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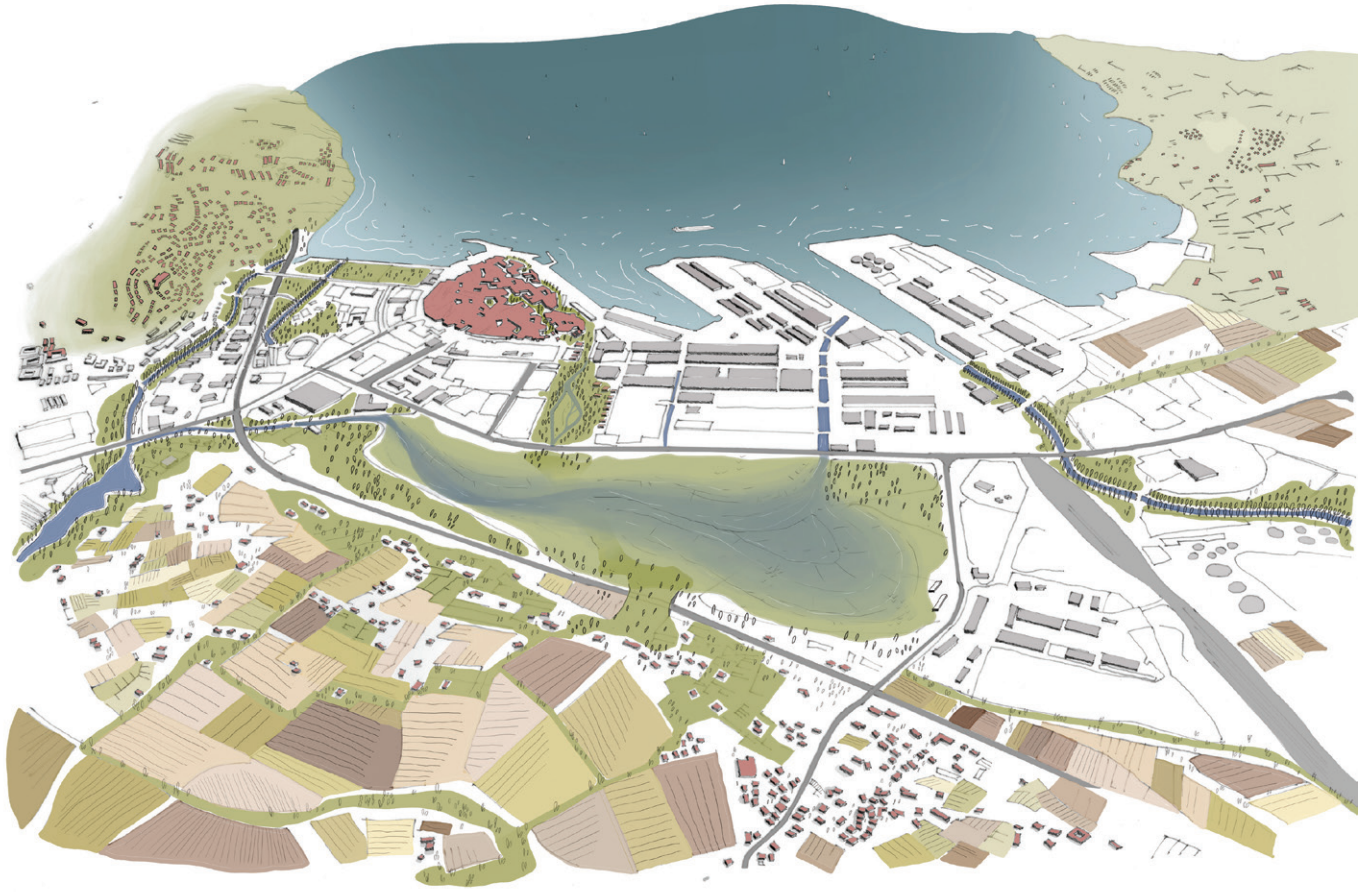
Along the coasts of the shared sea
Izola, 11–12 May 2021

Handbook for Recognising and Planning Green Infrastructure



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HANDBOOK FOR RECOGNISING AND PLANNING GREEN INFRASTRUCTURE

COMMUNICATION FROM THE EUROPEAN COMMISSION

Now, more than ever, citizens feel the need for a healthy environment. The Covid-19 pandemic has brought people closer to nature, to profit more from the green spaces around them, whether in natural areas, in the countryside, or in urban spaces. This has made it clearer how fragile nature is, and how important it is to make every possible effort to protect it.

Green infrastructure is a key element to do this, and to stop the loss of biodiversity. It provides huge benefits and vital services for people, the society, and nature.

In regions where many political borders create administrative as well as physical obstacles to the protection of nature and biodiversity, joint planning and the implementation of green infrastructure are key to revert the loss of biodiversity.

Macro-regional strategies offer an ideal framework for policy coordination in certain European regions. They allow a harmonised implementation of the relevant EU legislation and policy, both in the participating Member States and in candidate and potential candidate countries, therefore facilitating the alignment with the EU acquis and practices in this sector. In particular, they contribute to tailoring the implementation of the European Green Deal, including the EU Biodiversity Strategy for 2030 (COM (2020) 380 final), and to the needs of a specific territory crossing several borders.

In order to support the efforts of the EU Strategy for the Adriatic and Ionian Region (EUSAIR), and the EU Strategy for the Danube Region (EUSDR) for the deployment of Green Infrastructure, the European Commission financed a study under the EPPA (EU Environment Partnership Programme for Accession) in the Western Balkans, that identified conservation areas of high transboundary importance, and explored the level of the existing landscape connections between them. The study, finalised at the end of 2020, contributes to the EU Biodiversity Strategy for 2030, as well as to the establishment of a coherent Trans-European Nature Network, and to the implementation of the EU Nature Restoration Plan in the Region.

The “Handbook for Recognising and Planning Green Infrastructure” is a positive initiative that goes exactly in the same direction, and we are confident that it would be a good basis for planning an efficient network of green infrastructure in the framework of the EU Macro-regional strategies.

Jean-Pierre Halkin
Head of Unit Macro-regions, Transnational/Interregional/External Cooperation, Enlargement
Directorate General for Regional and Urban Policy
European Commission

COMMUNICATION FROM THE INTERNATIONAL SAVA RIVER BASIN COMMISSION

The International Sava River Basin Commission (Sava Commission) marked its 15th anniversary last year. It was established on the basis of the Framework Agreement on the Sava River Basin (2004), which created a new international framework for the cooperation of states that were established as a result of geopolitical changes in the 1990s, and which continued the briefly broken tradition of an integral approach to water management in the Sava Basin. Recognizing the crucial importance of exemplary cross-border cooperation aimed at the sustainable development of the basin, states, through their joint body – the Sava Commission – have achieved exceptional results in this relatively short period of time in all fields of activity.

We can proudly look back on some of the results of this cooperation, such as the joint river basin and flood risks management plans. Significant progress has been made towards the revitalization of navigation, with continuous work on standards related to navigation and a high degree achieved of harmonization of regulations with EU regulations. Among specific products, I would like to emphasize the Flood Forecasting and Warning System for the Sava Basin, which is the culmination of a long-standing joint effort in this area, and the establishment of which was preceded by successful cooperation on hydrological/hydraulic models and information systems developments.

These and other results could not have been achieved without reaching a high degree of mutual respect for representatives of the State Parties at all levels of work and decision-making. Here I would like to stress the fact that the Sava Commission is the only river commission in Europe that integrates water management and navigation as part of its work, which is a challenge but also a unique opportunity for cross-sectoral dialogue. Due attention is also paid to the involvement of interested stakeholders, and we are particularly proud of the existence and work of the Sava Youth Parliament, which meets every year on the occasion of Sava Day (01 June) to discuss the current problems in water management.

Everything achieved so far is a good basis for further breakthroughs and progress in all segments of the implementation of the Framework Agreement, with a balanced approach based on the principles of sustainable development. A good basis for action is the Joint Plan of Action for the Sava River Basin (JPA SRB), which follows the path towards further development of the region in the identified priority areas of cooperation, and which received the support of the Parties of the Sava Commission and Montenegro through the Joint Declaration signed in Bled on 15 July 2017. The JPA SRB was the basis for the preparation of the Sava and Drina Integrated Corridor Development Programme – with cooperation with the World Bank – which is in the final stage of preparation.

A great opportunity to further strengthen cross-border cooperation aimed at environmentally friendly development is also provided by the EU Green Deal, which can be particularly important at the level of the Sava Basin, which is shared between EU member states and non-EU members. The space for cooperation and, in particular, for the transfer of knowledge and experience is also opening beyond the borders of the Sava Basin because all states that are Parties to the Framework Agreement are also members of EUSAIR.

Finally, I would like to emphasize the importance and relevance of a publication such as this, in which the concept of green infrastructure is explained clearly; everything from the concept and the definitions of basic terms to the identification, management and planning of green infrastructure with examples of good practice. As such, this publication will find its place in application not only in Slovenia but also beyond, at the macro-regional level.

Dragan Zeljko, Secretary

FOREWORD

The main purpose of the handbook is to show links between the relief, waters, erosion and floodplains, vegetation, the coast, the sea, the population density, traffic, habitats and areas for producing food. These links are material (erosion, transport, accumulation), energy (thermal, kinetic) and biological (migratory routes of the flora and fauna).

The links are generated by water flows. It concerns the activity of droplets to extremely extensive and dynamic movements of water and land masses put in motion by rivers, sea currents, tides and sea waves. Such activity shapes the landscapes and regions. The flora and fauna has adjusted very well to these dynamic conditions with their varied habitats.

In the era of rapid economic development, the flows of surface, underground, coastal and sea waters were often treated carelessly. The reason: planning was prioritised for the fast construction of "grey infrastructure". This led to conflicts, with the deterioration of drinking water sources, the deterioration of the ecological situation, and the increased threat to people due to floods and droughts. These conflicts today are intensified by climate changes.

To overcome such actions, the responsible planners coined the term "green infrastructure", which should have the same meaning in spatial planning as the discussion of the "grey infrastructure". The reason: to reduce the vulnerability of settlements and to improve the ecological situation of the habitats as a measure to an increased water, food and flood protection of people. Our handbook is intended for that.

The handbook considers the experiences of our predecessors, who developed the sustainable management of forests across 2/3 of the surface area of Slovenia. They avoided areas with torrents and floods. They developed a modern method for tracing underground waters in the karst region, provincial ecology and regional planning. This know-how was used to develop the method for considering green infrastructure and the ecosystem services in modern spatial planning for comprehensive solutions at a cross-border level for an improved quality of life. This is our contribution to the comprehensive spatial development planning at the juncture of the Alps, the Adriatic and the Danube regions.

Mitja Bricelj phD.

TABLE OF CONTENTS

1 INTRODUCTION

Development designed on growth with a one-way usage of the natural resources has reached the point with perceptual impacts on the global and local environment. These are measurable structural changes that are reflected in the changes of the environment in:

- the deterioration of the **quality** of water, air, food,
- the reduction in the **amounts** of natural resources and green areas,
- the increased **dynamics** of the weather, river regimes, erosion processes and the activity of the sea.

These structural changes are causing more and more problems to the inhabitants and development planners in their search for optimal development solutions. In order to overcome the sectoral actions on the planning and administrative level, which have led to such a situation, the usage of the "green infrastructure" term and concept is increasingly gaining ground (the complementarily built "grey infrastructure"). The essence of including "green infrastructure" in modern development planning is for planners to also include the provincial and ecological functions and resources in the local environment, in addition to the existing building standards for the built environment or the "grey infrastructure". Therefore, when planning new uses of an area, contributions need to be made in terms of an improved climate, water, bio and food safety.

The biggest challenge in all of this is to have the existing actions in the majority of state administration working in a sectoral manner. The consideration of the "bigger picture", in relation to the dynamic "climate - relief - waters - habitats" link for sustainable safety and development, is weak for humans. It is weak because these matters and the implementation of each goal are considered by the administration in a fragmented, unconnected and static manner. The consequence of all of this are the numerous spatial clashes, which further degrade the environment, cause pollution and further deteriorate the general resilience of the environment and human society to unexpected changes, such as, for example, floods and droughts. Individual sectoral goals and actions must therefore consider sustainable development in the future, which also means that the social environmental and economic matters must also be considered in a balanced manner (**Figure 1**).

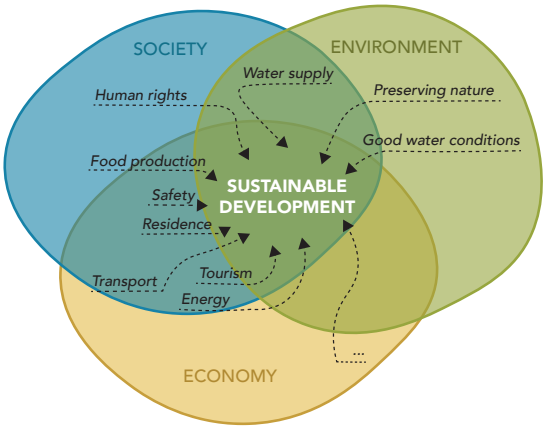


Figure 1: *Long-term success of implementing individual sectoral goals requires the observance of other sectoral goals and "movement" in the direction of sustainable development.*

The main motto in the green infrastructure concept is for the goods that are supplied by nature and healthy ecosystems, such as clean drinking water, healthy food, favourable microclimate conditions and many others, are included equally in the comprehensive planning of land use and resources. These goods, provided by healthy ecosystems and nature itself, are also called ecosystem services. These may also include biodiversity which, if high, is actually the main indicator of a healthy and rich environment full of diverse ecosystem services. The same applies in reverse - the higher the supply and diversity of the ecosystem services, the higher the biodiversity may be expected in a certain environment.

Preserving and planning green infrastructure is not only beneficial for biodiversity, but also for humans and their long-term prosperity.

The handbook is also intended to increase awareness of the great importance of considering green infrastructure in development planning. It is based on the concrete achievement of the regional approach application in the work of the intergovernmental committees in areas concerning waters, coasts and the sea, by considering the international conventions. A major acceleration in improving cooperation between states, in order to achieve these goals, is also made possible by the EU macro-regional strategies, with the implementation of the EU cross-border projects.

1.1 Development of the green infrastructure concept

The green infrastructure concept (hereinafter: GI) is a concept that highlights the importance of preserving and including the natural environment in an area. The GI concept has been around since the 1980s, when the USA developed "greener" or "bluer" rainfall drain management in settlements, by easing the erosion processes and improving the power supply of underground aquifers.

Two of the pioneers and major promotors of the GI concept are, undoubtedly, Benedict and McMahon, who upgraded the GI term and marked it as "a linked network of the natural and other open areas that preserve the values of the natural ecosystems and their functions, and ensure a wide spectre of benefits for people and wild animals". In this context, GI is an ecological framework for the environmental, social and economic health or natural system for supporting life [5.].

The literature mentions several terms that define the same concept, such as, for example, the ecological, natural, green and blue infrastructure; the choice of term usually depends on the academic, expert and contextual starting points. Nevertheless, the term "green infrastructure" leads the way, which is also an established term in scientific literature [3.]. The term "green systems" is also often in use, mainly in practice when planning and managing landscapes in an urban environment [4.]. In some parts, the GI term is replaced by the extended version, "multifunctional GI": multifunctionality in this context relates to the integration and interaction of the various functions and activities in a certain part of an area [2.]. Despite the differences in terminology, the conceptual starting points are the same: **they deal with the preservation and provision of benefits of the natural environment, including biodiversity** [35.].

The first projects, whose goal was to implement GI in the European space, date back to the beginning of the 21st century. In 2007, *the European Commission issued the Guidance on the maintenance of landscape connectivity features of major importance for wild flora and fauna [7.], and the document Towards*

a Green infrastructure for Europe – Developing New concepts for integration of the Natura 2000 network into a broader countryside [8.]. In 2011, it upgraded the documents with the Assessment of the potential of ecosystem-based approaches to climate change adaptation and mitigation in Europe [9.], instructions for the design, implementation and cost elements of green infrastructure projects [10.], and the implementation and efficiency assessment of the green infrastructure [11.]. In 2015, as a continuation of the support for the implementation thereof, it issued recommendations regarding the means to promote the geographical indication, to build the capacities for its implementation, to improve the exchange of information, and to assess the linked technical standards and opportunities for innovations in the GI area for the trans-European network (TEN-G - Trans-European Network for Green Infrastructure).

Compared to the grey infrastructure, it is much more difficult to justify the GI in economic, housing, infrastructural and financial matters. This is why the GI only rarely had the same level of interest or investment as the grey infrastructure. The main reason for this lies in financing: the preservation and increase of the GI is ensured by the natural functions (ecosystem services and biodiversity) that are applicable for general public benefits, while presenting additional operating costs for business entities without public mechanisms, which is why they increase their non-competitiveness compared to those who do not include such general benefits in their investment and operating costs. The implementation of the GI concept has therefore included the administrative legal and financial mechanisms in recent times, which would ensure that competitiveness is not built on account of burdening the environment, its functions and benefits.

Not long ago, as a form of support to meeting this challenge, the European Commission adopted the European Green Deal [1.], the core of which is the responsibility and commitment to preserve the environment and the natural resources for future generations as well. The Green Deal strives to establish a sustainable economy in the EU with zero emissions. It strives to reform the EU into a modern, competitive economy that will ensure water, food and energy security, whereby its growth will not be dependent on non-sustainable usage of resources. It therefore wishes to ensure further socio-economic development, which is why it is also establishing the financial supporting mechanisms that the economy, which preserves nature, a healthy environment and a sustainable usage of the resources and space, will also be competitive (**Figure 2**).

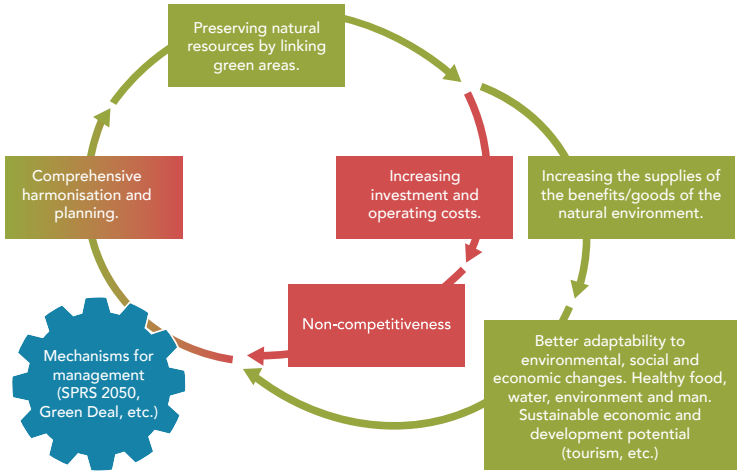


Figure 2: *The GI recognition and planning cycle in an area by considering clashes with other usages of the area and by including management mechanisms.*

1.2 The purpose of the handbook

The handbook is the result of a process with which we managed to harmonise the opinions and approaches of the various sectors in recognising and planning the GI, mainly those that deal with preserving nature, the landscape and water management and those that deal with the GI concept and its implementation the most. The GI concept also represents an integration field of the various goals and functions of various sectors, for example the agricultural/forestry and tourism sectors, and also the traffic, energy, education and other sectors.

The aim of the handbook is mainly to improve the inclusion of the ecology systems and natural green and water areas represented by forests, inland waters, the sea, etc., in the planning processes. In addition to their biodiversity, these areas also provide the main goods, from clean water to healthy food and living environments, and they also increase resilience against unexpected environmental, economic and social changes.

The handbook is intended for all those who are in any way involved in the spatial planning and landscape management processes. It also represents an expert material for raising awareness and educating the professional and general public.

The handbook presents both legal as well as methodological instruments in recognising GI and its spatial planning and management. We consider the motto in the sense of unifying and linking the management procedures with the GI at the various spatial and administrative levels.

The method used and the legal guidelines have been designed as a recommendation to users, and they offer expert support:

- **TO PLANNING AND DECISION-MAKING INSTITUTIONS ON THE STATE LEVEL:** consent givers/ providers of opinions for the harmonisation and simplification of procedures regarding the issue of consents/opinions, to planners of spatial strategies and plans, to draftsmen of strategic and programme documents for the successful implementation of the Water Framework Directive (WFD) and the Marine Strategy Framework Directive (MSFD), and the implementation of the EU measures in other development sectors, to draftsmen of programmes in priority areas/sectors and financing projects (EU, national), and to those harmonising matters on the bilateral and multilateral level in the Danube and Adriatic waters;
- **TO PLANNING AND DECISION-MAKING INSTITUTIONS ON THE LOCAL LEVEL:** to draftsmen of municipal and regional strategies (RSP) and plans (MSP), draftsmen of programmes concerning priority areas and projects co-financed by EU funds and national public funds.

The purpose of the handbook is also to point out the need to establish management of the GI and natural resources, which is one of the conditions for the successful intersectoral performance of activities to preserve a healthy and quality environment.

2 EXPERT BASIS

For a broader and harmonised understanding of the GI concept, some clarifications and definitions of the main terms need to be provided, such as, for example, what GI is, what its main spatial elements are, as well as its functions.

The implementation of the GI, which includes recognition and planning, is a process in which the analyses from spatial data may be helpful. This is why this chapter deals with the technical and methodological starting points for the preparation and analysis of the spatial data for recognising the GI, as well as the proposal of the process for planning the GI. The handbook's appendix provides expert clarification of the specific recognition method, and the process for planning the GI in an environment.

The GI implementation must, of course, be in line with the legal order and procedure, especially in the areas of strategic and spatial planning. The various administrative and spatial levels of legal arrangements must also be considered, from the local level all the way to the level of the European community and beyond. This is why this chapter is concluded with the provision of the legal starting points. Because these are broad, the legal bases and recommendations for supporting the implementation of the GI are presented in detail in the handbook's appendix.

2.1 Definitions of the main terms

In this chapter, we list the definitions of the main terms: GI, ecosystem services (hereinafter: ES), spatial recognition and planning levels for GI and the green and blue corridors.

2.1.1 The definition of green infrastructure

Because there are many planners and beneficiaries of the GI, and because their viewpoints regarding the theoretical and practical aspects of the GI may vary, the GI may be identified in many ways. Since the GI concept and its broad understanding are still being developed, we tend to avoid using the term "definition", which the user could understand as a final, widely accepted understanding. Even the European Commission used the term "working definition" when it explained the GI. This working definition of the European Commission, which is provided below, is most often used in the Slovenian and international space.

The identification or working definition of the European Commission (2013).

The message of the Committee from 2013 states: Many definitions of GI have been developed. It is therefore difficult to cover all aspects in one short paragraph. The following working definition will however be used for the purposes of this Communication: **"Green Infrastructure is 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."**

The report from the Commission to the European Parliament, the European Council, the European Social and Economic Committee and the Committee of the Regions: Review of progress on implementation of the EU green infrastructure strategy [14.] states: "Unlike single-purpose grey infrastructure,

biodiversity-rich green spaces can perform a variety of extremely useful functions, often simultaneously and at very low cost, for the benefit of people, nature and the economy. In the EU, green infrastructure (GI) includes the Natura 2000 network as its backbone, as well as natural and semi-natural spaces outside Natura 2000, such as parks, private gardens, hedges, vegetated buffer strips along rivers, or structure-rich agricultural landscapes with certain features and practices, and artificial features such as green roofs, green walls, or ecobridges and fish ladders."

In essence, the definition from the report is appropriate, because it is not limited only to areas, but also speaks of forming elements in spaces that are managed in order to ensure a wide spectre of ES. These are therefore also planned or formed and managed in parts of the environment which may also include facilities.

The table below provides and describes the various elements of the GI which may overlap, supplement each other, or form the GI together as a network of natural and semi-natural areas that ensure biodiversity and/or ecosystem services required by man.

Table 1: *Green infrastructure elements with examples, made under Mazza et al. [15.]*

GI ELEMENTS	
Core natural areas	Areas with a high value of preserving biodiversity, which are usually protected, such as, for example, Natura 2000 and broader habitats, like the coastal area or vast grasslands.
ES areas	Economically significant areas supplying ES (wood, food, drinking water), which are managed in a sustainable manner so that several other balancing and cultural ES are preserved. They may overlap with the core areas.
Renewed or artificial natural areas or the ES areas	New habitat areas or renewed ecosystems for specific target types and/or increase of inventories of the target ES. They are actually an integral part of the previous two elements.
Green urban and suburban areas	Parks, gardens, smaller forests, green walls and roofs, tree rows, sustainable rainwater collectors, ponds, even green schoolyards, cemeteries, small gardens.
Natural corridors/ links	Natural links, like rivers/creeks, natural linking tree zones, hedgerows, even stone walkways, all of which makes movement possible and improves the situation of species and even the inventory of ES. They are also called green or blue corridors.
Artificial corridors/ links	Artificially generated links with the function of connecting the previous GI elements to allow the movement and migrations of species and to increase the ES inventories. For example, passages for fish, ecoducts across traffic roads, tunnels below traffic roads, etc. Artificial corridors establish the functionality of the green and blue corridors, and as such, are their integral part.

