

Set of

RECOMMENDATIONS

Developed Together with Spatial Planners to
Avoid/Minimise Fragmentation of Ecological
Corridors and Natura 2000 Sites

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Set of Recommendations Developed Together with Spatial Planners to Avoid/Minimise Fragmentation of Ecological Corridors and Natura 2000 Sites

Deliverable 3.3.4

ConnectGREEN Project “Restoring and managing ecological corridors in mountains as the green infrastructure in the Danube basin”

Danube Transnational Programme, DTP2-072-2.3

June 2021

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Acknowledgement

This publication was elaborated as the Deliverable 3.3.4 of the ConnectGREEN Project “Restoring and managing ecological corridors in mountains as the green infrastructure in the Danube basin” (DTP2-072-2.3) funded by the Danube Transnational Programme through European Union funds (ERDF, IPA).

The authors appreciate the generosity of all photographers who provided suitable photographs.

The authors gratefully acknowledge the efforts of all ConnectGREEN project partners and stakeholders within the frame of the Carpathian Convention and trust in the potential benefit from the result.

Citation

Kadlečík, J., Okániková, Z., Finka, M., Ondrejčíka, V., Husár, M. & Staník, R. (2021). Set of Recommendations Developed Together with Spatial Planners to Avoid/Minimise Fragmentation of Ecological Corridors and Natura 2000 Sites. Danube Transnational Programme ConnectGREEN Project “Restoring and managing ecological corridors in mountains as the green infrastructure in the Danube basin”. State Nature Conservancy of the Slovak Republic, Banská Bystrica, 42 pg.

ISBN 978-80-8184-089-0

EAN 9788081840890

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Introduction



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The fragmentation of ecosystems influences biodiversity and ecological stability in a significant way. One of the most important challenges of our era is to halt this negative trend of habitat fragmentation and to set up worldwide efficient regulations for safeguarding the dignified life of mankind while respecting the needs of ecosystems. As a consequence of ongoing human population growth, increasing living standards and consumption per capita that exert pressure on limited natural resources, the existence and functions of ecosystems are disturbed or even destroyed.

The mistakes that many regions in western European countries have committed should not be repeated by other regions. This is most essential in regions that still have important pockets of biodiversity. Ongoing increases in landscape fragmentation will also increase the future costs for the restoration of wildlife corridors and habitats and for the rescue of endangered wildlife populations (EEA 2011).

A solution to avoid/minimise fragmentation of the landscape is to develop a coherent ecological network that combines existing patches of habitat with other still functioning natural sites. This increases the number of valuable habitat patches, improves connectivity, and restores natural processes so the ecosystems become more sustainable (Crick et al. 2020).

The ConnectGREEN project seeks to find solutions by harmonizing the diverging interests between ecosystem protection and anthropogenic demands for space and resources. Thus, the purpose of this paper is to **outline recommendations for policy makers, decision makers, spatial planners, nature conservationists and other involved stakeholders aimed at the improvement of spatial planning and planning and implementation of ecological networks.**

The recommendations are grouped as follows:

- » **Recommendations targeted at the level of the Carpathian Convention** tackle a challenging agenda of adoption of legislation and development and implementation of strategic documents. A cross-sectoral and internationally harmonized framework at the supranational level can provide a solid basis for long-term efficient and functioning ecological networks in the Carpathians.
- » **General recommendations for implementation within projects/actions** represent a set of basic rules referring to different aspects of ecological connectivity that project managers should keep in mind when planning and implementing projects. These rules are supposed to be considered during the whole project lifecycle and beyond.



FINDINGS OF THE CONNECTGREEN PROJECT

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ConnectGREEN is a complementary project to the preceding TRANSGREEN project¹ which mostly dealt with conflicts between nature protection and transport infrastructure. The ConnectGREEN project seeks solutions in favour of ecological connectivity in close cooperation with spatial planning experts. Findings of several studies carried out during the ConnectGREEN project have brought greater clarity into the topic and indicate possible approaches to solutions:

- » 'State of the Art Report on Existing Planning Systems and its Application in Ecological Corridor Identification and Management in the Carpathians',
- » 'Gap Analysis Report on the Identification of the Needs for Improving the Planning Processes and Tools',

- » 'Report on Best Practices Addressing Ecological Connectivity and Spatial Development'.

Moreover, national workshops were organized with national experts, both nature conservationists and spatial planners, to gain their expertise.

State of the Art Analysis²

Spatial planning is the most important tool for balancing the needs of society, the economy and the environment. Spatial planning offers the institutional, technical and policy framework for managing the territorial dimension of sustainability and for safeguarding the wellbeing and integrity of our habitats, ecosystems and landscapes. The key role of spatial planning is to promote a more integrated and coordinated approach to territorial decisions.

¹ Interreg DTP Project TRANSGREEN (<http://www.interreg-danube.eu/transgreen>).

² ConnectGREEN Deliverable 3.3.1 'State of the Art Report on Existing Planning Systems and its Application in Ecological Corridor Identification and Management in the Carpathians' (<http://www.interreg-danube.eu/approved-projects/connectgreen/outputs>).

Given that one of the most critical threats to the sustainability and biological diversity of ecosystems is anthropogenic land use change, effective spatial planning could help secure a balance between nature conservation and the natural resource needs of human society. To allow this, spatial development plans must integrate estimates of the economic value of biodiversity and ecosystem services, both in areas of high biodiversity and in critical areas, such as ecological corridors. It is essential that these identified critical areas be secured and included in local / county / regional / national development plans to avoid fragmentation of the corridors due to potential economic investments with a major negative impact on biodiversity.

Spatial planning differs from one country to another, but there are major common characteristics:

- » Spatial planning is concerned with identifying long- or medium-term objectives and strategies for territories,
- » Deals with land use and physical development,
- » It is a distinct sector of government activity, and
- » It has an important coordinating role between sectoral policies.

Gap Analysis³

Based on a questionnaire circulated among relevant national experts and stakeholders, the main gaps in the planning processes and tools related to the ecological corridors in the five analysed countries were identified. It is crucial to find these gaps first and analyse them in order to identify the most suitable and necessary improvements for the planning systems. Within the study, relevant policy frameworks and legislation were analysed for their provisions ecological networks, participatory planning and stakeholder involvement, and integration of ecological networks in spatial planning

The resulting paper 'Gap Analysis on the Identification of the Needs for Improving the Planning Processes and Tools Related to Ecological Corridor Identification and Preservation' answers

specific questions and provides findings that enables to identify problems in a country-specific thematic context.

Report on Best Practices⁴

The study gives examples for best practices that preserve the natural structures, linkages, and the overall network of core habitats and corridors in different types of landscapes mainly on the regional scale. The topics covered by the best practices gathered from around the world and particularly in the partner countries are:

- » Spatial and land use planning,
- » Ecological networks and corridors in urbanized areas and agglomeration zones,
- » Ecological networks and corridors in rural zones (arable land, grassland, etc.) and natural areas,
- » Land stewardship and local stakeholder involvement, and
- » Transportation infrastructure, mitigating hard measures.

Map of Core Areas, Ecological Corridors and Stepping Stones⁵

Within the ConnectGREEN project, a map was developed featuring the ecological network in the Carpathians, which consists of favourable and suitable habitats ((relatively) continuous favourable areas (assimilated to core areas) and other suitable areas), movement/migration zones (linkage areas, corridors and stepping stones) and critical zones (critical connectivity sectors and critical connectivity areas), based on the requirements of large carnivores. Restoration areas should be identified in detail if necessary to safeguard the full range of ecosystems, habitats, species and landscapes of importance and to counteract the main causes for decline by creating the right spatial and environmental conditions.

³ ConnectGREEN Deliverable 3.3.2 'Gap Analysis Report on the Identification of the Needs for Improving the Planning Processes and Tools' (<http://www.interreg-danube.eu/approved-projects/connectgreen/outputs>).

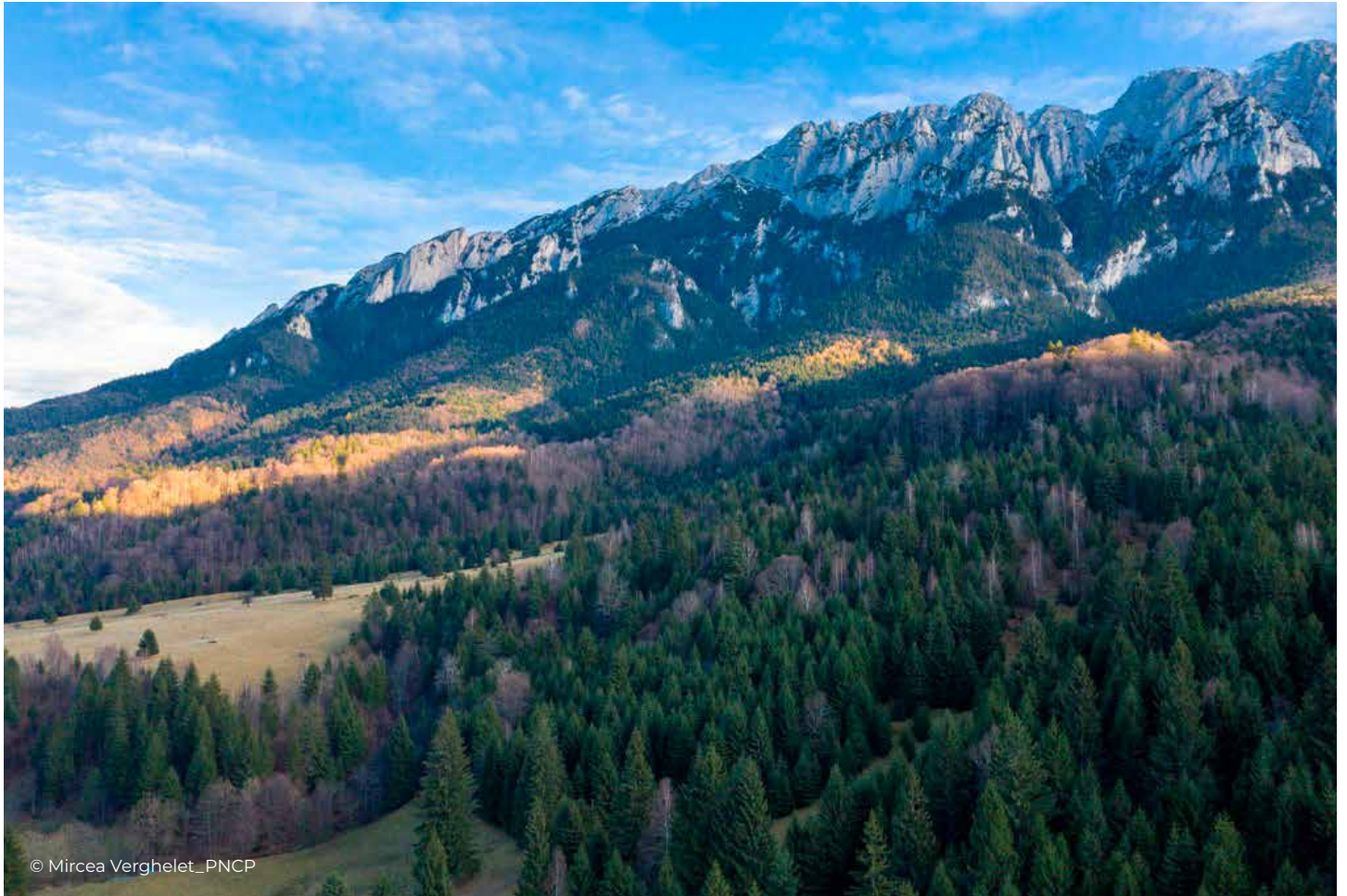
⁴ ConnectGREEN Deliverable 3.3.3 'Summary Report on Best Practices Addressing Ecological Connectivity and Spatial Development' (<http://www.interreg-danube.eu/approved-projects/connectgreen/outputs>).

