Political Economy Analysis in the Danube-Carpathian Region

What is the context for developing the Trans-European Nature Network (TEN-N) and what can be done?

Excerpt from Deliverable 2.1 Review and synthesis of best practice examples in governance and land-use policies to implement TEN-N

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This report, titled 'Political Economy Analysis in the Danube-Carpathian region. What is the context for developing the Trans-European Nature Network (TEN-N) and what can be done?' is an excerpt from **Deliverable 2.1 'Review and synthesis of best practices in governance and land-use policies to implement TEN-N'** (Bores et al. 2024, https://doi.org/10.3897/arphapreprints.e139236) and represents the collective effort of many contributors across various fields of expertise and sectors. Appendix 1 of this document is a separate document and available here.

We would like to express our sincere gratitude to all the stakeholders who generously contributed their time, knowledge, and insights throughout this project. Their active participation in interviews, surveys, and workshops has been invaluable in shaping the findings and recommendations presented in this report. The diversity of perspectives and expertise shared by government agencies, protected area management authorities, non-governmental organizations, academic institutions, and industry representatives have significantly enriched the quality and depth of this work. They provided real-world insights into the application of governance and land-use policies across different contexts. Their detailed analyses and on-the-ground experiences have been crucial in understanding the challenges and opportunities associated with the implementation of TEN-N.

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Abbreviations

CAP	Common Agricultural Policy
CBD	Convention on Biological Diversity
CC	Carpathian Convention
CBF	Carpathian Biodiversity Framework
CoP	Conference of the Parties
DCR	Danube-Carpathian region
ERDF	European Regional Development Fund
EAFRD	European Agricultural Fund for Rural Development
EAGF	European Agricultural Guarantee Fund
EC	European Commission
ES	Ecosystem Services
EU	European Union
EUROPARC	The Federation of Nature and National Parks of Europe
EUSDR	European Union Strategy for the Danube River
GAEC	Good Agricultural and Environmental Conditions
GBF	Kunming-Montreal Global Biodiversity Framework
GDP	Gross Domestic Product
GEF	Global Environment Facility
GI/GBI	Green Infrastructure / Green-Blue Infrastructure
ICPDR	International Commission for the Protection of the Danube River
Interreg	Interregional Instruments
IUCN	International Union for Conservation of Nature
LIFE	L'Instrument Financier pour l'Environnement
LULUCF	Land Use, Land Use Change and Forestry
n.d.	No data
NRL	Nature Restoration Law
NGO	Non-governmental organisations
OECM	Other effective area-based conservation measures
PA	Protected area
PAF	Prioritised Action Framework
PEA	Political Economy Analysis
PEEN	Pan-European Ecological Network
SAC	Special Areas of Conservation
SCI	Site of Community Importance

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SPA	Special Protection Area
TEN-E	Trans-European Networks for Energy
TEN-T	Trans-European Transport Network
TEN-N	Trans-European Nature Network
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
WFD	Water Framework Directive
WFD CIS	Water Framework Directive Common Integration Strategy
WG	Working Group
WP	Work Package

Glossary

Additional conservation area (ACA), Other effective area-based conservation measure (OECM), conserved area	A geographically defined area other than a protected area, which is governed and managed in ways that achieve positive and sustained long-term outcomes for the *in-situ* conservation of biodiversity values, with associated ecosystem functions and services and, where applicable cultural, spiritual, socioeconomic, and other locally relevant values (this is the definition of OECM per (CBD, 2018)).
Ecological connectivity	The movement of organisms, nutrients and ecological processes through a landscape (Crooks et al., 2011; Crooks and Sanjayan, 2006; Hilty et al., 2020).
Ecological corridor, connectivity conservation area	A defined geographical space that is governed and managed over the long term to conserve or restore the effective flow of natural processes between species, habitats, ecosystems, or protected areas (Hilty et al., 2020).
Governance	The individuals, groups, and institutions ultimately responsible for decision-making for an area or network of areas. Governance can also include the process of how decisions are influenced and made (Salafsky et al., 2024).
Green and Blue Infrastructure	An interconnected network of natural and semi-natural areas, including green terrestrial features such as green roofs, retention and detention ponds, re-naturalised and de-culverted rivers, swales, and rain gardens, as well as blue marine features, designed and managed to deliver a wide range of services (e.g., improvement in air and water quality, space for recreation, climate mitigation and adaptation) (Abbott et al., 2013) (Ghofrani et al., 2017) ('Green infrastructure - European Commission,' n.d.).
Natura 2000 site	Network of core breeding and resting sites for rare and threatened species, and for some rare natural habitat types, which aims to protect Europe's most valuable and threatened species and habitats, listed

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	under both the EU Birds Directive and the Habitats Directive (EC, 2008).
Protected area	A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values. Protected Areas include nationally designated sites and Natura 2000 sites (Dudley, 2013) ('Effective protected areas | IUCN,' n.d.)
Political Economy Analysis (PEA)	Applied political economy analysis (PEA) is a set of concepts, questions and tools that can help diplomats, development professionals and local reformers better understand the contexts in which they operate, and to engage effectively in supporting change. Applied PEA is concerned with the interaction of political, economic, social and cultural processes and how these generate particular outcomes. This can help explain how change processes happen and why they can become blocked (Australian Government - Department of Foreign Affairs and Trade, 2022).
Protected area network	A set of protected areas that are designed or grouped to collectively achieve long-term conservation of biodiversity and other values. Can include ecological networks and jurisdictional networks. Typically, this term refers only to the spatial sites and not the entities governing and managing them. A network can be formally designated, or it can be a grouping of existing areas with or across jurisdictional boundaries. Areas in an ecological network are ideally connected through ecological corridors to meet design criteria. (Salafsky et al., 2024)
Trans-European Nature Network (TEN-N)	The Trans-European Nature Network is a strategically planned network of protected areas and corridors, building on the existing Natura 2000 network and other protected areas, as well as natural and semi-natural areas that build on other Green Infrastructure. (European Commission, 2020)

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Abstract

The EU Biodiversity Strategy for 2030 aims to halt and reverse biodiversity loss besides other through the creation of the Trans-European Nature Network (TEN-N). This report, part of the NaturaConnect project, presents a comprehensive review of governance frameworks and land-use policies across European Union member states and neighbouring countries in the Danube-Carpathian region aimed at supporting the effective implementation of TEN-N. Using the Political Economy Analysis (PEA) framework, the report evaluates the economic, political, and social factors influencing policy reforms. It identifies key governance challenges such as weak regulations, unsustainable land use, and limited conflict management, alongside existing ecological connectivity frameworks. Data was gathered through literature reviews, interviews, surveys, and case studies from the countries in the Danube-Carpathian region.

Our findings reveal that while some countries have national strategies for ecological connectivity, legal gaps and poor implementation persist, impeding progress. However, successful practices from countries like Germany or the Czech Republic offer governance models. Furthermore, the report highlights opportunities to strengthen ecological connectivity through improved public funding mechanisms, private financing, and targeted interventions for regulatory reform, stakeholder engagement, and sustainable land-use.

This report provides valuable insights into the pathways of change and interventions necessary to enhance ecological connectivity and the role of Green and Blue Infrastructure in achieving biodiversity goals. The outcomes of this study are pivotal for shaping the future of European biodiversity conservation efforts and guiding the effective planning and governance of TEN-N.

This report was generated based on the 'Review and Synthesis of Best Practice in Governance and Land-use Policies to implement TEN-N' (Bores, J. et al., 2024) which includes the analysis of all six NaturaConnect case studies including Germany, Finland, France, Portugal and Spain. Appendix 1 of this document comprising the 'Review of EU and Danube-Carpathian countries' laws, regulations and governance, and finance mechanisms related to the establishment of the Trans-European Nature Network (TEN-N)' is a separate document and available here.

1. Introduction

Conserving biodiversity and ecosystems is one of today's most critical challenges. With the recognition of this urgency, the UN Global Biodiversity Framework and EU Biodiversity Strategy for 2030 envision a resilient, interconnected network of conserved areas aiming to safeguard at least 30% of land while ensuring ecological connectivity to support biodiversity, ecosystem resilience, and human well-being.

The EU Biodiversity Strategy for 2030, along with the EU Green Infrastructure (GI) Strategy provide integrated solutions to address biodiversity loss and ecosystem degradation. These initiatives emphasize enhancing and conserving natural habitats, fostering ecological resilience, and promoting sustainable land use.

Central to these strategies is the Trans-European Nature Network (TEN-N), which builds on the Natura 2000 network to strengthen connectivity among protected areas through the integration of GI landscape features crucial for providing ecosystem services.

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One of the key challenges for the TEN-N is to create and maintain ecological connectivity: the movement of organisms and the occurrence of ecological processes through a landscape (Crooks and Sanjayan, 2006). The different approaches to ecological connectivity have been extensively reviewed in a European context (Moreiro et al., 2024). The two most important concepts of connectivity are structural connectivity (the physical configuration of areas of habitat and their connections) and functional connectivity (the actual or potential movement of individual organisms and genetic material in the context of populations and ecological functions).

The main conservation interventions employed for ecological connectivity are ecological corridors and stepping stones (Moreiro et al., 2024). Ecological corridors are continuous linear connections between two habitat areas. Stepping stones are smaller habitat patches which form a network between larger habitat areas which provide temporary or permanent habitat and allow for movement and exchange between the larger areas. In networks of protected areas both interventions can be employed at the same time. The conservation of river ecosystems has further dimensions, notably the connection between upstream and downstream regions, the connection of the river to its floodplains or other riparian areas. A final type of ecological connectivity for this report is that between freshwater and terrestrial areas.

NaturaConnect, a Horizon Europe funded project, supports EU Member States in designing the TEN-N by providing knowledge, tools, and capacity-building for creating a resilient and connected network of conserved areas. This research examines European strategies, policies, and legislation to optimize governance and land-use policies in the context of Green Infrastructure and ecological connectivity. It aims to identify key factors impacting TEN-N development and highlight best practices in governance and land-use policies across EU Member States at various administrative levels.

This analysis focuses on the Danube-Carpathian region, one of the six NaturaConnect case studies, encompassing local, national, and cross-border scales.

A qualitative research approach, guided by the Political Economy Analysis (PEA) framework, was employed to meet the objectives. Data was gathered through semi-structured interviews and questionnaires involving stakeholders at local, national regional and European levels, complemented by a literature review. The analysis examined structural elements within the PEA framework: Foundational Factors, Rules of the Game, People and Organisations, and Political Economy Dynamics. The results are meant to provide actionable interventions for advancing a well-connected TEN-N.

The application of a PEA approach at the conceptual and design stage of a biodiversity policy intervention can help with:

- Elucidating potential consequences of government policies on biodiversity.
- Assessing the relative influence of environmental and conservation structures within decision-making processes.
- Gauging the impact of scientific analysis on legislative change.
- Deepening understanding of contextual factors and stakeholder dynamics.
- Informing strategies that account for both legal frameworks and practical realities within local environments.

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2. Planning the Political Economy Analysis

This section describes how the NaturaConnect team planned for conducting the PEA including defining the purpose, the nature of the main output and who will use it, the geographical scope of the analysis and resources used, how data were collected and analysed, and the limitations of the research.

2.1. The purpose of the PEA

The purpose for conducting this PEA was to understand the context of the implementation of ecological connectivity in the Danube-Carpathian region and formulate entry points to improve the ecological connectivity in the region. The findings inform the design of the TEN-N across European including EU accession countries.

2.2. What is the product

The product of the analysis is a set of possible interventions in general and for public institutions:

- National and regional governments
- Authorities for implementing nature conservation at national and regional levels
- Authorities responsible for agriculture and forestry at national and regional level
- Authorities responsible for nature conservation at landscape or local levels
- European Commission)

The recommendations are based on the potential pathways of change elaborated in the study. For a better overview, this study represents interventions at the general level only. Interventions addressing public institutions are available in the overall study 'Review and synthesis of best practices in governance and land-use policies to implement TEN-N' (Bores, J. et al., 2024).

2.3. Who will use it

The report will be used by the NaturaConnect project partners, especially WWF-CEE and BirdLife and its related offices in the Danube-Carpathian region, for advocacy work, strategic planning and the development of future projects.

2.4. How will it be done – modalities conducted

The analysis was conducted using a bottom-up PEA**.** Our internal team was responsible for the analysis and led a participatory approach involving local actors in the process. The team received valuable expert knowledge and input from The Policy Practice[1].

2.5. Geographic location and resources

Geographical location

The region spans ten EU Member States (Austria, Bulgaria, Croatia, Czech Republic, Germany, Hungary, Poland, Romania, Slovakia, and Slovenia) and five neighbouring countries that are all EU candidate states (Bosnia and Herzegovina, Moldova, Montenegro,

[1] The Policy Practice: https://www.thepolicypractice.com/

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Serbia, and Ukraine, Figure 1). Featuring Europe's vast expanses of wilderness and virgin forests, this region is pivotal for its biodiversity, including species like the brown bear, wolf, lynx, sturgeon and imperial eagle. The region requires collaborative planning to ensure ecological connectivity, utilising frameworks like the Carpathian Convention, the International Commission for the Protection of the Danube River and the EU Strategy for the Danube Region including protected area networks.

Figure 1.The Danube-Carpathian region, WWF.

Resources

Financial resources came from the Horizon Europe NaturaConnect project under Work Package 2 Policy and WWF International (PEA Bucharest Workshop in February 2024). The study was realized in two steps, 1) pilot study compiled by Eléonore Chenevois, a WWF-CEE intern from February 2023 until August 2023, and 2) the main study included in the NaturaConnect Deliverable D2.1 Review and synthesis of best practices in governance and land-use policies to implement TEN-N that features all six case studies across Europe (Bores, J. 2024).

Table 1. Summary outline of the scope and staff resources for the PEA.

Kind of PEA	In-depth participatory PEA, project-based
Field research	Yes, in the form of interviews, surveys and workshops
Staff time input	2 full-time equivalents spread amongst 5 people
Time to completion	1.5 years

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2.6. Setting the team

Conducting a Political Economy Analysis needs multiple expertise and skills. Thus, the team was compiled of persons with

- knowledge in conducting a PEA,
- knowledge of the region and policy background (regional/country knowledge),
- multi-disciplinary expertise (policy, science, management),
- technical expertise (MAXQDA analysis, artificial intelligence supported literature research),
- social/language skills, and
- facilitation and communication skills.

2.7. Ensuring research quality – data collection

Conducting a PEA requires a comprehensive gathering of information, encompassing the issue at hand, its root causes, contextual factors, formal and informal regulations, stakeholders involved, their influence, as well as their motivations and challenges.

To collect primary data, we employed a qualitative research approach using a variety of methods, including semi-structured interviews, surveys, and workshops (Figure 2. Sampling methods used to obtain the necessary information for this report; details are explained in the following. The appendices offer additional information on each section.

To further enhance the robustness of our research and mitigate the biases inherent in any single method, we used a mixed-method triangulation technique. This technique combines multiple research methods to cross-verify data and ensure comprehensive and reliable results.

Moreover, we compared and validated our findings through extensive literature. This entailed searching and reviewing academic literature, grey literature and official documents such as laws, regulations, policies, criteria and guidelines. This integrated approach ensured a comprehensive analysis of the governance and land-use policies related to establishing the TEN-N.

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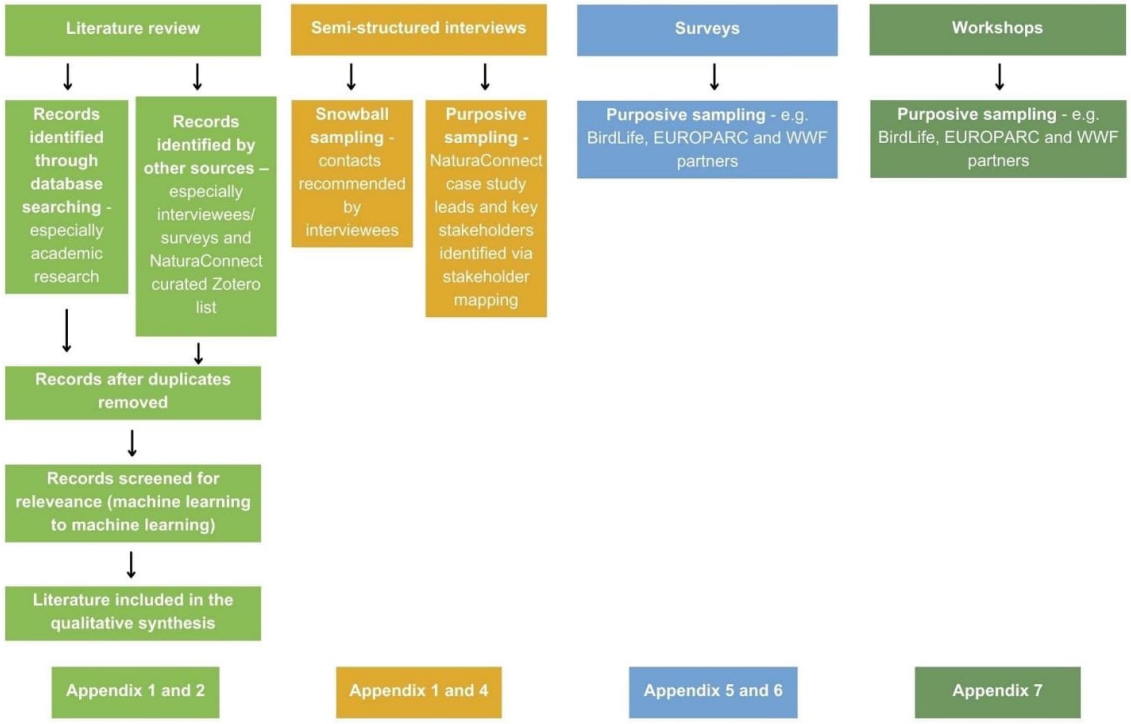

Figure 2. Sampling methods used to obtain the necessary information for this report; details are explained in the following. The appendices offer additional information on each section.

2.7.1. Literature review

Identification and selection of literature

A literature review was conducted to analyse governance practices and challenges in maintaining and enhancing ecological connectivity and environmental protection in EU Member States and ecologically connected neighbouring countries, with a focus on the Danube-Carpathian region.

The review aimed to identify enablers, barriers, and best practices related to ecological connectivity governance. Using the PRISMA methodology (Page, M.J. et al., 2021), relevant literature was systematically identified, screened, and selected from the Scopus database through optimized search strings, which accounted for keyword variations and included terms covering all EU Member States and relevant neighbouring countries.

Screening process

Abstract screening for relevance (as per step 3 in the PRISMA Methodology) utilised a machine-learning (ML)-assisted approach, specifically ASReview Lab 1.4 (ASReview LAB developers, 2023).

The machine-learning software solution supported the abstract screening by sorting the most likely relevant records to the top of the list. It was trained by a human reviewer to determine the relevance and prioritisation of an abstract. Ultimately, human reviewers made the final judgments based on relative relevance.

Inclusion of grey literature

Grey literature, including publications from administrative bodies, NGOs, and private sector organizations, was integrated into the review alongside peer-reviewed sources. A snowball-

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search method, guided by expert input, identified additional relevant materials by tracing references from reviewed works and references indicated in the surveys.

To address challenges in screening grey literature, a two-tiered approach was implemented. Peer-reviewed literature was initially screened to train machine learning algorithms, with expert verification ensuring relevance. The trained algorithm was then applied to grey literature, mitigating structural differences between the two types of sources and enhancing the accuracy of relevant content identification.

Evaluation and synthesis

Records identified through the screening process were assessed for eligibility and evaluated based on qualitative indicators derived from the research questions (Appendix 2: Literature review indicators table). In total, 400 peer-reviewed papers and grey literature reports were screened for relevance, 253 from the keyword-search and 157 from the snowball-search. After the screening 69 papers remained, of which 47 were peer-reviewed papers, 2 book-chapters and 20 grey literature reports. A qualitative synthesis of the literature was then conducted, incorporating relevant findings related to the Danube-Carpathian region into the PEA.

2.7.2. Review of legislation, policies and governance in case study countries

In addition to the literature review, a supplementary review was carried out to gather factual information on the current state of legislation, policy and governance of protected area networks and ecological connectivity in all countries in the Danube-Carpathian region. Additionally, spatial planning tools and funding sources were identified where possible. These can be considered as part of the formal rules of the game in the PEA framework.

The method used combined information from a literature review and internet search (including legislative texts) and input from the interviews and surveys (Appendix 5: Interview questions; Appendix 6: Survey questions for the nature conservation sector; Appendix 7: Survey questions for other sectors than nature conservation). Key resources that were integrated into the review include the European Environment Agency Biodiversity Information Service (BISE), a survey of EU Member States' protected area approaches carried out for the European Environment Agency (EEA) (Naumann et al., 2021), and the outcomes of the European Spatial Planning Observation Network (ESPON) LinkPAs project (ESPON, 2018), as well as other recent Interreg projects on ecological connectivity, e.g. (Borlea et al., 2022). The review also relied to a large extent on a recent publication on nature conservation across Europe (Tucker (ed), 2023).

The resulting content gathered during this review has been compiled into the 'Review of EU and Danube-Carpathian countries' laws, regulations and governance, and finance mechanisms related to the establishment of the Trans-European Nature Network (TEN-N)'[2] and summarised in Table 3.

2.7.3. Interviews

Semi-structured one-hour interviews in English, using guiding questions (Appendix 5: Interview questions), were carried out with targeted persons via video conference (Appendix 4: Breakdown of interviews according to stakeholders' type). However, due to difficulties with the English language, some persons answered in writing or in their mother language, but this was the minority (7 of 43).

For selecting the participants for the interviews, we used a mix of purposive and snowball sampling methods to identify key informants on the topic of our research. Purposive sampling means the identification of experts on the research topics from different institutions and

[2] Link: https://naturaconnect.eu/wp-content/uploads/2025/01/D2.1-PEA-in-the-Carpathians-Appendix-1.pdf

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sectors. Those who were available for the interviews indicated further relevant persons to be addressed (snowball sampling). The focus centred on the 15 countries in region representing a local, national and cross-border contexts within the European Union and neighbouring countries.

Initial interviews were conducted with the NaturaConnect project DCR case study leads, acting as central figures within the case study. These primary interviews aimed to gather comprehensive insights also for the problem analysis, aided by sharing questions in advance to ensure focused discussions. Following these primary interviews, the case study leads recommended additional stakeholders for further interviews and specific documents for review, employing a sequential approach.

At the national level, we tried to obtain at least three interviews for each country within the Danube-Carpathian region, distributed as follows: The Ministry of the Environment departments related to Natura 2000, protected areas, Green Infrastructure development, implementing the EU Biodiversity Strategy, etc.; a protected area or nature conservation agency if present (in some cases this agency is embedded in the ministry); and an environmental NGO to gain an outside view. A total of 43 interviews (7 interviews in written form) were conducted (Figure 3).

The interview recordings were transcribed, anonymized and analysed by using a code system software provided by MAXQDA (Appendix 3: MAXQDA Code System).

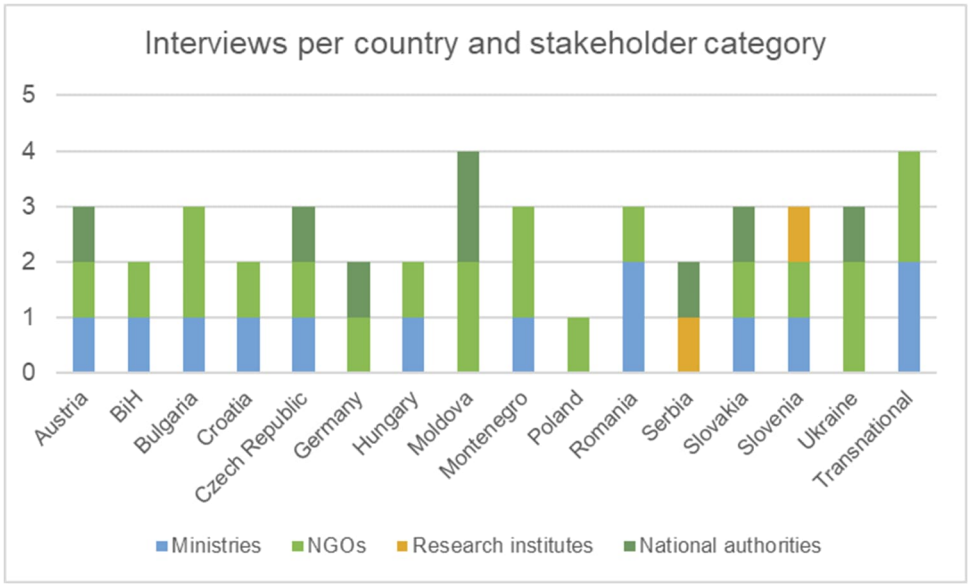

Figure 3. Number of interviews per country and stakeholder category, 43 in total (including 7 in writing), BiH = Bosnia and Herzegovina.