The issue in recognising the GI mainly concerns the question whether a certain area is a GI or not, or that areas may also be recognised as GI with various recognisability or value levels. In recent practices, the areas are recognised with a higher or lesser recognisability than GI, which was demonstrated, for example, by the Regional Workshop on Green Infrastructure and Ecological Connectivity [16.]. This handbook even recognises the GI in space with the help of a scale. The main goal when planning the GI is not just to preserve and increases biodiversity and the ES inventories in the existing GI areas, which are recognised as such with a higher added value, but also in areas which have been recognised as GI with a lower value level.

Photo 1: *Sava river near Ljubljana creates a new, extensive water space with dynamic lateral erosion. It represents a connection between Danube salmon (Hucho hucho) and sand martin (Riparia riparia) habitats as well as human habitats.*

An example of an artificial GI area is the reservoir near Kočevska Reka, which has been recognised as the feeding habitat of the white-tailed eagle, and the nearby forest is the forest reserve. The reservoir is an attractive fishing spot, and everything together is an attractive recreational tourist location. On the other hand, the area is also part of Natura 2000 due to several habitats and species. If the accumulation is removed, then we could lose a certain part of the biodiversity and some ES, but we would increase the habitats for target fish types due to the renewed natural hydro-morphology of the waters, such as, for example, the Mediterranean barbel (Barbus meridionalis) and the Balkan loach (Cobitis elongata).

This could be comprehensively and successfully resolved by establishing the management of the GI and the natural resources.

2.1.2 Ecosystem services

Based on the current practice, there are many definitions and various international ES classifications, such as, for example, The Common International Classification of Ecosystem Services – CICES, The Millennium Ecosystem Assessment – MEA, etc. The latter, the Millennium Ecosystem Assessment Board (MEA), from 2005, is the one that is the most established internationally, and divides the ES into four categories [17.]:

- **PROVISIONING SERVICES:** they provide food, water, wood and fibres as material or fuel, etc.
- **REGULATING SERVICES:** they affect the climate (e.g. carbon sinkhole), floods, diseases, the amount of waste and the quality of water (e.g. filtration of pollutants in surface waters), etc.
- **CULTURAL SERVICES:** they provide recreation, aesthetic and spiritual benefits, research and education, tourism potential, etc.
- **SUPPORTING SERVICES:** the generation of the soil, photosynthesis and the circulation of nutrients, etc.

There are no preservations of populations and habitats in the listed services which do, in fact, occur in some other classifications, like the RESI project classification [18.]. In general, we are proceeding from the viewpoint that a high biodiversity means higher inventories and ES diversity in a certain area, and vice versa. Because the GI includes areas in which we can recognise the function of preserving the endangered populations and habitats (nature conservation areas, etc.), and because biodiversity serves as the guarantee for certain, not yet recognised ES (medicines, research, balancing the number of certain species, etc.), we also included the preservation of populations and habitats into ES due to the recognition and planning of GI.

The division into four main ES categories in MEA has been checked in several studies. We often come across a critical assessment regarding the inclusion of the supporting services as a special category, mainly because supporting ES are more like consequential ES than directly used ES. This is why the standardised CICES classification omits this category, but the corresponding ES are adequately discussed in regulating services, which have been named "Regulation and maintenance services" in this case. **Table 2** shows the aforementioned division of ES into three main categories.

Table 2: *Categorisation of the ecosystem services*

ES CATEGORIES	ECOSYSTEM SERVICE
Provisioning services	Cultivating cultivated plants, pasture farming/grass as fodder, fishing and aquaculture, raw biotic materials (wood, fibres, etc.), water supply (drinking water/irrigation, process water, etc.), biomass for obtaining energy (from cultivated plants, forests), etc.
Regulation and maintenance services	Retention of nutrients/substances, water purification, reduction in greenhouse gasses, alleviating drains and flood hazards, alleviating drought conditions, soil generation, regulating the local climate, improving air quality, preserving populations and habitats, etc.
Cultural services	Landscape value, natural and cultural heritage, education and science, recreation and tourism (fishing, sailing, bathing, cycling, hiking), etc.

The inventory of each ES is interdependent. Inventories of some are being raised and supplemented (synergy), while the inventories of others clash. Example: if a certain area holds more wood (forest), then the same area will also serve as a bigger CO2 sinkhole, and will be able to retain more precipitation. And vice versa - areas with intensive farming or extensive cultivation of cultivated plants will hold less wood, tourism and the mitigation of high water drainages.

Inventories and demand for individual ES depend on the geographical peculiarities and the needs of the inhabitants, and are different from case to case. An example of the needs under certain ES, and for preserving their inventories, is provided in the table in Annex no. 1 - marked are the target ES, due to which a certain legal regime has been initially established, and the readers may think about the links between them (synergies and clashes) in specific cases. The table may also serve as a worksheet at harmonisation events, or when informing the public (local communities, schools, workshops) about ES and GI.

Figure 3 shows how the total ES inventory and the number of a certain target species changes with the change in the intensity of land use and the intensity of using certain ES. Let's take this example: An area is being used extensively for the production of food (agriculture), which means that the usage of fertilisers and plant protection products is limited, the agricultural surfaces are covered with hedgerows, and the natural vegetation state is preserved on watercourses. The crop is not at its maximum, of course, and even the agricultural management is more expensive than in the case of intensive use. However, the inventory and the diversity of other ES, and the presence of the target types, remain high in such land use. It is different in intensive farming, where there are more crops, i.e. a high inventory of ES cultivating cultivated plants, but due to the over-exploitation of the area, this leads to a dwindling inventory of all the other ES, as well as lower biodiversity.

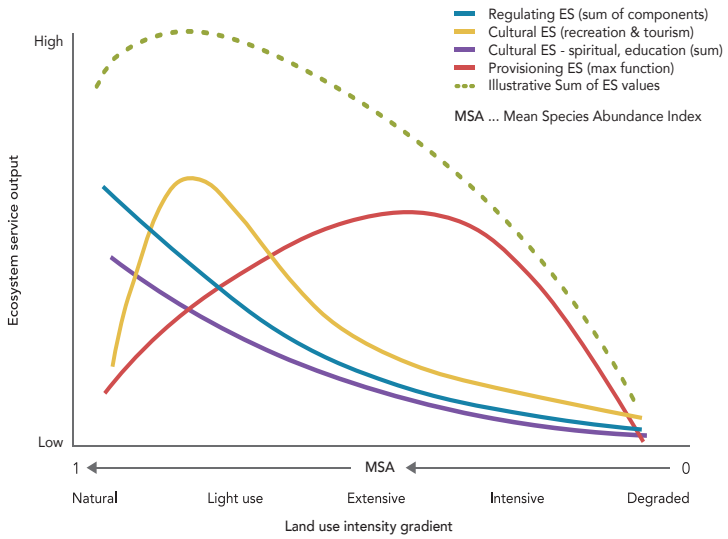


Figure 3: *Hypothetical interdependence between the intensity of land use, the index of the average number of species and the ES inventory in a certain area. Modified after [21.]*

For the avoidance of doubt, the term "landscape services" (hereinafter: LS) needs to be mentioned, which is also used in specialised literature. LS is an even broader term than ES, because in addition to the services of "nature" and "ecosystems", they also include services provided by the anthropogenic transformed area. Thus, LS also include accommodation, industrial production, extraction of minerals, production of food in greenhouses, etc. [19.] This handbook names these other landscape services as other landscape services. ES is a much more established term globally, and has also been clarified in

the MEA report - Ecosystems and human well-being [17.]. The terminology and typification of ES into four or three groups is widely recognised, which is why this handbook only uses the term ecosystem services, while other services, accommodation, traffic, etc., are named as other landscape services.

Photo 2: *Wooden retaining wall or weir ("Kranjska stena") is a traditional technique for erosion mitigation caused by water. Our ancestors used this technique in the construction of dams and mills to drive mills and sawmills. These arrangements do not endanger the local habitat but rather enrich it. For this reason, "Kranjska stena" is deservedly entered in the Register of Living Cultural Heritage of the Republic of Slovenia.*

The supply of quality drinking water is one of the key human needs which landscape that is not intensively used may efficiently provide. Over-usage of ES and inadequate planning of other landscape usages (traffic, accommodation, industry, etc.) at a catchment area for drinking water, reduces the supply and increases the risk of water pollution.

This is why the protection of the environment and the prevention of the possible risks of polluting or reducing water quantities need to be considered in the planning phase of the new rail connection between the coast and the hinterland (second railway track), and when seeking technically optimal and cost-efficient solutions The technical solution, which is more favourable investment-wise, may include a higher risk level for supplying water at the coast (the danger of spillages of hazardous substances, interruption of the underground water flows, etc.). This is why there may be higher costs to ensure an alternative supply of drinking water to the entire coastal region in the future, due to the pollution or a reduction in the water source flow. Such an alternative supply could require the construction of new pipelines from remote areas (even across the border) or desalinisation systems, which would additionally burden the landscape with objects and infrastructure, and would have a direct impact on the reduction in the value of the landscape and a negative indirect impact on the attractiveness for tourists. This is why the analyses of benefits and costs need to include the benefits provided by the natural area.

2.1.3 Levels: macro, mezzo, micro

We recognise and plan GI at various landscape levels, e.g. the cross-border, national and local levels. We have two methods for recognising and planning GI:

- **TOP-DOWN**: recognising and harmonising planning that begins at a smaller scale, such as, for example, on the regional macro level, which is then "dropped" through the national mezzo level to the specific, municipal/local recognition and planning,
- **BOTTOM-UP**: recognising and planning that begins on a large, detailed scale, for example on the level of the local community and its inhabitants, which is then "integrated" into smaller scales through the national into the regional scale.

Both methods are interrelated in practice and complement each other. If we wish to achieve solutions that will be efficient on various levels, then the GI planning process needs to include the decision-makers on the intergovernmental and macroregional level, on the strategic and on the local level, and good communication needs to be established between them.

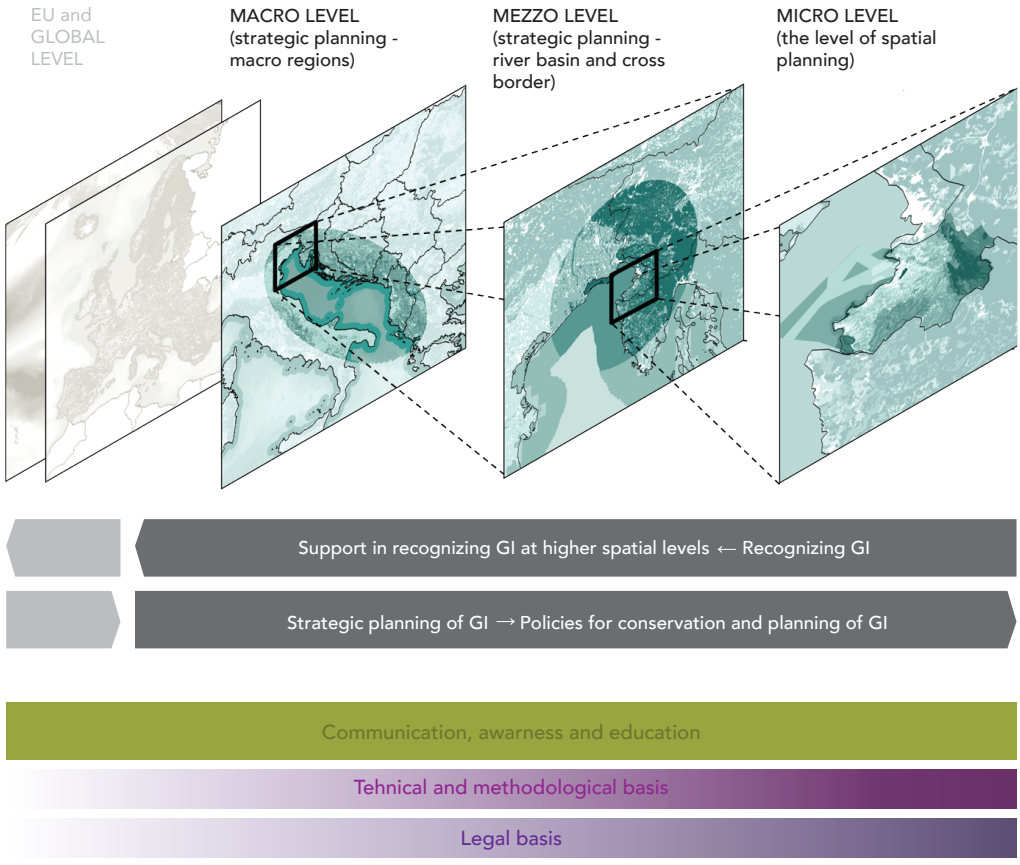


Figure 4: *Recognising and planning GI at the various legal and landscape areas.*

Macro level

The GI on the macro level is recognised and planned on the level of the EU macro regions. The GI implementation is an important goal of macroregional strategies and strategic programmes of the EU for the Adriatic-Ionian, Alpine and Danube regions. Without a harmonised plan to ensure ES on the macro/mezzo level, even the best situation at a certain micro area cannot ensure high and diverse inventories of ES. A good example is the Slovenian sea: because one part of the northern Adriatic, which falls under Slovenia, is

very small, and we are directly dependent on the strategies of the neighbouring countries, Italy and Croatia, in ensuring the quality of the sea environment. The precondition for a healthy natural environment in this case is to ensure sensible decisions of all the three countries and their good cooperation on the macroregional level.

Mezzo level

The GI on the mezzo level is recognised and planned in cross-border areas of the EU countries and in areas of individual river basins within the national state borders. Generally speaking, the national spatial strategy is also discussed at this level. The latter should also take into consideration the natural and geographical factors of a certain landscape, or even region [23.], when directing the spatial development, which generally dictate the adjustments of the inhabitants and the activity.

Micro level

Individual elements of the GI are recognised, preserved and renewed (as necessary) on the micro level, which ensure biodiversity, the main ES and the development of additional ES inventories. The latter may be recognised in a certain environment as a positive indicator for the development of a healthy environment for a better quality of life of people, and a good ecological situation of the habitats in each area.

When determining whether a certain situation is a macro, mezzo or micro level of decision-making and functioning, the terms "spatial and legal dimensions" need to be considered. The term "spatial dimension" relates directly to the size of the discussed area, while "legal dimensions" represent strategies, laws, etc., which need to be taken into account in a certain area. In practice, we often see cases in which the functioning needs to be on the macro level as well as on the micro level. Example: the Vipava river basin is not particularly vast, but it extends across two countries, Slovenia and Italy. The legal dimension in this case is the one due to which the interventions in this area must be planned on the cross-border mezzo level: the legal systems of both countries need to be observed.

Slovenia is relatively rich with waters and water sources - it is at the very top of the European countries in water richness. Even though a water protection area is secured by the state, the provision of drinking water is performed on the level of the municipalities (micro level).

Most of the water supply in Slovenia is provided within the same river basin, where the municipality which depends on this water source is also situated. This does not apply for the Slovenian coast: in order to provide the coastal municipalities with sufficient drinking water, water will probably have to be brought from another river basin, which extends the issue to: (1) the state's mezzo level, should we decide to preserve independence in the sense of water security and provide water ourselves from other available water sources, or (2) the cross-border mezzo level, should we obtain water from sources in the neighbouring countries (Croatia, Italy), whereby at least one part of the Slovenian territory becomes dependent on the decisions of the neighbouring countries.

To achieve long-term stability regarding drinking water sources, global thinking is required (macro level), especially in recent times. The precipitation samples, their quantities and evaporation, all depend on the events on a (much) larger area; climate changes are global. Planning and harmonising strategies in such cases must therefore be performed on a regional macro level or even on a global level.

2.1.4 Green and blue corridors

The GI elements are also spatial or functional links - the so-called green and blue corridors (hereinafter: GBC) - between individual other GI elements, especially core areas. The main function of GBC is the migration of organisms in the various development stages. Green corridors are functional links on land, while blue corridors are present on waters, i.e. seas and inland waters; in some cases, the so-called stone walkways (Figure 5) serve as corridors.

Organisms also move with material and energy flows between individual important natural areas that provide them with food and other conditions for their existence, such as reproduction, development and shelter. Even man seeks such corridors, because food supply in this area is higher; at sea, for example, such areas are those that have a richer fish presence. The additional support in recognising and managing GBC are the flows of materials and energies, human practices and other landscape facts.

The undisturbed ecological functions of GBC, the migration of organisms in all the development stages, and the transfer of materials and energies, all support the ecological functions and supply of ES in the core areas of GI. The opposite is also true - a good ecological situation in the core areas and their high biodiversity means that more organisms will migrate. The improvement of the functionality and moderate usage in GBC areas, together with core areas and other GI elements (**Table 1**), increase the inventory and diversity of ES (fishery, marine fish farming), which as such form a well preserved GI.

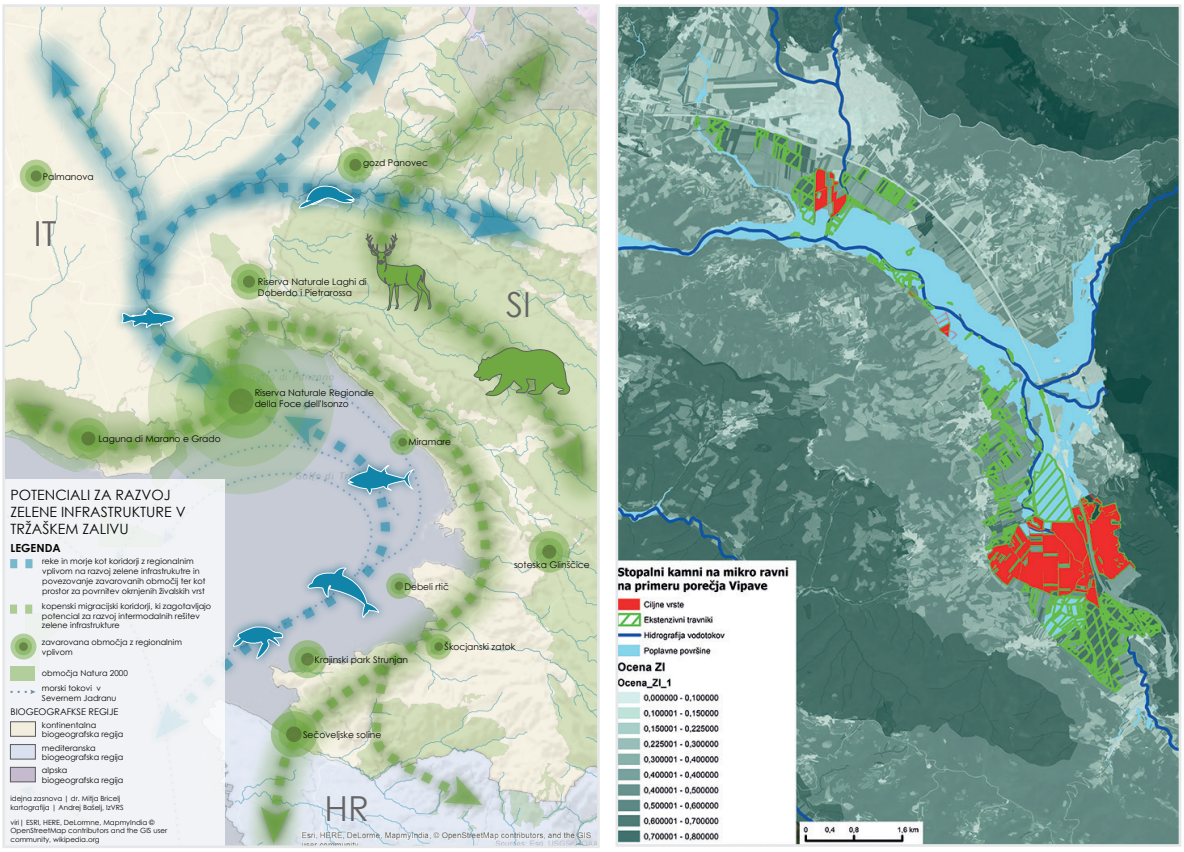


Figure 5: *The display of the blue and green corridors (left image: The green potential and corridors at the Gulf of Trieste) and stone walkways (image right: the red colour represents a habitat of two endangered species of butterflies near the Vipava river: the scarce large blue and the large copper; the Grevislin project). The corridors are an unbroken link between the GI areas, while stone walkways break off in places.*

In 2020, the Ministry of the Environment and Spatial Planning (MESP) organised several meetings in order to harmonise the sectoral views on GI and its implementation at sea and on the coast. These meetings were attended by experts in nature, spatial planning and water. Among other things, we agreed on the definition of green and blue corridors: **"Green and blue corridors are the spatial link between green infrastructure areas that preserve or improve biodiversity and/or the inventory of ecosystem services"**.

GBC can be discussed on all three levels: macro, mezzo and micro level. Corridors on the macro and mezzo level are recognised as the main general links where migrations of species, materials and energy take place. For example, the Danube river, as the regional stream, may be recognised as an inland blue corridor on the macro level. Concrete corridors are recognised and planned on the micro level, for example a natural mountain pass or ecoduct across a motorway in spatial planning processes.

In nature, the blue and green corridors often intertwine and pass from one to another. Let's think about brackish waters, river deltas, wetland areas, etc. Even land organisms need water to survive. The transfer of materials and energy in nature is performed continuously. **The motto in planning the green-blue corridors, especially blue corridors, is to preserve the water continuum, i.e. the flow continuity of organisms, materials and energy from rivers and lakes inland, through the coastal areas and brackish waters to the sea and back.**

Regarding the recognition and displays of the blue and green corridors in an area, it needs to be said that this is a generalisation. Namely, the line or zone of a certain width that represents a corridor in an area marks the highest probability of the occurrence of a certain indicative species or its migration path. There is, of course, a deviation from this line, because some members of a certain species may also appear at completely unexpected places.

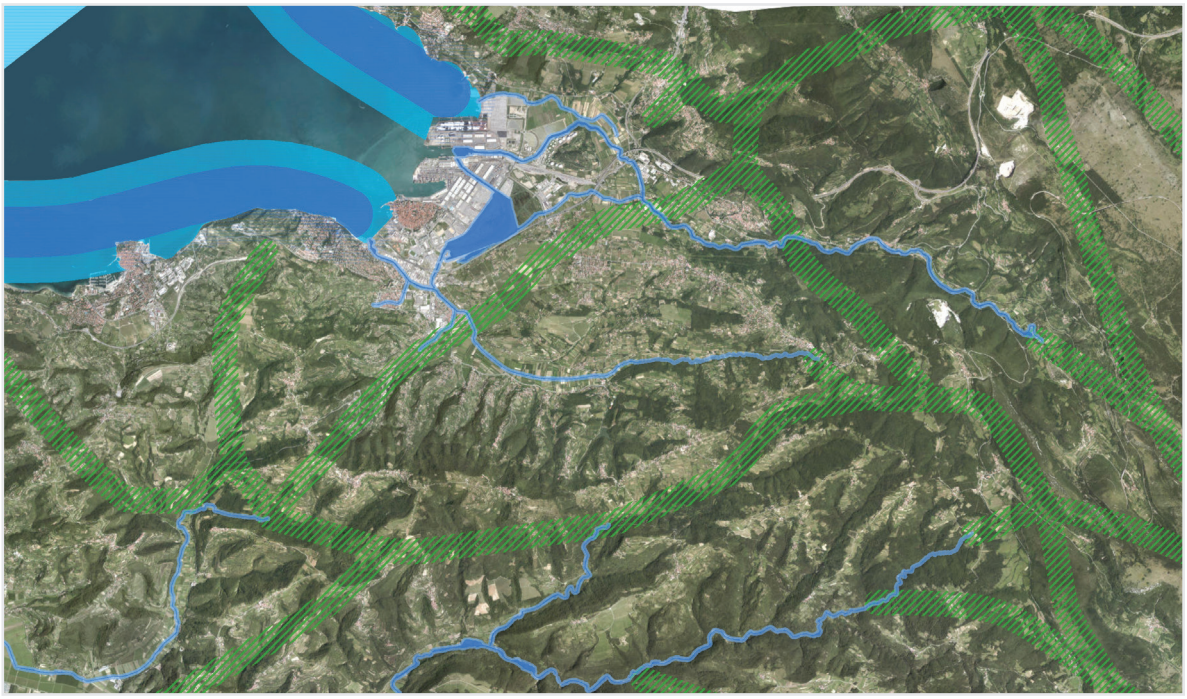


Figure 6: *The link between sea and land via the blue corridors (in the sea and in water areas on land) and green corridors (on land). We use the recognised corridors on this mezzo level to show the main links for the migration of organisms, and even the transfer of energy and materials; with spatial planning on the micro level, we can adjust these to the landscape resources and other usages thereof with diversions and artificial links.*

2.2 Important elements of a green infrastructure area

This subchapter describes the elements of an area that represent the basis for "green infrastructure". These are especially green areas, agricultural and forest land, waters and water lands, including wetland areas, floodplains and the sea. As well as hedgerows, individual trees, areas above the tree line, etc. The elements of space that represent the basis for the GI also include natural areas and semi-natural and constructed areas: parks, green bridges, water bridges, fish paths, etc. Even semi-natural and constructed elements link the core areas of GI, and serve to increase the biodiversity rate and ES inventories in the environment (artificial links/corridors of GI are planned mainly where the natural paths for animal species were broken off in the past). On the basis of all these spatial elements, we recognise the existing GI in an area and plan future GI elements.