⁵ ConnectGREEN Deliverable 3.2.3 'Map of Cores Areas for Large Carnivores (and their Prey Species) and Ecological Corridors of Transnational Relevance in the Carpathian Ecoregion' (<https://experience.arcgis.com/experience/03da1f6f67404518b3efe0d11f444e5a>). v

RECOMMENDATIONS



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2.1 Recommendations to the Carpathian Convention

The aim of the ConnectGREEN project is to undertake actions and work on results that amplify good practices from previous initiatives and projects, join forces and make the efforts efficient towards reaching common goals.

The following recommendations were adapted from the respective *TRANSGREEN Policy Recommendations on integrated road and rail transportation planning in the Carpathians*⁶ and are aimed at implementation of the Article 5 of the Carpathian Convention on spatial planning:

- 1. Launch works on the Protocol on Spatial Planning** reflecting the current state of the art knowledge on biodiversity and climate change as well as European strategic documents on spatial development, especially the Territorial Agenda EU 2030 and transpose them into the national strategic documents and national legal systems.
- 2. Define a common development strategy for the Carpathians** including spatial planning, transport and biodiversity aspects and analyse national development policies, e.g. on tourism with respect to their impact on spatial planning development, then set up mechanisms for reducing impact on wildlife corridors and other biodiversity objectives. The common development strategy for the Carpathians

⁶ For more information, please see: http://www.interreg-danube.eu/uploads/media/approved_project_output/0001/35/1c7a73f34d7d0c7f8e31657c4855fce9e5b86525.pdf.

should be reflected in the comprehensive national development strategies including spatial planning master plans.

- 3. Develop activities to raise public awareness** about biodiversity protection as an important aspect of spatial development management.
- 4. Enable sustainable spatial planning by amending, where necessary, relevant policies and laws, in particular those related to nature conservation and spatial planning**, e.g. on identifying and ensuring the functionality of ecological corridors.
- 5. Upgrade laws and policies** on public procurement, public–private partnerships, power purchase agreements and concession agreements to seek best results according to the three dimensions of sustainability (social – environmental – economic) across the infrastructure life cycle.
- 6. Amend spatial planning/building code legislation** so as to systematically require technical feasibility studies, cost and revenue forecasts (conducted in the project planning phase) **to consider mitigation measures**. This is particularly important for the coherence of protected areas and landscapes outside of the protected areas that provide critical ecosystem services, especially under current climate change effects.
- 7. Amend legislation on spatial planning, the building code and project preparation to make consultation of biodiversity action plans at respective hierarchical levels** and similar policies mandatory early in the infrastructure planning process.
- 8. Amend legislation to ensure that the national biodiversity plans highlight opportunities to use natural and nature-based infrastructure** as a part of the overall biodiversity conservation strategy to encourage planners, scientists, and nature conservation stakeholders to jointly determine the biodiversity value of different options and thus to identify the best trade-off.
- 9. Amend national climate change adaptation and mitigation plans** to integrate aspects of spatial planning, transport infrastructure, urban development and national biodiversity plans to make climate resilience an integral part of infrastructure plans and projects.
- 10. Set up a pool of experts and professionals and secure funding** specialized on sustainable spatial planning, research and expertise, especially for those who can be drawn in for solving conflicts between spatial planning and nature conservation objectives.
- 11. Set up interdisciplinary and interagency Working Groups** – including internationally – for sharing information, methodological developments, analysis of results and trade-off discussions; ensure that relevant staff is tasked to participate regularly, and meetings are prepared and moderated effectively.
- 12. Collect and share data on biodiversity and ecosystem services on an inter-ministerial platform** in order to promote the mainstreaming of biodiversity conservation in spatial planning and infrastructure deployment.
- 13. Periodically monitor and assess the impact of spatial planning master plan implementation.**
- 14. Define common international / Carpathian guidelines for data collection**, including proper legal and institutional arrangement of the obligation to make the data on spatial planning, biodiversity and ecosystem services, collected with public funding, publicly accessible.
- 15. Define common international / Carpathian guidelines for the cost-benefit analysis** of spatial planning programmes and projects, which fully reflect environmental costs and benefits.
- 16. Design and finance capacity building measures** to empower stakeholders to participate effectively in spatial planning processes. Further, design and finance capacity-building measures for spatial planners and policy-makers on how to properly design the Terms of Reference (ToR) of the impact assessments, supervise the development and conclude on results such as adapting the siting and design of infrastructure.
- 17. Strengthen the integrated approach in the EU Strategy for the Danube Region** (EUSDR): the EUSDR should enhance a) cross-sectorial exchange and cooperation among the relevant Priority Areas PA6 and PA1b; b) cooperation and exchange of information between the Carpathian Convention relevant Working Groups (Biodiversity and Sustainable Transport) and PA6 and PA1b Coordinators; c) the use of the knowledge base developed

under the TRANSGREEN, ConnectGREEN and SaveGREEN projects; d) the cooperation with other EU Initiatives and international processes for data sharing, mediation and resolution of environmental conflicts, while ensuring easy public access to data and information, both concerning the biodiversity and the transport aspects and plans; e) the use of existing data platforms like CCIBIS⁷, developed and updated thanks to several EU Projects (e.g. ETC SEE BioREGIO Carpathians, DTP TRANSGREEN, DTP ConnectGREEN); f) interagency / inter-ministerial / inter-sectoral dialogue.

18. Introduce the objective of conserving habitats of selected protected large mammal species and of ecological corridors to the spatial planning procedures (transport/urban planning, etc.) of the **Via Carpathia** highway network.

19. Provide and activate adequate financial resources for the implementation of integrative spatial planning and green infrastructure development approaches. In public investment policies, including the EU structural funds, it is necessary to prioritise integrated approaches aiming at balanced development, harmonising the interests of environmental protection and better spatial planning.

Immediate priorities

The current trend of continued increase of landscape fragmentation is clearly in contradiction to the principles of sustainability, and there is an urgent need for action on the European level, regional (Carpathian) level as well as on the national level.

The **general aim for Green Infrastructure** (GI) from a biodiversity conservation perspective should be to **contribute to the conservation of relevant species, habitats and ecosystems**, with an increased focus on those that are recognised as national and regional priorities in particular areas. Thus, the priorities would be:

- » To improve existing sites,
- » To increase their size,
- » To create more sites, then enhance connectivity,
- » Create new corridors (Green Infrastructure Working Group 2011).

In short, **Better>Bigger>More>More joined**.

Increasing connectivity helps, but there first need to be high quality sites to connect. Of course, this hierarchy must be adopted flexibly, to suit the particular circumstances in each case. Clearly, the most suitable approach in a highly fragmented lowland agricultural landscape will be very different from that in an upland landscape, with larger, more contiguous blocks of habitats.

Because GI deals with whole landscapes and multiple sites, and not just single locations, it draws heavily on ecological network theory and landscape ecology to consider how biodiversity conservation should be approached and designed.

The ecological network approach sets out a range of **potential measures**:

- » Protecting existing habitats/populations of species,
- » Maintaining and/or restoring their favourable condition (quality),
- » Buffering them against adjacent land use,
- » Ensuring patches and populations are large enough to survive in the long term,
- » Providing connectivity, corridors and other areas of permeability.

These need careful consideration in all GI planning to ensure that biodiversity conservation is central to the process.

The authors of the EEA report (EEA 2011) recommend putting into practice the following **three measures with highest priority**:

- 1. Immediate protection of large unfragmented areas, ecologically significant areas, and wildlife corridors:** The remaining large unfragmented areas, ecologically significant areas, and functional wildlife corridors should be protected immediately from further fragmentation by adding appropriate criteria and rules to the existing networks of protected areas, such as Natura 2000 and Emerald networks, national parks, and green infrastructure corridors. Critical areas should be identified where further fragmentation is an imminent threat. Their rapid preservation is crucial before they would be lost to fragmentation by roads, railroads or other constructions. This task is particularly urgent in regions with a rapid pace of development.

⁷ The Carpathian Countries Integrated Biodiversity Information System (<http://www.ccibis.org/>).

It is wise policy to implement protective measures from the beginning to avoid an increase of the level of fragmentation as much as possible.

Policymaking on the European and regional level has an important responsibility to advance this urgent need for action when funding for transportation infrastructure and other investments is provided. The provision of funds for infrastructure should be strictly linked to the requirement of protecting the remaining unfragmented areas in these regions. In addition, possible avenues for implementing targets, benchmarks and limits for the future degree of landscape fragmentation should be considered as a new policy.

2. Monitoring of landscape fragmentation:

Landscape fragmentation is an essential indicator of threats to biodiversity, to the sustainability of human land use, and to landscape quality. It should be implemented in monitoring systems of biodiversity, sustainable development, and landscape quality. Tracking the changes in landscape fragmentation on a regular basis is a precondition for being able to diagnose the rate of increase and changes in trends.

3. Application of fragmentation analysis as a tool in transportation planning and regional planning:

The cumulative effects of new transportation and other infrastructure on the degree of landscape fragmentation should be analysed quantitatively and in more detail in the planning process. The effective mesh density method⁸ (f. e. Girvetz et al., 2008) should be included in the planning process as an instrument for this task, in combination with other relevant criteria (such as habitat amount and quality), e.g. to compare alternative transportation corridors for new roads and railway lines. This should be a requirement for all transportation and other infrastructure to which the EU provides some financial support.

In addition, the uncertain effects of landscape fragmentation need to be considered more seriously and studied more systematically, e.g. through the use of the before-after-control-impact (BACI) study design.

Large unfragmented areas are a limited and non-renewable resource. This fact is particularly

important to consider in Europe, where high human population densities compete for land with biodiversity. Land and soils are finite and their destruction is irreversible within human life spans. Renewable energy supply requires large tracts of land, food production necessitates arable and pasture land with suitable soils, and land is also needed for urban-industrial purposes, transport, resource extraction, refuse deposition, and recreation, i.e. all of them compete for land.

As a consequence, mankind's growing demands for renewable energy, food, and land cannot be circumvented by any form of adaptation. These growing demands threaten mankind probably more severely than any other environmental problem. If endeavours for promoting sustainable development disregard these three ecological traps, they will inevitably miss their goals. As a consequence of these growing demands, the remaining unfragmented areas are under enormous pressure. Therefore, much higher efforts are now required to conserve unfragmented landscapes.

European processes to be supported by the Carpathian Convention

According to the **EU Biodiversity Strategy for 2030**, the European Commission, together with Member States and the European Environment Agency, at the time of development of this document works on **criteria and guidance** for identifying and designating additional **protected and strictly protected areas**, including a definition of strict protection, as well as for appropriate management planning. In doing so, it will indicate how Other Effective Area-based Conservation Measures (OECMs) and greening of cities could contribute to the targets.

Member States will have until the end of 2023 to demonstrate significant progress in legally designating new protected areas and integrating ecological corridors. On this basis, the Commission will assess, by 2024, whether the EU is on track to meet its 2030 targets or whether stronger actions, including EU legislation, are needed. Stronger implementation support and enforcement is also required in restoration efforts.

⁸ Girvetz et al., 2008. Integration of landscape fragmentation analysis into regional planning: A state-wide multi-scale case study from California, USA.