2.7.4. Surveys

Two distinct surveys were designed to gather insights on the integration of ecological connectivity within sector-specific planning processes, as well as the existence of supporting laws, regulations or strategies. The first survey (Appendix 6: Survey questions for the nature conservation sector) targeted professionals involved in nature conservation, while the second (Appendix 7: Survey questions for other sectors than nature conservation) directed at individuals working in other sectors which impact and are impacted by conservation, such as agriculture, forestry, energy, transport, spatial planning, and water management.

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The response rate to the surveys was lower than expected, which is a common challenge in survey-based research. The nature conservation survey (Figure 4) received a total of 34 responses, comprising 30 responses directly through the survey online, and an additional 4 responses from the BirdLife partnership in an earlier edition of this survey, indicating a strong engagement from this community. Out of the 34 responses, the number of representatives from NGOs dominated (n=12), followed by protected area professionals (n=6), national authorities, science institutions and private sector representatives (n=4 each), ministries (n=3) and representatives of transnational organisations (n=2). Two participants did not determine their affiliation.

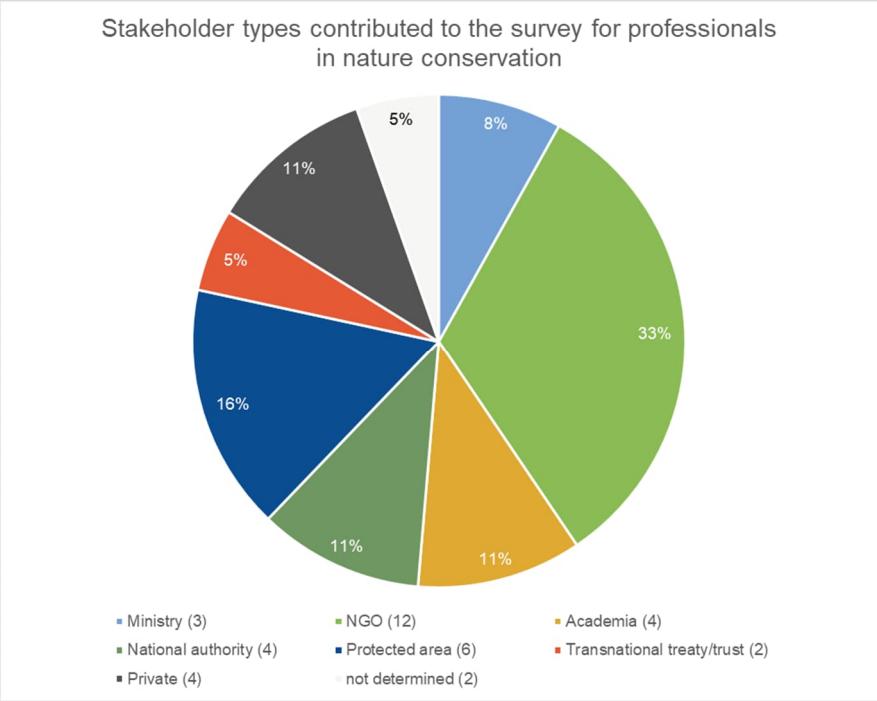

Figure 4. Stakeholder categories represented by the participants in the survey for the nature conservation professionals in the Danube-Carpathian region; n = 34.

The survey for other sectors (Figure 5) garnered 30 responses, 27 of them were from the countries of the Danube-Carpathian region and three outside our study area and therefore, not considered. (n=27). The responding sectors were agriculture (2), forestry (3), energy (2), spatial planning (7), transport infrastructure (3), and water management (10).

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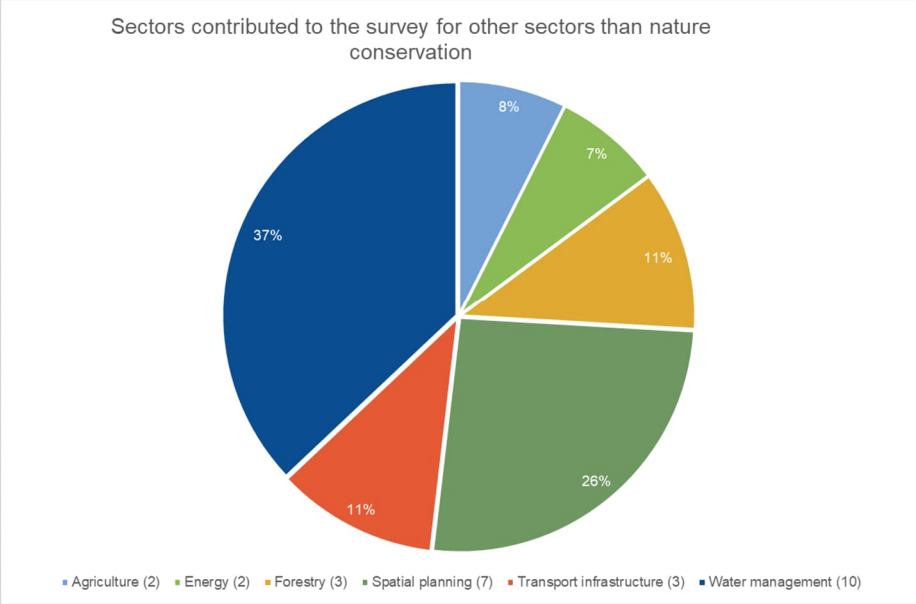

Figure 5. Sectors represented by the participants in the survey for other sectors than nature conservation in the Danube-Carpathian region (n=27).

Both surveys were distributed across diverse networks to capture a broad spectrum of insights on ecological connectivity integration. Utilising the WWF Connectivity Network, including partnerships with TRANSGREEN, ConnectGREEN, and SaveGREEN, and working groups from the Carpathian Convention on Biodiversity, Forestry, and Spatial Planning, the surveys reached professionals in transport, spatial planning, and water management. Additional distribution channels included the International Commission for the Protection of the Danube River (ICPDR) groups, Danubeparks, the EUROPARC Federation, and various EU Strategy for the Danube Region (EUSDR) Priority Areas such as Road & Rail, Water, Environmental Risks, and Biodiversity. We also engaged the BirdLife network, specifically the Nature and Climate Task Force and the Agriculture Task Force, along with other EU networks like the farmers' associations and spatial planners. Outreach was further extended through NaturaConnect's social media channels, ensuring a comprehensive reach across relevant sectors. Altogether, approximately 900 people were addressed directly.

2.7.5. Workshops

As part of our analysis on connectivity challenges in Europe, we organised a series of workshops aimed at fostering collaborative engagement and sharing of best practices and political tools (Table 2). The workshops employed a structured format to facilitate in-depth discussions and a holistic exploration of strategies. Participants from various sectors including government, academia, environmental organisations, private sector and local communities were involved to ensure diverse perspectives were represented.

The methodology included organising participants into roundtable discussions in a world café style setting (Löhr et al., 2020) or simple breakout groups, allowing flexibility to accommodate varying dynamics and demographics. In total, three key workshops were conducted partly following the Appreciative Inquiry approach (Cooperrider, D.L. and Whitney, D., 1999) which focuses more on what should be done in the future than on the current problems ('Methods | Art of Hosting,' n.d.). More details on the workshops can be found in Appendix 8: Workshop details.

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Each workshop was tailored to the specific types of participants and adjusted according to logistic considerations, ensuring effective discussions and meaningful outcomes by adapting both the questions asked and the feedback collection format.

Table 2. Workshops organised by the research team to gather information for the PEA analysis.

Workshop title	Location	Date	Participant details	Focus of workshop
NaturaConnect at BirdLife International Partnership meeting	Edinburgh, UK	17 May 2023	39 participants from BirdLife partnership institutions representing 22 countries, 4 of them were included for the DCR	Governance challenges for connectivity, identifying challenges, exploring solutions, envisioning necessary steps
Workshop at the 14th Meeting of the Biodiversity Working Group of the Carpathian Convention	Vsetín, Czech Republic	22-24 May 2023	28 participants including representatives of ministries and NGOs	Barriers and enablers for a well-connected protected areas network, stakeholder engagement strategies
NaturaConnect at the 7th Carpathian Convention Conference of the Parties	Belgrade, Serbia	11 October 2023	Approx. 40 participants from governments, public administrations and agencies, research institutions, NGOs and private sector	Implementation of ecological networks, discussions on how the Carpathian Convention can foster collaboration

2.8. Limitations in our research

Acknowledging limitations in our research is crucial for ensuring transparency and understanding the scope of our findings.

Changing political landscape: During our research, the political landscape in Europe has been evolving. The 2024 European farmers' protests, the EU Parliament elections, and national elections in several Member States are significantly impacting the implementation of the European Green Deal. As a result, some of the insights and opinions from interviews conducted in 2023 may now be outdated.

Interviews: One notable limitation has been the response rate to our interview invitations. Despite reaching out to a significant number of stakeholders through approximately 250 email addresses, we were able to conduct a total of 43 interviews. This low response rate may have been influenced by various factors, including the possibility that some contacted individuals were not the appropriate contacts for our inquiries. However, valuable insights were gained from those who did respond, and we were guided to better contacts through their assistance.

Surveys: Another limitation we encountered in our research pertains to the response rate for our surveys, particularly the non-conservation sectors survey. Despite our efforts, obtaining responses from stakeholders in certain sectors proved challenging. This effort resulted in more than 900 addresses being contacted, along with our announcements on social media. Notably, we received only two responses from the agriculture sector and linear infrastructure sector, respectively (Figure 4). This limited participation may have been influenced by various factors, including the complexity of the questions or constraints on stakeholders' time and resources,

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as well as some of the identified problems, such as a lack of awareness of the issue. While response rates were in line with other empirical social research studies, we had anticipated a higher level of engagement and found it challenging to involve people.

Literature review: Using the machine learning approach for grey literature was challenging. Experiences with using machine learning for grey literature are scarce, and to control the quality of the output, scientific literature was separated from grey literature for the screening. To solve the challenges, we adopted a two-tiered approach. In the first tier, the scientific literature was screened with the machine learning software as described above. The relevance was verified in a first round of full-text reading. The sources that were identified as relevant by full-text assessment were then used as prior knowledge for the abstracts screening of the grey literature list.

Qualitative approach: The research adopts a qualitative methodology, with a large part relying on semi-structured interviews, surveys and workshops. While this approach provides in-depth insights, it is inherently subjective and may be influenced by the perspectives and biases of the participants/reviewers. Additionally, the relatively small sample size in some surveys may limit the robustness of the conclusions.

Data availability and reliability: The availability and reliability of data, particularly from grey literature and stakeholder interviews, can vary significantly. Some data sources were outdated or incomplete, and the reliance on self-reported information from stakeholders could have introduce bias. The integration of different data sources aimed to mitigate this, but some inconsistencies may remain.

Language and communication barriers: Conducting interviews and surveys across multiple countries with diverse languages posed challenges. Although efforts were made to accommodate language differences, including translating interview questions and responses, some nuances and contextual meanings may have been lost or misinterpreted.

Media: In some cases, a media overview would provide an insight into the social and political opinions of a country or region, which can be helpful in developing interventions. Due to time constraints, we were unable to carry this out.

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3. Problem definition – what is the problem?

Having the outline of the procedure settled, the next step was to define the problem and to understand its main drivers and root causes. The main principle of defining a problem is to ask why things are the way they are. Several tools guide the definition of the problem. In our case, we used a framework approach called Ishikawa or fishbone diagram (Figure 6) that illustrates the problem and related root causes for the defined problem.

3.1. What did we do to localize the problem and generate the problem statement?

Findings of an interview with the WWF-CEE conservation director, Irene Lucius, and elaborated during the Applied Political Analysis training organised by The Policy Practice in spring 2023, and during the PEA Bucharest workshop in spring 2024 were compiled and illustrated in the fishbone diagram (Figure 6). Results of a brainstorming exercise with WWF-CEE colleagues from December 2023 focused on the implementation of ecological connectivity in the Carpathians were added.

For this analysis, the problem was explored and defined by the research team as

'Weak ecological connectivity and on-going loss of ecological connectivity of protected and conserved areas in the Danube-Carpathian region'.

This issue can be attributed to several causes that are consistently observed across various national contexts, despite specific local nuances. The underlying causes for the problem stem from a mix of economic, social, governance, and capacity aspects (Figure 6).

Considering the weak ecological connectivity between protected and conserved areas, it is important to highlight the need to look beyond national borders, both at regional and transnational levels. There has been a move in the last decades towards decentralised land planning, with power moved downwards to regions, provinces and municipalities. This comes with local pressure for specific infrastructure to the detriment of nature, with limited coordination across local actors, fragmentation, diversity of governance models, and insufficient capacity. At the transnational level, more and more organisations acknowledge the connectivity problem. An example is the Danube-Carpathian region where several transnational organisations have endorsed the 'Declaration on Achieving functional biodiversity in the Danube-Carpathian Region by mainstreaming ecological connectivity'. In addition, Interreg projects like SaveGREEN, ConnectGREEN or TRANSGREEN have provided additional insights to the problem at the transnational level.

Another aspect that needs to be highlighted is the complexity of the problem. There is a significant number of players at national, regional and transnational levels, from multiple sectors, and with different interests, understandings and powers.

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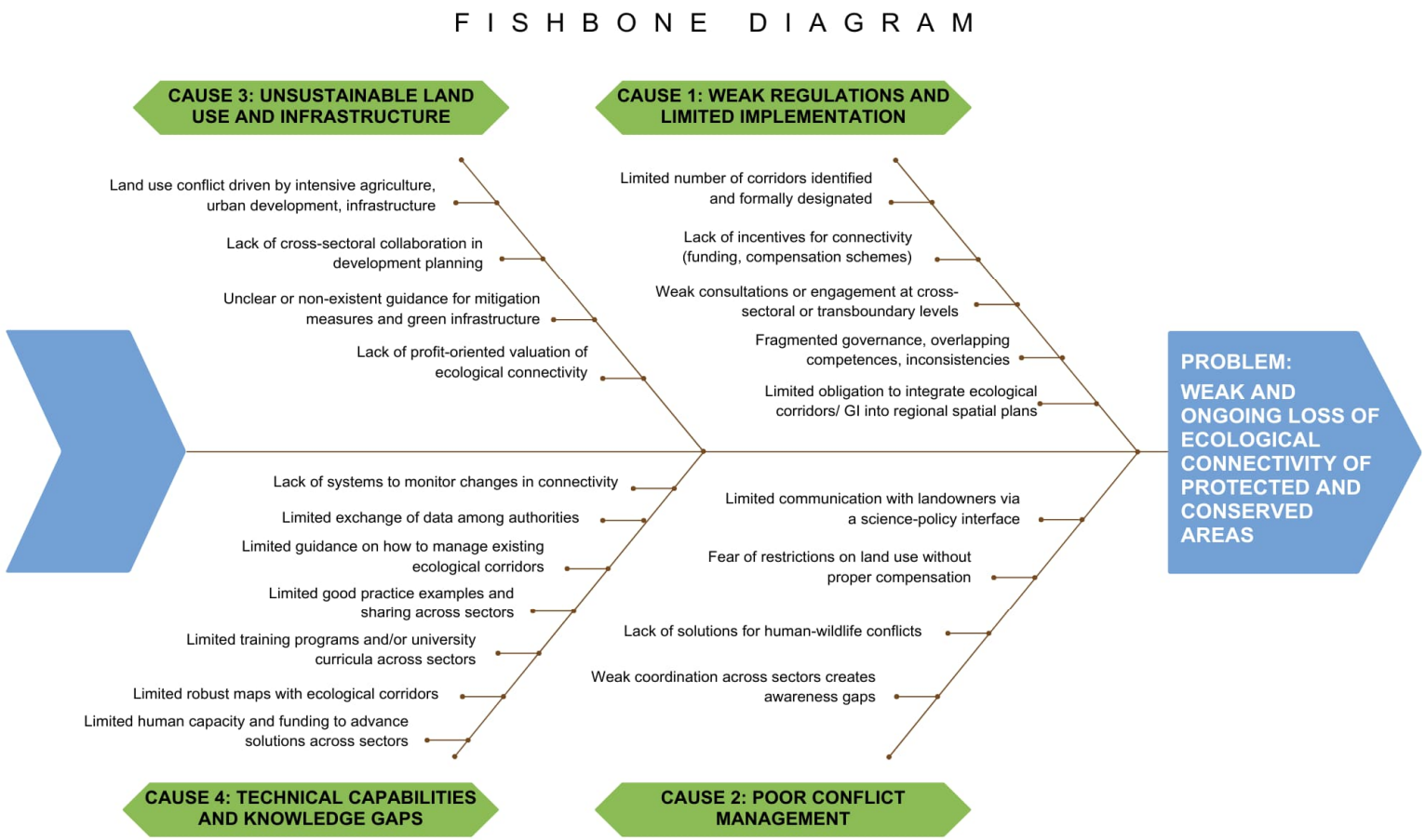

Figure 6. Fishbone diagram illustrating the problem analysis. To distil the problem's root causes, the team organised a Political Economy Analysis workshop in Bucharest. One of the outcomes was a visual of the problem and its causes, in the form of a cause-and-effect diagram. (GI=Green Infrastructure)

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Cause 1: Weak regulations and limited implementation

In many countries, regulations intended to support ecological connectivity exist but are poorly implemented due to fragmented governance frameworks and limited political incentives.

The Danube-Carpathian region is confronted with a limited overall number of corridors identified and formally designated, along with limited formal guidance on how to manage existing ecological corridors. In cases where laws and regulations are in place, their implementation proves difficult due to poor cross-sectoral cooperation. Furthermore, the laws and regulations contain weaknesses due to limited engagement of stakeholders in the design process. More concretely, there is a limited obligation to integrate ecological corridors in spatial/development plans (with small exceptions like Czech Republic, Hungary and Slovakia) and a lack of incentives for tackling connectivity (in terms of funding, compensation schemes).

Cause 2: Poor conflict management

A common problem is the lack of awareness and common understanding of the need for ecological connectivity among stakeholders, which leads to conflicts and resistance to connectivity measures. Many stakeholders, including decision-makers, landowners, and farmers across the Danube-Carpathian region, fear land use restrictions and lack adequate awareness of the importance of ecological connectivity.

Furthermore, limited communication of the advantages of ecological connectivity via a science-policy interface creates little awareness of the function of ecological connectivity across stakeholders, both at national and transboundary levels. Moreover, there is a fear of restrictions for landowners' activities on their land without proper information and compensation. Another sensitive aspect is the human-wildlife conflict that comes with complex social dynamics, in a context where development, habitat degradation, and climate change put pressure on wildlife.

Cause 3: Unsustainable land use and infrastructure development

Economic development pressures frequently override conservation efforts, posing a significant threat to ecological connectivity. In addition, measures are not sufficiently responding to climate impacts like droughts and rising temperatures that threaten to destabilise natural areas. The Danube-Carpathian region faces challenges, where rapid economic development and unclear implementation of mitigation measures lead to land use changes that disrupt natural habitats. The combined impacts of land-use change, climate change, and existing and new physical infrastructure are an important part of the problem.

Rapid economic development tends to be decoupled from balanced environmental safeguards and is in many cases compounded by a lack of cross-sectoral collaboration in development planning. The need for new linear infrastructure, and the intensification of agriculture, forestry and water management practices leads to land use change that transforms natural areas into areas that can no longer function as ecological corridors. In addition, unclear implementation and enforcement for mitigation measures and Green Infrastructure make these economic sectors more likely to overlook biodiversity and connectivity aspects.

Cause 4: Technical capabilities and knowledge gaps

There is a widespread lack of technical capabilities and knowledge, which hampers the effective management of ecological connectivity. The relevant authorities are short on time, resources, or in-depth knowledge, making it difficult to decide how to assess connectivity in a practical yet meaningful way. The Danube-Carpathian region also faces a lack of expertise, clear standards, and inadequate systems to monitor connectivity changes, along with insufficient training programs and limited knowledge sharing across sectors.

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There is limited expertise and clear standards for ecological connectivity. This can be seen in the limited robust maps with ecological corridors that need to be recognised by local authorities or in the lack of systems to monitor changes and trends in connectivity. While funding and capacity to develop advanced technical solutions across sectors are lacking, the few examples of good practice or other knowledge across sectors are hardly shared. Limited training programs and/or university programs in different sectors also contribute to the current knowledge gap.

4. Why does it happen? The four building blocks

This step aims to address the question 'Why does this happen?' through the PEA building blocks (Figure 7), which are as follows (Fritz et al., 2014; Australian Government - Department of Foreign Affairs and Trade, 2022).

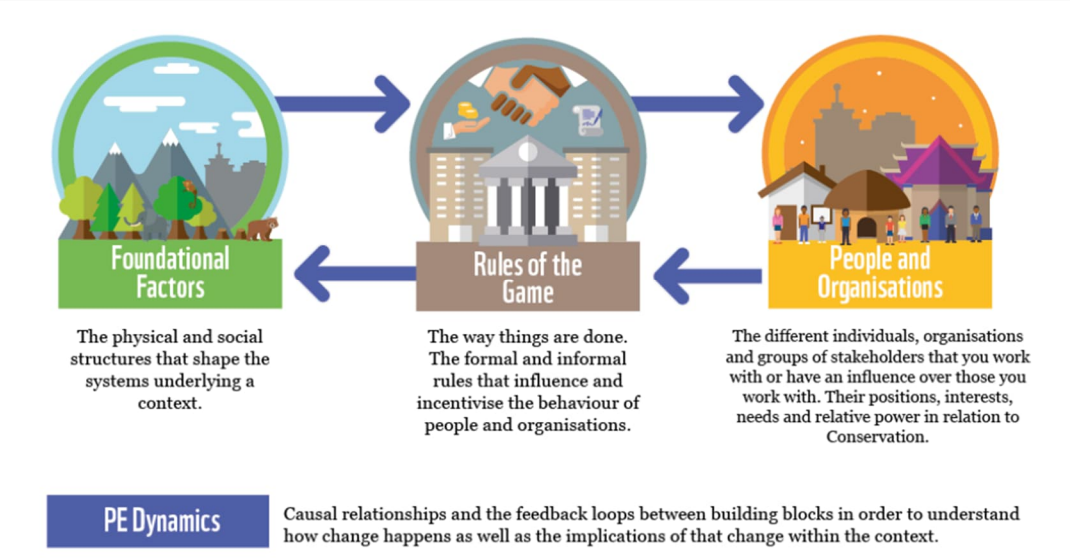

Figure 7. Building blocks and their relationship of the PEA Framework. Source: (Alexander and Williams, H., 2020)

4.1. Foundational factors

Foundational factors are tangible and intangible factors formulated in the past and strongly rooted in society as basic physical and social structures and rules. They cannot be changed or can only be changed slowly, in principle not by a project or program. PEA identifies five main elements:

- Physical and geographical structures, for example, the area of interest is a mountainous area that has specific characteristics.
- National or regional demographics, for example, rural-urban migration.
- Geo-political factors, for example impact of climate change or wars.
- Social structures, for example, how people live together in a certain environment.
- Historical legacies, for example, the fall of communism.

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It is to be noted that among these categories, the goal is not to be exhaustive but to find the main elements that are relevant to the problem.

4.1.1. Geography and biodiversity

The Danube-Carpathian region (DCR) comprises eleven EU Member States (Austria, Bulgaria, Croatia, Czech Republic, Germany, Hungary, Poland, Romania, Slovakia, Slovenia, Italy), and nine non-EU countries (Albania, Bosnia and Herzegovina, Kosovo, Moldova, Montenegro, North Macedonia, Serbia, Switzerland, Ukraine), see Figure 1. This study focuses on all countries that are either Parties to the ICPDR and/or the Carpathian Convention. Thus, Italy, Albania, Kosovo, North Macedonia, and Switzerland are not included, mainly because of their small share in the region.

The total area of the region is more than 801,000 km² and has a population of approximately 80 million people. (ICPDR, 2009).

The region comprises five biogeographic regions, whereby the Continental, Alpine, and Pannonian regions cover 94% of land area and the Steppic and Black Sea regions only 6%. Most of the Pannonian and Continental regions are used for agriculture. Most of the protected areas are located in the mountains. Forest coverage is around 35% on average with higher percentages in the mountain areas (Figure 8).

