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MANUAL FOR CREATING EVIDENCE-BASED GREEN INFRASTRUCTURE STRATEGIES AND ACTION PLANS

A Tool supporting Local Planning

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MANUAL FOR CREATING EVIDENCE-BASED GREEN INFRASTRUCTURE STRATEGIES AND ACTION PLANS - A Tool supporting Local Planning

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1. Preface

This manual is the final output of the MaGICLandscapes INTERREG Central Europe project. It is the culmination of research, consultations and field-testing of the various tools created within the project to aid in producing green infrastructure strategies and supporting action plans. The manual is based on the experiences, findings and lessons learnt by ten partners across five central European countries applying those tools to develop their own green infrastructure strategies and action plans for nine case study areas in cooperation with a wide range of stakeholders and decision-makers.

The purpose of this manual is to enable and encourage planners, decision-makers and stakeholders alike to plan for and implement green infrastructure using a suite of interconnected tools operating at different spatial scales and aimed at delivering the greatest public benefit possible when investing and planning for green infrastructure and contributing to sustainable development.

It enables various sectors such as city, regional and local planning, water management, forestry, agriculture and nature protection amongst others to identify shared objectives and deliver measures that meet common objectives and needs for their sectors.

The manual will guide the reader through the various green infrastructure assessment approaches, transnational/regional, functional assessment and benefit assessment and present a series of case studies demonstrating how strategies and action plans were developed using the tools developed and outlined in this manual.

With their varied socio-economic and environmental priorities and varied landscapes, it is hoped the reader can associate and identify with the case study area strategies and perhaps find inspiration to also implement the green infrastructure concept within their own regions, towns and landscapes and deliver the multiple benefits green infrastructure can provide and meet the challenges and requirements for sustainable development.

2. What is green infrastructure and why should you adopt the GI approach?

The European Union describes green infrastructure as

"A strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services such as water purification, air quality, space for recreation and climate mitigation and adaptation. This network of green (land) and blue (water) spaces can improve environmental conditions and therefore citizens' health and quality of life. It also supports a green economy, creates job opportunities and enhances biodiversity."

Green infrastructure (GI), nestling amongst the more identifiable grey infrastructure of development, has rarely attracted the same level of interest or investment, at least on the strategic level, with local-level investment often concentrating on a site by site basis taking into account recreational needs or the aesthetic requirements of changing development design trends over the years. Understandably, as settlements expand and change, the strategic potential of green infrastructure has remained a secondary consideration and opportunities have been missed to enjoy the benefits it can provide.

Today, our interdependence with the environment, its value and the benefits it provides for society are clear and its importance is better understood. It provides us with vital services, essential to our physical and mental health and well-being, economies and cultural identity. Healthy networks of green spaces for people and wildlife have also been acknowledged as a crucial approach in mitigating against the negative effects of our changing climate, providing resilience for our cities and towns, reducing flood risk, providing cooling and improving air quality.

In terms of the natural world, networks that enable species movement and genetic exchange are vital for adaptation to the changing climate and to reduce the fragmentation that threatens species' ability to persist and thrive. These networks also provide space within which communities can enjoy nature reinforcing the appreciation of the natural world and thus helping to protect it.

The European Union Green Infrastructure Strategy "Green Infrastructure (GI) — Enhancing Europe's Natural Capital", (European Commission 2013b) was adopted by the European Commission in 2013. This document states that green infrastructure plays a key role in policies related to climate change, disaster risk management and natural capital (Land and Soil, Water, Nature Conservation).

Moreover, Green infrastructure is considered a key element in meeting the European Union's EU 2030 Biodiversity Strategy's targets and highlights the use of GI to maintain and enhance ecosystem services. The EU Directorate-General for Environment consider GI as having four 'broad roles';

- Protecting ecosystem state and biodiversity
- Improving ecosystem functioning and promoting ecosystem services
- Promoting societal well-being and health
- Supporting the development of a green economy and sustainable land and water management

The multifunctional nature of green infrastructure means that it successful and well-planned implementation can help meet the objectives of several of the European Union's overarching strategies (Figure 1).

Figure 1 - Key European Strategies associated with green infrastructure.

1. A Blueprint to Safeguard Europe's Water Resources - COM(2012) 673 final (EU Water Blueprint)
2. WHITE PAPER Adapting to climate change: Towards a European framework for action – COM (2009) 147 final
3. EU Biodiversity Strategy for 2030 – Bringing nature back into our lives
4. Roadmap to a Resource Efficient Europe - COM(2011) 571 final (Resource Efficiency Roadmap)
5. COUNCIL DIRECTIVE 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (Habitats Directive), DIRECTIVE 2009/147/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 30 November 2009 on the conservation of wild birds (Birds Directive)
6. The European Green Deal – COM(2019) 640 Final
7. Urban Agenda for the EU, launched with the Pact of Amsterdam (2016)

The science of ecosystem services brings with it an opportunity to maximise the benefits that green infrastructure can provide and adds an extra, more tangible value to our green spaces, whether they are local parks or natural areas important for wildlife. However, application of a solely ecosystem services based approach does not necessarily address the strategic imbalance or how or where to plan green and open spaces at the city or regional scale.

As detailed above at the heart of the concept is the ability of green infrastructure to deliver multiple benefits. Well-planned and multifunctional green space and landscape elements can help meet the objectives of multiple sectors and providers and help to address local problems such as climate change mitigation, access to green space, remediation of contaminated, derelict or abandoned land and preserve biodiversity. Involvement of different sectors and inter-sectoral cooperation can enable multiple funding sources to be accessed, reducing the financial burden on a single sector or provider and such cooperation can only be conducive to a better and more integrated approach to planning.

In 2013 The European Commission published a list of the 13 recognised benefits of green infrastructure. (Figure 2). This list of benefits is a useful approach in conveying the relevance of creating and enhancing GI to stakeholders and decision-makers.

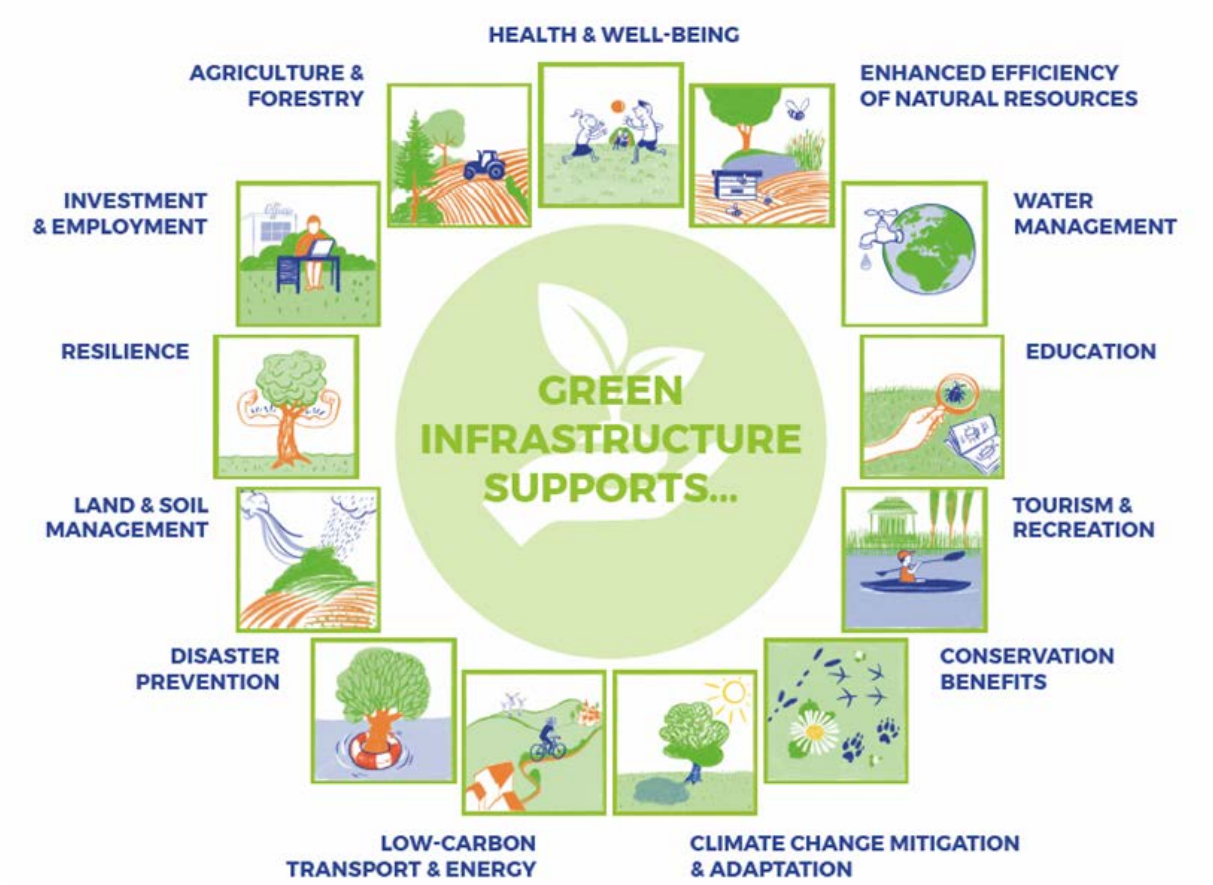

Figure 2 - The benefits of green infrastructure

	**Health and Well Being** ▪ Provides space for relaxation and exercise ▪ Positive effect on physical and mental health ▪ Location for social interaction and community activities ▪ Reduces and absorbs pollution, particulates e.g. dust and PM10, gases such as ozone, sulphur dioxide, nitrogen
	**Enhanced efficiency of resources** ▪ Maintains soil fertility, reduces erosion by water and wind, by reducing run-off reduces soil loss ▪ Wildflower strips, ponds and hedgerows provide habitat for pollinators and predators of agricultural pests ▪ Maintains soil moisture through ground-water recharge/infiltration
	**Water management** ▪ Protects water bodies from agricultural run-off such as soil, fertilisers and pesticides, reducing likelihood of algal blooms, set to worsen under a changing climate ▪ Reduces run-off from roads, intercepting heavy metals and other pollutants such as rubber and micro-plastics ▪ Slows flows across landscapes/townscapes to enable ground-water recharge and reduces flooding severity
	**Education** ▪ Provides a place for learning and other physical activities, outdoor classrooms and forest schools for example ▪ Encourages protection of the environment through exposure and appreciation ▪ Access to green space is associated with improved health, mental and physical and cognitive development of children
	**Tourism and Recreation** ▪ Provides a setting for tourism and recreation activities such as formal parks and riversides areas in towns and cities and natural areas in more rural areas ▪ Creating new or enhancing natural GI elements within an existing tourism area can provide alternative tourism products e.g. river-based activities or visitor centres on urban nature reserves ▪ Raises the image of urban areas whilst helping to mitigate against the negative effects of climate change
	**Conservation Benefits** ▪ Increases the permeability of the landscape for wildlife by providing a network of interconnected habitats, essential for distribution, forage and migration ▪ Provides spaces in which humans can enjoy and appreciate flora and fauna and a setting for environmental education ▪ Provides habitat for species vital to crop production and natural pest control

	**Climate Change Mitigation and Adaptation** ▪ Improves urban climates through providing shade and evapotranspiration providing usable and comfortable spaces for people in urban areas during heat-waves ▪ Improves air quality by accumulating airborne pollution such as carbon particulate emissions ▪ Acts as storage for rainfall, regulating rainfall run-off thus reducing flood risk ▪ Carbon storage
	**Low-Carbon Transport and Energy** ▪ Green routes in cities and between residential and workplaces provide pollution-free and safe alternative transport options ▪ Greening of urban area reduces energy usage on cooling i.e. air conditioning ▪ Biomass and carbon-neutral energy conversion
	**Disaster Prevention** ▪ Reduces flood risk through water retention/rainfall interception ▪ Maintains soil moisture during dry periods ▪ Increases groundwater recharge, helping to maintain rivers and streams during dry periods ▪ Reduces the likelihood of landslides through increasing soil stability and can help reduce avalanche risk
	**Land and Soil Management** ▪ Reduces vulnerability of soils to erosion through increasing soil moisture ▪ Reduces wind-flow across agricultural landscapes, reducing drying-out of soils and potential for erosion and soil loss ▪ Increases stability and regeneration of soils
	**Resilience** ▪ Connected habitat networks are more resilient to disturbance events such as fire and flooding and allow for recolonisation ▪ Increases intra-genetic variability through species population size and thus ability to adapt ▪ The more GI in an urban area the more able the area is to withstand the loss of some functions/benefits better than one with a limited amount of GI
	**Agriculture and Forestry** ▪ Increases soil moisture and reduces erosion through soil stability and protection from wind ▪ Increases pollination through providing habitat for pollinators and natural predators of crop pests as part of Integrated Pest Management ▪ Use of GI elements in agroforestry for example can improve productivity and reduce the need for pesticides

Investment and Employment

- Creates an attractive setting for employment and recreation activities
- Supports employment e.g. forestry, management and recreation
- Better labour productivity through improved physical and mental health
- Proven as vital element in regeneration of neighbourhoods and commercial areas

3. Why do you need a green infrastructure strategy? What are the advantages? Who are the actors of the strategy?

Improving and implementing green infrastructure doesn't happen overnight, it takes time, commitment and requires a shared vision, incorporating the needs of both the environment and communities. A strategy is the framework with which this commitment, addressing of needs and identification of opportunities is embodied in a single document charting the way forward. It should recognise both strategic and local needs and locations and themes that are regarded as priorities. It can be aspirational but at the same time it should present realistic, mutually agreed and achievable goals and objectives. Importantly, it should be accessible and able to be easily understood and used by a wide range of stakeholders. This accessibility and the connection with stakeholders' requirements and wishes for green infrastructure is perhaps the most important element in producing a sustainable and widely supported strategy.

We can outline the reasons why it is useful to have a local strategy for green infrastructure:

- to have an accessible public document;
- to raise public awareness;
- to present the evidence and reasons for intervention;
- to generate support from communities and decision-makers;
- to guide actions towards and focus on the best public benefit;
- to identify opportunities for cross-sector cooperation.

It is essential that green infrastructure strategies are public, and importantly, accessible documents that can help define and direct environmental improvements and investments that seek to meet strategic and local needs. They can be used a reference to guide development planning and help prevent the loss of important ecosystem functions and services and preserve and enhance natural capital.

Strategies should present the evidence and the case for intervention and investment. This evidence needs to be a balance of quantitative and qualitative information to provide the appropriate spatial portrait of the area covered by the strategy. Quantitative information can include various types of data such as demographics, geographical, hydrological, ecological, socio-

economic, etc. Qualitative information should be harvested from carefully planned and correctly timed and wide-ranging stakeholder involvement during all the stages of the strategy development process.

Ensuring both the involvement of stakeholders in the development of a green infrastructure strategy and promoting that strategy is fundamental in raising the awareness of the many benefits of a green infrastructure planning approach. Support for implementation can be generated through stakeholder involvement during the development phase of a green infrastructure strategy. It is vital to include the aspirations and suggestions from stakeholders from across the spectrum including policy-makers, NGOs, relevant public and private institutions, communities and land managers/owners.

Crucially, promoting the multifunctional approach of green infrastructure and demonstrating it can help meet the objectives and responsibilities of a number of sectors is also central to garnering support. The involvement of manifold sectors in the development phase enables more concentrated actions to be identified and fosters inter-sectoral cooperation. A green infrastructure strategy should demonstrate the cross-sectoral nature and advantages of a GI approach in planning. Whilst it is always useful to keep a level of pragmatism when developing a green infrastructure strategy, one shouldn't lose sight of the reasons for its creation and the many benefits it can deliver, for this reason a strategy should aim high and not reduce itself to the level of the common denominator, this is something to always keep in mind during any negotiations amongst stakeholders.

Once interventions have been identified that meet the shared needs/objectives of multiple sectors, the funding for those interventions can be sourced from across the sectors, enabling larger interventions at reduced costs for individual sectors and providers.

Not all strategies are the same, a strategy for an urban or peri-urban area will certainly differ from one in a rural landscape. Stakeholders' priorities are different as are landscapes and issues specific to an area, such as flood risk, population density, predominant land-use, biodiversity interest and protected areas for example. The cross-sectoral nature of green infrastructure means there should be no fear of innovation: exploring ways and channels through which agencies and stakeholders can work together presents plenty of opportunists to innovate and share ideas. The limits, scope, priorities and impact of a green infrastructure strategy are thus only bounded by the imagination, commitment and support of stakeholders and agencies.

3.1. Who should you use this manual?

A green infrastructure strategy is by its nature a strategic document and ideally should function as a 'go to' reference document for spatial planning and development.

As the planning sector is primarily responsible for land-use planning, the green infrastructure approach is, of course, principally intended for use in that sector. However, the wide-ranging number of benefits means that other sectors can employ its use to improve how and where they

manage land to increase the number of services, sustainability or to meet social responsibilities. An example could be the regeneration of an urban park where adopting a GI approach could help address a number of issues by maximising the benefits the park could provide. Or where changes to agricultural land-use can make the greatest improvement to wildlife corridors or where new development taking place can add to the existing network of green spaces and increase provision for local communities and where the benefits and functions of green infrastructure are considered equally as important as aesthetics.

Other examples could be how to prioritise planning for a new woodland, where choosing the right location could help reduce flooding, support groundwater recharge, species movement, wind- and water-based erosion, increased recreational opportunities.

The inter-sectoral nature of green infrastructure planning means when water management agencies are planning for retention ponds or perhaps flood-overflow areas consultation with planning and nature protection bodies should reveal where the ponds could help improve connectivity with natural habitats (functionality assessment) or where such ponds could bring biodiversity interest to an urban/peri-urban park whilst helping to manage urban rainfall run-off. A city looking to reduce air pollution and urban cooling can plan for the greening of streets in conjunction with transport planners looking to improve or provide sustainable travel options for residents and workers. Regeneration of brownfield land and abandoned spaces or linear routes can also be planned to compliment the strategy providing recreational space, safe transport routes and connected land- and cityscapes.

3.2. Who are the actors of a strategy?

The drafting, validation, application and review of a Green Infrastructure strategy involves a range of stakeholders who have to play different roles. Only the identification and involvement of all these stakeholders can allow the effective implementation of strategic planning at local level.

The essential roles are:

- the organisation responsible for implementing the strategy;
- the developer of the strategy;
- the parties concerned;
- the financial operators involved.

The first role is always played by the authority responsible for the management of the territory, which can include the findings and objectives of the strategy in its planning processes and implement the actions defined in the Action Plan, either directly or indirectly.

The strategy must be developed using a formalised procedure to analyse the existing situation, assessing the needs, requirements and difficulties in order to draw up a solid, evidence-based and

shared document. Consequently, the author must be an organisation that has the necessary expertise and experience to execute all the different stages of the drafting process.

These two roles may coincide when the organisation responsible for implementing the strategy has and can deploy all the necessary skills and resources (as in the case of the MaGICLandscapes project, the National Parks of Karkonosze and Krkonoše, or the Metropolitan City of Turin), or may be covered by different organisations (as in the case of the High Po Valley or the Eastern Waldviertel & Western Weinviertel study area, where the developers were research organisations).

The stakeholders can be local or general, institutional or private, individual or associated. Their identification is one of the preparatory steps for drafting the strategy, as their involvement is of significant importance. Economic operators (including those of local or extensive interest) may be involved as users of the results of the implementation of the strategy or as a source of funding for its implementation.

4. How should a strategy be structured?

4.1. Characteristics of a strategy

As mentioned above, a local green infrastructure strategy has to identify both the strategic and local needs and the sites and themes considered as priority. It can also be ambitious, but it must present realistic goals and targets that have been agreed upon and can be achieved. Finally, it must be accessible and be easy for a wide range of parties to understand and use. All these characteristics must be considered when developing a strategy.

Any operational planning process on a territorial scale aimed at identifying a series of actions to be implemented, regardless of the aim of the plan, must follow a series of steps that can be summarised as follows:

- definition of the method used to identify the objectives;
- identification of the objectives, potentially arranged on successive hierarchical levels;
- identification of criteria for the prioritisation of objectives;
- definition of the methods for attaining the objectives.

The core of the strategy is therefore the process of identification and prioritisation of the objectives, which must include both an environmental analysis process and a definition process involving the territory (local authorities, stakeholders, citizens).

These two paths can be pursued simultaneously or in sequence and can take on different weights depending on the territorial characteristics, the administrative situation, the characteristics of the territorial planning already in place, and the existing green infrastructure network.

The strategy for a more natural territory (e.g. a protected area, a mountain territory, etc...) will have a different structure, objectives and paths for their identification than that of a strategy developed for a territory with mainly urban and peri-urban areas. The implementation and development of a strategy for the improvement of green infrastructure where there is already a single authority responsible such as a protected area, will normally be the responsibility of that authority, a National Park Authority for example. However, in other territorial contexts, the identification of the organisation responsible for implementing the strategy may be a more complex (and, consequently, often more critical) process.

An important issue in the definition of the strategy and decisions regarding its implementation is identifying the geographical area to be covered by the strategy and the scale of spatial detail to be used to define the objectives and action plans. It is clear that the roles attributed to Green Infrastructure (protecting ecosystem state and biodiversity; improving ecosystem functioning and promoting ecosystem services; promoting societal well-being and health; supporting the development of a green economy and sustainable land and water management) can be fully pursued only with a strategy based on a medium to large area (territorial area, province,

catchment). This does not, however, exclude the possibility of strategic planning of green infrastructure with defined objectives, particularly in urban and suburban areas, on a more local scale.

The steps for drafting a strategy can be described in a series of steps, listed in a non-chronological order:

- characterisation/analysis of the territory affected by the strategy and the territorial context in which it is located;
- analysis of existing planning tools;
- analysis of the needs of the stakeholders;
- identification of territorials values and critical issues (environmental and non-environmental);
- zoning of the area affected by the strategy.

The environmental characteristics of the area covered by the strategic planning, the social and participatory aspects of the area, and the skills and professional background of the strategy developer must be considered when deciding whether to take a "mainly analytical" approach or a complementary approach, which can be defined as "mainly participatory".

In the first case, the starting point is the characterisation and analysis of the objective situation of the territory, according to the methods defined. The results of this phase, including an initial definition of the critical issues, needs and opportunities, are then used for presentation to the stakeholders, with whom the objectives are jointly finally decided upon and defined.

In the second case, interaction with stakeholders is prioritised in order to gather the necessary input to guide the drafting of the strategy. This input is then verified and supplemented in view of the results of the characterisation and analysis activity to allow the final drafting of the strategy.

The choice of approach can also be guided by the type of information available, the assessment of the awareness raised among stakeholders, the time frame established for the development of the strategy. Whatever the approach adopted, every phase must be developed in order to define tangible and shared objectives and a useful and realistic strategy.

As far as the analysis of the territory is concerned, we should bear in mind what is written in European Commission's document on Green Infrastructures states (European Commission, 2013b):

“…Consistent, reliable data are essential for effectively deploying GI. Information is needed about the extent and condition of ecosystems, the services they provide and the value of these services…”.

Furthermore:

"…more research is needed to improve our understanding of the links between biodiversity (species/habitats) and the condition of the ecosystem (vitality, resilience and productivity) and between the condition of the ecosystem and its capacity to deliver ecosystem services…".

4.2. The Public Benefits of Green Infrastructure

The strategic planning of green infrastructures must be guided by the aim of optimising the availability of Public Benefits to the communities that use and rely upon the ecosystem services provided by the territory (both residents and users for specific purposes i.e. commercial purposes).

In practice, Public Benefits define the way in which green infrastructure supplies ecosystem services to the communities (Figure 3).

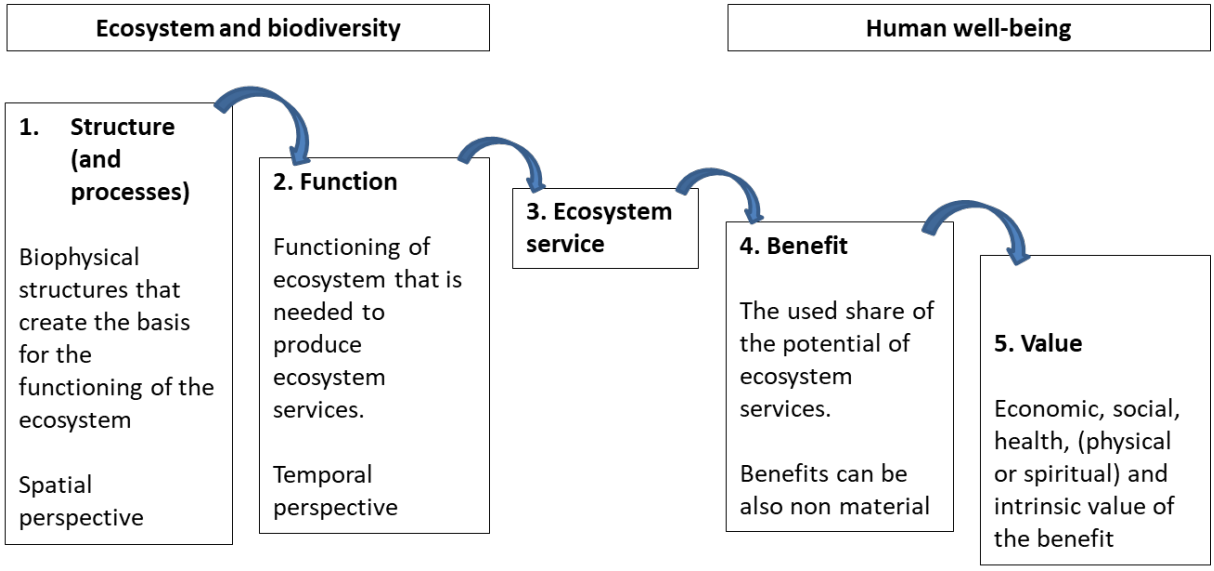

Figure 3 - The Cascade model (adapted from Haynes-Young & Potschin, 2010)

The list of the 13 Public Benefits established on a European scale and described in Chapter 1, reported in an extended view in Figure 4, needs to be formalised in different ways, depending on the uses made of them in the development of the strategy.

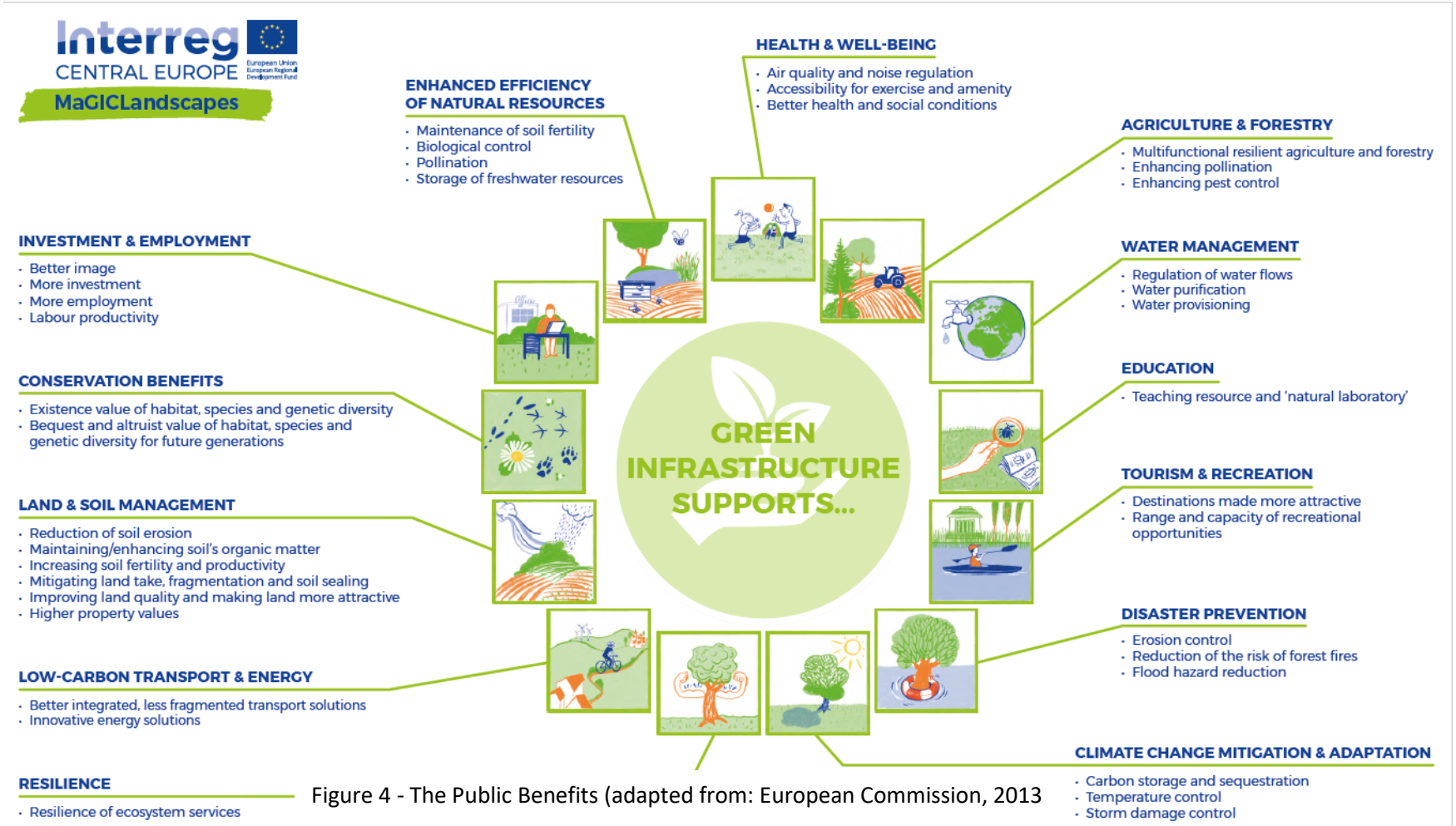

Figure 4 - The Public Benefits (adapted from: European Commission, 2013

On one hand, the Public Benefits are considered during the analysis phase, to identify the current level of supply by the territory in question. In this phase, the definition to be used is that related to the functions (which often correspond to single or variously grouped ecosystem services), as listed in Figure 5.

Agriculture and Forestry	**Land and Soil Management**
Multifunctionality and resilience of agriculture and forestry Pollination Pest control	Resistance to soil erosion Soil organic matter Soil fertility and productivity Capacity of mitigating land take, fragmentation and soil sealing Land quality and attractiveness Property values
Water Management	
Regulation of water flows Water purification Water provisioning	**Conservation Benefits**
Education	Existence value of habitat, species and genetic diversity Bequest and altruist value of habitat, species and genetic diversity for future generations
Teaching resource and natural laboratory	
Tourism and Recreation	
Attractiveness for tourism Range and capacity of tourism opportunities	**Investment and Employment**
Disaster Prevention	Image Investment Employment Labour productivity
Erosion control capacity Ability to prevent the risk of forest fires Flood risk prevention capacity	
Adaptability to Climate Change	**Efficiency of natural resources**
Carbon storage and sequestration Temperature control Storm damage control	Soil fertility Biological control Pollination Storage of freshwater resources
Resilience	
Resilience of ecosystem services	**Health and Well-being**
Low-carbon Transport and Energy	Air and noise environmental quality Accessibility for exercise and amenity Health and social conditions
Integration of transport solutions Innovation of energy solutions	

Figure 5 - Public Benefits defined as functions

On the other hand, when the needs of the territory are identified by analysing the existing planning tools and, above all, the needs of the stakeholders, it is useful to refer to the expression of these benefits as effects of improvement actions (Figure 6).

The Green Infrastructure Public Benefit (PB) Assessment aims at producing an analysis of the PB situation at the local scale, which can be combined with the results of analyses carried out on different scales within the characterisation activities, in the process to define strategies and action plans for Green Infrastructure. The fact that this process is carried out through a formalised process that is as replicable as possible is useful, as it allows the long-term monitoring of the effectiveness of the strategic choices made and the actions taken.

Agriculture and Forestry	Land and Soil Management
Enhancing multifunctionality and resilience of agriculture and forestry Enhancing pollination Enhancing Pest control	Reduction of soil erosion Maintaining/enhancing organic matter in soils Increasing soil fertility and productivity Mitigating land take, fragmentation and soil sealing Improving land quality and making land more attractive Increasing property values
Water Management	
Improvement in regulation of water flows Improvement in water purification Improvement in water provisioning	
Education	**Conservation Benefits**
Increase in teaching resource and natural laboratory	Maintaining/enhancing existence value of habitat, species and genetic diversity Maintaining/enhancing bequest and altruist value of habitat, species and genetic diversity for future generations
Tourism and Recreation	
Increase in attractiveness for tourism Expansion of range and capacity of tourism opportunities	**Investment and Employment**
Disaster Prevention	Better image More investment Increased and varied employment Improved labour productivity
Enhancing erosion control capacity Reduction to the risk of forest fires Flood hazard reduction	
Adaptability to Climate Change	**Efficiency of natural resources**
Increase in carbon storage and sequestration Improvement of temperature control Improvement of storm damage control	Maintenance of soil fertility Increase in biological control capacity Enhancing pollination Increase in storage of freshwater resources
Resilience	
Increase in resilience of ecosystem services	**Health and Well-being**
Low-carbon Transport and Energy	Improvement of air and noise environmental quality Increased accessibility for exercise and amenity Improvement of health and social conditions
Better integrated less fragmented transport solutions Opportunities for innovation for energy solutions	

Figure 6 - Public Benefits defined as effects

4.3. Structure of the Strategy

The combination of the activities undertaken in the analysis and data collection phases, whether priority was given to characterisation and analysis activities or the process was initiated through interaction with stakeholders, leads to the availability of the information needed to define the strategy:

- public benefits already provided;
- needs of the territory in terms of Public Benefits (priorities);
- existing values (environmental and social);
- critical issues to be addressed;
- needs of the local population (and any external users);
- restrictions and planning already defined.

The strategy can be hierarchically organised into general objectives and detailed objectives, which could be differentiated (if necessary) for the different areas defined in the zoning.

The general objectives are related to the benefits identified as priorities in terms of necessity, according to the diagram in Figure 7.

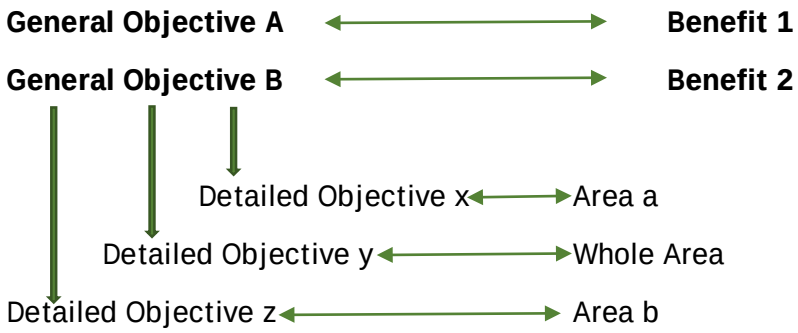

Figure 7 – Relations between objectives and benefits

One or more detailed objectives must be defined for each general objective. The detailed objectives can be located in specific parts of the territory or the whole territory and must be described in detail.

In conclusion, the choice of the general objectives is guided by the needs, threats, strengths, weaknesses and opportunities defined in the Public Benefit Assessment, while the location of the detailed objectives is guided by the geographical information collected during the analysis and characterisation phase.

4.4. The Action Plan

The Action Plan is the implementation of the Strategy, the way in which the objectives defined within it are put into practice. One or more actions represent the realisation of a detailed objective, illustrated by Figure 8.

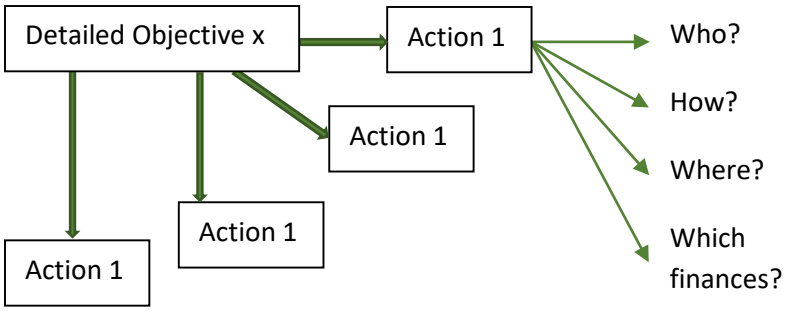

Figure 8 - Relations between detailed objectives and actions

The Action Plan can only include actions for which it is possible to identify the main stakeholders, how the Plan can be implemented, the appropriate location(s) and the sources of funding. This means that it is very difficult to include all the objectives defined in the Strategy in the Action Plan. The Action Plan is, therefore, a dynamic tool, which can be changed and supplemented following the implementation of an action or whenever certain actions become feasible. Win-win actions, actions that meet different objectives (and are aimed at contributing to different benefits), must be prioritised whenever possible.

5. Strategies in the MaGICLandscapes Project

The drafting of the Strategies in the different study areas has followed similar paths. The fact that they do not entirely coincide is due to the different characteristics of the areas considered, and to the different governance situations and the regulatory and planning situation of the area. Moreover, the different experiences within the Project have made it possible to formalise the process used to draw up a Strategy, which is one of the objectives of the Project.

As regards the type of territory considered, most of the case studies look at a purely agricultural land use, with a more or less significant presence of natural areas (obviously prevalent in the National Parks, such as Thayatal, Karkonosze and Krkonoše), and a limited area of development, restricted to small towns and isolated settlements. Consequently, the approach to green infrastructures mainly addressed the scale of land use, favouring objectives related to the increase of natural elements in the agricultural landscape (hedgerows, vineyards, river corridors) and the application of low impact farming techniques. Only marginally, and in individual areas was typical urban green infrastructure such as urban gardens and vegetable gardens also considered.

The analysis of the situation regarding the rules and strategic instruments already in force at different levels (national, regional and local) has also highlighted very different situations. For instance, in Austria institutional documents basically provide guidelines only; on the other hand in Italy, multiple levels of highly detailed strategic environmental planning are in force (despite not always being totally coordinated).

Here is the description of the route taken overall by the Project to achieve the objective of preparing a Green Infrastructure Strategy in each study area. The project phases were:

- Transnational Framework of Green Infrastructure Assessment (Work Package 1)
- Green Infrastructure Functionality Assessment (Work Package 2)
- Strategies for Intervention at European, Regional and Local Level (Work Package 3)

5.1. Transnational Framework of Green Infrastructure Assessment

Work package 1 was a fundamental basis for the project work. It provided the framework of the follow-up work packages including definitions, needs and a policy overview as well as the data base for spatial analyses using transnational and regional sources.

There were two main objectives of WP1. The first objective was to design a framework for green infrastructure assessment that identifies the specific informational needs regarding green infrastructure at the European, regional and local level and how green infrastructure management approaches are supported by European, territorial and local policies and objectives. This was achieved by investigating theoretical approaches of GI assessment towards their success in practical application (state of art) and analysing best-practice examples. Transnational cooperation in the definition of types of GI assessment ensured it meets the informational needs of the partner countries. The related output to this objective is the Handbook of Conceptual and Theoretical Background, Terms and Definitions (Output O.T1.1).