The Commission will put forward a **proposal for legally binding EU nature restoration targets** in 2021 to restore degraded ecosystems. The Commission will request and support Member States to raise the level of implementation of existing legislation within clear deadlines and to include a wide range of tools, approaches and a wide range of actors to achieve both economic and biodiversity conservation objectives. It will support the measures to provide space for wild animals, plants, pollinators etc. in agricultural land and to bring back at least 10% of agricultural area under high-diversity landscape features.

Member States will need to translate the 10% EU target to a lower geographical scale to ensure connectivity among habitats, especially through the **Common Agricultural Policy (CAP) instruments and CAP Strategic Plans**, in line with the Farm to Fork Strategy, and through the implementation of the Habitats Directive.

The EU also must increase the quantity, quality and resilience of its forests. Afforestation, reforestation

and tree planting to support biodiversity and ecosystem restoration will be promoted through the CAP Strategic Plans, and the Cohesion Policy funds.

The new **European Urban Greening Platform** will also facilitate tree planting and nature-based solutions in urban and peri-urban areas which should also help improve connections between green spaces. The Commission will develop **guidelines on biodiversity-friendly afforestation and reforestation and closer-to-nature forestry practices**. This will be done in parallel with the recently launched **EU Forest Strategy**⁹.

Carpathian countries committed themselves to safeguard and increase ecological connectivity between natural habitats, especially between Natura 2000 sites and other protected areas of transnational relevance in the Carpathian ecoregion in their Joint Statement welcoming the UN Decade on Ecosystem Restoration¹⁰ and will increase their efforts in contributing to the UN Decade with ambitious objectives of conservation of mountain ecosystems in the Carpathians.



9 COM(2021) 572 Final Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions New EU Forest Strategy for 2030 (https://ec.europa.eu/info/sites/default/files/communication-new-eu-forest-strategy-2030_with-annex_en.pdf).

10 Joint Statement by the Carpathian Convention welcoming the UN Decade on Ecosystem Restoration 2021 (http://www.carpathianconvention.org/tl_files/carpathiancon/Downloads/00%20NEWS/UN%20Decade%20Ecosystem%20Restoration%20-%20Carpathian%20Convention%20statement%20FINAL.pdf).

2.2 General recommendations on project level

A. Communication - Stakeholder involvement

- » Time aspect: must occur in all phases, crucial in the planning phase,
- » Sectoral aspect: involve all relevant sectors such as spatial planning, transport, nature conservation, river basin management, etc.,
- » Integrated discussions among scientists, practitioners, decision makers, and the public,
- » Selection of proper communication methods including consultation processes, presentations, round tables, etc.,
- » Communication of information about the location of sites with high biodiversity value,
- » Political support at community, county and national level.

B. Cooperation

- » Working together with clear competencies and sharing responsibilities,
- » Formalizing the cooperation – Memorandum of Understanding, Cooperation contracts, etc.,
- » Strategic long-term cooperation with vision,
- » Implement demonstrative projects that can be replicable by partners/other relevant stakeholders,
- » Include a wide range of tools, approaches and a wide range of actors,
- » Best practices from stakeholders and the business community,
- » Building the necessary partnerships and encouraging collaboration between these partners to overcome imminent conflicts.

C. Knowledge base

- » Access to high-quality data, information and knowledge,

- » Creating and sharing of common databases,
- » Harmonizing data among different stakeholders,
- » Regular update of databases,
- » Using modern methods of data processing,
- » Designing and completing an inventory of available data and documenting the source, quality and reliability of the data,
- » The spatial scale is one of the most important defining attributes of an assessment of ecological connectivity.

D. Fundamental implementation rules

- » Apply environmental assessments (Strategic Environmental Assessment, SEA, and Environmental Impact Assessment, EIA),
- » Adhere to the mitigation hierarchy: avoidance – mitigation – compensation,
- » Monitoring and assessment of applied measures,
- » Set of long-term objectives and measures for integrating the concept of ecological connectivity into the political process at national, regional and local level,
- » The pilot projects demonstrate how available resources can be used effectively to promote biodiversity in practice.

E. Financial aspects

- » Make use of financial analysis in the assessment of plans and alternatives (cost – benefit analysis, value for money, etc.),
- » Monitor existing and invent new financial instruments for financing ecological connectivity (Payments for Ecosystem Services, Polluter Pays Principle, etc.),
- » Communicate with relevant authorities and politicians about the financial gaps and secure their commitment to improve the financing of ecological connectivity in the framework of different financial schemes,
- » Adequate assessment of the specific socio-economic factors in which ecological networks are implemented is a necessary precondition for the success of this implementation process.

GUIDELINES FOR CONTROLLING LANDSCAPE FRAGMENTATION ON NATIONAL, (SUB) REGIONAL AND LOCAL LEVELS

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The approach, design and mechanisms for embedding, integrating and implementing the EU Green Infrastructure (GI) Strategy were developed by the Green Infrastructure Working Group (2011), including for national, regional and local levels.

3.1 Principles for creating networks for wildlife

The following 10 principles provide a summary of how to design nature networks in an integrated way, to benefit biodiversity and people. These principles are consistent with, and informed by both the Ecosystem Approach and the European Landscape Convention.

1. Understand the place: Recognise where the nature network will sit, in terms of how the natural characteristics of the area generate conditions for different habitats and how the

cultural landscape character has evolved and is valued. Identify what the area is special for, from a national and local perspective, how nature has changed and the potential for its restoration. This assessment should include biodiversity and ecosystem function, geodiversity, landscape and the historical environment. Understand where people live and work and how ecosystems provide benefits to them. This enables us to identify priorities and opportunities, and to be sympathetic to the current character of the landscape, while not being constrained from accommodating what the future might hold.

2. Create a vision for your nature network and be clear about your objectives: specify what the ultimate goals are for the network, identify the spatial scale, and the environmental and societal aspects that are important.

3. Involve people: People both benefit from and create nature networks; Plans should engage and be created with the communi-

ty; recognising that the landscapes and the ecosystems that support species, also provide **multiple benefits** to people.

- 4. Create core sites:** Core sites are the heart of nature networks; these are places that sustain thriving wildlife populations that may expand across the network. It will often be best to **build core areas of nature networks by enlarging, connecting and improving existing high-quality wildlife sites**, to make well-functioning ecosystems. However, on occasion, it will be appropriate to fill gaps in a network by creating core sites where little wildlife currently remains. Within landscapes, working with functional ecological units will provide the building blocks to support abundant and diverse wildlife and ecosystem services.
- 5. Build resilience: Enhance the resilience** of landscapes, ecosystems and their ecosystem services through **restoration that reinstates natural processes**, accommodates desirable change, improves low quality habitats and includes areas that provide buffering from the causes of current and potential future environmental degradation. Take opportunities to deliver nature-based solutions to climate change and reduce external pressures (such as diffuse pollution).
- 6. Embrace dynamism:** Remember that in a natural state, **ecosystems and landscapes change and are inherently dynamic over short and long time scales**; allow natural processes to operate whenever possible, as they will aid restoration of ecosystem function and enhance the sustainability of conservation efforts.
- 7. Encourage diversity:** Nature networks need to include **a diverse physical structure**, influenced by the underlying geodiversity, to accommodate the widest variety of opportunities (niches) for species. Biological **complexity and landscape diversity** are important to facilitate resilience. Such diversity is best founded on the restoration of natural environmental processes where this is possible, overlain by vegetation management regimes that encourage further diversity.
- 8. Think 'networks':** Networks need to be **planned at multiple spatial scales and address multiple issues**. Joined-up actions across adjacent landscapes help to deliver integrated

outcomes and ensure that the network acts as a coherent whole for all species (especially for those that live in the wider countryside), ecosystems and people within the area.

- 9. Start now but plan long-term:** Identify the locations that can deliver a coherent nature network, but prioritise those locations that provide the best opportunities **for action now**, while developing longer term solutions.
- 10. Monitor progress: evaluate actions and adapt management** in the light of results, to achieve long-term aims at local and national scales.

The handbook provides a flow chart to suggest how a nature network can be developed in practice and it can be found in **Annex II**.

3.2 National government role

The role of national administrations is likely to vary, but should include the **interpretation of any EU as well as non-EU framework for GI** to take account of national circumstances.

While playing a crucial role in developing the **strategic context and vision of GI**, depending on the distribution of competences within states, national authorities will have a variable degree of responsibility in **establishing the GI on the ground**. Nevertheless, opportunities exist for national authorities to give clear **guidance and direction to local authorities** on how to plan and manage GI.

Depending on the circumstances in each state, it is advisable for national governments to consider using their own national planning policy framework to set out the need for regional/local planning authorities to **consider GI provisions in local development planning and policy**. National authorities could also play a useful role in the **collation and sharing of regional information on GI**, particularly good practice with regard to GI design, mapping, assessment, delivery and implementation, and integration of GI into policy and planning. This is likely to be of particular importance in relation to climate change, where coherent national spatial planning ought to be aligned with regional and local planning activities and action, for example, to facilitate species dispersal when existing sites prove unsustainable due to changing climatic conditions.

3.3 Regional/local authority role

The role of regional/local authorities in successfully implementing the GI is crucial. In most European countries, these are responsible for spatial planning decisions. Different administrations would need to work together, such as environmental, planning, agricultural, treasury/financial, social departments. In addition, due to their close links to the local public, stakeholders and developers, local authorities are well-situated to **enhance communication, public participation** and involvement of stakeholders.

Regional/local authorities should be seen as the **mains actors to undertake detailed GI (master planning)**, including an assessment of GI assets, taking into account their location, threats, constraints, priorities and opportunities, and relevant regional factors (geographic, environmental, social, political, economic, etc.).

A multi- and interdisciplinary approach to the planning and management of GI is needed, relying on the input of a wide range of relevant professionals, such as biologists, agronomists, conservationists, engineers, economists, foresters, landscape architects, spatial and urban planners, ecologists and community workers. From a biodiversity conservation perspective, it is critical that the expertise of appropriately trained nature conservationists and ecologists is included, and that links are made to established biodiversity priorities and action plans.

The **establishment and maintenance of GI** will not be possible without the full and engaged **commitment of land managers** (e.g. farmers, foresters, urban, transport and energy infrastructure developers) who need to also see the advantages that GI can bring to their assets, their resources and their economic activities. Such stakeholders need to provide input to the design and lead on the implementation of GI. The motivation of landowners is obviously crucial for the success of GI projects which result in any land use change.

The involvement of environmental NGOs and other interest groups, as well as local knowledge, is also essential. There are many benefits of civil society and community involvement, namely enhancing the quality of decision-making, encouraging a sense of ownership and raising awareness. Early involvement in planning decisions can avoid conflicts and delays later in the process.

The potential policy instruments and tools on GI applications and relevant examples can be found in the table in **Annex III**, developed within a background paper for an expert workshop on Green Infrastructure (Ecologic Institute 2011).

3.4 Practical considerations

With regard to the multi-functionality of GI, it is likely to be important for multiple sectors to be involved. By definition, the **implementation of GI involves multiple sectors**, being underpinned by the Ecosystem Approach. In general, the earlier the concerned sectors engage, the greater the likelihood of longer-term sustainability of the GI development. **The biodiversity conservation sector should always be involved when creating GI spatial plans, but may not need to be involved at all levels.** Depending on the objectives/remit of the GI plan, other sectors need to be included and local authorities are essential in coordinating and leading on GI spatial planning.