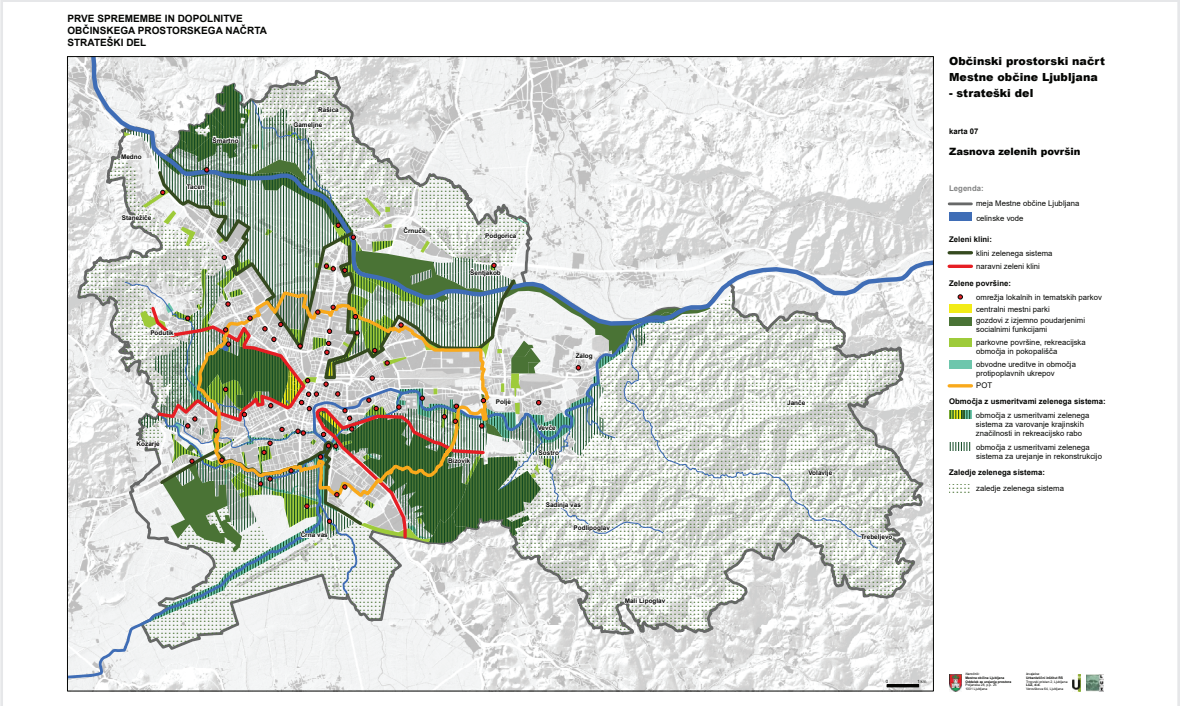


Figure 7: *The green area design in the City of Ljubljana on the strategic level as the basis for recognising and planning GI [38.].*

2.2.1 Green areas

Based on their planned use, the green areas are building lots where the construction of objects is generally not permitted. In line with the described GI elements (Table 1), these are green urban and certain suburban areas. Based on this planned use, an open space is arranged in settlements and is accessible to everyone. Within the colonisation areas, the predominant part of usage is intended for the second usage (facilities, grey infrastructure). However, it is required for a certain part of a building plot to be a green area or to include greening.

The spatial plan of the Republic of Slovenia states that green areas, in general, must not be reduced, or they need to be replaced. Because green areas do not have their "own" carrier of spatial arrangement, the implementation of this rule falls mainly on the municipality and its inhabitants.

In the case of urban and suburban green areas, we generally address the regulation and maintenance and cultural ES; the provisioning ES can, for example, be linked with the design of garden areas.

2.2.2 Agricultural and forest land

Planning agricultural and forest land in the framework of spatial planning runs in line with the guidelines of the competent ministry as the carrier of spatial arrangement, which is tasked with taking care of agricultural production and the protection of forests.

The main function or ES of agricultural land is the production of food. Based on their spatial extent, these areas are also performing other functions, like landscape, ecological and tourism functions: "In areas that preserve cultural heritage and in exceptional landscapes where agricultural surfaces are fragmentary and border on the forest edge, the existing scope of agricultural land is generally preserved as an important element of cultural heritage. /.../ The excessive growth of agricultural land is prevented at cultural heritage sites and exceptional landscapes are preserved, as well as favourable conditions for flora and fauna and in order to preserve the tourism potential."

From the perspective of recognising GI with a higher value of agricultural land, it is important to consider that they do not solely ensure the production of food, but also perform other functions or ES, especially in connection with environmentalism, water protection and the protection against water.

Forest land performs various functions or ensures diverse ES, also recognised by the legislation in its general provisions; namely, "The functions of forests are ecological (the protection of forest land and stands, the hydrology function, the function of preserving biodiversity, and the climate function), social (protective function - protecting facilities, recreational, tourism, educational, research, hygiene and health function, the function of protecting the natural values, the function of preserving the cultural heritage, defence and aesthetic function), and productive (wood production function, acquiring other forest goods, and the hunting function)."

2.2.3 Waters and water areas

The areas where the water is permanently or occasionally present, and thus special hydrological, geomorphological and biological conditions are formed that define the water and waterside ecosystem, are surface water areas.

The RS regulations on spatial planning state that the broader importance of the water areas and coastal land needs to be considered when planning spatial arrangements and activities, and during their development in the water land areas, in a way that:

- the properties of water areas as biotopes are preserved, as well as the important visible spatial elements, which contributes to the increase of landscape recognition,
- the ecosystem role and the continuity of surface waters are ensured (the living space of the protected and endangered flora and fauna, the passability for animal and plant types in surface water areas, etc.),
- water lands are treated as potential cultural heritage areas when planning spatial arrangements.

Coastal zone/coast/shore zone

To ensure a healthy water environment, the coastal zone spans for inland waters for streams of first order 15 m from the end of the water land in settlements, and 40 m outside settlements. With other inland waters, this zone is 5 m. At the sea, the shore zone is 25 metres. The coastal/shore zone does not belong to the scope of planned water use and is, regardless of its legal status and ownership, a type of regime for other purposes, such as agricultural or forest use, or one of the building plots in settlements.

Other land in the water area

Due to the protection of water areas, the enabling of flooding, enriching streamflow droughts, pre-

venting adverse consequences of water (floods, erosion, etc.), allowing public usage of waters and the water area, many other areas that are related to waters and water areas are recognised in line with the law governing waters which also determine the restrictions and conditions for using this area. In terms of recognising and planning GI, these are especially flood prone areas, water protection areas, bathing waters with an area of influence.

2.2.4 Sea

An integral part of GI is also the sea, as one of the most important water elements. Even when it comes to the sea, its protection and management is planned on the micro, mezzo and macro levels. Due to global issues and because a major part of the global oceans reaches beyond the national jurisdiction areas, we can, and must, lean on many international legal bases. Many of them highlight the preservation of the coastal area for the benefit of the current and future generations, in order to ensure natural resources, especially drinking water. Thus, the preservation of comprehensive coastal ecosystems, landscapes and geomorphology must be ensured. Measures for preventing and mitigating the impacts of natural disasters are important, as well as climate changes. To achieve these goals, active participation on the state and cross-border levels needs to be developed and strengthened.

2.3 Technical and methodological bases

The process of recognising and planning GI is supported by several studies and practices that offer methodologies and processes for describing and analysing an area. These are tools and methods that make it possible to prepare and analyse large databases containing spatial data, due to the development of information technologies.

Recognising and planning GI is a cyclical process in which the first step includes the recognition of an area in terms of the ecosystem services that define the recognition of the area as a GI. The second step then requires the planning of a new GI on the basis of the recognised needs to improve biodiversity, or ecosystem services that are needed (e.g. people need wood for heating) and for which a certain area has the required potential. Based on the assessment of the current situation and the demand for services, both for ecosystem as well as other services, e.g. the provision of a living environment, the production of goods, business services, transport, etc., a harmonised planning and GI implementation is then performed in the subsequent steps. The process is cyclical and is to be concluded again by capitalising and recognising the GI of a certain area.

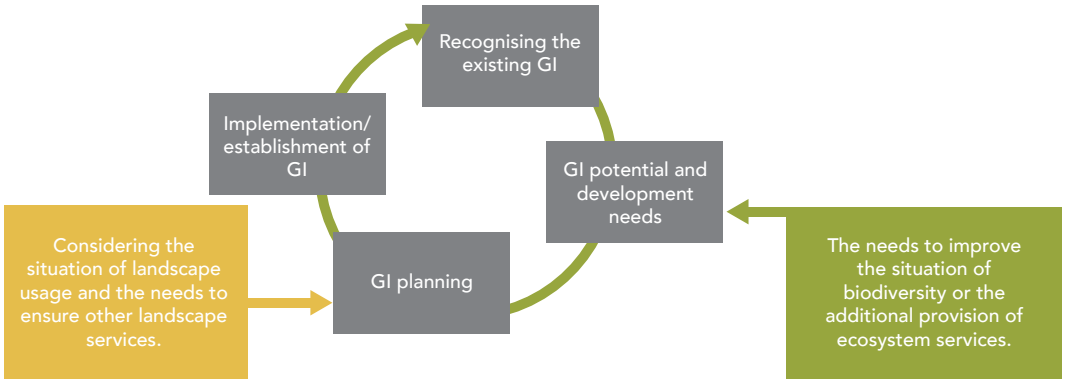


Figure 8: *The process of recognising and planning GI in an area.*

When recognising GI, it is appropriate to first include the available spatial information which legally defines an area with which the other usage of the area is either protected or restricted, and is primarily in the function of preserving and ensuring target ES (e.g. preserving appropriate habitats for endangered species or ensuring a quality water supply). Then, information that does not yet have a legal basis, but represents elements of space that are important for ensuring ES, should be included. E.g. natural and semi-natural areas, green belt, hedgerows/hedges or other elements that ensure a suitable microclimate, and anti-wind or anti-erosion protection. (**Figure 9**).

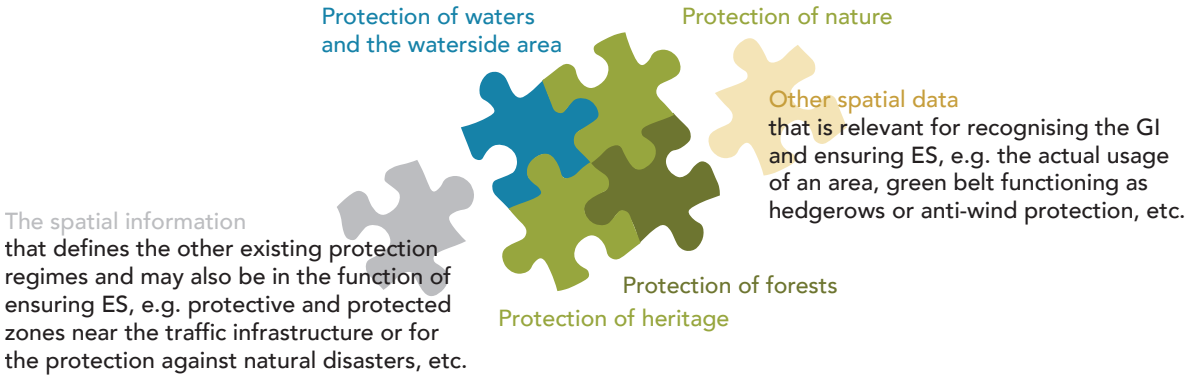


Figure 9: *Spatial data that is relevant for recognising GI.*

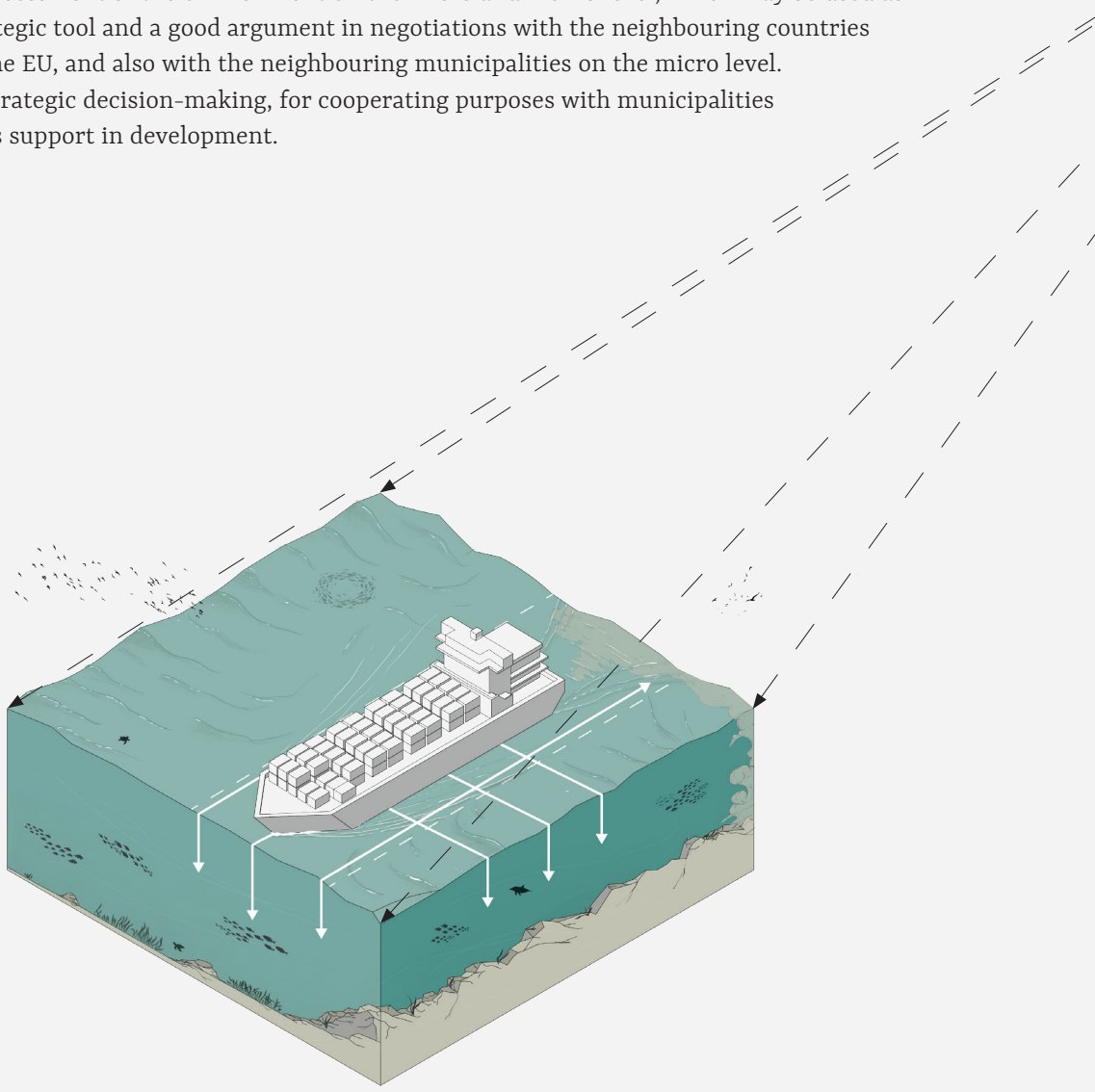
Because a detailed presentation of a concrete method and the implementation of its procedure is more extensive and more technically demanding, it is discussed separately in chapter 5 APPENDIX - METHODOLOGICAL BASES. **Figure 10** shows the result of this method, i.e. the GI map of the Slovenian sea and coast with its surroundings, which shows the area from the GI perspective with a scale. Areas with a higher level of recognised GI are marked with a darker green colour, and vice versa. A high level of recognised GI means that there are multiple protection regimes in the area (e.g. Natura 2000, water protection area, etc.) and that such an area is more natural, based on the actual usage (forest, water surface, etc.).

Example: We can assume that forests offer more ES than land with buildings: wood supply, better microclimate, the preservation of biodiversity and the supply of drinking water. Thus, a forest, by the very basic definition of GI, has a higher level of recognised GI compared to land with buildings.

The ecosystem services and the recognition of GI is not concerned only with the surface; the third dimension must also be taken into account. The land surface is made from various soil layers and even sediment or bedrock that are home to several organisms, and participate in biochemical processes. Not to mention the underground world (karst) and air (corridors and the living environment for birds and many other organisms). The third dimension and functionality is even more obvious in the sea, from the bottom of the sea (of various thick layers) to its surface where various physical (flows, temperature layers) and ecosystem layers and areas follow each other or intertwine. The above is shown in the snapshot of the sea in **Figure 10**.

The chart of the recognised GI may serve as the basis for:

- The statistics of municipalities: what share of the municipality is covered by the recognised GI areas, what are the inventory values of ES in the municipality, on the basis of which we could, for example, update the assessment of the environmental contribution.
- The chart of Slovenia: what proportion of the recognised GI surface has a value over 75%, for example; this information can directly affect the prices of land and real estate.
- Landscape design: the level of recognised GI in an area may be a very useful basis for spatial planning. Among other things, it shows where green areas should be expanded to, and where the transfer between the grey and green areas may be mitigated.
- Restrictions in an area: light coloured areas are areas where pressures are higher and where, should we wish to preserve the quality of life, interventions need to be carefully designed and their reasonability assessed.
- The assessment of the environment on the micro and mezzo level, which may be used as a strategic tool and a good argument in negotiations with the neighbouring countries and the EU, and also with the neighbouring municipalities on the micro level.
- The strategic decision-making, for cooperating purposes with municipalities and as support in development.



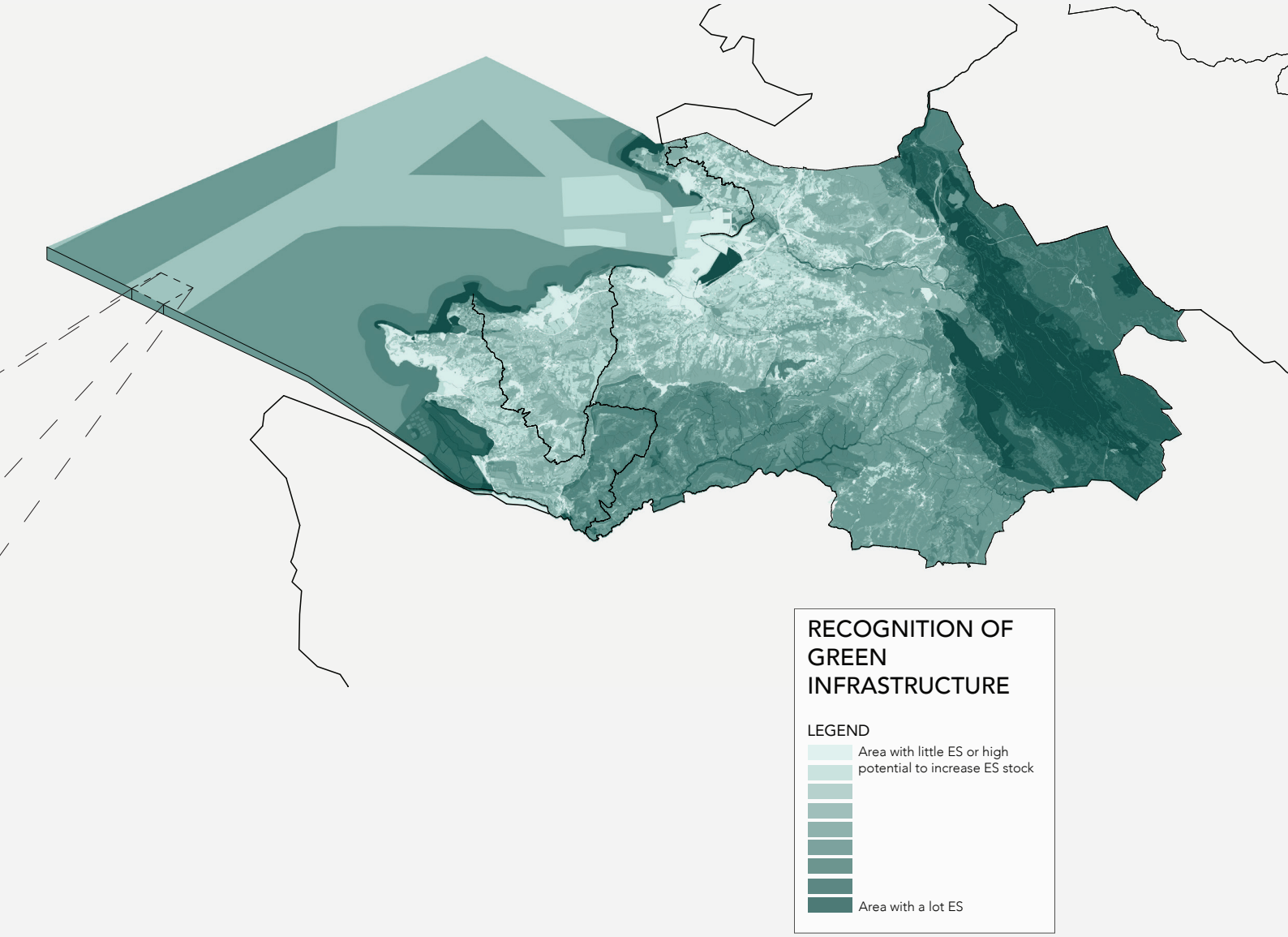


Figure 10: *A chart of the recognised green infrastructure of the sea and coastal municipalities with an increased snapshot of the sea.*

The chart of the recognised GI also shows potential green and blue corridors, and it may also serve as the basis for their planning: we may comprehensively assess how and when the green and blue corridors would be best designed in an area, in order to improve the biodiversity and/or the ES stock there.

The analyses for recognising the existing and planning the new GI may be very extensive, which is why it would be reasonable to implement them in the scope of the spatial planning processes when certain information may be additionally obtained. In today's information age, when measures and analyses are quickly linked and exchanged, and when satellite acquisition of the various information in real time is part of daily operations, the latter should not be a significant barrier. The continuation of the works presented by this handbook is also mentioned.

2.4 Legal bases

In today's time, we cannot speak of a classic legal arrangement of the GI because the term is not legally defined, and no legal consequences are tied to it. As opposed to the public economic infrastructure which is systemically defined by law governing spatial arrangements, and the legal consequences of which are defined in other regulations, the GI has no direct legal consequences. It does not even have any legal consequences in EU law, as opposed to, for example, the Natura 2000 areas, which constitutes a comprehensive material and procedural legal instrument. Thus, the issues of spatial planning, arrangement and management of GI are of a legislative or programme nature, and are resolved via the various other legal instruments. These are instruments that fall into the competence of the state or the local level, or the competencies of one or the other are complemented by one another. The intertwinement of powers is most common in formal positions.

The strategic and programme documents generally define the GI and its importance. Such directions also provide a basis for further planning and the normative upgrade of this area that is just being integrated into our legal order and conceptual apparatus. Spatial planning and the environmental interventions is a complex process which includes various levels of power, know-how and interests. As is common in legislative situations, the structure of a process defines the roles of the participants, and therefore the content of the final result. In legal bases, the management role plays a very major role. The division of competences between municipalities and the state is often poorly defined, which is also particularly apparent in recognising and planning the GI. We are therefore discussing the legal bases separately, which need to be considered on the macro, mezzo and micro levels of managing GI:

- **programme-normative aspects**, which include the strategic development and spatial directions, intended use, departmental legal regimes and other bases for interventions and activities: the main and detailed intended use, how it is defined in a settlement and landscape, insurances (nature, culture), the issue of multi-purpose use;
- **management aspects**, which include the competences and the management practice of (potential) GI: managing protected areas and cultural heritage, waters, Natura 2000, ownership - legal relations or the restriction of property rights and compensations, the transfer of state-owned land to municipalities, the role of the Farmland and Forest Fund of RS in leases and purchases;
- **procedural aspects** of spatial planning, the National Spatial Plan (NSP), the Regional Spatial Plan (RSP), the Municipal Spatial Plan (MSP), the Detailed Municipal Spatial Plan (DMSP) - for one or many municipalities, the Decree on the appearance of settlements, who participates in the process and in what way: the overview of the state of the area, the definition of the settlement's planning zone, the landscape development, the method and participation in the processes of adopting legal acts, subsidiarity and replacement measures by the state, the process of placing municipal landscapes in the area of the country's spatial and other regimes (NSP, defence, natural disasters, recoveries), control, costs;
- **cross-border aspects**: participation in the framework of the EU's acquis, macroregional strategies, the European Green Deal, the European Grouping of Territorial Cooperation, the Directive on establishing a framework for maritime spatial planning, the Water Directive, the Marine Strategy Framework Directive, the Habitat Directive and Birds Directive (Natura 2000), the Barcelona Convention, the protection of the seas outside the scope of national jurisdictions, the Particularly Sensitive Sea Area (PSSA), and other forms of protecting the blue corridors, protocols, bilateral agreements at river basins, cross-border project cooperation.