The second objective was to identify the green infrastructure map resources at the transnational scale and using them for GI mapping. A remote sensing-based methodology for transnational assessment of GI and ground-truthing the methodology in selected case study areas across the partnership was developed and applied. The re-integration of experiences and empirical findings delivered iterative improvement, ensured validity and that territorially specific needs were recognised in the development process of the transnational assessment methodology. As data bases, remote sensing-based data like High Resolution Layers and CORINE Land Cover data from the European Copernicus programme have been evaluated. Related to this objective, the Manual for Transnational GI Assessment (Output O.T1.2) was elaborated, including a collection of best-practice examples, digital Regional Maps of GI for Each of the Participating Regions (Output O.T1.3). Due to shortcomings of the transnational data in terms of spatial resolution and compound GI classes all maps on transnational scale have been supplemented by maps using national or regional data. The result is a standard procedure including a transnationally coordinated CE-wide classification scheme for green infrastructure that was used for all maps in all case study areas.

5.2. Conceptual and Theoretical Background, Terms and Definitions

The Handbook of Conceptual and Theoretical Background, Terms and Definitions (Output O.T1.1) contains the fundamentals of green infrastructure, which also includes the blue infrastructure. With its three chapters, the handbook covers issues such as definitions of important terms (Chapter A) as well as GI and its relationship to territorial law/policies of the five partner countries (Austria, Czech Republic, Germany, Italy and Poland) and international and EU regulations and programmes (Chapter B) (see Tab. 1 as a key result).

Regulation Topic	Global or regional international regulations	EU	AT	AT, Lower Austria	CZ	DE	DE, Saxony	IT	IT, Pied-mont	PL
Green Infrastructure										
Green Infrastructure		GI	GI	GI	GI	GI				GI
Protection of Nature, Biodiversity and Landscape										
Nature and Biodiversity Protection (in general)				GI	GI	GI	GI			GI
Biodiversity Protection	GI	GI	GI		GI	GI	GI	GI	GI	
Species Protection	GI	GI		GI	GI	GI	GI	GI		GI
Invasive Species Management		F		F	F	F	F	F		F
Protection of areas/habitats	GI	GI		GI	GI	GI	GI	GI	GI	GI
Landscape Protection		GI		GI	GI	GI	GI	GI	GI	GI
Protection of Cultural and Natural Heritage	GI	GI					GI		GI	GI
Environmental Protection										
Prevention of harmful Effects on the Environment (in general)		F		F	F	F GI		F		F
Environmental Liability		F	F	F	F	F		F		F
Environmental Assessment (EIA / SEA)	F	F	F		F	F	F	F	F	
Water Protection	GI	GI F	GI		GI	GI F	GI F	GI F	F	GI
Air and Climate Protection		F	F		F	F	F			F
Soil Protection		F		F	F	F	F	F	F	F
Economy and Sustainable Development										
Agriculture		GI		GI	GI	GI	GI			GI
Forestry		GI	GI	GI	GI	GI	GI	GI	GI	GI
Hunting and Fishing		GI F		GI F	GI F	GI F	GI F	F	GI F	GI F
Tourism and Recreation	GI	GI		GI	GI	GI	GI	GI		
Energy		F	F		F	F	F			F
Sustainable Development		F	F		F	F	F	F		F
Spatial Planning										
Regional and Local Planning		F		F	GI F	GI F	GI F		GI F	GI F
Urban Planning		GI		F	GI	GI	GI	GI	GI	GI
Sectoral Planning		F	GI F	F	F	F	F		GI F	GI F
Access to Information on the Environment and Public Participation	F	F	F	F	F	F	F	F	F	F

Table 1: Protection of Green Infrastructure (GI) or its Functionality (F) by regulations, laws and policies at different levels, for details see John et al. (2019)

Furthermore, it covers the territorial/international needs for a green infrastructure approach and its contribution to sustainable development (Chapter C). It shows how a green infrastructure approach can address specific territorial and common challenges. The nine multi-scale and multi-thematic case studies of the MaGICLandscapes project are introduced too. They offer the testing ground for our trans-disciplinary partner consortium to identify and feedback best practice for assessment, thus creating transnational added value

The handbook for practice-oriented information is based on a review of GI literature and legislations as well as practical experiences of the project partners and stakeholders. It is expected to be used as a reference for stakeholders and target groups wanting to know more about green infrastructure (GI) but also to aid them in justifying GI related actions and investments. This was done on the one hand by the provision of the policy/legal review for the concerned territories demonstrating how GI relates to multiple sectors. On the other hand it showed, what the needs for a GI assessment are and therefore, where the starting points for actions are. It is expected that the impact will be a greater support for GI as an approach and greater inter-sectoral working to achieve shared objectives that adopting a GI approach can deliver. The benefit will be:

- increasing in together-working and maximizing the public benefit that can be achieved through GI approaches to issues such as health and well-being/recreation;
- mitigating climate change, flooding or loss of pollinators;
- supporting productivity of the land;
- and protecting and enhancing our natural capital.

The tool is transferable to other territories despite only having the legal/policy review for the five participating project countries. The introduction, concept and explanation of GI to the reader is not country-dependant and thus transferable outside of the project area and indeed the CE Programme area. This handbook is also provided in country-specific shortened versions in the corresponding national language. They include only policies and legal reviews for the specific country and demonstrate regional examples of GI benefits in more detail. This will also form part of the final WP3 Output regarding GI strategy production (see chapter on WP3).

5.3. Transnational GI Assessment and Regional Maps of GI for each of the Participating Regions

The Manual of Transnational GI Assessment (Output O.T1.2) provides guidance in assessing the structure and types of GI at the transnational level. It demonstrates the process and methods of generating a transnational map of GI. The manual contains an evaluation of available data, for example data provided by the European Copernicus programme, and their suitability for assessing GI in Central Europe. Manifold European datasets are available, but only very few are suitable for a transnational GI mapping. Due to its full coverage and a relatively low amount of

misclassifications the CORINE land cover dataset proved to be the most appropriate dataset. A major added value of the transnational cooperation in this process was the possibility to test the methods together with regional experts of different countries under different circumstances and under consideration of specific biotopes/land use types not common to all countries to prove the suitability of the data. The CE-wide coordinated GI classification scheme would not have been possible without transnational cooperation.

The manual provides a method for ground-truthing and shows results of the individual ground-truthing carried out by the MaGICLandscapes regional experts in their respective case study areas. Furthermore, a GI classification scheme is presented, that was coordinated between all partners and that is suitable not only for all case study areas but also for Central Europe. This way, also regional specifics could be considered (e.g. poplar plantations in Italy). In addition to the full classification scheme, a simplified three-classes version containing 'green infrastructure', 'green infrastructure under specific circumstances or partly GI' (depending i.e. on composition, intensity of land use, national/regional characteristics) and 'not green infrastructure' is provided.

As a major result of this process the manual provides a GI map on transnational scale for whole Central Europe (see Figure 8 as a key result) as well as for each of the nine case study areas. Due to some shortcomings regarding transnational data (spatial resolution, accuracy, classified elements) the manual also demonstrates, how to refine maps to national/regional level using available detailed data (e.g. biotope or land use maps) and provides a collection of refinement examples from the nine case study areas of the MaGICLandscapes project.

The manual is designed to be a tool that guides the reader through the process of undertaking a large-scale Green Infrastructure (GI) assessment at transnational level in Central Europe (CE). It will encourage other institutions for similar realisation and provides decision-support to them using examples from the MaGICLandscapes project. The developed mapping process presented by this manual can be considered as a CE-wide applicable approach for the mapping of GI and its constituent elements. It can improve capacities of institutes for conducting GI assessments and monitoring across borders. With the examples demonstrating how to refine maps to national/regional level the manual also provides a useful and informative tool for regional stakeholders of different target groups.

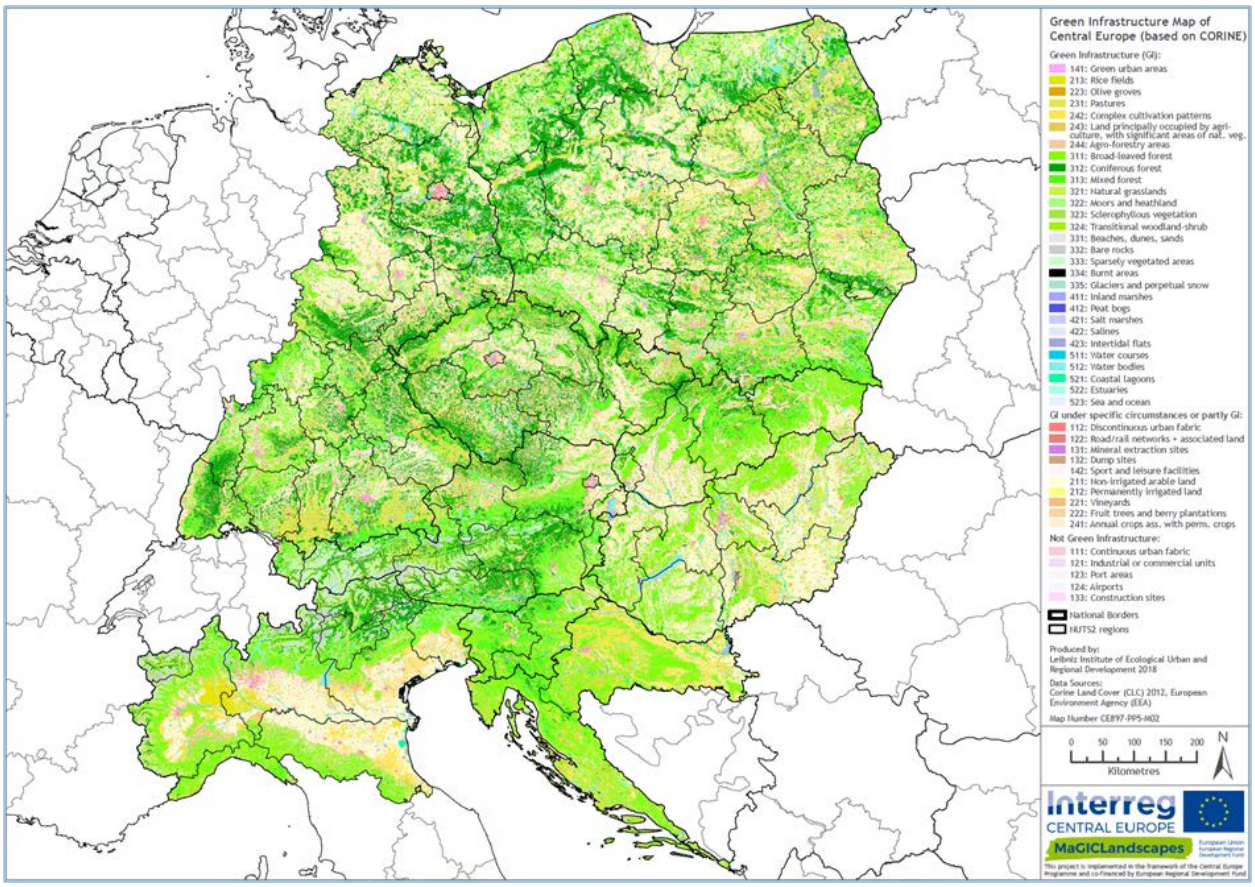

Figure 9 - Map of green infrastructure for the Central Europe programme area based on the transnational legend using CORINE land cover data from 2012, for details see Neubert & John (2019)

GI maps produced by following the instructions of the manual can be a very helpful basis for further analysis, such as on the provision of ecosystem services, biotope connectivity and functionality etc. (see chapter on WP2). The manual is available to the public to be used for other GI mapping and GI planning. Country-specific short versions in four languages are available too.

The mapping methodology provided is applicable to different levels/scales depending on the availability of suitable data for the specific scale. This is especially true for other regions within Europe since the transnational datasets used (mainly CORINE Land Cover data) are available for all European countries and similar data is also available beyond. Thus, by design the data and methods mentioned in the manual for transnational GI mapping are transferable to a large extent. With basic knowledge on GIS-software, different stakeholders will be able to use this tool and to apply the methods described.

The availability of the Regional Maps of GI (O.T1.3) in combination with the Manual of Transnational GI Assessment (O.T1.2) can stimulate and enable other stakeholders to prepare similar maps and implement them in their region. All maps produced are available to a wide public to use them for further implementation especially in spatial planning. Since the mapping methodology is provided in addition and only freely available or low cost data is used, the obstacles for transferring the regional GI mapping to other territories and stakeholders are minimal.

The conducted regional GI maps show that it is possible to prepare such maps in a comparable layout for the participating Central European territories. Despite regional differences the project team found ways to implement a coordinated approach in all case study areas using regional GI data.

The maps provide a useful tool to inform the following target groups about the status of GI in their region:

- the public, to raise awareness of GI and its benefits to communities;
- the policy and decision-makers, to take measures to protect and to enhance the GI Network;
- the planning sector, to implement measures.

While developing the handbook, we learned that the term green infrastructure (GI) is not well known in the public yet. The same is true for the regional and local planning levels that are important for implementation. The analysis of GI in laws/policies at EU/national/regional level showed that the topic is represented differently within the EU and its territories. We hope that the WP1 results help to enhance this situation in providing knowledge and guidance.

The transnational cooperation enabled us to perform a coordinated mapping approach using the same database on transnational level and similar data on regional level for all case study areas including a transnationally coordinated legend and colour scheme. Although some regional specifics, the results are comparable across Central Europe to a large extent.

The results of WP1 have been an important base for the subsequent working steps in the project and have been used in the follow-up work packages.

5.4. Green Infrastructure at European, Regional and Local Scale – Green Infrastructure Functionality Assessment

The Manual of Green Infrastructure Functionality Assessment is the main output of the Work Package 2 outputs, which were developed as part of the Interreg Central Europe project MaGICLandscapes - Managing Green Infrastructure in Central European Landscapes.

It is designed to be a tool that guides the reader through the process of undertaking a green infrastructure (GI) assessment on a regional and local scale in the central European context. Using practical examples it demonstrates the main steps for conducting a GI functionality assessment, starting from the regional discrepancies in the definition of GI, then shifting to the description of how and why particular datasets are more useful in conducting such assessments at this level. Finally, through various spatial analyses it shows how a map of regional and local GI functionality can be created.

The description of the assessment and mapping process presented in the manual are designed to provide decision-support to other users that want to fulfil similar tasks.

The manual describes the general procedure for assessing GI functionality. Besides a short introduction to GI definitions and ambiguities in the terminology at local/regional level, the available spatial data for assessing GI and Blue Infrastructure (BI) in central Europe are presented and discussed. Subsequently, the main methodologies employed to perform the GI functionality assessment are reported. These consist of an integrated synopsis of the results of the connectivity analysis, the field mapping methodology testing and the functionality analysis. In the manual, the general and specific findings of this assessment process are presented. Each step of the functionality assessment is explained by maps from the project's case study areas (CSA). Finally, conclusions are drawn and suggestions about the functionality assessment are provided for the transferability of good practice.

The benefit of assessing and analysing these data is the acquisition of knowledge about spatial distribution and quality of GI on a regional and local level. The findings of the manual help to identify hot spots of GI networks as well as GI with a high functional value or areas with a lack of such elements.

This valuable data, visualised in maps, is the basis for planning further actions. Using these results, concrete measures on different scales for the regions GI can be developed, in order to maintain the present structures as well as the sustainable use of land and to not only expand the network of GI within protected areas but also beyond their borders. Thus, the management of GI not only changes the landscape for the better from an ecological and nature conservation perspective, it also preserves and improves many landscape services from which humans benefit or actually depend on.

General Procedure of Green Infrastructure functionality assessment and mapping

Green infrastructure (GI) in spatial planning needs to cover many different policy sectors and its implementation is an on-going process dependent on political willingness. To date, tools for implementing the assessment of the multi-functionality of GI elements are still under progress. Examples of development of toolkits for the assessment of GI multifunctionality include the combination of spatial data with the knowledge of experts and regional and local actors (Kopperoinen et al. 2014), the creation of performance indicators of GI (Pakzad and Osmond 2016), and the use of field questionnaire surveys to explore the perceived benefits (e.g. Qureshi et al. 2010). Nevertheless, a holistic or combined approach to address the functionality assessments is rarely employed to date.

The following steps in the procedure of green infrastructure functionality assessment and mapping are explained in the manual:

1. Definition of Green and Blue Infrastructure elements representing the objects of interest at regional level
2. Data acquisition at the transnational, regional and local level
3. Generating transnational, regional and local maps of GI functionality for the case study areas (CSA)
    - Connectivity analysis
    - Field mapping methodology
    - Functionality analysis

The results can be used to inform the following target groups about the functionality assessment methodology of GI:

- General public (to raise awareness);
- Policy- and decision-makers (to take measures to protect and to enhance the GI Network); and
- Planning sector (to implement measures and to draft Strategies and Action Plans).

5.5. Generating a Regional Green Infrastructure Functionality Map

Definition of Green and Blue Infrastructure elements at regional level

In the transnational mapping phase of MaGICLandscapes different datasets able to spatially describe green and blue infrastructure (GI and BI) were explored. From the available dataset sources the standardised land cover classification CORINE Land Cover (CLC 2012) was considered the most adequate (see Manual of Transnational Green Infrastructure Assessment, Neubert and John, 2019, for further details). According to the CLC classification we identified 44 CLC classes that either represent one of three larger classes:

- those being GI elements,
- those that could contain GI elements under specific circumstances,
- those that should not be regarded as GI.

Some GI definitions do not fit the regional characteristics of an area and can deviate from the accepted classes, for example vineyards in Austria and Italy were considered GI and partial GI respectively, due to the intensive management. In this case, discussions with stakeholders in the region where the GI strategy is being developed are necessary to finalise the various GI classes.

These regional definitions of GI are very dependent on the available spatial and thematic resolution of geodata for technical reasons on the one hand and the current predominant land use, the intensity of management and general landscape characteristics on the other hand.

Data acquisition at transnational, regional and local level

As with any other mapping approach, high quality geodata regarding spatial and thematic resolution is an essential prerequisite to allow the operationalisation of the GI concept in the first place.

The requirement of incorporating green space elements on the state, regional, community and parcel scales (Benedict and McMahon 2002) emphasises the need for a profound data basis in terms of high spatial and thematic resolution geodata for local implementation of GI. For that reason, data acquisition at transnational, regional and local level is necessary in quite different ways, dependent on the scope and scale of GI implementation.

While the standardised CORINE Land Cover (CLC 2012) database is considered the most adequate (see Neubert and John 2019) for the mapping of GI on a transnational scale, there is no one-size-fits-all solution for the acquisition of suitable geodata at the regional and local level.

Therefore, the best solution to meet these requirements is the compilation of various regional geodata and small-scale field mapping data, ranging from e.g. regional land cover data to forest inventories and digital registration of GI elements from orthophotos.

The use of the highly detailed geodata can reveal differences in the realistic representation of the GI network in the different landscapes. On the one hand, due to the classification and generalisation inherent in CORINE Land Cover, the extent of fragmentation can be under-represented in large continuous areas and small elements of GI, like woodlands or vineyards. On the other hand, apparently, e.g. arable land or urban fabric are often greatly underrated for their provision of GI and landscape features such as hedgerows, ditches, ponds and single trees. Therefore, the regional data set can enhance the evaluation of the GI network in natural and semi-natural areas as well as in rural and urban settings, which allows for the regional operationalisation of the GI concept. The availability and thus comparability in most European countries is still a major benefit of the CORINE Land Cover classification though.

Through the compilation of various forms of local data to produce a regional highly detailed geodata set, the mapping quality of GI can be enhanced for all types of landscapes and constitutes a precondition to develop stakeholder-based strategies and action plans for future actions and investment in GI. It also enables the precise identification of the local GI network for land managers, policy-makers and communities.

Generating transnational, regional and local maps of Green Infrastructure functionality

The assessment and mapping of GI functionality carried out in MaGICLandscapes comprised of three main types of sub-analyses:

- the connectivity analysis;
- the field mapping methodology;
- the functionality analysis itself.

The methodologies were tested in all partner countries of the project: Austria, the Czech Republic, Germany, Italy and Poland. In this section we present each sub-analysis, divided into various steps, and provide examples of their application in the case study areas.

Connectivity analysis

The analyses of connectivity were performed through the software GuidosToolbox (Graphical User Interface for the Description of image Objects and their Shapes). GuidosToolbox is a free software collection by Peter Vogt (Joint Research Centre (JRC) of the European Commission) and offers a variety of modules targeted to investigate several spatial aspects of raster image objects, for example pattern, connectivity, cost, fragmentation, etc.

The GuidosToolbox is freely available at: https://forest.jrc.ec.europa.eu/en/activities/lpa/gtb/.

Besides the Morphological Spatial Pattern Analysis, a Network analysis and the module of Euclidean Distance was performed to illustrate the connectivity of GI.

Field mapping methodology

The key tool for the assessment of green infrastructure at the local level was the on-site inspection of selected test sections within the case study areas. The selection was derived from the results of the map of green infrastructure based on CORINE (2012) as well as the Morphological Spatial Pattern Analysis (MSPA) and the measurement of the Euclidean Distance in order to locate GI that is important for the connectivity on the landscape scale. The aim of the local GI mapping was to deliver a detailed view of the selected sites that shows the high diversity actually hiding behind the more general classes of CORINE or even the regional datasets.

Functionality analysis

The analyses of functionality were performed by plotting capacities of GI elements and all other land use classes to provide landscape services on the above mentioned rationalised geodata sets. Especially when based on participatory approaches, capacity matrices are widely used for assessment of ecosystems services (ESS), perfectly corresponding to MaGICLandscapes' motivation and objectives.

Basically, a capacity matrix is a look-up table that connects land cover types to ecosystem services or landscape services potentially provided. Introduced by Burkhard et al. in 2009 the method has since been developed and applied in an array of case studies (Campagne et al. 2017).

To create a sound matrix of landscape services capacities for the CORINE Land Cover types in central Europe, an existing matrix for the whole of Europe by Stoll et al. (2015) was used. It was assigned to the definitions of landscape services by de Groot et al. (2002, 2006 and 2010) and revised by the experts of each project partner. The key tool for the analysis of GI functionality was the resulting final matrix of landscape services, consisting of 30 single landscape services in five main services that are aggregated to the total function value for each land cover type.

Round-up of the mapping method and the usability of the methods and maps

Based on the objective to implement green infrastructure in central European planning policies the MaGICLandscapes project aimed to operationalise the GI concept in central Europe as well as in nine case study areas, by using a suite of GIS-based analysis methods, to provide land managers, policy-makers and communities with the adequate tools and knowledge, at different spatial levels.

It was found that the detailed representation of the regional GI network enhances the regional applicability and acceptance of GI initiatives and provides a crucial foundation for assessing GI connectivity and functionality. Based on that, well-founded strategies and action plans can be best developed through an intensive stakeholder involvement to direct future actions and investments in GI.

Therefore, GI assessment methods that focus on functionality in terms of connectivity and provision of landscape services were developed to communicate and facilitate the adoption of those assessment methods by institutions through stakeholder involvement and participatory approaches in order to implement and maintain a viable GI network.

Following the objectives and ideas of MaGICLandscapes, that of an integrated, cross-sectoral approach employing stakeholder involvement and participatory processes, the partner consortium defined an expert-based classification of GI based on CLC classes for the whole Central European Programme Area as a first step, followed by a round of stakeholder validation in the course of workshops in the case study areas to adapt the definitions and classification regionally. The implementation of project activities demonstrated the necessity, as a first step, for a detailed regional GI data basis to allow the realisation of the assessment methods and objectives stated above.

EU-wide available land cover maps, like CORINE (CLC), can help in coarse assessments of GI connectivity and functionality, but they cannot provide exact information about the local network of GI elements. Therefore, this data basis should be supplemented by more detailed available national and regional data. This approach could be adopted all over Europe, owing to the availability of similar kinds of detailed datasets (e.g. agricultural, digital cadastral and hydrographical data). The regional GI map and its various analysis products can be related to a variety of spatial planning measures. It enables politicians, planners, land users/managers and

communities to invest in GI by highlighting hot spots of highly fragmented areas or those dominated by well-established networks of GI as well as locating focus areas providing or in need of capacities of certain ecosystem services, influencing the well-being of individuals and communities.

When it comes to interventions or implementation measures at the local level, the ground-truthing through field mapping of selected test sections revealed the need for a local assessment of GI in terms of biodiversity, naturalness and structure in addition to the desk-based GIS analyses. Therefore, the EUNIS habitat classification (2017) provides a characterisation of GI that is comparable at the international level and also transferable to national classification schemes.

In the synopsis of the various products of the assessment and mapping of green infrastructure functionality and connectivity in a certain region, the needs and opportunities for GI become apparent, justifying investments in GI. This inventory of GI regarding its spatial structure, functionality and ecosystem services allows for considering cross-sectoral policy and planning objectives including the GI concept into regional and spatial planning.

5.6. Strategies for Intervention at European, Regional and Local Level

Within the scope of the MaGICLandscapes Project, a specific methodological tool, the Public Benefit Assessment Tool, has been prepared to guide the assessment of the Public Benefits in the different case studies.

Public Benefit Assessment Tool

The Green Infrastructure public benefit assessment tool is aimed at producing an analysis of the PB situation of a GI on a local scale, which can be placed side by side with the results of the analyses at different scales carried out within WP1 and WP2 of this project, in order to allow the definition of strategies and action plans for Green Infrastructure in the study areas.

Thanks to this integrated approach, strategies and action plans will be based on the evidence of the situation in the targeted areas and will respond to specific local and regional needs, will mitigate the threats and will seize the opportunities for the local stakeholders, maximizing multiple benefits from investment in GIs.

The PB assessment procedure is based on two processes, conducted in parallel, which are scoped to generate two different groups of information, which should be taken into account in the preparation of the strategies.

5.6.1. Process 1

The aim of the first process is to assess the level of availability of public benefits supplied by the territory considered and the relative territorial distribution.

Connection Landscape Services/Public Benefits

Each benefit from the Public Benefits list endorsed by the Project was connected to one or more of the Landscape Services (already used in the WP2), in order to clarify which PBs can be obtained from the landscape we are working on. In the matching process between Benefits and Services, the Services belonging to the "carrier" category are excluded, given their peculiarity and partial redundancy with other LSs.

The compilation of the matrix was guided by the principle of considering the correlations between Landscape Services (provided by the Green Infrastructure network) and Public Benefits guaranteed by these Services. Therefore, general correlations between Public Benefits and Landscape Services were not taken into consideration.

The correlations were defined at the level of general Benefits, but the definition of the specific benefits belonging to each group were used to better understand the kind of correlation (Table 2).

Information service					Production service					Habitat service		Regulation service										
Science and education	Spiritual and historic information	Cultural and artistic information	Recreation	Aesthetic information	Ornamental resources	Medicinal resources	Genetic resources	Raw materials	Food	Nursery service	Refugium service	Biotpical control	Pollination	Waste treatment	Nutrient regulation	Soil formation	Soil retention	Water supply	Water regulation	Disturbance prevention	Local climate regulation	Gas regulation	
							X			X	X	X	X	X	X	X	X	X	X	X	X		**Efficiency of natural resources**
																							Soil fertility
																							Biological Control
																							Pollination
																							Storage of freshwater resources
										X	X	X					X	X	X	X	X	X	**Adaptability to climate change**
																							Carbon storage and sequestration
																							Temperature control
																							Storm damage control
											X						X	X	X	X	X		**Disaster prevention**
																							Erosion control capacity
																							Ability to prevent the risk of forest fires
																							Flood risk prevention capacity
											X			X	X		X	X	X	X	X		**Water management**
																							Regulation of water flows
																							Water purification
																							Water provisioning
	X	X	X	X						X	X	X	X	X	X	X	X	X	X	X	X		**Land and soil management**
																							Resistance to soil erosion
																							Soil's organic matter
																							Soil fertility and productivity
																							Capacity of mitigating land take, fragmentation and soil sealing
																							Land quality and attractiveness
																							Property values
X		X		X			X			X	X	X	X	X	X	X	X	X	X	X	X		**Conservation benefits**
																							Existence value of habitat, species and genetic diversity
																							Bequest and altruist value of habitat, species and genetic diversity for future generations
										X	X	X	X	X	X	X	X	X	X	X	X		**Agriculture and forestry**
																							Multifunctionality and resilience of agriculture and forestry
																							Pollination
																							Resistance to the invasion of pest
X			X																				**Low-carbon transport and energy**
																							Integration of transport solutions
																							Innovativeness of energy solutions
X	X	X	X	X		X	X	X	X		X									X			**Investment and employment**
																							Image
																							Investment
																							Employment
																							Labour productivity
X	X	X	X	X										X				X		X	X	X	**Health and well-being**
																							Air and sound environment quality
																							Accessibility for exercise and amenity
																							Health and social conditions
X	X	X	X	X					X		X							X			X		**Tourism and recreation**
																							Tourist attractiveness of the territory
																							Availability of range and capacity for recreational opportunities
X	X	X	X	X						X	X												**Education**
																							Teaching resource and 'natural laboratory'
							X			X	X	X	X	X	X	X	X	X	X	X	X	X	**Resilience**
																							Resilience of ecosystem services

Table 2 - Connections between Landscape Services (rows) and Public Benefits (columns).

The same table can be condensed as illustrated below in Table 3.

			Public Benefits												
			Health and well-being	Education	Resilience	Investment and employment	Efficiency of natural resources	Adaptability to climate change	Disaster prevention	Water management	Land and soil management	Conservation benefits	Agriculture and forestry	Tourism and recreation	Low-carbon transport and energy
Landscape Services	Regulation service	Gas regulation	X		X			X							
		Local climate regulation	X		X		X	X	X	X	X	X	X	X	
		Disturbance prevention	X		X	X	X	X	X	X	X	X	X		
		Water regulation			X		X	X	X	X	X	X	X		
		Water supply	X		X		X	X	X	X	X	X	X	X	
		Soil retention			X		X	X	X	X	X	X	X		
		Soil formation			X		X				X	X	X		
		Nutrient regulation			X		X			X	X	X	X		
		Waste treatment	X		X		X			X	X	X	X		
		Pollination			X		X				X	X	X		
		Biological control			X		X	X			X	X	X		
	Habitat service	Refugium service		X	X	X	X	X	X	X	X	X	X	X	
		Nursery service		X	X		X	X			X	X	X		
	Production service	Food				X								X	
		Raw materials				X									
		Genetic resources			X	X	X					X			
		Medicinal resources				X									
		Ornamental resources													
	Information service	Aesthetic information	X	X		X					X	X		X	
		Recreation	X	X		X					X			X	X
		Cultural and artistic information	X	X		X					X	X		X	
		Spiritual and historic information	X	X		X					X			X	
		Science and education	X	X		X						X		X	X

Table 3 - Connections between Landscape Services (rows) and Public Benefits (columns).

PB-LS matches are established a priori for the entire project in a first general step, but they can be modified based on considerations relating to local situations (which will be declared from time to time). In particular, some connections can be considered or not depending on the specificity of the local land uses and landscape services.

Connection Land Cover Types/Landscapes Services

Subsequently, we can take in consideration the matrix defined in WP2 (Table 4), which relates landscape services with land use typologies, and defines the intensity on a range from 0 to 5.

CLC code	CLC description	Regulation functions	Gas regulation	Climate regulation	Disturbance prevention	Water regulation	Water supply	Soil retention	Soil formation	Nutrient regulation	Waste treatment	Pollination	Biological control	Habitat functions	Refugium function	Nursery function	Production functions	Food	Raw materials	Genetic resources	Medicinal resources	Ornamental resources	Information functions	Aesthetic information	Recreation	Cultural and artistic information	Spiritual and historic information	Science and education	Carrier functions	Habitation	Cultivation	Energy-conversion	Mining	Waste disposal	Transportation	Tourism-facilities	Total Functional Value
111	Continuous urban fabric	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	3	4	2	0	2	5	0	1	0	0	3	2	23
112	Discontinuous urban fabric	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	2	3	3	4	2	0	1	4	0	1	0	0	3	2	24
121	Industrial or commercial units	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	4	0	1	0	0	3	0	10
122	Road and rail networks and associated land	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1	1	1	0	0	1	0	0	0	0	0	5	2	11
123	Port areas	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	1	0	0	1	0	0	0	0	0	5	2	13
124	Airports	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	5	2	9
131	Mineral extraction sites	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	5	2	0	0	7
132	Dump sites	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	5	0	0	5
133	Construction sites	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
141	Green urban areas	2	2	4	1	2	1	2	1	1	2	1	1	2	2	1	0	0	1	0	0	1	2	3	5	3	0	1	1	0	1	0	0	0	0	4	40
142	Sport and leisure facilities	1	1	2	0	1	1	1	1	0	2	0	1	1	2	0	0	0	0	0	0	0	1	1	5	1	0	0	1	0	0	0	0	0	0	5	24
211	Non-irrigated arable land	1	1	3	1	3	0	1	2	1	1	1	2	2	2	2	2	5	2	2	1	1	1	2	1	3	0	1	1	0	5	0	0	0	0	0	43
212	Permanently irrigated land	2	1	3	1	4	0	1	2	1	1	1	2	2	2	2	2	5	2	2	1	1	1	2	1	3	0	1	1	0	5	0	0	0	0	0	44
213	Rice fields	2	1	3	1	4	1	1	2	2	1	1	2	4	3	4	2	5	2	2	1	1	2	3	1	4	2	2	1	0	5	0	0	0	0	0	54
221	Vineyards	2	1	3	1	3	1	2	3	1	1	1	1	2	2	2	2	5	3	2	1	1	3	3	3	4	3	2	1	0	5	0	0	0	0	1	55
222	Fruit trees and berry plantations	3	2	3	2	3	1	2	3	2	2	5	3	2	2	1	2	5	2	2	2	1	3	3	3	3	2	2	1	0	5	0	0	0	0	1	62
223	Olive groves	2	2	4	2	3	1	3	3	2	2	2	2	3	3	2	3	5	2	2	2	2	4	4	3	4	4	3	1	0	5	0	0	0	0	1	68
231	Pastures	3	1	3	1	3	1	4	4	2	3	3	3	4	4	3	3	5	2	3	3	1	3	4	4	3	1	3	1	0	5	0	0	0	0	1	70
241	Annual crops associated with permanent crops	2	1	3	1	3	1	2	3	1	1	3	2	2	2	2	2	4	3	1	3	1	2	2	2	3	1	2	1	0	4	0	0	0	0	1	52
242	Complex cultivation patterns	2	1	3	1	3	1	2	3	1	2	2	3	3	3	2	2	4	2	1	2	1	2	2	3	3	2	2	1	1	4	0	0	0	0	1	55
243	Land principally occupied by agriculture, with significant areas of natural vegetation	2	2	3	1	3	2	3	3	2	2	2	3	4	3	4	3	3	2	3	2	3	3	3	3	3	3	3	3	1	0	3	1	0	0	0	2	67
244	Agro-forestry areas	3	3	4	1	4	3	4	4	2	3	3	2	4	4	3	3	3	5	3	3	3	3	2	3	3	2	3	1	0	3	3	0	0	0	1	77
311	Broad-leaved forest	5	5	5	5	5	5	5	5	5	4	4	5	5	5	5	5	3	5	5	5	5	5	5	5	4	5	5	1	0	1	1	0	0	0	2	114
312	Coniferous forest	5	5	5	4	4	5	5	5	5	4	4	5	5	5	5	4	3	5	5	4	5	5	5	5	4	5	5	1	0	1	1	0	0	0	2	111
313	Mixed forest	5	5	5	4	5	5	5	5	5	4	4	5	5	5	5	4	3	5	5	4	5	5	5	5	4	4	5	1	0	1	1	0	0	0	2	111
321	Natural grasslands	4	3	3	3	4	4	5	5	4	3	4	4	5	5	5	3	2	1	5	3	4	5	5	5	4	4	5	0	0	1	0	0	0	0	1	92
322	Moors and heathland	4	3	4	4	4	4	5	5	4	3	3	4	5	5	5	3	2	3	5	3	4	5	5	5	4	4	5	0	0	0	1	0	0	0	1	95
323	Sclerophyllous vegetation	4	3	4	4	3	3	5	5	4	3	4	4	5	5	5	4	3	3	5	3	4	4	5	4	3	4	5	0	0	0	0	0	0	0	1	92
324	Transitional woodland-shrub	4	3	4	4	3	4	5	5	4	3	4	4	5	5	5	3	2	3	4	3	3	4	4	4	3	2	5	0	0	1	0	0	0	0	0	87
331	Beaches, dunes, sands	2	1	2	5	5	2	2	2	1	1	1	1	5	4	5	2	0	1	4	2	3	4	5	5	2	4	4	0	0	0	0	1	0	0	2	65
332	Bare rocks	0	0	0	1	1	1	0	0	0	0	1	0	3	4	1	2	0	0	3	2	3	3	4	4	0	5	4	0	0	0	0	0	0	0	2	36
333	Sparsely vegetated areas	1	1	1	1	1	2	1	1	1	1	2	1	4	4	4	2	0.	0	3	2	3	3	4	3	1	4	4	0	0	0	0	0	0	0	0	45
334	Burnt areas	0	0	0	0	0	0	1	1	0	1	1	2	1	2	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
335	Glaciers and perpetual snow	1	1	3	0	4	5	0	0	0	0	0	1	2	2	2	1	0	0	2	0	3	4	5	5	1	5	4	0	0	0	0	0	0	0	2	45
411	Inland marshes	4	4	4	4	5	5	4	5	4	5	2	1	5	5	5	3	1	2	5	4	2	4	4	4	2	4	5	0	0	0	0	1	0	0	1	88
412	Peat bogs	4	4	5	3	4	4	5	5	4	4	1	3	5	5	4	2	0	4	4	3	1	4	4	4	2	4	4	1	0	0	2	2	0	0	1	86
421	Salt marshes	3	1	3	3	4	3	4	4	3	3	2	1	5	4	5	2	1	1	4	3	2	4	4	3	3	4	5	0	0	0	0	0	0	0	0	70
422	Salines	1	0	2	0	3	2	0	2	1	2	0	0	4	4	4	2	1	0	3	2	2	2	3	2	0	4	3	0	0	0	0	0	0	0	1	41
423	Intertidal flats	2	0	3	5	3	0	1	1	1	3	0	2	5	5	4	2	3	0	3	3	2	4	4	4	2	4	4	0	0	0	0	0	0	0	1	58
511	Water courses	3	2	4	3	4	5	2	1	3	5	0	3	5	5	5	3	3	2	5	3	4	5	5	5	4	5	5	1	0	0	4	0	0	3	3	93
512	Water bodies	3	2	4	3	4	5	3	4	3	5	0	3	5	5	5	3	3	2	5	3	3	5	4	5	4	5	5	1	0	0	3	0	0	3	3	94
521	Coastal lagoons	4	3	5	4	4	4	4	4	4	5	2	3	5	5	5	3	4	1	5	3	4	5	5	5	4	4	5	0	0	0	0	0	0	0	1	93
522	Estuaries	3	3	5	3	4	4	3	3	3	5	0	4	5	5	5	4	4	2	5	3	4	5	5	5	4	4	5	1	0	3	1	0	0	2	1	95
523	Sea and ocean	3	3	5	2	4	5	3	1	5	5	0	3	5	5	5	5	5	3	5	5	5	5	5	5	5	5	5	1	0	0	2	0	0	4	3	103

Table 4 - Connections between Land Cover Types (rows) and Landscape Services (columns).

Connection Land Cover Types/Public Benefits

The matrix Land Cover Types / Landscape Services (Table 4) can be used to produce another matrix (tables 5 and 6) that correlates each benefit with each type of land use, expressing a value,

calculated as the average of the values attributed to each considered landscape service. To simplify the comparison between the different values, the result is expressed in a scale from 0 to 3. An excerpt from the matrix is shown in Table 5, which is fully reported in Annex 1.