In addition to national and regional planning instruments, there are also different obligations to establish plans and programmes which can be excellent vehicles for providing GI and ecosystem services, such as:

- » Biodiversity National Action Plans,
- » Natura 2000 Management Plan or equivalent instruments pursuant to the Habitats and Birds Directives and/or the Emerald Network of the Bern Convention,
- » National or regional Climate Change Adaptation Strategies,
- » Rural Development Programmes,
- » River Basin Management Plans including the Programme of Measures pursuant to the Water Framework Directive,
- » Flood Risk Management Plans pursuant to the Flood Risk Directive,
- » Forest Management Plans or equivalent instruments,
- » Cohesion Policy operational programmes,
- » Regulations that implement the EU Nitrates Directive,

- » Multinational conventions such as The Convention on the Protection and Sustainable Development of the Carpathians, or the Council of Europe's Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention), which provide a platform for cooperation, multi-sectoral policy coordination, joint strategies, and a forum for dialogue on sustainable development.

3.5 Measures at a strategic level

Preserving and restoring wildlife movement corridors

Landscape fragmentation must no longer continue to increase within trans-regionally important wildlife corridors. Rather, transport infrastructure that is not absolutely necessary should be removed or tunnelled under or bridged over. Likewise, built-up areas should be strictly prevented from expanding in these areas (EEA 2011).

The restoration of damaged or severed wildlife corridors is a significant step in recreating the opportunities for species to migrate and disperse.

Ongoing efforts for implementing a system of green infrastructure aim at addressing this issue on the European level. In many countries, some regulations and instruments can already be used either directly or indirectly to promote defragmentation; for example, protected areas, wildlife corridors/habitat networks, and defragmentation plans.

Within the projects implemented in the Carpathians, relevant studies have been developed and their results can be widely used.

It is important that wildlife corridors and plans match well along the boundaries between different countries. Coordination of these efforts at the Carpathian and European level is needed.

Effective protection of remaining large unfragmented areas

The protection of the remaining large unfragmented areas is a measure of high priority and we recommend it be implemented immediately, based on the existing maps and existing knowledge about habitat types, habitat amount, and habitat quality.

These areas should cover habitats of a range of species. The maps can help identify areas where further fragmentation is an imminent threat and their rapid preservation is critical.

Targets and limits

Targets and limits for the future degree of landscape fragmentation should be broadly discussed and implemented. Such targets and limits are urgently needed by government offices and administrations for being able to act and for justifying their decisions and actions towards better protection of the environment. This measure will contribute to making better use of the existing road network rather than constructing new roads. These limits cannot be set in stone but should be region-specific and should consider the ecological, geographic, social, economic, and historic characteristics of each region.

Specific targets, benchmarks and limits could be distinguished according to the respective type of landscape, for example:

1. Priority regions for large unfragmented areas; i.e. no further fragmenting elements are allowed here, and there is a priority for the removal of existing fragmenting elements,
2. Setting of targets for rural landscapes,
3. Further fragmenting elements could be allowed in densely settled landscapes or along development axes up to a certain limit.

3.6 Measures in traffic planning and regional planning

Based on EEA Report (EEA 2011), generally, four types of measures to address the problem of landscape fragmentation can be distinguished: (1) to minimise negative impacts during the planning and construction stages of new infrastructure, (2) to restore connectivity across existing transportation and other infrastructure, (3) to prevent further increase of the density of the transportation network, and (4) to remove existing transportation and other infrastructure.

Rethinking transport systems to improve their efficiency may be an important component of this.

Without better methods and higher awareness and

consideration of the remaining uncertainties it will be impossible to resolve the increasing conflicts about land use and landscape fragmentation in a responsible manner. However, this list of measures is not comprehensive. For example, it does not cover measures in the fields of communication and education of the public, economic or market-based instruments, reorganisation of traffic, and promotion of changes in behaviour. In addition, regional differences need to be considered.

This implies that different measures may be needed in regions with different current levels of fragmentation, with different departures of the observed from the predicted levels of fragmentation, and with different prevailing driving forces. Thus, the measures may need to be applied in differing combinations to the various regions. When deciding on these measures, the combined effects of a series of measures should be considered.

The measures include:

- » Tunnels and wildlife passages,
- » Priority of upgrading existing roads over construction of new roads,
- » Bundling of transport routes,
- » Keep bypass routes close to settlement areas,
- » Dismantling of transportation routes and other constructions,
- » Reduction of the width of roads with decreasing traffic volume,
- » Limiting urban areas, and internal urban development based on densification,
- » Oasis concept.

The consideration of relevant environmental indicators in the planning process is also important.

The details of how to understand and apply these measures can be found in the **Annex I**.

3.7 Nature Networks Evidence Handbook

To make an ecological network we need to involve people from the earliest stages of planning and design, taking into account their needs and the services that a landscape provides to society (Crick et al. 2020).

When engaging people, it is helpful to develop a “stakeholder map” to identify key participants for developing a vision for a network. Participatory approaches increase in effectiveness from informing and consulting, through collaboration and empowerment.

When implementing the plans for a nature network there are various key practical aspects that need to be considered: working within the planning system, working with landowners / land users and farmers and working with the natural processes that operate within a landscape.

The planning system is a major statutory instrument that can be used to help implement appropriate land use within and adjacent to a nature network.

Agri-environment schemes provide the opportunity to work with farmers and landowners / land users to support nature network development.

At a practical level, working with natural processes within a landscape requires thinking about hydrology, nutrients, soil and sediment processes, vegetation controls and species composition. Decision making operates at a number of spatial scales, from landscape to species, but needs to be aware of the needs of finer-levels of organisation at each level.

Conservation practitioners need access to a range of information and spatial tools to help design and implement nature networks.wv

The handbook for designers of nature networks (Crick et al. 2020) identifies 10 Principles for Nature Network Design to help in the planning process.

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Measures in traffic planning and regional planning (EEA 2011)

• Tunnels and wildlife passages

Existing roads and railways can be made more permeable for wildlife through tunnels, crossing structures (wildlife overpasses and underpasses viaducts), or by raising roads up on pillars so that wildlife can cross underneath. In general, the larger the areas linked together, the more effective the measures will be. Therefore, the neighbouring areas and the interactions with other measures should be taken into account in the development of defragmentation plans. This measure can take advantage of the topographic conditions of the landscape (e.g. bridges across streams and valleys).

• Priority of upgrading of existing roads over construction of new roads

The widening of existing highways and railways will increase their barrier effect, and higher traffic volumes will contribute to the stronger barrier effect. However, the upgrading of existing highways is still less detrimental than the construction of new highways at another location in most cases, even if the new highways were to be bundled with existing transportation infrastructure. The upgrading of existing highways is an example of making better use of the existing road network and of addressing increased transportation demands while minimising the increase in landscape fragmentation.

• Bundling of transport routes

The more densely transport routes are bundled together, the larger the remaining unfragmented areas of land. If, for example, a railway line is already present, any new road should be planned to run as close and parallel to the existing line as possible. The barrier effect of a bundle of transport routes will be higher than the barrier effect of a single transport route, but bundling is usually a better solution than the fragmentation

of a larger area. In addition, wildlife passages could then be placed so that all the transport routes could be crossed over or under in one go. In general, an upgrade of existing routes should, however, be preferred, see above.

• Keep bypass routes close to settlement areas

If bypasses (and other roads) are sited close to developed areas, their fragmentation effect is lower compared to the construction of bypasses away from settlements. The purpose of this measure is to preserve unfragmented areas that are as large as possible and to lessen the fragmenting impact of any new transport routes.

• Dismantling of transportation routes and other constructions

Transport and other infrastructure which is not urgently needed any more (e.g. due to the construction of new routes or changing requirements) should be removed. This is particularly important where existing infrastructure is located within an ecological corridor. Currently, actual dismantling of roads and other constructions (including water dams) that are no longer needed is very rare, and usually only affects sections of old roads that have been upgraded or moved to the side. The potential for removal of roads and other constructions is probably higher than the current practice suggests. Removal is essentially the more effective, the larger the areas that will be re-joined, but other criteria such as habitat quality should also be considered.

• Reduction of the width of roads with decreasing traffic volume

Roads, on which traffic volumes have decreased due to the construction of other transportation

infrastructure or due to changing conditions, should be downgraded and physically reduced in width. This means a reduction of their surface and their footprint on the ground through physical modification.

• Limiting urban areas, and internal urban development based on densification

In order to preserve open space in the countryside, it is necessary to limit the size of urban areas and to develop policies to curtail urban sprawl.

This would also help counteract continued landscape fragmentation since built-up areas are themselves barriers to animal movement and contribute to landscape fragmentation, and since urban sprawl and road construction mutually intensify each other: dispersed patterns of settlement areas lead to higher traffic volumes and more road construction, and roads attract urban development. Regional planning legislation should more effectively require local authorities to treat land sparingly in their land use plans. Regional and local authorities should limit the growth of built-up areas and encourage development within urban areas, e.g. through the reuse of brownfield sites, promoting compact design in developed zones and qualitative improvements of neighbourhoods. Limiting lines and green belts can ensure that clear open spaces are left between built-up areas. Open spaces are also significant in providing linkages for animals and plants as well as in providing local recreation areas.

• Oasis concept

The oasis concept is an innovative new idea for designing transport infrastructure. This means that small communities and areas suitable for preserving biodiversity or for recreational use (refuges or 'oases') will be kept free from trans-regional traffic. Road traffic will be concentrated onto a small number of roads located at a clear distance from such oases. Small communities will be connected by access roads. Current roads that route traffic directly from community to community will then be dismantled.

The major advantages of the concept are that communities are freed from through traffic, that areas for preserving biodiversity or for recreational use are protected from through traffic, and that it halts the trend of continually building new bypasses around communities. This concept may prompt new ideas for the planning of new roads. It can also be applied to roads dedicated to agricultural purposes, as part of continued restructuring in the agriculture sector, i.e. when farms are abandoned and the network of agricultural roads can be rearranged.

• Implementation of relevant environmental indicators in the planning process

Decisions in the planning process should be underpinned by the well-established status of the environment in the considered area. Environmental indicators are able to provide information on status but with multi-annual datasets available, also on trends that are developing in the researched area. There are several applicable sets of environmental indicators on European level, developed by the European Environment Agency, as well as national ones existing in the Carpathian countries. One of the indicators suitable for informing the process of planning new transport infrastructure is the descriptive type of indicator 'Fragmentation of natural and semi-natural areas' (SEBI 013), describing pressure on the environment within the Driver, Pressure, State, Impact, Response (DPSIR) framework.¹¹

¹¹ Indicator 'Fragmentation of natural and semi-natural areas', EEA (<https://www.eea.europa.eu/data-and-maps/indicators/fragmentation-of-natural-and-semi-1/assessment-1>).