When recognising and planning the GI, which, for now, does not have any legal bases, and only has directions, the existing legal regimes need to be respected. In the short term, it is reasonable to seek the means to preserve and establish green areas on an existing and established legal basis (in the area of nature, waters, forests, cultural heritage, etc.). In the long term, it would be sensible to think about (gradual) changes of laws so that strategic policies for GI eventually become binding.

The challenge for the (near) future is also the synergy between the various existing legal regimes: the sectoral partial approach, which is still strongly present in Slovenia, would need to be overcome. The opinions of experts from various areas often vary even regarding the recognition and planning of GI. We wish to note here that even the various legal regimes may be in synergy, and that they may be used in a synchronised manner to achieve the common goal - the implementation of the European green deal. Example: restricting the implementation of intensive agriculture and the use of fertilisers in coastal areas, the main purpose of which is to improve water quality (streams and underground waters) and to aid in preserving nature (the improvement of habitats for flora and fauna).

The area concerning the protection of water and water sources in Slovenia is directly governed by the water protection regulations. It mainly concerns the protection of the water protection areas, coastal/shore land as the mandatory integral part of a healthy stream, and flood areas. Certain usages in these areas that could threaten water supply, reduce the quality of streams and reduce flood areas, are restricted or prohibited.

An ownership right on land that is located in a surface water protection area can be taken away or restricted in line with the expropriation regulations. If more protection regimes are located in the same area in line with this law, then the stricter regime is used.

These and similar regulations have been adopted mainly to preserve the good quality of water, and in sufficient quantities, which also includes the supply of drinking water. The latter is a constitutional right in Slovenia. There are many regulations and provisions, but it is sufficient to know that money cannot be used for drinking, and to include this knowledge in the behaviour of the development of human activities and the implementation of measures.

3 THE CURRENT PRACTICE OF GREEN INFRASTRUCTURE

This chapter presents some of the successful cases of implementing the GI concept at various spatial levels that concern Slovenia. The handbook also presents some other cases in other places in text or image format; for example, the design of the green areas in the City of Ljubljana (**Figure 7**), and the design of the Municipality of Ankaran (**Figure 28**). There are many more (successful) practices and cases, of course. We should mention one of the more successful in the area of promotion, recognition and strategic planning of GI. This is the Strategy for the protection and development of green infrastructure in the Ljubljana urban region, which was prepared by the Regional development agency of the Ljubljana urban region and the Urban Institute of Ljubljana in the framework of the PERFECT project [26.]. It was prepared with the stakeholders at various levels: the representatives of the national, regional and local powers, expert services, research institutions, and managers of protected areas.

3.1 Macro level - protected areas and blue corridors

For the purposes of evaluating the situation of the protected areas in the Mediterranean sea and other efficient measures concerning the protection of nature, the harmonisation and the efficiency of the network of the protected sea areas at the Adriatic sea was assessed in the framework of the COHENET project, and a specific proposal was made to improve the efficiency and harmonisation of the protected sea areas with a specific proposal of having new protected areas and to ensure their interconnectivity.

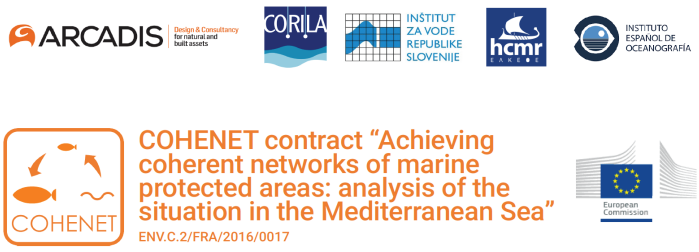


Figure 11: *The COHENET project - achieving harmonised networks of protected sea areas: the analysis of the situation in the Mediterranean sea aims to contribute to the part of the European Commission in the development and testing of the method for assessing the efficiency and harmonisation of networks of protected sea areas, and to provide tools for assessing any deficiencies of data sources and their consistency.*

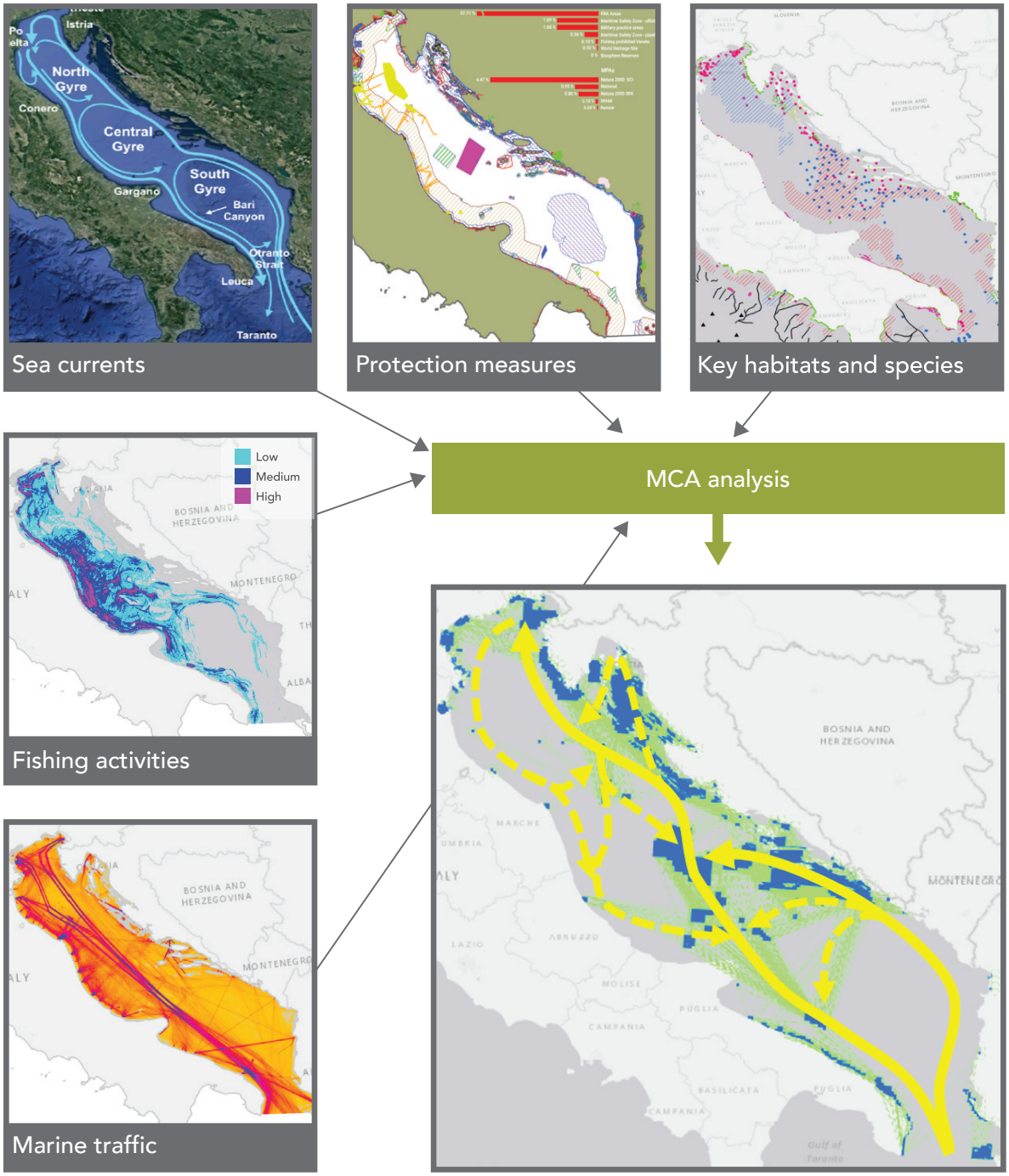


Figure 12: *A demonstration of the proposal of protected sea areas in the Adriatic sea by recognising the main blue corridors (yellow) on the basis of a multi-targeted analysis of the data on physical characteristics, important habitats and species, existing limitations of sea usage and the preservation of the main existing uses.*

3.2 Macro level - cross-border biospherical reserve Mura-Drava-Danube

In 2011, the ministers of the environment from Austria, Slovenia, Croatia, Hungary and Serbia signed the declaration on the establishment of a biospherical area of the five regions at Mura-Drava-Danube (MDD) in Budapest in 2011, at the initiative of the WWF. Its length of 700 km should serve as a kind of European Amazon river, connecting the most valuable environmental and natural river and alluvial areas near the three rivers. The MDD biospherical reserve spans 300,000 hectares of central and protected zones, and approximately 700,000 hectares of transition zones. According to the GI concept, the entire area is recognised as a GI, mainly due to the rich biodiversity and the varied habitats, water, waterside and land. In recognising other ES, it has been found that this area is a massive flood area with functions of retaining water, which mitigates the downstream flood threat and allows the charging of aquifers for drinking waters along and downstream from the biospherical MDD reserve.

The area itself may also offer several other ES with its sustainable usage, from fishing, hunting, using wood raw materials, the formation of humus, to research and educational activities and sustainable tourism (hiking, boating, relaxation, etc.).

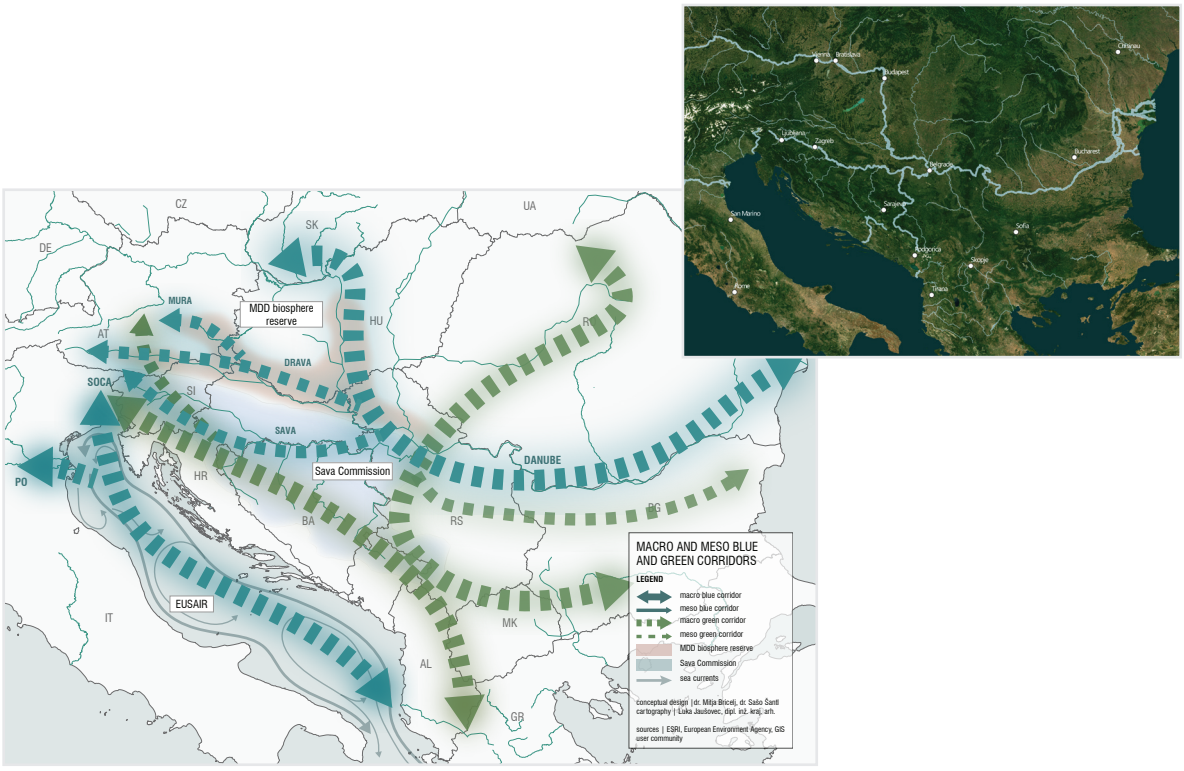


Figure 13: *The blue and green corridors as lifelines for sustainable development and connection on the macro regional level and beyond.*

Recognising and preserving the functions of macro blue and green corridors requires cross-border cooperation (**Figure 13**). For successful cooperation, it should be noted that migrations of organisms, flows of materials and energies, and the ES supply, are not aware of any administrative borders.

As a major core area, which the biospherical MDD reserve represents, additional blue and green corridors may be established, therefore successfully increasing the biodiversity and stock of other ES and

beyond. For example, by recognising the inland blue corridor in the downstream direction of the Danube river to the mouth of the Sava river and then upstream on that river, the story may be successfully linked with the international Sava Commission and its activities concerning flood protection, management of water sources, the achievement of good water statuses and the harmonisation with potential cross-usage, such as sailing and non-sustainable hydro power. The recognition and preservation of corridors allows connections between macro regions as well, for example between the Adriatic-Ionian and Danube macro regions.

3.3 Mezzo level - blue and green corridors at the Slovenian sea and coast

In the framework of preparing the Marine Strategic Plan of Slovenia (PPN), a more detailed discussion of the role of the sea and the corresponding function of the coastal area is being planned.

Each core GI area (protected sea areas, Natura 2000 areas, areas with a recognised major stock of ES) is part of the comprehensive network via the green and blue corridors or stone walkways. In designing PPN, we studied and implemented the process of recognising the blue corridors in the Slovenian sea and the blue and green inland corridors (**Figure 14**).

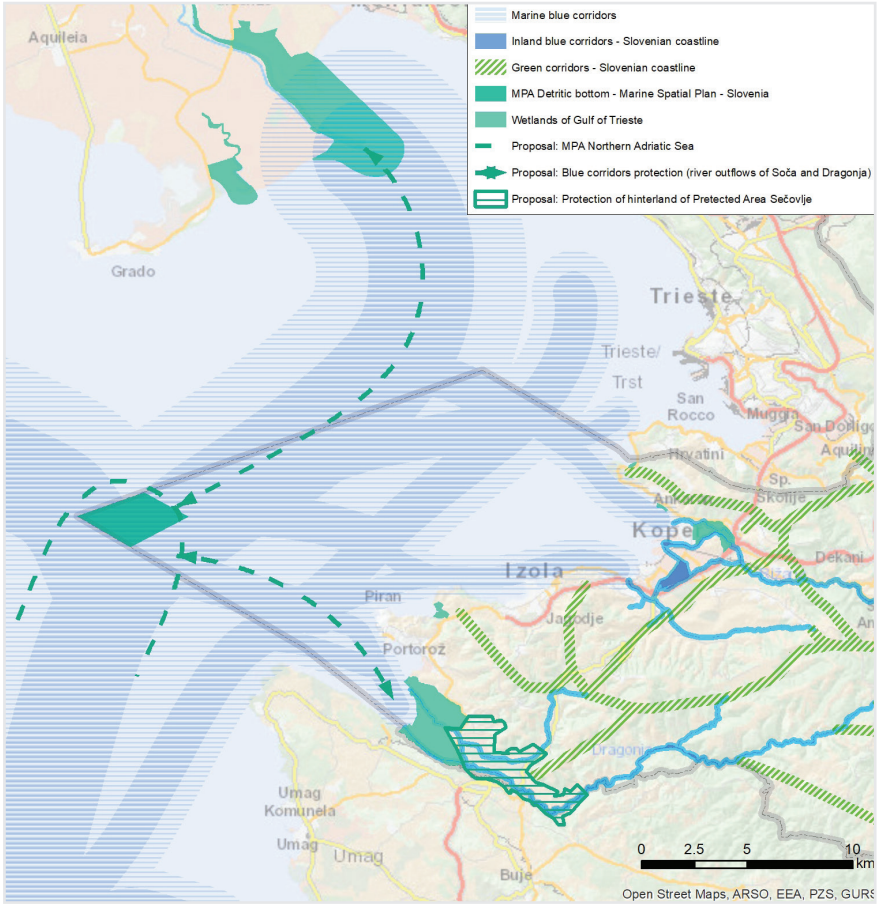


Figure 14: *An overview of the recognised main trajectories of the blue and green corridors and the proposal of new protected areas and blue corridors in the northern Adriatic sea. All corridors and protected areas are an integral part of GI.*

The results of this work were also welcomed on the level of the EU, and the General Secretariat of the Council of the European Union included them in March 2021 in their last adopted document on the Sustainable Blue Economy.

During the recognition of the blue and green corridors in the Slovenian sea, we considered the recognised main migration paths of sea mammals, the directions of the main sea currents (link with the macroregional GI), the results of the COHENET macroregional project (Figure 12), the location of the important coastal habitats (the Natura 2000 areas, protected areas) and the main river mouths on the Slovenian coast (Rižana, Badaševica, Drnica and Dragonja).

Because the reference biodiversity and the presence of fish species in the Slovenian sea, which are important for the economy, depend heavily on the management and usage of the sea in the neighbouring countries, especially Croatia and Italy, the PPN of Slovenia in the border area also addresses the need for recognising the protected sea areas and corridors in the sea of the aforementioned countries. This is how the PPN of Slovenia also became a document for harmonising cross-border issues regarding the ecological connection with the Italian and Croatian sides, for addressing the rights of Slovenia regarding the supply of healthy and sufficient seafood, and also for the start of activities in upgrading the necessary expert bases.

3.4 Mezzo level - Cross-border groundwater bodies

Cross-border groundwater body of Karavanke

Underground waters are a strategically important natural source for supplying people with a healthy drinking water. Due to the unsuitable agricultural, industrial, traffic, urban and tourism activities, the pressures and impacts on underground sources are still increasing. To preserve quality sources of drinking water for future generations, the representatives of Slovenia and Austria adopted the decision on the implementation of detailed and harmonised hydrogeological research of the mountain massif of Karavanke already in 1993 in the framework of the Permanent Slovenian-Austrian committee for the water economy. It is a mountain chain spanning more than 100 kilometres which is very rich with various water sources. The results of these research activities made it possible to determine the cross-border groundwater bodies at Karavanke and to declare this status in Slovenia and Austria in line with the EU water directive. This declaration makes it possible to regularly monitor the situation of underground waters and to exchange this information for implementing protection regimes and measures that are related to the development of the sensitive karst region of Karavanke and could affect the status of the water. More than two decades of cooperation of Slovenian and Austrian experts on underground waters at Karavanke is a good investment for the strengthening of the know-how and actions to responsibly manage the common riches that are of supraregional importance for our own and for the future generations in terms of their quality and abundance.

Figure 15: *Cross-border Austrian-Slovenian water body Karavanke [26.]*

The Mura aquifer

Due to the immense pressure and impact of agriculture in Austria and Slovenia on the underground water bodies in lowlands that serve as the main source for the local and regional supply of drinking water (Apače field), we have developed a modern cross-border project in the framework of the EU's "SI-MUR-AT" project in order to improve the quality of the drinking water, which is based on joint measurements, modern modelling of the underground aquifer, and on the strategy for preventing excessive nutrient inputs. An important achievement is the development of the common strategy for the co-existence of agriculture and the protection of underground water, that takes into account the experiences on the Slovenian and Austrian sides. These findings and modern tools are beneficial for all the inhabitants in the region, because they can improve the situation of the environment.

The SI-MUR-AT project was concluded in 2019 with the public signing of the Memorandum by the representatives of the official representative of Slovenia and Austria. The Memorandum defines the implementation of measures for achieving the goals of the strategy on both sides of the Mura river in agriculture by expanding the pilot phase of handling with nutrients and promoting bilateral projects for the sustainable usage of sources for drinking water and agriculture.

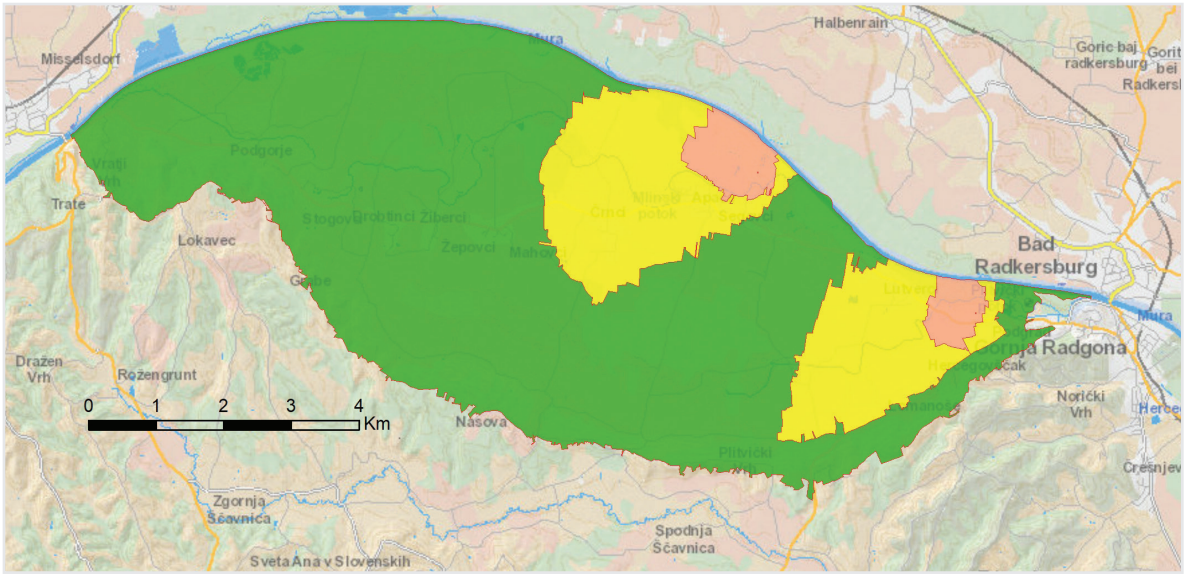


Figure 16: *The water protection area of the Apače field aquifer on the Slovenian side of the Mura river.*

3.5 Mezzo and micro level - planning green corridors at the Vipava river

In the cross-border project GREVISLIN ("Green infrastructure - conservation and improvement of the status of endangered species and habitat types along rivers"), which is co-financed in the scope of the Interreg project of Italy-Slovenia, we used the development method for recognising GI on the mezzo level (the river basin level) and as the basis for planning the GI on the micro level.

On the mezzo level, the GI at the Vipava river basin in the lowland area, where there are intensive areas of cultivation, is recognised with a lower value. In the scope of the project, we analysed the overlaps of two target species in the area: the scarce large blue (Maculinea teleius) and the large copper (Lycaena dispar). Both butterflies are on the red list of endangered animal species and are protected in Slovenia.

Habitat type: lowland, extensively propagated meadows (Alopecurus pratensis, Sanguisorba officinalis).

The analysis results have shown a tight overlapping of areas. Further analyses then confirmed the tight overlapping of the habitat type of extensive meadows with flood areas. Based on the analyses, we have found that the flood areas near the Vipava river enable the development of the habitat type of lowland extensively propagated meadows, which are a suitable living environment for the target types of butterflies. By appropriately preserving these meadows, both endangered butterfly species may thus be preserved.