CLC code	CLC description	Health and well-being		Gas regulation	Climate regulation	Disturbance prevention	Water supply	Waste treatment	Aesthetic information	Recreation	Cultural and artistic information	Spiritual and historic information	Science and education	Education		Refugium function	Nursery function	Aesthetic information	Recreation	Cultural and artistic information	Spiritual and historic information	Science and education	Resilience	
111	Continuous urban fabric	1,20	1	0	0	0	0	0	3	3	4	2	0	1,71	2	0	0	3	3	4	2	0	0,00	0
112	Discontinuous urban fabric	1,20	1	0	0	0	0	0	3	3	4	2	0	1,86	2	1	0	3	3	4	2	0	0,14	1
121	Industrial or commercial units	0,20	1	0	0	0	0	0	1	0	1	0	0	0,29	1	0	0	1	0	1	0	0	0,00	0
122	Road and rail networks and associated land	0,30	1	0	0	0	0	0	1	1	1	0	0	0,57	1	1	0	1	1	1	0	0	0,07	1
123	Port areas	0,60	1	0	0	1	0	0	2	2	1	0	0	0,71	1	0	0	2	2	1	0	0	0,07	1
124	Airports	0,10	1	0	0	0	0	0	0	0	1	0	0	0,29	1	1	0	0	0	1	0	0	0,07	1
131	Mineral extraction sites	0,00	0	0	0	0	0	0	0	0	0	0	0	0,00	0	0	0	0	0	0	0	0	0,00	0
132	Dump sites	0,00	0	0	0	0	0	0	0	0	0	0	0	0,00	0	0	0	0	0	0	0	0	0,00	0
133	Construction sites	0,00	0	0	0	0	0	0	0	0	0	0	0	0,00	0	0	0	0	0	0	0	0	0,00	0
141	Green urban areas	2,20	2	2	4	1	1	2	3	5	3	0	1	2,14	2	2	1	3	5	3	0	1	1,50	1
142	Sport and leisure facilities	1,30	1	1	2	0	1	2	1	5	1	0	0	1,29	1	2	0	1	5	1	0	0	0,86	1
211	Non-irrigated arable land	1,30	1	1	3	1	0	1	2	1	3	0	1	1,57	1	2	2	2	1	3	0	1	1,57	1
212	Permanently irrigated land	1,30	1	1	3	1	0	1	2	1	3	0	1	1,57	1	2	2	2	1	3	0	1	1,64	1
213	Rice fields	1,90	2	1	3	1	1	1	3	1	4	2	2	2,71	2	3	4	3	1	4	2	2	2,00	2
221	Vineyards	2,20	2	1	3	1	1	1	3	3	4	3	2	2,71	2	2	2	3	3	4	3	2	1,71	2
222	Fruit trees and berry plantations	2,30	2	2	3	2	1	2	3	3	3	2	2	2,29	2	2	1	3	3	3	2	2	2,36	2
223	Olive groves	2,90	2	2	4	2	1	2	4	3	4	4	3	3,29	2	3	2	4	3	4	4	3	2,36	2
231	Pastures	2,40	2	1	3	1	1	3	4	4	3	1	3	3,14	2	4	3	4	4	3	1	3	2,71	2
241	Annual crops associated with permanent crops	1,70	2	1	3	1	1	1	2	2	3	1	2	2,00	2	2	2	2	2	3	1	2	1,86	2
242	Complex cultivation patterns	2,00	2	1	3	1	1	2	2	3	3	2	2	2,43	2	3	2	2	3	3	2	2	2,00	2
243	Land principally occupied by agriculture, with significant areas of natural vegetation	2,50	2	2	3	1	2	2	3	3	3	3	3	3,14	2	3	4	3	3	3	3	3	2,57	2
244	Agro-forestry areas	2,70	2	3	4	1	3	3	2	3	3	2	3	2,86	2	4	3	2	3	3	2	3	3,07	2
311	Broad-leaved forest	4,80	3	5	5	5	5	4	5	5	4	5	5	4,86	3	5	5	5	5	4	5	5	4,86	3
312	Coniferous forest	4,70	3	5	5	4	5	4	5	5	4	5	5	4,86	3	5	5	5	5	4	5	5	4,71	3
313	Mixed forest	4,60	3	5	5	4	5	4	5	5	4	4	5	4,71	3	5	5	5	5	4	4	5	4,79	3
321	Natural grasslands	3,90	3	3	3	3	4	3	5	5	4	4	5	4,71	3	5	5	5	5	4	4	5	4,07	3
322	Moors and heathland	4,10	3	3	4	4	4	3	5	5	4	4	5	4,71	3	5	5	5	5	4	4	5	4,14	3
323	Sclerophyllous vegetation	3,80	3	3	4	4	3	3	5	4	3	4	5	4,43	3	5	5	5	4	3	4	5	4,07	3
324	Transitional woodland-shrub	3,60	3	3	4	4	4	3	4	4	3	2	5	4,00	3	5	5	4	4	3	2	5	4,07	3
331	Beaches, dunes, sands	3,10	2	1	2	5	2	1	5	5	2	4	4	4,14	3	4	5	5	5	2	4	4	2,57	2
332	Bare rocks	1,90	2	0	0	1	1	0	4	4	0	5	4	3,14	2	4	1	4	4	0	5	4	0,86	1
333	Sparsely vegetated areas	2,20	2	1	1	1	2	1	4	3	1	4	4	3,43	3	4	4	4	3	1	4	4	1,71	2
334	Burnt areas	0,00	0	0	0	0	0	0	0	0	0	0	0	0,43	1	1	2	0	0	0	0	0	0,57	1
335	Glaciers and perpetual snow	2,90	2	1	3	0	5	0	5	5	1	5	4	3,43	3	2	2	5	5	1	5	4	1,43	1
411	Inland marshes	4,10	3	4	4	4	5	5	4	4	2	4	5	4,14	3	5	5	4	4	2	4	5	4,14	3
412	Peat bogs	3,80	3	4	5	3	4	4	4	4	2	4	4	3,86	3	5	4	4	4	2	4	4	3,93	3
421	Salt marshes	3,20	2	1	3	3	3	3	4	3	3	4	5	4,00	3	4	5	4	3	3	4	5	3,14	2
422	Salines	1,80	2	0	2	0	2	2	3	2	0	4	3	2,86	2	4	4	3	2	0	4	3	1,64	1
423	Intertidal flats	2,90	2	0	3	5	0	3	4	4	2	4	4	3,86	3	5	4	4	4	2	4	4	2,21	2
511	Water courses	4,30	3	2	4	3	5	5	5	5	4	5	5	4,86	3	5	5	5	5	4	5	5	3,36	3
512	Water bodies	4,20	3	2	4	3	5	5	4	5	4	5	5	4,71	3	5	5	4	5	4	5	5	3,64	3
521	Coastal lagoons	4,40	3	3	5	4	4	5	5	5	4	4	5	4,71	3	5	5	5	5	4	4	5	4,07	3
522	Estuaries	4,30	3	3	5	3	4	5	5	5	4	4	5	4,71	3	5	5	5	5	4	4	5	3,71	3
523	Sea and ocean	4,50	3	3	5	2	5	5	5	5	5	5	5	5,00	3	5	5	5	5	5	5	5	3,64	3

	Gas regulation	Climate regulation	Disturbance prevention	Water regulation	Water supply	Soil retention	Soil formation	Nutrient regulation	Waste treatment	Pollination	Biological control	Refugium function	Nursery function	Genetic resources
111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
112	0	0	0	0	0	0	0	0	0	1	0	1	0	0
121	0	0	0	0	0	0	0	0	0	0	0	0	0	0
122	0	0	0	0	0	0	0	0	0	0	0	1	0	0
123	0	0	1	0	0	0	0	0	0	0	0	0	0	0
124	0	0	0	0	0	0	0	0	0	0	0	1	0	0
131	0	0	0	0	0	0	0	0	0	0	0	0	0	0
132	0	0	0	0	0	0	0	0	0	0	0	0	0	0
133	0	0	0	0	0	0	0	0	0	0	0	0	0	0
141	2	4	1	2	1	2	1	1	2	1	1	2	1	0
142	1	2	0	1	1	1	1	0	2	0	1	2	0	0
211	1	3	1	3	0	1	2	1	1	1	2	2	2	2
212	1	3	1	4	0	1	2	1	1	1	2	2	2	2
213	1	3	1	4	1	1	2	2	1	1	2	3	4	2
221	1	3	1	3	1	2	3	1	1	1	1	2	2	2
222	2	3	2	3	1	2	3	2	2	5	3	2	1	2
223	2	4	2	3	1	3	3	2	2	2	2	3	2	2
231	1	3	1	3	1	4	4	2	3	3	3	4	3	3
241	1	3	1	3	1	2	3	1	1	3	2	2	2	1
242	1	3	1	3	1	2	3	1	2	2	3	3	2	1
243	2	3	1	3	2	3	3	2	2	2	3	3	4	3
244	3	4	1	4	3	4	4	2	3	3	2	4	3	3
311	5	5	5	5	5	5	5	5	4	4	5	5	5	5
312	5	5	4	4	5	5	5	5	4	4	5	5	5	5
313	5	5	4	5	5	5	5	5	4	4	5	5	5	5
321	3	3	3	4	4	5	5	4	3	4	4	5	5	5
322	3	4	4	4	4	5	5	4	3	3	4	5	5	5
323	3	4	4	3	3	5	5	4	3	4	4	5	5	5
324	3	4	4	3	4	5	5	4	3	4	4	5	5	4
331	1	2	5	5	2	2	2	1	1	1	1	4	5	4
332	0	0	1	1	1	0	0	0	0	1	0	4	1	3
333	1	1	1	1	2	1	1	1	1	2	1	4	4	3
334	0	0	0	0	0	0	1	1	0	1	1	1	2	1
335	1	3	0	4	5	0	0	0	0	0	1	2	2	2
411	4	4	4	5	5	4	5	4	5	2	1	5	5	5
412	4	5	3	4	4	5	5	4	4	1	3	5	4	4
421	1	3	3	4	3	4	4	3	3	2	1	4	5	4
422	0	2	0	3	2	0	2	1	2	0	0	4	4	3
423	0	3	5	3	0	1	1	1	3	0	2	5	4	3
511	2	4	3	4	5	2	1	3	5	0	3	5	5	5
512	2	4	3	4	5	3	4	3	5	0	3	5	5	5
521	3	5	4	4	4	4	4	4	5	2	3	5	5	5
522	3	5	3	4	4	3	3	3	5	0	4	5	5	5
523	3	5	2	4	5	3	1	5	5	0	3	5	5	5

Table 5 - Connections between Land Cover Types (rows) and Public Benefits (groups of columns).

Also this matrix can be condensed as in Table 6.

CLC code	CLC description	Health and well-being		Education		Resilience		Investment and employment		Efficiency of natural resources		Adaptability to climate change		Disaster prevention		Water management		Land and soil management		Conservation benefits		Agriculture and forestry		Tourism and recreation		Low-carbon transport and energy	
111	Continuous urban fabric	1.2	1	1.71	2	0.0	0	1.09	1	0.0	0	0.0	0	0.0	0	0.0	0	0.75	1	0.44	1	0.0	0	1.33	1	1.5	1
112	Discontinuous urban fabric	1.2	1	1.86	2	0.14	1	1.18	1	0.15	1	0.11	1	0.17	1	0.13	1	0.88	1	0.56	1	0.17	1	1.44	1	1.5	1
121	Industrial or commercial units	0.2	1	0.29	1	0.0	0	0.18	1	0.0	0	0,0	0	0.0	0	0.0	0	0.13	1	0.13	1	0.0	0	0.22	1	0.0	0
122	Road and rail networks and associated land	0.3	1	0.57	1	0.07	1	0.36	1	0.08	1	0.11	1	0.17	1	0.13	1	0.25	1	0.19	1	0.08	1	0.44	1	0.5	1
123	Port areas	0.6	1	0.71	1	0.07	1	0.55	1	0.08	1	0.11	1	0.17	1	0.13	1	0.38	1	0.25	1	0.08	1	0.56	1	1.0	1
124	Airports	0.1	1	0.29	1	0.07	1	0.18	1	0.08	1	0.11	1	0.17	1	0.13	1	0.13	1	0.13	1	0.08	1	0.22	1	0.0	0
131	Mineral extraction sites	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
132	Dump sites	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
133	Construction sites	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
141	Green urban areas	2.2	2	2.14	2	1.50	1	1.45	1	1.15	1	1.78	2	2.0	2	1.88	2	1.88	2	1.63	1	1.58	1	2.11	2	3.0	2
142	Sport and leisure facilities	1.3	1	1.29	1	0.86	1	0.82	1	0.69	1	1.0	1	1.17	1	1.13	1	1.13	1	0.81	1	0.92	1	1.33	1	2.5	2
211	Non-irrigated arable land	1.3	1	1.57	1	1.57	1	1.82	2	1.38	1	1.67	1	1.67	1	1.5	1	1.56	1	1.69	2	1.58	1	1.89	2	1.0	1
212	Permanently irrigated land	1.3	1	1.57	1	1.64	1	1.82	2	1.46	1	1.78	2	1.83	2	1.65	1	1.63	1	1.75	2	1.67	1	1.89	2	1.0	1
213	Rice fields	1.9	2	2.71	2	2.00	2	2.36	2	1.85	2	2.22	2	2.17	2	2.0	2	2.19	2	2.25	2	2.08	2	2.67	2	1.5	1
221	Vineyards	2.2	2	2.71	2	1.71	2	2.64	2	1.54	1	1.78	2	2.0	2	1.75	2	2.13	2	2.0	2	1.75	2	2.89	2	2.5	2
222	Fruit trees and berry plantations	2.3	2	2.29	2	2.36	2	2.55	2	2.15	2	2.11	2	2.17	2	2.13	2	2.5	2	2.44	2	2.42	2	2.67	2	2.5	2
223	Olive groves	2.9	2	3.29	2	2.36	2	3.09	2	2.08	2	2.44	2	2.67	2	2.5	2	2.75	2	2.63	2	2.42	2	3.44	3	3.0	2
231	Pastures	2.4	2	3.14	2	2.71	2	3.0	2	2.62	2	2.56	2	2.67	2	2.63	2	2.88	2	2.94	2	2.83	2	3.11	2	3.5	3
241	Annual crops associated with permanent crops	1.7	2	2.00	2	1.86	2	2.18	2	1.69	2	1.89	2	2.0	2	1.75	2	2.0	2	2.0	2	2.0	2	2.22	2	2.0	2
242	Complex cultivation patterns	2.0	2	2.43	2	2.00	2	2.27	2	1.85	2	2.11	2	2.17	2	2.0	2	2.25	2	2.13	2	2.17	2	2.56	2	2.5	2
243	Land principally occupied by agriculture, with significant areas of natural vegetation	2.5	2	3.12	2	2.57	2	2.64	2	2.38	2	2.67	2	2.5	2	2.38	2	2.69	2	2.69	2	2.58	2	2.89	2	3.0	2
244	Agro-forestry areas	2.7	2	2.86	2	3.07	2	2.91	2	2.77	2	3.11	2	3.33	3	3.13	2	2.94	2	3.0	2	3.08	2	3.0	2	3.0	2
311	Broad-leaved forest	4.8	3	4.86	3	4.86	3	4.73	3	4.46	3	5.0	3	5.0	3	4.88	3	4.81	3	4.81	3	4.83	3	4.67	3	5.0	3
312	Coniferous forest	4.7	3	4.86	3	4.71	3	4.55	3	4.31	3	4.78	3	4.67	3	4.63	3	4.69	3	4.69	3	4.67	3	4.67	3	5.0	3
313	Mixed forest	4.6	3	4.71	3	4.79	3	4.45	3	4.38	3	4.89	3	4.83	3	4.75	3	4.69	3	4.75	3	4.75	3	4.56	3	5.0	3
321	Natural grasslands	3.9	3	4.71	3	4.07	3	3.82	3	3.92	3	4.0	3	4.0	3	3.88	3	4.19	3	4.25	3	4.08	3	4.11	3	5.0	3
322	Moors and heathland	4.1	3	4.71	3	4.14	3	4.09	3	3.92	3	4.22	3	4.33	3	4.13	3	4.25	3	4.31	3	4.17	3	4.22	3	5.0	3
323	Sclerophyllous vegetation	3.8	3	4.43	3	4.04	3	4.0	3	3.85	3	4.00	3	4.0	3	3.88	3	4.06	3	4.19	3	4.08	3	4.0	3	4.5	3
324	Transitional woodland-shrub	3.6	3	4.00	3	4.07	3	3.55	3	3.83	3	4.11	3	4.17	3	4.0	3	3.94	3	4.13	3	4.17	3	3.67	3	4.5	3
331	Beaches, dunes, sands	3.1	2	4.14	3	2.57	2	3.27	2	2.54	2	3.0	2	3.33	3	2.75	2	2.94	2	2.88	2	2.58	2	3.11	2	4.5	3
332	Bare rocks	1.9	2	3.14	2	0.86	1	2.45	2	0.92	1	0.89	1	1.17	1	0.88	1	1.38	1	1.25	1	0.75	1	2.44	2	4.0	3
333	Sparsely vegetated areas	2.2	2	3.43	3	1.71	2	2.6	2	1.69	2	1.78	2	1.67	1	1.5	1	2.0	2	2.0	2	1.67	1	2.88	2	3.5	3
334	Burnt areas	0.0	0	0.43	1	0.57	1	0.27	1	0.62	1	0.44	1	0.17	1	0.25	1	0.44	1	0.50	1	0.58	1	0.11	1	0.0	0
335	Glaciers and perpetual snow	2.9	2	3.43	3	1.43	1	2.18	2	1.23	1	2.00	2	2.33	2	1.75	2	2.06	2	1.81	2	1.42	1	3.33	3	4.5	3
411	Inland marshes	4.1	3	4.14	3	3.93	3	3.64	3	3.85	3	4.11	3	4.5	3	4.5	3	3.94	3	4.06	3	4.08	3	3.78	3	4.5	3
412	Peat bogs	3.8	3	3.86	3	3.93	3	3.36	3	3.54	3	4.11	3	4.33	3	4.25	3	3.81	3	3.81	3	3.92	3	3.56	3	4.0	3
421	Salt marshes	3.2	2	4.00	3	3.14	2	3.18	2	3.08	2	3.11	2	3.5	3	3.38	3	3.31	2	3.44	3	3.25	2	3.33	3	4.0	3
422	Salines	1.8	2	2.86	2	1.64	1	2.0	2	1.62	1	1.67	1	1.83	2	1.75	2	1.81	2	1.81	2	1.67	1	2.33	2	2.5	2
423	Intertidal flats	2.9	2	3.86	3	2.21	2	3.36	3	2.15	2	2.56	2	2.83	2	2.63	2	2.63	2	2.56	2	2.33	2	3.22	2	4.0	3
511	Water courses	4.3	3	4.86	3	3.36	3	4.09	3	3.15	2	3.67	3	3.83	3	3.88	3	3.69	3	3.69	3	3.33	3	4.56	3	5.0	3
512	Water bodies	4.2	3	4.71	3	3.64	3	4.0	3	3.46	3	3.78	3	4.0	3	4.0	3	3.88	3	3.88	3	3.67	3	4.44	3	5.0	3
521	Coastal lagoons	4.4	3	4.71	3	4.07	3	4.09	3	3.77	3	4.11	3	4.33	3	4.38	3	4.19	3	4.25	3	4.08	3	4.56	3	5.0	3
522	Estuaries	4.3	3	4.71	3	3.71	3	4.09	3	3.38	3	4.0	3	4.0	3	4.0	3	3.88	3	3.94	3	3.67	3	4.56	3	5.0	3
523	Sea and ocean	4.5	3	5.00	3	3.64	3	4.55	3	3.31	2	3.89	3	4.0	3	4.25	3	3.94	3	3.94	3	3.58	3	5.0	3	5.0	3

Legend:
Not GI
GI according to specific circumstances
GI

Table 6 - Connections between Land Cover Types (rows) and Public Benefits (columns).
In this way, it is possible to assign, to each land use category, a value to the intensity of each benefit provided.

Mapping Public Benefits

On the basis of the tables presented above, it is possible to produce a series of maps presenting the distribution of the provision of each benefit in the analysed area from the existing Green Infrastructure network, working on land use maps already used in WP1 and WP2, and the extension of GI as defined in the WP1 maps. Before maps are drawn up, the role of "yellow" land cover types (GI according to specific circumstances) must be resolved, possibly by preparing two different sets of maps.

The examples presented in Figures 11-14 show how this type of mapping was carried out in the study area of the Upper Po Plain and how the different consideration of rice paddies (such as GI or non-GI) gives rise to different maps, which highlight in a very different way the role played by other territories, such as the river corridor and the forest areas.

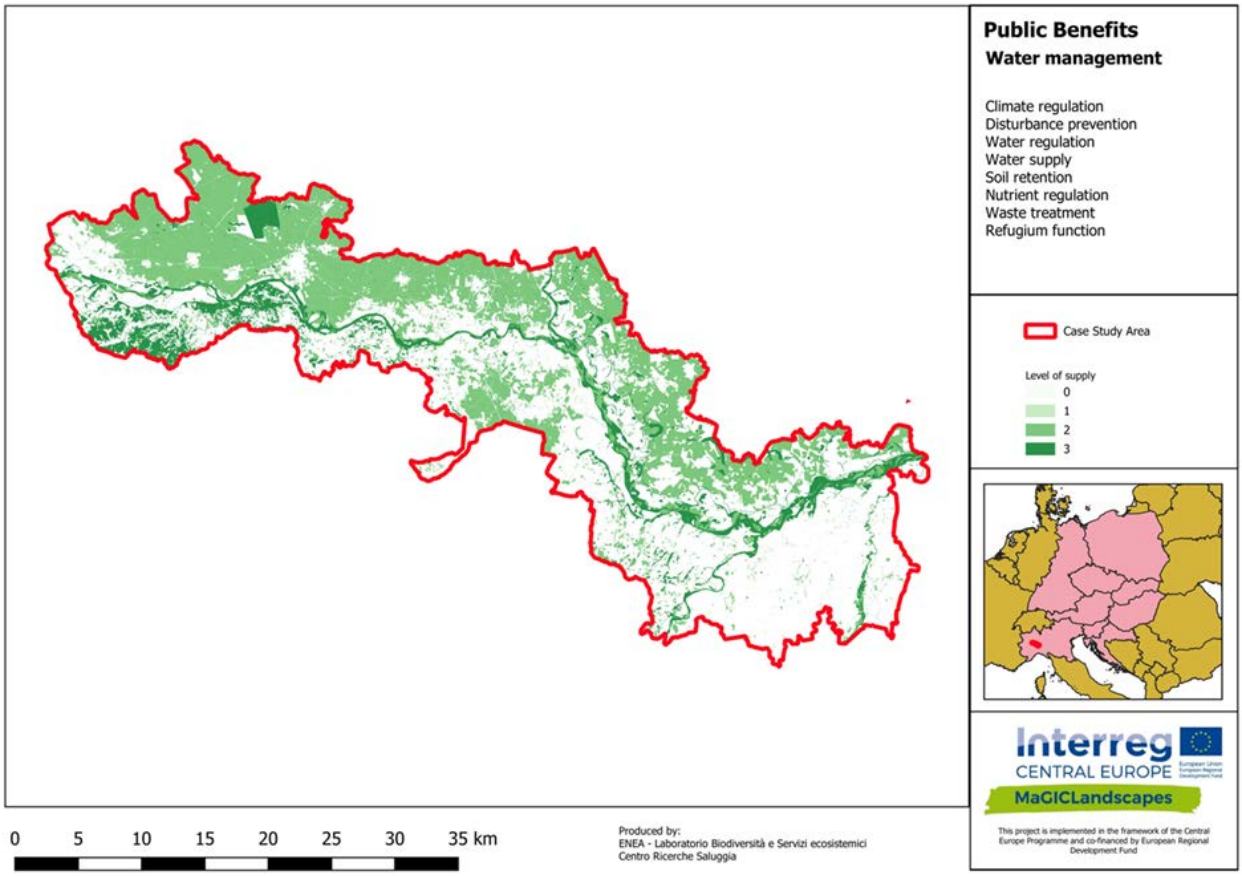

Figure 11 – Map of Water management Benefits in Upper Po Plain Case Study Area (considering ricefields as Green Infrastructure): river corridors, followed by woods and ricepads, present the highest capability in delivering benefits in water management. Areas where this benefit is lacking are also detectable from the map, while areas where it is more needed can be identified with further analysis.

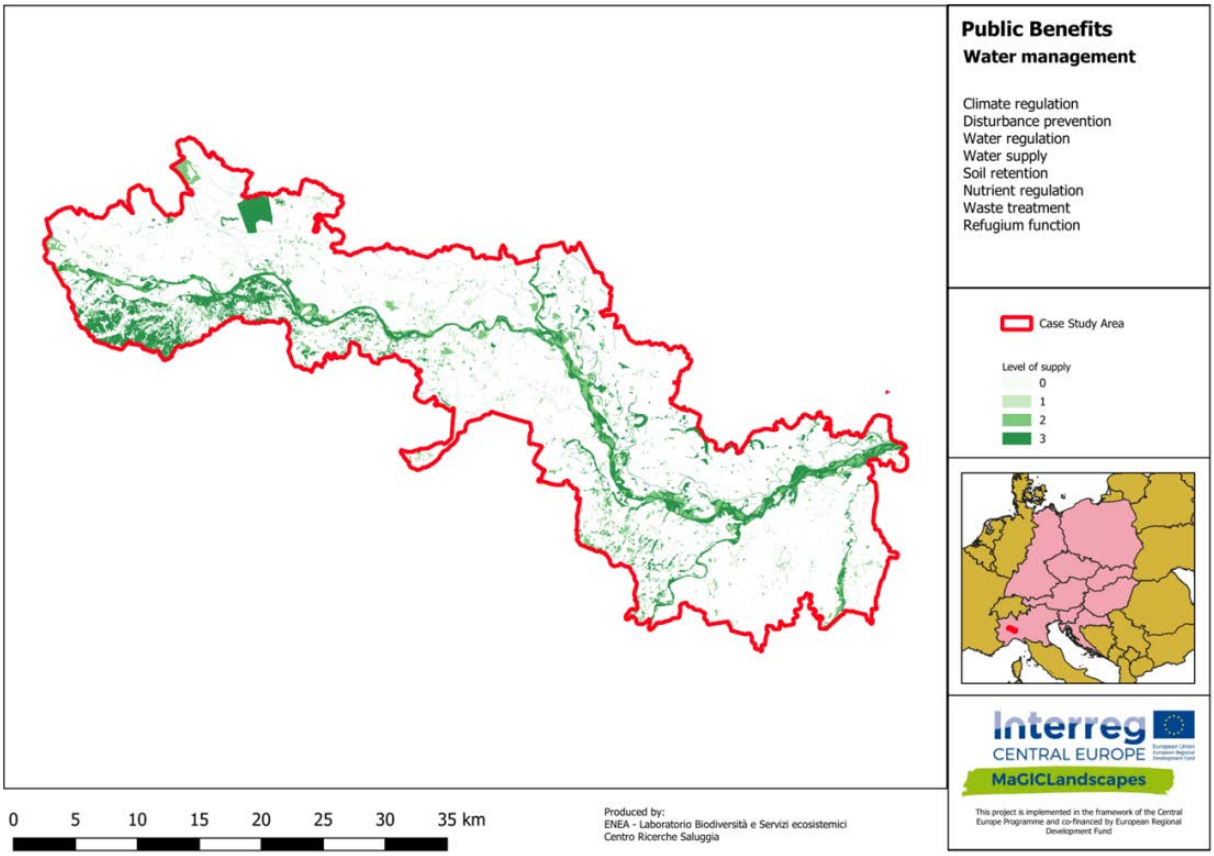

Figure 12 – Map of Water management Benefits in Upper Po Plain Case Study Area (not considering ricefields as Green Infrastructure): the exclusion of areas whose capability in delivering benefits strongly depends on the actual management, makes it possible to identify core area for the benefit which should be improved, connected or re-created.

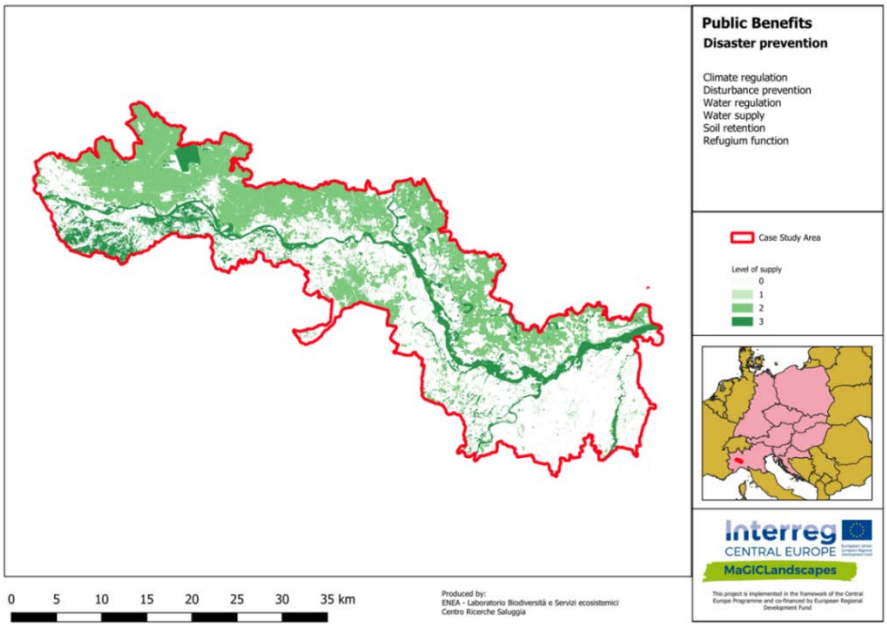

Figure 13 – Map of Disaster prevention Benefits in Upper Po Plain Case Study Area (considering ricefields as Green Infrastructure): the protection from flood is a major concern for the inhabitants of the Po Plain and mapping the areas contributing to enhance land security is a key passage in the definition of the Green Infrastracture role in the territory.

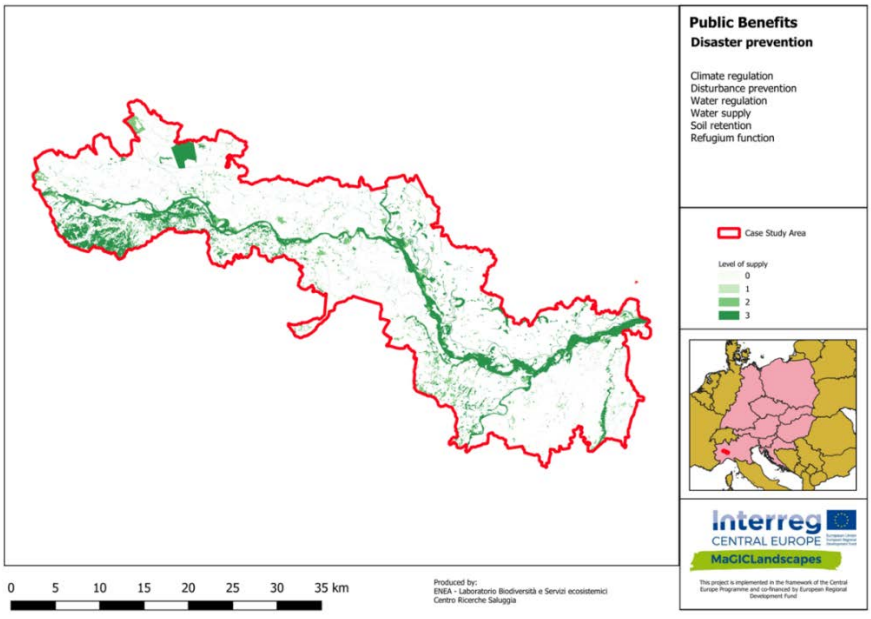

Figure 14 – Map of Disaster prevention Benefits in Upper Po Plain Case Study Area (not considering ricefields as Green Infrastructure): keep ricepads submerged in late autumn and winter, when water is abundant, can give agricultural benefits to the rice production and reduce the pressure on water courses.

The mapping of information also makes it possible to evaluate quantitative aspects relating to the entire area as a whole or to specific portions of the territory, as shown in Figure 15.

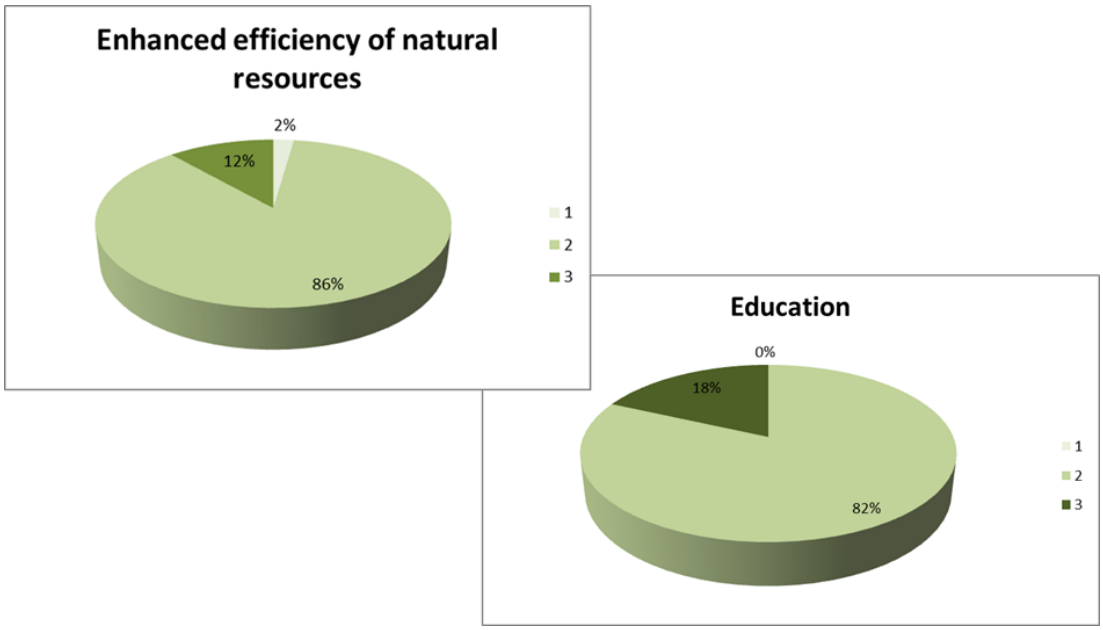

Figure 15 – Diagrams of quantitative data about some families of Benefits in Upper Po Plain Case Study Area

Lastly, it is also possible to draw up a map of the so-called "Global Benefits", understood as the combination of all the Public Benefits considered (Figure 16).

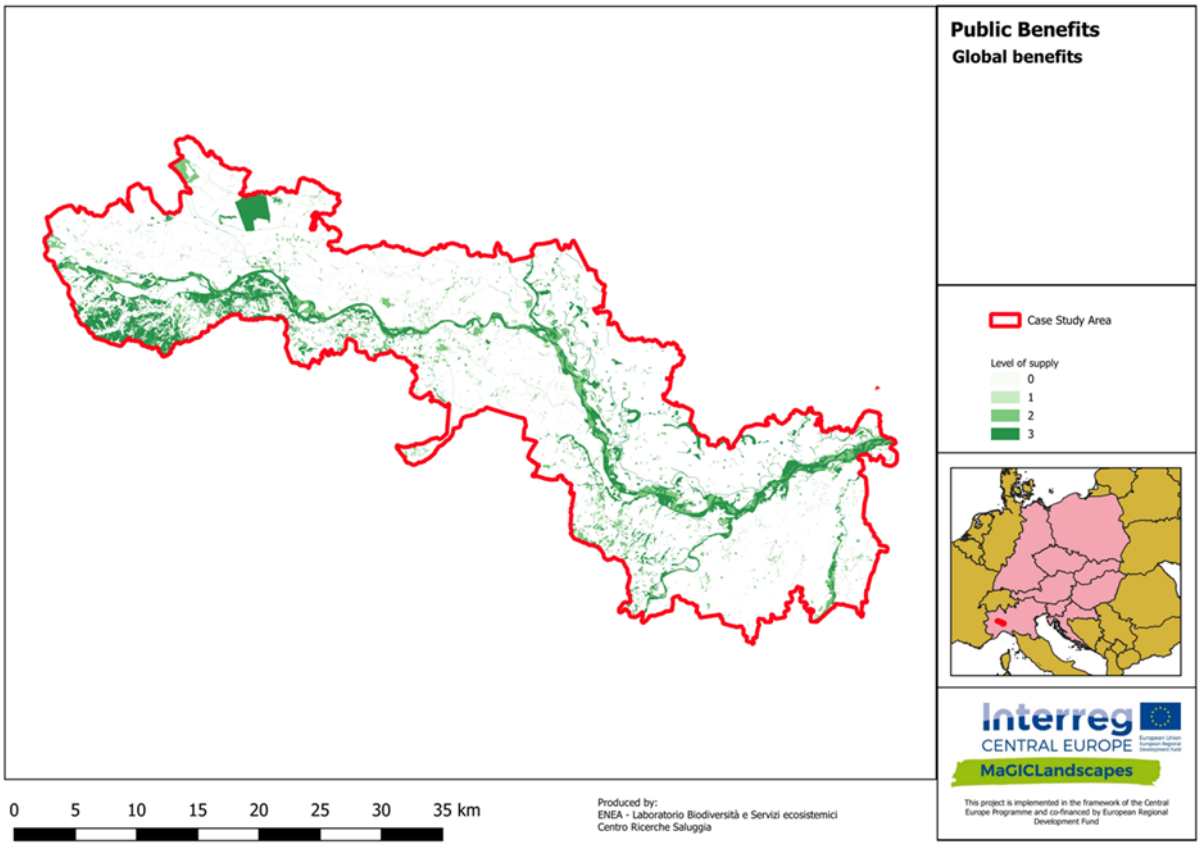

Figure 16 – Map of Global Benefits in Upper Po Plain Case Study Area (not considering ricefields as Green Infrastructure): river corridors and woods confirm their key role in the general provision of public benefits to the study area.

It is important to underline that, while for many Public Benefits it is possible to produce maps that express the distribution of the different levels of supply across the territory, for others (such as low carbon transport and energy or investment and employment) the maps are perhaps not as effective.

These maps can be combined with other drafted using directly the matrix connecting Land Cover Types (rows) and Landscape Services (Table 5), depending also on the results of the activities of process 2 of Public Benefit Assessment Tool. In this case, it is necessary to take into account the difference between public Landscape Services (provided to whole society) and private Landscape Services, whose benefits are provided to specific stakeholders (land-owners, farmers, quarry owners…).

The use of other, different source datasets, such as reports, regional databases, statistics etc., useful in the assessment of the Benefit availability provided by the GI in a territory, can be put in

place in order to integrate this land use-based evaluation (Figure 17). Actually, some benefits (such as Low-carbon transport and energy or Investment and employment) cannot be easily described through land use data analysis, but could find more explanatory descriptors in other data sources.