Stages to be undertaken in nature network design (Crick et al. 2020)

Step 1: Evidence gathering to develop an initial vision for the nature network

1. Understand the place and assess what aspects of nature are special about an area or have been degraded or become threatened
 - a. Landscape character & beauty
 - b. Geology & soils
 - c. Natural processes (e.g. hydrological, geomorphological)
 - d. Biodiversity
 - i. Identify existing and potential core sites for biodiversity
 - ii. Identify opportunities for expansion and joining up existing areas and for improving their natural functioning
 - iii. Review matrix (land between core sites)
 1. Identify important species and habitats
 2. Identify opportunities to improve connectivity
 - e. Ecosystem services
 - f. Historical environment
 - g. Socio-cultural context (e.g. traditions, affluence, life-styles, etc.)
2. Assess what aspects of nature could be restored or created, taking into account current and potential national importance
3. What opportunities are there for new or enhanced ecosystem service provision
4. Think in a network way rather than about individual sites

Step 2: Identify and involve stakeholders in refining the vision

1. Develop a stakeholder map based on land ownership and ecosystem service provision and usage
2. Hold a workshop to review the initial vision and to refine it
3. Use a variety of tools to present relevant data
4. Identify opportunities
 - a. For ecosystem restoration and habitat creation
 - b. For restoring natural processes
 - c. For new and enhanced ecosystem service provision
5. Use participatory approaches to engage with the wider community to encourage support and to refine the vision further

Step 3: Prepare final vision

1. Agree ultimate goals for nature network
 - a. Biodiversity goals
 - b. Natural capital goals
 - c. Ecosystem service goals
 - d. Landscape character and cultural heritage
 - e. Other societal goals, such as access to the countryside
2. Agree constraints and opportunities
 - a. Ecological issues e.g. soil types, likely climate change impacts, natural processes
 - b. Landscape issues e.g. cultural expectations
 - c. Cultural issues e.g. population make-up

3. Agree areas of uncertainty including aspects requiring a search for compromise
4. Agree size of area over which the network will be designed
5. Identify links to wider networks
 - a. Including how it contributes to national and regional needs
6. Develop a suite of targets against which progress can be assessed

Step 4: Develop a project team for the delivery of nature network vision

1. Develop an organisational and governance structure
2. Identify leads (teams) for each key aspect of the project
3. Teams to develop aims and objectives for their component of the project
4. Project teams work together to ensure an overall integrated plan
5. Implement plans
 - a. Start immediately, but think long-term

Step 5: Building the Nature Network

1. Build resilience
 - a. What are the pressures?
 - b. Think about social resilience
2. Design the nature network using the suite of rules of thumb
 - a. Make sites better
 - i. Big enough, complex, messy, dynamic
 - ii. Enhance natural processes
 - iii. Develop buffers where possible
 - b. Make sites bigger
 - c. Create new sites
 - d. Improve connectivity
 - e. Improve quality of resources for wildlife in the wider countryside

Step 6: Implement the plans

1. Work with the planning system
 - a. National planning policy frameworks
 - b. Green Infrastructure
2. Working with farmers and landowners
 - a. Use of agri-environment schemes where practicable
3. Detailed ecosystem management
 - a. Tailored to improving and using natural processes, working towards rewilding where appropriate
 - b. Tailored to specific habitats

Step 7: Undertake monitoring and surveillance to allow evaluation of nature network

1. Develop a programme to monitor progress that takes into account local and national objectives
2. Refine implementation plan as it progresses in the light of evaluation (adaptive management)
3. Undertake management interventions scientifically to grow the evidence base.

Potential instruments and tools and how they may relate to Green Infrastructure *(based on Ecologic Institute 2011)*

Policy tools and instruments	Description/explanation – with working insights into potential GI application
Strategies and Action Plans	
Setting out overall strategic approach to GI provision	<p>Adoption of a non-binding forward looking, strategic document identifying the need to take measures to identify, preserve and/or invest in (new) Green Infrastructure (GI). This is guidance with political commitment.</p> <p>This can potentially include (new) objectives (including targets) or general principles to allow for GI to be better taken into account in policy-making across all policy areas and governance levels and in particular in spatial planning. In some cases this will announce that concrete priorities and measures will be taken in some policy areas (e.g. biodiversity) or geographic areas. We note that there are already existing GI Strategies at Member State (MS) or regional level, even if they generally focus on only certain components of green infrastructure and are often not called GI strategies – e.g. biodiversity strategies, forest strategies etc.</p>
Information gathering and mapping	
Identification and mapping of GI elements¹² and requirements	<p>Drawing up maps both for identifying current GI elements that need to be protected and or enhanced or areas where new connectivity features, restoration measures or other GI elements are required to enhance the overall coherence and resilience of ecosystems and the delivery of Ecosystem System Services (ESS). This is an essential element of spatial planning fully taking GI into consideration – useful at different geographic scales, from local to continental.</p>
Monitoring of GI elements and their impact objectives	<p>Monitoring of GI elements, their quantity, quality and impacts would include the development and use of indicators in particular for the monitoring of the health of GI elements and their impacts in terms of biodiversity and ecosystem service benefits. It also includes monitoring trends in accounting of the stock of the different GI element types over time. The development of indicators and monitoring allows to set baselines, monitor trends, inform instruments and set targets. A mix of appropriate biodiversity and ESS indicators for the quantity and quality of GI elements will be needed. They are also critical for impact objectives (e.g. on the resilience of ecosystems) and instrument design (e.g. Payments for Ecosystem Services (PES)) and for subsequent monitoring and reporting on performance.</p>
Analysis of GI benefits in view of integration into decision-making	<p>Analysis of GI benefits would require identification, quantification and valuation of these. Authorities may choose to contract consultants or researchers to identify and/or value the various ESS benefits GI elements deliver in a given area (e.g. a forest) and ways in which these could be secured or enhanced by integrating this value into policy-making, e.g. by setting up PES schemes or purchasing the land. This can be at the local level (e.g. city exploring the importance of its green belt) to EU level (e.g. requirement for integration into impact assessment and to duly consider the value of the benefits when selecting an option that will be chosen).</p>
Regulation and planning	
Regulation of land use	<p>This would involve a political institution, whether at the local, regional, or national level adopting new legislation (or revising an existing legislation) to regulate the use of land in an attempt to avoid further deterioration of the identified green infrastructure by clearly setting out how land foreseen for GI provision is to be treated, thus avoiding land use conflicts, further GI degradation and fragmentation to ensure the provision of certain ESS (e.g. water provision) and biodiversity benefits. Depending on the level at which they have been adopted these might have to be translated in local land use plans (e.g. Natura 2000).</p>

¹² Green Infrastructure elements include: Core areas (e.g. Natura 2000 sites), restoration zones, sustainable use/ESS zones (e.g. high nature value farmland), green urban areas, natural connectivity features (hedgerows, ponds, rivers), artificial connectivity features (e.g. green bridges).

<p>Spatial planning/integrated territorial development</p>	<p>Spatial planning at local, regional, national or supra-national levels, generally results in the creation of a spatial plan reflecting the choice to preserve or enhance GI to ensure planning decisions do not lead to a development which would further undermine the provision of ESS and biodiversity conservation objectives and aiming at a balanced development which acknowledges the need to preserve strategic natural elements in the landscape. Links may be established between GI and territorial cohesion.</p> <p>It is important to note here that spatial planning systems generally already exist and most of them protect some GI elements, e.g. core areas, but often fail to protect/consider GI as a coherent whole. This is therefore as much about how the spatial planning system protects GI as about new initiatives to protect GI through spatial planning.</p>
<p>Procedural requirements: EIA/SEA</p>	<p>Setting clear procedural requirements within the EIA/SEA legislation for the consideration of impacts on the overall coherence of the green infrastructure and the delivery of their ecosystem services. Possibly also encouragement or requirement for avoidance, mitigation and off-setting measures to be taken before a certain development is authorised (for EIA) or a plan or programme adopted (SEA), to ensure “no-net loss” or “net positive gain” of biodiversity or ecosystem services. EIA and SEA already consider impacts on some GI elements, but in many cases there is arguably opportunity for expanding this e.g. through additional requirements and/or guidance.</p>
<p>Standards</p>	<p>Requirements in building regulations stating e.g. that for a given surface of built/sealed land a determined share of land/space has to be dedicated to GI to facilitate the provision of ESS (be it only requiring the creation of private green spaces). This primarily encompasses, but is not limited to, building/development regulations.</p>
<p>Liability and compensation</p>	<p>Liability of operators for unauthorised environmental damage they cause through the requirement to return the environment back to its original state (e.g. before the accident occurred) and/or off-set the environmental damage caused elsewhere (possibly strategically, through habitat banking, taking into account where restoration could best contribute to overall coherence of the green infrastructure). The way in which Natura 2000 protected areas are treated in the Environmental Liability Directive (ELD) Directive could be expanded to some of the GI elements.</p>
<p>Economic/ market instruments</p>	
<p>Resource pricing (e.g. taxes, charges, fees, land values)</p>	<p>The pricing of certain resources is introduced in some way or another to increase the incentive to preserve GI for the ESS it provides. This might for example include introducing water pricing (or increasing the price of water) in view of introducing a PES-scheme or a tax on land use in areas identified as part of the GI (e.g. for housing developments) where the income of the tax is used to finance enhancing the GI elsewhere.</p>
<p>Land management contracts/agreements (incl. PES-schemes)</p>	<p>A land management contract or agreement is an agreement negotiated between the leaseholder and the land owner which guides the sustainable use of the lease land for the term of the lease. It may or may not include PES. A PES is defined as a voluntary transaction where a well-defined ESS is ‘bought’ by at least one ESS buyer from at least one ESS provider if – and only if- the ESS provider secures ESS provision. This therefore involves setting up a system through which those benefiting from a particular ESS (e.g. direct beneficiaries such as water companies, irrigation authorities, etc.) compensate those who provide it (e.g. foresters, farmers), thus providing them with an incentive for improving land-use and management practices in view of supplying those services. PES-schemes may be public and based on legal obligations or private schemes with little government involvement. Scales might also differ depending on the beneficiaries, the providers and the spatial relationship between them. There is a fine line between PES and a subsidy, e.g. PES for flood control, for management practices that support water quality, European expenditure which could also be considered PES-schemes (e.g. agri-environment schemes) will be considered “EU expenditure” under this classification.</p>

<p>Public procurement</p>	<p>There is also some scope for using public procurement to support green infrastructure. This could happen on the one hand via procurement requirements for road, rail and energy infrastructure and on the other hand, by encouraging the development of labels for and purchase of “greener products”, i.e. organic, FSC, MSC, etc.</p> <p>As regards greening grey infrastructure - public procurement may be relevant in relation to GI where the list of criteria links to the effort of the producer to implement practices which ensure that GI elements were not determinately affected in the production of the good/service. When commissioning the building of new grey infrastructure, public authorities assess offers against criteria including the consideration of the need to preserve/enhance GI in the proposed development. Projects going beyond mere compensation and seizing opportunities for creation of valuable GI are considered more highly given the additional value they deliver to the community.</p> <p>For public procurement of certified timber, agricultural or fisheries produce, the market pull by Green Public Procurement (GPP) can encourage the development of greener production /greener natural infrastructure.</p>
<p>Public investments</p>	
<p>EU Expenditure for GI <i>(national to local and private detailed below)</i></p>	<p>Using the different funding instruments of the EU (EAFRD, EFRD, CAP, EFF, LIFE+, etc.) to support the maintenance or enhancement of GI or supporting ecosystem-based solutions rather than grey infrastructure for the delivery of certain services (e.g. water cleansing and wastewater treatment). Some of this expenditure, e.g. the agri-environment schemes, could arguably also have been included under PES schemes above.</p> <p>Other levels: national to local and private using appropriate funds and budgets – see below.</p>
<p>Land purchase</p>	<p>Public authorities purchase land to protect or manage GI elements. Owners may be given the possibility to leave their land to the public authorities requesting that it be managed in the wider public's interest (statutory bodies may be created to manage these lands according to clear criteria).</p>
<p>Restoration projects/ programmes</p>	<p>Projects/programmes may be undertaken to restore green infrastructure elements for biodiversity and ESS provision at various levels of governance and backed with the necessary funding, possibly from different sources. These will take place where valuable GI elements have deteriorated.</p>
<p>GI creation projects/ programmes (including reducing impacts of grey infrastructure)</p>	<p>Projects or programmes, most probably publicly funded or NGO-driven/ funded which aim at strategically creating GI elements in certain places to ensure overall coherence/resilience of ecosystems and/or ensure that specific groups of people may benefit from the services the GI may deliver to them.</p> <p>This would include public authorities adopting programmes or implementing projects to reduce fragmentation caused by existing grey infrastructure.</p>
<p>Securing long-term financing/maintenance</p>	<p>Public authorities commit to long-term financing of the management of GI (e.g. through creating publicly funded institutions or creating permanent jobs whose purpose is to preserve and enhance GI) or funds where proceeds pay for GI. This is a category apart as it recognizes a specific need (e.g. around protected areas internationally).</p>
<p>Respond to the value of GI when setting priorities</p>	<p>When disbursing public funds/assessing applications for grants/loans to support grey infrastructure investments/development projects/programmes, include criteria referring to green infrastructure and ensure that appropriate weight is given to these criteria, giving the value of the services delivered by GI due consideration. Having a high adverse impact on a GI element (or any impact at all, depending on the type of project) should penalise the applicant.</p> <p>This is also linked to the above-mentioned public procurement, investments, etc.</p>
<p>Governance</p>	
<p>Institutions</p>	<p>Establishing an institution / a statutory body or expanding the mission statement of existing institutions covering a relevant geographical scale to allow them to take measures to preserve GI / deliver their objectives through ecosystem-based approaches and allow them to allocate some of their budget to such approaches; e.g. river basin authorities, municipalities (expanding mission).</p>