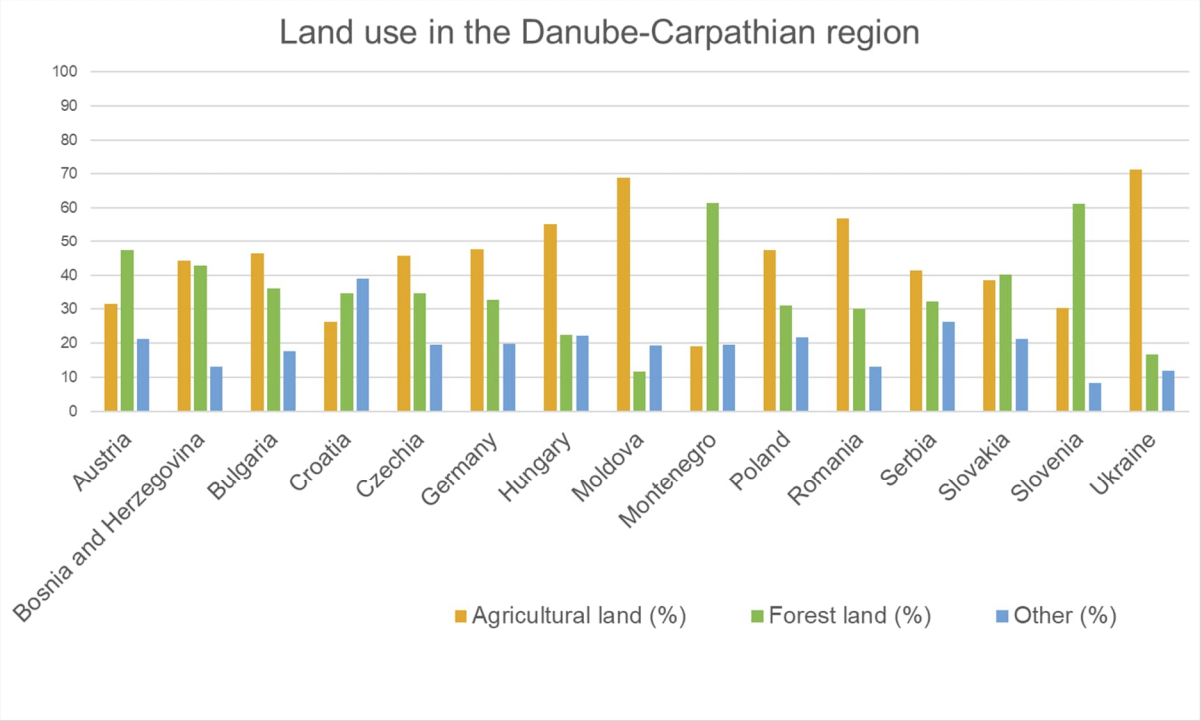

Figure 8. Land use in the countries of the Danube-Carpathian region, agricultural and forest land highlighted, FAOSTAT, 2021.

The Danube-Carpathian region is a biodiversity hotspot in Europe. It harbours Europe's greatest natural values, including primary and old-growth forests, wetlands, free-flowing rivers as well as areas of wilderness. Seven of eight European sturgeon species are critically endangered according to the IUCN Red List of Species. The Danube River provides the last remaining refuge in Europe where four sturgeon species still reproduce naturally (Jahrl, 2013) (Striebel, 2023). Two exceptional areas have been put under protection: At 6 750 km², the

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Danube Delta is one of the world's largest wetlands (and Europe's largest remaining natural wetland) featuring rare fauna and flora, as well as 30 different types of ecosystems. Located in the territories of Romania and Ukraine, it became a UNESCO World Heritage Site in 1991. In 2021, the world's first 5-countries UNESCO Biosphere Reserve and Europe's largest riverine complex was established to protect 700 km of free-flowing rivers of Mura, Drava and Danube (WWF, 2021).

The Carpathians, the second-largest mountain range in Europe, feature a huge diversity of valuable habitats such as natural ecosystems or cultural mosaic landscapes for over 60,000 animal and plant species (UNEP, 2007) including numerous endemic taxa (Mráz and Ronikier, 2016). Two-thirds of Europe's large carnivore populations - brown bear, wolf, lynx - live in the Carpathian Mountains and so do bison ('WWF - Welcome to the Green Heart of Europe,' n.d.). These migratory species are particularly vulnerable to habitat fragmentation and barriers to ecological corridors due to linear infrastructure development such as roads (Papp et al., 2022) and other economic activities.

The Dinaric Arc is home to one of the largest disappearing lakes in Europe (Cerknica, Slovenia), the world's deepest subterranean free waterfall (the 513 m high Divka Gromovnica shaft in Northern Velebit National Park, Croatia), one of two remaining old growth forests in Europe (Perućica in Sutjeska National Park, Bosnia and Herzegovina), one of the deepest canyons in Europe and the 10th largest in the world (Tara river, Montenegro), and the oldest lake in Europe and one of the deepest (Lake Ohrid, North Macedonia; ('People and Nature | WWF,' n.d.), WWF-Adria). Like in the Carpathians, viable populations of large carnivores roam the area. Many endemic plant species account for the mountains' high biodiversity.

Overall, large and complex natural landscapes are better preserved in Eastern and South-eastern than in Western Europe (Germany & Austria). An interviewee from Slovakia emphasised that Slovakia still had rich biodiversity in many larger ecosystems or habitats compared to the Western European countries which would be more degraded and smaller.

4.1.2. Historical legacies

Almost all countries in the Danube-Carpathian region except for Germany, Austria, Italy and Switzerland, were part of the Eastern Bloc until the fall of communism in the early 1990s. They all had a centralised economy. The land was mainly state-owned (interviews, all South-eastern countries), and collectivised for agriculture in the lowlands of most countries. In Poland, the resistance of Polish farmers led to the failure of collectivisation (Bauerkämper and Iordachi, 2014), as well as in Slovenia. (Young et al., 2007) Collectivisation caused a loss of the former biodiversity-rich, cultural landscapes in the lowlands with their hedgerows, flower stripes and other landscape features which were shaped by co-evolution of human and nature. These areas, at least in the Czech Republic (interview), were replaced by large fields with intensive agriculture that needed drainages and irrigation, high amounts of fertilisers and biocides.

Despite intensification trends, many countries in the region have sustained, through historical and cultural factors, relatively large areas of extensive farming and semi-natural ecosystems (Young et al., 2007), especially in the mountainous regions where the landscape did not allow for larger fields (interviews, Czech Republic and Romania).

During communism, the protected area management approach was the 'fine and fence' one, with strict rules on natural resource use and limited public access (Stanciu and Ioniță, 2014). 'Although this was also the case across most of Europe, the difference is that when the first protected areas were established in the 1960s, they were strictly protected and not open to the public. The protected areas focused on biodiversity conservation and restricting people's activities' (interview, Serbia).

Thirty-five years after the fall of communism, the countries in the region have developed various forms of democracy with market capitalism; still, the communist legacy is noticeable

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(several interviews in the Eastern and South-eastern countries) and impacts the current situation.

The **connection between rural communities and the land** got lost because of collectivisation (Szabo et al., 2008) and with it the knowledge of traditional management practices. 'There is a lack of responsibility or it's like an irresponsible attitude to land and nature in our country because somehow we lost this tradition of private lands' (interview, Ukraine). Through **land restitution**, many people had their land parcels returned or were financially compensated. Once in private hands, many landowners rented or sold their land to big (often foreign) companies that created large privately-owned corporate farms (interviews, Czech Republic and, Bulgaria). In protected areas that had been established during communist times and were entirely state-owned (Bulgaria), the situation after restitution looked different. Despite potential restrictions on their activities without prior agreement, many new private landowners engaged in agriculture or forestry within protected areas (interview, Montenegro). In almost all countries of the region, land ownership has changed in protected areas toward multiple entities, such as state, local governments, agencies, companies, communities, individuals etc. 'And that's why in some national parks there are more than 50% private ownership. But these people say that they have never given consent to the establishment of these national parks, and this creates problems even nowadays' (interview, Slovakia). At least in Slovakia, the new owners have never received compensation, because the protected area was established during communism (same interview). In Hungary, the ownership in protected areas is mixed, with larger state-owned areas (Stanciu et al., 2013). In Ukraine, most of the protected areas are still state-owned, but according to one interviewee from Ukraine 'land ownership is now a significant political issue for Ukraine and there are ongoing changes in land policies'.

State agricultural cooperatives forced on small farmers during communism and disassembled during restitution caused scattered and unclear property rights - it still results today in problems with difficult stakeholder discussions with many owners, e.g. when it comes to wetland restoration. Nowadays, in some countries, landowners are not known as they are scattered around the globe (interview, Croatia) due to the Balkan War in the 1990s or the economic situation. These circumstances make negotiations difficult when a new protected area is to be designated. 'It is very difficult, from a state point of view, to know exactly who owns that piece of land and to address the right person' (interview, Romania).

Moreover, after the fall of communism, countries underwent **legal reforms**, also under the *'acquis' communautaire* which refers nature conservation. Many new protected areas, including Natura 2000 sites, have been designated in preparation for **EU accession**. In 2004, the Czech Republic, Hungary, Poland, Slovakia and Slovenia joined the EU. They were followed by Bulgaria and Romania in 2007, and Croatia in 2013. Bosnia and Herzegovina, Montenegro, Serbia and recently Ukraine and Moldova became candidate countries.

In the former strictly hierarchical system, stakeholder participation was unusual. Nowadays, authorities and agencies organise consultations, but the timing and content of stakeholder engagement during policy development and the way authorities use input received from interested parties often is not according to good practice.

However, it needs to be taken into consideration that people in these countries still have a culture of leaving decisions to a higher hierarchical level, especially for environmental decisions (Stanciu and Ioniță, 2014). An interviewee from Romania stated that 'the ability of the Eastern Bloc to respect authority should be used for the benefit of biodiversity. We must not consider it a weak point. If you find financial incentives and instruments you can really protect biodiversity, at least in this part of Europe'.

Nevertheless, the former Czechoslovakia established the Terrestrial System of Ecological Stability of the Landscape (TSES) in the 1990s (Mackovčin, 2000), which is still part of the

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spatial plans in the Czech Republic and Slovakia. The first concepts were developed in the 1970s as a reaction to landscape fragmentation and land use change.

4.1.3. Demography

The decrease and ageing of the rural population lead to **land abandonment** and loss of traditional land management followed by natural succession. In the Western Balkans, people left because of the Balkan War and afterwards due to economic reasons. Younger people move to cities or western countries for work. 'Demographically, the population is in decline, which appears to be a problem for maintaining some important habitats, such as mountain grasslands, which are the result of a hundred-years-long traditional land use for agriculture, now being abandoned and given up to its natural succession' (interview Croatia). Negative or mixed effects of abandonment on biodiversity prevail in cultural landscapes and closely interwoven socioecological systems that are characterized by low-intensity, often subsistence farming. The long co-evolutionary history of these landscapes and their people, found in, for example, Eastern Europe, has created high habitat heterogeneity that can disappear after abandonment and lead to the loss of locally rare species and to biodiversity homogenization (Fischer et al., 2012) (Daskalova and Kamp, 2023). An interviewee from Moldova observed that abandoned land was more and more included in agricultural activities. And an interviewee from Slovakia stated that 'it means that even if there is an interest and financing for the environment, demographic processes will not allow doing… management on a small scale, which is very important in the case of Slovakia, because the biodiversity was created mainly on small patches by traditional management'.

While in Eastern countries, depopulation leads to the loss of certain habitats and associated biodiversity, Germany and Austria are too densely populated. 'Germany is so densely populated and overdeveloped that we hardly have any nature left, in the truest sense of the word' (interview, Germany).

4.1.4. Socio-economic structures and relation to the environment

After the fall of communism, the new EU members have become significantly healthier and wealthier. Their economic growth is predominantly driven by industrial development (car, food industries, etc.) and is generally higher than those from the candidate countries Figure 9).

The road and rail networks and energy infrastructure are undergoing modernisation to provide better access to economic centres, education and health care. 'We want to develop our structure of roads, infrastructure of railways, etc. Those are the priorities for us' (interview, Poland). Moreover, people think there is enough nature and do not see the necessity to protect it (interview, Romania). 'Nature is not really that important. We still have quite a lot of it, so that we don't have to really protect it' (interview, Poland). In reality, nature is quite under pressure due to rapid economic development (Stanciu et al. 2013; interviews, Poland and Serbia), but also illegal activities like the establishment of second homes and ski resorts ('White Elephants in the Green Mountains - Ski developments in Bulgaria, Romania, Slovakia and Ukraine,' n.d.) in protected areas or illegal logging ('Illegal logging,' n.d.)

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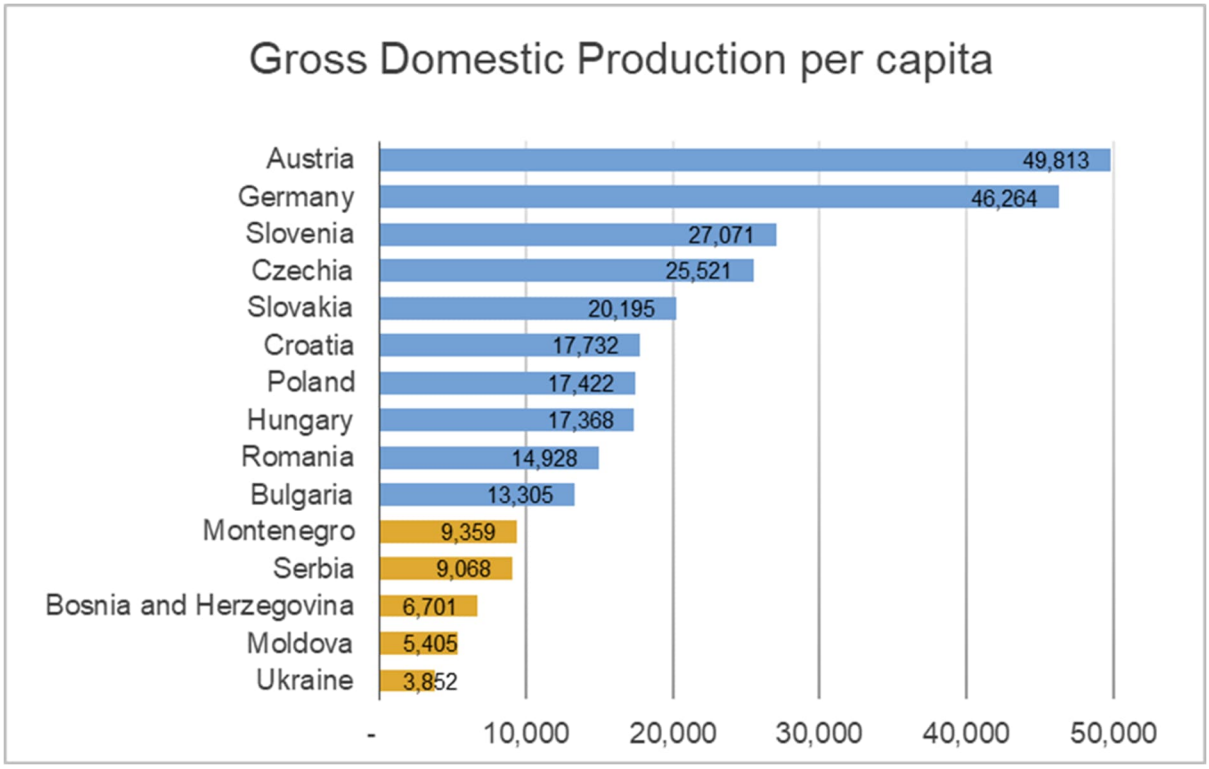

Figure 9. Gross Domestic Production (GDP) per capita in Euro (blue = EU member states, orange = candidate countries), source: ('FocusEconomics - Global Economic Data, News & Forecasts,' n.d.), data are from 2022, except for Ukraine (2021).

Many interviewees said that historically, nature was part of the culture and valued as the basis for living (interviews, Bulgaria and Slovakia). Also, a Ukrainian NGO wrote that 'Ukraine is rich in millennia-old glorious customs and rituals regarding the protection, careful treatment of the environment, its non-exhausting use, and harmonious coexistence within it. … The first important habit of ancient Ukrainians was to take from nature only what was necessary without causing significant harm to the environment'.

Landowners are proud of their land. 'The land is seen very often here as a symbol of resilience and independence. Also, this is somehow a national pride' (interview, Montenegro). 'The Slovenian population has a strong connection to the land and nature, viewing it as a source of national pride and heritage' (in writing, Slovenia). In Germany as well as in Austria, landowners have strong bonds to their land since the former generations 'wrested it from nature. Otherwise, we wouldn't have agriculture, well, and we wouldn't be able to feed so many people' (interview, Germany). In the second half of the 20th century, Austria drained many wetlands to receive arable, productive land (interview, Austria). Thus, it might be understandable why farmers or landowners most likely oppose any rules applied to their property since their ancestors put a lot of effort into turning it into arable land.

Nowadays, nature/land is mainly considered a resource for generating income. People do not see the full implications of having an intact nature or using it sustainably. 'The role of nature is not very well understood. The main driver is development and nature, and it comes just with supplementary constraints for development' (interview, Romania). Also, an interviewee from Serbia mentioned 'Now the general understanding is … more about the natural resources, and the other values of nature are not that well understood and not integrated into the policies'. In Hungary, people perceive nature conservation as a kind of control or enemy that needs to be defended. Landowners sometimes successfully influence governmental decisions (interview, Hungary).

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Besides the common view that land as such must be utilised economically, valuable natural places provide the basis for tourism and therefore, need to be protected. This is the case in some countries with a high share of mountainous areas and rich biodiversity, the natural value is assessed through the lens of tourism. 'The main tourist potential of the country is with nature' (interview, Slovenia). This is true for Austria, Croatia and many other countries in the region. Especially since COVID-19, nature has become more and more valuable for and used by local people, which has caused pressure on nature. Some protected areas are managed like tourism areas, for example, Plitvice waterfalls in Croatia (interview, Croatia).

On the other side, organic production increases with Austria as a forerunner with 26.2% of the total agricultural land ('FocusEconomics - Global Economic Data, News & Forecasts,' n.d.), especially in mountainous areas where large-scale agriculture is difficult to implement. Small-scale, secondary farms still contribute to the mosaic landscape shape that creates biodiversity hotspots, for example, the hay meadows in the Apuseni mountains, Romania, with multiple vascular plant species.

4.1.5. (Geo-) political factors

The Russian invasion of Ukraine shifted the priorities of Ukraine with less focus on nature conservation. Various players in the region have already started working on how to rebuild Ukraine, once the war is over. The nature conservation community is advocating for integrating nature conservation and nature-based solutions into reconstruction plans (WWF and Boston Consulting Group, 2022). The war does not only impact the economy but also the environment. Many protected areas suffer from devastation and pollution due to military manoeuvres ('New coordination centre to assess environmental impacts of the war on Ukraine | United Nations Development Programme,' n.d.).

Many interviewees perceive nature conservation as becoming less important for politicians due to the energy crisis caused by the Russian invasion. 'Since all the crises are now present, biodiversity really needs an additional push to be left on the top of the discussions since the energy crisis, the emergence of war in Ukraine, climate crisis, are all present. This green wave that was happening is a little bit lowered' (interview, transnational actor).

The European Union provides an excellent framework for nature conservation in Europe. However, countries encounter problems translating the Green Deal targets into implementation. The total percentage of protected areas (Figure 10) in the EU Member States varies between 21.9% in the Czech Republic and 41% in Bulgaria, whereas in non-EU countries between 4.1% in Bosnia and Herzegovina and 13.9% in Montenegro.

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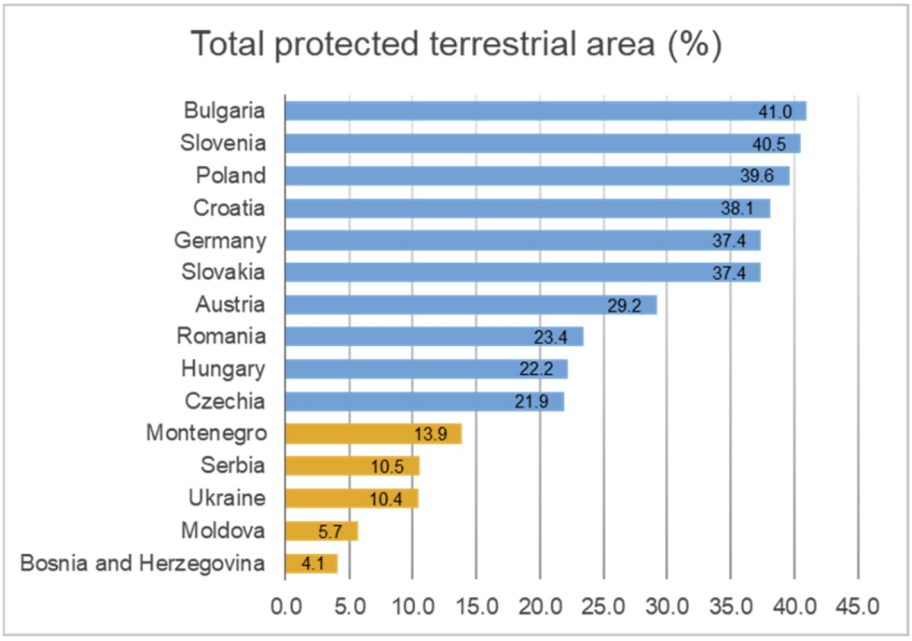

Figure 10. Percentage of protected areas in the study area (blue = EU member states, orange = candidate countries); for resources see Appendix 1 (extra document).

The Natura 2000 network was established with some gaps and still not all designated habitats and species have a management plan or are in a favourable status. Candidate countries in preparation for EU accession partly analysed their territory for potential Natura 2000 sites based on formerly assessed Emerald networks under the Bern Convention. In Montenegro, for example, the territory found suitable for protection is more than 50% (interview, Montenegro).

Interviewees perceive the European Union as unstable, as it seems the EU wants to roll back the Green Deal, the fundamental policy to preserve nature in Europe due to the war in Ukraine and the economic/energy crisis (interview, Austria). The ongoing increase of populism could reinforce the tendency and undermine evidence-based decision-making. Nature conservation could be pushed into the background.

Internal political instability at the national level: eroding democracy in Hungary and Slovakia. Hungary implemented a special decree due to the war in Ukraine and the energy crisis. It overrules all laws which not only makes nature conservation difficult. 'Overall, the government's conflict with the EU has a very negative impact on nature conservation' (interview, Hungary). Since the Slovakian elections in the autumn of last year, the country has become politically polarised, bearing the risk of losing cohesion with the European Union.

4.2. Rules of the game

Rules of the game are existing formal and informal agreements, ways of acting and power relations between stakeholders in the present. They explain how things are done and what the incentives are to support, oppose or be neutral to change. They are divided between formal and informal rules of the game, often referred to as institutions. They can be of an economic, political or social/cultural nature and are central to all that follows in the analysis. Formal rules are, for example, laws and norms, or written agreements. Informal rules are values, expected behavioural patterns in society, customs, or the unofficial information flow within an organisation. Rules of the game influence and affect people and organisations, including the actions that are taken.

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According to the Political Economy Analysis Framework, rules of the game (RoG hereafter) can be divided into formal and informal and can have various levels as international, regional, national etc. Formal rules can be various legislations, laws, directives, and protocols. These formal rules are usually known and publicly available to everyone (WWF & Integrity, 2020). The informal rules can be adopted from the formal ones and constructed from the social structures, norms, and perceptions (WWF & Integrity, 2020). Several questions of the interviews (Appendix 5: Interview questions) were set to understand the rules of the game related to the extension of protected areas and the establishment of TEN-N, to open the discussion on their efficiency, and to reveal informal, but accepted procedures or circumstances.

4.2.1. Formal rules of the game: critical review of governance, policies, and laws at the global, EU, and national levels

Most of the interview participants referred to the formal rules of the game, summarised for all case study countries in Appendix 1. All countries in the region have centralised nature conservation laws except for Germany and Austria, where each federal state has its own nature conservation law and is responsible for its implementation. 'Austria is a federal state, and everything related to nature protection is the responsibility of the regional governments. Having nine regions makes it very difficult to establish overall goals or coordinate approaches' (interview, Austria). The most relevant international treaties, strategies and laws related to ecological connectivity in the Danube-Carpathian region are highlighted below.

Formal rules of the game: global biodiversity policy

Initiatives to maintain, enhance and restore ecological connectivity are a key feature of global biodiversity policy. Global Goal ‘A’ for 2050 of the Kunming-Montreal **Global Biodiversity Framework** (GBF) under the Convention on Biological Diversity (CBD) is ‘The integrity, connectivity and resilience of all ecosystems are maintained, enhanced, or restored, substantially increasing the area of natural ecosystems by 2050’.

The second and third Global Targets for 2030 also refer to connectivity. The second Global Target for 2030 is to ‘Ensure that by 2030 at least 30 per cent of areas of degraded terrestrial, inland water, and marine and coastal ecosystems are under effective restoration, in order to enhance biodiversity and ecosystem functions and services, ecological integrity and connectivity’. The third Global Target for 2030 is to 'Ensure and enable that by 2030 at least 30 per cent of terrestrial and inland water areas, and of marine and coastal areas, especially areas of particular importance for biodiversity and ecosystem functions and services, are effectively conserved and managed through ecologically representative, well-connected and equitably governed systems of protected areas and other effective area-based conservation measures [...]’.Finally, the first Global Target to 2030 is also relevant for connectivity through its reference to 'biodiversity inclusive spatial planning'.