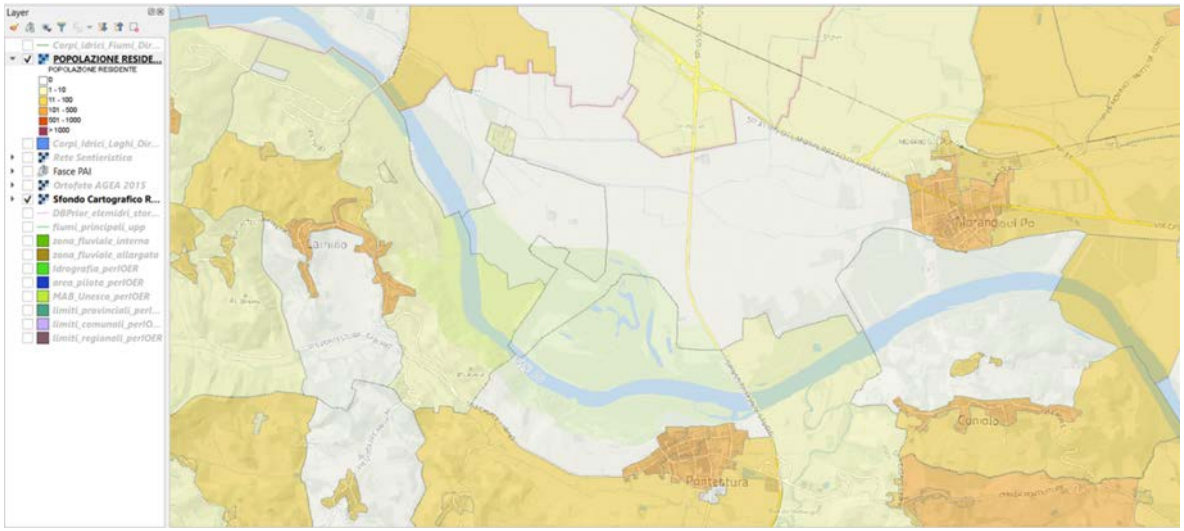

Figure 17 – Map of population density in a portion of Upper Po Plain Case Study Area (from: Regione Piemonte). Such information is crucial in the identification of the hot spots of pubblic benefit necessity as well as in the quantification of human pressure on natural and seminatural elements

5.6.2. Process 2

The aim of the second process is to collect the information needed to identify the existing needs and prospects regarding the implementation of the Green Infrastructure network in the area considered, and as much data as possible from the territory and institutional stakeholders on the benefits supplied by the existing Green Infrastructures (in addition to that identified by Process 1).

The consultation of the stakeholders identified for the project in each study area, joined in groups according to the best interaction methods (meetings, questionnaires, interviews, etc.) should have been planned.

The consultation may cover two topics, discussed separately in two groups defined as Table A and Table B respectively.

Working Table A

The purpose of table A is to gather from institutional stakeholders (mayors, public administrators, officials, others) indications on the benefit needs required by the territory. Moreover, information will be collected about the development perspectives of the Green Infrastructure network, on projects or scenarios already formalised and on the expectations for increases in the supply of public benefits (e.g.: the mayor of "Village A" declares the project of creation of a new wooded area on a public property; the Province administration reports the need to increase biodiversity in the agricultural area…).

This assessment can be carried out through the different consultation channels and also through the identification of the main regional and local policies or strategies that directly address the various public benefits or can indirectly determine their implementation (e.g.: a measure of the Rural Development Program targets the realisation of hedges in agricultural areas)

Another way to identify local needs can be based, as discussed before, on spatial/demographic data that also identifies needs, e.g. floodplain data, areas of deprivation, poor air quality mapping, surface sealing rates, tree cover, walking zones, areas earmarked for future development, schools etc. (example in Figure 18 and 19). This kind of data can be used as a basis for the consultations with institutional stakeholders, besides being considered a direct source of information.

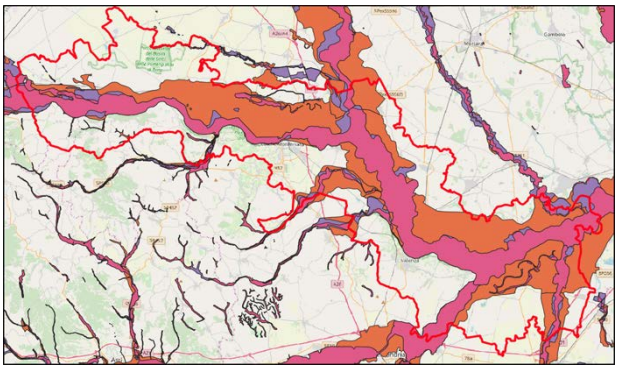

Figure 18 (Left) – Map of the probability of flooding in a portion of Upper Po Plain Case Study Area (from Autorità di Bacino Distrettuale del Fiume Po): this map can be matched with the water management and flood prevention Benefits maps to identify the areas where improvement and creation of green infrastructure are more effective.

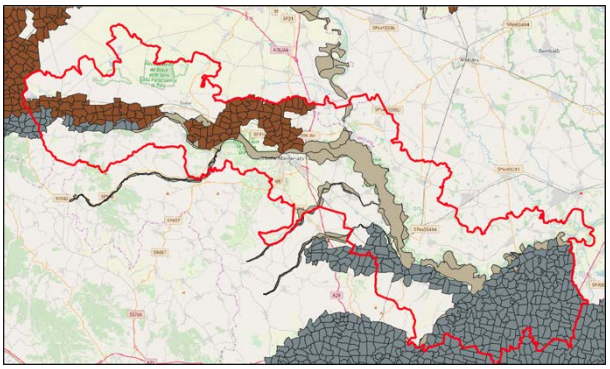

Figure 19 (Right) – Map of Nitrate Vulnerable Zones of agricultural origin (ZVN) in a portion of Upper Po Plain Case Study Area (from Regione Piemonte): demonstrate where the impact of chemical fertilisation and farming is highest makes it possible to locate actions for the creation of hedges, wooded patches and greening that can protect water bodies from eutrophication.

The information gathered within the working Table A activities could be reported using a scheme like the one reported in Table 7. Obviously, it is not a form to fill out, rather a check list to refer

to. The matrix, therefore, may not be completely filled, but it is useful to organise and order the collected information.

TABLE A

EFFECTS	NEEDS, PERSPECTIVES, PROJECTS, SCENARIOS			
	A	B	C	D
Health and well-being				
Increase in air quality and noise control				
Improvement of accessibility for exercise and amenity				
Improvement of health and social conditions				
Education				
Increase in teaching resource and 'natural laboratory'				
Resilience				
Increase in resilience of ecosystem services				
Investment and employment				
Better image				
More investment				
More employment				
Increase in labour productivity				
Enhanced efficiency of natural resources				
Maintenance of soil fertility				
Increase in biological control capacity				
Enhancing pollination				
Increase in storage of freshwater resources				
Climate change mitigation and adaptation				
Increase in carbon storage and sequestration				
Improvement of temperature control				
Improvement of storm damage control				
Disaster prevention				
Enhancing erosion control capacity				
Reduction of the risk of forest fires				
Flood hazard reduction				
Water management				
Improvement of regulation of water flows				
Improvement of water purification				
Improvement of water provisioning				
Land and soil management				
Reduction of soil erosion				
Maintaining/enhancing soil's organic matter				
Increasing soil fertility and productivity				
Mitigating land take, fragmentation and soil sealing				
Improving land quality and making land more attractive				
Higher property values				
Conservation benefits				
Maintaining/enhancing existence value of habitat, species and genetic diversity				
Maintaining/enhancing bequest and altruist value of habitat, species and genetic diversity for future generations				
Agriculture and forestry				
Enhancing multifunctionality and resilience of agriculture and forestry				
Enhancing pollination				
Enhancing pest control				
Tourism and recreation				
Increase in tourist attractiveness of the territory				
Expansion of range and capacity for recreational opportunities				
Low-carbon transport and energy				
Better integrated, less fragmented transport solutions				
Enhancing innovativeness of energy solutions				

Table 7 - Scheme to summarise information gathered in working Table A activities

Working Table B

Working table B aims at gathering information on the presence and location of elements of Green Infrastructure and the relative Public Benefits ("which benefits from which infrastructure"), interacting with both institutional stakeholders and with organisations or with single or associated citizens (e.g.: the Park Authority reports about a network of small wetlands managed for the

conservation of a amphibian species; an association signals a pathway useful for teaching activities…).

The information deriving from this type of consultation will constitute an integration of the results obtained from the activities of land use analysis conducted by the Partners, also within the framework of the results of Work Package 2 Functionality Assessment.

The purpose of this collection of information is, on the one hand, integrating the knowledge of the local existing network of Green Infrastructure, and on the other hand to acquire awareness of the ways in which green infrastructure and the relative public benefits are considered by local stakeholders.

Also this information can be reported using a matrix (Table 8).

TABLE B

BENEFIT OF GREEN INFRASTRUCTURE	EXISTING GREEN INFRASTRUCTURE ELEMENTS			
	A	B	C	D
Health and well-being				
Air and sound environment quality				
Accessibility for exercise and amenity				
Health and social conditions				
Education				
Teaching resource and 'natural laboratory'				
Resilience				
Resilience of ecosystem services				
Investment and employment				
Image				
Investment				
Employment				
Labour productivity				
Efficiency of natural resources				
Soil fertility				
Biological Control				
Pollination				
Storage of freshwater resources				
Adaptability to climate change				
Carbon storage and sequestration				
Temperature control				
Storm damage control				
Disaster prevention				
Erosion control capacity				
Ability to prevent the risk of forest fires				
Flood risk prevention capacity				
Water management				
Regulation of water flows				
Water purification				
Water provisioning				
Land and soil management				
Resistance to soil erosion				
Soil's organic matter				
Soil fertility and productivity				
Capacity of mitigating land take, fragmentation and soil sealing				
Land quality and attractiveness				
Property values				
Conservation benefits				
Existence value of habitat, species and genetic diversity				
Bequest and altruist value of habitat, species and genetic diversity for future generations				
Agriculture and forestry				
Multifunctionality and resilience of agriculture and forestry				
Pollination				
Resistance to the invasion of pest				
Tourism and recreation				
Tourist attractiveness of the territory				
Availability of range and capacity for recreational opportunities				
Low-carbon transport and energy				
Integration of transport solutions				
Innovativeness of energy solutions				

Table 8 - Scheme to summarise information gathered in working Table B activities

Drafting the Strategy

The strategy must refer to all the results of the various phases:

- Transnational mapping (WP1)
- Policy and strategy review (WP1)
- National and Regional mapping (WP1-WP2)
- Field mapping (WP2)
- Naturalness, connectedness and functionality assessment (WP2)
- Public Benefit Assessment (WP3)

In the experiences conducted in the several study areas of the MaGICLandscapes Project, each group of results was used, sometimes in different ways.

Transnational mapping and Policy and strategy review

The transnational cartography represented, for all the experiences, a framework tool for large-scale analysis, whose limited detail, however, did not allow the partners to operationally use it in the process of drafting the Strategy.

The analysis of regulatory, planning and strategic tools at EU, National, regional and local level, on the other hand, has been a tool of fundamental importance, allowing to frame the strategic guidelines at local level in the context of existing planning at different levels, and to make the best use of the tools and guidelines provided by existing legislation, which has proved to be very differentiated between different areas. In some cases, the Green Infrastructure Strategy has to be part of an articulated and complex architecture of planning tools, while in other situations the absence or limited presence of an strong planning for the area made it possible (and necessary) to proceed with greater freedom in the definition of objectives.

National and Regional mapping and Field mapping

In all the case studies, the analysis of the existing situation was based on a regional land use map, significantly more detailed than that provided by CORINE Land Cover (available on a transnational scale), which allowed the analysis of the territory and the return of information in a more appropriate way. The use of the CLC legend for the definition of the types of land use to be considered as Green Infrastructures, however, made it possible to create maps and, more generally, congruent and comparable analyses.

The field mapping, on the other hand, experimented by all the project partners, was not used in strategic planning. In fact, it has been verified that the extent of the field activity necessary for the detailed survey of land use at a very small scale makes this activity suitable for the design of punctual interventions, rather than as a tool for large territorial analysis and planning.

Naturalness, connectivity and functionality assessment

The analyses of naturalness and functionality conducted within the project were of fundamental importance for the drafting of the Strategies. In fact, they allowed to identify the spatial distribution of the network of existing Green Infrastructure, also taking into account the level of

provision of landscape services by current types of land use. This method of analysis also provided tools of great utility, for different partners, in the interaction with stakeholders, with whom it has been possible to work on the basis of objective data.

Finally, the evaluation of connectivity, carried out through the use of GuidosToolbox, provided further evidence of the needs and possibilities of reconnecting the green infrastructure network in the considered territories.

On the basis of the data collected, it is possible to proceed with the zoning process, through the definition of different areas, to be considered in planning.

The area subject to planning can be mapped out in different ways, as shown in Figures 20 and 21, but the identification of the different territorial areas must be functional to the identification of the detailed objectives and, above all, to the location of the corresponding actions.

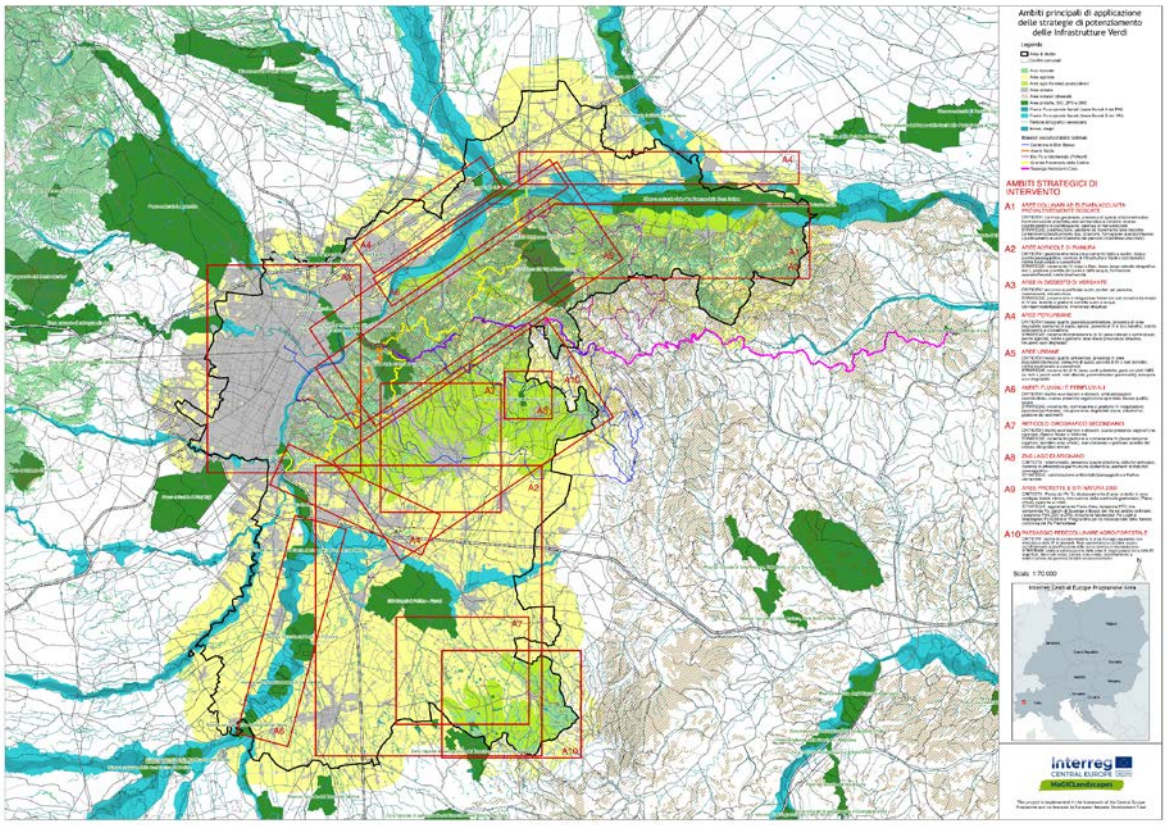

Figure 20 – Areas identified for action plan implementation (Po Hills around Chieri CSA)

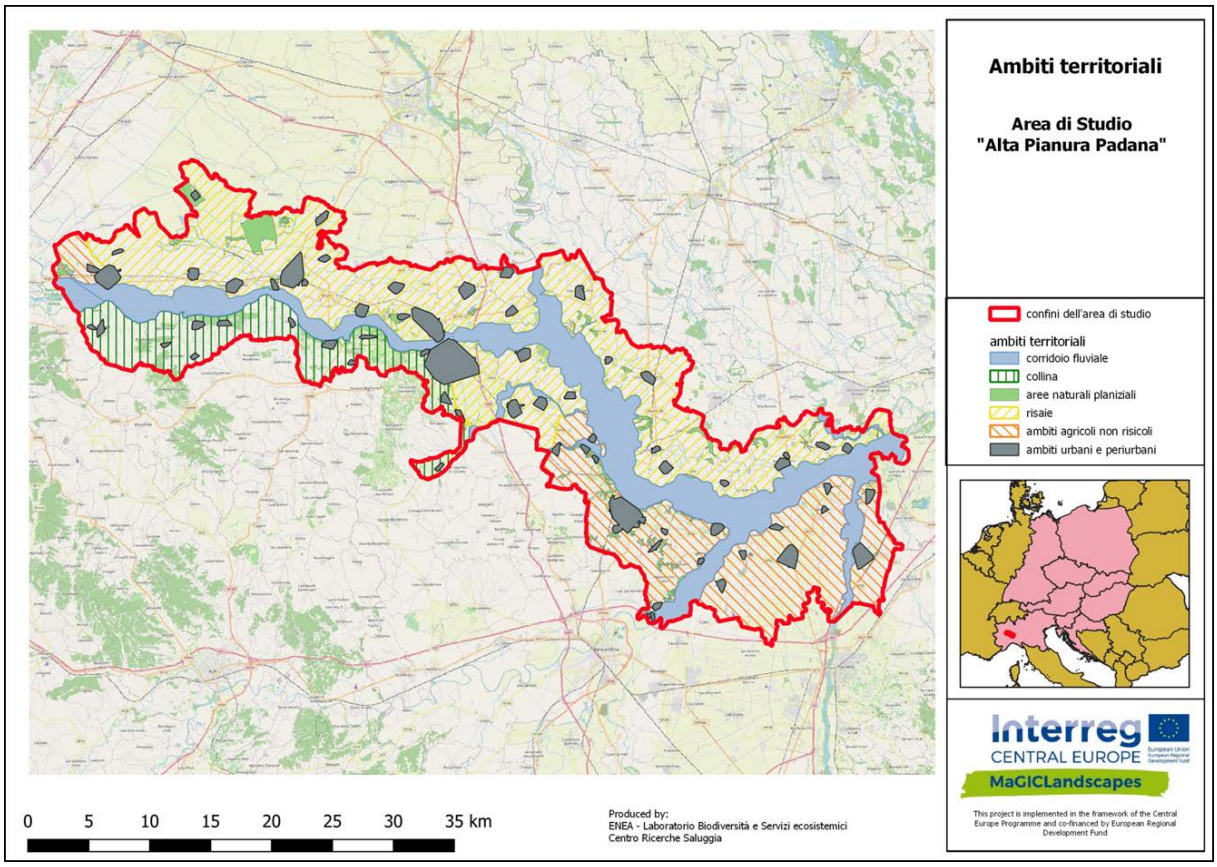

Figure 21 – Main action plan areas identification (Upper Po Plain CSA). The map shows the principal sectors of the study area where specific action plans can be located

Public Benefit Assessment

The Public Benefit Assessment process, conducted according to the procedures described in the PBA Tool above, or in other ways depending on the needs and peculiarities of each area of study, made it possible to obtain a clear geographical representation of the availability of public benefits provided to citizens by existing green infrastructure. This information, together with the assessment of the availability of landscape services, allows to evaluate the existing situation and to identify the needs of the territory.

First of all, the Benefits can be listed in a scale of intervention priorities, as the example reported in Table 9, referred to Upper Po Plain CSA.

Conservation benefits
Maintaining/enhancing existence value of habitat, species and genetic diversity
Maintaining/enhancing bequest and altruist value of habitat, species and genetic diversity for future generations
Disaster prevention
Enhancing erosion control capacity
Reduction of the risk of forest fires
Flood hazard reduction
Climate change mitigation and adaptation
Increase in carbon storage and sequestration
Improvement of temperature control
Improvement of storm damage control
Agriculture and forestry
Enhancing multifunctionality and resilience of agriculture and forestry
Enhancing pollination
Enhancing pest control
Water management
Improvement of regulation of water flows
Improvement of water purification
Improvement of water provisioning
Tourism and recreation
Increase in tourist attractiveness of the territory
Expansion of range and capacity for recreational opportunities

Table 9 - Example of a scale of intervention priorities (Upper Po Plain CSA)

Subsequently, a list of actual availability can also be drafted (Table 10).

Conservation benefits
Existence value of habitat, species and genetic diversity
Bequest and altruist value of habitat, species and genetic diversity for future generations
Water management
Regulation of water flows
Water purification
Water provisioning
Disaster prevention
Erosion control capacity
Ability to prevent the risk of forest fires
Flood risk prevention capacity
Agriculture and forestry
Multifunctionality and resilience of agriculture and forestry
Pollination
Resistance to the invasion of pest
Adaptability to climate change
Carbon storage and sequestration
Temperature control
Storm damage control
Health and well-being
Air and sound environment quality
Accessibility for exercise and amenity
Health and social conditions

Table 10 - Example of a list of actual availability (Upper Po Plain CSA)

For the benefits identified in the first list, the planning and/or strategic tools at a regional or local scale have to be identified (Table 11). They must be taken into account in the design of GI on a local scale, jointly with the National rules.

Conservation benefits	Piano d'Area del Parco del Po Piani di Gestione di siti Natura 2000 Misure di conservazione dei siti Natura 200 Piano Paesaggistico Regionale Piano regionale delle attività estrattive
Disaster prevention	Piano di Gestione del Rischio di Alluvioni Piano di Gestione del distretto idrografico Piano di tutela delle acque
Climate change mitigation and adaptation	
Agriculture and forestry	Programma di sviluppo rurale
Water management	Piano di Gestione del distretto idrografico Piano di tutela delle acque
Tourism and recreation	Progetto CicloVia VenTo (Venezia-Torino)

Table 11 - Example of a list of planning and/or strategic tools at a regional or local scale (Upper Po Plain CSA)

The benefits which were considered as a priority in the study areas of the project are "Conservation benefits" and "Tourism and recreation". It is interesting to note that "Conservation benefits" were identified in the majority of cases at the top of the priority list. This identification can be put in relation to the type of areas examined (mainly natural or rural areas, with the presence of protected areas, in some cases also of national interest), but it is not secondary to consider that often priority was given to the implementation of natural areas, believing that in this way it is possible to increase the potential of the territory also for other types of benefits.

The target of the strategy: general and detailed objectives

The benefit priorities identified through the consultation activities with the stakeholders (Process 2 Working Table A), must be taken into consideration in the definition of the General objectives.

Similarly, information on the location and quantification of actual benefits (Process 2 Working Table B) must be taken into account.

All the different sources can be taken into consideration for the identification of general and detailed objectives

- the analysis of existing planning tools
- the evidence resulting from the environmental analysis
- the expression of preferences/priorities in terms of Public Benefits by the territory

The strategy can be hierarchically organised into general objectives and detailed objectives, differentiated (if necessary) for the different areas defined in the mapping, but a matrix approach has also been used within the Project, to highlight the multiple interactions of each detailed objective with the general objectives defined (Table 12).

	Protecting and increase the conservation value of the area	Protecting and improve the ecological reticularity of the territory	Improving the integrity of aquatic environments and river territories in particular	Strengthening the hydraulic safety of the territory	Reducing pollution and improving community health	Building a climate change resilient territory	Protecting the identity elements of the landscape and increase the landscape quality	Encourage the development of sustainable economic activities
Biodiversity								
Protection of Habitats and Species of Interest for the Natura 2000 Network								
Improving Regulation and Supporting Landscape Services								
Increasing connectivity between natural elements								
River Functionality and hydrological hazard								
Improving the ecological integrity of major watercourses								
Improvement of the ecological integrity of natural and minor irrigation water network								
Rationalization of irrigation and reduction of water consumption								
Promotion of interventions for the creation of buffer strips								
Promotion of conservation management interventions of riparian vegetation								
Contrast of erosive phenomena on the slopes								
Landscape								
Promotion of hedges, rows, wooded strips along watercourses, minor roads, property limits								
Urban sprawl containment								
Maintenance of hillside agriculture								
Pollution/Health								
Reduced vulnerability to nitrates (including management of low protective capacity land)								
Improvement of air quality								
Agriculture								
Promotion of low impact agricultural methods								
Promotion of product and process brands								
Encouraging business choices aimed at the conservation of natural environments in the company land								
Increasing cores of timber arboriculture (also "unconventional" poplar cultivation) in place of "conventional" poplar cultivation (use M.S.A. clones for better environmental sustainability).								
Non agricultural sustainable development								
Addressing mining activities in sustainable mode								
Recovering and strengthening the minor roads for the realization of cycle and pedestrian paths								
Promotion of the systems of routes and sites of historical landscape importance (Enhancement of the systems of parish churches, "grange", castles, hydraulic structures).								
Develop rural hospitality activities								

Table 12 – Matrix of general objectives (columns) and detailed objectives (rows) in Upper Po Plain CSA

The drafting of a map of the Strategy can be a very useful tool, both as a document for disseminating and sharing the strategic choices made, and for summarising information (Figure 22).

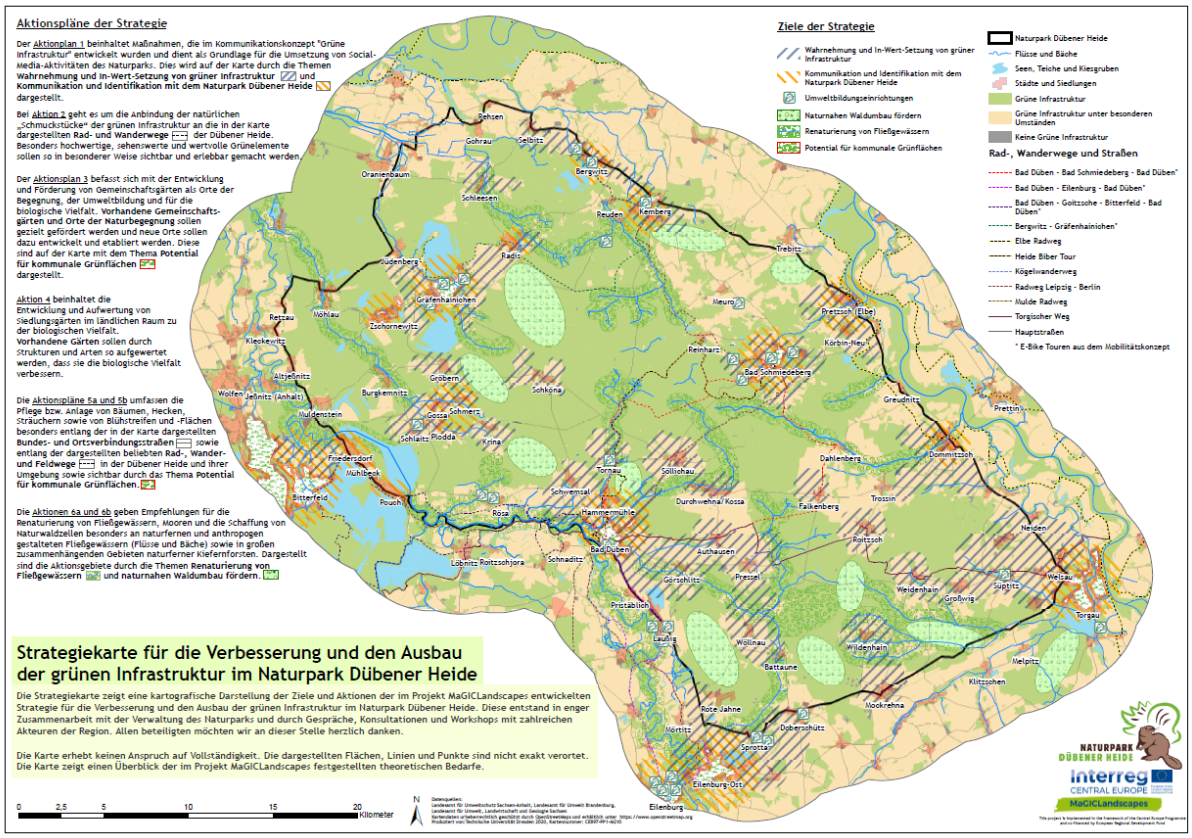

Figure 22 – Strategy map of Dübener Heide Case Study Area (Germany)

Action Plan

The Action Plan is the implementation of the Strategy: the method used to implement the objectives defined in it. One or more actions represent the implementation of a detailed objective. To draft the Action Plan, we can define a list of action types that have a correlation with a specific benefit. Whenever possible, we will prioritise win-win actions, defined as actions that respond to different objectives (and are finalised to different benefits).

In the Action plan we can insert only the actions for which we can define who is the principal actor, in which way it can be realised, where is the best localisation and which could be the sources of funding. This means that we probably can't insert in the Action Plan all the objectives defined in the Strategy. But the Action Plan can be implemented when some action may become feasible. In order to provide a guide for the formalisation and description of the detailed objectives and corresponding actions, two specific diagrams have been drawn up. For each identified action, it should be compiled a form, containing all the information needed to describe and plan the action. If it isn't possible to fill all the fields, we must reconsider if the action is really feasible. Two examples of a detailed objective and one action are shown below.

Detailed objective	**Increasing connectivity between natural elements**
Location / territorial areas	▪ river corridor ▪ natural plain areas ▪ rice fields ▪ hills ▪ other agricultural areas
Motivation	The natural areas present in the study area are mainly distributed along the river corridor, as well as in the hilly area, and in isolated areas distributed in the agricultural territory, both rice (mainly on the left of the river Po) and non-rice (on the right of the river Po). The agricultural matrix is strongly anthropized, and during the last decades the connections between the different areas, even residual ones such as hedges and rows and natural spaces along the minor hydrographic network, have been progressively reduced. It is therefore necessary to promote, through planning and promotion tools, the creation of new connections between the cores of naturalness of greater and lesser size.
Description of the objective and its framing within the strategy	Increasing connectivity between natural elements is a detail objective that has a direct influence on many of the general objectives identified: ▪ Protect and increase the conservation value of the area ▪ Protect and improve the ecological network(s) of the territory ▪ Improve the integrity of aquatic environments and river territories in particular ▪ Building a territory resilient to climate change ▪ Protect the identity elements of the landscape and increase the landscape quality This is a governance objective that involves local authorities and, through their awareness, provides the guarantee over time for the preservation of ecological gaps and, where necessary, their reconstitution. In particular, it is necessary to connect the river corridor (coinciding with the territory of the SPA "Fiume Po, tratto vercellese-alessandrino") with: ▪ areas that host important animal populations that can reconnect with the isolated populations of the SPA or that can be a source for its re-colonisation; on a large scale these areas include the course of the Po upstream and its confluence with the Dora Baltea river, the course of the Po downstream that connects to the Ticino river corridor, the river corridors of the tributaries (Stura della Valcerrina, Sesia, Grana, Tanaro, Scrivia, Agogna and Curone

	rivers) and the connections with the hilly forests of Monferrato. On a local scale, they mainly include the connections with the system of fountains and irrigation ditches of the Vercellese Plain, Lomellina and the Tortonese Plain. ▪ areas with climax or strongly autochthonous plant formations that can play a role as seed carriers such as the marshes of San Genuario and San Silvestro (Fontanetto Po and Crescentino), the Bosco delle Sorti della Partecipanza (Trino), Fontana Gigante (Tricerro), wooded formations, shrubs and dry meadows of Monferrato, the oxbows on the left bank of the Po in Lombardy, the ditches and marshes of Lomellina. Some smaller size areas outside main core areas are also significant: ▪ The tree formations of Northern Monferrato are important, some of them just outside the river corridor, including the wood of Castello di Gabiano, the wood on the hillside north of Isolengo (Gabiano), the wood of Castello di Camino, the agroforestry system of the white truffle of the Dardagna valley (Camino), the wood of Mount Sion (Camino and Mombello), the wood of Roletto (Pontestura), the wood of Zerbi (Pontestura), the agro-ecosystem of stable meadows and hedges of the hill of Coniolo, the wood of Rolasco (Casale Monferrato), the Bric Montariolo of Pecetto; ▪ Less extensive, but still of conservationist importance, some residual lowland formations such as the area of the oak grove of Cascina Florida (Coniolo), the marshy meadows of Cascina Guardapasso (Frassineto Po), the reeds of Roggia Stura between Balzola and Villanova Monferrato, the alder grove on the limestone waters of Riale Provero (Rivarone), the springs of Roggia Riale near Grava (Alluvioni Piovera). Finally, we must remember the presence of areas of even significant extension, the result of processes of spontaneous renaturalisation or redevelopment actions. These include, first of all, the area near the Leri Cavour industrial site where an important process of spontaneous renaturalisation is underway and the area near the former Trino landfill along the River Poetto, which is the subject of reforestation.
Structure of the objective: the planned actions	Since this is a governance objective, the actions envisaged concern both planning activities at local level and promotion to local administrations and stakeholders. **Planning** ▪ Analysis of connectivity at local scale (as a deepening of the analysis conducted within the Project) ▪ Identification of the areas of possible expansion and priority directions for the expansion of ecological network(s) ▪ Planning of interventions to create new connections through active interventions of environmental restoration **Promotion** ▪ Dissemination of the results of planning activities to local administrations and stakeholders

	▪ Analysis of the financial instruments potentially available (Rural Development Plan, LIFE Projects, Interreg Projects, Funds for the redevelopment of Piedmont water bodies ▪ Support to the planning of active interventions by the Park Authority or other local actors
Expected medium and long term results	Protect and increase ecological connectivity through conservation and the creation of ecological corridors Ensuring the conservation of biodiversity in the territory
Involved institutions	Po Park Piedmont Region Lombardy Region Province of Alessandria, Province of Vercelli, Province of Pavia Municipal Administrations
Stakeholders (social categories)	Agricultural associations Environmental associations Farms

Action	**Identification of possible areas of expansion and priority directions for the expansion of the ecological network**
Location / territorial areas	▪ river corridor ▪ hill ▪ natural lowland areas ▪ rice paddies ▪ other agricultural areas
Type of action	☐ active intervention ☒ regulation action ☐ monitoring or research program ☐ education and dissemination ☐ promotion
Motivation	The identification of the need to create connections between natural areas distributed in an anthropised matrix of agricultural type (the river corridor, the lowland, forest and marshland natural areas, the edges of hilly forests), does not correspond to the identification of the locations of possible interventions aimed at implementing such connections. It is necessary, in fact, on the basis of a detailed scale analysis, to identify the areas where such connections are really possible (areas of possible expansion of the ecological network) and the directions along which it is appropriate to concentrate possible interventions (priority directions of expansion of the ecological network). Actually, the correct localization of environmental restoration interventions, in particular in an extremely anthropised territory such as the study area of the Po Park Tourist Area, can determine the greater or lesser effectiveness for the intended purposes.
Contextualisation within the Green Infrastructure improvement strategy and within the territorial governance framework	The action of identifying the areas of possible expansion and the priority directions of expansion of the ecological network is fundamental for the achievement of the goal of detail "Increasing connectivity between natural elements" and, consequently, contributes directly to the general objectives: ▪ to protect and improve the ecological network of the territory ▪ protect and increase the conservation value of the area and may also contribute, in part, to the objectives: ▪ improve the integrity of aquatic environments and river territories in particular ▪ protect the identity elements of the landscape and increase the landscape quality

	Increasing ecological connectivity is an objective present in all wide area planning tools, from the Po Park Area Plan to regional and provincial landscape planning tools. The application of methodologies that allow to identify the most suitable locations for the realization of interventions, can make the individual interventions more effective. For decades, the Po River Park has been conducting an activity of creation of natural core areas in its territory, taking advantage of all the opportunities (both in terms of resources and availability of areas) to increase connectivity. The Province of Vercelli, during a long period of time, has also promoted the use of resources deriving from European funded projects and from the Rural Development Program of the Piedmont Region, to carry out interventions on areas of public property or belonging to active farms. All these interventions have contributed to reduce the contemporary process of trivialization of the agricultural landscape, which has intensified during the last part of the last century and the current period.
Description of the action and operational programme	The availability of a detailed analysis of the land use (used within the Project), which is accompanied, for the areas included in the territory of the SPA "Fiume Po tratto vercellese-alessandrino", to an update with more detailed surveys, makes it possible the conduction of detailed analysis of the ecological network, allowing the identification of the structural elements of the network itself and the areas of possible expansion. This analysis can be integrated with the identification of situations of fragility, impact extroversion and irreversibility, which may constitute limits to the possible expansion of ecological functionality. It is therefore possible to define the priority areas of expansion of the network, within which it is possible to define the connection guidelines, preparatory to the identification of the areas of connection: topographical location, in greater or lesser detail, of the sites in which to provide interventions to create new spaces with high ecological functionality. This localisation integrates, in addition to the described process of analysis of the territory, an assessment based on the potential availability of the areas (public properties, presence of farms "sensitive" to the problems of ecological connectivity and the increase of Green Infrastructure).
Checking the status of implementation/ progress of the action	Level of deepening of territorial analysis Level of sharing with Administrations involved in the planning process and stakeholders
Description of expected results	Definition of the cartography of the areas of ecological connection, with definition of the levels of priority for the interventions
Monitoring indicators	Number of sites subject to project activity (also at preliminary level)

Economic interests involved	Farms Irrigation consortia
Competent subjects	Park Authority Province of Vercelli Province of Alessandria Province of Pavia Piedmont Region
Stakeholders	Agricultural entrepreneurs Agricultural associations Irrigation consortia Environmental associations Land professionals (agronomists, foresters, naturalists, environmental biologists)
Times and cost estimate	The action can be carried out in a period of time limited to a few months, given the availability of the data to be used. The cost can be borne directly by one of the competent subjects identified, through the activity of its technical staff, or be the subject of an assignment.
Programme references and funding lines	Own funds of the competent subjects; ad-hoc regional funding; Rural Development Plan
References and technical attachments	Minciardi M.R., Ciadamidaro S., Rossi G.L., Alberico S., Grasso S., Vayr P. – 2019 - Modalità tecniche per l'analisi e il miglioramento della reticolarità ecologica del territorio. Applicazione al territorio della città metropolitana di Torino- Rapporto Tecnico ENEA RT/2019/3/ENEA Alberico S., Grasso S., Vayr P., Minciardi M.R., Rossi G.L., Ciadamidaro S., Quaglio G. – 2014 – Linee Guida per la Rete Ecologica. In: Linee Guida per il Sistema del Verde. PTC 2 della Provincia di Torino: progetto definitivo Allegato 3 bis. Provincia di Torino. 83 pp.

6. Strategies Summaries

In this final chapter there follows a description of how each of the nine case study regions in the MaGICLandscapes project used the outputs and findings from the tools and methods developed in the project and how they informed the creation of green infrastructure strategies and action plans. For each case study summary the following are included; description of the area, issue and challenges, how the strategy was developed using the project's tools, an outline of the key themes, priorities and directions for the strategies and action plans, the key actors and players in implementing the strategies and action plans, the expected benefits and contact details.

It is hoped that with these practical examples from five different central European countries the reader can find parallels and inspiration with their own area and contribute towards the development and implementation of a green infrastructure strategy in their own regions and communities.