Participatory decision-making processes	Ensuring the participation of a wider range of stakeholders in decision-making processes which have implications for green infrastructure to ensure that the benefits derived from GI elements are not undervalued by only focusing on economic interests.
Reporting on implementation	<p>Reporting on the extent to which measures which were foreseen have been implemented on the ground: e.g. whether money allocated to projects has resulted in their implementation or legislation/regulation adopted at national level have resulted in effective implementation of requirements (e.g. local authorities contributing to meeting a target set for GI through their spatial planning decisions; farmers implement requirement for riparian vegetation along rivers, etc.).</p> <p>Reporting on the state of GI as part of wider natural capital reporting, which in turn can be part of natural capital accounts and extended income accounts – e.g. linked to national accounts regulation (<i>also an issue for measurement above</i>).</p>
Coordination of policies	Legislative measures leading to the amendment of existing policies and/or drafting legislative proposals to ensure a consistent approach with regard to GI across all relevant policy areas. Policies making cross-reference to how they can deliver ESS through GI in synergy with other policies. This would be best achieved by exploring the benefits supporting policy objectives across all policy areas and integrating this into the different policy areas when these could better account for the benefits they may deliver which would underpin the objectives in other policy areas.
Communications and advisory measures	
Awareness raising	Increase policy maker and overall public awareness of GI benefits. This could include reform of educational programmes at schools and universities to increase awareness of GI. In higher education focus especially on disciplines which result in an increased likelihood of having to deal with GI elements (e.g. engineering, architecture).
Advice and guidance	Issuing guidance documents targeted at different stakeholder groups, which may need support in implementing new requirements, or interpreting new legal provisions meant to ensure GI is preserved/enhanced and its ESS provision optimised. These may be directed at e.g. key staff members in local/regional authorities meant to implement revised planning regulations or foresters/farmers meant to change their practice on the ground to comply with new requirements.
Capacity building	Through targeted training on GI and its benefits public authorities ensure that those meant to implement GI measures are appropriately skilled and aware of the objectives they need to promote through GI. This will often also be required for staff working in public administration who will have to change their perception with regard to the value of GI elements and the use that can be made of GI to deliver policy objectives.
Technical assistance on EU level (for policy making)	EU support to MS administration for the interpretation and implementation/ transposition of new EU-level requirements in the area of GI across a wider range of policies.
Technical assistance at MS/ regional level for potential beneficiaries of EU-financed projects	Support (either from EU to MS or MS to regions) to help applicants develop successful applications for projects and programmes involving e.g. delivering objectives (including objectives such as social cohesion, growth and jobs/rural development) through ecosystem-based solutions. Support to potential applicants for funds (e.g. NGOs, farmers).

International and national frameworks to avoid / minimise fragmentation

1. Global

IUCN Guidelines for conserving connectivity through ecological networks and corridors¹³

The International Union for the Conservation of Nature (IUCN) Guidelines for conserving connectivity through ecological networks and corridors (Hilty et al. 2020) is a new document aiming to consolidate the scientific knowledge and best-available practices to support efforts to combat fragmentation. Chapter 5 of the Guidelines provides detailed recommendations on planning and implementing ecological corridors. The Guidelines introduce fundamental principles and objectives of ecological connectivity. Special attention is dedicated to the governance of ecological corridors, in respect to the decision-making processes and responsibilities. Several case studies illustrate different approaches how the different land use interests can be harmonized (e.g. Case Study 17).

2. European (EU)

European defragmentation strategy

Various ecological network initiatives exist on the European level (EEA, 2011). Four important examples are:

- » the **Pan-European Ecological Network** (PEEN) under the aegis of the Council of Europe (CE), the United Nations Environmental Programme (UNEP) and the European Centre of Nature Conservation (ECNC) (Jongman et al. 2011);
- » the network **Natura 2000**, established by the EU Habitats and Birds Directives, comprising Special Areas of Conservation (SAC) of the Habitats Directive (92/43/EEC, 1992) and Special Protection Areas (SPA) of the EU Birds Directive (2009/147/EC, 2009);
- » the **Emerald Network**, also known as **Network of Areas of Special Conservation Interest**, launched in 1989 by the CE (Council of Europe 2009); and
- » the **Trans-European Wildlife Networks Project** (TEWN) (EuroNatur 2010).

The Natura 2000 and Emerald networks are based on the same idea, but EU Member States design Natura 2000 sites, while non-EU countries designate Emerald sites (e.g. Ukraine, Serbia).

However, the impact of the existing initiatives has been rather low.

The current Natura 2000 system is highly fragmented and represents an unconnected set of unevenly protected 'islands'. Even though there is a strong legal instrument for establishing the Natura 2000 system in EU Member States, this mandate has still not been sufficiently implemented by the countries. The Natura 2000 system needs to be developed into a system of **green infrastructure** (Green Infrastructure 2007) and the **coherent Trans-European Nature Network** (EC 2020).

Suitable and feasible measures for bringing about a trend reversal in landscape fragmentation were proposed within the EEA report **Landscape fragmentation in Europe** (EEA 2011). This is focused on transport infrastructure, but it can be applied also in other fields. The authors of this report recommend that all these measures be broadly applied in transportation planning and regional planning and their feasibility and effectiveness be evaluated in more detail.

ESDP - European Spatial Development Perspective towards Balanced and Sustainable Development of the Territory of the European Union¹⁴

The European Spatial Development Perspective is a non-binding document agreed in 1999 by the ministers responsible for spatial planning in the Member States, which outlined concepts for the future development of the territory of the European Union. The ESDP is a suitable policy framework for the sectoral policies of the Community and the Member States that have spatial impacts, as well as for regional and local authorities, aimed as it is at achieving a balanced and sustainable development of the European territory. The aim of spatial development policies is to work towards a balanced and sustainable

¹³ <https://portals.iucn.org/library/sites/library/files/documents/PAG-030-En.pdf>

¹⁴ European Spatial Development Perspective (https://ec.europa.eu/regional_policy/sources/docoffic/official/reports/pdf/sum_en.pdf).

development of the territory of the European Union. It is important to ensure that the three fundamental goals of European policy are achieved equally in all the regions of the EU, in particular economic and social cohesion; conservation and management of natural resources and the cultural heritage; and more balanced competitiveness of the European territory.

Territorial Agendas of the European Union 2020¹⁵ and 2030¹⁶

The Territorial Agenda is a non-binding document that draws attention to the main territorial challenges. The document underlines that a coordinated approach is needed to transform the challenges into potentials for sustainable and harmonious territorial development. Loss of biodiversity, vulnerable natural, landscape and cultural heritage are listed among the most important challenges. Overexploitation of these resources to provide for increasing demand, as well as industrial hazards can cause serious damage and may threaten territorial development. Urbanisation, intensification of agriculture and fisheries, transport and other types of infrastructure development, particularly where they take place in a territorially uncoordinated manner, can cause severe environmental problems. Changes in land- and sea use, urbanisation and mass tourism threaten cultural assets and landscapes and may lead to fragmentation of natural habitats and ecological corridors. In historic and cultural environments, as well as in areas for new development or constructions, attention paid to the character of the place can improve the coherence and quality of the built environment.

The Territorial Agenda defines six territorial priorities for the EU which can contribute to the successful implementation of the Europe 2020 Strategy. Priority 6. *Managing and connecting ecological, landscape and cultural values of regions* underlines that well-functioning ecological systems and the protection and enhancement of cultural and natural heritage are important conditions for long-term sustainable development. We are all responsible for ensuring they are well functioning, protected and enhanced. Joint risk

management is particularly important, taking into consideration different geographical specificities. Moreover, the integration of ecological systems and areas protected for their natural values into green infrastructure networks at all levels is needed. Enhancing territorial cohesion calls for effective coordination of different policies, actors and planning mechanisms, and the creation and sharing of territorial knowledge plays an important role. Implementation instruments and competences are in the hands of EU institutions, Member States, regional and local authorities and private actors. Multi-level governance formats are required to manage different functional territories and to ensure balanced and coordinated contribution of local, regional, national and European actors in compliance with the principle of subsidiarity. This needs vertical and horizontal coordination between decision-making bodies at different levels and sector-related policies to secure consistency and synergy.

The Territorial Agenda of the EU 2030 (TA EU 2030) reflects the need to act as people and places drift apart – increasing imbalances and inequalities and to respond to the increasing pressure concerning sustainable development and climate change e.g. in the fields climate change, loss of biodiversity and land consumption, air, soil and water quality, secure, affordable and sustainable energy, just transition, circular value chains and nature, landscape and cultural heritage.

Ecosystems are the bases of our existence and important for long-term sustainable development. The Territorial Agenda of the EU 2030 (TA EU 2030) supports the development of nature-based solutions and green infrastructure networks that link ecosystems and protected areas, in the field of spatial planning and other relevant policies.

Based on this the TA EU 2030 defined six priorities:

- » Better balanced territorial development utilising Europe's diversity,
- » Better ecological livelihoods and climate-neutral towns, cities and regions, local and regional development,
- » Less inequality between places,
- » Strong and sustainable local economies in a globalised world,

¹⁵ Territorial Agenda of the EU 2020 (https://ec.europa.eu/regional_policy/sources/policy/what/territorial-cohesion/territorial_agenda_2020.pdf).

¹⁶ Territorial Agenda of the EU 2030 (<https://www.territorialagenda.eu/home.html>).

- » Living and working across national borders,
- » Sustainable digital and physical connectivity of places.

EU Biodiversity Strategy for 2030¹⁷

A coherent network of protected areas (Trans-European Nature Network) is one of the priorities of the proposed new EU Biodiversity Strategy. In order to have a truly coherent and resilient Trans-European Nature Network it will be important to set up **ecological corridors** to prevent genetic isolation, allow for species migration, and maintain and enhance healthy ecosystems. In this context, investments in green and blue infrastructure¹⁸ and cooperation across borders among Member States should be promoted and supported, including through European Territorial Cooperation.