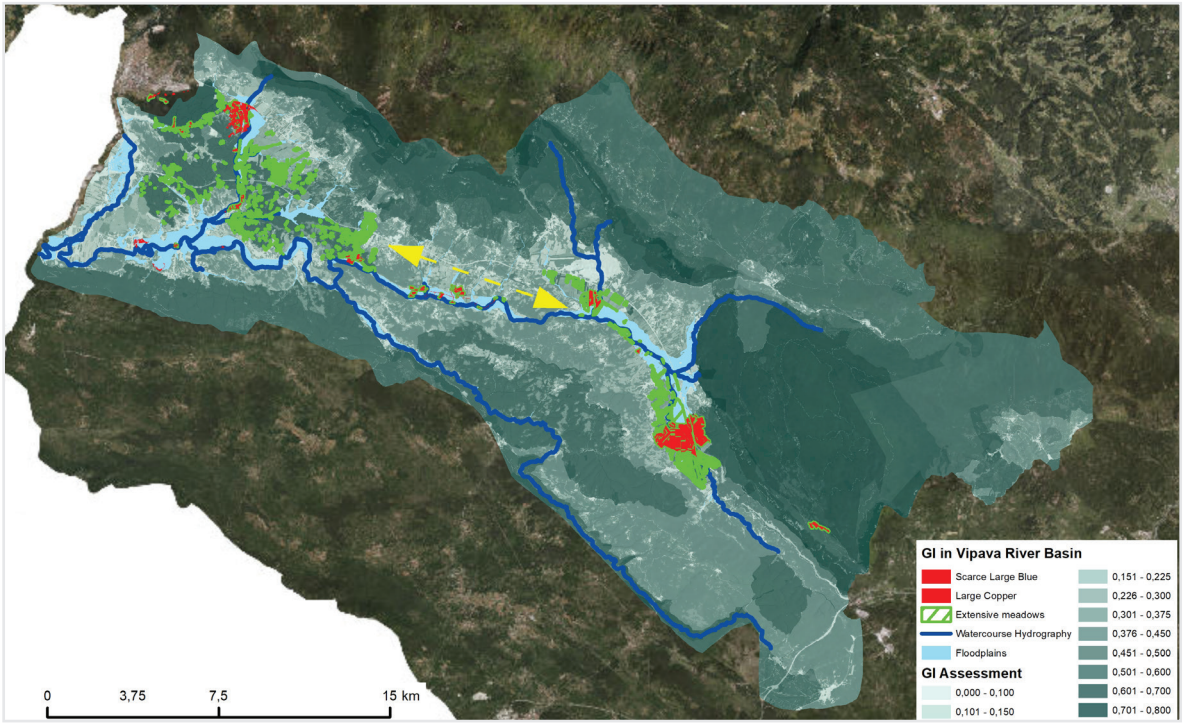


Figure 17: *Planning GI in order to preserve the habitats of the scarce large blue and the large copper: the establishment of the required corridors (yellow line) between areas on the mezzo level of adequate flood safety (the Interreg - Grevislin project).*

Planning measures for the development of GI on the micro level at the Vipava river basin is shown for the area of Selo, in the municipality of Ajdovščina (**Figure 18**). Based on the recognition on the mezzo level, there is a tendency/possibility of linking areas of extensively propagated lowland meadows at Selo, where there are intensive areas of cultivation.

During the determination of the measures that address the establishment of a habitat type of extensively propagated lowland meadows, we have found that occasional floods are present at the area in question, which indirectly enables the development of extensive meadows. The GI planning is based on the joint overview of the environmental legal regimes and their synergistic potentials. This is why we reviewed the measures or restrictions on the mezzo level of the recognised green corridor in this area, which, together with the regulations or legislations, govern the said area, as well as the measures that have been included in the Natura 2000 Management Programme (hereinafter: PUN) and relate to the target habitat type and target species.

In line with the regulations concerning waters, it is forbidden to use fertilisers or means for the protection of plants on coastal land. For the target species and target habitat type, the PUN assumes measures without fertilisers, extensive damp meadows that are occasionally flooded, mowing after a certain

date, etc. In this specific case, we recognised the possibility to develop the GI in the area of coastal land. By changing the usage of the coastal land, the stock of the target ES would increase, i.e. the increase of biodiversity. To assess the efficiency of such a measure, the benefits and costs must first be assessed in terms of the benefits due to the increase of the stock of other spatial services or costs due to the reduction in the stock of certain spatial services. We have therefore found:

- an increase of the stock of other spatial services: self-cleaning ability of the stream and thus an improvement of the ecological situation of the Vipava river, the enablement/preservation of high water floods or the retention ability, the establishment of habitats and corridors for other animals, recreation, an increased production of fodder, anti-erosion protection or the retention of the soil, etc.;
- a reduction in the stock of other spatial services: reduced production of the extensively produced food.

Based on the recognised benefits and costs of planning the green corridor and adjustment of the uses of coastal land, which is 40 metres wide in the case of the Vipava river (the first order stream), a wider agreement must be made between the stakeholders in order to arrange the green corridor, especially with the agricultural sector on one hand and the environmental and water protection sector on the other hand.

The success of the GREVISLIN project is mainly the discovery that environmental sectors may achieve their goals more efficiently if they connect with each other. **In this case, the coastal land, as a legal regime in water management, is successfully supporting the achievement of the goals of improving biodiversity.**

Figure 18: *Planning GI in order to preserve extensive damp meadows and ensure flood safety and establish a green corridor along the coastal zone of the Vipava river (the Interreg - Grevislin project).*

4 THE GREEN INFRASTRUCTURE OF THE FUTURE

The area of recognising and planning the GI in Slovenia is not specifically terminologically defined. The discussion of GI and green systems is fragmented: we have no formal definition of the terms, nor do we have any statutory procedures for planning the GI or clearly defined principles for managing GI. The consequence of this fragmentation and obscurity in practice is, among other things, a less efficient management of space and natural resources. For a better overview, **Figure 19** shows a cross-section of the Slovenian coastal outskirts, across the sea to Gradež on the Italian side, and "almost all" management arrangements that are present at the coast and in the sea.

However, if the guided spatial planning that considers the sectoral goals mentioned several times above, which address the ES and the GI and combines their sectoral management, then the establishment of GI management is actually just a thing of coordination.

This chapter is therefore intended to show the existing management arrangements that require the GI and that could make a step forward by connecting with other similar management arrangements. The chapter is concluded with proposals for a more comprehensive management of GI and ideas on how to implement the GI concept in Slovenia as efficiently as possible.

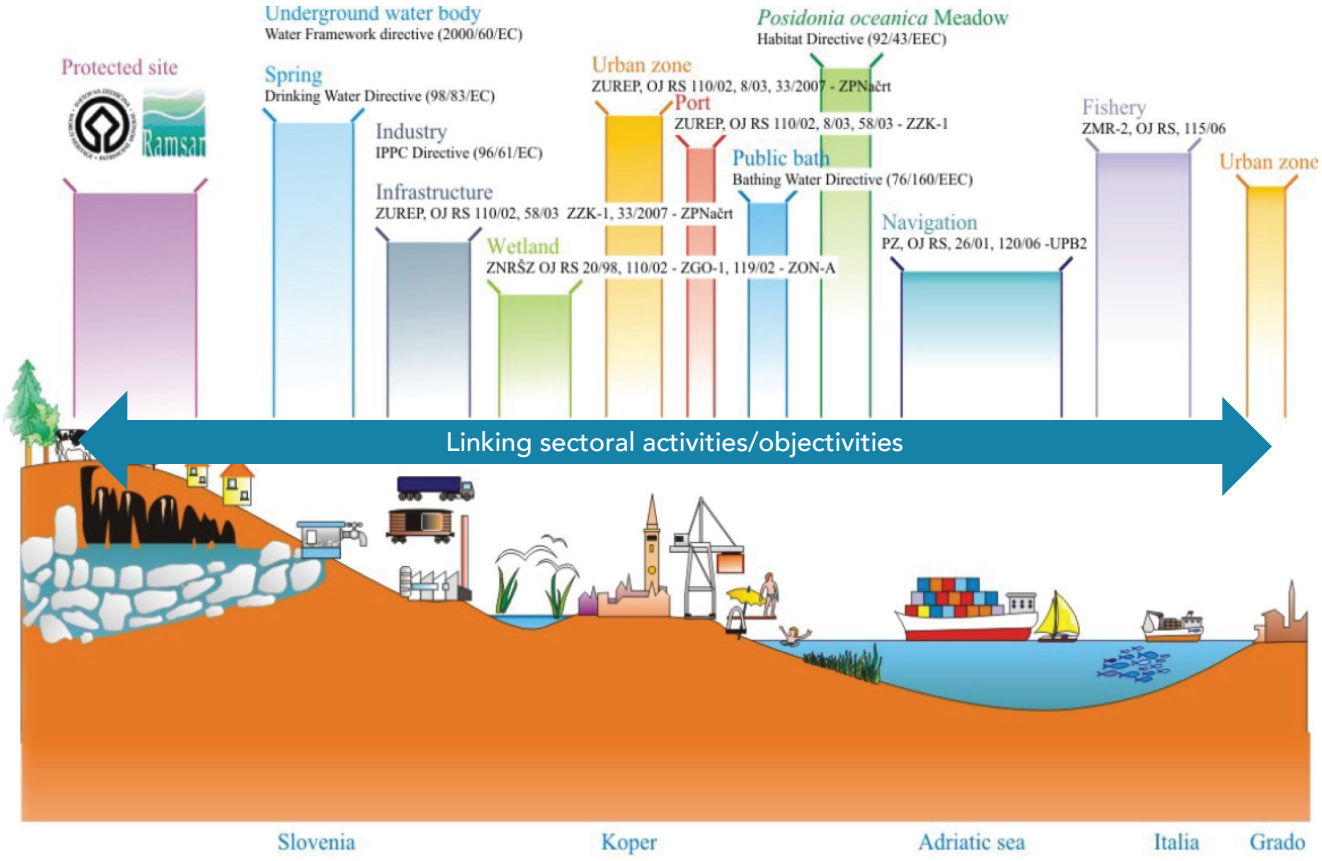


Figure 19: *The legislative framework for management at the coastal area and at sea [36.].*

4.1 Managing the green infrastructure

The management includes both normative as well as implementation measures. The GI [1] or its potential is the subject-matter of management processes on the intergovernmental, state and municipality levels. The implementation of the GI concept in spatial planning processes also requires a (legally supported) consensus on who is managing the GI areas, who monitors them and how their design, implementation, supply and upgrades are financed. This issue undoubtedly requires a harmonisation of the opinions and needs of the various sectors, whereby the powers are currently divided. The most important ones are the spatial planning sector, the nature preservation sector and the water sector.

The management plan (even though it is mostly the product of EU regulations) is a normative and an implementation document that defines the content and carriers of tasks at each area and requires management to be performed in public interest. In the (near) future, the competencies of sectors will need to be clearly defined regarding the responsibilities and rights. The main task carrier will also need to be defined, and will be given the managerial powers in this area. Based on the small size of Slovenia, the most reasonable possibility for now is a centralised management by a state apparatus.

The GI concept and implementation is a relatively new area. It is more than just an instrument for preserving biodiversity because it can substantially contribute to the achievement of the goals of the EU policy related to the regional development and suburban development, climate changes, agriculture and forestry, as well as the environment and taking action for natural and other disasters. Even though the GI concept is included in the EU strategy for preserving biodiversity, the very understanding of the GI term differs from member state to member state. **Regardless of the different naming of some GI aspects, we have reached an agreement regarding the understanding of GI as an ecological and spatial concept for promoting the health and resilience of ecosystems, which also greatly contributes to the quality of the lives of people.**

4.1.1 Water management

Water[2] management and the management of water and coastal land is the central focus of preserving and arranging GI. We mostly already have instruments with which we can implement the measures to protect waters that are located at GI.[3] In the water protection area, [4] the central role is played by the **Slovenian Water Agency (DRSV)** in the framework of the **Ministry of the Environment and Spatial Planning (MOP)**[5], which was established with the purpose of providing comprehensive and efficient water management.

The tasks and powers of DRSV:

- As the national management body, it provides directions and opinions for spatial acts (OPN and DPN), and issues water consents and opinions for all interventions that affect the water regime and the water situation, in order to preserve the water and waterside space, natural hydro-morphological and morphological conditions, and the quality of the available water sources. It focuses on water and coastal land, water protection areas, areas of bathing waters, flood areas, erosion and avalanche areas in line with the principle that the adjustment of the human activities to the natural water regime takes precedence over adjustment of the natural water regime to the human activities.

- In the area of water management, it maintains the water and coastal areas of inland waters and the sea (management of inflows, high sea embankments, etc.) and performs extraordinary measures during hazards due to the damaging activity of waters.

Water Act (ZV-1)

ZV-1 defines the preparation of legislative acts for the achievement of a good situation, protection and arrangement and the corresponding measures[6]. The important acts are the **Management Plans**, which define, in detail, the processes and measures in this water area. The water management plans (good ecological situation, reduction in flood risks, etc.) could define, in detail, the means of planning, harmonising, implementation, monitoring the situation of all measures. They could also evaluate the measures for GI in light of providing ES.

The permitted interventions that the municipality may plan on water and coastal land are restricted to the exhaustive procedures that are defined therein. The permitted interventions on waters that are intended to be used for a certain purpose on the coastal land (which is not part of this usage) are defined in ZV-1, and may be divided into two sets: on interventions in the function of water protection and on infrastructure.[7] Reconstruction, adaptation and renewal of the existing facilities are all permitted.

Environmental Protection Act (ZVO-1)

ZV-1[8] gives municipalities the task of introducing protection against the damaging effects of rainwater in settlements. The municipal authority is supplemented by the national one, because the arrangement of rainwater and other wastewater is governed also by ZVO-1, which defines the method of performing the public service of draining and treating urban wastewater and rainwater with the **Decree on the discharge and treatment of urban wastewater**[9] and the **Operational Programme**.[10] Detailed measures and the protection means against the damaging impacts of rainwater should have been regulated in line with ZV-1, but the regulation has not been adopted. The implementation of measures in urban areas is therefore left to the municipal self-regulation. An appropriate measure of implementing GI in municipal authority would also require a draft of uniform standards of the co-natural usage of rainwater for the purposes of establishing green corridors and infrastructure. The technical aspects[11] of GI would need to be included in the standards that also take into consideration the arrangements in comparable states.[12]

Agricultural Land Act (ZKZ)

Chapter 5 of ZKZ defines meliorations that include drainage, irrigation and the improvement of farmland. The four regulations[13] define the means of establishing, managing and maintaining the irrigation and drainage systems. The Farmland and Forest Fund of RS (SKZ) is one of the system managers. System maintenance and management is performed on the basis of the management programme and the maintenance programme, which should define the performance of the various co-natural measures of GI.

Sea

As per the **Spatial Management Act (ZUreP-2)**, a municipality has the right to independently plan only the exhaustively[14] defined arrangements in the sea area, which must also meet the conditions provided in ZV-1. The Protocol on Integrated Coastal Zone Management in the Mediterranean (ICZM) defines the reasonable planning of activities for the sustainable development of coastal areas, whereby

the environment and the landscape need to be considered, and harmonisation must be achieved with the economic, social and cultural development. These goals are considered by the EU Strategy for the Adriatic-Ionian Region (EUSAIR) when preparing plans for the sustainable management of the coastal and sea environment.

Photo 3: *Planinsko polje in the flooding phase. Several times a year high waters of the Unica river regularly flood fields and meadows. Settlements and agriculture have historically been adapted to this water dynamics.*

The competence regarding water management on the mezzo level (regions, river basins) is divided into water areas in line with the Water Act, whereby the main unit of management is the river basin, and the water body of the sea for the sea. On the other hand, the Local Self-Government Act, as the cornerstone of the self-government local community, references a municipality, whereby the municipal borders often do not conform to the borders of the river basin.

The non-conformity of the management borders is also seen in the water management area because the borders of water area sectors do not overlap with the borders of water bodies of underground and surface waters. Deviations between the borders of the bodies of water are also evident when we speak about managing nature and space: the main unit for managing space is defined as an area with uniform design properties by considering the legal regimes, whereby the basis is represented by the planned land use and the spatial conditions stemming from the comprehensive land analysis, its values, properties, recognisability and the planned spatial arrangements.

Based on the aforementioned spatial non-conformity and the findings that most of the organism migrations, the transfers of materials, and even drinking water and energy, are carried out within the river basin, it would be most efficient to have the GI management performed on the level of the river basin. In the coast and sea areas, management is simply connected, because the aims of achieving a good water status and environmentalism for inland waters and the sea are the same. In areas that are defined or that run between individual river basins (nature protection areas, cultural heritage areas, protected forests, etc.), water management is connected to other competent sectors. The management mentioned above is strategic, and may be performed on the operational level by regional managing units and in connection with municipalities.

4.1.2 Managing natural (cultural) heritage and nature conservation areas

The preservation of the natural values stems from the Constitution of the Republic of Slovenia. Every person is obliged to protect the natural attractions and rarities in line with the law, and the state and local communities are responsible for the natural heritage. Based on the Nature Conservation Act, the founder itself may directly manage the secured area in the regime, for which it creates a public institution, entrusts management to a public institution that has been established for the purpose of directing sustainable management of natural resources, or awards a management concession. In addition to the protection of nature, the important goals also include management and care of the presentation of the secured area and the management of visitors, the harmonisation of protection-related research activities and the promotion of sustainable development in the secured area. The secured areas may be established on the local or state level, or as part of the cooperation of both. In all types of the broader secured areas, a characteristic landscape diversity is retained, which occurred on the basis of man's actions in the past. When establishing broader secured areas, the development possibilities of the inhabitants and the spiritual relaxation are considered.

Nature Conservation Act[15] (ZON)

ZON states that measures[16] for the protection of the natural values and the preservation of natural processes are carried out by the state[17] and the local communities. ZON protects the landscape[18] or the landscape variety, which is important for the preservation of biodiversity. The law also assumes measures for dense settlements[19], the aim of which is to protect the connection of the habitats with nature outside these areas. Green areas are especially protected, and special technical solutions for the protection of animals are required during construction processes. Regulations that were not yet adopted, but are assumed by ZON for determining the characteristics of a landscape and landscape variety, and for the protection of the flora and fauna and habitats in densely populated areas, could be defined through GI.

ZON defines the process and entities for establishing broader protected areas. The measures of protecting the natural values of national importance are carried out by the state, while the municipality carries out those of local importance. The law establishes the responsibility of the state so that, should a municipality fail to perform their obligations, then the state must do that instead - alternate action-taking.[20] In the area of natural protection, subsidiarity is applied, providing the broader values are not threatened, which also includes the natural values of local importance.

The state has not used this authorisation yet because the opposite situation is more common in practice, where municipalities establish a landscape park and therefore secure and manage the natural values of national importance. The law also adjusted to this, and Article 46.a of the law states that "one or many local communities and the state may agree to have one or many local communities implement the measure of protecting the natural values of national importance that is on their territory". The ministry that is responsible for the environment (MOP) concludes an agreement on the initiative of one or many municipalities and after obtaining expert opinions from the **Institute of the Republic of Slovenia for Nature Conservation (ZRSVN)**, with which it authorises municipalities to use acts to establish a protected area that includes the natural values of national importance, such as Natura 2000. The municipal decree in such a case is the Nature Conservation Act, which must define the manager of the protected area.

ZON in the area of preserving nature also governs the public service for preserving nature, which is performed by ZRSVN and the managers of protected areas. The tasks of this public service are defined in detail in the law.[21] The manager may also perform other activities that are determined in the Nature Conservation Act and the statute, which are not contrary to the tasks of the public service from the

previous Article, generally on the basis of the management plan, the subject-matter of which is also the arrangement and management of GI.[22]

The operational programme of managing Natura 2000 areas in Slovenia between 2014 and 2020 (PUN)

The PUN was adopted by the government in April 2015. The programme defines the detailed protection goals and measures for each of the 354 Natura 2000 areas in Slovenia, and the carriers and financial sources. Projects have been defined, with which certain goals are meant to be achieved and opportunities of the Natura 2000 areas are meant to be taken for local development, jobs, and economic growth, and to preserve the cultural heritage. In addition to state institutions, the carriers of the measures are also the managers[23] of protected areas and municipalities.

Managing underwater archaeological sites[24]

The area for the preservation of underwater archaeological sites is highly inadequate in legal terms, as well as in practice. The legal protection is only ensured when adopting spatial acts, and it is not applicable during interventions. Because municipalities are generally not authorised to plan at sea, such protection cannot be ensured outside the narrow lane of coastal waters.

Underwater archaeological heritage is a non-renewable cultural element of the sea environment, and part of the ecosystem services of the sea environment.[25] By performing interventions and endangering it, damage is caused, which is not permitted as per the national law and the EU law, and responsibility is determined as "the polluter pays", which includes the implementation of preventive measures. The Nature Conservation Act should define a manager and establish monitoring processes over its situation, and the respect of the legal protection regimes for the underwater archaeological heritage that meets the statutory conditions for the cultural monument status.

ZON makes it possible for the manager of protected areas to also manage nature as cultural monuments. Managers have their own supervisory services and experience in presenting both natural and cultural heritage. Underwater cultural monuments could also be managed by managers who are not managing protected areas at sea directly, but are bound to them - such areas are, for example, the Škocjanski zatok Nature Reserve and the Sečovlje Saltworks - in addition to the municipality of Ankaran and the Nature Park Strunjan, who manage the protected areas at sea and the nearby Natura 2000 areas.

Based on the definition of GI by the European Commission, the legal basis for the protection of nature already represents the basis for recognising GI, thus forming the backbone of GI. These regimes, in addition to the main function of preserving biodiversity, often have a positive contribution to the preservation of the water source quality in practice because they often overlap with the water protection areas.

This is why it is key for the successful GI planning and management that institutions, which are responsible for individual protection regimes that have been established to preserve and provide ES, to cooperate. This way, each goal will be achieved much more easily. The sole management will be even more efficient because there will be less bureaucratic work and better supervision. This means that employees in these sectors will have more time for creative work and to seek harmonised solutions, even in sectors that are only burdened by the protection of nature and the environmental assets, or hindered by them in the achievement of their goals.

4.1.3 Managing ownership entitlements

The establishment and arrangement of GI is often enabled only when the ownership right on the respective land is established. Because we are discussing various forms of GI, the ownership situations also differentiate.

Water and coastal land may be in public or private ownership. Constructed water for public good is generally owned by the state. This definitely applies to newly established constructed public good. ZV-1 anticipated the ownership of water land that was publicly owned. Regarding the protection of waters, the law broadly defines public interest that includes the protection of the water regime, the general usage of the water good, and the implementation of state and municipal public services, not only on water and coastal land, but also on so-called "other land",[26] such as protected and endangered land. The law for these areas stipulates that "the ownership or any other material right on land /.../ or at a water facility or device, may be dispossessed for the public good, or restricted in cases defined by the law, and in the way and under the conditions that are defined by the regulations that govern expropriation".

Even in nature protection areas and areas of cultural heritage protection, it is assumed that such natural values as monuments may also be in private ownership. In such cases, restrictions of the ownership right and a compensation system are assumed. The sectoral legislation assumes a pre-emptive right of the state and municipalities and expropriation. ZON also defines a special expropriation purpose[27], which must stem from the act on the establishment of a protected area. Even immovable cultural monuments with influential areas are under strict statutory conditions of being expropriated.[28] The Act on Forests assumes a pre-emptive right and the option of expropriation of protected forests and forests with a special purpose, which are proclaimed with a special decree.[29]

ZUreP-2 redefines the public infrastructure: "The economic public infrastructure includes facilities or networks intended for the purpose of performing economic public services in line with the law, and facilities or networks for other purposes in the interest of the public, which are, as such, defined by the law or decree of a local community, as well as all other facilities and networks in the public domain." It is crucial that the facility is in the public domain, and that either the state or the municipality may define its public interest. GI generally meets the statutory public infrastructure conditions.

4.2 Support for the recognition of GI and evaluation of ES

Even though several projects in the last couple of years have introduced various attempts to recognise GI and evaluate ES (e.g. Greta [30.], AlpES [18.], HyMoCARES), we still lack a commonly adopted method for a quantitative analysis of the environment or evaluation of the ES stock. There are also no uniform indicators with which to evaluate the impacts of measures of the planned GI, or the impact of interventions for the sustainable usage of natural resources.

The proposed method for recognising GI enables a comprehensive analysis of space, which allows a quantitative evaluation and assessment of the various legal regimes and the target discussion, in order to pursue certain categories (water, certain flora and fauna, target habitats, etc.). It also offers the option of upgrading the current spatial planning procedures: with the described method, we can include the various expert data layers, some of which have no legal basis, but represent certain important properties of space (vegetation, pedology, plant group types, paths, flows). The method will continue to be developed on the basis of harmonisations and supplementations, with users and decision-makers in spatial planning processes on the local, national and intergovernmental level, in order to ensure the function value for various sectors of space and the environment.

If we stem from the principles of sustainable development, which are based on an efficient usage of resources in an environment and a sensible arrangement of an area, then multi-purpose projects are seen as an efficient tool, especially those that respect the restrictions of the natural resources and the time required for the regeneration of nature and the environment. The GI namely has many functions (environmental: preserving biodiversity, adjusting to climate changes, etc., social: ensuring drainage or green areas, etc., economic: providing jobs, dynamics of real estate prices, etc.), with which they enable us to have multiple benefits at the same time in a certain environment. Multi-purpose projects and intermodality, in addition to the wider perspective, require the cooperation of experts from various areas and going beyond the sectoral approach, and especially dialogue that will balance the process of the exploitation and preservation of nature.

Here, the issue about the mobilisation of private interest and capital in ES and GI arises. We have found that the following would therefore need to be ensured or at least reviewed:

- the promotion of natural processes with their benefits for man, and successful technical and technological solutions that, in addition to the main purpose, also preserve the ES stock,
- the establishment of a system of economic motivations by determining the price of interventions into the (potential) ES,
- the establishment of subsidies and/or mechanisms for reducing costs in the event of alternative measures or constructions of GI, in the form of a special waiver of utility charges - in the sense of green public orders,
- the discussion of placing GI as maintenance work types - in the sense of energy-saving building renovation,
- the establishment of a special status for objects or arrangements with a smaller intervention in the environment, such as, for example, buried objects and objects on pillars, vertical gardens, etc.