Formal rules of the game at the EU level

This section reviews the EU legislation and governance mechanisms relevant for ecological connectivity and the most relevant sectoral policies. The EU has included the restoration and maintenance of ecological connectivity in legislation that is binding for the EU Member States. In addition, there have been a series of strategies, projects and initiatives for ecological connectivity since the 1990s. The Council of Europe’s Pan-European Ecological Network and the European Green Belt Initiative are at the continental scale. The European Commission has launched the Green Infrastructure Strategy and is promoting the establishment of the TEN-N as part of the EU Biodiversity Strategy for 2030.

It is important to highlight that there is a large diversity among the policies in this section; ecological connectivity is, in some cases, a side result rather than the objective. For example,

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not all of the measures under the Water Framework Directive or Floods Directive will provide connectivity and assessing whether the measures provide ecological connectivity needs to be done on a case-by-case basis (Lázaro et al., 2021).

EU legal mechanisms

The EU **Nature Restoration Law** (Regulation (EU) 2024/1991) aims at the long-term and sustained recovery of biodiverse and resilient ecosystems in the EU. The key obligation under the Regulation is for the Member States to prepare and implement a National Restoration Plan. Ecological connectivity for species is an integral part of this plan. For species mentioned in Article 4 the quantification of the habitats required for reaching favourable conservation status is explicitly required to take connectivity into account.

Member States are specifically required to map the agricultural and forest areas in need of restoration, in particular the areas that, due to intensification or other management factors, need enhanced connectivity and landscape diversity. Article 12 addresses the restoration of forest ecosystems. Member States are required to achieve an increasing trend at national level of at least six out of seven indicators, one of which is forest connectivity. The Regulation also foresees the planting of three billion additional trees by 2030 in the EU. The measures to achieve this commitment should aim to among others increase ecological connectivity

Article 9 addresses river connectivity. The Regulation requires Member States to make an inventory of barriers that need to be removed to contribute to the restoration of ecosystems and to restore 25 000 km of free-flowing rivers by 2030. The removal is then governed by the National Restoration Plan. In addition, for floodplains Member States should take complementary measures to improve their natural function. The restored connectivity of rivers and floodplains should then also be maintained.

The **Habitats Directive** (Directive 92/43/EEC) aims to restore and maintain ecological connectivity. The Directive established the Natura 2000 network in Europe. Article 10 of the EU Habitats Directive states that:

‘Member States shall endeavour, where they consider it necessary, in their land-use planning and development policies and, in particular, with a view to improving the ecological coherence of the Natura 2000 network, to encourage the management of features of the landscape which are of major importance for wild fauna and flora. Such features are those which, by virtue of their linear and continuous structure (such as rivers with their banks or the traditional systems for marking field boundaries) or their function as stepping stones (such as ponds or small woods), are essential for the migration, dispersal and genetic exchange of wild species.’

This article explicitly includes ecological connectivity in the form of linear features, stepping stones, migration, dispersal and genetic exchange. The **Birds Directive** (Directive 2009/147/EC), while not explicitly mentioning ecological connectivity, also includes the management of habitats outside protected areas under Article 3, as well as areas along migratory routes under Article 4. The European Commission issued a guidance document on Article 10 of the Habitats Directive and Article 3 of the Birds Directive in 2007 (Kettunen et al., 2007). In its 2023 assessment of investment needs and priorities for Natura 2000 and for Green Infrastructure, the European Commission urged the Member States to include Green Infrastructure for Natura 2000 in their Prioritized Action Framework (PAF) (European Commission, 2023).

The **Water Framework Directive** (Directive 2000/60/EC) requires Member States to achieve good ecological status or good ecological potential of water bodies on their territory. Ecological connectivity is included in the assessment of several quality elements of surface water bodies. River continuity, hydrological regime and connection of rivers to groundwaters and riparian zones are direct quality elements providing ecological connectivity, while thermal and oxygenation conditions can, in some cases, constitute a barrier for migratory fish.

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Member States are, therefore, expected to take measures to maintain or re-establish continuity. This may include removing barriers and dams, or building fish passes or other passes around barriers. Member States may designate rivers or sections of rivers as river reserves where connectivity must be preserved. Protected areas under the Water Framework Directive can also protect ecological connectivity as they include Natura 2000 areas, drinking water protection areas, and areas designated for the protection of economically significant aquatic species. The Water Framework Directive also provides for cooperation across Member States through international river basin management plans under Article 13.

Smart implementation of the Water Framework Directive provides further opportunities for ecological connectivity. Natural water retention measures (NWRM) are natural or nature-based structures that slow down the flow of stormwater, increase infiltration and reduce pollution through natural processes. The Water Framework Directive Common Implementation Strategy (WFD CIS) recommends NWRM as cost-effective measures to achieve the goals of the Water Framework Directive (WFD CIS Working Group Programme of Measures, 2014). Riparian buffer zones or strips with a minimum width and permanent vegetative cover along water bodies, created to maintain water quality (under the Water Framework Directive and/or the **Nitrates Directive** (Directive 91/676/EEC) can also provide linear connectivity.

Ecological connectivity can also be maintained by flood protection areas under the EU **Floods Directive** (Directive 2007/60/EC). The EU Directive does not directly require legal restrictions in areas with high flood hazard risk, but Member States can choose to restrict potential land uses in flood-prone areas. Flood risk management measures must take account of EU environmental objectives and must address the potential effects of flooding on Natura 2000 and protected waters.

EU strategies and initiatives addressing ecological connectivity

The **EU Biodiversity Strategy to 2030** (European Commission, 2020) provides the overarching policy framework for biodiversity conservation in the EU. The Strategy sets priorities for strengthening the legal framework implementing and enforcing EU nature legislation. The Strategy follows and integrated and whole-of-society approach, covering all relevant sectors including agriculture, forestry and renewable energy. The Strategy builds upon the previous EU Biodiversity Strategy (European Commission, 2011).

In 2013, the European Commission launched the **EU Green Infrastructure Strategy** as part of its commitments to the EU Biodiversity Strategy 2020 and the Aichi Biodiversity Targets (Convention on Biological Diversity, 2010). The European Commission has defined Green Infrastructure as (European Commission, n.d.):

‘A strategically planned network of natural and semi-natural areas with other environmental features, designed and managed to deliver a wide range of ecosystem services, while also enhancing biodiversity.’

The key principles of Green Infrastructure are connectivity, spatial planning, and multifunctionality; it has wider aims than ecological networks, promoting the multifunctional nature of space and the benefits that appropriate management approaches can deliver (van der Sluis and Schmidt, 2021). The EU strategy aimed to create an enabling framework for green infrastructure using existing EU legal, policy and financial instruments.

The EU Green Infrastructure Strategy has been complemented by the **Guidance on a strategic framework for further supporting the deployment of Blue and Green Infrastructure**. The Guidance aims to integrate Green Infrastructure into key EU policies, improve information, strengthen the knowledge base and promote innovation, improve access to finance and foster investments in EU-level Green Infrastructure projects and promote good practices. The Guidance specifically requires EU level Green Infrastructure projects to

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contribute to the goals of the Birds and Habitats Directives, including via implementing Article 10 of the Habitats Directive and connecting Natura 2000 with buffer zones to defragment the landscape.

The EU **Forest Strategy for 2030** promotes closer-to-nature forestry in the EU through technical support and a voluntary certification scheme. The Guidelines on Closer-to-nature forest management include a toolbox with several interventions for ecological connectivity such as setting areas aside for biodiversity networks and corridors and landscape scale planning and management ('mosaic' approaches).

The EU **Pollinators Initiative,** revised in 2023, aims to improve the conservation of pollinators and tackle the causes of their decline. To achieve this the Initiative promotes strategically planned restoration activities to ensure adequate areas of well-connected, high-quality habitats for pollinators through species conservation plans. By 2027, the Initiative foresees the development of a blueprint of a network of 'Buzz lines' - ecological corridors for pollinators - with an accompanying implementation plan. The Initiative calls on Member States to integrate the 'Buzz lines' into spatial planning at national, regional and local levels.

At European level there have been several regional initiatives which include cooperation between EU Member States and third countries. Under the Council of Europe, there have been efforts to design, plan, and implement a **Pan-European Ecological Network** (PEEN) since 1996 (Bouwma et al., 2002). The PEEN was developed in three subprojects: Central and Eastern Europe, completed in 2002; South-eastern Europe, completed in 2006; and Western Europe, also completed in 2006. The Network consists of core areas (sites of Pan-European importance), buffer zones, ecological corridors and nature restoration areas. The methodology of the development of the three maps was broadly comparable but data availability, differences in national databases, technical developments and geographical differences caused variations in the detailed approach (Bouwma et al., 2002). The maps have no legal standing and there is no enforcement mechanism.

The **European Green Belt Initiative** has ecological connectivity as its goal (Zmelik et al., 2011). It aims to create a chain of protected areas along the former Iron Curtain between Western and Eastern Europe from the Barents Sea at the Russian-Norwegian border, along the Baltic Coast, through Central Europe and the Balkans to the Black and the Adriatic Sea.

The **Carpathian Biodiversity Framework** under the Carpathian Convention aims among others to restore and safeguard ecological connectivity in the Carpathian area especially linked to large carnivores' protection. The **International Commission for the Protection of the Danube River** (ICPDR) advocates for the implementation of the Water Framework Directive in the Danube River basin including activities to enhance migratory fish, especially sturgeon protection. The EU **Strategy for the Danube Region** (EUSDR) Priority Areas 6 (Biodiversity) and 4 (Water Quality) have initiated a number of activities related to ecological connectivity and migratory fish protection.

The Trans-European Nature Network

In 2020, the European Commission published the new EU Biodiversity Strategy for 2030 (European Commission, 2020), which states that the EU must build a truly coherent Trans-European Nature Network (TEN-N), and defines one of the three leading goals as: *'to legally protect at least 30% of the land, including inland waters, and 30% of the sea in the EU, of which at least one third (10% of land and 10% of sea) to be under strict protection.'* The Strategy mentions the following as components of the TEN-N:

- Designation of a minimum extra 4% of land and 19% of sea, either to complete the Natura 2000 network or under national protection schemes, with the exact area depending on which national protected areas Member States consider contributing to the 30% targets. The land target is to be achieved in each EU biogeographical region.

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- Strict protection of an additional 7% of land and 9% of sea. All remaining primary and old-growth forests need strict protection. Significant areas of other carbon-rich ecosystems, such as peatlands, grasslands, wetlands, mangroves and seagrass meadows should be strictly protected. Strict protection of coastal ecosystems and wetlands for climate adaptation.
- Designations can include the spatial protection measures to comply with the EU Water Framework Directive and the EU Marine Strategy Framework Directive.
- Designations can include Other Effective area-based Conservation Measures (OECMs) – these are areas that have a form of legal protection that is not related to the protection of habitats and species but that indirectly promotes the conservation of biodiversity. Administrative or contractual arrangements should have a minimum duration that is set on the basis of the ecological requirements of the species or habitats to be protected (European Commission, 2022).
- All protected areas should have clearly defined and tailored conservation objectives and measures. This applies to both the new designations, OECMs, and all existing areas including Natura 2000 sites and other protected areas.
- All protected areas (including OECMs) must have effective management and monitoring of the biodiversity in the area in place.

In order to have a truly coherent and resilient TEN-N, the Strategy underlines the importance of:

- Setting up ecological corridors to prevent genetic isolation, allow for species migration, and maintain and enhance healthy ecosystems.
- Promoting and support investments in Green and Blue Infrastructure, as well as cross-border cooperation among Member States.

Both new designations and the process of defining or adding conservation objectives to existing designations are expected to:

- Protect species and habitats covered by EU nature legislation (even if they are not Natura 2000 sites) if the protection is needed to address gaps in coverage of habitats and species. For example, those gaps highlighted by the sufficiency assessments performed by the European Environment Agency on behalf of the European Commission, or identified through scientific analyses
- Protect species and habitats covered by EU nature legislation to buffer the effects of climate change on Natura 2000 sites or to facilitate species migration.
- Protect species identified in European or national red lists (that are not covered by the EU nature legislation).
- Protect areas hosting wild pollinating insects, such as semi-natural grasslands, to help restore pollinator populations.
- Protect land that falls under one or more of the categories of the LULUCF Regulation (Annex III point b).
- Protect land that has been restored under the requirements of the EU Nature Restoration Law.

Sectoral EU policies

Several sectoral policies also support the maintenance of ecological connectivity. The **Renewable Energy Directive (**Directive 2023/2413) requires Member States to exclude major bird and marine mammal migratory routes from their renewable energy acceleration areas. The **Trans-European Network for Transport Regulation** (Regulation 2024/1679) specifically refers to the connectivity of free-flowing rivers in relation to the construction of new inland waterway infrastructure and includes road overpasses for animals as elements of road infrastructure and thus as projects of common interest.

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The **Common Agricultural Policy** conditionality rules require the protection of linear landscape features on farmland (Regulation 2021/2115, GAEC 8), and the creation of buffer strips along watercourses (GAEC 4) which could also provide linear connectivity. The protection of grassland outside Natura 2000 (GAEC 1) and the protection of wetlands and peatlands (GAEC 2) could provide stepping stones and structural connectivity.

The **Regulation on deforestation-free products** (Regulation 2023/1115) aims among other things to protect primary forests from conversion into plantation forests, other forests and shrublands by prohibiting the marketing of timber from such clear-cuts. Given the high degree of fragmentation of primary forests in the EU, this prohibition can be relevant for ecological connectivity. The prohibition is scheduled to enter into force on 30 December 2024. The LULUCF Regulation (Regulation 2018/84) addresses the impact of land use on sources and sinks of greenhouse gases in the EU. While it does not directly address connectivity directly, the Regulation does require Member States to keep an account of the area of forests, wetlands and grasslands on their territory.

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Formal rules of the game: Strategies and frameworks in the Danube-Carpathian countries

The realisation of ecological connectivity and Green Infrastructure will predominantly occur through national laws, frameworks, and policies. Despite the importance of these strategies, a comprehensive summary of ecological connectivity strategies and frameworks across EU countries has not yet been developed. Table 3 below presents a summary of the ecological connectivity strategies and frameworks in the 15 Danube-Carpathian countries; among them 5 non-EU countries in the process of accession. The Table includes information on the types of designated protected areas, the ecological connectivity strategy or legal framework across administrative levels, the name and legal basis of these frameworks, governance mechanisms (including the responsible authority for implementation), the stated connectivity goals (structural connectivity, functional connectivity, or none), the integration or linkage of the strategy/legal framework to Natura 2000 sites, the types of connectivity included, and the estimated coverage of the national territory included under each strategy or law.

Table 3. Summary of ecological connectivity strategies and legal frameworks at national level across project case study countries (for more information on regional/municipal levels, please, check Appendix 1).

Country	Types of designated protected areas	Ecological connectivity strategy or legal framework across administrative levels	Name/legal basis	Governance mechanisms (incl. responsible authority for implementation)	Stated connectivity goal (structural connectivity /functional connectivity /none)	Does the strategy/legal framework integrate/link to Natura 2000 sites?	Types of connectivity included	Estimated coverage of national territory included under strategy/law
Austria	National, regional, local Natura 2000 sites: 15.4% of land area. 29.2% of land covered by protected areas	National level: No Regional level: partly yes	N/A	N/A Provincial government, district authority	N/A .	N/A	N/A Green zones/green corridors	N/A

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Country	Types of designated protected areas	Ecological connectivity strategy or legal framework across administrative levels	Name/legal basis	Governance mechanisms (incl. responsible authority for implementation)	Stated connectivity goal (structural connectivity /functional connectivity /none)	Does the strategy/legal framework integrate/link to Natura 2000 sites?	Types of connectivity included	Estimated coverage of national territory included under strategy/law
Bosnia and Herzegovina	National, regional, local 4.1% of land covered by protected areas	National level: No	Federal Environmental Strategy	Division of Environmental Responsibilities	N/A	N/A	N/A	N/A
Bulgaria	International, National, regional, local 34.9% of land covered by protected areas	National level: Yes	Spatial Development Act; The Law on Biological Diversity, National Ecological Network; Lower Danube Green Corridor Declaration	Ministry of the Environment and Water	Structural, functional connectivity	Yes	Principal features of the landscape (rivers and riverbanks and water-logged old riverbeds, natural marshes, lakes, wet meadows and other wetlands, caves, rock edges, faces and dunes, valleys and other natural	N/A

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Country	Types of designated protected areas	Ecological connectivity strategy or legal framework across administrative levels	Name/legal basis	Governance mechanisms (incl. responsible authority for implementation)	Stated connectivity goal (structural connectivity /functional connectivity /none)	Does the strategy/legal framework integrate/link to Natura 2000 sites?	Types of connectivity included	Estimated coverage of national territory included under strategy/law
							landforms linking separate mountains, field boundary markings, forest shelter belts, dry meadows and pastures, flood plains and riverside vegetation, and forests located at an altitude not exceeding 500 m above sea level)	
Croatia	International, National, regional, local	National level: No (partially integrated into other laws, e.g. on transportation)	N/A (integrated into 'The Ordinance on Wildlife Crossings', 'The Common Agricultural Policy Strategic Plan')	Ministry of Economy and Sustainable Development	N/A	N/A	Due to size and location Natura 2000 is functionally connected; in transport it's	N/A

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Country	Types of designated protected areas	Ecological connectivity strategy or legal framework across administrative levels	Name/legal basis	Governance mechanisms (incl. responsible authority for implementation)	Stated connectivity goal (structural connectivity /functional connectivity /none)	Does the strategy/legal framework integrate/link to Natura 2000 sites?	Types of connectivity included	Estimated coverage of national territory included under strategy/law
	38.1% of land covered by protected areas						'green bridges', in agriculture it's Environmentally Sensitive Permanent Grasslands (ESPG)	
Czech Republic	International, National, regional, local 21.9% of land covered by protected areas	Yes - Three interconnected levels: supra-regional, regional and local	Nature and Landscape Protection Act Territorial System of Ecological Stability of the Landscape (TSES)	Ministry of the Environment, Nature Conservation Agency	Structural and functional	Yes	Green Infrastructure, biocentres and bio corridors, interactive elements	more than 56% of the country
Germany	International, National, Regional 37.4% of land covered by protected areas	National level: Yes	Federal Nature Conservation Act (national ecological network, Biotopverbund); European Green Belt Initiative	Ministry for the Environment On the state level: Highest nature protection administration (states´	Structural, functional	Yes	Landscape planning, defragmentation, Green Infrastructure	Federal Nature Conservation Act: 10% of each federal state´s territory to be destined for

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Country	Types of designated protected areas	Ecological connectivity strategy or legal framework across administrative levels	Name/legal basis	Governance mechanisms (incl. responsible authority for implementation)	Stated connectivity goal (structural connectivity /functional connectivity /none)	Does the strategy/legal framework integrate/link to Natura 2000 sites?	Types of connectivity included	Estimated coverage of national territory included under strategy/law
			(German Green Belt); States´ Nature Conservation Acts; Regional - Bavarian Nature Conservation Act (BayNatSchG)	environment ministries) Higher nature protection administration (Regierungs-bezirke) Lower nature protection administration (Landkreise)				biotope network
Hungary	International, National, Municipal 22.2% of land covered by protected areas	National level: Yes	National Ecological Network/ Instrument	The Ministry of Agriculture - Department for Nature Conservation or the Department of National Parks and Landscape Protection	Structural, functional	Yes	Core areas, ecological corridors, buffer zones,	36% of the total area of the country
Moldova	International, National 5.66% of the country's territory	National level: Yes	National Ecologic Network/Law	Ministry of the Environment	Structural goal	N/A (Natura2000 sites is in preparation)	Corridors	N/A

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Country	Types of designated protected areas	Ecological connectivity strategy or legal framework across administrative levels	Name/legal basis	Governance mechanisms (incl. responsible authority for implementation)	Stated connectivity goal (structural connectivity /functional connectivity /none)	Does the strategy/legal framework integrate/link to Natura 2000 sites?	Types of connectivity included	Estimated coverage of national territory included under strategy/law
Monte-negro	International, National, Regional 13.9% of land is covered with protected areas	National level: No	N/A	The Ministry of Ecology, Spatial Planning and Urbanism; the Nature and Environment Protection Agency	N/A	N/A (Natura 2000 sites is in preparation)	N/A	N/A
Poland	International, National, Regional. 39.6% of land area (excluding Biosphere Reserves, Natural Monuments, Ecological Areas and Nature Landscape complexes)	National level: Yes	The Polish Nature Conservation Act, The National Spatial Development Concept 2030	The Ministry of Climate and Environment, The General Directorate of Environment Protection (GDOŚ) at the national level and the 16 Regional Directorates of Environment Protection (RDOŚ) are responsible for management of Natura 2000 sites and Nature	Structural and functional	Yes	Corridors for fighting defragmentation, spatial instruments, buffer zones	N/A

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Country	Types of designated protected areas	Ecological connectivity strategy or legal framework across administrative levels	Name/legal basis	Governance mechanisms (incl. responsible authority for implementation)	Stated connectivity goal (structural connectivity /functional connectivity /none)	Does the strategy/legal framework integrate/link to Natura 2000 sites?	Types of connectivity included	Estimated coverage of national territory included under strategy/law
				Reserves, as well as species conservation				
Romania	International, National, regional, 23.4% of the national territory covered by protected areas	National level: No (although the spatial planning legislation mentions ecological corridors)	N/A; Spatial legislation is National Spatial Plan, County Spatial Plans, and Zonal Regional Spatial	The Ministry of Environment, the Water and Forests Agency and the Protected Area Agency	Structural and Functional (as part of land-use planning)	N/A; Spatial planning legislation refers to Natura2000 cites	Ecological corridors (e.g. natural river valleys, semi-natural recreation areas for local settlements), core areas,	N/A
Serbia	International, National, regional, 10.5% of land covered by protected areas	National level: Yes Regional level: Autonomous Region Vojvodina	Law on Nature Conservation, The Serbian Regulation on the Ecological Network, The Spatial Planning legislation 'Law on Planning and Construction'	Ministry of Environment, provincial Secretariat for the Environment	Structural	N/A	Ecological corridors, mainly larger and smaller watercourses including structural and functional connectivity, ecologically significant areas,	N/A

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Country	Types of designated protected areas	Ecological connectivity strategy or legal framework across administrative levels	Name/legal basis	Governance mechanisms (incl. responsible authority for implementation)	Stated connectivity goal (structural connectivity /functional connectivity /none)	Does the strategy/legal framework integrate/link to Natura 2000 sites?	Types of connectivity included	Estimated coverage of national territory included under strategy/law
							protection zones	
Slovakia	International, National, regional, local 37.4% of land covered by protected areas	National level: Yes	State Nature Protection Act No. 543/2002 on Nature and Landscape Protection; Spatial law - Territorial System of Ecological Stability (TSES)	Ministry of the Environment; Regional Environmental District Offices; State Nature Conservancy	Structural	Yes	Bio-centres, bio-TSES corridors, interacting elements and eco-stabilising measures	N/A
Slovenia	International, National, regional, local 40.5% of land covered by protected areas	National level: Yes	Spatial Planning Strategy of Slovenia 2050	The Ministry of Natural Resources and Spatial Planning	N/A	Yes	Ecological networks, Green Infrastructure	N/A
Ukraine	International, National, regional,	National level: Yes	'On the National Programme for the Formation of the National Ecological	Ministry of Environmental Protection and Natural Resources of	Structural and functional	No	Ecological corridors, stepping stones, rivers and riparian	N/A

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Country	Types of designated protected areas	Ecological connectivity strategy or legal framework across administrative levels	Name/legal basis	Governance mechanisms (incl. responsible authority for implementation)	Stated connectivity goal (structural connectivity /functional connectivity /none)	Does the strategy/legal framework integrate/link to Natura 2000 sites?	Types of connectivity included	Estimated coverage of national territory included under strategy/law
	10.4% of land covered by protected areas		Network of Ukraine for 2000-2015'; the Law of Ukraine 'On the Ecological Network'	Ukraine; Regional Environmental Departments			zones, reservoirs, forests, windbreaks, and grasslands, core areas	

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In the following, a few positive examples related to the legal protection of ecological connectivity in some of the Danube-Carpathian countries are described.

Legal protection of connectivity

Many EU Member States have formally designated ecological networks (see Table 3). Providing the ecological corridors, rivers, stepping stones and other landscape elements of ecological networks with an adequate degree of legal protection is important for the long-term functionality of such networks. This section complements the review of legislation in the case study. It is also worth noting that designating corridors with legal protection is very similar to designating protected areas in terms of challenges and best practice.