The EU Nature Restoration Plan will help improve the health of existing and new protected areas, and bring diverse and resilient nature back to all landscapes and ecosystems. This means reducing pressures on habitats and species, and ensuring all use of ecosystems is sustainable. It also means supporting the recovery of nature, limiting soil sealing and urban sprawl.

3. Regional

Ecological Connectivity in the Danube Region – Final report¹⁹

The final report to the project Ecological Connectivity in the Danube Region brought several findings.

The analysis of the current state of knowledge, available studies and selected interviews with representatives of ALPARC and DANUBEPARKS shows a number of different gaps to be addressed in the future. The different gaps refer to:

- » Research and knowledge gaps,
- » Cooperation gaps,
- » Institutional gaps,

- » Communication gaps.

Based on the literature review, the spatial analysis and the derived gaps, several project ideas were recommended and grouped in the following areas:

- » Physical improvements of corridors,
- » Transnational or trans-sectoral cooperation,
- » Research,
- » Planning instruments to institutionalize connectivity by integrating them into policy instruments.

From seven project ideas the project consortium selected three as the most relevant and important. All selected project ideas are related to interaction with spatial planning.

Proposal Nr. 1 strives to develop harmonized approaches and tools for macroregional planning of corridors and prepare the ground for transboundary implementation of GI- or corridors based on sound data and information.

Proposal Nr. 2 is considered crucial for the long-term work on ecological connectivity as connectivity topics need to be dealt with in an intersectoral environment. Thus, a platform which includes all relevant stakeholders is the basis.

Proposal Nr. 3 aims to promote particularly successful solutions that exist but that most decision-makers and planners are not aware of. These results and a related methodological toolbox should enable decision-makers in the future to easily implement connectivity measures.

4. National

Assessment of Landscape Fragmentation Caused by Traffic. Systematic guide²⁰

An example for a relevant national framework is the methodological guide developed by the Agency for Nature Conservation and Landscape Protection of the Czech Republic (Anděl et al. 2005) describing one of the methods enabling a

¹⁷ COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS - EU Biodiversity Strategy for 2030 Bringing nature back into our lives, COM/2020/380 final (<https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1590574123338&uri=CELEX:52020DC0380>).

¹⁸ Guidance on a strategic framework for further supporting the deployment of EU-level green and blue infrastructure (SWD(2019)193). (https://ec.europa.eu/environment/nature/ecosystems/pdf/SWD_2019_193_FL_STAFF_WORKING_PAPER_EN_V4_PL_1024680.PDF).

¹⁹ Ecological Connectivity in the Danube Region, E.C.O. Institut für Ökologie (<https://nature.danube-region.eu/the-study-ecological-connectivity-in-the-danube-region/>).

²⁰ Anděl, P., Gorčicová, I., Hlaváč, V., Miko, L. & Andělová, H. (2005). Assessment of Landscape Fragmentation Caused by Traffic. Systematic guide. ANCLP CR. 99 pp.

practical description of the problem of landscape fragmentation. The proposed procedure defines those areas which are considered to be still unfragmented, and assesses the quality of these areas. These designated areas may then be approached as particularly precious components of the landscape which must be preserved. These can be drawn onto maps, confronted with a variety of plans, while practical methods can be proposed to preserve their integrity. This procedure then becomes applicable in landscape planning, nature conservation, and when assessing different investment schemes. The principal purpose of the guide is to support the incorporation of the issue of landscape fragmentation into all decision-making processes in the landscape planning and nature conservation sectors and to assess the impact of concepts and plans on the environment.

The guide includes chapters on practical applications:

- » Landscape fragmentation as a factor in the decision-making process,
- » Applications in landscape planning,
- » Design of roads and motorways,
- » Prognosis of further development,
- » Planning measures to protect species.

National, regional and local roles and responsibilities²¹

The approach, design and mechanisms for embedding, integrating and implementing the EU Green Infrastructure Strategy were developed by the Green Infrastructure Working Group (2011).

At national, regional and local levels, Green Infrastructure establishment and maintenance involves a complex array of actors, working together in order to draw up and execute an appropriate action plan. This is likely to include a wide range of disciplines and organisations in both public and private sectors, from local planning authorities to environmental agencies (including Government sponsored and NGOs), regional/local partnership boards, land-owners and land-users, development agencies/companies, health and recreation bodies, landscape architects, and environmental consultants.

Conservation of connectivity can be considered successful when it is possible to move on all spatial and temporal scales, for a certain species or a suite of species in a certain landscape.

For effective planning and implementation, it is important to involve all stakeholders from the initial phase of the planning.

A fundamental step in assessing connectivity is designing and completing an inventory of available data and documenting data source, quality and reliability.

²¹ Green Infrastructure Working Group, EU Green Infrastructure Strategy (<https://circabc.europa.eu/sd/a/ad331ba8-2425-457e-920c-1fe5be2f8aca/GI%20TASK%202%20RECOMMENDATIONS.pdf>).

Carpathian Convention legal framework

The Carpathian Convention is a sub-regional treaty to foster the sustainable development and the protection of the Carpathian region.

Carpathian Convention, Article 5

Article 5 – Spatial planning

1. The Parties shall pursue policies of spatial planning aimed at the protection and sustainable development of the Carpathians, which shall take into account the specific ecological and socio-economic conditions in the Carpathians and their mountain ecosystems, and provide benefits to the local people.
2. The Parties shall aim at coordinating spatial planning in bordering areas, through developing transboundary and/or regional spatial planning policies and programmes, enhancing and supporting co-operation between relevant regional and local institutions.
3. In developing spatial planning policies and programmes, particular attention should, inter alia, be paid to:
 - (a) transboundary transport, energy and telecommunications infrastructure and services,
 - (b) conservation and sustainable use of natural resources,
 - (c) coherent town and country planning in border areas,
 - (d) preventing the cross-border impact of pollution,
 - (e) integrated land use planning, and environmental impact assessments.

Carpathian Convention, Article 4

Article 4 - Conservation and sustainable use of biological and landscape diversity

1. The Parties shall pursue policies aiming at conservation, sustainable use and restoration of biological and landscape diversity throughout the Carpathians. The Parties shall take appropriate measures to ensure a high level of protection and

sustainable use of natural and semi-natural habitats, their continuity and connectivity, and species of flora and fauna being characteristic to the Carpathians, in particular the protection of endangered species, endemic species and large carnivores.

2. The Parties shall promote adequate maintenance of semi-natural habitats, the restoration of degraded habitats, and support the development and implementation of relevant management plans.
3. The Parties shall pursue policies aiming at the prevention of introduction of alien invasive species and release of genetically modified organisms threatening ecosystems, habitats or species, their control or eradication.
4. The Parties shall develop and/or promote compatible monitoring systems, coordinated regional inventories of species and habitats, coordinated scientific research, and their networking.
5. The Parties shall cooperate in developing an ecological network in the Carpathians, as a constituent part of the Pan-European Ecological Network, in establishing and supporting a Carpathian Network of Protected Areas, as well as enhance conservation and sustainable management in the areas outside of protected areas.
6. The Parties shall take appropriate measures to integrate the objective of conservation and sustainable use of biological and landscape diversity into sectoral policies, such as mountain agriculture, mountain forestry, river basin management, tourism, transport and energy, industry and mining activities.

Protocol on Conservation and Sustainable Use of Biological and Landscape Diversity

Article 5 - Integration of the objectives of conservation and sustainable use of biological and landscape diversity of the Carpathians into sectoral policies

1. The Parties shall take into consideration the objectives of this Protocol in their other policies, in particular on spatial planning and land resources management, water and river basin

management, agriculture and forestry, transport and infrastructure, tourism, industry and energy.

2. The Parties shall cooperate on integration of the objectives of conservation and sustainable use of biological and landscape diversity into other regional or global sectoral policies and strategies which could have influence on the conservation and sustainable use of biological and landscape diversity in the Carpathians.

Article 9 - Continuity and connectivity of natural and semi-natural habitats, ecological network in the Carpathians

1. Each Party shall take measures in its national territory with the objective to improve and ensure continuity and connectivity of natural and semi-natural habitats in the Carpathians, thus allowing dispersal and migration of wild species populations particularly of large carnivores, and genetic exchange between such populations.
2. Each Party shall maintain, manage and, if need be, expand existing protected areas in its national territory in the Carpathians, and encourage the designation and management of new protected areas in the Carpathians.
3. The Parties shall cooperate on establishing an ecological network in the Carpathians, composed of protected areas and other areas significant for biological and landscape diversity of the Carpathians and for coherence of the network.

International Action Plan on Conservation of Large Carnivores and Ensuring Ecological Connectivity in the Carpathians

The International Action Plan on Conservation of Large Carnivores and Ensuring Ecological Connectivity in the Carpathians adopted at the sixth Conference of the Parties (COP6) of the Carpathian Convention in 2020, is implementing those provisions of the Protocol on Conservation and Sustainable Use of Biological and Landscape Diversity to the Carpathian Convention that have a specific focus on conservation of large carnivores and ecological connectivity in the Carpathians. The International Action Plan on Conservation of Large Carnivores and Ensuring Ecological Connectivity in the Carpathians sets seven strategic objectives:

STRATEGIC OBJECTIVE 1 Standardize monitoring procedures of large carnivores in the Carpathians

STRATEGIC OBJECTIVE 2 Prevent habitat fragmentation and ensure ecological connectivity in the Carpathians

STRATEGIC OBJECTIVE 3 Improve coexistence of humans with large carnivores

STRATEGIC OBJECTIVE 4 Improve law enforcement with respect to illegal killing of large carnivores

STRATEGIC OBJECTIVE 5 Improve communication and cooperation between all relevant stakeholders

STRATEGIC OBJECTIVE 6 Strengthen institutional capacity-building

STRATEGIC OBJECTIVE 7 Decrease impacts of climate change on large carnivores and their habitats

Aiming at the maintenance of the long-term viability of large carnivores' populations in the Carpathians, while ensuring their favourable conservation status in the individual countries through transparent national processes, cross-border cooperation and a transdisciplinary approach, the Parties and relevant actors shall undertake the following actions in respect to the Strategic Objective 2:

1. Identify a) patches of suitable habitats including core areas and stepping stones for large carnivores, within and between protected areas, Natura 2000 and Emerald networks b) key ecological corridors including wildlife/movement/migration corridors between them, and c) critical zones in terms of barrier permeability, with the use of the Methodology for Identifying Ecological Corridors in the Carpathian Countries by using Large Carnivores as Umbrella Species, as appropriate.
2. Include and regularly update, if applicable, the Map of ecological networks in the Carpathians for the large carnivore's species, and other relevant information, into the Carpathian Countries Integrated Biodiversity Information System (CCIBIS).
3. Develop and use, as appropriate, guidelines on identification, conservation, restoration and management of ecological corridors in the Carpathians
4. Promote the use the Wildlife and Traffic in the Carpathians - Guidelines on how to minimize the impact of transport infrastructure development on nature in the Carpathian countries²²

²² TRANSGREEN Output 3.2 'Wildlife and Traffic in the Carpathians - Guidelines on how to minimize the impact of transport infrastructure development on nature in the Carpathian countries' (http://www.interreg-danube.eu/uploads/media/approved_project_output/0001/35/02caafe3c1c1365f76574e754dbdc4e1af4a7a.pdf).

5. Gap analysis on the identification of the needs for improving the planning processes and tools related to ecological corridors identification and preservation, if applicable.²³
6. Address the need of enhanced connectivity with other mountain ranges and neighbouring areas in order to improve the gene pool of large carnivore populations, through knowledge exchange and increased cooperation at the regional and European level

Protocol on Sustainable Transport

Article 1 - General objectives and principles

The Protocol invites the parties to increase transnational cooperation in order to, among other goals, avoid landscape fragmentation, ensure maintenance and improvement of ecological connectivity on the local, national and regional level and develop environmentally friendly transport models and systems.