The concept of short-term development and the circular economy is a reaction to the excessive exploitation policy of the environment and natural resources. Since sustainable development is expansively defined in legal terms, the interest of development and economic growth usually still prevails, whereas the sustainable element that no autonomous interest group represents directly is lost in the conflict of various priorities. Its implementation is thus left to the awareness of the actors in the economic policy process. Because this is a complex area with a high rate of uncertainty, sustainability is threatened, even in countries with a long environmental protection tradition and an efficient legal system. The final decision must be the result of a compromise of well organised interest groups.

To achieve this, a different kind of thinking is required. A different economic model would have to be introduced, which would include the costs of operations and also the environmental costs and costs of the ecological risks - short-term and long-term. The assessment of all additional costs should be transparent and repeatable, which requires the development of a verified methodology. The means on how to evaluate the quality of green measures and risks of non-ecological interventions remains a challenge. The EU certainly has an interest in financing well-designed projects on the basis of the Green Deal, and the question on how to efficiently include the economy of the environment in the mechanisms supporting the environment remains.

It would be worth evaluating the changes in land policies, especially paying for usage and revenues that are made possible by land due to the improvement of the GI implementation and ES supply. Namely, regardless of the primary usage of a land, the land may also have additional functions, or such functions may be preserved. For example, hedgerows are preserved or established on agricultural land, corridors are preserved on infrastructure objects, and significant greening is preserved on building lots which are interlinked between individual plots. In such cases, when the other land use still preserves other functions that are related to GI and the preservation of ES stock, it would be worth thinking about changing the way payments are made for land usage. All these functions are also for the public benefit.

A possible solution is shown in the direction of upgrading the scales for pay-to-use or the income of land that would anticipate reductions of payments in the event of preserving the ES stock, and include the GI and increased payments in the event of a reduction in ES stock or interruptions in GI. The realisation, or at least a more detailed review of the efficiency of the aforementioned, falls mainly on the shoulders of sectors that are responsible for the land, agricultural, forestry and tax policy.

4.3 Micro level policies

In practice, the concrete planning of GI and its implementation is performed on the local level. The implementation of GI on the local level contributes to sustainable growth, which includes the protection of the environment and the socioeconomic development of each area, by considering the existing network of protected areas, cultural heritage, natural sites, ecological agriculture, ecotourism destinations, etc. By implementing the necessary changes in the management process, and by gradually implementing the principles of GI in OPN and OPPN, we can significantly contribute to the improvement of biodiversity and the increase of ES stock in the environment.

Municipalities would need to define the conditions for planning green areas and other green elements (green roofs, vertical gardens) at building lots in more detail, especially in the sense of multi-functional connections. By determining the arrangement area of a settlement assumed by the new legislation, a municipality may define the function of agricultural and forest land in the regulatory zone of a settlement.

For this purpose, the municipalities could specify the spatial implementation conditions at certain units for arranging agricultural land areas, namely with focus given to extensive agricultural usage and the preservation of green hedgerows in the function of the green system of a settlement or landscape. Municipalities do not generally opt for this, because there is no administrative control over the changes of the agricultural activity, which is why such provision remains declarative.

Because the strict division of functions in nature cannot exist (in the sense of defining a certain land only as agricultural or a water protection zone), a multi-purpose usage must be defined on the remaining agricultural land, in the sense of the strict reservation compensation (e.g. exclusively for agricultural use in permanent protected zones) regarding the establishment of the GI. Farmers may be offered subsidies as compensation for intensive farming in water protection (and other vulnerable) areas, or such areas may also be bought for a reasonable price.

Even in areas that are intended for the expansion of a settlement, municipalities could primarily establish GI by initially establishing green elements in practice (even experimentally), which are then supplemented, and not replaced, by subsequent constructions. It is this preliminary regime, which even enables municipalities to acquire land, that could enable the arrangement of GI.

4.4 Example: The municipality of Ankaran

One of the successful cases of implementing changes in the direction of the implementation of GI on the micro level is the municipality of Ankaran. The municipality was formed with the secession[30] from MOK, and also due to opposition to the spatial policy of the municipality of Koper and the policy of Luka Koper. It did take the spatial legal arrangements from the municipality of Koper, however it started to change those immediately. In an open public discussion, the new municipality initially adopted the spatial concept (scenario), which it concretised during the adoption process of the first OPN[31] with expert bases with a distinct green policy or valorisation of the ES of the sea area. It adopted the special Strategy for the protection and development of green areas for a municipality that builds on partnerships between public and private[32] green, and especially park, areas. It represents the framework for OPN and for the ZUreP-2 assumed Decree on the arrangement of the image of settlements and the landscape.

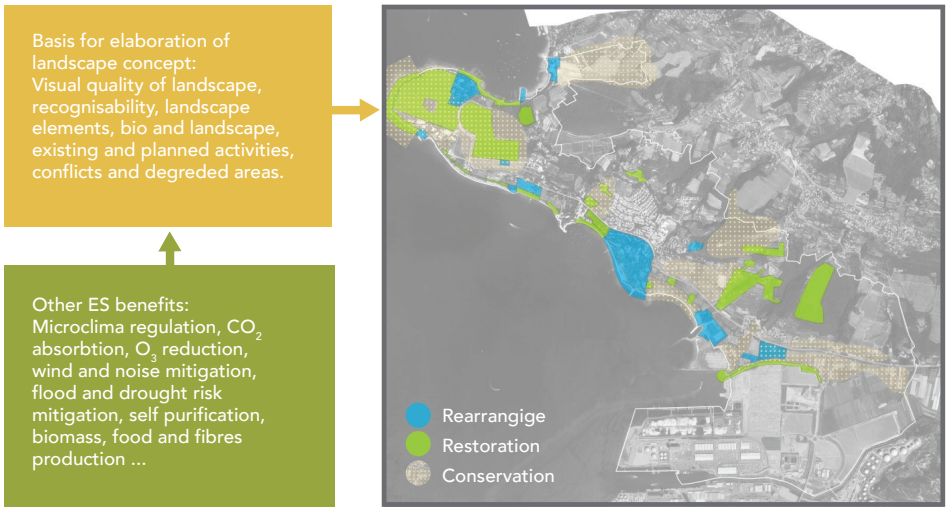


Figure 20: *Considering the ES function of an area and GI planning in the process of preparing an urban and landscape design as a compulsory professional basis in spatial planning; an example of the municipality of Ankaran [39.]*

The landscape design for the municipality of Ankaran was made in 2017[33] and represents the basis for OPN and the design for preparing spatial and administrative plans. The municipality used the Barcelona convention as its starting point for arrangements, with the argument of establishing a link between spatial planning and water management in the coastal zone. In light of the sustainable comprehensive management of coastal areas, the landscape design also discusses the sea part, even though planning and arrangements at sea only exceptionally fall under the jurisdiction of the municipality.

The connectedness of the coast and the sea in terms of usage planning is key, because it has an important influence on the coast, the coastal zone and the sea zone, which is why the 200 metre sea zone was also included in the discussion. Because the Protocol on Integrated Coastal Zone Management in the Mediterranean (ICZM)[34] defines that a zone of at least 100 m in width must be defined from the highest winter water line in coastal areas where construction is prohibited, the 100 m starting zone is also considered and treated with special care regarding the connectivity and impact on the sea. The landscape design therefore especially discusses the 100 m coastal zone[35], which is completely in line with ZV-1 that enables the expansion of coastal land through the general 25 m zone. The coastal zone may, for public access purposes, be declared by the municipality for the public good.

The landscape design for the municipality of Ankaran especially highlights the importance of the

water environment and the role of forests, which are the core areas of GI. In addition to the sea and[36] the linked activities and bathing waters,[37] the water environment also exposes an artificial water body of the right relieving stream of Rižana. The forest is seen as a key "resource in the cultural landscape", which despite its vast surface area (or because of it), has major and multi-layered importance. Because there are fewer forests, the forest patches and wedges play an important role, because they perform important functions and improve the landscape diversity of an area, and represent one of the most important resources of the area's landscape.

With the Decree on the landscape park of Debeli rtič, the natural values are additionally protected, and management is established, in the framework of which the management of cultural monuments and archaeological sites are also assumed, should the state issue an act on the declaration of a cultural monument. In cooperation with the other competent services, the protection of forests is also upgraded. In addition to this, the landscape design also recognises the aesthetic value of monocultural crops, and proposes their preservation with ecological corrections in the sense of forest vegetation links.

On the basis of the strategic decisions and proposals based on professional grounds, the municipality of Ankaran adopted the implementation of measures. In the process of adopting OPN, it changes the NRP and harmonises it with DRP: in NRP, it plans vast surface areas of unbuilt building plots, it also preserves all the forest land, while unbuilt building plots in the coastal zone are changed into farmland, and where unbuilt land is kept, it changes them into green areas. Where possible, the municipality, as the core for the implementation of GI, uses legal bases, while elsewhere it leans on policies.

The example clearly shows how a landscape design may serve as a lever for planning GI in an area. A landscape design must consider not only the appearance of the landscape, but also the functions and services of the area - ecosystems and others. If the landscape design, which is a compulsory part of spatial planning, would also be required to include an analysis of an area as per the GI and ES, then the green planning on the micro and mezzo level would become standard. Nature, waters, agriculture, forests, etc. - these are all areas in which we are fully dependent on nature and the quality of the natural environment, in practice and in legislation. The GI in spatial planning should therefore serve as a link between sectors and usages, functions and services of areas in the future.

4.5 The implementation of the payment system for ecosystem services

In a human society, the exchange of goods and services is done almost exclusively on a market which, in addition to the supply and demand, defines, with its monetary model, the relationships of mutual value of individual goods and services. Can the ecological aspect also be included in this socioeconomic context by making ecosystems the providers of goods and services as well? Are ecosystems fairly evaluated as suppliers of goods and services that we market (wood, game, fish, mushrooms, etc.), or is this just exploitation and an excess depletion?

If a man chops down a tree on his property because he needs more space to park his car, then he loses important ecosystem services that were provided by this tree. For example, some shade or more favourable microclimate conditions, not to mention those that we are not even aware of, like the production of oxygen, a place for birds, binding carbon, the occurrence and preservation of ground fertility, etc. Of course, shade may be provided by a pergola, and favourable microclimate conditions may be created by installing a new air conditioner. However, in general, technological solutions may replace comprehensive ecosystem services provided by nature to a limited scope. In addition, raw materials from

nature need to be provided for the production of a pergola and an air conditioner, as well as an area for production and energy. These three things, again, reduce the total stocks of ecosystem services (**Figure 3**), which supports the continuation of the non-sustainable development of the economy.

To bridge the above, economic approaches in this area have been introduced for some time globally. Based on the "polluter pays" principle, these approaches make those who damage the environment (emissions of pollutants, nutrients, heat, CO_2, etc.), also pay for the damage. Thus, the economy is motivated to include in their development and operations, the plans for reducing the burdens on the environment.

In a similar fashion, approaches are being developed in the area of evaluating, preserving and renewing ecosystem services that would promote the preservation of the ecosystem services in an environment at the economic development and area usage. Of course, comparable or increased competitiveness of such an economic development and operations must be made possible for those acting responsibly, compared to the economic entities who are ignoring these measures (**Figure 2**).

One of the projects that develops such approaches is also ECO-SMART (the marketplace of ecosystem services for advanced policies of protecting the NATURA 2000 areas, the Interreg V-A Italy-Slovenia 2014-2020 cooperation programme). The Italian partners of the project include the Veneto region, which is also the leading partner, the municipality of Tržič, and Padova university. Slovenian partners include the Koper regional development centre (RRC Koper) and the Mediterranean Institute for Environmental Studies of the Science and Research Centre Koper (MIOS, ZRS Koper).

Interreg
UNIONE EUROPEA
EVROPSKA UNIJA
ITALIA-SLOVENIJA
ECO-SMART
Progetto standard co-finanziato dal Fondo europeo di sviluppo regionale
Standardni projekt sofinancira Evropski sklad za regionalni razvoj

The aim of the ECO-SMART project is to develop useful tools that will promote the usage of payments for ecosystem services (PES) as an innovative system of financial incentives, through which they could improve the means of managing and monitoring the consequences of climate changes at Natura

Photo 4: *The edge of a fragile cliff above Moon Bay. A protected coastal area that forms an important backbone of green infrastructure in the Gulf of Trieste.*

2000 areas. The innovative approach of the ECO-SMART project is based on creating synergies between the various aspects of evaluating ecosystem services and between the various stakeholders, while also promoting adjustment approaches that are based on ecosystems. Based on the performed analyses of ecosystem services and their vulnerabilities, the project partners intend to propose harmonised border plans of adapting to climate changes for two pilot areas of Natura 2000 in Italy and one in Slovenia, namely on the basis of the ecosystem adaptability approach. On the global level, the ecosystem-based adaptation approach (EbA; [41.]) was defined as an adaptation concept that is based on the assumption that measures for the protection of biodiversity and ecosystem services lead to higher socioecological resilience of the local communities to climate changes. By using the described approach, the long-term goal of the ECO-SMART project partners is to contribute to the increased resilience of Natura 2000 areas and local communities on the borders of Italy and Slovenia. To maximise the effect, all project phases also include activities for strengthening the capability of the local communities.

The innovative aspect of the project is mainly the introduction of payment schemes for ecosystem services (PES), whereby the recipients of benefits of certain quantifiable ecosystem services in the economic sense, contribute to those who provide the services, i.e. maintainers or operators of these ecosystems (Figure 21). The described financial mechanisms are usable as an innovative way of co-financing renewals and maintenance works of Natura 2000 areas and beyond, and other natural areas of the green infrastructure.

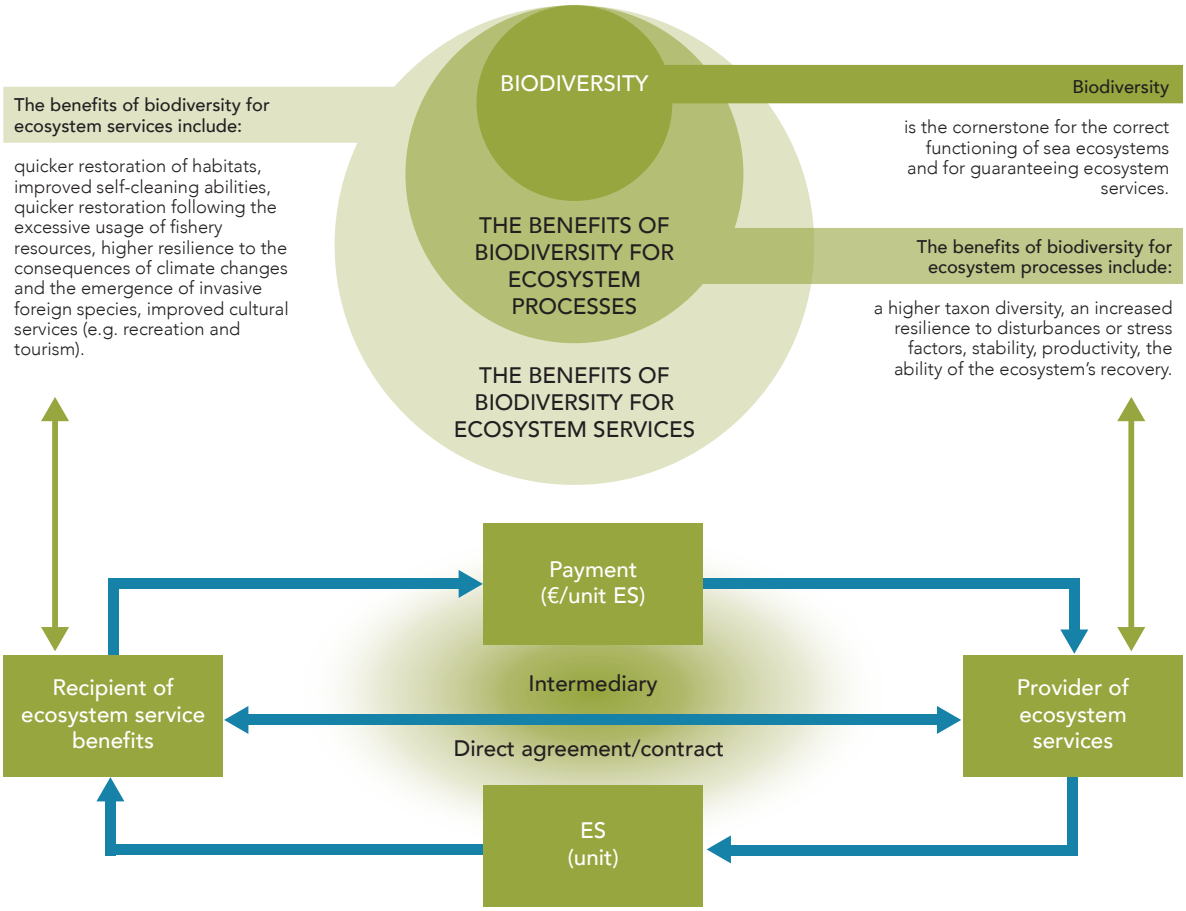


Figure 21: *The importance of biodiversity and ecosystem processes for guaranteeing ecosystem services has been described in the case of sea ecosystems (made as per [42.]) and the schematic overview of the financial mechanism of PES for maintaining and preserving the benefits brought forward by the ecosystem services and biodiversity (made as per [43.]).*

Photo 5: *Planning and implementation of coastal spatial arrangements require active participation, including control.*

5 APPENDIX - METHODOLOGICAL BASES

The approaches to the recognition and planning of GI, which are described in this chapter, include natural and semi-natural areas or surfaces in an area. They also include the already established regimes that support the preservation of ES supplies and an indirect recognition of GI. The other present usage of the area is also considered in the method for the evaluation and possible planning of GI. The results also allow for easier identification of blue and green corridors as connection elements of GI. The method for recognising GI and the requirements for its planning, is useful on various spatial levels with simple adjustments.

For an efficient implementation of GI, which includes the recognition and planning, the first step is to plan the entire process. **Figure 22** shows such a diagram that is a technical upgrade of the cycle for recognising and planning GI as shown by **Figure 8**. The process starts with the acquisition of data layers that are authentic for recognising an area from the perspective of GI. A quantitative assessment of the area is then performed, which requires a concrete procedure to be defined. A certain procedure must also be followed when planning GI, which must be repeatable and objective. We also include other "non-ecosystem" data and sectoral goals. Everything is part of a cyclical process in which, based on the cooperation, harmonisation and reviews, the entire process and individual methods may be complemented and developed further. The aforementioned steps are provided below.

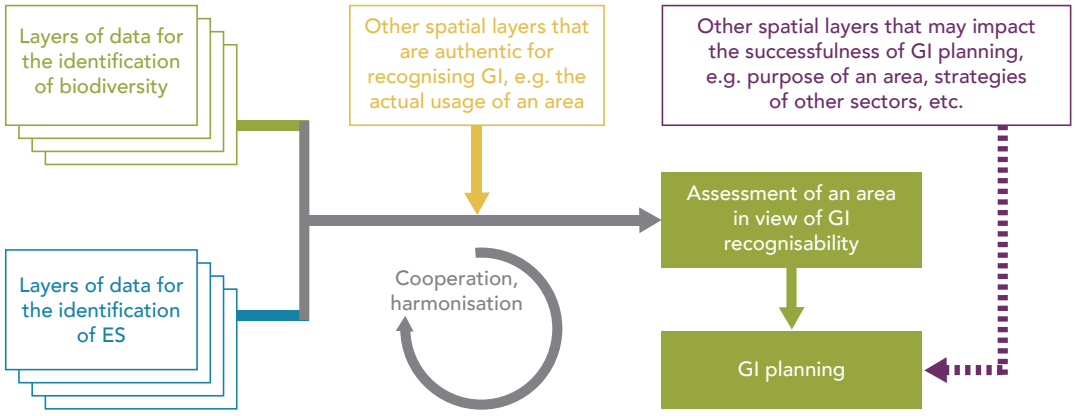


Figure 22: *Procedural diagram for recognising and planning GI.*

5.1 Data layers

In order to recognise GI, the actual and planned status of the spatial arrangement of the chosen area needs to be recorded and analysed. The starting point for the determination of the main spatial units are the categories of spatial use and the corresponding expert bases. In analysing the current situation in an area, we stem from charts of various land protection regimes and charts of the actual land usage (DRP). The schematic overview of the data layers which are currently available for analysing the status of land in Slovenia, and which we used, is shown in Figure 23. Individual groups of data layers are treated separately in sub-chapters 6.1.1 (protection of nature and biodiversity), 6.1.2 (protection of other ES in an area: waters, forests, cultural heritage) and 6.1.3 (actual and intended land use).

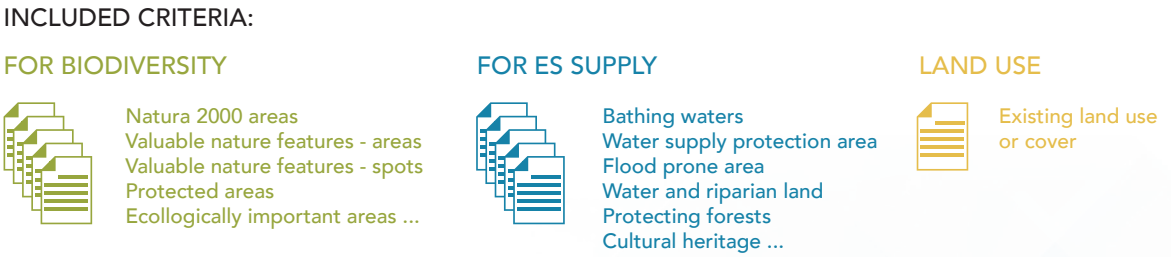


Figure 23: *A set of layers of protection regimes for which the spatial data is available, and may be included in the spatial analysis for recognising GI.*

It needs to be said that we have mainly considered those data layers which were available, and are clearly recognised in terms of ensuring ES. If, at any time, a possibility arises for including additional layers (e.g. a map of hedgerows or other maps that are being prepared and prove to be important), then the proposed method allows us to do that. The current set of all the spatial regime categories can be found at: http://www.pis.gov.si/ (spatial information system - legal regimes).

In addition to the protection regimes, the data layers also considered the actual land use (DRP). The reason is mainly that the actual status of land use or ground cover is not necessarily in line with the goals of protection regimes (current status or other significant socioeconomic reasons). Example: coastal land which, if in good condition, provides more ES (the retention of nutrients/materials, water purification, favourable microclimatic conditions and waterside habitats, river continuum, flood safety, erosion prevention, etc.). But because the protection regime in coastal land is established under the current status (construction up to the river streams, farmland use, grey infrastructure), the actual status or usage must also be considered in respect of the GI for the correct evaluation of an area. The latter also enables a more efficient planning and clarification of measures to improve GI.

5.1.1 Protection of nature and biodiversity

Nature protection areas represent the backbone of GI, which already, on its own, ensures a broad spectrum of ES, the development of GI for providing various other ES, and it promotes the connection of individual core areas of GI.

We have discussed the following spatial arrangement categories with the adopted legal arrangements regarding the protection of nature (https://www.naravovarstveni-atlas.si/):

- **The Natura 2000 areas (SCI, SAC)**: these are areas which are important in the territory of the EU for preserving or achieving a favourable situation of bird species (a special protection area) and other flora and fauna, their habitats and habitat types (special preservation area), the preservation of which is in the interests of the EU. The Natura 2000 areas primarily enable the preservation and improvement of biodiversity.
- **Protected areas (broad and narrow)**: are compact natural areas where viable and non-viable factors intermingle, and where the activities and interventions of man are in line with the natural resources. By considering the size of an area, we separate narrow and broad protected

areas. The general term "natural parks" is used for broad areas, these are national, regional and landscape parks. Narrow protected areas include strict natural reserves, natural reserves and natural monuments.

- **Natural values (state and local importance)**: these are areas for preserving and improving the characteristics of natural phenomena and natural forms in a certain area (types of natural values: surface geomorphological, underground geomorphological, geological, hydrological, botanical, zoological, ecosystem, trees, formed natural values and landscape values, and minerals and fossils).
- **Ecologically important areas**: these are areas of protected habitat types and habitats of protected flora and fauna, the preservation of which is carried out on the basis of ratified international contracts or their preservation is in the interests of the EU; it may also be a part of such a habitat or major ecosystem unit that significantly contributes to the preservation of biodiversity.

Additionally, we could also consider other protection regimes, such as, for example, forest reserves; these are forests with a highlighted research function and function of preserving the natural heritage, waters of particular importance from the aspect of preserving fish species and other protected areas that are in the function of preserving biodiversity and indirectly also other ES.

