept of the Municipality of Kanal ob Soči – Final Report, Goriška local energy agency, 2024

Local Energy Concept of the Municipality of Kobarid – Final Report, Goriška local energy agency, 2023

Local Energy Concept of the Municipality of Miren – Kostanjevica – Final Report, Goriška local energy agency, 2023

Local Energy Concept of the Municipality of Nova Gorica – Final Report, Goriška local energy agency, 2016

Local Energy Concept of the Municipality of Renče – Vogrsko – Final Report, Goriška local energy agency, 2023

Local Energy Concept of the Municipality of Šempeter – Vrtojba – Final Report, Goriška local energy agency, 2013

Local Energy Concept of the Municipality of Tolmin – Final Report, Goriška local energy agency, 2011

Regional Development Programme of the Northern Primorska (Goriška) Development Region 2021–2027, Posoški razvojni center, 2022.

Resolution of the spatial development strategy of Slovenia 2050 (ReSPR50), Official Gazette of the Republic of Slovenia [Uradni list RS], No. 72/23 of 3 July 2023.

Resolution on the National Environmental Protection Programme for the Period 2020–2030 (RENPVO20-30), Official Gazette of the Republic of Slovenia [Uradni list RS], No. 31/20 of 20 March 2020.

Resolution on the National Energy Programme (ReNEP), Official Gazette of the Republic of Slovenia [Uradni list RS], No. 57/04 of 5 April 2004.

Spatial Management Act (ZUreP-3), Official Gazette of the Republic of Slovenia [Uradni list RS], No. 199/21 of 22 December 2021.

Interreg Alpine Space | Co-funded by the European Union | PlanToConnect

PlanToConnect

Mainstreaming ecological connectivity in spatial planning systems of the Alpine Space

Project partners:

Urban Planning Institute of the Republic of Slovenia (SI)
Veneto Region (IT)
ALPARC – the Network of Alpine Protected Areas (FR)
Asters, organisation for the conservation of natural areas in Upper Savoy (FR)
Eurac Research (IT)
ifuplan - Institute for Environmental Planning and Spatial Development (DE)
University of Würzburg (DE)
Salzburg Institute for Regional Planning and Housing (AT)
E.C.O. Institute of Ecology Ltd. (AT)
Fondazione Politecnico di Milano (IT)

GBI-network: Land use conflicts for renewable energy production and other threats

Author(s)
Tim Gerdin, Urban Planning Institute of the Republic of Slovenia, timge@uirs.si
Andrej Gulič, Urban Planning Institute of the Republic of Slovenia, andrejg@uirs.si
Sergeja Praper, Urban Planning Institute of the Republic of Slovenia, sergejap@uirs.si
Damjana Gantar, Urban Planning Institute of the Republic of Slovenia, damjanab@uirs.si

Layout
Tim Gerdin, Urban Planning Institute of the Republic of Slovenia, timge@uirs.si

February, 2025

Urbanistični inštitut Republike Slovenije
Urban Planning Institute of the Republic of Slovenia
www.uirs.si