Figure 23 – Map of Central Europe showing the nine MaGICLandscapes Case Study Areas

6.1. Case Study Area – Kyjovsko

Location: South Moravia, Czech Republic

Photo: Tomáš Slach

Description of the area

Kyjovsko is a region in South-Moravian, Czech Republic. It is an administrative district of municipality with extended competence, named after its administrative centre - city of Kyjov. The region covers an area of 470 km^2 and has about 55,000 inhabitants living in 42 municipalities. It is situated in the lowlands and is characterised by undulating terrain. Most of the region is intensively used, especially for agriculture, resulting in very large, impermeable blocks of arable fields that suffer from wind and water erosion. Due to its warm and dry climate (and the terrain), the region is known for its vineyards, and to a lesser extent for its orchards, which are unfortunately gradually disappearing. Green infrastructure is mainly represented by large woodland complexes in the north and south, some remnants of dry grasslands and the unique but quickly disappearing mosaic of smallholdings. Approximately 20 percent of the region is covered by protected areas in the form of NATURA 2000 sites, significant landscape elements or small protected areas.

Issues

Kyjovsko, like other parts of the Czech Republic, was affected by socialist collective agriculture, which manifested itself among other things in land consolidation resulting in destruction of the fine harmonious cultural landscape mosaic. This consolidation dramatically decreased the number of field roads, grasslands and woody strips, woodlots and groups of trees. This has significantly **reduced the permeability of the landscape** not only for humans but also for wildlife. Another consequence of socialist and contemporary intensive agriculture, and also of ongoing change in climate, is **increased soil erosion and the reduced water retention ability** of the landscape. The reduced retention function has been perceptibly worsened by agricultural ameliorations (e.g.

efforts to accelerate water drainage, watercourse straightening/canalisation and draining of wetlands).

Challenges

There are several challenges related to implementing GI in the region and in order to combat the aforementioned issues. The most pressing one is the fact that the majority of municipalities lack complex land consolidations that allow for implementation of GI. This is often due to the land owners' reluctance to agree with these consolidations and lack of money. Another challenge is to persuade some farmers to implement anti-erosion measures. Last but not least, spatial planning and environmental protection lack complete documentation related to green infrastructure, such as a digital layer of the Territorial System of Ecological Stability (TSES). The TSES is a planned (though not completely realised) network of natural and semi-natural ecosystems that incorporates existing ecosystems and identifies where creating new ones would improve its network function. This includes connectivity, providing habitats to support species survival and increasing the positive effect of natural ecosystems on their less stable surroundings.

How was the Strategy developed?

Stage 1 Transnational GI Assessment and Identification of Priorities

Based on consultation with local stakeholders, three main priorities were identified within the work packages. Firstly, to identify how to improve permeability of the landscape, secondly, to upgrade data about GI and thirdly to identify gaps in existing GI in order to tackle soil erosion and worsened water retention. Two main maps were created – the map of current landscape structure that shows areas with lack of GI and map of historical landscape structure that can serve as an inspiration for restoring GI in these gaps. The map of current landscape structure was based on combination of several sources of regional data and manual digitising, while the map of historical landscape structure was based on stable cadastre.

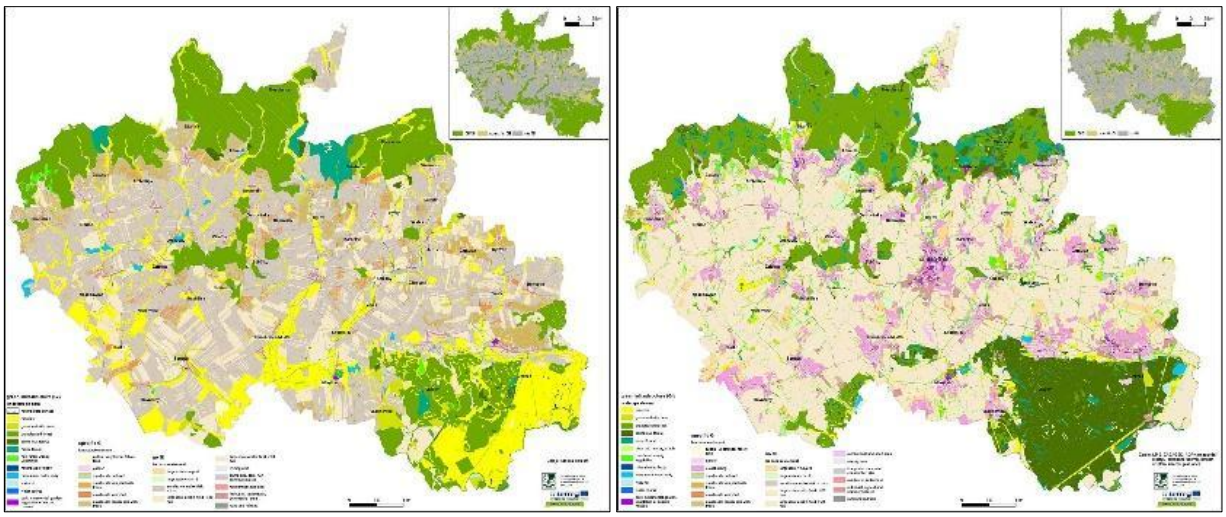

Figure 23 - Historical (left) and current (right) green infrastructure in the Kyjovsko region

Stage 2 – Functionality Assessment

The Functionality Assessment predominantly focused on identifying areas with low connectivity and permeability. Connectivity can be enhanced by full implementation of the TSES. With regard to the challenges identified, a digital layer of TSES for the whole case study was created and used in a further functionality assessment. It was based on computing Euclidian distances and morphological spatial pattern analysis (MSPA). Maps of Euclidian distances showed mostly areas of large arable fields with low permeability. Further analyses of historical landscape structures revealed where the missing GI elements used to be and could be restored to increase current landscape permeability. MSPA analyses then identified which non-existing elements from TSES would help in increasing connectivity, if realised.

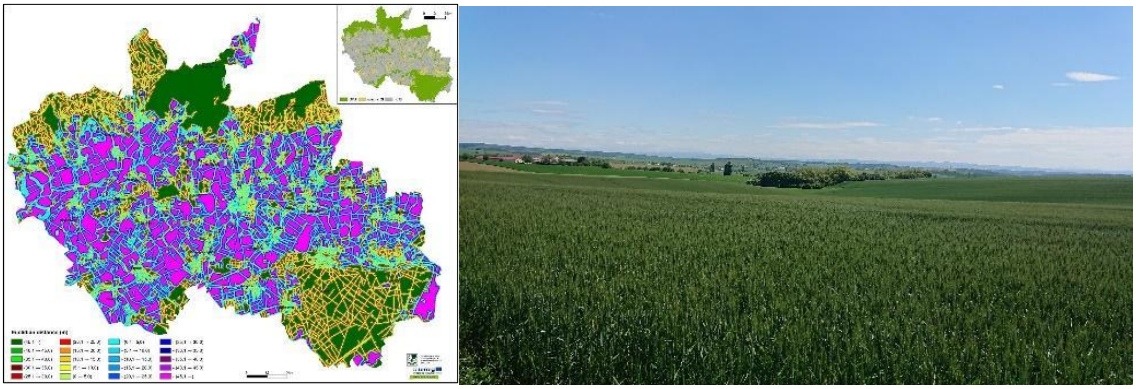

Figure 24 - Map of Euclidian distance (left) revealing localities with impermeable landscape (purple); currently unrealised TSES bio-corridor that would help increase GI connectivity (right). Photo: Hana Skokanová

Two separate actions were undertaken in order to assess priorities/ areas and benefits. One element dealt with meetings with stakeholders and discussing their needs, the other focused on the assessment of existing strategic documents. Meetings were held with mayors from the region's municipalities as well as the interested public. Both groups of stakeholders identified several areas where GI implementation would help in improving landscape permeability, retention and connectivity. With regards to strategic documents, 27 documents were assessed, with a focus on GI related themes and their relation to benefits. These themes can be grouped to infrastructure (e.g. cycle paths, nature trails, field roads), concepts (e.g. land consolidation, erosion control measures, education), water (e.g. ponds, flood control measures, renaturalisation of streams and rivers), and planting greenery (e.g. village greenery, greenery outside villages, afforestation). Each theme was associated to the several benefits it can produce.

Figure 25 - Discussion with stakeholders about identifying localities that would benefit the most GI implementation (Photo: Marek Havlíček and Pavla Pokorná)

Outline of Key Themes, Priorities and Directions for the Strategy and Action Plan.

Based on the identified needs and problems and other analyses, three main objectives were suggested: better landscape permeability, increase of water retention ability and reduction of soil erosion. These objectives are also, to some degree, included in strategic documents of the region and individual municipalities. They can be subdivided to diversifying landscape mosaic, connecting existing road/path network (with accompanying GI), enhancing organism migration, creating educational trails, creating/restoring water ecosystems and other GI elements. Their realisation would contribute to benefits stated in the table below. Measures that can help in fulfilling these goals are, for example, the realisation of planned but non-existing TSES elements, planting grassland belts (with and without trees) in erosion prone localities, building cycling paths, restoration of field roads, surveys and mapping of interesting/unique GI elements, building/restoration of wetlands and water bodies, and the renaturalisation of streams and rivers. Historical maps helped in identifying where the previous GI elements as well as where roads used to be and could be restored to help fulfil the goals. The combination of functionality assessment with other sources then enabled the prioritisation of which of the TSES elements should be realised first in order to fulfil the goals.

GI Benefit	Strategic Tools/Policies	Partners
Land & Soil Management	Community Local Development Strategy for Kyjovské Slovácko region; strategic plan, development programme/strategy for 33 municipalities	municipalities, MAS Kyjovské Slovácko v pohybu (Local Action Group), seat of Kyjovsko region
Tourism & Recreation	Community local development strategy for Kyjovské Slovácko region; strategic plan, development programme/strategy for 33 municipalities	municipalities, MAS Kyjovské Slovácko v pohybu (Local Action Group), seat of Kyjovsko region
Education	Community local development strategy for Kyjovské Slovácko region strategic plan, development programme/strategy for 33 municipalities	municipalities, MAS Kyjovské Slovácko v pohybu (Local Action Group), seat of Kyjovsko region
Climate Change Mitigation & Adaptation	Community local development strategy for Kyjovské Slovácko region strategic plan, development programme/strategy for 33 municipalities	municipalities, MAS Kyjovské Slovácko v pohybu (Local Action Group), seat of Kyjovsko region
Health & Well-Being	Community local development strategy for Kyjovské Slovácko region strategic plan, development programme/strategy for 33 municipalities	municipalities, MAS Kyjovské Slovácko v pohybu (Local Action Group), seat of Kyjovsko region
Water management	Community local development strategy for Kyjovské Slovácko region strategic plan, development programme/strategy for 33 municipalities	municipalities, MAS Kyjovské Slovácko v pohybu (Local Action Group), Kyjovsko regional authority

Table 14 – Benefit priorities, key tools and key actors.

Key Players/actors in delivering the strategy and those that support its implementation.

The key player and main supporter in the delivery of the strategy is the regional authority of the Kyjovsko region – Municipal authority Kyjov, Department of Environment and Territorial Planning who is also an associated partner in the project. They will have all data and outputs from the project and will be able to distribute them in the region. Some outputs will be incorporated into the development/territorial plan of the region. Other actors using the strategy and outputs will be the municipalities who can base their investment plans for GI intervention on the project's outputs.

Expected Benefits

Implementing at least some parts of the strategy will help in reducing the current problems that occur in the Kyjovsko region. The benefits resulting from implementations are; improved land and soil management/less soil erosion, an increased water retention ability of the landscape/enhanced water management, better connectivity leading to a higher resilience of the landscape/ecosystems. This implementation will also to provide more recreational opportunities and subsequently better health and well-being of local communities.

Contact Details

Strategy and data of the region will be distributed by Municipal authority Kyjov, Department of environment and territorial planning, Masarykovo náměstí 30/1, 69701 Kyjov, e-mail: urad@mujkyjov.cz

6.2. Case Study Area – Dübener Heide Nature Park

Photo: Zadlitzbruch – Presseler Heidewald und Moorgebiet: Naturpark Dübener Heide

Description of the area

The Dübener Heide is a cross-border landscape area on the southern edge of the North German lowlands between the northern Saxony and southern part of Saxony-Anhalt. Key elements are the river valleys of the Elbe and Mulde in the west, north and east. In the north, the Dübener Heide is characterised by the post-mining landscapes, a legacy of the historic extraction of brown coal. The central core of the park is mixed woodland, the largest in Germany

The landscape of heath, bog, marshland, woodland, waterways, ponds, grassland and agriculture is home to a wide range of species including cranes, otters, ospreys and the beaver, the park's symbol. It is also home to people with scattered small settlements and larger towns such as Bad Düben and Bad Schmiedeberg. The park is a popular destination for residents and visitors alike. Cultural attractions and events add to the multifunctional attraction of the park. The park is a National Nature Reserve and a Special Protection area.

The Dübener Heide is highly valued by local communities and their contribution to its conservation is both impressive and considerable. With almost 400 members the Verein Dübener Heide e.V. (Dübener Heide Association) is organised into nine local groups. The association has demonstrated the effectiveness of community involvement and ownership of conservation activities in the park and is the perfect example of professional bottom up conservation efforts supported by established and effective funding mechanisms

Issues

Although in principle the area offers a well-preserved and diverse green infrastructure, it is important to continue to protect, continuously expand and secure it for future generations, especially so for a tourist recreation area like the Dübener Heide.

There is a partial lack of grey infrastructure that encourages small and medium-sized enterprises to settle in the region (e.g. lack of rail connections). The expansion of broadband and digitalisation

as well as the development of cycle paths and other tourism developments are currently ongoing and these plans and developments must be evaluated and possibly adapted with regard to their impact on the existing and future green infrastructure.

The Dübener Heide region is subject to relatively strong demographic changes and migration processes. A lack of perception, identification and access to green infrastructure has also been identified. There are also many challenges posed by climate change such as increasing drought, falling water levels in the bogs, calamities, heavy rainfall events.

Through the evaluation of the public benefits for GI and through the workshops and consultations with local actors and associated partners during the project, a deficit was identified in the perception and appreciation of existing and exceptional green structures and elements as well as in the communication and identification with the Dübener Heide Nature Park and the region.

Challenges

For many of these challenges, the concept of green infrastructure can offer solutions. An analysis of existing guidelines, planning instruments and political strategies showed that a large number of these documents for the Dübener Heide region referenced the elements and benefits of green infrastructure. However, the term or strategic concept of green infrastructure is almost unknown or applied. Several planning and strategy documents were revised and updated (e.g. the maintenance and development concept for the nature park). This created the opportunity to anchor the concept of green infrastructure, methods and tools developed and tested in the MaGICLandscapes project in planning and contribute directly to the improvement of green infrastructure. The perception and communication of the advantages of the green infrastructure concept is also a challenge and if there is no adequate appreciation, the benefits for people will only unfold to a limited extent and currently communication of the nature park so far only reaches the target groups to a limited extent.

How was the Strategy developed?

Stage 1 Transnational GI Assessment and Identification of Priorities (political and others)

The transnational cartographic survey was the first step towards gaining an understanding of land use in the Dübener Heide. The CORINE (Coordination of information on the environment) land cover dataset (CLC) was used for this purpose. It was shown that a large part of the Dübener Heide consists of green infrastructure in the form of woodland (coniferous, mixed and deciduous), meadows, pastures, floodplains, post-mining lakes, rivers, and bogs. Many urban and village structures are interspersed within the green infrastructure and agricultural areas.

At this level of analysis it was already apparent that there was a specific need for networking and connecting the green infrastructure elements, both with each other and the settlement areas.

In a second step, the production of maps with more detailed regional data from Saxony (BTLNK - 2005), Saxony-Anhalt (BTNT - 2009) and Brandenburg (BTLN - 2009) showed a more heterogenic mosaic of land uses and biotopes in the area.

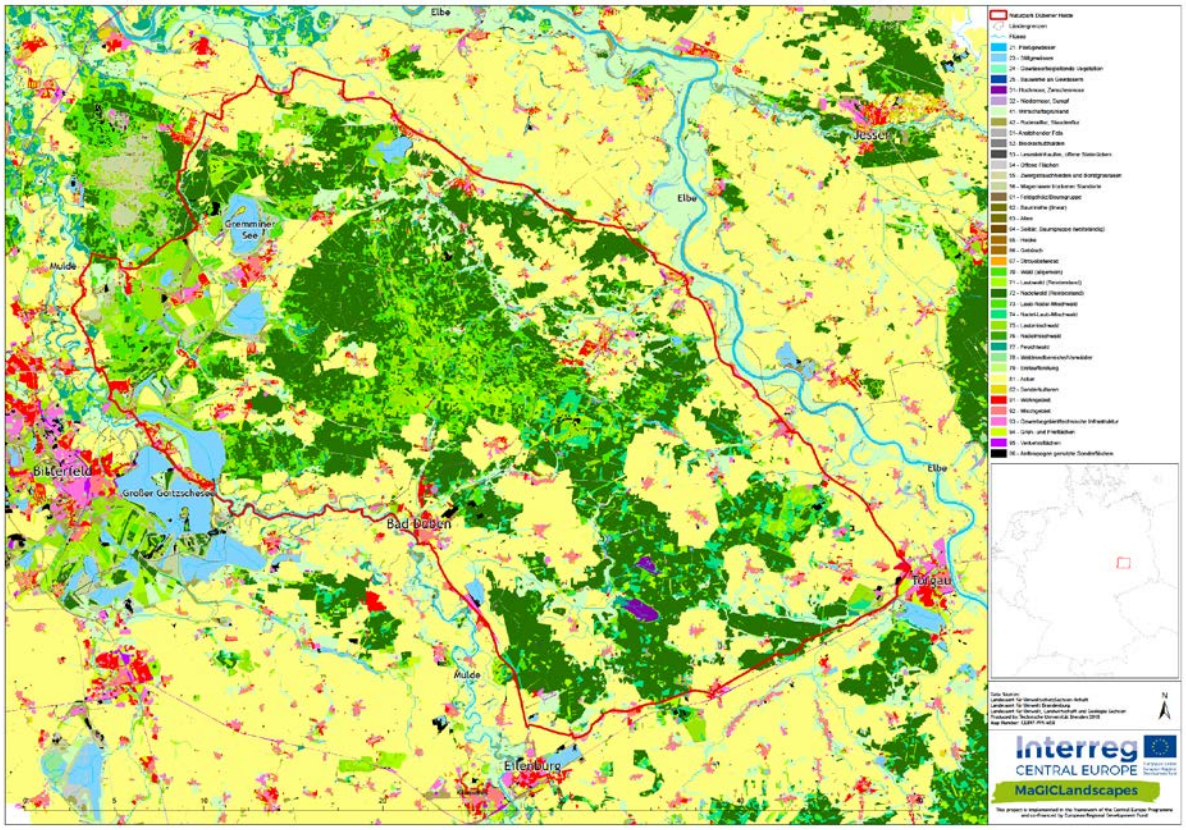

Figure 26 – Land use map Dübener Heide and surrounding area

Stage 2 – Functionality Assessment

Using the Guidos Toolbox, various connectivity and functional assessments for GI were carried out. Areas of green infrastructure were defined as core areas and their connections, networks, corridors and their location relative to each other were presented as "bridges", "branches", "loops" or "islands". Using this information so-called focus areas were selected for further investigation and mapping and analysis.

The Dübener Heide with its near-natural and structure-rich forest core areas, moorlands and many lakes, rivers and streams has good to very good natural connectivity, but these are highly influenced by anthropogenic activities. In addition, many re-naturalisation processes are currently taking place. Nevertheless, the potential for improvements of the green infrastructure was identified in some areas. For example, rows of trees, hedges and shrubs could be created along local roads connecting the core areas of the green infrastructure. The agricultural landscape could also be adapted to help connectivity, as well as other ecosystem services. The floodplain areas along the rivers Elbe and Mulde and the numerous streams also represent important habitats and habitats that perform a wide range of ecosystem services and could be improved and protected.

Another important aspect is the creation and maintenance of near-natural green spaces in settlement areas and the connection of urban areas with the immediate surroundings and core areas of green infrastructure.

Figure 27 – Dübener Heide Nature Park (Photo Naturpark Dübener Heide and Sven Riedl)

Stage 3 Assessment of Public Benefit

Two workshops were held with local stakeholders including the nature park administration, regional management, regional planning associations and landscape conservation associations. In addition many consultations and discussions with associated partners took place on site. During these meetings the strengths, needs, risks and opportunities for the expansion and improvement of GI were specifically identified and demonstrated (e.g. by thematic mapping on large-scale maps of the Dübener Heide).

Current and future projects, development perspectives and various scenarios were also discussed as were expectations of increasing the supply of public services. Information on where valuable elements of green infrastructure are located and how the respective public benefits are currently assessed, as well as the process of updating the nature park plan, also played an important role in the discussions. During discussions it became apparent that there is a particular deficit in communication, perception and identification with GI in the Dübener Heide Nature Park and surrounding areas.

At the end of the first process of the PBA tool it was possible to produce a series of maps showing the geographical distribution of the public services provided by the GI network and the benefits derived from them.

Figure 28 – Public consultation Dübener Heide (Photo Anke Hahn)

Outline of Key Themes, Priorities and Directions for the Strategy and Action Plan.

As a result of the processes carried out, five main themes were defined for the strategy and action plans for the expansion and improvement of green infrastructure in the Dübener Heide Nature Park. Firstly, involving and informing residents about the benefits of GI and connecting people with nature (in terms of health and well-being and tourism and recreation). Secondly, improving the perception and value creation as well as the communication and identification with GI in the region.

These first two themes were addressed through the development of the Communication Concept "Increasing the perception of the advantages and functions of green infrastructure in the Dübener Heide Nature Park"). With this concept, target groups that have not yet been reached are specifically addressed and the advantages of green infrastructure can be communicated. In addition to an analysis of the current situation (SWOT), the concept provides strategic recommendations and proposals, on the basis of which concrete Projects and measures on the Social media channels from the nature park administration can be implemented.

A third theme is access to, and connection with the existing green infrastructure. A further focus is education for sustainable development and the topic of expanding and improving elements of GI. Finally, adapting and reacting to climate change is also a major theme.

Spatially, the cities and settlements in the Dübener Heide and their connection to the surrounding core areas of green infrastructure are of particular importance. A key role is played by the management of the nature park. As a result, the following table was compiled, which reflects the advantages of GI according to priority and the strategies and partners involved for the Dübener Heide.

GI Benefit	Strategic Tools/Policies	Partners
Health and Well-Being	▪ Regional Plan Leipzig-Western Saxony ▪ Networked Mobility Dübener Heide ▪ District Development Concept 2030 North Saxony ▪ LEADER Development Strategy (LES) Dübener Heide ▪ Maintenance and Development Concept for the Dübener Heide Nature Park (PEK) ▪ Location Marketing Concept Dübener Heide	Dübener Heide Nature Park Cities and Municipalities Regional Management Dübener Heide Heath Spa
Adaptability to Climate Change	▪ German Strategy for Adaptation to Climate Change ▪ Regional Plan Leipzig-Western Saxony ▪ Integrated Climate Protection Concept ▪ Integrated Urban Development Concept (InSEK) ▪ LEADER Development Strategy (LES) Dübener Heide ▪ Maintenance and Development Concept for the Dübener Heide Nature Park (PEK)	Dübener Heide Nature Park Cities and Municipalities Regional Management Dübener Heide Nature conservation authorities
Tourism and Recreation	▪ Cycle Traffic Concept of the district of Nordsachsen ▪ Networked Mobility Dübener Heide ▪ LEADER Development Strategy (LES) Dübener Heide ▪ Maintenance and Development Concept for the Dübener Heide Nature Park (PEK) ▪ Location Marketing Concept Dübener Heide	Dübener Heide Nature Park Cities and Municipalities Regional Management Dübener Heide Tourism managers
Conservation Benefits	▪ Biotope network Saxony ▪ Biodiversity Saxony 2020 ▪ Maintenance and Development Concept for the Dübener Heide Nature Park (PEK)	Dübener Heide Nature Park Cities and Municipalities Regional Management Dübener Heide Nature conservation authorities Landscape conservation associations NABU, BUND
Disaster Prevention	▪ River Development Concept North Saxony ▪ Regional Plan Leipzig-Western Saxony ▪ Maintenance and Development Concept for the Dübener Heide Nature Park (PEK)	Dübener Heide Nature Park Cities and Municipalities Regional Management Dübener Heide Water authorities
Education	▪ Education for Sustainable Development (ESD) ▪ Maintenance and Development Concept for the Dübener Heide Nature Park (PEK)	Dübener Heide Nature Park Cities and Municipalities Regional Management Dübener Heide Nature Park Schools

Table 15 – Benefit priorities, key tools and key actors.

Health and well-being	Regional Plan Leipzig-Western Saxony
	Networked mobility Dübener Heide
	District development concept 2030 North Saxony
	LEADER Development Strategy (LES) Dübener Heide
	Maintenance and development concept for the Dübener Heide Nature Park (PEK)
	Location marketing concept Dübener Heide
Adaptability to climate change	German Strategy for Adaptation to Climate Change
	Regional Plan Leipzig-Western Saxony
	Integrated climate protection concept
	Integrated urban development concept (InSEK)
	LEADER Development Strategy (LES) Dübener Heide
	Maintenance and development concept for the Dübener Heide Nature Park (PEK)
Tourism and recreation	Cycle traffic concept of the district of Nordsachsen
	Networked mobility Dübener Heide
	LEADER Development Strategy (LES) Dübener Heide
	Maintenance and development concept for the Dübener Heide Nature Park (PEK)
	Location marketing concept Dübener Heide
Conservation benefits	Biotope network Saxony
	Biodiversity Saxony 2020
	Maintenance and development concept for the Dübener Heide Nature Park (PEK)
Disaster prevention	River development concept North Saxony
	Regional Plan Leipzig-Western Saxony
	Maintenance and development concept for the Dübener Heide Nature Park (PEK)
Education	Education for Sustainable Development (ESD)
	Maintenance and development concept for the Dübener Heide Nature Park (PEK)

Table 16 – Benefit priorities and Planning Instruments.

Key Players/actors in delivering the strategy and those that support its implementation.

The main actor for the implementation and execution of the strategy and action plans for the expansion and improvement of green infrastructure in the Dübener Heide nature park is the nature park administration. In cooperation with the two planning offices (Saxony and Sachsen-Anhalt), which are responsible for the creation of the Maintenance and Development Concept, many contents of this strategy as well as the concept of the GI could be included and serve as guidelines and orientation for further planning and projects for the next 10 years. In the same way, participating landscape management associations, the regional planning associations and the nature conservation authorities will be able to use parts and findings of this strategy for their future work.

Expected Benefits

The strategy for green infrastructure in the Dübener Heide Nature Park and the associated action plans will make an important contribution to improving future living conditions in the region. In addition to the benefits for health, quality of life and recreation, tourism in the region will also be promoted by improving the accessibility and access to GI. The diverse and valuable flora and fauna will be protected by the implementation of the GI concept as well as the inhabitants of the Dübener Heide from reduced vulnerability to natural disasters such as floods or the negative effects of climate change. Moderation processes between nature conservationists, agriculture and forestry can also be initiated to find sustainable solutions for a sustainable region, also in the sense of education for sustainable development.

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6.3. Case Study Area – Karkonosze Mountains and Jelenia Góra Basin

Location: South-west Poland, Lower Silesia Voivodship

Description of the area

The Jelenia Góra Basin, together with the surrounding Karkonosze, Rudawy Janowickie and Kaczawskie Mountains, is a special landscape, beautiful and valuable both from the natural and cultural point of view. The turbulent history of this region, changes in the national identity and related influences of different nations and customs has resulted in a diverse cultural landscape, shaped in an area of above average natural value. Towns and villages nestle among a natural mosaic, consisting of mountains and valleys, forests and fields as well as marshes and ponds. The largest city in the valley - Jelenia Gora (about 75,000 inhabitants), forms an agglomeration with cities lying at the foot of the Karkonosze Mts. (Kowary, Karpacz, Piechowice and Szklarska Poreba - between 5 to 10 thousand inhabitants) and also with villages of very different sizes. The green areas are well preserved and varied, which is of great importance for the protection of biodiversity and landscape. They include elements both strongly shaped by man: urban parks, squares, allotment gardens, as well as economic forests, agricultural areas, and semi-natural and natural ecosystems in the highest parts of the mountains. The most valuable areas have been included in the Natura 2000 network, including the Karkonosze National Park - the area with the largest nature protection regime in Poland. The area of the Jelenia Góra basin is also known as the "The Valley of Gardens and Palaces", with palace and park complexes of the highest historical and cultural values. The most important factor in the development of the area has become tourism, the intensity of which can be observed in the area of the Karkonosze (Karpacz, Podgórzyn, and Szklarska Poręba). In Jelenia Góra, the main city in the area, industrial zones and service centres are more important.

Issues

The intensive development of tourism, seen during the economic transformation of the 1990's as a basis for development for the region, has recently been recognised as a threat for local nature. It is estimated that the region is visited by about 4 million tourists per year, of which the

Karkonosze Mountains alone attract over 2.5 million. The Karkonosze National Park has the highest density of hiking trails of all of the Polish national parks and some of the most attractive places, such as the highest peak of Sniezka (1,603 m), which at the same time the highest natural value. The most valuable ecosystems and unique species are relatively easily accessible and subject to tourist pressure practically all year round, both in summer (hiking) and in winter (skiing). Negative influence is connected with constant presence of people, trampling places off the trails, litter and also with inefficiency of water and sewage management in mountain hostels. A consequence of the tourist pressure is also the expansion of sub-montane areas, especially large buildings: hotels and apartments. The ease of transforming agricultural land, especially mountain meadows, which, as a result of the withdrawal of agriculture, are used for building development, results not only in the impoverishment of habitats, but also in the fracturing of local ecological corridors. In the areas abandoned by agriculture, invasive vegetation appears. More and more frequent periods of drought combined with intensive water uptake from the mountain results in a lack of natural flow. Regulated rivers, especially in urban areas, increase the speed of the outflow of water. There is less and less retention due to the development and drying-out of wetlands, drainage of land and drainage of rainwater directly into storm channels.

Challenges

A big challenge for the development of green infrastructure is its popularisation and implementation in the spatial planning process. Due to the lack of legal rights for green infrastructure, this challenge is mainly related to its promotion both among the region's authorities, investors and residents. The challenge is to convince everyone how many benefits are delivered by the creation of sustainable investment concepts and local plans, which, in addition to the grey infrastructure, preserve or create multifunctional elements of the GI, secure compensatory actions or landscape values. The challenge in areas where greenery is relatively abundant and accessible is to preserve it by setting boundaries for sustainable landscape use. Sometimes it is much easier to gain support for costly implementations based on green infrastructure than to maintain elements of already existing natural greenery. The challenge is also to introduce GI topics, ecosystem services, into education that, in addition to knowledge of the benefits of GI, would create a sense of spatial order and explain the role of public participation in the spatial planning process.

How was the Strategy developed?

Stage 1 Transnational GI Assessment and Identification of Priorities

This stage was the first step to understand the idea of green infrastructure, an opportunity to check if and how it functions in Polish law and policies developed in the region. This stage also included the identification of the GI network in the area of Karkonosze and Jelenia Góra Basin. On the basis of available GIS data maps were produced, which show the spatial distribution of GI elements and places where GI is missing. For this purpose, the publicly available data of CORINE area coverage and topographic data 1:10 000 were used. For the mesoregion of the Karkonosze Mts. an additional detailed ecosystem map was created, for which the European classification system EUNIS (level 3) was applied. For this area, elements of green infrastructure such as linear

woods, marshes, field borders, buffer zones along streams were also mapped. The knowledge on the ecological functions of these small GI elements is still too low. It was increased during workshops, where local governments and institutions responsible for shaping the GI in our region met. One of the main conclusions of the workshop was that it is necessary to implement the idea of GI in spatial planning as soon as possible in order to maintain ecological connectivity, to protect functionally important elements of GI and – what is important in the mountains - landscape values. Additionally, during consultations with stakeholders, the need to develop a strategy how to keep meadow habitats located in lower locations of the Karkonosze, within the Natura 2000 area, was stressed.

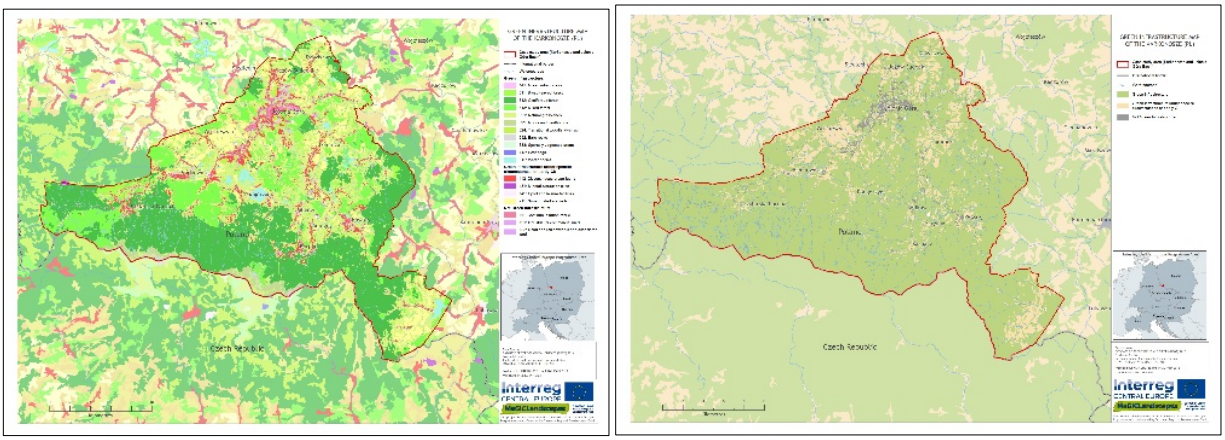

Figure 29 – Green infrastructure distribution in Karkonosze and Jelenia Góra Basin

Stage 2 – Functionality Assessment

The essence of green infrastructure, which also comes from its definition, is to shape the GI as a network. The links are important both for the migration of animals and plants (ecological corridors), but also for man (potential for marking out green routes: bicycle paths, walking routes). The analyses made in the GUIDOS program illustrated the condition of the GI network in the area and indicated areas important for maintaining connectivity e.g. between Natura 2000 areas. Additionally, planning documents from all municipalities were analysed in order to assess potential threats to connectivity in the case of implementation of planning records. In some places it may be completely interrupted or significantly reduced by new developments. Appropriate legal implementation is needed to protect these strategic connectivity sites. The functionality of green infrastructure based on landscape services has also been assessed. Due to the fact that the GI areas occupy about 70 % of the CSA and a significant proportion of them are forest areas, and high values of landscape services have been recorded in a relatively large area. Places where it is advisable to take measures to strengthen e.g. regulatory services mainly concern dense urban development or industrial and commercial areas.

Figure 30 – Cycle route in Jelenia Góra Basin (left) and grazing for habitat management (right)

Stage 3 Assessment of Public Benefit

The services provided by ecosystems are human benefits. Therefore, it is very important to show the value of green areas through the prism of specific benefits. The associated partners of the project in the framework of the consultations indicated the following priorities: clean air, prevention of natural disasters, and improvement of water management and preservation of the aesthetic features of the landscape. Nature protection institutions also mentioned the need to maintain and shape ecological connectivity as a condition for biodiversity. A survey was also conducted among the inhabitants of Karkonosze towns and cities. In this group, air quality, the influence of greenery on the harmony and beauty of the landscape, water retention and purity were also repeated. There were also proposals for actions that support these benefits: revitalisation of existing parks, squares, planting of trees, e.g. species characteristic for the village. Some of the tasks can be carried out within the commune, in cooperation with active communities, the others require inter-communal cooperation with many institutions or landowners, e.g. planning a network of bicycle paths or protecting ecological connectivity.

Outline of Key Themes, Priorities and Directions for the Strategy and Action Plan.

One of the key benefits of the project itself and the beginning of one of the strategy's objectives was the creation of a cross-sectoral forum where the needs of shaping green infrastructure were discussed in the form of workshops. In the region of the Karkonosze and Jelenia Góra Basin the GI areas are quite well preserved and are largely under area protection, so most of the proposed actions focus on how to preserve the GI in the face of pressure from tourism, buildings or climate change. These are quite difficult topics, as they are usually related to the introduction of restrictions and the need to define the boundaries for maintaining healthy ecosystems and functioning networks. These topics are close to institutions responsible for nature protection, but also more and more often to local associations, which care about preserving the natural and landscape values of the places where they live. The plans of local governments are primarily

related to the maintenance, revitalisation or creation of urban green areas and thus adaptation to climate change. Therefore, the most important goals of the GI Strategy include: shaping ecological connectivity and improving the state of biodiversity, improving water management, implementing the GI concept in improving local spatial planning and building partnerships for the GI in the region.

GI Benefit	**Strategic Tools/Policies**	**Partners (only some of them)**
Nature conservation	Plany ochrony parku Narodowego, parków krajobrazowych, obszarów Natura 2000	Regionalna Dyrekcja Ochrony Środowiska, Dolnośląski Zespół Parków Krajobrazowych, Karkonoski Park Narodowy
Health & Well-Being	Strategia rozwoju Miasta Jeleniej Góry na lata 2014-2025 Lokalny Program Rewitalizacji Gminy Podgórzyn na lata 2016-2023 Gminny program rewitalizacji dla Szklarskiej Poręby 2016-2023 Lokalny program rewitalizacji gminy Karpacz na lata 2016-2020 Program Ochrony Środowiska Gminy Miejskiej Kowary	Miasto Jelenia Góra Gmina Podgórzyn Gmina Szklarska Poręba Gmina Karpacz Gmina Kowary Gmina Piechowice Lokalna Grupa Działania Partnerstwo Ducha Gór
Water management	Kompleksowy projekt adaptacji lasów i leśnictwa do zmian klimatu – mała retencja oraz przeciwdziałanie erozji wodnej na terenach górskich.	PGLLP Nadleśnictwo Szklarska Poręba, Śnieżka, PGW Wody Polskie Zarząd Zlewni w Lwówku Śląskim
Education	Statut Towarzystwa Statut Stowarzyszenia Sołecka Strategia Rowoju Wsi, Statut	Zachodniosudeckie Towarzystwo Przyrodnicze Stowarzyszenie Ochrony Krajobrazu i Architektury Sudeckiej Stowarzyszenie Karkonoskie Zachełmie

Table 17 – Benefit priorities, key tools and key actors.

Figure 31 – Stakeholder involvement

Key Players/actors in delivering the strategy and those that support its implementation

Many of the key institutions and local governments in the Karkonosze and Jelenia Góra Basin have been involved in the preparation of strategies and action plans. In addition to the associated partners defined in the project, it was possible to involve active residents - members of associations that implement many projects supporting the GI. The GI Strategy is the first study on green infrastructure in the region, which as well as providing general directions for the future also demonstrates specific implementation ideas. We hope that they will become a mutual inspiration for further actions, help in updating the planning documents and elaboration of plans e.g. city climate change adaptation plans, in which green infrastructure is one of the most important tools.

Expected Benefits

The implementation of strategies and action plans will allow us to maintain the attractiveness of the landscape and natural resources of the region. Maintaining green links and open areas not only enables the migration of animals, but also shapes the spatial order, preventing the dispersion of buildings, which burdens additional costs on local governments. Any measure improving landscape retention may prove to be a priority for the difficult to predict effects of climate change. The benefit in regulating the urban climate can be gained by revitalising and increasing the area of green spaces in cities, which will also improve the quality of life of residents. Cross-sectoral partnership, the promotion of public participation and the expansion of education on the functions and benefits of GI can result in further projects to improve GI and will indirectly also strengthen local identity for residents.