5.1.2 Protection of the environment and waters

The spatial arrangement categories which are defined by individual adopted environmental and water protection regimes represent the basis for the GI, and have been established to protect the supply of ES. The following spatial arrangement categories are discussed with the adopted legal arrangements regarding the protection of the environment and waters (http://www.evode.gov.si/; http://www.zgs.si; https://www.gov.si/teme/register-kulturne-dediscine/):

- **Bathing waters** (bathing water areas, influential areas of bathing waters): these are surface water areas where a large number of people are bathing, or where a large number of people are expected to bathe. The burdening of waters with emissions or other risky usage is also restricted in influential areas of bathing waters which could have a negative impact on the quality of the bathing waters.
- **Water protection areas**: these are water areas that are used to supply the public with drinking water. With their protection, pollution and other burdens are prevented that could reduce the quantity of pure drinking water.
- **Flood areas**: these are areas where major rainfall causes the flooding of waters outside their streams. Sediment and nutrients are deposited with floods. Floods reduce the flood risk downstream, and enable longer enrichment of flows in drought periods.
- **Coastal land**: this is land that directly borders on water areas of streams and other surface waters. Naturally preserved coastal land may be an important habitat, offering hiding places for water organisms, representing a filter zone between environmental burdens (e.g. fertilisation) and the stream, reducing erosion, and improving microclimate conditions (shade, lower water temperature). Coastal (or even shore) land is an integral part of water bodies. Preserving coastal land in its natural state increases the self-cleaning ability of the stream (Note: publicly accessible spatial databases for coastal land are not available)
- **Protected forests**: these are forests that enable the preservation of biodiversity, the protection of land against swilling and exfoliation, mitigation of the premature draining of water and therefore the protection of land against erosion and landslides, the protection of forests and land against the wind, water, spray drifts and landslides.
- **Cultural heritage**: areas of specific types of cultural heritage, such as, for example, archaeo-

logical areas, parks and gardens, buildings with parks or gardens, areas with commemorative facilities and places, cultural landscapes, settlements and their parts which, together with their protection regimes, also represent a green potential and ES supply, especially in terms of tourism and education.

5.1.3 Land usage

Land usage: using an earth's surface, defined based on its current and planned/permitted functional dimension or socioeconomic purpose (e.g. residential, industrial, agricultural, recreational usage, etc.). Land usage is divided into the existing/actual and planned/intended use.

Actual land use: an area of the earth's surface defined based on its existing cover, functional dimension or socioeconomic purpose.

Intended land use: an area of the earth's surface which, in line with the spatial acts, is defined based on its planned functional dimension or socioeconomic purpose.

The actual use determines the actual status of an area, while the intended use defines the harmonised planning and the placement of various harmonised sectoral usages in an area.

In our land use analysis for recognising GI, we used the data on the actual land use (http://rkg.gov.si/GERK/documents/Sifrant_rabe.pdf) (Ministry of the Environment and Spatial Planning - Spatial Planning, Construction and Housing Directorate).

Because GI planning mainly deals with harmonising clashes and seeking synergies with the other existing and planned usages of space, it is efficient to also use the information about the planned land use (the existing municipal spatial plans and the applicable spatial arrangements of the long-term and medium-term plans of municipalities) in this process, as well as the registry of persons who need to obtain the integral environmental permit for IED (former IPPC), the registry of persons subject to the SEVESO directive, the cadastre of the public economic infrastructure, etc.

During the analysis of sea and coast usage in terms of recognising GI, we took into account the entire area of the Slovenian sea with the main recognised usages at sea: international navigation corridor, areas prohibiting sea voyages, fishing areas, mariculture areas, anchorages and the port of Luka Koper, areas of other ports.

In the EU and in other parts of the world, farm production and farmland are defined differently. In some countries (e.g. Austria), farmland is part of the GI, because it provides an important supply service, i.e. food. The main question concerns the intensity of food production. A higher intensity and therefore more produce means large cultivable monocultures and uniform surfaces, and a higher usage of fertilisers and plant protection products. The above worsens or completely erases supply of other ES that the natural (or close to being natural) ecosystem offers. With such management, newer measures need to be sought to preserve the scope of producing food, which leads to an even bigger vulnerability of the environment and man. In the event of major social, economic or climate changes, such governance could immediately fail, there are no available adjustments, or the environment requires decades to recover.

Preserving diverse ES in a certain area for producing food can result in higher costs and less produced food per hectare, but only currently. In the medium term, this cost is negligible, considering the benefits.

5.2 Recognising the green infrastructure

Recognising an area in terms of ensuring ES stock and diversity, and therefore, as a GI is the first step which represents the basis for its planning, together with the recognised needs for its increase (the activities and goals of society at the area and trends and strategies of the economic development on the local and national level), represents the basis for its planning.

Recognising GI is based on the analysis of spatial data, which must be transparent and repeatable. This is why a concrete method is presented below, which is explained in steps, and also includes an example of recognising GI for better understanding.

5.2.1 Method: multi-criteria (multi-layered) spatial analysis

When evaluating an area in terms of recognising GI, many various data layers (often with different units of measure) need to be considered with varying importance. This is why it is sensible to use the method from the methodological group of multi-criteria analyses [28.]. By using such an approach, which is scientifically supported and implemented in practice as an efficient tool to support the decision-making process and used in several practical cases, structure, repeatability, transparency and consistency in decision-making processes are ensured [27.].

Figure 24 shows the basic steps for the implementation of a multi-criteria analysis, which begins with the definition of spatial units of the analysis (variant). Then, the means for assessing units are chosen and the criteria under which individual units are assessed. Criteria must also be given the authenticity or importance, weights are applied. What follows is the analysis and the assessment of the area in terms of recognising the GI rate. Determining the weights is generally an expert procedure, which may also be subjective. This is why a sensitivity analysis may be included, or the process of calibrating the importance (weight) of the included criteria [27.]. This enables the reduction in the total number of criteria. The latter is very efficient when analysing large areas, because less data is needed for the analysis.

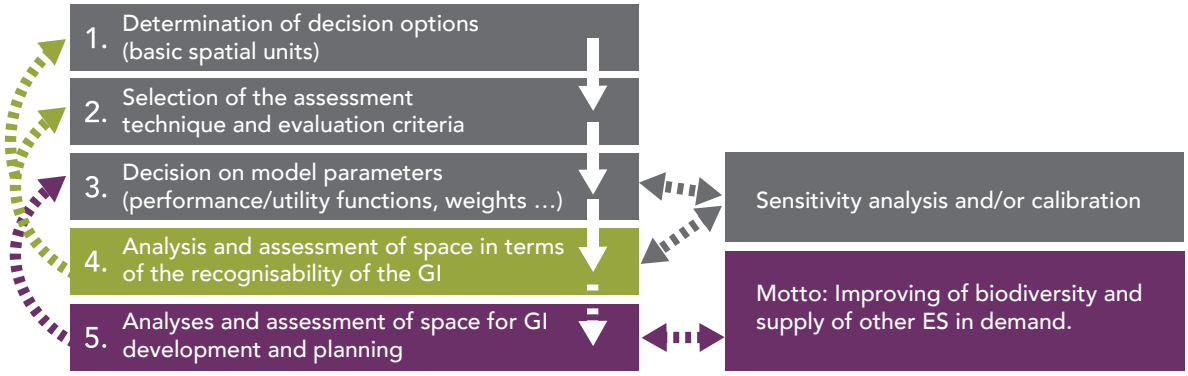


Figure 24: *The main steps in the method for recognising GI in an area (adjusted under the general procedure of the multi-criteria analysis [28.]) and the estimated steps for the analysis and assessment of an area in terms of the GI development.*

5.2.2 Definition of the main spatial unit

To define the main spatial unit for the analysis, we can stem from two main approaches:

a) the definition of the raster cell of a chosen dimension of the discussed area, which is the main unit for adding data, analysis, and the preparation of results,

b) considering the presence of areas that support supply of GI and the assignment of sub-units based on the sections with considered areas or their ranges.

Approach a) is used mainly when dealing with large areas (i.e. in a very small scale - spatial macro level) and less often when analysing space in a large scale (spatial micro level). The chosen size of the raster cell (e.g. 100 x 100 m) can include various types of surfaces on the micro level, and therefore various properties of an area within each cell; the result in each raster cell therefore reflects the average state inside the cell. This may lead to confusion in the event of spatial planning, because it is based on unambiguous delimitations between individual spatial units that are, in practice, generally of various spatial sizes and forms. Results for usage on the micro level are improved by reducing the size of the raster cell, but even in cases of very small cells (e.g. with sides of 1 m) within the cell, various actual usages or environmental legal regimes are possible. Such an approach is only appropriate when analysing space on the micro level if dynamic monitoring of the size of cells and their valuation is ensured when a switch is made to a smaller spatial scale.

Approach b) enables the discussion of space based on the actually present and recognised areas with different sized surfaces (ranges). In this case, all the included layers (ranges) are initially overlapped, and then, on the basis of all the cuts of the included layers, the spatial (sub-)units are defined. This way, we make it possible for the results to be spatially harmonised with all the conditions and requirements that may stem from the individual layers and regimes. We use approach b) in our method.

The means of determining the main spatial units for approach b) are displayed in **Figure 25**. The illustrative example given aims to analyse an area where three spatial layers that were used as valuation criteria, i.e. the Natura 2000 area, the water protection area, and the actual land use (DRP) overlap. If we stem from the layer of the Natura 2000 area with the concluded unit "A", we cover this layer with two other data layers. From the main "A" unit, four spatial sub-units are thus created ("1/1" to "1/4").

Of course, even in the case that includes approach b), when many layers are included in the analysis, a vast analysis of spatial data may occur, especially if the analysed area is spatially vast. By increasing the size of an area, we move from the spatial planning phase to an ever more strategic level. The latter is often a generalisation, and uses a smaller number of authentic criteria, which is why it is effective to estimate the dynamics in both approach a) and b), that will enable the consideration of many different layers based on the scope of the discussed area.

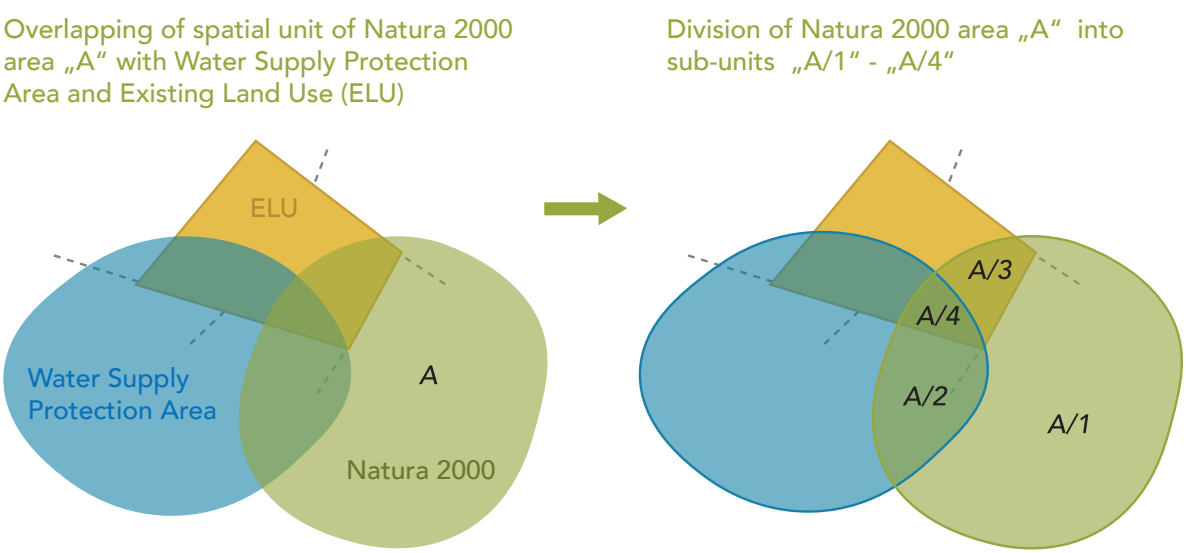


Figure 25: *The division of an area into sub-units on the basis of cuts with included range spatial data.*

When the area is divided, we must give a numerical value to each sub-unit A, with which we will be able to assess the GI level of each sub-unit. Multi-criteria assessment functions are often used for such cases, among which the following two prevail: (1.) the weighted summation method and (2) the weighted multiplication method. Both methods are simple to understand and use [28.]. This method uses the weighted summation method, which is simpler to use and accurate enough for the strategic level. We write it as:

$$A_i = \sum_{j=1}^{No.\ of\ criteria} \| f_j(x_{ij}) \| * \| w_j \|$$

whereby:

f_j ... the assessed function for the *j* criteria

x_{ij} ... the value of the *i* sub-unit under the *j* criteria

w_j ... the weight of the *j* criteria

In order to get the total *A* assessment, the *fj* assessments of each considered *j* criteria (i.e. considered data layers of protection regimes and area usage) need to be considered for each discussed spatial sub-unit of *i*, multiplied by the *w* weights that reflect their importance. The more protection regimes there are at a certain unit/sub-unit, the higher the GI value is for this sub-unit. Values of assessments and weights change depending on the importance of the protection regimes; their main values are given in **Table 3**.

We must also note that the values are benchmarked, because the assessment functions and weights are also benchmarked. This guarantees us to have the A_i interval for all the discussed *i* sub-units ranging from 0 to 1.

Table 3: *The range of assessments and weights that are used in the method shown. Values depend on the considered criteria (data layers). Each sub-unit is given a final (benchmarked) value on the basis of the weighted summation method.*

SELECTED LAYERS / CRITERIA		PROTECTING REGIME / LAND USE	MIN	MAX	IMPORTANCE	NORM. WEIGHT	OVERALL
Biodiversity	1	Natura 2000	0	1	5	0.104	**0.375**
	2	Protected area	0	1	4	0.083	
	3	Natural values - area	0	1	4	0.083	
	4	Natural values - spot	0	1	4	0.083	
	5	Eco important area	0	1	1	0.021	
Ecosystem service	6	Bathing water	0	1	4	0.083	**0.375**
	7	Water supply protecting area	0	1	6	0.125	
	8	Water and riparian land	0	1	2	0.042	
	9	Flood hazard area	0	1	3	0.063	
	10	Protecting forest	0	1	2	0.042	
	11	Cultural heritage	0	1	1	0.021	
Suitabilty due to existing land use	12	Existing land use	0	1	12	0,250	**0.25**
					Min score	0	**1**
					Max score	0	**1**

Thus, if the A_i sub-unit is covered with a certain data layer (criterium), then the share of the assessment of this layer is added to it. For example, if the A_i sub-unit is within the Natura 2000 area, then the assessment of at least 0.104 is added to it. The more layers there are that are covered with the A_i sub-unit, the closer its assessment is to the value of 1. Certain assessment functions only assess by using two possible assessments, 0 (the sub-unit is not covered with this layer) or 1 (the sub-unit is covered with this layer). Certain assessment functions may also have a larger range of possible assessments. For example, in the coverage of the sub-unit with the water protection zone, the protection regime with which the sub-unit is covered also impacts the assessment of the sub-unit. If it is in the discussed area or within the area of the 1st protection regime, then the value 1 is added under the chosen assessment function, and by considering the benchmarked weight of 0.125 in value. If it is within the 2nd protection regime, the value of 0.667 is added and by considering the benchmarked weight of 0.083 in value. If it is within the 3rd protection regime, the value of 0.333 is added and by considering the benchmarked weight of 0.042 in value.

The most complex assessment function is the one that concerns the coverage with actual use. Here, we had to assess, for all types of actual land use, the ES stock and its diversity. **Figure 26** shows the assessment function by types of actual usage. For example, we believe a built or related land has zero ES, while a marsh offers a high amount of diverse ES.

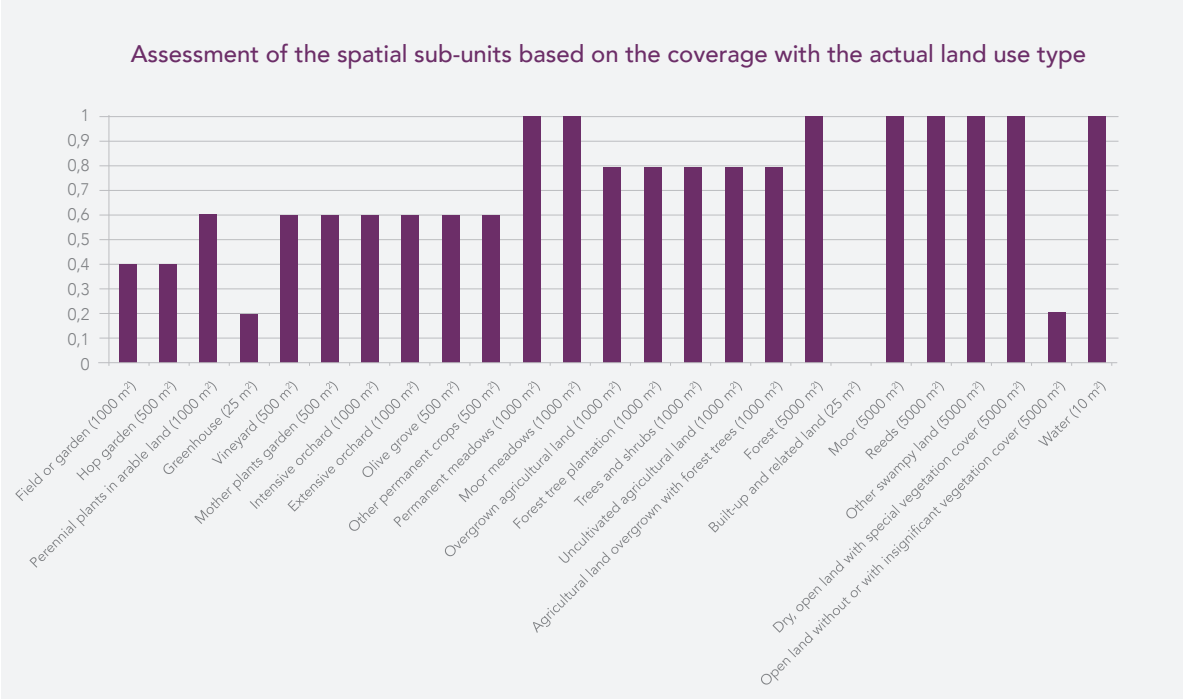


Figure 26: *Assessment of the spatial sub-unit based on the coverage with the actual land use type.*

An example of the final result of this method for the Vipava river basin area and part of the Idrija river basin is in **Figure 27**. For a better understanding, the figures that include the two sub-units also show the concrete assessments of GI and how they have been calculated on the basis of overlapping with the considered layers or criteria.

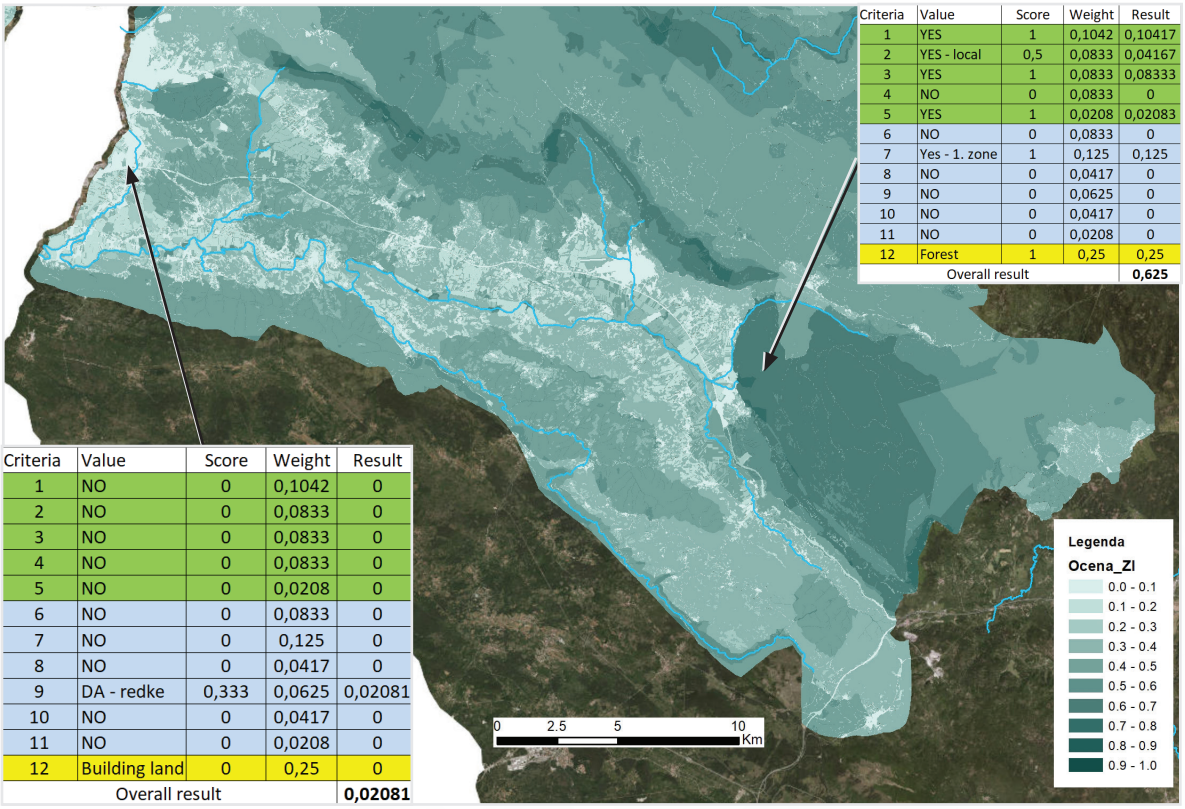


Figure 27: *The GI assessment of the Vipava region, showing the assessments in individual layers (criteria), and in total for the two chosen sub-units.*

Photo 6: *Štanjel did not have any water supply in the time of the architect Max Fabiani, who was able to use local knowledge and karst characteristics to design a masterpiece called the Ferrari Garden.*

5.3 Planning the green infrastructure

GI planning is a strategic process, the aim of which is to increase ES stock and diversity in a certain area. When planning, we make sure that the appropriately and sustainably preserved and designed green infrastructure provides a healthy environment for man, with a wide range of ES, as well a good ecological state of habitats and therefore biodiversity.

As support in planning GI, the following steps need to be performed in terms of analysing the benefits and costs.

1. A leading sectoral goal needs to be chosen, which is also ES.
2. Measures need to be planned in an area to improve the stock of this ES.
3. Conflicts with other existing and planned land usages need to be reviewed.
4. Synergistic impacts per stock and supply of other ES that are in demand, both locally and beyond, need to be reviewed.
5. To perform an analysis of benefits of the possible measures in terms of the total positive impacts on ES stock, and costs regarding the worsening (or increased costs) of other usages or services of the area.
6. To assume balancing or mitigation measures (supporting financial mechanisms) for preserving other usages or services of an area.
7. To perform the final analysis of the benefits and costs and to adopt decisions or to return to the previous steps, including step one.

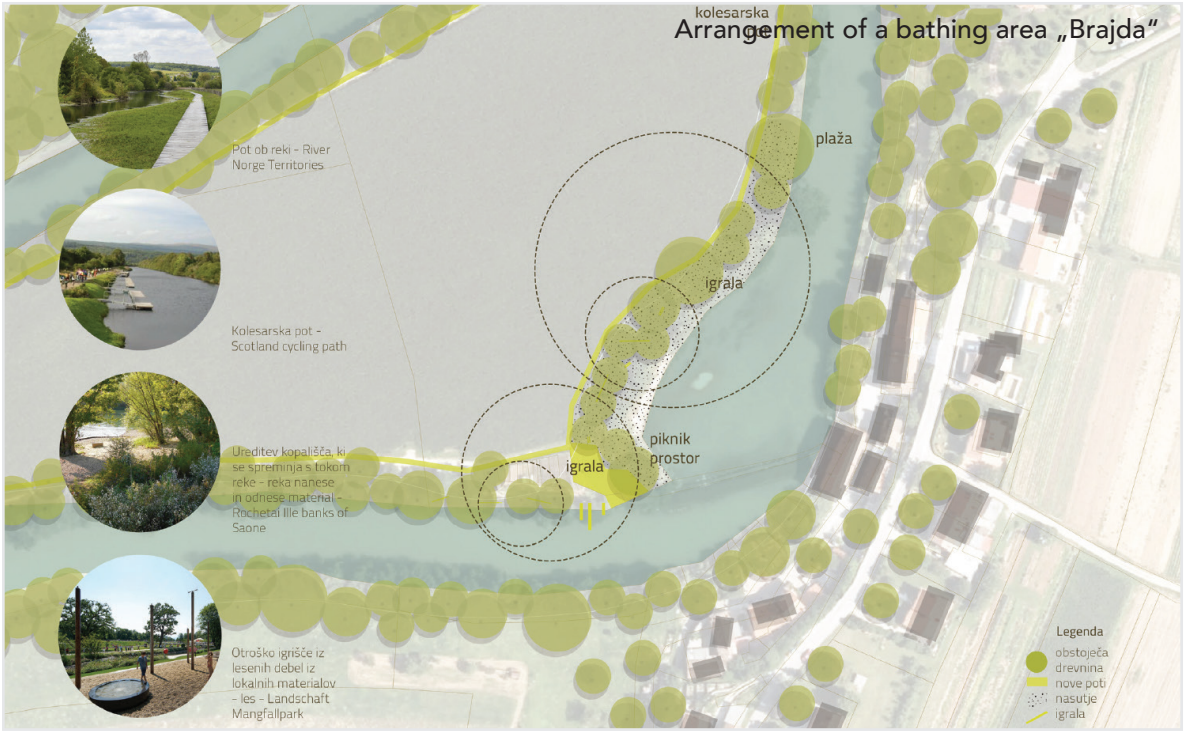


Figure 28: *An example of GI planning on the micro level - green urban areas and corridors (arrangement of a bathing area at Miren, on the Vipava river) in terms of improving the usage of recreation and tourism ES [37.].*

Special attention is required in step 3, when conflicts with other existing and planned land usages are reviewed. In practice, this often means restricting or hindering the development of this usage or GI. Regardless of such cases, the long-term strategy of the state would need to include the fact that even areas that are severely in conflict with the development of GI, are at least partially adjusted to the needs of flora and fauna and the ES demands. For example, the re-establishment of green belt (hedgerows, hedges) in major agricultural areas means a reduction in crop areas for farmers. Green zones also require some maintenance. On the other hand, hedgerows improve the microclimatic conditions (reduced wind erosion, lower temperatures), and serve as shelter for pollinators and various predators that balance the population size of field pests. With good planning of hedgerows, the supply of certain ES may be achieved, i.e. wood, berries, etc., increasing the landscape value, which is important for tourism and leisure activities.