An example of best practice for the legal protection of connectivity is the protection of the network of protected areas in the **Czech Republic** (Václav et al., 2021). The Czech Republic has a network of protected areas based on Act 114/1992 on Nature and Landscape. This Act is complemented by Act 183/2006 on Spatial planning and Buildings Regulations. The Nature and Landscape Protection Agency AOPK of the Czech Republic is responsible for implementing this act developed guidance on how to integrate connectivity requirements for large mammals into spatial planning.

The guidance introduces a map of biotopes, migratory corridors and bottlenecks. Bottlenecks have a high degree of protection. The AOPK will not permit buildings or infrastructure that would reduce passage by large mammals. Migratory corridors have a lower degree of protection. When constructing new buildings, a minimum corridor width of 500 meters needs to be maintained. New linear infrastructure can be subject to mitigation measures. Most types of fences are prohibited. New waterworks are assessed on a case-by-case basis.

Legal protection of wildlife crossings is a best practice measure to ensure their functionality. **Croatia** has a substantial population of large carnivores. Wildlife crossings allow these mammals to cross highways for example the highway from Zagreb to Rijeka through the Dinaric Alps which were found to be highly effective (Kusak et al., 2009). The legal basis for wildlife overpasses is the Ordinance on Animal Crossings (Government of Croatia, 2006). This Ordinance divides corridors into category I corridors (crossings for small wild animals (up to 20 meters wide, existing crossings for all wild animals up to 600 meters wide, and specially constructed crossings) and category II (corridors wider than 600 meters).

The Ordinance obliges the developer to construct wildlife crossings, and the legal entities responsible for roads, railways, forests, water and water resources to maintain their permeability, as well as to maintain the vegetation in a radius of 300 meters. On category I crossings all human activities (hunting, economic activities, recreation, etc.) are prohibited that temporarily or permanently affect the functionality of the corridor.

Rivers are often important structural connections between protected areas. A study on river connectivity on the **Balkan peninsula** found that 52% of the protected land area is connected by rivers without large dams generating more than one Megawatt (Papazekou et al., 2022). Planned dams will reduce this area to 33%. Strategic planning of hydropower is considered best practice, on a basis of optimal selection of further sites for hydropower in combination with dam removal. Local communities have been key stakeholders in preserving connectivity in several countries, and empowering them in decision making is crucial, as is ensuring international cooperation and funding for non-EU countries.

Combining floodplain restoration with flood protection has shown its potential in **Hungary**. A study reviewed floodplain restoration initiatives and policies in the country and five others (Schindler et al., 2016). Historic and recent losses in floodplain connectivity occurred due to many different pressures including hydrological alterations, agricultural intensification, hydroelectric dams and urban development. The major successes in floodplain restoration in Hungary shared extensive stakeholder involvement in all stages of the process and a task for the relevant agencies managing floodplains to address flood protection as the number one

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priority. In addition, National Park Directorates played a key role in Hungary as local champions.

4.2.2. Rules of the game at the international and transnational levels in the Danube-Carpathian region – stakeholders' perception of international treaties

An important global policy framework for the Danube-Carpathian region is the **Convention on Biological Diversity** (CBD) and the related Global Biodiversity Framework (GBF). All countries in the region are parties to the CBD, which provides an overarching direction for the extension of protected areas to 30% of the land surface, with 10% of land strictly protected and the ecological network creation. Although it is not legally binding, the global goals and targets in this agreement give countries a set of markers to guide action. One interviewee acting transnationally mentioned 'Even if the GBF does not have any implementing power, it ensures that all counties have a common set of objectives, which is a first step to open the discussions'. In the context of the Carpathian region, the Parties to the **Carpathian Convention** (CC) have aligned the Carpathian Biodiversity Framework to the GBF and adopted the new Framework at the 7th Conference of the Parties in autumn 2023. The results of the interviews data on Connectivity barriers at the transnational level is possible to see below in Figure 11.

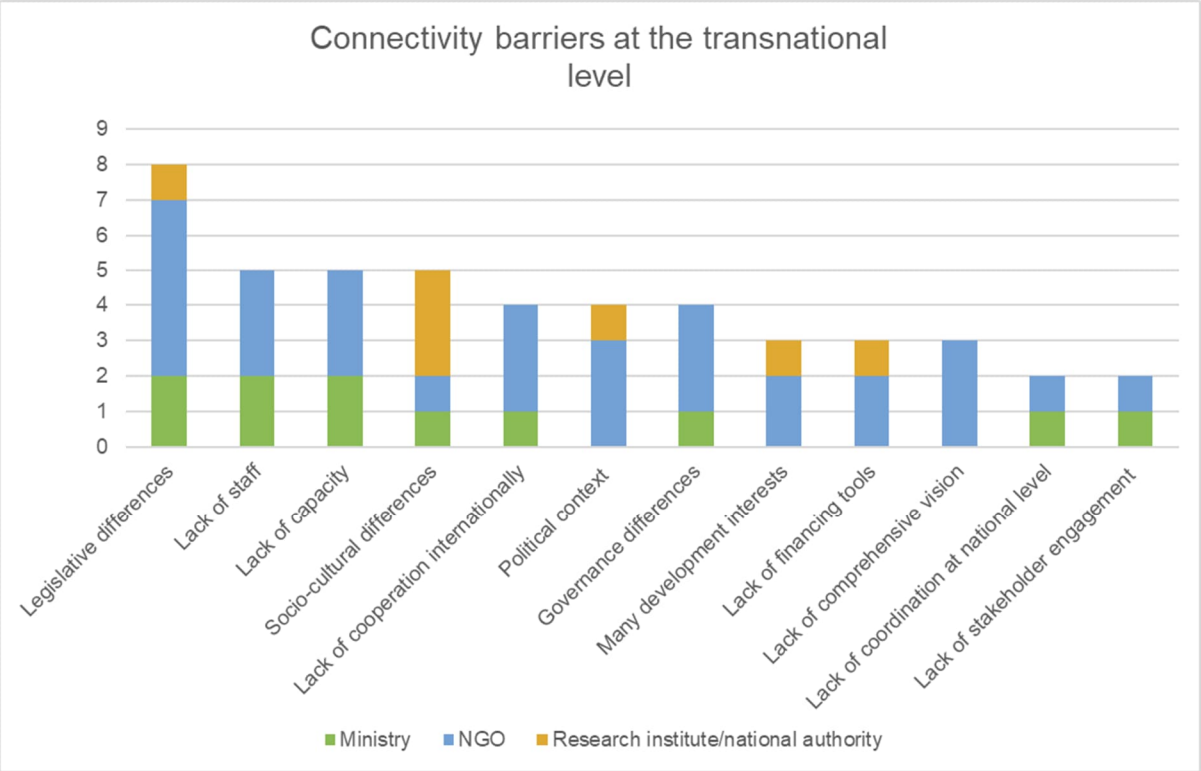

Figure 11. Connectivity barriers at the transnational level; results of 43 interviews analysed using MAXQDA software.

The **International Commission for the Protection of the Danube River** (ICPDR), the **Carpathian Convention** and the **EU Strategy for the Danube Region** (EUSDR) provide good transnational cooperation platforms in the region. Their strategic directions and action plans are dedicated to cooperation in line with the principles of sustainable development, for the benefit of the people living in the region. The formal and informal rules associated with the aforementioned bodies were explored via perceptions expressed by interviewees and

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workshop participants. Emphasis was placed on the role of regional governance bodies in facilitating transboundary cooperation in the designation/connection of protected and conserved areas.

There is a certain lack of awareness of the functions of such bodies like ICPDR or EUSDR or a lack of participation in joint actions. For example, there is a lack of national representation in the conventions, in strong connection to the lack of political will, as stated by an interviewee from Serbia.

Hereafter are several positive and difficult elements mentioned by the interview participants in relation to the ICPDR, EUSDR and the Carpathian Convention (Table 4 and Figure 12).

Table 4. How stakeholders in the region perceive the regional governance bodies (Carpathian Convention, ICPDR, EUSDR); results of 43 interviews conducted in the Danube-Carpathian region.

Item	Explanation
Space for discussion	Regional governance bodies provide a platform for effective communication and allow parties to meet and discuss in person and exchange experience (interview, Czech Republic). Regional governance bodies were mentioned by several interviewees (ten) as extremely important tools for promoting dialogue and coordination at the regional level and 'helping to address transboundary environmental challenges and the exchange of perspectives (interview, Slovenia).
Guidance and protocols	Four interviewees described the development of protocols as useful (Czech Republic), guidance (Slovakia), joint monitoring programs, information sharing mechanisms, and capacity-building activities by regional governance bodies (Slovenia).
Pressure to act	Two interviewees described the mechanisms of regional governance bodies as helpful in creating pressure for the governments to act. For instance, one NGO representative mentioned the following 'demonstration effect', when one country implements the decision (often to 'impress') and its neighbouring countries follow the example (interview, Romania). Additionally, it is said that regional governance bodies 'create some kind of international pressure where the national government can feel uncomfortable with doing the 'bad' things.' (interview, Slovakia).
Limited stakeholder engagement	Especially NGO participation, due to the communication only through a governmental associated Focal Point which is restricted and not inclusive enough; therefore, the operational effectiveness can be questioned, despite having a potential to influence the decisions (interview, Croatia). Some environmental NGO representatives were not familiar enough with the activities of regional governance bodies, which consequently can lead to lower levels of engagement. This assumption is in contrast to the principles of the Carpathian Convention where all interested players in the region including NGOs, academia etc. are welcome to participate in the role of observers
Lack of effective of national involvement	The reason is appointed ministries lack staff capacity (interview, Montenegro) and also knowledge (interview, Austria). Some interviewees implied that the decision process of regional governance bodies take a long time (interview, Austria).

It is important to note that the interview participants' perceptions related to transnational and regional cooperation bodies are varied. In Figure 12 below, the various perceptions related to regional governance bodies are illustrated based on the interviews. The graph represents the views of three groups of interviewees: NGO representatives, ministry representatives, and representatives of either research institutes or national authorities (e.g., National Conservancy Agency).

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According to the interview results, ministry representatives are more likely to attribute a key role to regional governance bodies compared to NGO representatives, with a ratio of 6 to 5. Additionally, NGO representatives are more inclined to describe regional governance bodies as 'soft tools' or 'weak' compared to ministry representatives, with a ratio of 10 to 2. Furthermore, NGO representatives provided more suggestions for improvements for these bodies, whereas ministry representatives preferred to mention solely the positive sides attributed to the regional governance bodies.

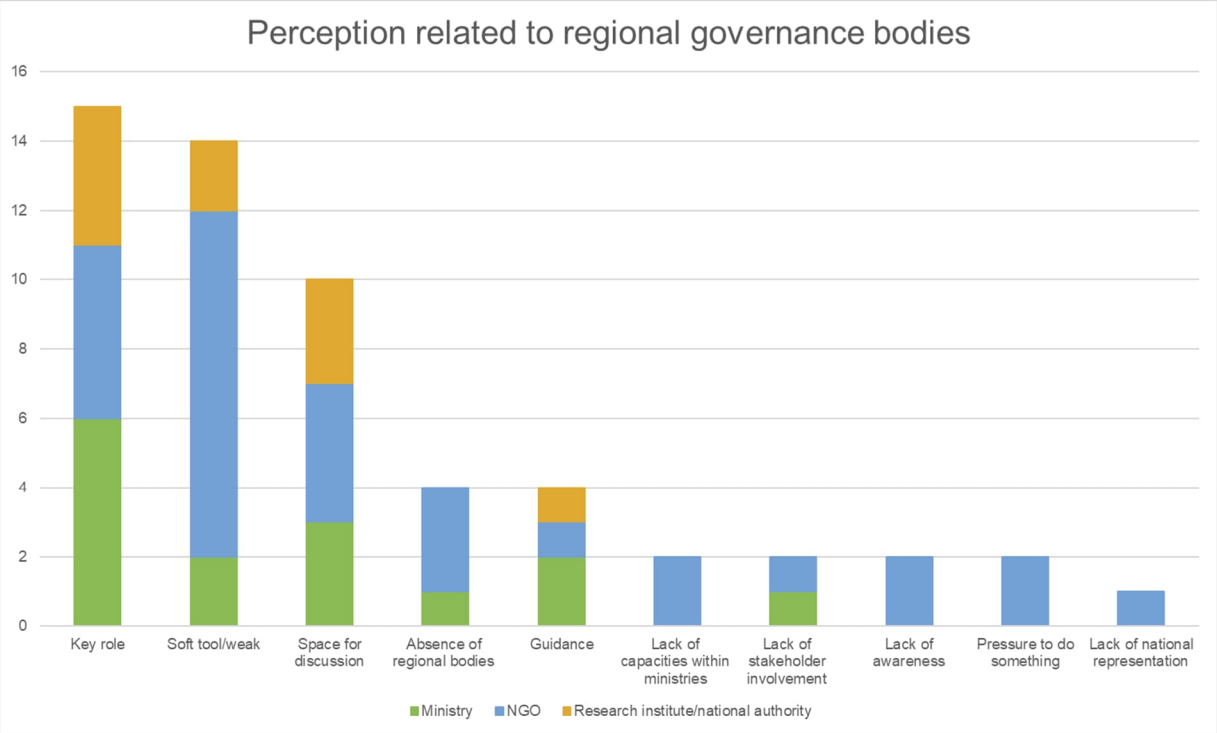

Figure 12. Perception related to regional governance bodies; results of 43 interviews analysed using MAXQDA software.

Hereafter, are some successful examples of cross-national collaboration within regional governance bodies, provided by the interviewees:

- Successful usage of the 'methodologies issued from the projects developed under the Carpathian Convention' (interview, Romania).
- Projects under the umbrella of the Carpathian Convention such as TRANSGREEN or SaveGREEN are said to have good results, although implementation is still lacking at the national level (interview, Slovakia).

International treaties, regional frameworks and EU legislation are connected and do not work independently from each other. The CBD signed a Memorandum of Cooperation with the Carpathian (CC) and the Alpine Convention, CC signed various memoranda of cooperation with the EUSDR Priority Areas (PA)1b Mobility - Rail-Road-Air, PA2 Energy, PA4 Water Quality, PA5 Environmental Risks and PA6 Biodiversity, and an Initiative of Mutual Observership Status between the Secretariat of the CC and the ICPDR. EUSDR Priority Areas 4 and 5 signed a Joint Paper on Cooperation and Synergies with the ICPDR.

The Joint Declaration 'Achieving functional biodiversity in the Danube-Carpathian Region by mainstreaming ecological connectivity' laid the basis for cooperation between the ICPDR, CC and EUSDR PA4, PA5 and PA6 where they committed to strengthen cooperation on the implementation of ecological connectivity at all levels and sectors (‘Achieving functional

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biodiversity in the Danube-Carpathian Region by mainstreaming ecological connectivity,' 2022).

However, according to some interviewees, they are too theoretical, 'We are generally a little bit reluctant when it comes to having these kinds of MoU because it's the activity that matters, not the process.' (interview, international actor).

The European Green Deal, EU Biodiversity Strategy for 2030, Habitat and Birds Directives, Environmental Impact Assessment Directive, Water Framework Directive, Common Agricultural Policy and other EU agreements create a comprehensive framework which unites the Member States in the call to address environmental challenges. The obligations of the EU Member and candidate states for the mentioned frameworks are very often referred to by the interviewees as the main drivers for the legislative change in the country (interview, Montenegro). It is important to note that some interviewees mentioned that the national governments lack a proactive approach towards implementing the EU policies related to nature protection (interview, Bulgaria). For some ministries in the EU countries, meeting the obligations under the EU Biodiversity Strategy 2030 (interview, Austria) and Nature Restoration Law (interview, Hungary) is considered 'unrealistic'.

Biodiversity-related EU directives are not implemented sufficiently. 'The EU sits on the Habitats Directive, and they don't impose it in the way that we would like them to impose it', interview, transnational actor. According to this actor, the EU should strengthen the legislation and the implementation mechanisms at the national level.

Nevertheless, most interviewees consider EU legislation as helpful. With regards to Austria, the current infringement procedure was recognized as a driver for the administrations to work on the issues raised and take steps forward. The pressure from the European Union and the Commission played a role in reaching a satisfactory level of protected areas (interview, Austria). An additional influence factor is funding from the EU for infrastructure projects, where it is required to take into consideration Natura 2000 sites and other impacts on protected areas (interview, Hungary). On top of that, the existence of such a 'request from a higher institution or a higher competence' highly contributes to the enhanced collaboration between federal states and lands that are usually separated and complex to coordinate (interview, Austria).

4.2.3. Rules of the game related to protected areas governance and management at the national level – stakeholders' perception

In the Danube-Carpathian countries, various bodies are in charge of governing and managing protected areas: environment ministries, protected area agencies, regional/local governments or agencies, state-owned agencies and NGOs. The **set of formal rules at the national level** (laws, strategies, governance structures etc. related to TEN-N implementation) is described in Appendix 1 and the summary for better comparison capabilities of the national legislation in regard to the protected areas and ecological connectivity is synthesised in a summary table presented above (Table 3).

Protected areas are core areas for a well-connected TEN-N, therefore, their efficient and proper management toward a favourable conservation status of the area is of utmost importance for ecological connectivity. The interviewees from all countries pointed out that protected areas lack capacity in various ways. The main barriers around protected areas, as reflected by the interviews, are displayed in Figure 13.

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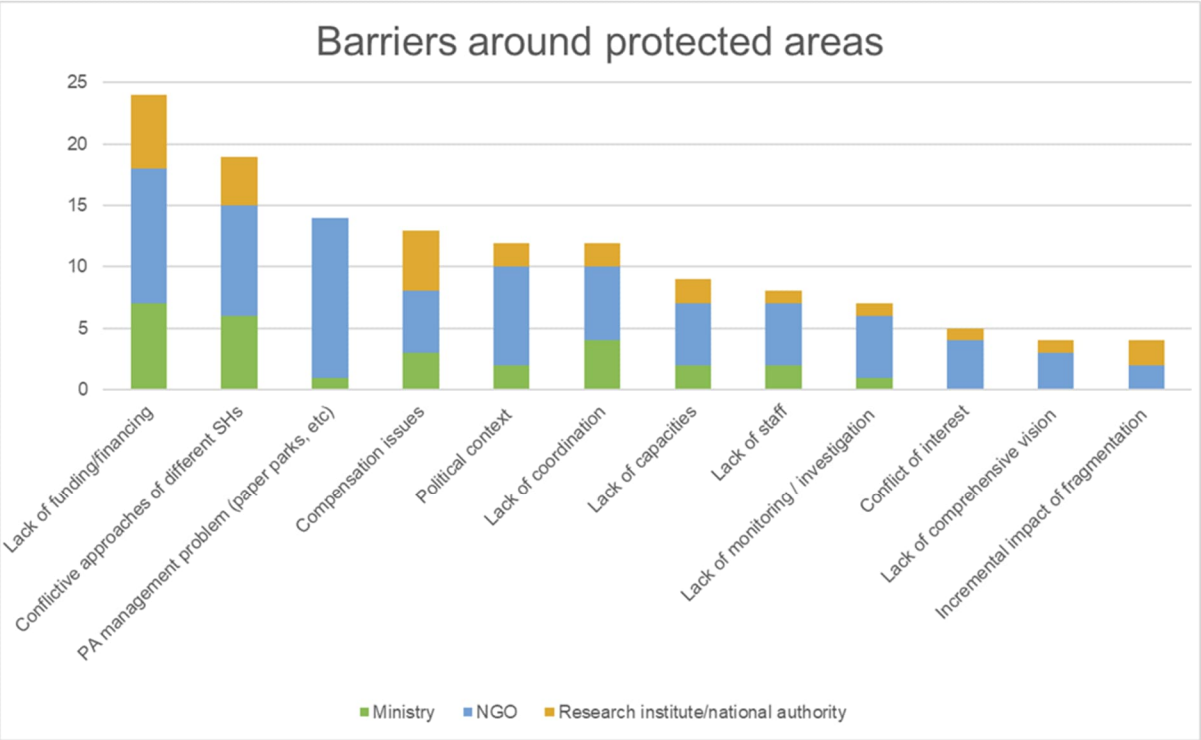

Figure 13. Barriers around protected areas related to their management; results of 43 interviews analysed using MAXQDA software (SH = stakeholder).

Table 5. Description of barriers around protected areas related to their management; results of 43 interviews conducted in the Danube-Carpathian region.

Barrier	Explanation
Lack of funding/ financing	As we can see in the visualisation of the interview results (Figure 13), the lack of funding is mentioned by the largest number of interview participants i.e. 24 participants in total. In general, this is described as the main issue in the way of effective management of protected areas at the national level. For example, 'the funding is very often not enough and not sufficient for effective management of protected areas. So, this is the big issue here in Montenegro; funding is not enough for effective governance of the protected areas.' (interview, Montenegro).
Conflictive approaches of different stakeholders	Conflictive approaches of other stakeholders are mentioned as one of the biggest issues by most of the interviewees. The detailed description is available in the People and Organisations section below (Chapter 4.3 People and organisations).
Protected area management problem	The following major problem was revealed during the interviews. Many interviewees mentioned the problem of 'paper parks', a wording first developed for marine protected areas (Di Cintio et al., 2023) (Relano and Pauly, 2023) (Perry et al., 2020). 'Paper parks' are designated protected areas without management and thus, are not effective in conserving natural features. For example, one interviewee from Hungary said 'On paper we have a lot of protected forests. But on the other hand, the management of those forests is not really different from the management of those which are not protected or not under Natura2000.'
Compensation issues	According to the results of the interviews, the absence of a compensation mechanism for income forgone due to the protection status of land is an important barrier to effective protected area designation and to reaching a good level of

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	ecological connectivity. This issue is observed in many countries such as Austria, Slovenia, Germany, Serbia, Bulgaria, Romania, and Slovakia.
Political context	Political context, which includes the level of political will, and the dynamics of political powers in the country, plays a crucial role in protected area management effectiveness. The political context was mentioned most frequently as a barrier by the participants (27 times throughout the interviews). According to the interviewees, the effectiveness of the protected area instruments and legislation cannot be measured solely based on the official description of the protected area management system and it is highly dependent on the political context. For example, an interviewee from Serbia mentioned that: 'The main barrier is the political context, the political issues. At the operational level, the protected area managers are finding a way, somehow, to cooperate. For example, with Croatia, we have a border dispute along the Danube. And it's really complicating the whole situation. But you can see that at the operational level, at least something is happening there. I would say that the political context is still one of the big obstacles in the region, depending on the country'.
Lack of coordination	Lack of coordination among ministries, NGOs, and academia poses a challenge to the effectiveness of managing protected areas. In some countries, the level of coordination is very low due to the complicated political system and division (Bosnia and Herzegovina), or due to the federal structure of the lands in the country (Germany, Austria). The issue of effective coordination can be seen in Ukraine mainly due to the war. In Croatia, one interviewee mentioned 'One of the biggest problems is that ministries do not communicate very well between them because one minister is from one political party, and another is from another. And this is a huge problem.'
Lack of capacities	It is mentioned by a few interviewees that especially authorities in rural communities have rather limited capacities to support the implementation of the frameworks on the ground (interview, Moldova). There is also a lack of technical equipment at the local level (interview, Montenegro). On top of that, some interviewees referred to the general lack of expertise, both at the ministry level (interview, Montenegro), but also at the local level (interviews, Bosnia and Herzegovina, and Montenegro).
Lack of staff	The lack of staff in ministries and other authorities creates a significant disturbance in the efficient management of protected areas. In this sense, the flawed capacity loop triggered by low motivation and low salaries was mentioned (interview, Bulgaria). Some interviewees referred to the capacity issue relating to the burnout of existing staff due to heavy workload (interview, Slovenia).
Lack of monitoring/ investigations	The lack of monitoring or investigation was mentioned several times in connection to the issue of corruption (Moldova, Bosnia and Herzegovina, Ukraine). Corruption is driving environmental degradation and biodiversity loss, enabling the illegal exploitation of the natural environment.
Conflict of interest	National forest administrations are responsible for both the conservation of the protected areas and the economic activities meant to generate profit and pay salaries (Romania, Serbia).
Lack of comprehensive vision	The lack of a comprehensive vision of protected areas and the absence of clear strategies at the national level play a negative role in effective protected area management and designation. The interviewee from Slovenia said, 'The policy system in general is not very effective because the state doesn't have a clear perspective on what they would like to do with nature at all. … The ministry is weak, the parks are weak, and funding from the national budget is very poor. We have a concession for one state-owned nature reserve, and we are managing the site. With the funds from the government, we could not run it. We always need to apply for additional projects to cover all the costs of staff and material.'

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NATURA CONNECT

Incremental impact of habitat fragmentation	The urgent need to address the rapidly advancing process of habitat fragmentation was mentioned by several interviewees (Austria, and Slovenia). 'The main problem, not only in our country, is the small steps. For example, if a young family wants to stay in a village and build a house bordering Natura 2000 sites, the impact of that house on the site is small. You can't say no, but when is it enough? These small steps, calculated over a year, cover a large area and have a significant impact on our environment and natural values year after year. We can't stop this, and it's a huge problem.' (interview, Slovenia).