Contact Details

The strategy with action plans, GIS database and other studies are available at;

Headquarters of Karkonosze National Park

Chałubińskiego 23 58-570

Jelenia Góra,

sekretariat@kpnmab.pl.

You can also download them from the project subpage https://kpnmab.pl/magiclandscapes.

6.4. Case Study Area – Krkonoše Mountains National Park and its Surroundings

Location: Královéhradecký and Liberecký region, Czech Republic

Description of the area

Krkonoše Mountains National Park (KRNAP) is oldest National Park in the Czech Republic. This mountainous, unique and valuable protected area encompasses a wide variety ecosystems and landscapes. Those landscapes include the lowlands of villages, fields and pastures, mountain mixed and spruce forests containing highly biodiverse meadows and arcto-alpine tundra characterised by natural grasslands with dwarf pine shrubs on the upper slopes and sparsely vegetated areas on the highest peaks.

The main purpose for the park's designation is its geo-biodiversity, variability of the landscape and many species including those endemic to KRNAP such as the IUCN Red List *Campanula bohemica* and glacial relicts such as the Bluethroat (*Luscinia svecica svecica)*. KRNAP has also been listed as a UNESCO Biosphere Reserve, Special Protection Area, and Site of Community Importance and is under the Ramsar Convention.

Issues

Despite the valuable biodiversity and many protected species, KRNAP has been declared by the IUCN as a one of the most endangered national parks. Air pollution was a significant issue in the past decades. Nowadays there are problems connected with development pressure (housing, hotels, ski centres), heavy tourism and climate change, with many valuable ecosystems and species exposed to the threat of drought. The advancing treeline is also increasing pressure on the fragile tundra ecosystem. Increasing tourism and the associated infrastructure (transportation, ski lifts and slopes etc.) have led to further landscape fragmentation and created barriers, reducing the ability of large mammals to move through the landscape.

Challenges

Krkonoše Mts. National Park faces a number of challenges. A key challenge lies in finding a common approach for all stakeholders (National Park and Protected areas Administrations, municipalities, etc.) in the park and its surroundings. Secondly it is necessary to improve connectivity and the functionality of green infrastructure in the whole region. The cross-border (Czech and Poland) location of the park means bilateral implementation and financing of mutual projects between municipalities, Parks Administrations and municipalities on both sides of the border is fundamental. Last but not least it still remains a challenge to persuade some stakeholders of the benefits of green infrastructure, especially those benefits which are not obvious to stakeholders or associated with their roles and responsibilities.

How was the Strategy developed?

Stage 1 Transnational GI Assessment and Identification of Priorities (political and others)

A series of discussions with local (municipalities, businesses, ski centres), regional (regional and districts administrations) and national (Ministry of Environment, universities and research institutions) stakeholders identified key priorities for GI of KRNAP case study area. They include preserving biodiversity, reducing fragmentation without reducing the recreation functions of the landscape, improving water management in the landscape and mitigation against climate change.

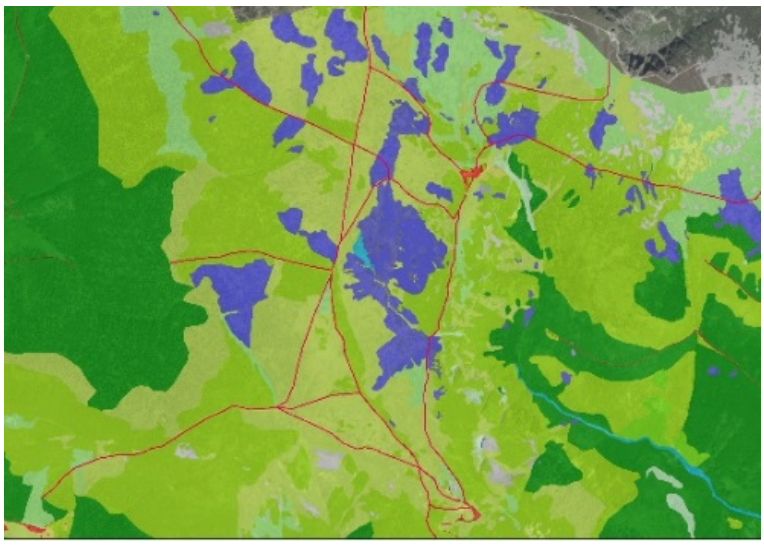

Figure 32 - Peat bogs are an important habitat, seen here in purple among the Arctic-alpine tundra of grassland and dwarf pines in green, and are heavily fragmented by a dense network of tourist paths shown in red.(source: GI map of KRNAP, Consolidated Layer of Ecosystems)

These discussions were supported by fundamental legal and strategic documents investigated in the policy review including Acts No. 114/1992 Coll., on the conservation of nature and landscape and No. 289/1995 Coll., on forests and on amendments to some acts (the Forest Act) and the Plan for Maintaining the Krkonoše National Park and its Buffer Zone. Regional and local maps of GI based on various geographical data created in the transnational assessment also supported discussions and included the consolidated layer of ecosystems of the Czech Republic (KVES ČR) perhaps one of the most important of background information sources.

Stage 2 Functionality Assessment

The next stage was to analyse the landscape functionality using the outputs of Work Package 1 (mapping) and simple to use software. Using the results of the GI functionality analyses, specifically connectivity, habitat function and fragmentation indexes, key landscape services were identified as well as locations characterised by a reduced functional value, which in turn provided focus areas.

Although KRNAP appears on the surface to have high values for most landscape services, there is a risk of this decreasing due to high level of landscape fragmentation in the lower areas, those surrounding the main tourism centres. The habitat and refugium functions are most at risk. It necessary to keep original landscape structure (formed by strips of woodland – see figure 33) in the lower parts to connect areas with other protected areas in the region.

Figure 33 - Landscape structure of the lower parts of the KRNAP case study area. The thin strips of woodland shown here help to connect habitats for key species. (source: Kamila Antošová, KRNAP Administration)

The assessment of public benefits was helped by the existing long-term cooperation between KRNAP Administration, the most important authority regarding nature conservation in the park, and others local and regional stakeholders.

The key topics of green infrastructure were discussed during regular meetings with the mayors of municipalities and the representatives of the KRNAP Administration in Vrchlabí.

The most important issues surrounding GI have been incorporated into the production of statutory strategic documents for which the KRNAP Administration is responsible. This was necessary because nature conservation authorities prioritise "environmental" benefits (conservation and biodiversity, water management), while most municipalities and others (e.g. ski centres) favour those GI functions and benefits associated with recreation and tourism.

The identification of the significant benefits of GI was supported by the outputs of Work Package 2 (functional landscape analyses) and other research and preceding long-term monitoring results arising from many internal and external projects. This research also helped identify GI elements and locations with the largest intersection of multi-sector of benefits were to be found. Field trips with local authorities proved to be very useful tool in explaining the benefits and functions of green infrastructure (Figure 34).

Figure 34 - Field trip with stakeholders to discuss public benefits and landscape services of key GI elements, in this case a forest meadow in Sklenářovice. (source: Kamila Antošová, KRNAP Administration).

Outline of Key Themes, Priorities and Directions for the Strategy and Action Plan.

Based on the previous stages and assessments the key themes and priorities of the green infrastructure strategy were identified. One of those key themes is Preserving Biodiversity and Nature Conservation to maintain the natural value of area and the various endemic and relic

species. To fulfil this goal the management of key ecosystems and refuges will be necessary. In valuable arcto-alpine tundra ecosystem the park will fell the *Pinus mugo* shrubs (planted during last centuries) to support other protected floral and faunal species. The second planned action for this habitat is tourism management. During the nesting period in spring some selected trails will be closed and visitors will be directed to other tracks and locations. Additional measures such as projects that realise the renewal of grazing and appropriate mowing regimes will also ensure the perseverance of the mountain meadows and their biodiversity interest.

The second, though equally important, theme is landscape fragmentation and increasing connectivity. Krkonoše Mts. National Park is a one of the most visited protected areas in Europe, placing significant pressure on valuable ecosystems (i.e. arcto-alpine tundra) and is causing the fragmentation of protected key species habitats, such as those for Eurasian Lynx (*Lynx lynx) and Black Grouse (Tetrao tetrix*) for example. The KRNAP Administration are preparing (together with municipalities and district authorities) a new Territorial System of Ecological Stability to help migration for many species and for habitat creation. The creation of new black grouse habitats is another action to help reach this objective.

KRNAP provides many educational benefits, such as how nature and GI can help us and provide us with many services and benefits. Management of sustainable tourism based on field education is one way how we can protect the most valuable parts of the area. The construction of new education trails with views and other attractions and the reconstruction of current paths will support this objective.

Lastly, the themes connected with climate change and mitigation are a pressing issue and actions to water retention support were identified by all key stakeholders in the case study area. One key action to be undertaken is to address this is the building of small dams in aquatic ecosystems (springs, peat bogs). The list of the key benefits and priorities is shown below in Table 1.

Players/actors in delivering the strategy and those that support its implementation.

The selected goals of the Strategy have been incorporated into the fundamental strategic and statutory document of Krkonoše Mts. National Park - Plan for Maintaining the Krkonoše National Park 2021 – 2040. This is statutory document for all municipalities and other stakeholders in the case study area. The strategic plan for connectivity support (TSES) was adopted by the responsible authority of municipalities with extended powers (Trutnov, Jilemnice, Vrchlabí, Semily, Tanvald). Most of municipalities committed to implement TSES for habitat and landscape connectivity support into their territorial planning.

GI Benefit	Strategic Tools/Policies	Partners
Conservation Benefits	Plán péče o Krkonošská národní park 2010 – 2020 (Zásady péče 2021 – 2040) Zásady územního rozvoje a Strategie Královéhradeckého a Libereckého kraje NATURA 2000 ÚSES a ÚP obcí na území KRNAP Zákon 114/1992 Sb.	KRNAP Administration Královéhradecký a Liberecký Region Authority Trutnov, Jilemnice, Vrchlabí, Semily, Tanvald municipalities with extended powers Ministry of Environment of The Czech Republic Municipalities
Tourism and Recreation	Plán péče o Krkonošská národní park 2010 – 2020 (Zásady péče 2021 – 2040) Integrovaná strategie rozvoje regionu Krkonoše 2014 – 2020 (s výhledem do roku 2030) Strategie rozvoje Královéhradeckého a Libereckého kraje	KRNAP Administration Krkonoše – Alliance of towns and municipalities Municipalities Královéhradecký a Liberecký Region Authority
Water Management	Plán péče o Krkonošská národní park 2010 – 2020 (Zásady péče 2021 – 2040) Strategie rozvoje Královéhradeckého a Libereckého kraje	KRNAP Administration Ministry of environment Municipalities
Health and well-being	Integrovaná strategie rozvoje regionu Krkonoše 2014 – 2020 (s výhledem do roku 2030) Strategie rozvoje Královéhradeckého a Libereckého kraje	KRNAP Administration Krkonoše – Alliance of towns and municipalities Municipalities Královéhradecký a Liberecký Region Authority

Table 18 - Key GI public benefits and Strategic tools approved by responsible stakeholders.

Key Expected Benefits

By implementing the strategy the connectivity of landscape and habitats of key species will increase helping to preserve some threatened species through the defragmentation of the landscape. The landscape will become more resistant to drought and climate changes. Importantly the negative impacts of tourism and recreation will be reduced and the role of the park as an education resource will be enhanced.

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6.5. Case study Area - Tri-border region CZ-DE-PL

Location: Northern Bohemia (Czech Republic), South-eastern Upper Lusatia (Germany), South-western Lower Silesia (Poland)

Description of the area

The case study area of the three-border region Czech Republic-Germany-Poland stretches from Bohemian Switzerland in the west through the Zittau and Lusatian Mountains to the Iser Mountains in the east. An important landscape feature is the River Neisse and its tributaries. This network of waterways connects the three countries and passes through mountainous areas with forests, peat bogs, rocky areas and mountain meadows and the lowlands with their settlements (e.g. Zittau and Liberec) and agricultural areas. Open cast lignite mining still impacts this landscape, with the Turów mine being the largest.

Issues

The region is an important ecological corridor between the national park regions of Saxon-Bohemian Switzerland and the Giant Mountains. However, between the Zittau/ Lusatian Mountains and the Jizera Mountains, elements of green infrastructure (GI) are often not sufficiently connected. Urban and peri-urban areas are characterised by a lack of green spaces and contain abandoned or unused areas offering very few benefits. The area has a lot of straightened or channelised rivers that can increase the risk of flooding for downstream areas and the floodplains have limited biodiversity and/or multifunctionality.

Challenges

A key challenge surrounds the issue that the term GI and concept is understood very differently by different actors or is even unknown to some stakeholders in the case study area. In addition, all three countries have their own biotope network system, individual formal planning systems, each with different legal basis, and various geodata on land use, often differing in projection and

content. All this currently makes cross-border planning of GI difficult. Informal planning - instruments have a high potential to implement GI, but their establishment in the case study area is a further challenge.

How was the strategy developed?

Stage 1 Transnational GI Assessment and Identification of Priorities

Analyses of the legal and strategic framework showed where aspects of GI are already being considered. The EU directives on the Natura2000 network as the backbone of GI have been transposed into national law. In addition, there are GI concepts (e.g. DE: Bundeskonzept Grüne Infrastruktur/German Federal Green Infrastructure concept), strategy documents (e.g. CZ: Politika architektury a stavební kultury České republiky/Policy of Architecture and Building Culture of the Czech Republic) or the term is already anchored in regional development plans (e.g. PL: Plan Zagospodarowania Przestrzennego Województwa Dolnośląskiego/Spatial Development Plan of Lower Silesian Voivodeship).

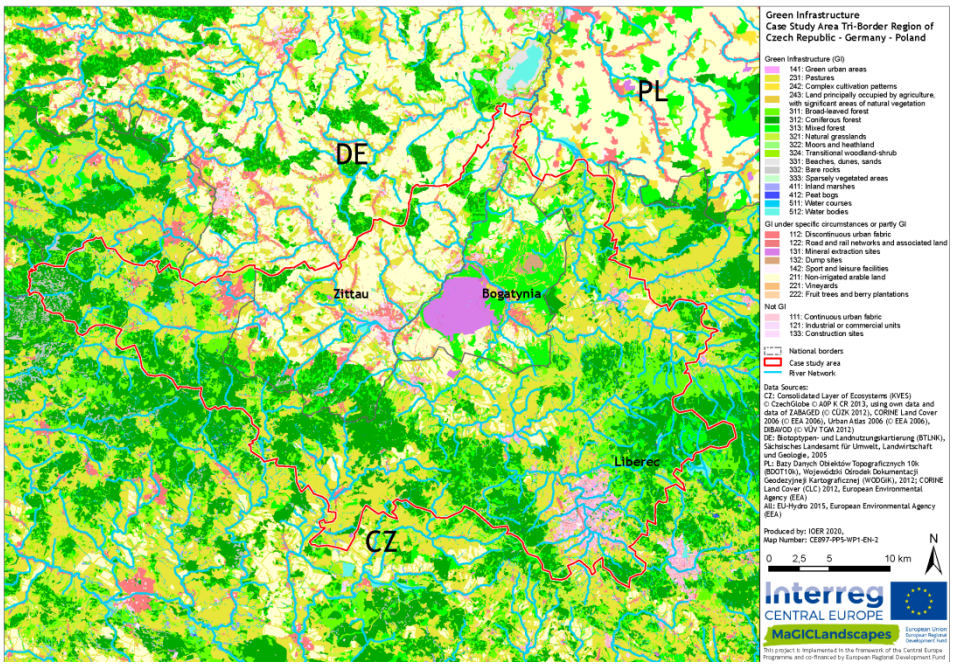

Figure 35 - GI map Tri-border region CZ-DE-PL

The GI mapping was carried out on the basis of full-cover regional geodata on land cover/land use. Gaps in the GI network are mainly found between the Zittau/Lusatian Mountains and the Jizera Mountains, which are due to settlements, transport infrastructure, open-cast mining and intensive agricultural use. The three largest cities Liberec (CZ), Zittau (DE) and Bogatynia (PL) have a limited amount of green space, especially in the centres. Regional stakeholders confirmed these gaps and limitations and helped prioritise activities to address them (see Step 3).

Step 2 - GI functionality assessment

An analysis of the networking and spatial patterns of the GI elements revealed several areas within the cities and their surroundings where there is a lack of green spaces and where green routes could link smaller urban green spaces with larger green spaces in the surrounding area. On-site mapping of selected areas showed how differently certain green spaces can be characterised and how their functionality may differ. The maps of the provision of different landscape services proved to be an important basis for integrated development concepts, especially for the cities in the case study area such as Zittau. On this basis, it was possible to identify areas where new GI should be created (e.g. urban gardens) or existing GI should be enhanced (e.g. river restoration).

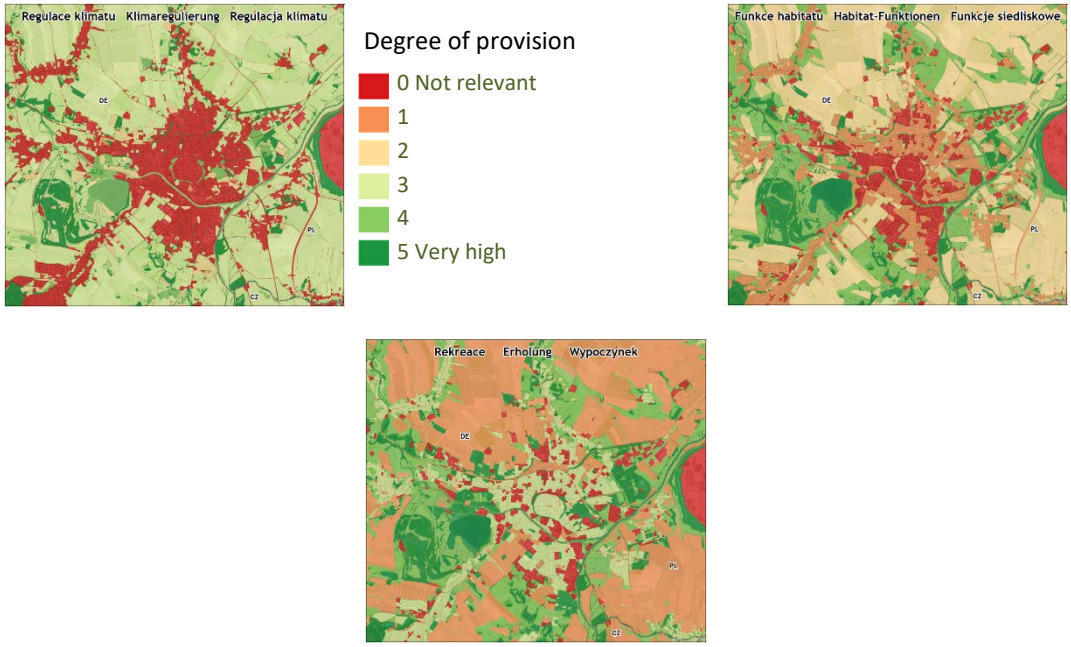

Figure 36 - Example maps of three GI services (climate regulation, habitat function, recreation) for the city of Zittau (DE) and surroundings

Step 3 - Assessment of the public benefits of green infrastructure

Over the course of several workshops, thematic mapping was carried out together with regional stakeholders. The participants represented various target groups (including NGOs, universities/research institutions, local public administrations/authorities, sectoral agencies and planning offices). The thematic mapping identified the strengths of and threats to existing GI as well as the needs and opportunities for the creation of new GI. The issues mentioned by the stakeholders were assigned to GI benefits that could be achieved by implementing appropriate measures. Those benefits that were often identified by stakeholders as being significant became those prioritised in the strategy.

Figure 17 - Stakeholder Workshop Liberec (CZ), February 2019 (Photo: M. Neubert)

Key themes, priorities and direction for the strategy and action plans

Two fields of action determine the direction of the strategy for the tri-border region. They are:

- Creation and enhancement of urban green spaces
- Restoration of watercourses, floodplains and catchment areas

All action plans are assigned to these two fields of action. Each action offers several benefits. Priority GI benefits identified for the tri-border region are 'Health & well-being', 'Education' and 'Tourism & recreation'. Key actions for these three benefits focus on the creation and improvement of green spaces in urban and rural areas. Other priority benefits include:

- the 'conservation benefits', e.g. by increasing biodiversity in the cities;
- 'land & soil management' and 'agriculture and forestry', with emphasis of actions on improved erosion control and resilient forestry; and
- 'climate change mitigation & adaptation' and 'disaster prevention', e.g. to achieve improved flood protection through the restoration of rivers and floodplains.

GI Benefit	Strategic Tools/Policies	Partners
Health & well-being	Integrated urban development concept (INSEK) Zittau	Zittau Urban Development Corporation (Stadtentwicklungsgesellschaft Zittau)
	Elaboration of a common development concept for the Liberec-Zittau region	Interreg SN-CZ Project 'ALiZi'
Education	Urban Gardening Initiatives	"Amaliengarten" Zittau, University of Applied Sciences Zittau Görlitz (HSZG); City of Bogatynia
	Special training measures of the Employment office (motivation workshop 2.0)	bao GmbH - Service provider for education, work and orientation
Tourism & recreation	Tourism concepts	International University Institute, TU Dresden (IHI), Tourism Centre Zittauer Gebirge Nature Park
	Cultural Capital application Zittau	6-City Association, City of Zittau, City of Liberec
Conservation Benefits	Biotope network systems/Natura 2000	Agentury ochrany přírody a krajiny ČR - AOPK (CZ), Regionalna Dyrekcja Ochrony Środowiska we Wrocławiu - RDOS (PL), Saxon State Ministry for Energy, Climate Protection, Environment and the Economy - SMEKUL (DE), Lower Nature-Protection Agency Landkreis Görlitz (DE)
Land & soil management	Participation procedure for the second comprehensive update "Regional Plan Upper Lausitz - Lower Silesia"	Regional Planning Association Upper Lusatia-Lower Silesia
	Central network grassland management for the promotion of biodiversity in the southern district of Görlitz (DE)	Zittau Mountains & Foreland Landscape Conservation Association (Landschaftspflegeverband Zittauer Gebirge & Vorland e.V.)
	RAINMAN Toolbox	Interreg Central Europe project 'RAINMAN'
Agriculture & forestry	EPLR project 'Forest restructuring outside protected areas'	Eigenbetrieb Forstwirtschaft Zittau
	Programme for sustainable forest management	Czech Forestry Agency (Lesy České republiky)
Climate change mitigation and adaptation	European Green Leaf Award of the European Commission	Zittau Urban Development Corporation (Stadtentwicklungsgesellschaft Zittau)
Disaster prevention	Cross-border cooperation of Saxony and the Czech Republic in flood risk management	EU Project 'STRIMA II'

Table 19 - Benefit priorities in descending order (dark to light green, same intensity = same priority level) with strategic tools/policies and partners that are important for achieving these benefits

Actors involved in the implementation of the strategy

One of the main actors in the tri-border region is the **Stadtentwicklungsgesellschaft Zittau (Zittau Urban Development Corporation)**, which is incorporating the GI concept into the Integrated Urban Development Concept (INSEK) for the municipality of Zittau (DE). In addition, the Stadtentwicklungsgesellschaft Zittau is currently working with the **City of Liberec** (CZ) on a joint development concept for the Liberec-Zittau region as part of the "ALiZi" project, in which the results of MaGICLandscapes are also to be taken into account. The **bao GmbH** is another important partner in Zittau in the design of public open spaces, e.g. within the scope of special training measures of the employment office. The City of Bogatynia (PL) is already planning a number of measures that will deliver the three top priority benefits. The nature conservation authorities of all three countries (see table above) are working on the biotope network and the Natura 2000 network of protected areas.

The University of Applied Sciences Zittau-Görlitz (HSZG) as well as the International University Institute of the TU Dresden (IHI) increasingly integrate GI and its achievements into teaching and support student activities in this field, as in the case of the HSZG the urban gardening project "Amaliengarten" in Zittau. Networking with other ongoing (research) projects (e.g. RAINMAN, STRIMA II) is equally important in order to exchange and harmonize proposed measures for the region and thus to promote their implementation.

Regional representatives of the Bündnis 90/Die Grünen party act as multipliers of the GI concept in the region. In addition, a number of funding programmes are available which can support the implementation of the GI concepts in the region. One example are the small project funds, administered by the Euroregion Neisse-Nisa-Nysa, which support cross-border projects between Saxony and Poland as well as Saxony and the Czech Republic.

Expected benefits

The strategy and action plans cover two main fields of action. The field of action "Creation and enhancement of urban green spaces" aims to improve the quality of life of city dwellers and to create recreational areas and environmental education opportunities. At the same time, this is expected to increase biodiversity and improve the adaptation of cities to climate change. The field of action "Restoration of watercourses, floodplains and catchment areas" is intended to prevent future heavy flooding, reduce soil erosion in the catchment areas and increase the biodiversity of the floodplains.

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6.6. Case Study Area – Western Weinviertel and Eastern Waldviertel

Location: Lower Austria, Austria | Districts: Hollabrunn and Horn

Description of the area

The Lower Austrian case study area of MaGICLandscapes project covers the districts of Horn and Hollabrunn and is a transition area between two landscapes, the Waldviertel in the west and the Weinviertel in the east. The Waldviertel is shaped by the highlands of a shallow gneiss landscape. The River Thaya partially marks the northern border to the Czech Republic and gives its name to the trans-boundary Thayatal National Park / Podyjí, recognised as an outstanding biodiversity hot spot. The Weinviertel is characterised by wide open valleys and rolling hills. The area is one of the driest parts of Austria and lacks distinctive river networks. There are more meadows and less wetlands compared to the Eastern Waldviertel and due to the Pannonian climate and the loess soil it is Austria's largest wine growing region. River regulation and drainage associated with arable farming means many wet meadows and waterlogged habitats have been lost. On steeper hillsides and knolls the landscape becomes more varied with viticulture interspersed by patches of dry and xeric grasslands as well as heaths. At slightly higher elevations warm temperate oak forest can be found. The vegetation in this area is unique and home not only to Pannonian species but also species normally found much further to the east such as the European ground squirrel (*Spermophilus citellus*). Due to its high biodiversity large areas of the case study area are part of the Natura 2000 Network.

Issues

The landscape of the case study area is typically characterised by narrow partitioned strips of farmland with many field margins and boundary ridges. Due to changes in agriculture, an increasingly intensive cultivation and the abandonment of small and unattractive sites, parts of the landscape nowadays are pretty much cleared and featureless.

Existing migration axes and gaps in the GI-network have to be identified and several disconnected Natura 2000 areas should be linked. A main issue is the need to recreate ecologically relevant landscape elements taking the private economic interests of local land managers into account.

Grasslands and streams in the Waldviertel and dry and xeric grasslands in the Weinviertel have been identified as priorities for action. The large-scale spread of the invasive Robinia (*Robinia pseudoacacia)* on abandoned meadows, dry and xeric grassland, woodlots and hedges seriously affects the quality and functionality of GI elements in the region. In the more wooded western part of the case study area, the Waldviertel, monotone species-poor plantations of spruce dominate extensive parts of the landscape.

Challenges

Due to the rural character of the region, containing 44 municipalities with just 4 larger cities and covering a relatively large area of nearly 1,800 km², a major challenge is the absence of an overarching instrument for spatial and in particular landscape planning. Thereby the broad scope of tasks for small municipal administrations seldom allows for an intensive involvement in issues like Green Infrastructure (GI) or nature conservation at the local level. Providing an easy to use inventory of GI regarding its spatial structure, functionality and ecosystem services on regional and local level can supply decision-support for politicians, planners, land users/managers and communities to invest in GI and will support the further implementation of GI.

How was the Strategy developed?

Stage 1 Transnational GI Assessment and Identification of Priorities (political and others)

Starting from the common, comparable data base of CORINE Land Classification (CLC), MaGICLandscapes partners supplemented individual geographic information system (GIS) projects using available national and regional data. For the compound Austrian case studies this was obtained by compiling the following data sets:

- Copernicus High Resolution Layers (HRLs): High Resolution Layer - Forest Types
- Agricultural data of the Integrated Administration and Control System (IACS) and Land Parcel Identification System (LPIS)
- Digital cadastral data
- Regional waterways network

The data sets were aggregated and reclassified according to CORINE and, using various GIS-based tools, sequenced according to their thematic coverage to obtain an accurate description of land cover.

Over several workshops and meetings stakeholders identified the following issues:

- Further intensification of land use and therefore loss of valuable extensively used habitats of the cultural landscape (orchards, meadows, pastures) and small biotopes and landscape features

- Building development, infrastructure projects, urban sprawl, land consolidation and spatial planning
- River regulation and drainage
- Disposal of waste and residual materials

Rural agricultural landscapes are the dominant type of landscape in the area (Figure 36), and face major challenges in implementing a connected and functional GI network. In these intensively farmed areas elements of GI are very often limited to linear structures, and as such, important linking elements crucial to the GI network. At the same time, GI improves the overall environmental resilience of farmed landscapes towards climate change and extreme environmental events.

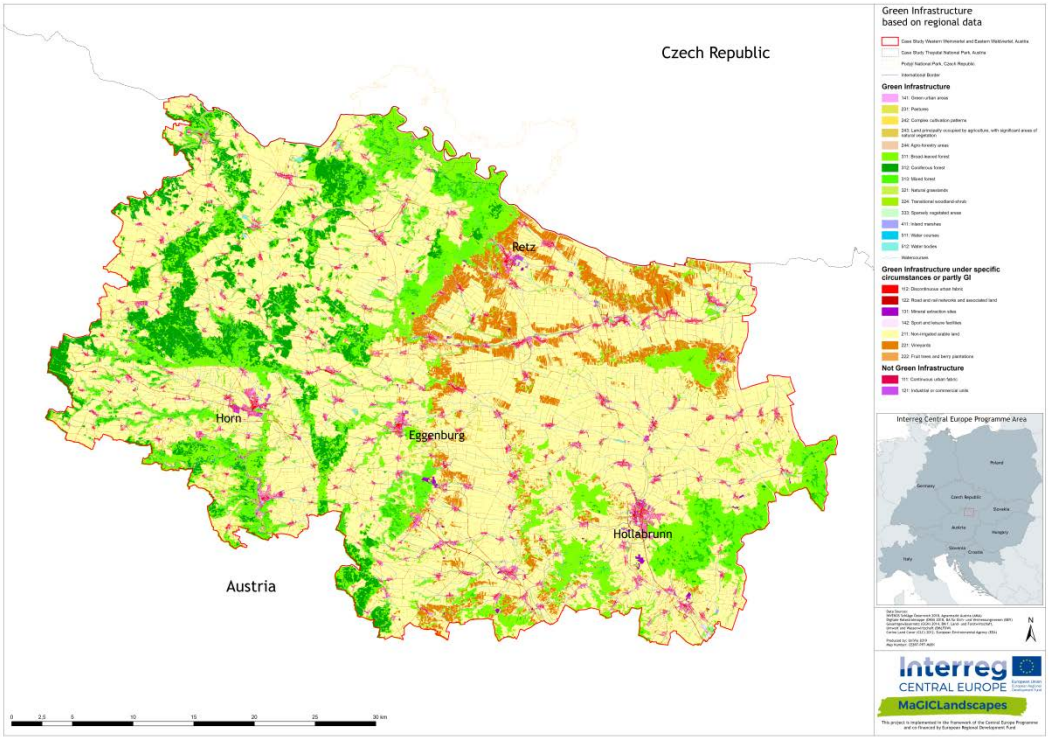

Figure 38 - Map of Green Infrastructure of the Austrian case studies based on regionalised geodata

Green Infrastructure as a concept has not yet been established in Austrian legislation. Nonetheless, legal matter referring to elements of Green Infrastructure appears in different national and regional legislation. In Austria most of the legislation regarding nature and landscape conservation, etc. lies within the responsibility of the federal states. The only documents directly referring to GI are the Austrian Biodiversity Strategy 2020+ (Biodiversitäts-Strategie Österreich 2020+) and the Lower Austrian Nature Protection Concept (Naturschutzkonzept Niederösterreich).

Stage 2 – Functionality Assessment

The use of detailed regionalised GI geodata revealed specific details of the landscapes' structure and fragmentation as well as land use patterns and landscape features. Furthermore, this dataset provided an ideal basis to enhance the specific analyses of connectivity, by an additional assessment of functionality in terms of provision of landscape services. The synopsis of the results of the connectivity and functionality analysis, including sample field mapping surveys, helped greatly to identify hot spots of GI networks as well as GI with a high functional value and areas lacking such elements. Throughout the case study area the predominant agricultural landscape shows many rather featureless areas. These areas represent one of the most important target regions for the establishment of new elements of GI, like small woodlots, copses, hedges, riparian woods and strips as well as field trees (figure 39)

Figure 39 - Typical aspect of the agricultural landscape of the Western Weinviertel and Eastern Waldviertel

Stage 3 Assessment of Public Benefit

To enhance the data driven approach of the functionality assessment in stage 2, a broad stakeholder process was implemented to integrate local needs and priorities to establish a comprehensive strategy document. By using a dual system to include stakeholder's opinion, firstly a direct consultation of experts and institutions was conducted, to explore problems, priorities and interests, and secondly a series of more open public workshop events took place, where also individuals from various sectors could add their views. A tool for the assessment of public benefit for both of these stakeholder groups served to identify target areas as well as to prioritise GI benefits.

Figure 40 - Stakeholder involvement to highlight and prioritise GI benefits and locations

Outline of Key Themes, Priorities and Directions for the Strategy and Action Plan.

As a result of stakeholder involvement and application of various tools to assess the public benefit of GI, a prioritisation of the key aspects of local GI (Table 1) was achieved and provided the basis for the coordinated development of strategies and action plans for the Western Weinviertel and Eastern Waldviertel.

Conservation benefits	Thayatal National Park Lower Austria network of protected areas Lower Austrian League for Nature Conservation Biologists, NGOs & nature conservationists
Maintaining/enhancing existence value of habitat, species and genetic diversity	
Maintaining/enhancing bequest and altruist value of habitat, species and genetic diversity for future generations	
Tourism and recreation	State and municipalities Tourism associations
Increase in tourist attractiveness of the territory	
Expansion of range and capacity for recreational opportunities	
Disaster prevention	State and municipalities Water board Climate Change Adaptation Model Regions
Enhancing erosion control capacity	
Reduction of the risk of forest fires	
Flood hazard reduction	
Land and soil management	State and municipalities District agricultural authorities Chamber of Agriculture Winegrowers' Association Federal Ministry of Agriculture, Regions and Tourism Climate Change Adaptation Model Regions Land owners
Reduction of soil erosion	
Maintaining/enhancing soil's organic matter	
Increasing soil fertility and productivity	
Mitigating land take, fragmentation and soil sealing	
Improving land quality and making land more attractive	
Higher property values	
Agriculture and forestry	State and municipalities District agricultural authorities Chamber of Agriculture Winegrowers' Association Austrian Federal Forests Federal Ministry of Agriculture, Regions and Tourism Climate Change Adaptation Model Regions Land owners
Enhancing multifunctionality and resilience of agriculture and forestry	
Enhancing pollination	
Enhancing pest control	
Investment and employment	State and municipalities Tourism associations Chamber of Agriculture Climate Change Adaptation Model Regions
Better image	
ore investment	
More employment	
Increase in labour productivity	

Table 20 - Prioritisation of GI benefits for the case study area and representative stakeholders

According to this prioritisation and the data driven analysis, the following actions and areas for intervention were identified as most urgent:

- Action Plan 1 - Enhancement of the cleared, arable dominated cultural landscape by re-cultivating it with landscape elements such as hedges, field margins or flower strips
- Action Plan 2 - Climate-friendly forest conversion of spruce plantations with tree species appropriate to the location and designation of natural forest reserves
- Action Plan 3 - Creation of retention and buffer areas, widening of water bodies, promotion of small water bodies and increase of structural diversity in river beds and bank areas of water bodies and wetland habitats for ecological upgrading, raising of the groundwater level and improvement of flood protection
- Action Plan 4 - Securing and improving Green Infrastructure in areas of fruit and wine growing complexes by preserving and returning to the traditional small-scale cultural

landscape and its numerous intermediate structures such as slopes, rows of trees and individual trees.

- Action Plan 5 - Targeted maintenance and resumption of traditional forms of use such as mowing and grazing of the remaining dry grasslands, meadows and pastures which, as scattered residual areas within the intensively used cultural landscape.
- Action Plan 6 - Improvement measures for green areas close to settlements, such as home gardens and parks as well as accompanying areas of road and rail infrastructure offer the possibility to improve the environmental conditions in the villages and towns and to increase the quality of life of the people.
- Action Plan 7 - Securing and establishing habitat corridors to re-connect protected areas, improve an effective biotope network and increase the connectivity of the landscape.

Key Players/actors in delivering the strategy and those that support its implementation.

The strategy and action plans are supported by institutions, individuals and municipalities in the case study area. The findings and recommendations of the project will be used to ensure that policy-making and decisions improve the GI resource. Local land owners and managers and nature conservation bodies are encouraged to use the findings to safeguard and improve the functionality of the existing and planned GI network.

Expected Benefits

The implementation of concrete measures of the developed action plan will contribute positively to the safeguard and, ideally, expand the provision of GI benefits regarding, amongst others, conservation, tourism and recreation, disaster prevention, land and soil management, agriculture and forestry as well as investment and employment greatly. By promoting and improving Green Infrastructure associated with the agricultural landscape, forests and woods, watercourses, still waters and wetlands, fruit and wine growing complexes, dry grasslands, meadows and pastures as well as urban and rural settlements, the multifunctional role of these areas providing a wide range of benefits could be increased strongly to serve the human well-being. In addition, by the cross-linking and re-connection of the fragmented GI network, migration and dispersal possibilities of living beings will be improved to protect ecological fitness, genetic variability and biodiversity.

Contact Details

If you live/work in this case study area and if you are interested in the strategy for a better Green Infrastructure in this region please feel free to contact magiclandscapes.cvl@univie.ac.at at the University of Vienna.

6.7. Case Study Area – Thayatal National Park

Location: Lower Austria, Austria | District: Hollabrunn

Description of the area

The Thayatal National Park in the north of Austria was founded in 1999 to protect the high biodiversity of the meandering River Thaya valley. It plays an important role in the landscape protection in the border region between Austria and the Czech Republic. With over 90% of the park being woodland, the Thayatal National Park is a true forest national park and a core area of the regional green infrastructure. The National Park is a biodiversity hotspot and is home to a large number of rare animal and plant species. This biodiversity can only be maintained and enhanced, if there is a sufficient network of suitable habitats, as otherwise there is a risk of genetic decline. Green infrastructure is of particular importance in the region so that the Thayatal National Park does not become an isolated island. Forest and meadow areas in particular represent occasional interruptions to the monotonous agricultural activities that need to be protected and enhanced.

Issues

The National Park provides a refuge for rare and endangered species which otherwise would not be able find a suitable habitat in an agricultural landscape. In order to maintain and improve the biodiversity of the National Park, green infrastructure is a key factor in sustaining the park. Many species struggle to find migration corridors through the agricultural land, which for the most part surrounds the National Park. For example, the rare European wildcat (*Felis silvestris*), which was believed extinct in Austria, found its way back into the country. Sightings in the Thayatal National Park were confirmed on several occasions using DNA-analyses. For the preservation of a healthy wildcat population an exchange of genetic material must be ensured.