In many cases in Slovenia, land has many functions. For example, the land may be farmland and a coastal zone at the same time. A coastal zone near waters has many functions (sub-chapter 6.1.2). On the other hand, farming is often carried out on land by streams, both extensively as well as intensively. Fertilisers and plant protection products are drained into the subsoil, and flow into the very stream itself. To resolve the issue of cross-usage in this case, cooperation is required from at least three sectors: agriculture, water sector and the sector for preserving nature.

The rigidity of determining an intended land use that does not allow multi-purpose uses is causing problems in GI planning, which is generally recognised on green areas, water and coastal land and forest and farmland.

- In practice, municipalities, due to the inability of determining a dual or overlapping use , determine restrictions with spatial implementation conditions, e.g. restrictions that allow the placement of a ski resort or dry collectors on farmland, which is not in line with the rules.
- In addition, the restrictions brought forward by the intended land use (e.g. in areas for defence needs outside settlements) generally do not allow additional activities or the development of GI, especially at the consistency of the defence department in the spatial planning process.
- In addition, measures for preserving GI could be permitted at intended land areas "N - areas for the needs of protecting against natural and other disasters", or this would also be functional and recommended, providing the protection standards are respected.

ZUreP-2 defines the planning of a landscape in a different manner, and does not differentiate between a dispersed populated area and dispersed construction. The OPN must define arrangement areas for settlements, and independently arrange the landscape. The specification of an arrangement area of a settlement already includes land that is not (yet) building lots. For the purposes of long-term expansion of a settlement, the OPN must define an area for the long-term development of the settlement.

For a comprehensive definition of an area in terms of recognising the value of an area, such as GI, the discussed area would need to be checked in terms of the availability and demand of all the classified ES. In essence, it is easier to recognise areas, in an expert and analytical manner, that already provide ES, than to plan new such areas. In the first case, the matter only concerns the recognition of the existing situation, while in the second case, the needs of the people (short-term and long-term) need to be included in the upgrade thereof. Here, additional supporting methods or tools for environmental, social and economic analyses often need to be used, with which we can support the sectoral harmonisation and optimal planning.

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ANNEX 1: ECOSYSTEM SERVICES - SYNERGIES AND CONFLICTS

Main class	Ecosystem services	Legal regimes with recognition of their targeted ES				
		Natura 2000	Protected area	Natural values - area	Natural values - spot	Ecologically important area
Provisioning services	Cultivated plants					
	Pasture farming/grass as fodder					
	Hunting and fishing					
	Surface water for drinking water supply					
	Ground water for drinking water supply					
	Raw biotic materials (wood, fibres etc.)					
	Water supply in industry and agriculture					
	Biomass for obtaining energy					
	…					
Regulation and maintenance services	Retention of nutrients/substance					
	Reduction in greenhouse gases/ imporving air quality					
	Flood risk mitigation					
	Drought risk mitigation					
	Natural water retention and flow regimes					
	Erosion and sediment transport control					
	Soil formation					
	Regulation of local climate (temperature, wind etc.)					
	Preserving populations and habitats	o	o	o	o	o
	…					
Cultural services	Landscape value (diversity, naturalness, speciality)					
	Natural and cultural heritage					
	Experience of natural environment					
	Education and science					
	Recreation and tourism (fishing, sailing, bathing, cycling, hiking)					
	…					

Legal regimes with recognition of their targeted ES						
Bathing water	Flood hazard area	Water and riparian land	Flood hazard area	Protecting forest	Cultural heritage	...
	○					
				○		
			○			
					○	
						○
○						

Legend:

Targeted ES	○
Positive effects on supply of other ES	+
Strong negative effect on targeted ES	!

ANNEX 2: NOTES AND EXPLANATIONS

1 The green infrastructure, as well as the ecosystem services, have been implicitly known for a long time, albeit not so defined.

2 The Water Act with amendments (Off. Gaz. of RS, No. 67/02, 02/04 and 57/08) governs the water management and the management of water and coastal land by determining:

- priority usage (for drinking water),
- the term, status and ownership of water and coastal land,
- water management carriers,
- the main rules for managing waters, such as protection against floods, erosion, preserving and balancing water quantities,
- the decisions on water usage and water interventions (concessions, water permits and consents),
- public services, water objects and devices,
- types of water management acts, such as the national programme, plans and detailed plans for managing waters and the sea environment, as well as programme measures,
- the participation means of the public in water planning,
- the means of financing public services,
- protection areas, such as water protection areas, endangered and protection areas of bathing and surface waters.

The water quality assurance is governed by the Environmental Protection Act (Off. Gaz. of RS, No. 39/06). The Act defines the principles and normative arrangement, which defines:

- the core principles of the protection of the environment, i.e. principles such as comprehensiveness, cooperation, prevention, caution, responsibility of the person responsible, the ecological ownership functions, subsidised action-taking of the state in the elimination of the consequences of the excessive usage of the environment,
- measures for the protection of the environment, such as the threshold emission values, environmental quality standards, monitoring, taking action in the event of an environmental disaster,
- programmes and plans regarding the protection of the environment,
- the assessment of the impacts of environmental interventions (PVO, CPVO),
- the organisation of the administrative structure concerning the environment, etc.

3 If the measures from the group of measures that may be identified as "green infrastructure" are actually optimal measures, then this may be recognised in the optimisation process of measures in order to achieve the target situation while the green infrastructure measures in themselves cannot be the only possible method to achieve the target situation.

4 The most important tasks of managing waters and sea areas are performed on the state level. The Republic of Slovenia does not have a regional management level. Local communities (municipalities) have little power regarding the management of waters as per the Water Act.

On the state level, the tasks are performed by the competent ministry, namely:

- it defines the policy,
- it prepares the proposal of the national plan for managing waters,
- it prepares statutory and regulatory proposals and adopts regulations,
- it prepares proposals of operational programmes and programmes of measures,
- it manages the processes in the comprehensive assessment on impacts on the environment (CPVO).

The Slovenian Water Agency, which is part of the ministry, is responsible for:

- issuing water permits,
- issuing permits for the operation of plants that may cause pollution,
- issuing environmental consents for each procedure that may significantly affect the environment,
- managing the water cadastre,
- monitoring waters and reporting on the situation thereof.

The Inspectorate for the Environment and Spatial Planning, which is tasked with supervision, is responsible for:

- sanctioning and taking action if water and environmental regulations are breached.

5 During the Yugoslavian era, a special institute for the water economy of the Republic of Slovenia was organised, which had the general power to manage waters. Its territorial and regional units were privatised following the Slovenian independence. Today, as private companies with a concession from the Ministry of the Environment and Spatial Planning, they carry out a large part of the public service for managing waters.

6 The water protection area is part of the EU's jurisdiction and is the normative activity in this area; it is vast and requires active management and reporting:

- The EU water directive framework has established the framework for the protection of the inland surface waters, brackish waters, coastal waters and underground waters. Its goal is to prevent and reduce pollution, to promote sustainable water usage, to protect the water environment, to improve the situation of the water ecosystems, and

to mitigate the consequences of floods and droughts. The general goal is to achieve a good environmental situation in all waters. This is why the member states must prepare the so-called plans for managing river basins on the basis of natural geographical river basins and special programmes of measures for achieving these goals. The water directive framework is complemented by special target directives, such as the directive on underground waters, the directive on drinking waters, on bathing waters, on nitrates, on urban wastewater treatment, on environmental quality standards and on floods.

- In the directive on the protection of groundwater against pollution and deterioration, special criteria are defined for assessing a good chemical situation, the determination of important and continuously increasing trends, and the definition of the starting points for trend reversals. The threshold values of all the pollutants are determined by the member states, except for nitrates and pesticides, the values of which are defined in the special legislation of the EU.
- The directive on drinking water defines the core quality standards for water intended for human consumption. It requires the member states to use the sampling location method to regularly monitor the quality of this water. The member states may implement additional special requirements on their territory, but only if higher standards are defined. The directive also requires consumers to be regularly informed.
- The purpose of the directive on bathing waters is to improve public health and environmental protection by determining the measures for monitoring and classifying bathing waters into four categories. During the bathing season, the member states must take samples of the bathing waters and measure the concentration of at least two specific bacteria at each bathing spot at least once per month. The member states must also inform the public on the profile of the bathing waters, including data on pollution sources and sources that affect the quality of the bathing water.
- The directive on environmental quality standards required the formation of a list of 33 priority substances which pose a significant risk for the water environment on the EU level, or the risk that is transmitted in the water environment, as well as 8 other pollutants of surface waters. 12 new substances were added to the list during the review, and the Commission was tasked to form an additional list of substances that need to be monitored in all the member states (watch list), with which future reviews of the list of priority substances would be supported.
- The purpose of the directive concerning urban wastewater treatment is to protect the environment against the damaging impacts of emissions of urban wastewater and industrial emissions. It defines the minimum standards and timetables for the collection, treatment and emission of urban wastewater, implements control over the disposal of mud from treatment plants, and prohibits the disposal of such mud into the sea. (Discussions are currently on-going regarding new rules with which to prevent water shortages, so as to enable the re-use of the treated wastewater for irrigation purposes)
- The aim of the directive on nitrates is to protect waters against nitrates from agricultural sources. The supplementary regulation demands that member states submit a report to the Commission with information about good agricultural codes of practice, on areas that are sensitive to nitrates, on water monitoring and a summary of important aspects of action programmes every four years. The purpose of the directive is to protect the drinking water and to prevent damage due to eutrophication.
- The purpose of the directive on floods is to reduce and manage risks due to floods that threaten the health of the people, the environment, the infrastructure and property. It requires that member states must perform an assessment for determining the endangered river basins and the corresponding coastal areas, and prepare flood risk charts and management plans which are focused on prevention, protection and preparedness. All these tasks must be performed in line with the framework directive on waters and the defined river basin management plans contained therein.

7 Article 37 of the law defines the permitted interventions in an area.

"No interventions in the area can be made on water and coastal land and at intermittent lakes, except for:

1. the construction of public infrastructure facilities, communal infrastructure and communal connections to the public infrastructure, and arrangements directly related to the construction of public infrastructure facilities that are planned on the basis of regulations concerning the embedding of spatial arrangements of national importance in an area, if they meet the conditions of paragraph three of this Article,
2. the construction of facilities of the built public good under this and other laws,
3. the measures that relate to the improvement of hydro-morphological and biological properties of surface waters,
4. the measures that relate to the preservation of nature,
5. the construction of facilities necessary for the usage of waters that must be built on water or coastal land for carrying out the special usage of the water (e.g. facilities for collecting or releasing water), for ensuring the safety of navigation, and for ensuring the protection against drowning in natural bathing resorts,
6. the construction of facilities intended for the protection of waters against pollution, and

7. the construction of facilities intended for national defence, the protection and rescue of people, animals and property, and the implementation of tasks of the police.

8 Article 92 of ZV-1 (protection against rainwater):
"(1) The local community is tasked with the protection against the damaging effects of rainwater in settlements.
(2) The protection against the damaging effects of rainwater especially includes measures for the reduction of rainwater drainage from urban areas and measures for limiting the emissions of wastewater and rainwater.
(3) The detailed measures and the protection means, as per the previous paragraph, are prescribed by the minister."

9 Off. Gaz. of RS, No. 98/15 and 76/17.

10 The operational programme on the drainage and treatment of urban wastewater (draft 2019) only mentions rainwater in paragraph (3.3.7), which is not systematically defined.

11 The adoption of standards is defined mainly in Articles 24, 26, and 27 of the Building Act, where the standards, policies, etc., are defined as the core requirements for the facilities.

12 An example of a British manual on sustainable drainage system (SuDs Manual) http://www.hrwallingford.com.cn/pdfs/news/CIRIA%20report%20C753%20The%20SuDS%20Manual-v2.pdf.

13 Regulation of the execution order on irrigation and drainage systems (Off. Gaz. of RS, No. 108/05, 45/08 – ZKme-1 and 95/11); Decree on the provision of public utility services for hydrological improvement systems (Off. Gaz. of RS, No. 95/11, 108/13 and 31/14); Decree on the provision of public utility services for hydrological improvement systems (Off. Gaz. of RS, No. 31/14, 91/15 and 82/18) – does not apply to the 2018 Decree on the operation of the national public services of drainage and irrigation systems (Off. Gaz. of RS, No. 82/18).

14 *All the spatial arrangements are of national importance in the sea area, except:*
- ports intended for special purposes, with piers for up to 200 vessels and the corresponding pier infrastructure, and piers that are not intended for international public transport with the corresponding pier infrastructure,
- floating docks of up to 50 m in length and 100 m2 of surface area,
- bridging walkway or cycling paths,
- bathing areas and erected beaches,
- breakwaters that do not exceed 7 m in width over the sea surface,
- local communal and energy infrastructures.

15 Off. Gaz. of RS, No. 96/04 - official consolidated text, 61/06 - ZDru-1 and 8/10 - ZSKZ-B.

16 ZON, Article 45 (measures for the protection of natural values):
"(1) To protect the natural values or to preserve the natural processes and determine the means for carrying out the protection of the natural values, the state and the local communities carry out the measures aimed at the protection of the natural values.
(2) The measures aimed at protecting the natural values are contractual protection, security, temporary security and renewal.
(3) The state performs measures from the previous paragraph in order to protect the natural values of national importance.
(4) The local community carries out the protection measures as per the second paragraph of this Article to protect the natural values of local importance.
(5) The type of the measure from the second paragraph of this Article to be implemented is proposed to the state or local community by an organisation that is responsible for preserving nature."

17 ZON, Article 136 (managing natural values owned by the state):
"(1) The natural values, real estate in secured areas, and things that serve them or are owned by the state, are managed by the body that is responsible for preserving nature, unless otherwise specified in the regulations.
(2) The management from the previous paragraph includes:
- - taking care of the usage of the natural values and real estate in protected areas, which ensures the protection of the natural values and the implementation of purposes, due to which the protected area was established,
- - concluding legal transactions regarding the usage of real estate in protected areas and with things that serve them, in line with the law."

18 ZON, Article 35 (landscape):
"(1) A landscape is a spatially concluded part of nature that, due to its properties of a viable and non-viable nature, and man's actions, have a certain arrangement of landscape structures.
(2) A landscape diversity is a spatial structure of natural and anthropogenic landscape elements.
(3) The landscape diversity is preserved, developed and re-established, as well as those properties of the landscape that are important for preserving biodiversity.
(4) Spatial interventions are planned and performed by preserving the properties of the landscape from the previous paragraph as a priority, as well as the landscape diversity.
(5) The government determines the properties of the landscape and landscape diversity that is significant for preserving biodiversity, as well as the policies for preserving biodiversity in a landscape that is considered in arranging an area, and the usage of natural resources."

19 ZON, Article 36 (densely populated areas):
"(1) Biodiversity in areas of urban agglomeration is preserved by: - enabling the connection of the habitats in such areas with the nature outside such areas, if this is technically possible and does not require any disproportionate costs,

- preserving green areas, trees, groups of trees, standing and running waters and other living spaces, - using technical solutions that do not trap or hinder animals during construction projects, or to eliminate such problems after the construction of a facility by means of additional measures."
(2) The minister, with the consent of the competent minister, prescribes for the flora and fauna, or for the habitats of their populations in densely populated areas, the means and conditions for interventions that conform to the requirements of the previous paragraph.

20 ZON, Article 46.

21 Thus, Article 133 of ZON therefore states that the manager of a protected area performs the following public service tasks:

1. they prepare proposals for the management plan,
2. they adopt the annual work programme on the basis of the management plan and carry out or take care of the realisation of the tasks defined in the plan,
3. they cooperate with the local communities to achieve the purpose of the protection and the set goals of protecting and developing the protected areas,
4. they regularly monitor and analyse the status of the nature and natural values in the protected area,
5. they manage the real estate that is owned by the founder in the protected area for management purposes, if the Act so specifies,
6. they cooperate with the Institute for Nature Conservation in preparing the nature protection guidelines for the part that relates to the protected area,
7. they carry out the protection measures in the protected area,
8. they conclude contracts for the protection of natural values in protected areas,
9. they conclude custodianship contracts for natural values in protected areas,
10. they harmonise and monitor the implementation of research tasks in relation to protected areas,
11. they take care of the maintenance, renewal and protection of natural values in protected areas,
12. they take care of the presentation of the protected area,
13. they cooperate with owners of protected areas, and offer expert aid and advice,
14. they prepare and maintain paths and markings and the other infrastructure intended for visitors of the protected area,
15. they lead visitors through the protected area,
16. they ensure access to information about the protected area.

22 Article 60 of ZON also governs the management plan for the protected area as the most important programme act, with which the development policies are determined, as well as the means for implementing protection, usage and management of the protected area, and detailed policies for the protection of the natural values in the protected area by considering the development needs of the local inhabitants. The protected area is managed on the basis of the protected area management plan, unless otherwise specified in the Nature Conservation Act.

23 The managers of Natura 2000 areas are managers of protected areas, in their own territory and in border territories. Where there are no managers, the Natura area is managed by ZRSVN, while certain measures may also be adopted by the municipality.

24 The issue is comprehensively exposed by: The material for the meeting of the Thematic focus group in the framework of the renewal of the Spatial development strategy of Slovenia (2017) - the sea and the coast.

25 Thus, explicitly: The material for the meeting of the Thematic focus group in the framework of the renewal of the Spatial development strategy of Slovenia (2017) - the sea and the coast.

26 "Other land from the previous paragraph is land in protected or endangered areas in line with this law, and land on which water is being researched or which is necessary for the implementation of the water right (hereinafter: other land)".

27 Article 88 of ZON: "A public benefit is shown if the expropriation of a real estate is required in order to carry out the protection and development policies of the natural values, the accessibility or consumption of the natural value properties, and the protection and development of the protected area or the renewal of natural values, when this is defined in the Nature Conservation Act /.../"

28 Article 63 of the law states: "Expropriation is permitted if the monument or its protected values are threatened, or if their preservation cannot be achieved by any other means, or if it is not possible to ensure the accessibility of the monument in any other way in line with the proclamation act. Any interference in the ownership right must be proportional to the public benefit due to which the expropriation took place."

29 The Decree on protective forests and forests with a special purpose describes these areas in Article 3.

30 Following a lengthy and complex procedure, the municipality of Ankaran, which includes the settlement of Ankaran in Slovenia, was founded by the Constitutional Court of Slovenia with its judgement on 9 June 2011. It also said that the municipal council is made up of 13 members, of whom one is a member of the Italian indigenous national community. It also said that the first elections are to be carried out at the next regular elections. It also announced municipal elections at MOK, which was withheld the previous year, whereby the first elections to the bodies of the new municipality were carried out in the framework of the regular local elections in 2014.

31 The process is managed under ZPNačrt.

32 In the process of preparing the Strategy, owners and managers of major rounded green areas were recognised, opin-

ions of the key actors and inhabitants were obtained regarding the arrangement of the green areas, and a strategic assessment of the status of the green areas was made. We have found that there is interest among the major owners and inhabitants of the municipality of Ankaran to actively cooperate with the municipality in managing green areas, that more owners of important green areas in the municipality have problems with the lack of assets for managing the areas, that the owners and inhabitants are aware of their limited knowledge on managing green areas and trees, that several public green areas in the municipality need to be renovated and require an upgrade in terms of their programme, that the conditions for preserving nature in the municipality are good in the broad sense, and that the municipality of Ankaran also has remains of an enviable park heritage that has not been appropriately preserved and comprehensively assessed.

33 The landscape design of Ankaran, the coastal zone of Ankaran and the Ankaran outskirts, Locus prostorske informacijske rešitve, d.o.o., Ljubljanska cesta 76, 1230 Domžale, September 2017.

34 The Protection of the Marine Environment and the Coastal Region of the Mediterranean - the Protocol was ratified by the NA of RS with the Ratification Law of the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Off. Gaz. of RS, No. 84/2009). The ICZM protocol is one of the protocols of the Protection of the Marine Environment and the Coastal Region of the Mediterranean convention (the Barcelona convention). For an efficient performance of obligations from the Barcelona convention and its protocols, the Mediterranean Action Plan (MAP) was adopted in the framework of the United Nations Environment Programme (UNEP). In line with Article 4 of the Ratification law of the ICZM protocol, the Ministry of the Environment and Spatial Planning is tasked with the implementation of the protocol. Considering the ICZM protocol, we as a state must:

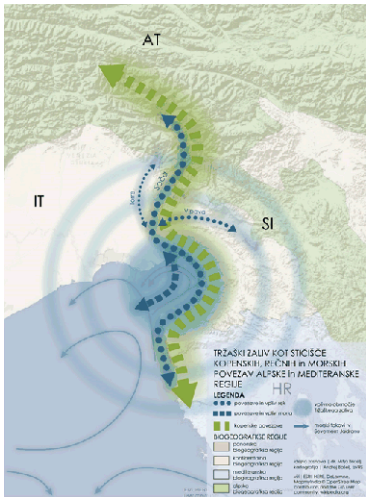
1. establish a coastal zone (coastal zone: 100 m coast + 200 m sea) as a special management zone;
2. establish a management structure for an integral management of the coastal zone (between the various administrative levels and various sectors, between stakeholders from the economy and civil society).

The role of coastal municipalities is therefore significant, or it should be.

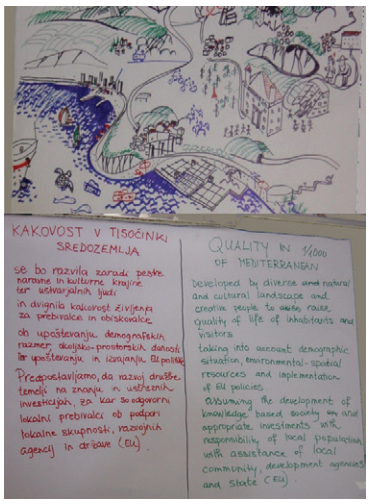
35 Due to the specificity of the coastal zone and the cultural environment of the hinterlands, the landscape design divides the municipal area into two units: the “Ankaran coastal zone” that includes the coastal zone of the entire municipality, including Debeli rtič, the culturally preserved area over the Lazaret border crossing, and the area between the Adriatic road and the relieving canal of Rižane; the “Ankaran hinterland” includes the remaining areas north of the Adriatic road, and due to the connectedness with the surrounding cultural landscape, it also includes the settlement of Ankaran. The settlement is discussed in more detail in the framework of the Urban design of Ankaran.

36 The entire gulf of Koper in the Water Management plan for the Adriatic sea for the period of 2016-2021 is defined as a heavily reformed water body.

37 There are three bathing waters in the area: Debeli rtič, RKS MZL Debeli rtič, and Adria Ankaran, which conform to the statutory criteria for the determination of natural bathing waters. The quality of the water is regularly monitored in these sections (during the bathing season between 1 June and 15 September every 14 days).



Gulf of Trieste – centre of biodiversity in the Adriatic ecoregion



Vision for the Slovenian coast – result of UNEP/MAP CAMP Slovenia workshops, (Koper, 2004-2006)

ECOSYSTEM SERVICES

recreation
bio material
biodiversity
microclimate
oxygen
water supply
food
self-purification

OTHER SERVICES

energy
living
municipal infrastructure
mineral resources
services
transport
industry