4.2.4. Rules of the game related to ecological connectivity at the national level – stakeholders' perception

All EU Member States have a National Biodiversity Strategy, and non-EU Member States in the region are updating their National Biodiversity Strategy and Action Plans (NBSAP) under the Convention on Biological Diversity. Various strategies include laws/rules on the identification and management of ecological connectivity. These laws/rules are mostly broad and vague. For example, the **Polish** Nature Conservation Act defines an ecological corridor as 'an area for the migration of animals, plants and fungi". However, there is no legal form of protection (interview, Poland). Poland can use one of their nine categories of protected areas, the landscape protected area, as a corridor. 'It is explicitly stated that one of the aims of this protected area type is ecological connectivity. So, it should fulfil the role of an ecological corridor' (interview, Poland).

On the other hand, there are countries in the DCR that include ecological networks in spatial planning. In the **Czech Republic** and **Slovakia**, in the 1990s, the Territorial System of Ecological Stability of the Landscape (TSES) was established and must be considered in spatial planning. It comprises three components, bio-centres, bio-corridors and interacting elements connected by ecological corridors.

According to the interviews, TSES still has design and implementation problems. First, the TSES should be better designed and updated since it was created in the 1990s. Being a spatial planning instrument and elaborated by spatial planners, interviewees suggested that nature conservation experts revise the TSES (interviews, Slovakia, and Czech Republic). The TSES does not integrate any new infrastructure development or changes in biodiversity (interview, Czechia). Moreover, some parts of the Slovakian TSES are not digitised and are, therefore, not accessible to all experts. Consequently, they are not used regularly. Nevertheless, an interviewee from Slovakia observed positive but slow progress.

Second, when designated, the corridors should be protected in the Czech Republic and Slovakia. In many cases, they are not secured due to contradicting interests around the area of ecological corridors - linear transport infrastructure, agriculture, forestry, and settlements. An interviewee from the Czech Republic stated that nature conservation was not a priority. Moreover, there is no control system if ecological corridors are respected. Several interviewees called for stronger legislation. In the Czech Republic, nature conservation took a step forward and put under protection a network of migratory routes for large carnivores in 2020 which must by law be considered at all levels of land use plans. However, the corridors were put under protection without the participation of local stakeholders who were not informed about the corridor areas.

Hungary established the National Ecological Network with core and buffer zones, and ecological corridors as a spatial planning instrument. Rules were set, like establishing a new mine is forbidden, but their implementation was weakened recently during the period of special legal order when the government rules by decrees. The new decrees allow for opencast mining and other infrastructure development in ecological corridor zones (interview, Hungary). The interviewee resumed, 'The good news is that we have a national ecological network; the bad news is that it does not work'.

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NATURA CONNECT

In many countries in the region (e.g. Austria, Poland, Romania) teams of experts modelled and partly verified ecological corridors mainly through short-term projects. In Romania, a working group started creating a methodology for identifying and designating ecological corridors in 2014. So far, the ministry has not made any decision, even though ecological corridors are mentioned in the spatial planning legislation (interview, Romania). An interviewee stated that the decision-making process would take so long as the subject is rather delicate to deal with related to the landowners who have a share in the ecological network (interview, Romania). There are no formal rules for the corridor designation and their management and monitoring. This leads to the fact that their locations are undefined. Regular monitoring is necessary to assess trends in connectivity (structural and functional) and settle efficient management measures (workshop participants). In response to this situation, new Natura 2000 sites could be established as stepping stones for connectivity. 'Now we have to improve the legislation (...) to identify and designate (these sites) with a legal act as corridors and not to be confused or assimilated with protected areas' (interview, Romania).

Financial contributions to establish landscape elements improving ecological connectivity are scattered across different policies (CAP, ERDF, rural development funds, etc.). CAP in Austria, for example, funds farmers who establish flower strips or hedgerows on their territory only. There is no connection to the neighbours' territories; only in case they collaborate. The broader view of connectivity is missing.

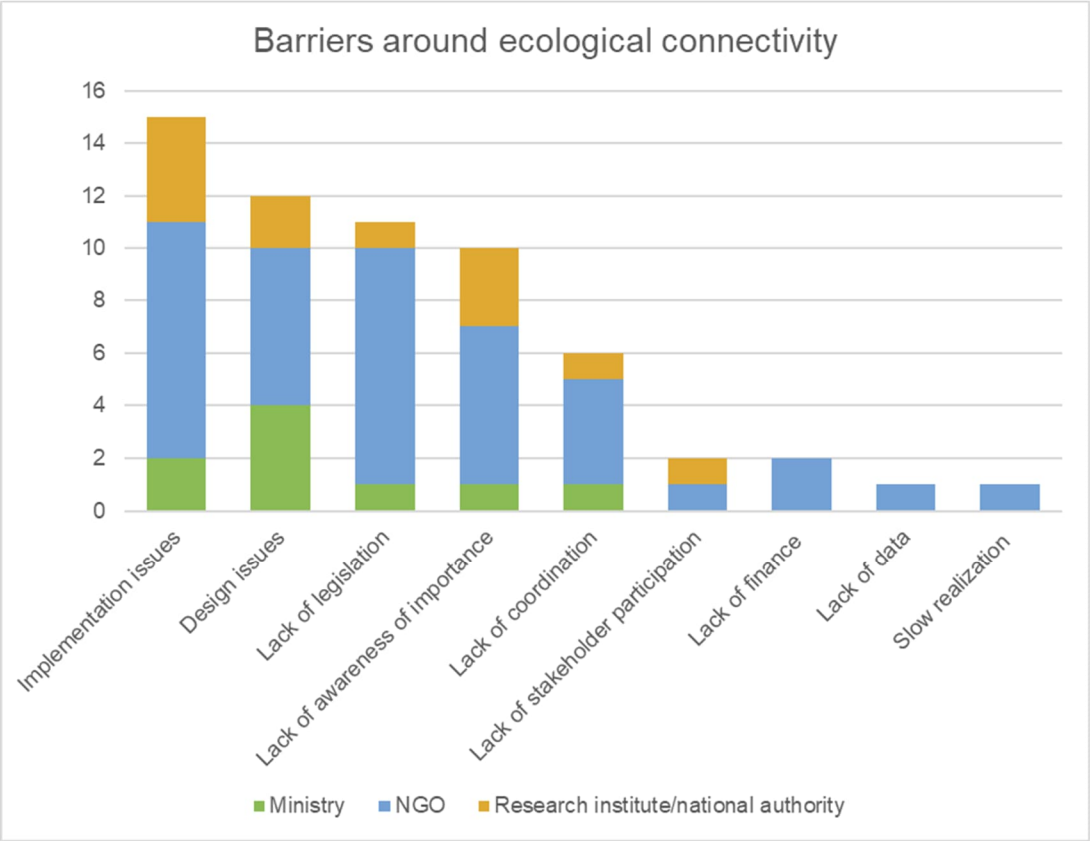

Figure 14. Barriers around the establishment of ecological connectivity in the Danube-Carpathian region; results of 43 interviews analysed using MAXQDA software.

In the following results of the interviews (Figure 14) are described in detail.

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Implementation issues

Implementation issues for ecological connectivity are referred to by the interview participants the most, in particular in 15 interviews. The issues connected to the implementation of ecological corridors are the following:

- Despite legal provisions and mapping efforts, actual management of ecological corridors remains inadequate. In Serbia, for instance, there is recognition on paper but little to no practical implementation or conservation efforts in the field (interview, Serbia).
- Political will and financial support are crucial but often missing. Interview participants from countries such as Hungary and Germany highlight the discrepancy between legislative mandates and actual financial allocations for managing and expanding ecological corridors (interviews, Hungary and Germany).
- Even with the official implementation of an ecological corridor, there are still doubts as to whether these corridors fulfil their function - 'In case by case decision, there are often discussions and I'm not sure if it really works or whether these overall goals are overridden by spatial interests like wind turbines or things like that, or hunting grounds or fences' (interview, Austria). Lack of strategy towards the establishment of ecological connectivity is often referred to (interview, Germany).

Addressing these implementation issues requires enhanced financial resources, improved coordination among stakeholders, strengthened political commitment for transboundary cooperation, and bridging the gap between legislative frameworks and on-ground action. Only through concerted efforts can countries effectively realise the ecological benefits of interconnected protected areas and corridors across Europe.

Design issues

Among design barriers is the lack of data and information (interview, Romania), as pointed out by an interviewee from Slovakia, 'We lack the complete database about where they [ecological corridors] are. We are working on that, but it's still not done.'

A significant design issue is the prolonged discussion and insufficient implementation of the zoning system in national parks. An interviewee from Hungary pointed out that the need for a zoning system has been stipulated in conservation law for more than 25 years, but little progress has been made. Despite ongoing negotiations among key stakeholders, including National Park Directorates, the Ministry of Agriculture, and State Forest Companies, the establishment of these zones remains largely unfulfilled. One successful example is the implementation of a zoning system at Hortobágyi National Park, but this remains an exception rather than the norm (interview, Hungary). Another design flaw identified by the interviewees is the failure to identify ecological corridors for various species. Although the ConnectGREEN project has mapped corridors for large carnivores, this crucial information is lacking for most species (interview, Romania). This omission leads to protected areas becoming isolated, which hinders species movement and genetic exchange, threatening biodiversity (interview, Montenegro).

Lack of legislation

The challenge of establishing effective ecological corridors is exacerbated by insufficient legislative support across many countries in the Danube-Carpathian region:

- Absence of legislation - ‘absence of legislation on their regard’ (interview, Serbia), Bosnia and Herzegovina (BiH), ‘There is no specific legislation addressing ecological corridors in Bosnia and Herzegovina. The absence of legal frameworks hampers coordinated conservation efforts and sustainable development planning’.
- Important habitat corridors are not legally protected and rely on voluntary guidelines, varying in the federal states, ‘Although Austria has identified important habitat corridors,

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these designations lack legal protection status. They serve more as guidelines without enforceable protection measures, varying in implementation across different federal states' (interview, Austria).

- Absence of clear national-level legislation hampers biodiversity initiatives and local conservation efforts - 'Biodiversity advisors in Germany struggle with poor framework conditions and a lack of clear legislation at the national level. Local initiatives often face challenges in transposing into comprehensive legal protection' (interview, Germany). Despite consultation efforts, comprehensive legal frameworks for conserving ecological corridors are lacking (interview, Romania). Another issue connected to it is fragmented efforts due to the ineffective state-level legislation, 'Slovenia lacks state-level legislation specifically addressing ecological corridors. This gap results in fragmented conservation efforts and uncertain protection measures' (interview, Slovenia).
- The mapped ecological network lacks legislative support for monitoring, hindering effective implementation, 'The Ukrainian ecological network, while mapped, lacks effective legislative support for monitoring and conservation (interview, Ukraine). The construction of major infrastructure projects such as highways without adequate consideration for ecological corridors has been identified as a spatial planning oversight in Slovakia (interview, Slovakia). Additionally, there is a significant gap in translating this data into actionable policies or legislative frameworks, which limits its real-world impact. (interview, Slovakia).

These examples underscore the critical need for robust legislative frameworks across Europe to ensure the effective establishment and protection of ecological corridors. Clear and enforceable laws are essential to safeguarding biodiversity and promoting sustainable development amid increasing pressures from human activities.

Lack of awareness of importance

Ecological connectivity faces significant challenges globally due to a pervasive lack of awareness among stakeholders and decision-makers. Key observations from the interview participants underscore this critical issue in the following way:

- Misunderstanding - stakeholders often misunderstand the goals of ecological connectivity, viewing it as a hindrance rather than a necessity for biodiversity conservation (interview, Austria). On top of that, 'Financial sectors have the misconceptions that conservation designations decrease land values, contributing to societal apathy towards supporting ecological connectivity' (interview, Germany).
- Lack of integration into planning processes - municipalities and regional planners frequently fail to integrate ecological corridors into their planning processes, despite acknowledging their existence on maps (interview, Slovenia,).
- Insufficient governmental recognition - governments exhibit inadequate recognition of the importance of ecological corridors, leading to a lack of supportive policies and funding (interview, Bulgaria).
- Limited engagement with stakeholders illustrates the communication gap between conservationists and stakeholders (interview, Austria).

Lack of coordination

The challenge of achieving effective ecological connectivity is compounded by a notable lack of coordination and integration as highlighted by the interview participants:

- Exclusion of NGOs from decision-making processes (Hungary), discords between environmental experts and the ministries regarding the implementation and definition of biotope networks (Germany).
- Efforts to establish transboundary ecological connectivity, such as for Lake Skadar in Montenegro and Albania, often face political challenges and a lack of cooperative frameworks (survey, Montenegro).

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- There is a disconnection between legislative frameworks and practical implementation. In many countries such as Ukraine and Moldova, the ecological network exists on paper but lacks the necessary resources, funding, and coordinated efforts for effective establishment and maintenance (interviews, Ukraine and Moldova).

The two survey participants from the agricultural sector responded to the question about the main barriers to integrating ecological connectivity into their field as follows: lack of coordination between authorities and/or no functional administrative authorities, lack of legislation, lack of data and monitoring, non-secure tenure rights for connectivity, land abandonment and vegetation succession, intensive agriculture and primacy of agricultural profits, and lack of awareness. Interestingly, these points are similar to what the environmental sector analysed as barriers.

4.3. People and organisations

Here the analysis focuses on identifying stakeholders and their relationships mainly with elements of power, influence and exclusion, including, but not restricted to positions, interests and needs, power and relative power, incentives and disincentives, and their space to act. Interests are not the only drivers for certain behaviour; ideology, affiliation, constraints and knowledge can be drivers too. Effective influence is all about power and its direct and visible forms as well as hidden forms. We used the matrix of stakeholders (Figure 15) to map the involved actors' support, influence and interest in relation to TEN-N.

If you want to learn more about the stakeholder analysis methodology, please refer to the Stakeholder Engagement Module on the NaturaConnect Learning Platform.

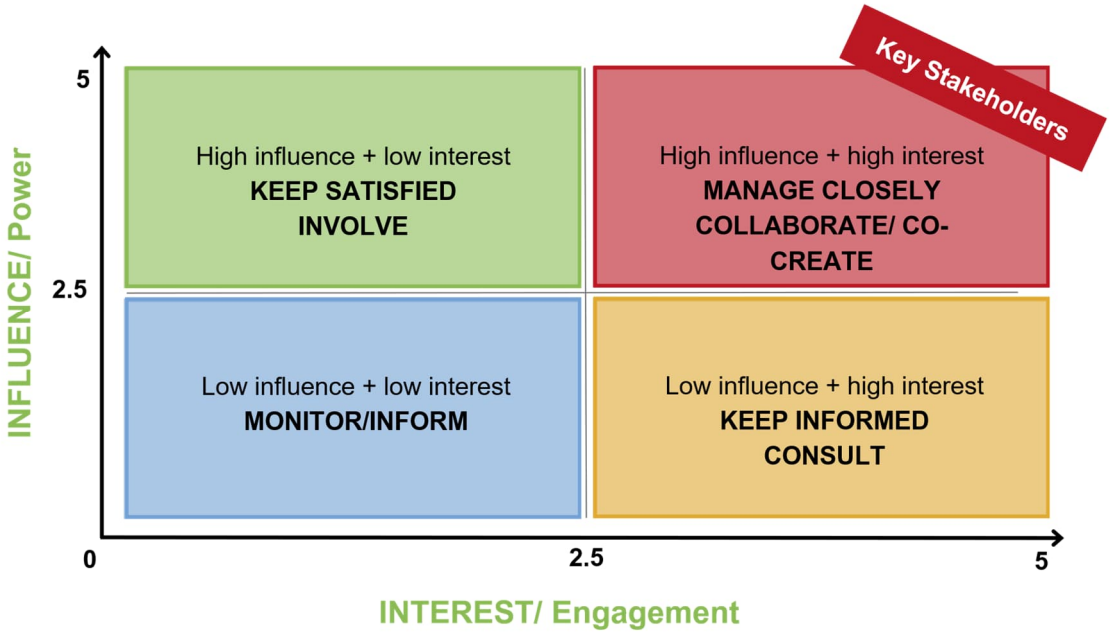

Figure 15. Mendelow stakeholder matrix applied by the NaturaConnect project, adapted by NaturaConnect/EUROPARC Federation based on (Mendelow, 1981).

Two main types of stakeholders have been identified by the case study team as playing a role in establishing TEN-N in the Danube-Carpathian region. Firstly, those involved in nature conservation or its regulation, and secondly those involved in land-use (agriculture, forestry, etc.) and development (transport and energy infrastructure, etc.). Ideally, those sectors

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collaborate for the best solutions integrating the needs for biodiversity, ecosystem services, ecological connectivity and with it, human welfare.

4.3.1. Actors at the transnational level in the Danube-Carpathian region

There are three international treaties in the DCR, all of which commit to sustainable development of the region which comprises a balance of social, economic and environmental aspects. In the following the International Commission for the Protection of the Danube River (ICPDR), the EU Strategy for the Danube Region (EUSDR) and the Carpathian Convention are briefly described.

International Commission for the Protection of the Danube River (ICPDR)

The International Commission for the Protection of the Danube River (ICPDR) is a transnational body established in 1994 to implement the Danube River Protection Convention (DRPC), the major legal instrument for cooperation and transboundary water management in the Danube River Basin. It works to ensure the sustainable and equitable use of water in the Danube River Basin. The ICPDR is the platform responsible for the implementation of all transboundary aspects of the EU Water Framework Directive and Floods Directive.

The ICPDR is formally composed of the Delegations of all Contracting Parties to the Danube River Protection Convention and is assisted by a permanent secretariat including technical experts. The technical work is carried out in the Expert Groups composed of national experts from the Contracting Parties and representatives from ICPDR observer organisations.

The most relevant Expert Groups related to ecological connectivity are

- Hydro-morphology Task Group (HYMO TG) and the
- River Basin Management Expert Group (RBM EG).

While Observers are not granted decision-making rights, they actively participate in all meetings of the ICPDR experts and task groups, as well as plenary meetings. Delegates of Observers have access to information including all technical meeting documents and the right to contribute to all technical discussions.

EU Strategy for the Danube Region (EUSDR)

Countries of the Danube region supported by the EU established in 2010 the European Union Strategy for the Danube Region (EUSDR), identifying common needs, challenges and opportunities that can be fully exploited only in cooperation to boost regional cohesion.

EUSDR's mission is to protect nature and people, build a prosperous region with a healthy environment, equal societies and high living standards, create sustainable jobs and open fair opportunities from the Black Forest to the Black Sea. It is meant to provide platforms of exchange, guidance and networking, coordination of policies and joint actions.

The Commission´s Directorate General for Regional Policy helps to implement the Strategy by facilitating and supporting the actions of the participating countries. The High-Level Group (HLG) on macro-regional strategies is made up of official representatives from all countries involved. It assists the Commission in the policy coordination of the Strategy.

The National Coordinators (NCs) have a strategic coordination function within their national or regional government. The NCs coordinate and keep an overview of the participation of their country in the implementation of the EUSDR including all Priority Areas.

The Danube Region Strategy addresses a wide range of issues; these are divided into 4 pillars and 12 Priority Areas (PAs). Each Priority Area is managed by at least two countries as Priority Area Coordinators (PACs) and assisted by the Danube Strategy Point. The PACs organise Steering Group meetings in which mainly the representatives of the ministries of foreign affairs of the Danube countries participate along with other stakeholders as observers.

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The most relevant priority areas for ecological connectivity are included in the Environmental Pillar composed of Priority Area 6 ‘Biodiversity, Landscapes, Quality of Air and Soils', PA 4 ‘Water Quality’ and PA5 ‘Environmental Risks’. Also, PA1b Road & Rail and PA1a Navigation are relevant.

The Danube Civil Society Forum is the platform for civil society dialogue and networking in the Danube basin under the EU Strategy for the Danube Region (EUSDR). It functions as the interface for structured consultations between civil society and public and private authorities on the regional, national and EU levels as well as to international and intergovernmental organisations active in the region.

The Danube Civil Society Forum is dedicated to supporting civil society organisations in the Danube basin. It aims to promote and enhance civil society participation and networking in the framework of the European Union Strategy for the Danube Region.

Interview observations concerning ICPDR and EUSDR

The ICPDR is viewed positively for its multifaceted contributions, benefiting various sectors beyond just the environment, as noted by several interviewees. This comprehensive benefit highlights the organization's broad and effective approach to addressing various aspects of societal development.

Additionally, it is recognized for setting long-term agendas rather than immediate implementation, as emphasized by other interviewees. Cooperation with the EU Strategy for the Danube Region (EUSDR) is noted for its effectiveness in fostering knowledge exchange, identifying joint priorities, and gaining political support.

The Carpathian Convention (CC)

The Framework Convention on the Protection and Sustainable Development of the Carpathians (Carpathian Convention) unites the 7 Carpathian countries of Central and Eastern Europe in a unique partnership, providing a transnational framework for cooperation and multisectoral policy integration. It is an open forum for stakeholder and public participation and a platform for developing and implementing transnational strategies, programmes and projects for protecting and sustainably developing the region. The Convention was signed in 2003 and ratified in 2006 by all 7 Parties. It is the only multi-level governance mechanism and international legal framework that covers the entire Carpathian region. In addition, it is the second sub-regional treaty-based regime for the protection and sustainable development of a mountain region worldwide, following the Alpine Convention.

The following bodies are relevant:

- Secretariat of the Carpathian Convention
- Carpathian Convention Implementation Committee (country focal points from the Carpathian ministries of the environment)
- CC Working Groups of Biodiversity, Forestry, Sustainable Transport, and Sustainable Agriculture comprising representatives of the respective ministries and observers (research institutions, NGOs, consultants, interested groups, representatives of other relevant projects in the region)

Observations by the interviewees, workshops and surveys participants

Workshop participants at the 14th Carpathian Convention Working Group on Biodiversity Meeting in the spring of 2023 agreed that the transnational treaties function as enablers across the regions, also based on EU legislation, funding mechanisms and projects. Mainly initiatives around raising awareness about the natural value of biodiversity and harmonising research and monitoring efforts were highlighted. This involved cross-sectoral cooperation and stakeholder engagement. Barriers to better collaboration across borders include different

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legislations in the countries in and outside of the EU with diverse entities in charge. The participants regret the lack of capacity concerning coordination of the relevant sectors and a comprehensive vision for the TEN-N. Participants concluded that countries do work together in different ways, officially, for example, the ministries of the environment or state conservation agencies of the Czech Republic and Slovakia, or unofficially through personal contacts. Mainly EU-funded projects allow for cooperation across borders (Interreg, Cross-border cooperation programs, Cohesion Funds, etc.), but unfortunately, only on a short-term basis. The Carpathian Countries Integrated Biodiversity Information System is an open online information hub that provides GIS data and publications for policymakers, project managers and scientists. The conclusion was that this platform should be maintained and developed further.

'The Secretariat of the Carpathian Convention took part in the preparation of project proposals, and they helped them in it. So, at this level, we are cooperating with them, and we are trying to use their power to support our projects' (interview, Poland).

A representative of the Czech Republic said that the Carpathian Convention 'can also have some direct impact in terms of implementation of those projects as, you know, we are all involved'. A representative of Slovakia wrote that the Carpathian Convention accounted for reliable partners and solid resources of knowledge in nature protection, underlined by an interviewee in Slovakia. The interviewee stated that the main role of the Convention was to facilitate cross-border projects that develop concrete results. To conclude, 'there were some good ideas and some good results, but the implementation is still lacking at the national level. This is a problem everywhere'.

'Animals and plants do not recognise borders and migrate. That's why cooperation is important here. And these bodies, since many countries are involved, can act as coordinating offices. They also involve … networking and the creation of a network of experts who are interested and qualified in creating such facilities or fulfilling the relevant obligations' (interview, Ukraine).

Representatives of NGOs from Poland, Serbia, Hungary and Romania share the opinion that the Convention was rather weak since the instruments are not legally binding, and their representatives are not active enough to get recommendations in policy papers and afterwards in implementation.

Protected area networks

The members of the various protected area networks play an important role in developing and implementing nature conservation projects also related to ecological connectivity. Their protected areas represent core areas for the future TEN-N. Some administrations were project partners in connectivity projects and bear the technical know-how and experience in identifying and monitoring ecological connectivity in the field. Their strength is their knowledge and eagerness to improve the conservation status of their protected area and are close to local players.