Challenges

Without sufficient green infrastructure many species would suffer of genetic depletion. The role of such protected nature sites in Central Europe, which are often surrounded by agricultural land, is very important for the preservation of a functioning natural environment. It allows the natural vegetation to adopt to climate change and therefore protects biodiversity for generations to come. In order to secure the continuance of the functionality of the natural protection sites, green infrastructure is indispensable in keeping the landscapes and its people healthy. Therefore, it is of high interest for the Thayatal National Park to improve its connectedness to other natural habitats and protected sites throughout Central Europe.

How was the Strategy developed?

Stage 1 Transnational GI Assessment and Identification of Priorities (political and others)

Starting from the common, comparable data base of CORINE Land Classification (CLC), MaGICLandscapes partners supplemented this with available national and regional data. For the compound Austrian case studies this was obtained by compiling the following data sets:

- Copernicus High Resolution Layers (HRLs): High Resolution Layer - Forest Types
- Agricultural data of the Integrated Administration and Control System (IACS) and Land Parcel Identification System (LPIS)
- Digital cadastral data
- Regional waterways network

The data sets were aggregated and reclassified according to CORINE and, using various GIS-based tools, sequenced according to their thematic coverage to obtain an accurate description of land cover.

Over several workshops and meetings stakeholders identified the following issues in the surroundings of the Thayatal National Park;

- Further intensification of land use and therefore loss of valuable extensively used habitats of the cultural landscape (orchards, meadows, pastures), irrigation
- Building development, infrastructure projects, urban sprawl, land consolidation and spatial planning
- River regulation and drainage
- Disposal of waste and residual materials
- Loss of small biotopes

Mixed deciduous forest is the dominant type of landscape in the area (Figure 39), which is surrounded mostly by agricultural land. To keep the National Park and the inhabitants of the region healthy, the surrounding region faces major challenges in implementing a connected and functional GI network. In the intensively farmed areas elements of GI are very often limited to just linear structures, and as such, important linking elements crucial to the GI network. At the same time, GI improves the overall environmental resilience of farmed landscapes towards climate change and extreme environmental events.

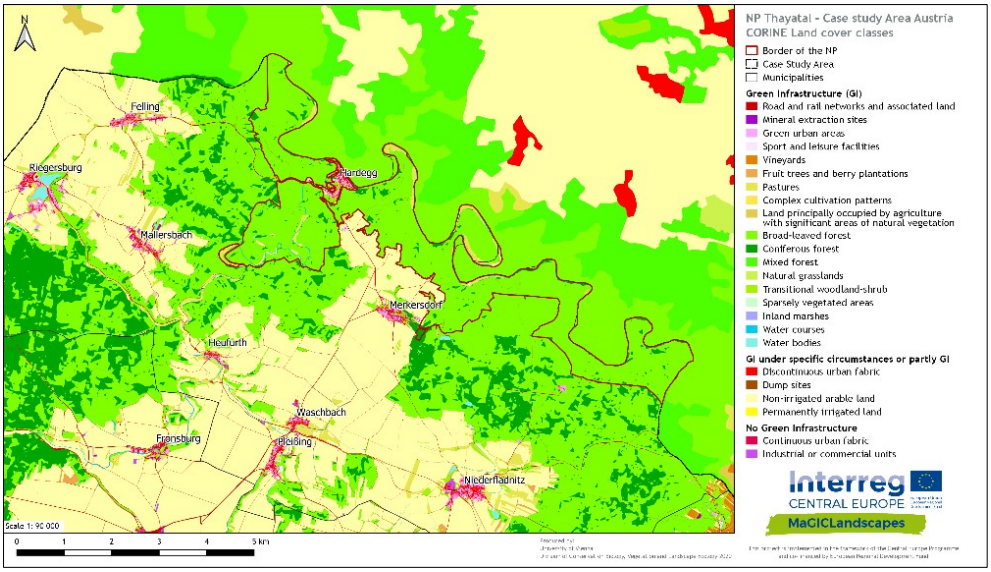

Figure 41 - Map of Green Infrastructure of the Austrian case studies based on regionalised geodata

Green Infrastructure as a concept has not yet been established in Austrian legislation. Nonetheless, legal matter referring to elements of green infrastructure appears in different national and regional legislation. In Austria most of the legislation regarding nature and landscape conservation, etc. lies within the responsibility of the federal states. The only documents directly referring to GI are the Austrian Biodiversity Strategy 2020+ (Biodiversitäts-Strategie Österreich 2020+) and the Lower Austrian Nature Protection Concept (Naturschutzkonzept Niederösterreich).

Stage 2 – Functionality Assessment

The use of detailed regionalised GI geodata revealed specific details of the landscapes' structure and fragmentation as well as land use patterns and landscape features. Furthermore, this dataset provided an ideal basis to enhance the specific analyses of connectivity, by an additional assessment of functionality in terms of provision of landscape services. The synopsis of the results of the connectivity and functionality analysis, including sample field mapping surveys, helped greatly to identify hot spots of GI networks as well as GI with a high functional value and areas lacking such elements.

Figure 42 – Steep sided valley of the Thayatal National Park

Stage 3 Assessment of Public Benefit

To enhance the data driven approach of the functionality assessment in Stage 2 a broad stakeholder process was implemented to integrate local needs and priorities to establish a comprehensive strategy document. By using a dual system to include stakeholder's opinion, firstly a direct consultation of experts and institutions was conducted, to explore problems, priorities and interests, and secondly a series of more open public workshop events took place, where also individuals from various sectors could add their views. A tool for the assessment of public benefit for both of these stakeholder groups served to identify target areas as well as to prioritise GI benefits.

Outline of Key Themes, Priorities and Directions for the Strategy and Action Plan.

As a result of stakeholder involvement and application of various tools to assess the public benefit of GI, a prioritisation of the key aspects of local GI (Table 1) was achieved and provided the basis for the coordinated development of strategies and action plans for the Thayatal National Park.

Conservation benefits	Thayatal National Park Lower Austria network of protected areas Lower Austrian League for Nature Conservation Biologists, NGOs & nature conservationists
Maintaining/enhancing existence value of habitat, species and genetic diversity	
Maintaining/enhancing bequest and altruist value of habitat, species and genetic diversity for future generations	
Tourism and recreation	State and municipalities Tourism associations
Increase in tourist attractiveness of the territory	
Expansion of range and capacity for recreational opportunities	
Disaster prevention	State and municipalities Water board Climate Change Adaptation Model Regions
Enhancing erosion control capacity	
Reduction of the risk of forest fires	
Flood hazard reduction	
Land and soil management	State and municipalities District agricultural authorities Chamber of Agriculture Winegrowers' Association Federal Ministry of Agriculture, Regions and Tourism Climate Change Adaptation Model Regions
Reduction of soil erosion	
Maintaining/enhancing soil's organic matter	
Increasing soil fertility and productivity	
Mitigating land take, fragmentation and soil sealing	
Improving land quality and making land more attractive	
Higher property values	
Agriculture and forestry	State and municipalities District agricultural authorities Chamber of Agriculture Winegrowers' Association Austrian Federal Forests Federal Ministry of Agriculture, Regions and Tourism Climate Change Adaptation Model Regions
Enhancing multifunctionality and resilience of agriculture and forestry	
Enhancing pollination	
Enhancing pest control	
Investment and employment	State and municipalities Tourism associations Chamber of Agriculture Climate Change Adaptation Model Regions
Better image	
ore investment	
More employment	
Increase in labour productivity	

Table 21 - Prioritisation of GI benefits for the case study area and representative stakeholders

According to this prioritisation and the data driven analysis, the following actions and areas for intervention were identified as most urgent:

- Action Plan 1 - Communication activities to the public

  The importance as well as the possibilities for improving green infrastructure are identified and spatially located. Together with the municipalities and other institutions, the elements of the green infrastructure, their maintenance and promotion in the region are being discussed.
- Action Plan 2 - Meadow and dry grass management

  Whilst the region has a high proportion of forest, other open but extremely important ecological locations such as meadows, dry grassland and heathlands are of great importance for the biodiversity in the region. In order to maintain a structurally rich and diverse habitat, however, maintenance and care measures are essential.
- Action Plan 3 – Environmental education and recreation

  The diverse elements of the green infrastructure also serve for recreation and environmental education of the public. This is particularly possible if the visitor infrastructure is in harmony with the elements of the green infrastructure. For this reason, new visitor infrastructure is being created in the region, which on the one hand makes the space more diverse, on the other hand allows natural elements to be experienced and thus helps to raise awareness in the region.
- Action Plan 4 – Display garden

  A display garden at the location of the National Park Centre is intended to bring the regional population and visitors closer to nature-oriented gardening and to show what an important element of the green infrastructure gardens in urban areas are, even in a national park region. Visitors are shown which species thrive particularly well in this region, are native here and adapted to the climate.
- Action Plan 5 – Habitat networking

  The network of habitats plays a very important role in maintaining the high biodiversity that the Thayatal National Park is currently home to. In order to avoid a genetic impoverishment of this diversity, there must be regular exchanges with species from other populations. However, if a habitat is very isolated or not networked with other habitats, this exchange cannot take place and species diversity would ultimately decline. Therefore, the National Park supports actions and implementations of green infrastructure in the region, which supports the connectivity of the protected area with the region and other habitats.

Key Players/actors in delivering the strategy and those that support its implementation.

The strategy and action plans are supported by institutions, individuals and municipalities in the case study area and the findings, recommendations of the project will be used to ensure that policy-making and decisions improve the GI resource. Local land owners and managers and nature conservation bodies are encouraged to use the findings to safeguard and improve the functionality of the existing and planned GI network.

Expected Benefits

The implementation of concrete measures of the developed action plan will contribute positively to the safeguard and, ideally, expand the provision of GI benefits regarding, amongst others, conservation, tourism and recreation, disaster prevention, land and soil management, agriculture and forestry as well as investment and employment greatly. By promoting and improving Green Infrastructure associated with the agricultural landscape, forests and woods, watercourses, still waters and wetlands, fruit and wine growing complexes, dry grasslands, meadows and pastures as well as urban and rural settlements the multifunctional role of these areas providing a wide range of benefits could be increased strongly to serve human well-being. In addition, though cross-linking and re-connection of the fragmented GI network, migration and dispersal possibilities of living beings will be improved to protect ecological fitness, genetic variability and biodiversity.

Contact Details

If you live/work in this case study area and if you are interested in the strategy for a better green infrastructure in this region please feel free to contact office@np-thayatal.at at the Thayatal National Park GmbH.

Figure 43 - Stakeholder involvement to highlight and prioritise GI benefits and locations

6.8. Case Study Area – Po Hills around Chieri

Location: Piedmont Region, Italy (Photo: Gabriele Bovo)

Description of the area

The Case Study Area (CSA) includes Turin, one of Italy's main cities, and the surrounding peri-urban areas located on the plain near the hills to the east of Turin. Italy's longest river the River Po also flows through the area. The Turin hills to the east are covered with woodlands and vineyards. There are many Special Areas of Conservation (SAC), both on the hills and on the plain, along the River Po. To the south of the area there is the Altopiano di Poirino and a wide plain, where the woodlands were replaced by agriculture. The area has a significant naturalistic-environmental and landscape value.

Issues

The problems in the area are manifold and include landscape deterioration (urban and peri-urban areas particularly), urban expansion and sprawl in the plains and in the hills along the main transport routes. The loss of biodiversity and reduced environmental connectivity caused by soil consumption and sealing, and spread of exotic species is also an issue. The landscape has been transformed due to cereal crops and arboriculture (especially on Altopiano di Poirino) and hydro-geological fragility results in many landslides and flooding is also an issue particularly in the southern sector. In agricultural areas and in the urban/peri-urban contexts there is a shortage of GI benefits and reduced biodiversity and connectivity.

Challenges

Key challenges are the planning, management and increase of woodlands, increasing riparian/perifluvial vegetation along the hydrological network and promoting the appropriate soil and water management in agricultural, urban and peri-urban contexts to reduce soil erosion, particularly in areas of slope instability. A further challenge is the re-connection and increase in

area of natural and semi-natural areas such as hedgerows, isolated woodlands and small wetlands and the rehabilitation of brownfield areas in urban and peri-urban areas.

How was the Strategy developed?

Stage 1 Transnational GI Assessment and Identification of Priorities

The CSA map of green infrastructure (GI) at the transnational level, based on CORINE Land Cover data showed a large amount of non-irrigated arable lands in the south-eastern part of the CSA. The GI shown on the map corresponds mainly to the large wooded areas on the hills and to the main rivers (Po and Stura). In the plain there are settlements and transport infrastructure. The priorities were identified through a consultation with the project's Associated Partners (Po Park, Piedmont Region and Chieri Municipality). The Po Park Management Body proposed to update the Park Plan and to draft a Plan (Operational Territorial Project) which includes the Po, Superga and Bosco del Vaj parks and to link the hills to lowlands in the west and to the south of the CSA. The main expectation is the development of an analysis model and the design/management of GI which is both understandable and easily used by local administrations.

Stage 2 – Functionality Assessment

As a first stage the Piedmont Land Use Land Cover (2010) was used and then integrated the LCP with more detailed and recent data to create GI maps. Using GUIDOS toolbox, a map was then produced the showing core areas, islets, bridges and loops. The MSPA (Morphological Spatial Pattern Analysis) map correctly recognised that the *core areas* are restricted almost exclusively to the most extensive and the most intact hilly wooded areas. The rest of the hilly woods areas are classified as corridors (red), since they are extremely fragmented. The other core areas are located in the flood plain correspond with the Natura 2000 network sites.

Stage 3 Assessment of Public Benefit

Stages of Assessment are: evaluation of territory critical issues, weaknesses and threats and their general representation on a map; strategies analysis (an in-depth analysis of the work done in WP1); localisation of specific objectives to be pursued in the various areas of the CSA. Then we held a stakeholder consultation including institutional stakeholders and associated organisations/associations). During the workshop we gave each participant a questionnaire containing the list of benefits/effects provided by GI and we asked them: a) to select the 5 effects/benefits produced by GI which they consider most important; b) to localise the benefits (whole area or a specific location); c) to briefly describe which instruments/plans or actions could be used to achieve the objectives identified. In this way we integrated our previous analyses and studies and prioritised benefits.

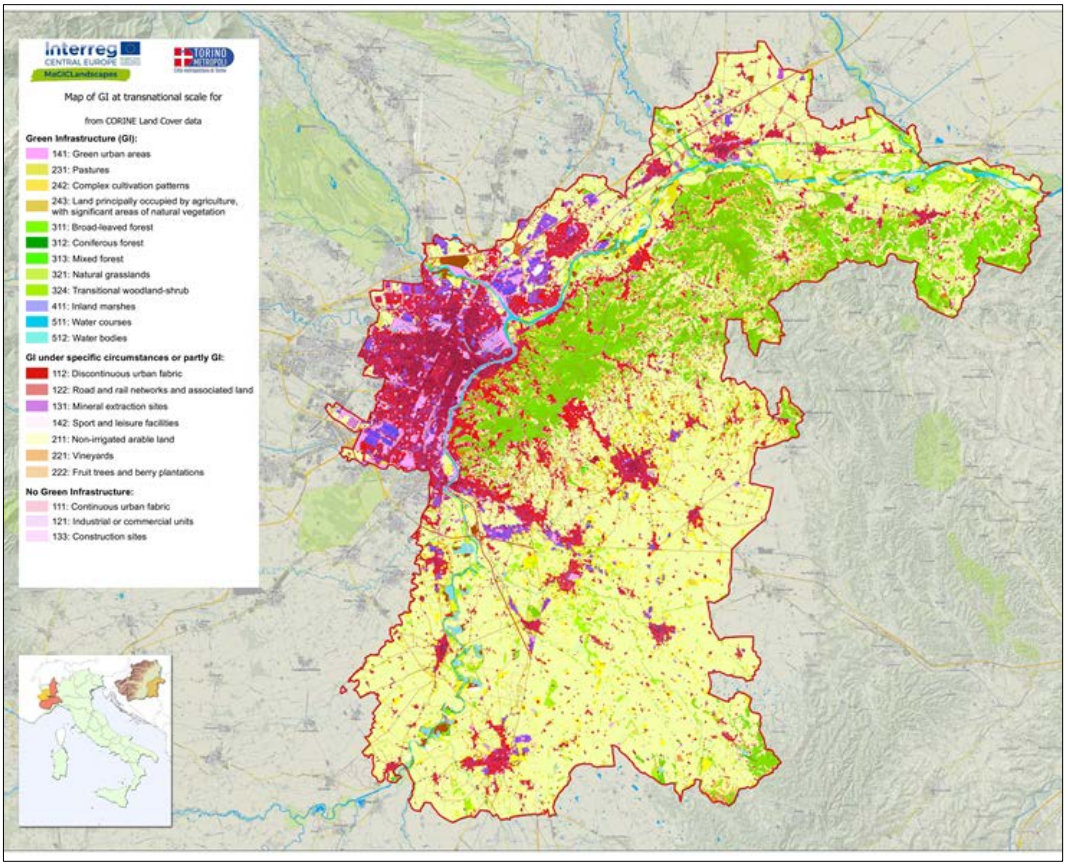

Figure 44 - GI map of the CSA "Po Hills around Chieri"

Figure 45 - Shrubby and arboreal hedgerows in agricultural areas contrasts the removal of fertile soil (windbreak)

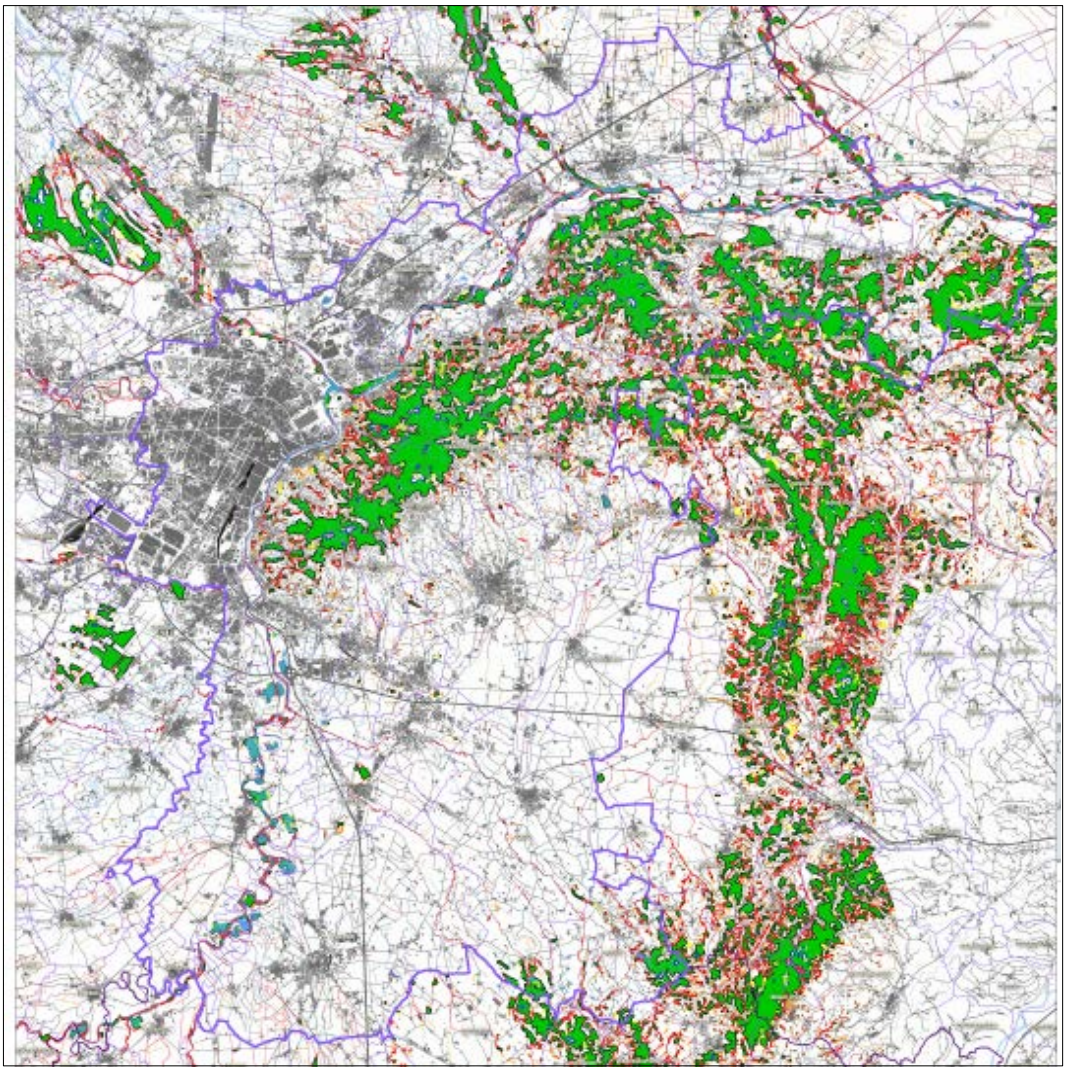

Figure 46 - Result of the MSPA of the Metropolitan City of Turin CSA "Po Hills around Chieri"

Outline of Key Themes, Priorities and Directions for the Strategy and Action Plan.

Through the analysis of workshop results we identified the final locations of the objectives to be pursued with the enhancement/implementation of GI; the planning instruments and strategies to achieve these objectives and the actors in charge of drawing up the plans / strategies (Public Institutions) and implementing them (Public Institutions, private citizens, organisations, associations …). Below is an extract of the table.

GI Benefit	Strategic Tools/Policies	Subjects to draft plans/strategies
Land and soil management: soil productivity and fertility	**Agricultural areas**: PSR; lr 21/2016; Piano d'Azione MAB; n.1-361/2019 **Peri-urban/degraded areas:** LG AP, LG MC e "Piano Compensazioni"; lr. 16/2018 e smi e legge di bilancio 2020 sulla rigenerazione urbana; Decreto Clima	**Regione:** PSR; **CMTo**: LGAP e nuove LG MC; Piano Compensazioni; PTGM; progetti per forestazione ex Decreto Clima **Comuni**: NdA del PRGC o Regol. Polizia Rurale (ins norme); Reg/Piani del Verde Urbano ex l.10/2013; progetti per Mosaico Verde **Enti Gestori AP e SIC**: progetti per Mosaico Verde; PdG e Piani Area
Land and soil management ability to mitigate the effects of soil consumption (waterproofing, fragmentation, impoverishment)	**Ban on new land use**: PTR, PTC2, PTGM; PRGC: inserimento di norme **Recovery / restoration of abandoned areas:** PTGM: Mosaico Verde; Piani del Verde Urbano; Prog strategici attuazione del PPR **Urban forestry / creation of green areas**: Mosaico Verde, D Clima;	**Regione**: legge regionale sul consumo di suolo; Progetti/Piani Strategici di cui all'art. 44 PPR **CMTo**: PTGM; LGAP e nuove LGMC; Piano Compensazioni; progetti/Piani Strategici di cui all'art. 44 NdA PPR **Comuni**: NdA del PRGC o Regol. Polizia Rurale; Reg/Piani del Verde Urbano; Piani di rig urbanistica ex lr. 16/2018 e smi; progetti Mosaico Verde
Biodiversity and connectivity: Variety level of flora and fauna and habitat connectivity	**CSA**: PARBCP, PTC2/ LGREP, PTGM, nuove LGMC e Piano Compens. AP e Siti Natura 2000 Piani d'Area e PdG. Mosaico Verde. Reg /Piani del Verde. De-creto Clima. PFV Reg le e Prov le **Periurban/urban areas**: LG AP, PdI tra MATTM, Regione, CMTo e Comune di Torino, PRGC **Agricultural areas:** PSR **Fragile areas:** PTC2 e LGREP; PTGM	**Regione:** PSR; PFR; Strategia IV ai sensi del PdI tra MATTM, Regione, Città di Torino e CMTo. PFVR **CMTo**: PTC2 e LGREP. PTGM; LG AP e nuove LGMC; Piano Compensazioni; PdA del Lago di Arignano (insieme a Comuni, Associazioni ecc); PFVP **Comuni**: PRGC e loro allegati (Reg Verde, Piani del verde) Reg di Polizia Rurale. Progetti per Mosaico Verde **Enti gestori SIC e parchi**: PdG SIC e Piani Area; progetti per Mosaico Verde
Health & Well-Being: Air quality and environmental quality	**CSA**: PPR, PARBCP, PRQA; PR Mobilità e Trasporti + PRLog e PRMoP; PUMS (BiciPlan e Piano Access e Intermodalità). PRG dei Comuni **Peri-urban/urban areas**: PUMS; LGAP; LGMC e Piano Compens.; Mosaico Verde; Decreto Clima; **Urban forestry/ creation of green areas**: Mosaico Verde, Decreto Clima; PRQA (m RUO2);	**Regione**: PPR, PRQA; PR Mobilità e Trasporti e PRLog PRMoP; PRMC; **CMTo**: PUMS con Zone Omogenee e Comuni. Biciplan. LGAP, LGMC e Piano Compensazioni. Progetti forestazione urbana (Decreto Clima). **Comuni**: PRGC e Biciplan, PUT. Piano del Verde e Reg del Verde. Progetti per Mosaico Verde. **Enti gestori AP e SIC**: progetti per Mosaico Verde; PARBCP
Tourism and Recreation	**CSA:** PPR; Decreto Clima; PUMS. PRGC; Piani/Reg del Verde. PARBCP. Coordinamento e valorizz percorsi ciclabili ed escursionistici; LGMC e Piano Compensazioni; Mosaico Verde; PTGM in recepimento del PPR	**Regione**: PRMC; strategia sul turismo/ strategia sullo sport; coordinamento e valorizz percorsi ciclabili ed escurs; **CMTo:** PUMS; recepimento PRMC; PTGM; LGMC; Piano Compensazioni **Comuni**: Recepimento PUMS nei PRG e nei piani settoriali; progetti per i bandi regionali (sport/cultura)

Table 22 - Public Benefit, Strategic Tools/Policies and Subjects to draft plans/strategies

The final products were: a map with the location of the objectives to be reached (sector/areas), and a brief description of critical issues and strategies for each area/sector; a document that collects the planning instruments /strategies useful to achieve the objectives and improve public benefits and the actors responsible for their implementation. The document provides, for each type of actor (Metropolitan City, Municipalities, private citizens ...), concrete indications regarding the tools to be used to pursue the enhancement of GI. For the Action Plan the steps are the same, but the evaluations are much more detailed and aimed at enhancing Arignano Lake and its surroundings from an environmental and touristic point of view.

Key Players/actors in delivering the strategy and those that support its implementation.

The following actors are supporting the implementation of the strategy and action plan; municipalities through the drafting and implementation of the rules of the PRGC and Urban Green Plans or Regulations, Po Park Management Body through the drafting and implementation of Plans/Programmes (Management Plans of the of Natura 2000 Sites; PTO; Program of the Piedmontese Po shared forest; update of Park Plan). The Metropolitan City of Turin will include the strategy in its Strategic and Territorial Plan and in other documents like Guidelines). For the Action Plan the key actors are the 4 municipalities in the area (Arignano, Andezeno, Marentino and Chieri) and a cultural/environmental association (Arignano Lake conservation committee).

Expected Benefits

The inclusion of rules and regulations in the various territorial and urban planning tools will help to protect and implement GI and their benefits such as: prevention and mitigation of soil erosion/instability, ability to mitigate the effects of soil consumption (waterproofing, fragmentation, impoverishment), improvement of air quality and environmental quality; the Action Plan is aimed at the environmental and touristic enhancement of Lake Arignano area; it will consist of concrete actions.

Contact Details

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Tel. 011.861 6595; Fax 011.8614272

6.9. Case Study Area – Upper Po Plain

Location: Piemonte, Italia

Description of the area

The case study area corresponds to the Tourist Area of the Po River Park - Vercelli-Alessandria stretch and includes, in addition to Regional Nature Reserves, several Natura 2000 Network sites. The area is characterized by the presence of the river corridor, which runs through the territory for about 90 km. This corridor consists of the riverbed, the riparian vegetation strips and marginal areas such as oxbows, side branches and wetlands.

On the left bank of the Po, the landscape consists of an expanse of paddy fields, within which the minor hydrographic network is very important. In addition to allowing the distribution of the water needed for agriculture, it is in itself a significant component of the green infrastructure network. In monoculture there are several areas, more or less large, which host strips of lowland forest that represent the residue of the original land cover. The largest area is the Bosco della Partecipanza di Trino, located in the northernmost part of the study area.

On the right bank of the river corridor, in the western area the hills are characterized by the presence of a discontinuous but widespread forest cover, alternating with more or less extensive forms of agriculture. The eastern, flat area is occupied by intensive forms of agriculture (maize, cereals), within which the natural areas, with the exception of those connected to the hydrographic network, are very scarce.

Issues

The study area is affected by an extremely intense agricultural activity, which over time has been reducing more and more the spaces of naturalness, although small, that existed previously (rows, hedges, vegetated banks). The territory, so trivialized, reduced its capacity to preserve significant levels of biodiversity and ecological connectivity. As regards the main hydrographic network (the Po River and its main tributaries) and the secondary one (the minor hydrographic network), this trivialisation has led to a reduction in resilience capacity in the face of flood events that have been more frequent in recent decades.

Challenges

The main challenges to which the case study area is subject are first and foremost those concerning agricultural activity: identifying production methods that, while meeting the needs of financial sustainability, guarantee environmental sustainability in the short, medium and long term. The application of the "Green Deal" principles to regional rural development programming will make it possible to achieve these objectives, also by allocating a portion of the agricultural area to the creation of new natural nuclei.

At the same time, the promotion of ways of fruition of a territory which, in the collective imagination, doesn't present a tourist attraction but which actually hosts values of great naturalistic, historical and landscape interest, can determine the creation of new flows (both of people and of economic resources deriving from them).

How was the Strategy developed?

Stage 1 Transnational GI Assessment and Identification of Priorities (political and others)

From the analysis of the Green Infrastructure Map, it emerges that the areas in which there are green infrastructures, not considering rice fields which in any case play a significant role, are limited to a fairly continuous river belt, to a widespread and frayed mosaic placed in the hilly belt and to a single point mosaic in the plain areas of both Vercelli and Alessandria. There are also some important areas such as the Bosco della Partecipanza di Trino, the area around the abandoned power plant of Leri Cavour and, of smaller size, the natural areas included in the SACs of Palude di San Genuario and Fontana Gigante.

The analysis of the planning tools made it possible to identify a series of common thematic areas that are suitable for increasing the functionality of the Green Infrastructure network in the area under examination:

- Protecting and improving the existing natural formations/elements (from the most important core areas to the linear and punctual elements).
- Improving the quality of aquatic ecosystems and increase the naturalness of the river territory (to increase biodiversity and to protect against hydrogeological risk).
- Protecting the landscape
- Promoting the development of highly sustainable economic activities

Stage 2 – Functionality Assessment

The connectivity analysis underlined how the river corridors and, at a higher level of detail, the minor hydrographic network, constitute the fundamental structure of connectivity in the case study area, and the ambit of possible expansion of the green infrastructure network at local scale.

Figure 47 – River Po and rice fields in the background

The Total Function Value Map, which provides information on the multifunctionality of the territory, drawn up considering the four considered families of landscape services (Regulation, Habitat, Production, Information) highlights, even more, the fundamental role assumed by the river territory and forest formations. The highest value is reached by spontaneous tree formations, while the river corridor is characterized by a slightly lower level.

Stage 3 Assessment of Public Benefit

The maps drawn up using the methodology of Public Benefit Assessment developed within the Project make it possible to represent the level of provision of each benefit by the territory under consideration, based on the land use cartography. These maps, although each referring to a different "family" of benefits, connected to the provision of a different list of Landscape Services, do not appear, from a general point of view, significantly different: in almost all cases the fundamental role to be attributed to the river corridor and the wooded areas present in the territory is highlighted.

Figure 48 – Water body in the Po Valley

Public Benefits that were identified in the interaction activities with local stakeholders as priorities for the drafting of the strategy are:

- Conservation benefits
- Disaster prevention
- Climate change mitigation and adaptation
- Agriculture and forestry
- Water management
- Tourism and recreation

It should be noted that, at the scale of the entire territory, there is ample room for possible intensification in the provision of individual benefits, through an action to improve functionality and ecological connectivity. In addition, it is highlighted the importance of the conservation of all the existing natural areas (wooded areas, wetlands, river areas), which currently ensure the availability of benefits for all users of the territory of the Po Park and its Touristic Area.

Outline of Key Themes, Priorities and Directions for the Strategy and Action Plan.

The activities carried out by the Project made it possible to identify the list as Public Benefits on which to operate primarily in the study area (Table 22).

GI Benefit	Strategic Tools/Policies	Partners
Conservation Benefits	– Piano d'Area del Parco fluviale del Po – Piano di Gestione della ZPS Fiume Po – Tratto Vercellese Alessandrino IT1180028 – Piano di Gestione della ZSC Palude di San Genuario IT1120007 – Piano di Gestione della ZSC/ZPS Bosco della Partecipanza di Trino IT1120002 – Piano di Gestione della ZSC/ZPS Fontana Gigante IT1120008 – Piano Paesaggistico Regionale del Piemonte – Piano Forestale Aziendale del Parco del Po vercellese-alessandrino – Piani Forestali di Area per le aree "coinvolte" – Piano Regionale delle Attività Estrattive	– Ente di Gestione del Parco del Po – Regione Piemonte – Provincia di Vercelli
Disaster Prevention	– Piano di Gestione del Rischio di Alluvioni del Bacino del Po – Piano di Gestione di Distretto del Bacino del Po – Piano di Tutela delle Acque della Regione Piemonte	– Ente di Gestione del Parco del Po – Regione Piemonte – Autorità di Bacino Distrettuale del Fiume Po
Climate Change and Adaptation	– Strategia Regionale sui Cambiamenti Climatici (in preparazione)	– Regione Piemonte
Agriculture and Forestry	– Piano di Sviluppo Rurale	– Regione Piemonte
Water Management	– Piano di Gestione del Rischio di Alluvioni del Bacino del Po – Piano di Gestione di Distretto del Bacino del Po – Piano di Tutela delle Acque della Regione Piemonte	– Ente di Gestione del Parco del Po – Regione Piemonte – Autorità di Bacino Distrettuale del Fiume Po
Tourism and Recreation	– Piano Paesaggistico Regionale del Piemonte – Piano Territoriale di coordinamento della Provincia di Vercelli – Piano Territoriale di coordinamento della Provincia di Alessandria – Progetto VEN.TO. – ciclovia Venezia-Torino	– Ente di Gestione del Parco del Po – Agenzia di promozione Turistica

Table 23 - Public Benefits, Strategic Tools/Policies and Partners

Based on interactions with local stakeholders, some priorities were defined:

- the connection through natural elements of the core areas; the connection axes that seem most relevant are those that would allow the connection between Bosco della Partecipanza and Palude di San Genuario, and those that would connect these ZSC with the river corridor;
- the recovery and strengthening of minor roads for the realization of cycle and pedestrian tourist routes;
- improving the integrity of the irrigation network.

Key Players/actors in delivering the strategy and those that support its implementation.

The strategy was drawn up in collaboration with the Po Park Authority, associated partner of the Project, which is interested in achieving the defined objectives, through the implementation of specific actions. The Province of Vercelli, which has been carrying out for years activities aimed at increasing biodiversity on a territorial scale in the rice sector through direct interventions and promotion of good practices, will also be a key player in the implementation of the strategy.

Expected Benefits

The implementation of the actions identified under the Strategy will allow the improvement of ecological connectivity, in particular in the rice sector, which can lead to increased biodiversity and the conservation of species and habitats that are of specific value to the case study area. It is also expected to reduce the risk of flood damage and increase the potential for sustainable use of the territory.

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Appendix

Connections between Land Cover Types (rows) and Landscape Services (columns).