Article 3 - Definitions

Provides the definition of terms used also in the Transport Strategic Action Plan (SAP), especially regarding “ecological connectivity”, “external costs”, “sensitive areas”, “transport infrastructure” and “Trans-European Network”.

Article 4 - Integration of the objectives of sustainable transport and transport-infrastructure development in the Carpathians

1. The Parties shall take into consideration the objectives of this Protocol in their other policies and strategies, in particular but not limited to spatial planning and resource management, conservation of biological and landscape diversity, water and river basin management, agriculture and forestry, tourism, industry and energy.

Article 8 - Transport infrastructure networks and their connectivity

- highlights the importance of the protection of sensitive, biodiversity-rich and ecological connectivity areas.

Article 17 – Implementation

4. The Conference of the Parties shall develop and adopt the Strategic Action Plan in the Carpathians, which will accompany the implementation of this Protocol.

Joint Strategic Action Plan 2021 – 2026 for the Implementation of the Protocol on Sustainable Transport, with focus on ecological connectivity and biodiversity conservation²⁴

The Joint Strategic Action Plan (hereinafter referred to as “Transport SAP”), adopted at COP6 of the Carpathian Convention in 2020, implements those provisions of the Protocol on Sustainable Transport to the Carpathian Convention that have a specific focus on ecological connectivity and biodiversity conservation and which relate to terrestrial modes of transport.

It includes actions (focused mainly on implementing Articles 1, 2, 3, 8 and 17 of the Sustainable Transport Protocol) required to be taken by various stakeholders. The Transport SAP seeks to clearly identify priorities and explicitly outline the potential expected results stemming from the implementation of suggested actions.

This SAP proposes a series of objectives that should jointly be reached by all Carpathian countries. For each of the proposed main objectives, specific actions, expected results, source of funding and timeframe of implementation are also included. Ultimately, the goal of the current Transport SAP is to provide indications to maintain and enhance environmental quality standards in the Carpathians, without curbing its infrastructural development.

The Transport SAP is addressed to competent authorities in each Carpathian country pointing, first, at the enhancement of the cooperation among different Ministries and responsible actors in each Carpathian country, and providing indications on the actions needed for the development of

²³ ConnectGREEN Deliverable 3.3.2 ‘Gap Analysis Report on the Identification of the Needs for Improving the Planning Processes and Tools’ (<http://www.interreg-danube.eu/approved-projects/connectgreen/outputs>).

²⁴ Joint Strategic Action Plan 2021-2026 for the Implementation of the Protocol on Sustainable Transport (http://www.carpathianconvention.org/tl_files/carpathiancon/Downloads/03%20Meetings%20and%20Events/COP/2020_COP6_Online/official%20documents/CC%20COP6_DOC8_Transport%20Strategic%20Action%20Plan_FINAL%20DRAFT%20.pdf)

ecologically-friendly transport infrastructure and the implementation of the EU Green Infrastructures (GI) Strategy at national and Carpathian level.

STRATEGIC OBJECTIVE 1

Reducing negative impact of existing transport infrastructure on ecological connectivity

Pursuant to Articles 1, par. 2 a), b), d) and e), Article 3 and Article 8 of the Protocol, the following actions shall be undertaken:

1. Support and promote a common methodology for collection, analyses and mapping about fauna traffic mortality.²⁵
2. Identify “critical sections” on existing transport infrastructure.
3. Preparation of “restoration projects”, detailed proposal of measures to restore ecological connectivity for all critical sections.

STRATEGIC OBJECTIVE 2

Ecological connectivity and wildlife-vehicle collisions are taken into account in the development of transport infrastructure

Pursuant to Article 1, par. 2 d), Article 3 and Article 8 of the Protocol, the following actions shall be undertaken:

1. Ensure the protection of migration corridors and ecological connectivity in spatial planning.
2. Make available the Innovative Decision Support Tool²⁶ for transport/spatial planners.
3. Make use of the “Wildlife and Traffic in the Carpathians-Guidelines how to minimize the impact of transport infrastructure development on nature in the Carpathian countries”²⁷ for monitoring the impact of transportation on nature and for evaluating the effectiveness of mitigation measures.
4. Share common practices related to the application of methodologies (e. g., SEA, EIA, TIA, AA²⁸) for the assessment of impact of transport infrastructure on ecological connectivity.
5. Make use of the Carpathian Countries Integrated Biodiversity Information System (CCIBIS)²⁹ to collect information about existing and planned transport infrastructure in the Carpathian region.
6. Collect data about monitoring the impact of transport on fauna, new GI elements, prevention systems, mitigation measures and ecological corridors into CCIBIS.
7. Make use of CCIBIS to identify strategic ecological connections in the Carpathian region.
8. Based on CCIBIS, overlap existing and planned transport infrastructure and areas of ecological importance.³⁰

25 TRANSGREEN Output 3.2 ‘Tool for registering animal-vehicle collisions’ (http://www.interreg-danube.eu/uploads/media/approved_project_output/0001/35/a8315c06442b2a29426b674458779cd0b92ee9a9.pdf). Link to the online tool: <https://road-kill-registration.green-web.eu/?lang=en>.

26 An ‘Innovative Decision Support Tool’ for the preservation of ecological corridors to be used by landscape planners is under development within the EU DTP Project ConnectGREEN. The Decision support tool is planned to be integrated into the CCIBIS platform. According to the proposed target group of the tool (spatial planners, local decision-makers, local authorities and investors), there will be two main parts of the tool: 1) the narrative part will identify potential conflicts among specific land use functions, define a logic algorithm to propose changes or new investments (through check-list), 2) based on this information, the proposed solutions/mitigation measures will be advised.

Relevant links: <http://www.ccibis.org/> and <http://library.spectra-perseus.org/>.

27 Chapter 12 of the TRANSGREEN ‘Wildlife and Traffic in the Carpathians-Guidelines how to minimize the impact of transport infrastructure development on nature in the Carpathian countries’ (http://www.interreg-danube.eu/uploads/media/approved_project_output/0001/35/02caaaf3c1c1365f76574e754ddbdc4e1af4a7a.pdf).

28 SEA: Strategic Environmental Assessment; EIA: Environmental Impact Assessment; TIA: Territorial Impact Assessment; AA: Appropriate Assessment. The TRANSGREEN project produced a Training Package ‘Keeping Nature Connected – EIA for Integrated Infrastructure Planning’ (http://www.interreg-danube.eu/uploads/media/approved_project_output/0001/35/f5374e0aaee3813cfd352c8005b5ceb0da52d52c5.pdf).

29 The Carpathian Countries Integrated Biodiversity Information System (CCIBIS) is an online platform for collecting and sharing scientific information and data generated in projects within the Carpathian Convention Community. The CCIBIS works to provide a scientific network for professionals and a platform of increased awareness, not only for relevant stakeholders, but also for members of civil society as well as anyone interested in the Carpathian region. The CCIBIS is an open source tool and living platform, thus any organization, institution or private person is welcome to share its data. The platform contributes to overcome the generally observed lack of data availability. It has been built and extended under the Interreg projects BioREGIO, TRANSGREEN and ConnectGREEN. (<http://www.ccibis.org/>).

30 E.g. TEN-G, migration corridors of large carnivores, ecological corridors, Natura 2000 sites (and other sites of national and international importance), components of the Emerald network, UNESCO World Heritage Properties, Man and Biosphere Reserves, wildlife dispersal areas, protected areas, linkage and roadless areas

STRATEGIC OBJECTIVE 3

Fostered cooperation of all relevant stakeholders of the Carpathian Convention and enhancement of stakeholder participation in spatial planning, and development of transport infrastructure

Pursuant to Articles 1, par. 2, Article 5 and Article 8 of the Protocol, the following actions shall be undertaken:

1. Facilitate integrated consultations, coordination and cooperation between all relevant stakeholders, in order to encourage their active participation in discussing current and future environmental conflicts and raise awareness on the potential impact of planned infrastructures on ecologically sensitive areas.
2. Disseminate and promote the implementation of the *“Wildlife and Traffic in the Carpathians-Guidelines how to minimize the impact of transport infrastructure development on nature in the Carpathian countries”*³¹ among transport infrastructure, spatial planning and other relevant authorities, with regards mainly to:
 - » Basic steps and processes for ensuring ecological connectivity within transport linear infrastructure
 - » Fauna passages and other technical solutions
 - » Monitoring the impact of transport on nature
3. Conduct proper public participation procedures³², such as public consultations on feasibility studies or environmental impact assessments, making use of good practices.
4. Develop and make use of training courses on interrelations between biodiversity and transport networks for national and local stakeholders.

31 TRANSGREEN Output 3.2 'Wildlife and Traffic in the Carpathians - Guidelines on how to minimize the impact of transport infrastructure development on nature in the Carpathian countries' (http://www.interreg-danube.eu/uploads/media/approved_project_output/0001/35/02caaafe3c1c1365f76574e754ddbdc4e1af4a7a.pdf).

32 TRANSGREEN Output 3.2 'Public Participation – Scheme for an integrated linear transport infrastructure development / planning' (http://www.interreg-danube.eu/uploads/media/approved_project_output/0001/35/d9697e33f311110be59cae6a14002130484978b6.pdf).

ConnectGREEN DTP2-072-2.3

Restoring and managing ecological corridors in mountains as the green infrastructure in the Danube basin

Project partners:

Romania: WWF Romania (Lead Partner) · National Institute for Research and Development in Constructions, Urban Planning and Sustainable Spatial Development · Piatra Craiului National Park Administration

Austria: WWF Central and Eastern Europe

Czech Republic: Nature Conservation Agency of the Czech Republic · Silva Tarouca Research Institute for Landscape and Ornamental Gardening

Hungary: CEEweb for Biodiversity · Hungarian University for Agriculture and Life Sciences (formerly Szent Istvan University)

Slovakia: Slovak Environment Agency · The State Nature Conservancy of the Slovak Republic · Slovak University of Technology in Bratislava – SPECTRA Centre of Excellence of EU

Serbia: Institute of Architecture and Urban & Spatial Planning of Serbia · National Park Djerdap

Associated Strategic Partners

Czech Republic: Ministry of the Environment · Ministry of Regional Development of the Czech Republic

Hungary: Bükk National Park Directorate

Romania: Ministry of Environment of Romania

Serbia: Ministry of Environmental Protection of the Republic of Serbia

Slovakia: Ministry of Transport and Construction of the Slovak Republic

Ukraine: Ministry of Ecology and Natural Resource of Ukraine

Austria: Danubeparks – Danube River Network of Protected Areas

France: Alpine Network of Protected Areas – ALPARC

Montenegro: Parks Dinarides – Network of Protected Areas of Dinarides

Pilot Areas

1. Piatra Craiului National Park – Bucegi Nature Park (Romania)
2. Apuseni-SW Carpathians (Romania) / National Park Djerdap (Serbia)
3. Western Carpathians (Czech Republic – Slovakia)
4. Bükk National Park (Hungary) / Cerová vrchovina Protected Landscape Area (Slovakia)

ISBN 978-80-8184-089-0

Project co-funded by the European Regional Development Funds (ERDF, IPA)

Budget

Overall Budget: 2,603,415.83 EUR

ERDF Contribution: 2,040,010.84 EUR

IPA Contribution: 172,892.55 EUR

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