- Members of the Danubeparks, which bring together national and nature parks, biosphere and nature reserves from nearly all the Danube countries including Romania, Moldova, Bulgaria, Serbia, Croatia, Hungary, Slovakia, Austria, and Germany
- Members of the Carpathian Network of Protected Areas (CNPA; park administrations from the 7 Carpathian countries)
- Members of the EUROPARC Federation, the protected area network for the entire of Europe, in and outside the EU.
- Members of Parks Dinarides, based in Montenegro and comprising 100 protected areas in the Dinaric Arc
- Members of ALPARC, the network of protected areas in the Alps; collaborate and support the CNPA

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NGOs active in the case study area

Both globally and nationally active organisations (e.g. BirdLife, WWF, Greenpeace) are committed to nature conservation and related policy and advocacy work, but also to awareness raising of civil society, including youth. They are also committed to scientific research and fieldwork. The NGOs act as watchdogs and can draw the public's attention to environmental problems. They are important drivers of the topic, support governments, and mediate between the sectors, but are often opposed or ignored. Representatives of the economic sectors perceive them as 'green dreamers', meaning their claims are unrealistic (workshop result, TRANSGREEN Kick-off Meeting, 2017).

4.3.2. Actors at the national level

It is obvious from the number and diversity of players involved that the topic requires a complex approach to achieve concrete implementation of the ecological network at the national level. There are many interests in land use and management. There is no guarantee of completeness for actors listed in the following since the NaturaConnect team engaged mainly with actors on the transnational level representing their governments. In addition, all 15 analysed countries have their particularities in governance and law enforcement.

National public authorities/institutions:

- Ministries of the environment, agriculture, forestry, spatial, urban and land use planning, rural development, water management, transport, tourism and energy
- Regional governments responsible for the environment, agriculture, forestry, spatial, urban and land use planning, rural development, water management, transport tourism and energy like in Austria and Germany
- Regional and local agencies for nature conservation and protected areas like in Romania
- Spatial planning and rural development institutions
- Forest management institutions
- Water management institutions
- Chambers of agriculture, forestry, etc.
- Public service providers related to transport and energy infrastructure
- Municipalities, local communities

Interest groups

- Landowners
- Farmer associations
- Hunting and fishing associations
- Industry
- Tourism organisations
- Companies
- Academia
- NGOs
- Media
- Citizens

To simplify, the actors per sector are described jointly in the following.

Environmental actors at the national level

The **ministries** of the environment of each country are important players when it comes to decision-making. They work on new laws or frameworks for nature conservation. Many interviewees agree that their influence is limited compared to other ministries. Most countries have a **protected area and/or a nature protection agency**, either embedded in the ministries

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of the environment or as a separate entity. In Austria and Germany, the federal states are responsible for nature conservation in their territory, making it difficult to have a joint vision and direction of activities. However, the interviewees agreed that most agencies have insufficient funding and capacity to cope with the wide portfolio of tasks, including administration. 'There are a bunch of people in Bucharest in the office. They basically issue permits. In the field, two or three people per county are in charge of managing tens of Natura 2000 sites. In many cases, there are no funds for field trips, monitoring and other key elements that should be part of the management.' (interview, Romania).

The **European legislation framework** concerning nature conservation gives organisations and persons the right to submit complaints to the European Court when serious implementation failures occur (for example building an illegal ski resort in the Pirin National Park in Bulgaria). In this way, the Lech Valley, a natural jewel in Austria could be saved from the construction of river dams and is now a sustainable tourism destination. European legislation is a powerful tool for nature conservation at the national level. With the help of the European Court of Justice, non-transparent dealings at the national level can be revealed and stopped.

4.3.3. Other actors at the national level and their relationship to nature conservation

Many interviewees, workshop and survey participants stressed the importance of cross-sectoral cooperation at the national and transnational level to achieve a better conservation status of protected areas and create robust ecological corridors. To reach this objective, sectors which impact and are impacted by conservation efforts (e.g. agriculture, energy, transport, forestry, industry) need to integrate environmental and biodiversity aspects in their planning and management. There are some positive examples of integration but in reality, this is often hard to attain due to land management mainly being driven by economic interests.

According to the participants in the interviews, surveys and workshops, the main sectors impacting conservation/ecological connectivity/TEN-N are agriculture, forestry and energy, followed by transport, water management and industries (mining), and the main stakeholder groups are landowners and communities (Figure 16).

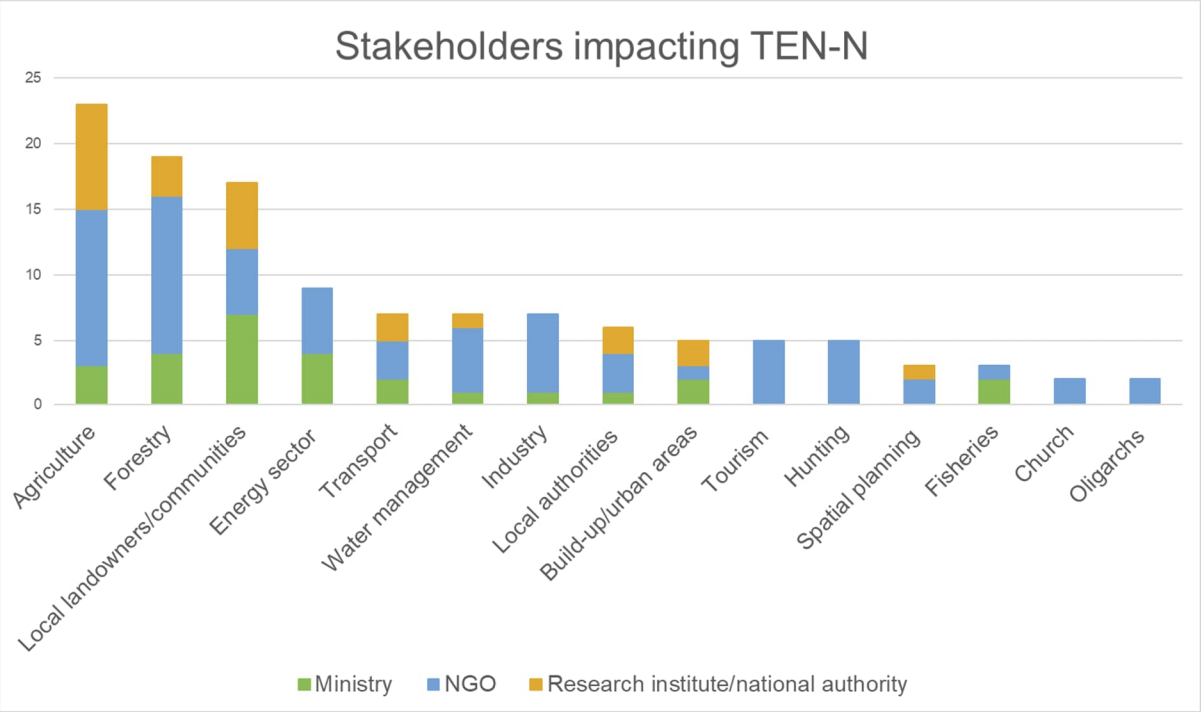

Figure 16. Stakeholders impacting TEN-N, results of 43 interviews analysed using MAXQDA software.

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Agricultural actors

The agricultural sector is very powerful across the region. The average share of agricultural land in the DCR countries is approximately 45%, with fewer shares in Montenegro and Croatia. Important players are the ministries of agriculture, sometimes covering the ministries of the environment and forests, chambers for agriculture, associations and farmers. Overall, the interviewees report that cooperation with the agricultural sector is difficult. Actors argue to be responsible for food security and therefore, changing the land use towards providing land for nature conservation is not aligned with their mandate (interview, Austria). This is a topic of discussion and demonstrations in the EU concerning the Nature Restoration Law. At the same time, the landowners sell arable land for settlements or industrial and infrastructure development. This land can no longer be used for cultivation. Agri-environmental schemes and contractual nature conservation are in place in some countries with national rules. Still, most farmers do business as usual. The intensification and expansion of agricultural land are continuing on the one side, and on the other side, land abandonment is increasing too, depending on the relief and the associated workability of the soil.

In Romania, the Ministry of the Environment and the Ministry of Agriculture had a conflict about the compensation system and land management in protected areas, which the interviewees from an NGO and a public authority confirmed. The Ministry of the Environment opted for some obligatory management measures in the protected areas, which was opposed by the Ministry of Agriculture. In their view, such measures would not receive any financial compensation, neither from the agri-environmental schemes nor from Natura 2000 payments. This illustrated the 'financial conflict about subsidies for farmers', stated an interviewee from Romania and a 'political decision in favour of the Ministry of Agriculture'.

'We have much lower influence in the case of agricultural land in comparison to the cooperation in the management of forests' (interview, Slovakia).

'The Ministry of Agriculture is not really the easiest partner when it comes to the expansion of protected areas. They are usually against it' (interview, Poland).

'The agricultural sector has a huge standing in Austria though when it comes to hard figures about the economy, the importance of the agricultural sector is very low (...). But when it comes to political influence, it's huge' (interview, Austria). Similarly, an interviewee from Germany said that farmers' associations strongly influence the Ministry of Agriculture. Farmers' demonstrations in Germany in early 2024 show the strong opposition toward nature conservation.

Based on compensation measures, farmers are more willing to integrate biodiversity into their fields. For example, in Austria the share of organic production is around 26%, which is rather high in comparison to other countries. 'We have 26% of the agriculture areas under organic farming. So that also indicates that we have quite a lot of landowners who are interested in ecology and farming, who are interested in the environment, in protecting nature (...) And that also includes that species can move and migrate from one area to the other. And they [farmers] are interested in getting information.' (interview, Austria).

Small-scale farmers in many of the investigated countries in the Danube-Carpathian region manage their mosaic landscape with more sustainable practices and thereby, contribute substantially to biodiversity conservation.

Forestry actors

Forestry actors comprise the ministries of forestry, agencies and institutions for forestry, the state and private forestry companies, and forest owners and users. On average, the DCR has a forest coverage of 35.7%, with high shares in Slovenia (61.4%), Montenegro (61.5%), and less in Ukraine (16.7%), Moldova (11.7%) and Hungary (22.7%), see Figure 8. Forests represent an important natural resource which is an essential source of income in the region.

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The forest sector has an ambiguous relationship with nature conservation. Forests provide various ecosystem services, like the uptake of greenhouse gases, wood and non-timber forest production, recreation for people and more. Forests with high biodiversity values are often protected and represent core conservation areas or can serve as ecological corridors.

Through discussions and interviews with people in the DCR, some good examples of collaboration between the forest sector and nature conservation were mentioned. In Austria, the integration of ecological corridors in the forest development plans is being tested in pilot areas. However, no specific management measures are recommended. Forest owners and managers are encouraged to voluntarily manage the identified ecological corridors. An interviewee from Germany stated similarly, ‘This is extremely pronounced and is of course also strongly championed by the relevant groups, whether it's the farmers' association or the forest owners' association, all these property owners' associations emphasise that everything should be done on a voluntary basis.’ (interview, Germany)

The forest’s area size can determine the resistance to change, and the level of collaboration with the nature conservation sector. ‘When we want to restrict the management of small areas for some birds or some plants, something in the forest, the large state forest companies can easily change their planned activities and switch from one area where there is a restriction to another, whereas a small landowner cannot easily change because he only has that little bit of forest or farm.‘ (interview, Hungary) In Montenegro where forests cover more than 60% of the land and therefore are especially important for the local economy, an interviewee said ‘the forest owners... are very much in conflict with new protected areas because there is a part of Montenegro where the logging or timber extraction is a significant local industry. So, a lot of people depend on this industry and don't want to see the new protected areas because, for them, that means that they cannot extract the forest anymore.’

For some politicians, reputational incentives are of interest. An interviewee from Montenegro said, ‘The biggest obstacle is political willingness. If there is a mayor who wants to be remembered as a person who designated an area as protected, or if he sees that this could bring him votes, then good. If not, then we are in trouble.’

'Most of the forests are managed by state-owned forest companies. Their political power is stronger than the national parks or the conservation itself. This management and good production orientation are still in place after many years since the first national parks were established.’ (interview, Hungary)

‘The largest owner of the forests is the church, and this is a problem because the church is exploiting forests massively without mercy. They were the first to purchase the largest machinery to massively exploit forests. They log, sell, and get money.’ (interview, Slovenia)

In some countries like Hungary, Serbia, Czech Republic, and Romania, actors from the forest sector manage protected areas. Thus, collaboration is fundamental. For example, the state forest company Romsilva manages almost all national parks in Romania based on a contract with the Ministry of the Environment. The forest companies shall apply sustainable forest management by integrating conservation goals, and at the same time pay for the salaries of the protected area staff.

The forestry sector can strongly oppose extending new protected and conserved areas because new ways of management could cause a loss of income (interview, Romania). This is especially true for the strictly protected areas. ‘The tensions are really long lasting for many decades. So, this is not a stable situation. For example, the conservation and forestry sectors are always in a kind of dispute.’ (interview, Hungary)

‘There are also cases in which the forestry institutions disagree with the designation of new protected areas in forest lands because of the quite strict regimes and with the argument that those areas are already included in Natura 2000 sites and are being protected as Natura 2000 sites.’ (in writing, Bulgaria)

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When looking at the implementation of the Terrestrial System of Ecological Stability (TSES) in the Czech Republic, one interviewee said that 'the System only applies to forests with naturally occurring tree species which can barely be found in commercial forests and are also important for large carnivores. It is recommended to grow tree species naturally occurring in a location, but in reality, this is not easy. There is no power to change the artificial forests which are focused on production.'

Despite all the above-illustrated difficulties, many interviewees observed a trend for better cooperation between the forest sector and nature conservation in the DCR.

Spatial planning actors, landowners and communities

Important actors in this field are the ministries of spatial planning, regional branches, sectoral agencies, consultant companies and politicians. The contribution of this sector to ecological connectivity is highly dependent on the legislation and the political environment. Who oversees the law implementation and whether the laws are complied with represent other relevant components.

For example, the response to the potential collaboration between the Ministry of the Environment and the Ministry of Spatial Planning in Romania was as follows: 'It's not a collaboration. They came with some strategies and some projects, and we needed to approve them' (interview, Romania). Spatial planning systems are different in the examined countries, but at the local level, the responsibility for designating areas for certain purposes is with the municipalities. In most countries, there are national, regional and local authorities building on a top-down approach that involves the ministries, regional and local authorities. Since in most countries ecological corridors are not part of the spatial plans, they are not known to decision-makers, and thus not integrated into development plans. In some cases, like in Austria, a map of ecological corridors exists, but without legal protection, they are not considered by spatial planners. However, spatial planning is a political issue with many incentives for municipalities, companies and landowners. Designating areas for commercial purposes benefits the mayor and the municipality economically in contrast to ecological corridors - therefore there is no short-term and clearly visible benefit.

Overall, according to many interviewees and survey participants, landowners and managers are concerned about limitations on their land or their land losing value because of environmental measures. 'If you design a migration corridor somewhere, you want to protect the land from being built up or from intensive use. This is the problem with the landowners because, of course, they do not want such a limit on their land use' (interview, Czech Republic). Also, in Bulgaria, landowners are reluctant to designate additional protected areas on their land after the Natura 2000 designation process in 2007 (in writing, Bulgaria). The coverage of protected areas in Bulgaria is 41% and one of the most extended ones in Europe. In Austria, it was mentioned that the landowners and farmers do not want to restrict their descendants when agreeing to longer-term nature conservation measures (e.g. planting hedgerows, which could limit them from certain future activities (interview, Austria). The same interviewee also stated that not all landowners and farmers can be lumped together since there are some who are in favour of ecological corridors or protected areas on their territory and produce organically.

Landowners and managers are reluctant to accept environmental measures because of the weak compensation schemes connected to an administrative burden (interviews Czech Republic and Romania). In addition, the communication between the environmental authorities, landowners and managers on the subject appears insufficient. Thus, this group does not understand why it should make any effort to protect nature. An interviewee from Slovakia said 'Nothing is really working towards the stakeholders. So not the communication, even not the financing'. Raising awareness for landowners was also mentioned by an interviewee from Ukraine, 'People don't always understand the benefits of declaring a territory a nature reserve. But we are working on this, holding meetings, working with people. It is

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explained that this can give them certain advantages in terms of raising additional funds. This means working with village councils, working with communities, working with landowners.'

A Serbian interviewee observed some local initiatives to protect valuable areas, but the decision about where protected areas should be located is made top-down in his country. 'I would say that we also have to improve our support to them [local landowners] and somehow empower them', (interview, Serbia), since Serbia's protected coverage is only around 10% and needs to be increased. In Moldova, awareness of the importance of nature protection slowly increases through the many conversations with the landowners who usually oppose new protected areas on their territory (interview, Moldova).

In the Czech Republic, where theoretically, a good compensation scheme is in place, farmers and managers complain about the complicated administrative procedures to get compensation (interview, Czech Republic). The situation seems to be worse in other countries as stated by several interviewees from Slovakia and Romania, where the compensation scheme is delayed.

These are two problems many interviewees mentioned, the insufficient awareness of the importance of an ecological network including protected areas and the deficient compensation schemes for efforts in biodiversity-friendly management.

Transport infrastructure actors

Transport infrastructure development and extension are high on the agenda in many countries of the Danube basin. This is subject to the ministries of transport and its motorway or railway companies as contractors and service providers. The EU supports these economic activities with huge investments, but in some countries, there is not enough experience in preparing bankable projects. Although the EU aims at financing only sustainable transport infrastructure, there is little knowledge on how to integrate mitigation measures in road and rail projects to serve nature conservation and reduce habitat fragmentation. NGOs and other players therefore often oppose the plans which leads to lengthy delays of the construction, as can be seen in the case of the Lugoj-Deva highway in Romania. In other countries such as Croatia or Austria, it is obligatory to construct green bridges for a new motorway and to retrofit existing motorways to make the linear infrastructure permeable again. In the Czech Republic, transport projects comply with good practice standards concerning ecological connectivity. A representative of the transport sector stated, 'The fact is that in the past years, environmental measures have been more accepted by the transport sector' and '... we have good cooperation with the Directory of Roads and Highways, so I don't think that the roads are the most conflictive sectors.'

Energy development actors

Since the European Union and its Member States are under high pressure to reduce procurement of fossil fuels from Russia, the switch to renewable energy has to be accelerated with less stringent environmental impact assessment obligations. For example, in Romania, hydropower projects that had been stopped in the past for reasons of nature conservation are being reactivated. Photovoltaic power plants are often fenced and used for grazing, reducing the movement of wildlife.

Water management actors

Results of the survey (from 11 respondents from the water management sector in 7 countries across the region) reveal that all participating countries integrate ecological connectivity in their river basin management plans, according to the EU Water Framework Directive (WFD) and ICPDR policies.

The main objective of the WFD is to achieve good chemical and ecological status of surface waters. Classification of the ecological status of rivers includes hydro-morphological quality elements such as river continuity when the continuity of the river is not disturbed by

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anthropogenic activities and allows undisturbed migration of aquatic organisms and sediment transport. In addition, morphological conditions include an appropriate structure and condition of the riparian zone.

The WFD is implemented at the transboundary Danube basin level under the Danube River Protection Convention implemented by the ICPDR. Concerning ecological connectivity, the most important objectives at the ICPDR level are migratory fish protection and sediment management, with sturgeon being the flagship species. Food protection activities sometimes reduce the longitudinal and/ or lateral connectivity of rivers. To re-establish former floodplains and wetlands, several projects are going on in the Danube basin. This is why nature-based solutions are being promoted by the ICPDR to complement or replace grey infrastructure solutions integration of river basin management. Flood risk management plans have become the aim. Stumbling blocks for these integrated solutions are property rights and a high number of stakeholders that need to be involved and agreed with, including from the agricultural sector. Besides agriculture, hydropower and navigation sectors can harm ecological connectivity and their impact needs to be mitigated. Discussions around free-flowing rivers and dam removals have just started in the region.

Actors from tourism

Tourism relies on the beautiful scenery of an intact natural landscape. Tourism facilities and tourists often deteriorate popular areas such as the High Tatra Mountains in Poland or the Plitvice Lakes in Croatia. For some countries, tourism is an important source of income for local people, thus this industry has a strong lobby. The challenge is to find a balance between tourism development and the natural and cultural aspects.

Other actors

Actors from other sectors, like mining and fisheries, were mentioned by a few interviewees but did not appear to be as important as the previous ones. This might be connected to their small-scale impact on the landscape.

4.3.4. Collaboration across borders

As already described above, transnational treaties provide a good platform for exchange and collaboration. The EU supports projects that foster cross-border cooperation e.g. through Interreg Programmes. Various projects have been conducted on the topic of ecological connectivity in terrestrial and freshwater ecosystems.

There are good examples of cooperation in the Czech Republic and Slovakia, where cross-border meetings take place to discuss the environmental impacts of linear transport infrastructure on nature. Representatives of the ministries of the environment and transport, the motorway companies and national authorities for nature conservation participated. Five countries in the region agreed on the establishment of the Mura-Drava-Danube Biosphere Reserve and work together for its conservation and joint management. There are many more, project-based collaborations across borders mentioned by the interviewees and communicated by the survey participants.

In some areas, there are difficulties. Ongoing resentments between the former countries of Yugoslavia (Serbia, Kosovo, …) hinder certain countries from collaborating across borders and even at the national level (Bosnia and Herzegovina). According to an interviewee, Montenegro seems isolated, and we really believe in cross-border cooperation, especially in the area of nature protection and management of shared natural resources, because nature does not know about the borders, is of immense importance for Montenegro' (interview, Montenegro).

The stakeholder matrix (Figure 17) shows that currently most of the powerful stakeholders are rather resistant to support the introduction of ecological connectivity.

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To the group of the supportive or neutral but influential stakeholders belong some European Commission Directorate General, mainly DG ENV but also DG REGIO and DG MOVE. Unfortunately, the on the other hand DG AGRI does not support / is not interested in ecological connectivity, while at the political level lately also the European Council and the European Parliament also favours believed agricultural needs over nature conservation and the need to restore nature outside Natura 2000 areas.

From the national ministries and sectors agriculture, energy and spatial planning are very reluctant towards change and the forest and transport sector also, although with less resistance. Landowners and managers are also against the change. Environmental ministries, academia, NGOs are supportive, but they have much less power when it comes to taking political decisions.

There are some macro-regional players (Carpathian Convention, ICPDR, EUSDR) that are supportive towards new ideas on ecological connectivity especially at transboundary level, but they have limited power when it comes to national implementation on the ground.

The stakeholder matrix (Figure 17) shows that currently less powerful stakeholder groups support ecological connectivity and more numerous and powerful groups are reluctant to introduce it. There is a need to convince reluctant stakeholder groups on the importance of ecological connectivity and to make them interested in establishing ecological corridors and build ownership of the issue among them. At the same time macro-regional stakeholders as well as environmental institutions and NGOs should be empowered to have equal voice in the political debate.

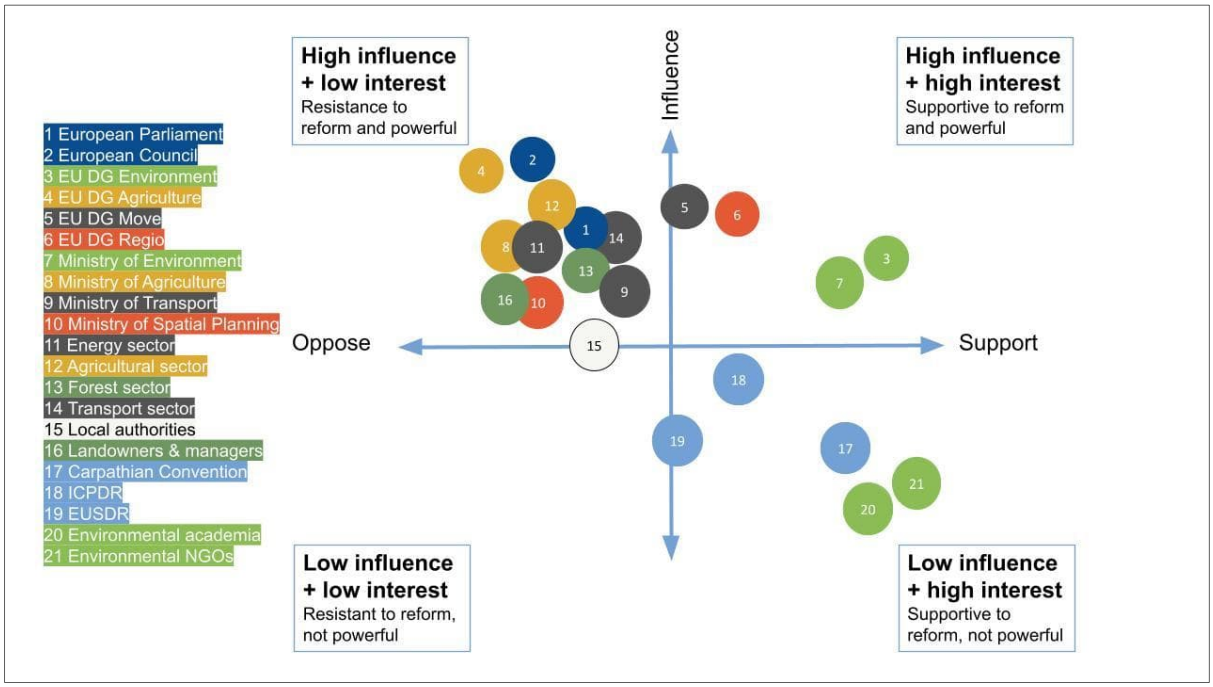

Figure 17. Stakeholder matrix for the Danube-Carpathian region based on workshops and discussions, WWF-CEE.