CLC code	CLC description	Health and well-being		Gas regulation	Climate regulation	Disturbance prevention	Water supply	Waste treatment	Aesthetic information	Recreation	Cultural and artistic information	Spiritual and historic information	Science and education	Education		Refugium function	Nursery function	Aesthetic information	Recreation	Cultural and artistic information	Spiritual and historic information	Science and education	Resilience		Gas regulation	Climate regulation	Disturbance prevention	Water regulation	Water supply	Soil retention	Soil formation	Nutrient regulation	Waste treatment	Pollination	Biological control	Refugium function	Nursery function	Genetic resources
111	Continuous urban fabric	1,20	1	0	0	0	0	0	3	3	4	2	0	1,71	2	0	0	3	3	4	2	0	0,00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
112	Discontinuous urban fabric	1,20	1	0	0	0	0	0	3	3	4	2	0	1,86	2	1	0	3	3	4	2	0	0,14	1	0	0	0	0	0	0	0	0	1	0	1	0	0
121	Industrial or commercial units	0,20	1	0	0	0	0	0	1	0	1	0	0	0,29	1	0	0	1	0	1	0	0	0,00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
122	Road and rail networks and associated land	0,30	1	0	0	0	0	0	1	1	1	0	0	0,57	1	1	0	1	1	1	0	0	0,07	1	0	0	0	0	0	0	0	0	0	0	1	0	0
123	Port areas	0,60	1	0	0	1	0	0	2	2	1	0	0	0,71	1	0	0	2	2	1	0	0	0,07	1	0	0	1	0	0	0	0	0	0	0	0	0	0
124	Airports	0,10	1	0	0	0	0	0	0	0	1	0	0	0,29	1	1	0	0	0	1	0	0	0,07	1	0	0	0	0	0	0	0	0	0	0	1	0	0
131	Mineral extraction sites	0,00	0	0	0	0	0	0	0	0	0	0	0	0,00	0	0	0	0	0	0	0	0	0,00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
132	Dump sites	0,00	0	0	0	0	0	0	0	0	0	0	0	0,00	0	0	0	0	0	0	0	0	0,00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
133	Construction sites	0,00	0	0	0	0	0	0	0	0	0	0	0	0,00	0	0	0	0	0	0	0	0	0,00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
141	Green urban areas	2,20	2	2	4	1	1	2	3	5	3	0	1	2,14	2	2	1	3	5	3	0	1	1,50	1	2	4	1	2	1	2	1	1	2	1	1	2	1	0
142	Sport and leisure facilities	1,30	1	1	2	0	1	2	1	5	1	0	0	1,29	1	2	0	1	5	1	0	0	0,86	1	1	2	0	1	1	1	1	0	2	0	1	2	0	0
211	Non-irrigated arable land	1,30	1	1	3	1	0	1	2	1	3	0	1	1,57	1	2	2	2	1	3	0	1	1,57	1	1	3	1	3	0	1	2	1	1	1	2	2	2	2
212	Permanently irrigated land	1,30	1	1	3	1	0	1	2	1	3	0	1	1,57	1	2	2	2	1	3	0	1	1,64	1	1	3	1	4	0	1	2	1	1	1	2	2	2	2
213	Rice fields	1,90	2	1	3	1	1	1	3	1	4	2	2	2,71	2	3	4	3	1	4	2	2	2,00	2	1	3	1	4	1	1	2	2	1	1	2	3	4	2
221	Vineyards	2,20	2	1	3	1	1	1	3	3	4	3	2	2,71	2	2	2	3	3	4	3	2	1,71	2	1	3	1	3	1	2	3	1	1	1	1	2	2	2
222	Fruit trees and berry plantations	2,30	2	2	3	2	1	2	3	3	3	2	2	2,29	2	2	1	3	3	3	2	2	2,36	2	2	3	2	3	1	2	3	2	2	5	3	2	1	2
223	Olive groves	2,90	2	2	4	2	1	2	4	3	4	4	3	3,29	2	3	2	4	3	4	4	3	2,36	2	2	4	2	3	1	3	3	2	2	2	2	3	2	2
231	Pastures	2,40	2	1	3	1	1	3	4	4	3	1	3	3,14	2	4	3	4	4	3	1	3	2,71	2	1	3	1	3	1	4	4	2	3	3	3	4	3	3
241	Annual crops associated with permanent crops	1,70	2	1	3	1	1	1	2	2	3	1	2	2,00	2	2	2	2	2	3	1	2	1,86	2	1	3	1	3	1	2	3	1	1	3	2	2	2	1
242	Complex cultivation patterns	2,00	2	1	3	1	1	2	2	3	3	2	2	2,43	2	3	2	2	3	3	2	2	2,00	2	1	3	1	3	1	2	3	1	2	2	3	3	2	1
243	Land principally occupied by agriculture, with significant areas of natural vegetation	2,50	2	2	3	1	2	2	3	3	3	3	3	3,14	2	3	4	3	3	3	3	3	2,57	2	2	3	1	3	2	3	3	2	2	2	3	3	4	3
244	Agro-forestry areas	2,70	2	3	4	1	3	3	2	3	3	2	3	2,86	2	4	3	2	3	3	2	3	3,07	2	3	4	1	4	3	4	4	2	3	3	2	4	3	3
311	Broad-leaved forest	4,80	3	5	5	5	5	4	5	5	4	5	5	4,86	3	5	5	5	5	4	5	5	4,86	3	5	5	5	5	5	5	5	5	4	4	5	5	5	5
312	Coniferous forest	4,70	3	5	5	4	5	4	5	5	4	5	5	4,86	3	5	5	5	5	4	5	5	4,71	3	5	5	4	4	5	5	5	5	4	4	5	5	5	5
313	Mixed forest	4,60	3	5	5	4	5	4	5	5	4	4	5	4,71	3	5	5	5	5	4	4	5	4,79	3	5	5	4	5	5	5	5	5	4	4	5	5	5	5
321	Natural grasslands	3,90	3	3	3	3	4	3	5	5	4	4	5	4,71	3	5	5	5	5	4	4	5	4,07	3	3	3	3	4	4	5	5	4	3	4	4	5	5	5
322	Moors and heathland	4,10	3	3	4	4	4	3	5	5	4	4	5	4,71	3	5	5	5	5	4	4	5	4,14	3	3	4	4	4	4	5	5	4	3	3	4	5	5	5
323	Sclerophyllous vegetation	3,80	3	3	4	4	3	3	5	4	3	4	5	4,43	3	5	5	5	4	3	4	5	4,07	3	3	4	4	3	3	5	5	4	3	4	4	5	5	5
324	Transitional woodland-shrub	3,60	3	3	4	4	4	3	4	4	3	2	5	4,00	3	5	5	4	4	3	2	5	4,07	3	3	4	4	3	4	5	5	4	3	4	4	5	5	4
331	Beaches, dunes, sands	3,10	2	1	2	5	2	1	5	5	2	4	4	4,14	3	4	5	5	5	2	4	4	2,57	2	1	2	5	5	2	2	2	1	1	1	1	4	5	4
332	Bare rocks	1,90	2	0	0	1	1	0	4	4	0	5	4	3,14	2	4	1	4	4	0	5	4	0,86	1	0	0	1	1	1	0	0	0	0	1	0	4	1	3
333	Sparsely vegetated areas	2,20	2	1	1	1	2	1	4	3	1	4	4	3,43	3	4	4	4	3	1	4	4	1,71	2	1	1	1	1	2	1	1	1	1	2	1	4	4	3
334	Burnt areas	0,00	0	0	0	0	0	0	0	0	0	0	0	0,43	1	1	2	0	0	0	0	0	0,57	1	0	0	0	0	0	0	1	1	0	1	1	1	2	1
335	Glaciers and perpetual snow	2,90	2	1	3	0	5	0	5	5	1	5	4	3,43	3	2	2	5	5	1	5	4	1,43	1	1	3	0	4	5	0	0	0	0	0	1	2	2	2
411	Inland marshes	4,10	3	4	4	4	5	5	4	4	2	4	5	4,14	3	5	5	4	4	2	4	5	4,14	3	4	4	4	5	5	4	5	4	5	2	1	5	5	5
412	Peat bogs	3,80	3	4	5	3	4	4	4	4	2	4	4	3,86	3	5	4	4	4	2	4	4	3,93	3	4	5	3	4	4	5	5	4	4	1	3	5	4	4
421	Salt marshes	3,20	2	1	3	3	3	3	4	3	3	4	5	4,00	3	4	5	4	3	3	4	5	3,14	2	1	3	3	4	3	4	4	3	3	2	1	4	5	4
422	Salines	1,80	2	0	2	0	2	2	3	2	0	4	3	2,86	2	4	4	3	2	0	4	3	1,64	1	0	2	0	3	2	0	2	1	2	0	0	4	4	3
423	Intertidal flats	2,90	2	0	3	5	0	3	4	4	2	4	4	3,86	3	5	4	4	4	2	4	4	2,21	2	0	3	5	3	0	1	1	1	3	0	2	5	4	3
511	Water courses	4,30	3	2	4	3	5	5	5	5	4	5	5	4,86	3	5	5	5	5	4	5	5	3,36	3	2	4	3	4	5	2	1	3	5	0	3	5	5	5
512	Water bodies	4,20	3	2	4	3	5	5	4	5	4	5	5	4,71	3	5	5	4	5	4	5	5	3,64	3	2	4	3	4	5	3	4	3	5	0	3	5	5	5
521	Coastal lagoons	4,40	3	3	5	4	4	5	5	5	4	4	5	4,71	3	5	5	5	5	4	4	5	4,07	3	3	5	4	4	4	4	4	4	5	2	3	5	5	5
522	Estuaries	4,30	3	3	5	3	4	5	5	5	4	4	5	4,71	3	5	5	5	5	4	4	5	3,71	3	3	5	3	4	4	3	3	3	5	0	4	5	5	5
523	Sea and ocean	4,50	3	3	5	2	5	5	5	5	5	5	5	5,00	3	5	5	5	5	5	5	5	3,64	3	3	5	2	4	5	3	1	5	5	0	3	5	5	5

CLC code	CLC description	Investment and employment		Disturbance prevention	Refugium function	Food	Raw materials	Genetic resources	Medicinal resources	Aesthetic information	Recreation	Cultural and artistic information	Spiritual and historic information	Science and education	Efficiency of natural resources		Climate regulation	Disturbance prevention	Water regulation	Water supply	Soil retention	Soil formation	Nutrient regulation	Waste treatment	Pollination	Biological control	Refugium function	Nursery function	Genetic resources
111	Continuous urban fabric	1,09	1	0	0	0	0	0	0	3	3	4	2	0	0,00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
112	Discontinuous urban fabric	1,18	1	0	1	0	0	0	0	3	3	4	2	0	0,15	1	0	0	0	0	0	0	0	0	1	0	1	0	0
121	Industrial or commercial units	0,18	1	0	0	0	0	0	0	1	0	1	0	0	0,00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
122	Road and rail networks and associated land	0,36	1	0	1	0	0	0	0	1	1	1	0	0	0,08	1	0	0	0	0	0	0	0	0	0	0	1	0	0
123	Port areas	0,55	1	1	0	0	0	0	0	2	2	1	0	0	0,08	1	0	1	0	0	0	0	0	0	0	0	0	0	0
124	Airports	0,18	1	0	1	0	0	0	0	0	0	1	0	0	0,08	1	0	0	0	0	0	0	0	0	0	0	1	0	0
131	Mineral extraction sites	0,00	0	0	0	0	0	0	0	0	0	0	0	0	0,00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
132	Dump sites	0,00	0	0	0	0	0	0	0	0	0	0	0	0	0,00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
133	Construction sites	0,00	0	0	0	0	0	0	0	0	0	0	0	0	0,00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
141	Green urban areas	1,45	1	1	2	0	1	0	0	3	5	3	0	1	1,15	1	0	1	2	1	2	1	1	2	1	1	2	1	0
142	Sport and leisure facilities	0,82	1	0	2	0	0	0	0	1	5	1	0	0	0,69	1	0	0	1	1	1	1	0	2	0	1	2	0	0
211	Non-irrigated arable land	1,82	2	1	2	5	2	2	1	2	1	3	0	1	1,38	1	0	1	3	0	1	2	1	1	1	2	2	2	2
212	Permanently irrigated land	1,82	2	1	2	5	2	2	1	2	1	3	0	1	1,46	1	0	1	4	0	1	2	1	1	1	2	2	2	2
213	Rice fields	2,36	2	1	3	5	2	2	1	3	1	4	2	2	1,85	2	0	1	4	1	1	2	2	1	1	2	3	4	2
221	Vineyards	2,64	2	1	2	5	3	2	1	3	3	4	3	2	1,54	1	0	1	3	1	2	3	1	1	1	1	2	2	2
222	Fruit trees and berry plantations	2,55	2	2	2	5	2	2	2	3	3	3	2	2	2,15	2	0	2	3	1	2	3	2	2	5	3	2	1	2
223	Olive groves	3,09	2	2	3	5	2	2	2	4	3	4	4	3	2,08	2	0	2	3	1	3	3	2	2	2	2	3	2	2
231	Pastures	3,00	2	1	4	5	2	3	3	4	4	3	1	3	2,62	2	0	1	3	1	4	4	2	3	3	3	4	3	3
241	Annual crops associated with permanent crops	2,18	2	1	2	4	3	1	3	2	2	3	1	2	1,69	2	0	1	3	1	2	3	1	1	3	2	2	2	1
242	Complex cultivation patterns	2,27	2	1	3	4	2	1	2	2	3	3	2	2	1,85	2	0	1	3	1	2	3	1	2	2	3	3	2	1
243	Land principally occupied by agriculture, with significant areas of natural vegetation	2,64	2	1	3	3	2	3	2	3	3	3	3	3	2,38	2	0	1	3	2	3	3	2	2	2	3	3	4	3
244	Agro-forestry areas	2,91	2	1	4	3	5	3	3	2	3	3	2	3	2,77	2	0	1	4	3	4	4	2	3	3	2	4	3	3
311	Broad-leaved forest	4,73	3	5	5	3	5	5	5	5	5	4	5	5	4,46	3	0	5	5	5	5	5	5	4	4	5	5	5	5
312	Coniferous forest	4,55	3	4	5	3	5	5	4	5	5	4	5	5	4,31	3	0	4	4	5	5	5	5	4	4	5	5	5	5
313	Mixed forest	4,45	3	4	5	3	5	5	4	5	5	4	4	5	4,38	3	0	4	5	5	5	5	5	4	4	5	5	5	5
321	Natural grasslands	3,82	3	3	5	2	1	5	3	5	5	4	4	5	3,92	3	0	3	4	4	5	5	4	3	4	4	5	5	5
322	Moors and heathland	4,09	3	4	5	2	3	5	3	5	5	4	4	5	3,92	3	0	4	4	4	5	5	4	3	3	4	5	5	5
323	Sclerophyllous vegetation	4,00	3	4	5	3	3	5	3	5	4	3	4	5	3,85	3	0	4	3	3	5	5	4	3	4	4	5	5	5
324	Transitional woodland-shrub	3,55	3	4	5	2	3	4	3	4	4	3	2	5	3,85	3	0	4	3	4	5	5	4	3	4	4	5	5	4
331	Beaches, dunes, sands	3,27	2	5	4	0	1	4	2	5	5	2	4	4	2,54	2	0	5	5	2	2	2	1	1	1	1	4	5	4
332	Bare rocks	2,45	2	1	4	0	0	3	2	4	4	0	5	4	0,92	1	0	1	1	1	0	0	0	0	1	0	4	1	3
333	Sparsely vegetated areas	2,60	2	1	4	0.	0	3	2	4	3	1	4	4	1,69	2	0	1	1	2	1	1	1	1	2	1	4	4	3
334	Burnt areas	0,27	1	0	1	0	1	1	0	0	0	0	0	0	0,62	1	0	0	0	0	0	1	1	0	1	1	1	2	1
335	Glaciers and perpetual snow	2,18	2	0	2	0	0	2	0	5	5	1	5	4	1,23	1	0	0	4	5	0	0	0	0	0	1	2	2	2
411	Inland marshes	3,64	3	4	5	1	2	5	4	4	4	2	4	5	3,85	3	0	4	5	5	4	5	4	5	2	1	5	5	5
412	Peat bogs	3,36	3	3	5	0	4	4	3	4	4	2	4	4	3,54	3	0	3	4	4	5	5	4	4	1	3	5	4	4
421	Salt marshes	3,18	2	3	4	1	1	4	3	4	3	3	4	5	3,08	2	0	3	4	3	4	4	3	3	2	1	4	5	4
422	Salines	2,00	2	0	4	1	0	3	2	3	2	0	4	3	1,62	1	0	0	3	2	0	2	1	2	0	0	4	4	3
423	Intertidal flats	3,36	3	5	5	3	0	3	3	4	4	2	4	4	2,15	2	0	5	3	0	1	1	1	3	0	2	5	4	3
511	Water courses	4,09	3	3	5	3	2	5	3	5	5	4	5	5	3,15	2	0	3	4	5	2	1	3	5	0	3	5	5	5
512	Water bodies	4,00	3	3	5	3	2	5	3	4	5	4	5	5	3,46	3	0	3	4	5	3	4	3	5	0	3	5	5	5
521	Coastal lagoons	4,09	3	4	5	4	1	5	3	5	5	4	4	5	3,77	3	0	4	4	4	4	4	4	5	2	3	5	5	5
522	Estuaries	4,09	3	3	5	4	2	5	3	5	5	4	4	5	3,38	3	0	3	4	4	3	3	3	5	0	4	5	5	5
523	Sea and ocean	4,55	3	2	5	5	3	5	5	5	5	5	5	5	3,31	2	0	2	4	5	3	1	5	5	0	3	5	5	5

CLC code	CLC description	Adaptability to climate change		Gas regulation	Climate regulation	Disturbance prevention	Water regulation	Water supply	Soil retention	Biological control	Refugium function	Nursery function	Disaster prevention		Climate regulation	Disturbance prevention	Water regulation	Water supply	Soil retention	Refugium function	Water management		Climate regulation	Disturbance prevention	Water regulation	Water supply	Soil retention	Nutrient regulation	Waste treatment	Refugium function
111	Continuous urban fabric	0,00	0	0	0	0	0	0	0	0	0	0	0,00	0	0	0	0	0	0	0	0,00	0	0	0	0	0	0	0	0	0
112	Discontinuous urban fabric	0,11	1	0	0	0	0	0	0	0	1	0	0,17	1	0	0	0	0	0	1	0,13	1	0	0	0	0	0	0	0	1
121	Industrial or commercial units	0,00	0	0	0	0	0	0	0	0	0	0	0,00	0	0	0	0	0	0	0	0,00	0	0	0	0	0	0	0	0	0
122	Road and rail networks and associated land	0,11	1	0	0	0	0	0	0	1	0	0	0,17	1	0	0	0	0	0	1	0,13	1	0	0	0	0	0	0	0	1
123	Port areas	0,11	1	0	0	1	0	0	0	0	0	0	0,17	1	0	1	0	0	0	0	0,13	1	0	1	0	0	0	0	0	0
124	Airports	0,11	1	0	0	0	0	0	0	1	0	0	0,17	1	0	0	0	0	0	1	0,13	1	0	0	0	0	0	0	0	1
131	Mineral extraction sites	0,00	0	0	0	0	0	0	0	0	0	0	0,00	0	0	0	0	0	0	0	0,00	0	0	0	0	0	0	0	0	0
132	Dump sites	0,00	0	0	0	0	0	0	0	0	0	0	0,00	0	0	0	0	0	0	0	0,00	0	0	0	0	0	0	0	0	0
133	Construction sites	0,00	0	0	0	0	0	0	0	0	0	0	0,00	0	0	0	0	0	0	0	0,00	0	0	0	0	0	0	0	0	0
141	Green urban areas	1,78	2	2	4	1	2	1	2	1	2	1	2,00	2	4	1	2	1	2	2	1,88	2	4	1	2	1	2	1	2	2
142	Sport and leisure facilities	1,00	1	1	2	0	1	1	1	1	2	0	1,17	1	2	0	1	1	1	2	1,13	1	2	0	1	1	1	0	2	2
211	Non-irrigated arable land	1,67	1	1	3	1	3	0	1	2	2	2	1,67	1	3	1	3	0	1	2	1,50	1	3	1	3	0	1	1	1	2
212	Permanently irrigated land	1,78	2	1	3	1	4	0	1	2	2	2	1,83	2	3	1	4	0	1	2	1,63	1	3	1	4	0	1	1	1	2
213	Rice fields	2,22	2	1	3	1	4	1	1	2	3	4	2,17	2	3	1	4	1	1	3	2,00	2	3	1	4	1	1	2	1	3
221	Vineyards	1,78	2	1	3	1	3	1	2	1	2	2	2,00	2	3	1	3	1	2	2	1,75	2	3	1	3	1	2	1	1	2
222	Fruit trees and berry plantations	2,11	2	2	3	2	3	1	2	3	2	1	2,17	2	3	2	3	1	2	2	2,13	2	3	2	3	1	2	2	2	2
223	Olive groves	2,44	2	2	4	2	3	1	3	2	3	2	2,67	2	4	2	3	1	3	3	2,50	2	4	2	3	1	3	2	2	3
231	Pastures	2,56	2	1	3	1	3	1	4	3	4	3	2,67	2	3	1	3	1	4	4	2,63	2	3	1	3	1	4	2	3	4
241	Annual crops associated with permanent crops	1,89	2	1	3	1	3	1	2	2	2	2	2,00	2	3	1	3	1	2	2	1,75	2	3	1	3	1	2	1	1	2
242	Complex cultivation patterns	2,11	2	1	3	1	3	1	2	3	3	2	2,17	2	3	1	3	1	2	3	2,00	2	3	1	3	1	2	1	2	3
243	Land principally occupied by agriculture, with significant areas of natural vegetation	2,67	2	2	3	1	3	2	3	3	3	4	2,50	2	3	1	3	2	3	3	2,38	2	3	1	3	2	3	2	2	3
244	Agro-forestry areas	3,11	2	3	4	1	4	3	4	2	4	3	3,33	3	4	1	4	3	4	4	3,13	2	4	1	4	3	4	2	3	4
311	Broad-leaved forest	5,00	3	5	5	5	5	5	5	5	5	5	5,00	3	5	5	5	5	5	5	4,88	3	5	5	5	5	5	5	4	5
312	Coniferous forest	4,78	3	5	5	4	4	5	5	5	5	5	4,67	3	5	4	4	5	5	5	4,63	3	5	4	4	5	5	5	4	5
313	Mixed forest	4,89	3	5	5	4	5	5	5	5	5	5	4,83	3	5	4	5	5	5	5	4,75	3	5	4	5	5	5	5	4	5
321	Natural grasslands	4,00	3	3	3	3	4	4	5	4	5	5	4,00	3	3	3	4	4	5	5	3,88	3	3	3	4	4	5	4	3	5
322	Moors and heathland	4,22	3	3	4	4	4	4	5	4	5	5	4,33	3	4	4	4	4	5	5	4,13	3	4	4	4	4	5	4	3	5
323	Sclerophyllous vegetation	4,00	3	3	4	4	3	3	5	4	5	5	4,00	3	4	4	3	3	5	5	3,88	3	4	4	3	3	5	4	3	5
324	Transitional woodland-shrub	4,11	3	3	4	4	3	4	5	4	5	5	4,17	3	4	4	3	4	5	5	4,00	3	4	4	3	4	5	4	3	5
331	Beaches, dunes, sands	3,00	2	1	2	5	5	2	2	1	4	5	3,33	3	2	5	5	2	2	4	2,75	2	2	5	5	2	2	1	1	4
332	Bare rocks	0,89	1	0	0	1	1	1	0	0	4	1	1,17	1	0	1	1	1	0	4	0,88	1	0	1	1	1	0	0	0	4
333	Sparsely vegetated areas	1,78	2	1	1	1	1	2	1	1	4	4	1,67	1	1	1	1	2	1	4	1,50	1	1	1	1	2	1	1	1	4
334	Burnt areas	0,44	1	0	0	0	0	0	0	1	1	2	0,17	1	0	0	0	0	0	1	0,25	1	0	0	0	0	0	1	0	1
335	Glaciers and perpetual snow	2,00	2	1	3	0	4	5	0	1	2	2	2,33	2	3	0	4	5	0	2	1,75	2	3	0	4	5	0	0	0	2
411	Inland marshes	4,11	3	4	4	4	5	5	4	1	5	5	4,50	3	4	4	5	5	4	5	4,50	3	4	4	5	5	4	4	5	5
412	Peat bogs	4,11	3	4	5	3	4	4	5	3	5	4	4,33	3	5	3	4	4	5	5	4,25	3	5	3	4	4	5	4	4	5
421	Salt marshes	3,11	2	1	3	3	4	3	4	1	4	5	3,50	3	3	3	4	3	4	4	3,38	3	3	3	4	3	4	3	3	4
422	Salines	1,67	1	0	2	0	3	2	0	0	4	4	1,83	2	2	0	3	2	0	4	1,75	2	2	0	3	2	0	1	2	4
423	Intertidal flats	2,56	2	0	3	5	3	0	1	2	5	4	2,83	2	3	5	3	0	1	5	2,63	2	3	5	3	0	1	1	3	5
511	Water courses	3,67	3	2	4	3	4	5	2	3	5	5	3,83	3	4	3	4	5	2	5	3,88	3	4	3	4	5	2	3	5	5
512	Water bodies	3,78	3	2	4	3	4	5	3	3	5	5	4,00	3	4	3	4	5	3	5	4,00	3	4	3	4	5	3	3	5	5
521	Coastal lagoons	4,11	3	3	5	4	4	4	4	3	5	5	4,33	3	5	4	4	4	4	5	4,38	3	5	4	4	4	4	4	5	5
522	Estuaries	4,00	3	3	5	3	4	4	3	4	5	5	4,00	3	5	3	4	4	3	5	4,00	3	5	3	4	4	3	3	5	5
523	Sea and ocean	3,89	3	3	5	2	4	5	3	3	5	5	4,00	3	5	2	4	5	3	5	4,25	3	5	2	4	5	3	5	5	5

CLC code	CLC description	Land and soil management		Climate regulation	Disturbance prevention	Water regulation	Water supply	Soil retention	Soil formation	Nutrient regulation	Waste treatment	Pollination	Biological control	Refugium function	Nursery function	Aesthetic information	Recreation	Cultural and artistic information	Spiritual and historic information	Conservation benefits		Climate regulation	Disturbance prevention	Water regulation	Water supply	Soil retention	Soil formation	Nutrient regulation	Waste treatment	Pollination	Biological control	Refugium function	Nursery function	Genetic resources	Aesthetic information	Cultural and artistic information	Science and education
111	Continuous urban fabric	0,75	1	0	0	0	0	0	0	0	0	0	0	0	0	3	3	4	2	0,44	1	0	0	0	0	0	0	0	0	0	0	0	0	3	4	0
112	Discontinuous urban fabric	0,88	1	0	0	0	0	0	0	0	0	1	0	1	0	3	3	4	2	0,56	1	0	0	0	0	0	0	0	1	0	1	0	0	3	4	0
121	Industrial or commercial units	0,13	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0,13	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
122	Road and rail networks and associated land	0,25	1	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	0	0,19	1	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0
123	Port areas	0,38	1	0	1	0	0	0	0	0	0	0	0	0	0	2	2	1	0	0,25	1	0	1	0	0	0	0	0	0	0	0	0	0	2	1	0
124	Airports	0,13	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0,13	1	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0
131	Mineral extraction sites	0,00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0,00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
132	Dump sites	0,00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0,00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
133	Construction sites	0,00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0,00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
141	Green urban areas	1,88	2	4	1	2	1	2	1	1	2	1	1	2	1	3	5	3	0	1,63	1	4	1	2	1	2	1	1	2	1	1	2	1	0	3	3	1
142	Sport and leisure facilities	1,13	1	2	0	1	1	1	1	0	2	0	1	2	0	1	5	1	0	0,81	1	2	0	1	1	1	1	0	2	0	1	2	0	0	1	1	0
211	Non-irrigated arable land	1,56	1	3	1	3	0	1	2	1	1	1	2	2	2	2	1	3	0	1,69	2	3	1	3	0	1	2	1	1	1	2	2	2	2	2	3	1
212	Permanently irrigated land	1,63	1	3	1	4	0	1	2	1	1	1	2	2	2	2	1	3	0	1,75	2	3	1	4	0	1	2	1	1	1	2	2	2	2	2	3	1
213	Rice fields	2,19	2	3	1	4	1	1	2	2	1	1	2	3	4	3	1	4	2	2,25	2	3	1	4	1	1	2	2	1	1	2	3	4	2	3	4	2
221	Vineyards	2,13	2	3	1	3	1	2	3	1	1	1	1	2	2	3	3	4	3	2,00	2	3	1	3	1	2	3	1	1	1	1	2	2	2	3	4	2
222	Fruit trees and berry plantations	2,50	2	3	2	3	1	2	3	2	2	5	3	2	1	3	3	3	2	2,44	2	3	2	3	1	2	3	2	2	5	3	2	1	2	3	3	2
223	Olive groves	2,75	2	4	2	3	1	3	3	2	2	2	2	3	2	4	3	4	4	2,63	2	4	2	3	1	3	3	2	2	2	2	3	2	2	4	4	3
231	Pastures	2,88	2	3	1	3	1	4	4	2	3	3	3	4	3	4	4	3	1	2,94	2	3	1	3	1	4	4	2	3	3	3	4	3	3	4	3	3
241	Annual crops associated with permanent crops	2,00	2	3	1	3	1	2	3	1	1	3	2	2	2	2	2	3	1	2,00	2	3	1	3	1	2	3	1	1	3	2	2	2	1	2	3	2
242	Complex cultivation patterns	2,25	2	3	1	3	1	2	3	1	2	2	3	3	2	2	3	3	2	2,13	2	3	1	3	1	2	3	1	2	2	3	3	2	1	2	3	2
243	Land principally occupied by agriculture, with significant areas of natural vegetation	2,69	2	3	1	3	2	3	3	2	2	2	3	3	4	3	3	3	3	2,69	2	3	1	3	2	3	3	2	2	2	3	3	4	3	3	3	3
244	Agro-forestry areas	2,94	2	4	1	4	3	4	4	2	3	3	2	4	3	2	3	3	2	3,00	2	4	1	4	3	4	4	2	3	3	2	4	3	3	2	3	3
311	Broad-leaved forest	4,81	3	5	5	5	5	5	5	5	4	4	5	5	5	5	5	5	5	4,81	3	5	5	5	5	5	5	5	4	4	5	5	5	5	5	4	5
312	Coniferous forest	4,69	3	5	4	4	5	5	5	5	4	4	5	5	5	5	5	4	5	4,69	3	5	4	4	5	5	5	5	4	4	5	5	5	5	5	4	5
313	Mixed forest	4,69	3	5	4	5	5	5	5	5	4	4	5	5	5	5	5	4	4	4,75	3	5	4	5	5	5	5	5	4	4	5	5	5	5	5	4	5
321	Natural grasslands	4,19	3	3	3	4	4	5	5	4	3	4	4	5	5	5	5	4	4	4,25	3	3	3	4	4	5	5	4	3	4	4	5	5	5	5	4	5
322	Moors and heathland	4,25	3	4	4	4	4	5	5	4	3	3	4	5	5	5	5	4	4	4,31	3	4	4	4	4	5	5	4	3	3	4	5	5	5	5	4	5
323	Sclerophyllous vegetation	4,06	3	4	4	3	3	5	5	4	3	4	4	5	5	5	4	3	4	4,19	3	4	4	3	3	5	5	4	3	4	4	5	5	5	5	3	5
324	Transitional woodland-shrub	3,94	3	4	4	3	4	5	5	4	3	4	4	5	5	4	4	3	2	4,13	3	4	4	3	4	5	5	4	3	4	4	5	5	4	4	3	5
331	Beaches, dunes, sands	2,94	2	2	5	5	2	2	2	1	1	1	1	4	5	5	5	2	4	2,88	2	2	5	5	2	2	2	1	1	1	1	4	5	4	5	2	4
332	Bare rocks	1,38	1	0	1	1	1	0	0	0	0	1	0	4	1	4	4	0	5	1,25	1	0	1	1	1	0	0	0	0	1	0	4	1	3	4	0	4
333	Sparsely vegetated areas	2,00	2	1	1	1	2	1	1	1	1	2	1	4	4	4	3	1	4	2,00	2	1	1	1	2	1	1	1	1	2	1	4	4	3	4	1	4
334	Burnt areas	0,44	1	0	0	0	0	0	1	1	0	1	1	1	2	0	0	0	0	0,50	1	0	0	0	0	0	1	1	0	1	1	1	2	1	0	0	0
335	Glaciers and perpetual snow	2,06	2	3	0	4	5	0	0	0	0	0	1	2	2	5	5	1	5	1,81	2	3	0	4	5	0	0	0	0	0	1	2	2	2	5	1	4
411	Inland marshes	3,94	3	4	4	5	5	4	5	4	5	2	1	5	5	4	4	2	4	4,06	3	4	4	5	5	4	5	4	5	2	1	5	5	5	4	2	5
412	Peat bogs	3,81	3	5	3	4	4	5	5	4	4	1	3	5	4	4	4	2	4	3,81	3	5	3	4	4	5	5	4	4	1	3	5	4	4	4	2	4
421	Salt marshes	3,31	2	3	3	4	3	4	4	3	3	2	1	4	5	4	3	3	4	3,44	3	3	3	4	3	4	4	3	3	2	1	4	5	4	4	3	5
422	Salines	1,81	2	2	0	3	2	0	2	1	2	0	0	4	4	3	2	0	4	1,81	2	2	0	3	2	0	2	1	2	0	0	4	4	3	3	0	3
423	Intertidal flats	2,63	2	3	5	3	0	1	1	1	3	0	2	5	4	4	4	2	4	2,56	2	3	5	3	0	1	1	1	3	0	2	5	4	3	4	2	4
511	Water courses	3,69	3	4	3	4	5	2	1	3	5	0	3	5	5	5	5	4	5	3,69	3	4	3	4	5	2	1	3	5	0	3	5	5	5	5	4	5
512	Water bodies	3,88	3	4	3	4	5	3	4	3	5	0	3	5	5	4	5	4	5	3,88	3	4	3	4	5	3	4	3	5	0	3	5	5	5	4	4	5
521	Coastal lagoons	4,19	3	5	4	4	4	4	4	4	5	2	3	5	5	5	5	4	4	4,25	3	5	4	4	4	4	4	4	5	2	3	5	5	5	5	4	5
522	Estuaries	3,88	3	5	3	4	4	3	3	3	5	0	4	5	5	5	5	4	4	3,94	3	5	3	4	4	3	3	3	5	0	4	5	5	5	5	4	5
523	Sea and ocean	3,94	3	5	2	4	5	3	1	5	5	0	3	5	5	5	5	5	5	3,94	3	5	2	4	5	3	1	5	5	0	3	5	5	5	5	5	5

CLC code	CLC description	Agriculture and forestry		Climate regulation	Disturbance prevention	Water regulation	Water supply	Soil retention	Soil formation	Nutrient regulation	Waste treatment	Pollination	Biological control	Refugium function	Nursery function	Tourism and recreation		Climate regulation	Water supply	Refugium function	Food	Aesthetic information	Recreation	Cultural and artistic information	Spiritual and historic information	Science and education	Low-carbon transport and energy		Recreation	Science and education
111	Continuous urban fabric	0,00	0	0	0	0	0	0	0	0	0	0	0	0	0	1,33	1	0	0	0	0	3	3	4	2	0	1,50	1	3	0
112	Discontinuous urban fabric	0,17	1	0	0	0	0	0	0	0	0	1	0	1	0	1,44	1	0	0	1	0	3	3	4	2	0	1,50	1	3	0
121	Industrial or commercial units	0,00	0	0	0	0	0	0	0	0	0	0	0	0	0	0,22	1	0	0	0	0	1	0	1	0	0	0,00	0	0	0
122	Road and rail networks and associated land	0,08	1	0	0	0	0	0	0	0	0	0	0	1	0	0,44	1	0	0	1	0	1	1	1	0	0	0,50	1	1	0
123	Port areas	0,08	1	0	1	0	0	0	0	0	0	0	0	0	0	0,56	1	0	0	0	0	2	2	1	0	0	1,00	1	2	0
124	Airports	0,08	1	0	0	0	0	0	0	0	0	0	0	1	0	0,22	1	0	0	1	0	0	0	1	0	0	0,00	0	0	0
131	Mineral extraction sites	0,00	0	0	0	0	0	0	0	0	0	0	0	0	0	0,00	0	0	0	0	0	0	0	0	0	0	0,00	0	0	0
132	Dump sites	0,00	0	0	0	0	0	0	0	0	0	0	0	0	0	0,00	0	0	0	0	0	0	0	0	0	0	0,00	0	0	0
133	Construction sites	0,00	0	0	0	0	0	0	0	0	0	0	0	0	0	0,00	0	0	0	0	0	0	0	0	0	0	0,00	0	0	0
141	Green urban areas	1,58	1	4	1	2	1	2	1	1	2	1	1	2	1	2,11	2	4	1	2	0	3	5	3	0	1	3,00	2	5	1
142	Sport and leisure facilities	0,92	1	2	0	1	1	1	1	0	2	0	1	2	0	1,33	1	2	1	2	0	1	5	1	0	0	2,50	2	5	0
211	Non-irrigated arable land	1,58	1	3	1	3	0	1	2	1	1	1	2	2	2	1,89	2	3	0	2	5	2	1	3	0	1	1,00	1	1	1
212	Permanently irrigated land	1,67	1	3	1	4	0	1	2	1	1	1	2	2	2	1,89	2	3	0	2	5	2	1	3	0	1	1,00	1	1	1
213	Rice fields	2,08	2	3	1	4	1	1	2	2	1	1	2	3	4	2,67	2	3	1	3	5	3	1	4	2	2	1,50	1	1	2
221	Vineyards	1,75	2	3	1	3	1	2	3	1	1	1	1	2	2	2,89	2	3	1	2	5	3	3	4	3	2	2,50	2	3	2
222	Fruit trees and berry plantations	2,42	2	3	2	3	1	2	3	2	2	5	3	2	1	2,67	2	3	1	2	5	3	3	3	2	2	2,50	2	3	2
223	Olive groves	2,42	2	4	2	3	1	3	3	2	2	2	2	3	2	3,44	3	4	1	3	5	4	3	4	4	3	3,00	2	3	3
231	Pastures	2,83	2	3	1	3	1	4	4	2	3	3	3	4	3	3,11	2	3	1	4	5	4	4	3	1	3	3,50	3	4	3
241	Annual crops associated with permanent crops	2,00	2	3	1	3	1	2	3	1	1	3	2	2	2	2,22	2	3	1	2	4	2	2	3	1	2	2,00	2	2	2
242	Complex cultivation patterns	2,17	2	3	1	3	1	2	3	1	2	2	3	3	2	2,56	2	3	1	3	4	2	3	3	2	2	2,50	2	3	2
243	Land principally occupied by agriculture, with significant areas of natural vegetation	2,58	2	3	1	3	2	3	3	2	2	2	3	3	4	2,89	2	3	2	3	3	3	3	3	3	3	3,00	2	3	3
244	Agro-forestry areas	3,08	2	4	1	4	3	4	4	2	3	3	2	4	3	3,00	2	4	3	4	3	2	3	3	2	3	3,00	2	3	3
311	Broad-leaved forest	4,83	3	5	5	5	5	5	5	5	4	4	5	5	5	4,67	3	5	5	5	3	5	5	4	5	5	5,00	3	5	5
312	Coniferous forest	4,67	3	5	4	4	5	5	5	5	4	4	5	5	5	4,67	3	5	5	5	3	5	5	4	5	5	5,00	3	5	5
313	Mixed forest	4,75	3	5	4	5	5	5	5	5	4	4	5	5	5	4,56	3	5	5	5	3	5	5	4	4	5	5,00	3	5	5
321	Natural grasslands	4,08	3	3	3	4	4	5	5	4	3	4	4	5	5	4,11	3	3	4	5	2	5	5	4	4	5	5,00	3	5	5
322	Moors and heathland	4,17	3	4	4	4	4	5	5	4	3	3	4	5	5	4,22	3	4	4	5	2	5	5	4	4	5	5,00	3	5	5
323	Sclerophyllous vegetation	4,08	3	4	4	3	3	5	5	4	3	3	4	4	5	4,00	3	4	3	5	3	5	4	3	4	5	4,50	3	4	5
324	Transitional woodland-shrub	4,17	3	4	4	3	4	5	5	4	3	4	4	5	5	3,67	3	4	4	5	2	4	4	3	2	5	4,50	3	4	5
331	Beaches, dunes, sands	2,58	2	2	5	5	2	2	2	1	1	1	1	4	5	3,11	2	2	2	4	0	5	5	2	4	4	4,50	3	5	4
332	Bare rocks	0,75	1	0	1	1	1	0	0	0	0	1	0	4	1	2,44	2	0	1	4	0	4	4	0	5	4	4,00	3	4	4
333	Sparsely vegetated areas	1,67	1	1	1	1	2	1	1	1	1	2	1	4	4	2,88	2	1	2	4	0.	4	3	1	4	4	3,50	3	3	4
334	Burnt areas	0,58	1	0	0	0	0	0	1	1	0	1	1	1	2	0,11	1	0	0	1	0	0	0	0	0	0	0,00	0	0	0
335	Glaciers and perpetual snow	1,42	1	3	0	4	5	0	0	0	0	0	1	2	2	3,33	3	3	5	2	0	5	5	1	5	4	4,50	3	5	4
411	Inland marshes	4,08	3	4	4	5	5	4	5	4	5	2	1	5	5	3,78	3	4	5	5	1	4	4	2	4	5	4,50	3	4	5
412	Peat bogs	3,92	3	5	3	4	4	5	5	4	4	1	3	5	4	3,56	3	5	4	5	0	4	4	2	4	4	4,00	3	4	4
421	Salt marshes	3,25	2	3	3	4	3	4	4	3	3	2	1	4	5	3,33	3	3	3	4	1	4	3	3	4	5	4,00	3	3	5
422	Salines	1,67	1	2	0	3	2	0	2	1	2	0	0	4	4	2,33	2	2	2	4	1	3	2	0	4	3	2,50	2	2	3
423	Intertidal flats	2,33	2	3	5	3	0	1	1	1	3	0	2	5	4	3,22	2	3	0	5	3	4	4	2	4	4	4,00	3	4	4
511	Water courses	3,33	3	4	3	4	5	2	1	3	5	0	3	5	5	4,56	3	4	5	5	3	5	5	4	5	5	5,00	3	5	5
512	Water bodies	3,67	3	4	3	4	5	3	4	3	5	0	3	5	5	4,44	3	4	5	5	3	4	5	4	5	5	5,00	3	5	5
521	Coastal lagoons	4,08	3	5	4	4	4	4	4	4	5	2	3	5	5	4,56	3	5	4	5	4	5	5	4	4	5	5,00	3	5	5
522	Estuaries	3,67	3	5	3	4	4	3	3	3	5	0	4	5	5	4,56	3	5	4	5	4	5	5	4	4	5	5,00	3	5	5
523	Sea and ocean	3,58	3	5	2	4	5	3	1	5	5	0	3	5	5	5,00	3	5	5	5	5	5	5	5	5	5	5,00	3	5	5