4.3.5. People and organisations at the international level

At the global level, key players like the **Convention on Biological Diversity** (CBD) and the **International Union for Conservation of Nature** (IUCN) provide platforms for discussions and the development of knowledge and frameworks essential for nature conservation. The CBD, an intergovernmental process governed by a convention, and the IUCN, a membership

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organization comprising government and civil society members, are influential in shaping biodiversity policy. The CBD's Global Biodiversity Framework lays out common goals and objectives, providing an overarching structure for developing National Biodiversity Strategy and Action Plans (NBSAPs). The EU Green Deal also aligns with the broader CBD Post-2020 Global Biodiversity Framework, as does the Carpathian Convention's Biodiversity Framework.

Intergovernmental organisations, in particular the Convention on Biological Diversity (CBD) play a role in the EU through agenda setting at EU and national level. The CBD has promoted concepts such as ecosystem services and No net loss and framing the conservation debate through protected area targets and OECMs, as well as providing technical guidance. Importantly, the EU Biodiversity Strategy to 2030 is built on the global biodiversity framework of the CBD. Other agencies of the UN also support policy and action for ecological connectivity. In particular the IUCN and its World Committee on Protected Area Connectivity Conservation Specialist Group contribute to knowledge sharing and capacity building via guidance documents and its Transport Working Group, a community of professionals working on transport, which covers roads, railways and canals.

The **EU** is a dominant player in environmental policies within its Member States, but the implementation of connectivity-related legislation varies significantly across the Union. This variation is influenced by the Member States' legal and institutional setups, socio-economic characteristics, time of accession, and key political moments, such as rulings from the Court of Justice of the EU. The Nature Restoration Regulation will add another dimension to this work through national restoration plans aimed at establishing an ecological network via the Trans-European Nature Network (TEN-N), a key element of the European Commission's Biodiversity Strategy.

Despite being the original architect of the TEN-N concept, the EU faces challenges in integrating environmental matters into broader policy areas. Various Directorates-General (DGs) often work in silos (according to various interviewees), leading to contradictory signals sent to stakeholders. For instance, the EU promotes strategies for developing energy and transport infrastructure through the Trans-European Networks for Energy and the Trans-European Transport Network, which are not always sufficiently integrated with nature protection efforts. This lack of integration is evident in Romania where an interviewee mentioned the contradictory EU financing concerning water dams: EU funds simultaneously support dam removals for river restoration and the completion of large hydropower projects on the last free-flowing rivers.

During interviews, it was highlighted that the EU's role is crucial in pressuring Member States to implement and maintain ecological connectivity.

In addition to its environmental policy, the EU is also an important source of funding and has the power to ensure this funding maintains and enhances connectivity. In some Member States the EU is the major funder of large infrastructure projects. The European Commission’s decisions on which infrastructure projects to fund under the Connecting Europe Facility, and how to address environmental concerns during design and construction can have a major impact. A similarly important decision is the approval and amendments to CAP Strategic Plans. Given the apparently low ambitions of the CAP Strategic Plans (Nemcová et al., 2022), requesting remedial action to address the deficiencies such as in the share of land under management for landscape features can make a difference for connectivity in countries or regions.

Financial resources allocated for nature protection in the EU Budget 2021-2027 (€29.2 billion) are considerably less than those for other sectors, such as the Common Agricultural Policy (CAP) with €386.6 billion. This funding disparity reflects the balance of power among DGs. Moreover, the EU plays a crucial role in pressuring Member States to maintain and enhance ecological connectivity.

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The Infrastructure and Ecology Network Europe (IENE) brings together a range of experts on transportation, infrastructure and ecology from a range of ministries and agencies, universities and research institutes, enterprises and NGOs from more than 50 countries, with a focus on Europe ('Harmonizing Transportation and Nature | IENE,' n.d.). The network organises conferences and workshops for knowledge exchange and collets relevant guidance from its member countries. The IENE Handbook on Transport and infrastructure (Rosell et al., 2023) brings together best practice in addressing biodiversity impacts of roads, railways, powerlines and pipelines, waterways and ports and airports. The Handbook identifies best practice on a range of topics such as policy and strategic planning, implementation of the mitigation hierarchy, monitoring and maintenance.

4.4. Synthesis of building blocks – PEA dynamics

The synthesis creates the big picture of the context based on the building blocks defined in the previous steps. The outcome reveals the relevant dynamics that are important for creating the next steps, the pathway of change and interventions. It explains how the foundational factors, rules of the game and people and organisations influence one another to identify how change happens. This step also reveals what we have learned from the most influential building blocks and how they interact. The building blocks are then used to answer the question 'How can the problem be addressed?', with a more enlightened vision. This enables the identification of pathways of change, which is an explanation of how change can happen, given a particular starting point and a desired outcome, and the possible interventions (Australian Government - Department of Foreign Affairs and Trade, 2022).

Table 6. Description of Political Economy Dynamics in the Danube-Carpathian region, a synthesis of the three building blocks (foundational factors, rules of the game, people and organisation).

Political Economy Analysis building blocks	Political Economy Dynamics
Foundational factors **&** **Rules of the game**	**Historical legacies and policy implementation**: Many regions and countries have land use and governance histories that shape current conservation strategies and land management practices. For example, the centralization under communism in the Danube-Carpathian region has left a legacy of unclear property rights, fragmented land ownership, and continued centralization of power that poses challenges to effective environmental governance and ecological connectivity. **Urbanisation, demographic trends, and spatial planning:** High levels of urbanisation and demographic shifts impact land use and conservation policies (e.g. urban-rural disparities and demographic shifts, such as rural depopulation, impact the effectiveness of national conservation policies, emphasising the need for tailored approaches at different administrative levels; **Implementation challenges and policy instruments:** All countries in the region face difficulties in effectively implementing national policies and legislation through the lens of foundational factors.
Foundational factors **&**	**Historical land use influences**: *Professional Bodies and Research Institutes* (e.g. organisations like the Infrastructure and Environment Network Europe IENE) provide expertise and historical context, helping governments understand how past land use affects current ecological connectivity and

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Political Economy Analysis building blocks	Political Economy Dynamics
People and organizations	guiding more informed decision-making, including for linear transport infrastructure development. **Land restitution** in regions with a communist history like the Danube-Carpathian region led to multiple ownership and lengthy negotiations in the designation of protected areas. On the other hand, the communist heritage led to a hierarchical order and poorly structured stakeholder involvement. **Local stakeholders** *Landowners, Farmers, and Foresters* groups often oppose ecological corridors due to perceived or real restrictions on land use and poorly designed/ communicated compensation mechanisms or conflict management strategies. Their opposition is often linked to their political and economic position and their intensity of land use. **Rural depopulation:** *Local Governments and Ministries for Rural Development* are responsible for managing such demographic trends. They need to both counter abandonment with alternatives for economic development and manage the transition in a way that considers nature restoration or conservation. In depopulated areas, green entrepreneurs and conservation NGOs may find opportunities to implement rewilding and habitat restoration projects, though the success of rewilding and restoration depends heavily on public participation and inclusive decision-making. **Political instability**, influenced by external factors like the war in Ukraine or by internal factors like unstable governments and frequent new elections, threatens to deprioritize conservation efforts at national level. The role of the EU legislative framework and international cooperation then becomes crucial in maintaining focus on ecological connectivity. **High demand for land in urban areas:** The high demand for infrastructure in urban areas poses challenges for *Urban Planning Authorities* in maintaining ecological connectivity. Spatial planning authorities must navigate the tension between development needs and environmental protection. *NGOs and Civil Society* groups advocate for the integration of green infrastructure within urban planning, often pushing for policies that incorporate ecological corridors into city designs.
People and organizations **&** **Rules of the game**	**Gaps in the legislative framework:** Even where the legislative framework encompasses ecological connectivity, there are often gaps, such as legal loopholes or missing requirements, which hinder effective implementation. **Ineffective spatial planning integration:** Many policies do not effectively integrate ecological connectivity into spatial planning, leading to potential threats from land use changes and infrastructure developments. **Lack of political will:** Some countries face challenges due to a lack of political will to enforce legislation, leading to ecological corridors existing only on paper. This reflects a lack of incentives for enforcement and political motivation to prioritise ecological connectivity. **Mismatch between the responsible administrative level and the scale of action:** Responsibility for ecological connectivity often falls on regional or municipal authorities, leading to a mismatch between the scale of action needed and the scale of implementation possible.

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Political Economy Analysis building blocks	Political Economy Dynamics
	Sectoral planning gaps: There is often a lack of strategic planning in sectors like transport and hydropower, which impacts ecological connectivity, especially in some countries from the Danube-Carpathian region. **Transboundary coordination:** Lack of cross-border coordination hinders efforts in maintaining connectivity, reflecting geopolitical and administrative challenges. Some positive efforts in this respect are the regional governance bodies (e.g. EUSDR, the Carpathian Convention and ICPDR in the Danube Carpathian region). **Integration with ecosystem services:** Linking ecological connectivity to ecosystem services (e.g., flood protection, carbon sequestration) expands stakeholder involvement and potential support. **Power dynamics:** There is significant opposition in relation to new nature protection legislation from powerful organisations in farming and forestry or from other landowners; this is due to perceived restrictions on land use, mirroring conflicts in protected area designations. Stakeholder groups like national environmental bodies, macro-regional bodies and NGOs lack empowerment and participation in advancing, developing and implementing strong ecological connectivity related legislation. **Economic compensation:** Economic solutions, including financial compensation, and other tools to reduce conflict are missing or hampered by ideological opposition to conservation. **Collaborative learning:** Collaborative learning processes to build common visions and joint stakeholder evaluation remain difficult to scale up, with only a few successful projects. **Financing challenges:** the lack of financial resources is a common issue across case studies. There is potential for innovative financing mechanisms to support ecological connectivity initiatives.

5. How can the problem be addressed?

The third step of the method aims to identify how the problem can be addressed, through examining pathways of change and possible interventions. This part of the PEA analysis is reflected in the discussion (Section 4), conclusions and recommendations section of this report (Section 5).

5.1. Desired outcome

Workshop participants identified and summarized the desired outcome in the following statement:

‘Enhanced ecological connectivity and the role of Green and Blue Infrastructure in achieving biodiversity goals in the Danube-Carpathian region, via effective planning and governance of TEN-N.’

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5.2. Pathways of change

A pathway of change is an explanation of how a desirable outcome might arise due to the actions of (possibly multiple) other actors. Pathways of change are driven by a whole host of mechanisms, many of which cannot easily be influenced by external actors. They should be understood as conditions and therefore they are not mutually exclusive. There might be more than one pathway of change. The possible pathway of change draws on the knowledge gained from the steps described above. Usually, the pathway of change can only support parts of existing change processes or try to lead these in a different direction.

A useful way of writing a pathway of change is to use the **if … then … because** notation.

'**If** situation S occurs, **then** change process C occurs **because** of reason R':

- **If …**: This describes the situations under which the pathway of change becomes active.
- **Then …**: This describes the change that takes place in terms of changing actor behaviour and institutions.
- **Because …**: This explains how and why the change takes place and must be consistent with the incentives, interests, actors and institutions identified in the PEA.

This exercise can also identify which pathways of change are not feasible.

To tackle the problem, based on the analyses performed and the criticalities identified, we outlined four different pathways of change and corresponding potential interventions. These four pathways to change should be pursued in parallel by EU Member States in order to achieve a coherent, resilient, connected TEN-N. Unlike other usages of the term, in PEA, pathways are not mutually exclusive but rather a set of conditions. We use 'pathway' here to maintain consistency with PEA literature. They should not be seen as individual scenarios to choose from, but rather as a mix of approaches that can be implemented together.

Efforts to design effective TEN-N governance and land-use policies should include the application of pathways of change that focus on regulatory frameworks, land use, knowledge and capacity building, and empowerment and conflict management.

The challenges and best-practice examples both reveal the opportunities that exist for improving ecological connectivity governance across the EU, across various scales.

For a better overview, we arranged the four pathways of change in a flowchart (Figure 18).

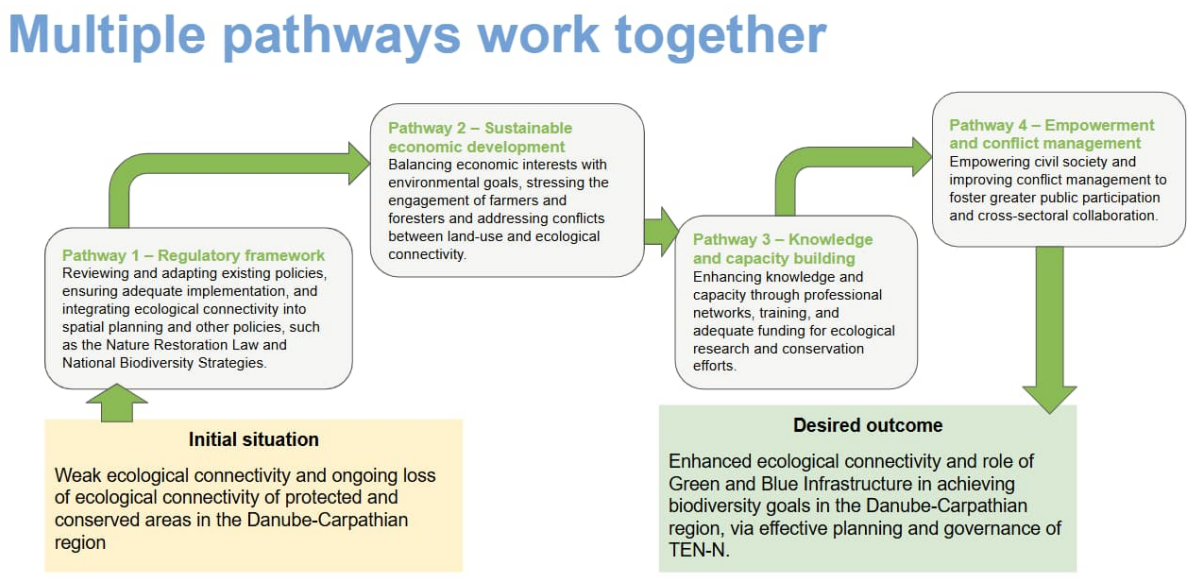

Figure 18. Pathways of change illustration; WWF-CEE.

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Pathway 1 – Regulatory framework

If an appropriate ecological connectivity regulatory framework exists, it is implemented well, and it is backed by solid incentives, **then** the different stakeholder groups are supportive **because** they recognise the values, benefits and importance of the ecological connectivity for people and wildlife.

Conflicts can be turned into win-win situations where potential losses are prevented and/or compensated. A regulatory framework brings clarity for all players in terms of prevention and compensation mechanisms. Legislation should address the need for ecological corridor planning and design to be embedded in spatial planning and that guidelines be provided for all sectors and stakeholder groups involved. The legislation should also address tenure rights and provide the necessary funding, incentives, prevention and compensation schemes, clear governance and thorough consultation processes.

A legal instrument for ecological connectivity is the most coherent and effective governance mechanism, if well-designed and implemented. It is important that ecological corridors are protected from construction and infrastructure and other activities that would undermine their functioning. The detailed protection provisions of the Czech Republic on corridors (Václav et al., 2021), and the legal requirements for wildlife crossings in Croatia (Government of Croatia, 2006) are examples of best practice legal instruments.

Implementing legal instruments for connectivity can be challenging. A range of best practice was identified in the Belgian Region of Flanders (INBO, 2023). These included swaps of state land, a range of financial tools, the introduction of a biodiversity offsetting mechanism as well as encouraging experimentation. A previous review of protected area networks across the EU (Naumann et al., 2021) surveyed a range of experts across EU Member States for barriers and solutions for ecological connectivity, the latter equivalent to best practice.

Several studies identified best practice in financing connectivity. Voluntary payments for farmers, in the form of agri-environment(-climate) schemes have been used for connectivity implementation. Best practice is to target these payments to farmers contributing the most to connectivity, on the basis of landscape level connectivity considerations, and work towards high participation and building long-term commitments on the basis of dialogue and adequate and stable financing (Arponen et al., 2013). Depending on the landscape, landscape level agri-environment-climate schemes that promote agroforestry, landscape complexity and the restoration of riparian vegetation can also be a strong tool (De La Fuente et al., 2018).

Maintaining and enhancing ecological connectivity and ecosystem services are a promising combination. A strategically planned network at EU level can efficiently provide a range of ecosystem services, a robust TEN-N with adequate cross-border connections (Hermoso et al., 2020). Combining connectivity can overlap with achieving carbon neutrality in forested regions (Forsius et al., 2021).

Pathway 2 – Sustainable economic development

If economic development is coupled with clear guidance for mitigation measures, accounting for ecosystem services, and preventing land use conflicts via collaboration across sectors, **then** it shifts towards a sustainable economic model that values and profits Green Infrastructure **because** the power of each sector is balanced when all have to work towards mutual benefits.

Social dilemmas can be addressed by taking leadership and encouraging collective thinking. If a solution is found to land use conflicts that is acceptable for all stakeholders and potential

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losers are compensated, then acceptance of the solution increases mainly if it helps improve sustainable economic development. Shared goals improve trust and implementation results.

A legal instrument can ensure the balance of sustainable economic development with ecological connectivity. In the absence of a legal instrument, spatial planning mechanisms can also be used. The protection of certain ecosystem types throughout out the landscape (Isola et al., 2022), the use of zonation in forestry (Elbakidze et al., 2016) can be very effectively used to maintain or enhance connectivity. Environmental Impact Assessment and Strategic Environmental Assessment can also be instrumental in maintaining connectivity if adequate guidance is in place (WWF, 2018). For transport infrastructure connectivity considerations can be integrated in planning, design, construction and maintenance (Rosell et al., 2023). For river connectivity, strategic planning of any new hydropower facilities combined with dam removal is a key method (Papazekou et al., 2022).

The development of Green Infrastructure will also contribute to providing non-market benefits and ecosystem services which are important for human well-being.

Pathway 3 – Knowledge and capacity building

If the appropriate knowledge base, technical and human capabilities related to ecological connectivity are developed and communicated, **then** planning and design as well as the implementation of a well-connected, resilient TEN-N improves **because** they will facilitate the access of all relevant sectors to the most beneficial solutions, with optimised costs.

Improvements in the evidence base and information sharing can build trust and encourage collective action. Monitoring and data collection should be established and harmonised in this respect along with common, transboundary projects and networks that work together and share information to improve cross-border cooperation. Also, implementation capacities of ecological connectivity management institutions should be improved related to data collection, processing and stakeholder services. It should be ensured that ecological knowledge is strongly embedded in the teams involved with planning and deciding on land-use. Thus, ecologists and conservation scientists need to be hired in the key institutions involved in land-use planning, not just responsible for the impact assessments.

Professional organisations can play a key role in maintaining and strengthening ecological connectivity. The Infrastructure and Ecology Network Europe (IENE) is a prime example of such an organisation. This network brings together a range of experts on transport and ecology in Europe. The network is instrumental in disseminating best practice, collected in the IENE Handbook on Transport and Infrastructure (Rosell et al., 2023).

A similarly crucial role can be played by local champions. Transmission system operators can take the initiative to create ecological corridors under the power lines, if empowered by regulation and access to the land under the lines.

Pathway 4 – Empowerment and conflict management

If civil society working for ecological connectivity (NGOs, environmentally-friendly farmers and foresters, other green entrepreneurs) is empowered and causes of existing conflicts around connectivity are clarified by bringing actors together **then** engagement can be built, conflicts can be managed, and stakeholder trust and intersectoral and cross-border cooperation improved, **because** bottom-up initiatives and improvements are catalysing positive change.

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A prerequisite for cooperative solutions is to develop a shared vision and framing, build trust and credible commitments and enable an acceptable distribution of costs and benefits (relational values, health benefits, ethics and aesthetics, and others). Our research shows that existing conflicts between sectoral stakeholders hinder realisation of ecological corridors. Conflict management can help in this respect to build mutual trust, improve stakeholder engagement and intersectoral and cross-border cooperation and coordination. Along with conflict management awareness campaigns for the general public, behavioural change campaigns for targeted sectors can also be useful.

Civil society can drive ecological connectivity in a bottom-up approach that is radically different from top-down legislative approaches. For such initiatives by civil society, there is also a range of best practice available. Most of the best-practice examples borrow elements from 'collaborative learning', a conflict management approach that has been applied frequently to natural resource management. A rule of the game of collaborative learning is that stakeholders work as equals, which means that there can be tension with top-down legislative approaches.

Common framing of a problem is crucial, and successful connectivity initiatives have been underpinned by shared vision. Some of these visions used a well-chosen concept to bring different groups together (van Rooij et al., 2021). These visions have been successfully employed at urban level (Perini and Sabbion, 2016), landscape level (van Rooij et al., 2021) or in between (Perini and Sabbion, 2016).

Governance arrangements are important for maintaining and enhancing ecological connectivity. A review across Europe found that mobilisation of social capital and grassroots initiatives were promising arrangement for increasing connectivity in urban areas (Buijs et al., 2016). For mobilising social capital, the financing and facilitating the organisation of citizens and flexibility with the rules are important. Urban grassroots initiatives can be strong advocates for realising ecological connectivity as an independent voice in urban planning.

The above four pathways of change are complementary in many cases, and elements from all four pathways of change are needed to achieve a coherent, resilient and well-connected TEN-N for Europe.

5.3. Interventions: What are the implications of the analysis?

The intervention strategy outlines activities that can support the pathways of change, offering options relevant to various stakeholders across different levels. Each player can determine the most suitable combination of interventions for their specific context. Therefore, we have opted to present a broad overview of potential interventions.

Based on the suggested pathways of changes in the previous Chapter 5.2, concrete interventions were elaborated for specific actors to improve the implementation of TEN-N at various levels.

5.3.1. Interventions for regulatory frameworks (addressing Pathway 1)

Reviewing existing policies and legislation

The first step on this pathway is reviewing and, eventually, adapting the existing policies and legislation. In countries where there are no policies or legislation governing ecological connectivity, it is necessary to first adopt such policies or legislation. It is worth to underline here that biodiversity policy alone will not be sufficient to maintain and enhance ecological connectivity. For governments at any level the best practice is to have specific legal obligations, with a binding effect on spatial planning and sufficiently detailed protection of ecological

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corridors and their management. Adequate public participation in decision-making is a must during the adaption or amendment of any legislation.

It is also necessary to check at EU level whether existing policies support ecological corridors and TEN-N and revise those EU level policies that hinder their implementation. Additional policies might be needed in order for corridors to be formally designated or integrated into spatial planning, or to finance TEN-N. Finally, it is also important that the planning of ecological corridors and other actions for connectivity are based on the latest scientific evidence ((Fernández et al., 2020) for an example at the European level and (De La Fuente et al., 2018) for an example at the national level).

Improving implementation

Where existing legislation and policies are adequate, the next step is to improve their implementation. The responsible authorities should have a political mandate for implementation, adequate staffing and financing. Given the importance of connectivity at the landscape level it is recommended to consider scaling up connectivity governance efforts in a way that increases the role of regional or national authorities. Implementation should be underpinned by adequate enforcement. For cross-boundary ecological connectivity, bilateral or multilateral agreements should be implemented, covering the key ecological corridors and ecosystems.

Integrating connectivity into other policies

Bringing coherence into the ecological connectivity agenda by including it in other policies is key. Crucial steps include fully implementing the Nature Restoration Law, in particular the national restoration plans, and integrating ecological connectivity into countries' National Biodiversity Strategies and Action Plans (NBSAPs) and the implementation of the relevant targets of the Global Biodiversity Framework. Of particular relevance are the targets on managing protected areas (Target 1), restoration of degraded ecosystems (Target 2), designation of protected areas and OECM (Target 3), reduction of the impact of Invasive Alien Species (Target 6) and minimizing the impacts of climate change (Target 8). Member States can also revise their national Common Agricultural Policy (CAP) Strategic Plans to improve connectivity on farmland, including through targeted eco-schemes and agri-environment-climate measures and support for cooperative actions (see below).

Synergies with spatial planning legislation

Often, other spatial planning legislation offers synergies with implementing legislation on ecological connectivity. Examples are forestry zonation and spatial planning instruments protecting ecosystem categories or land use types. Designation of ecological corridors or stepping stones under such legislation can provide protection against specific threats.

Addressing land use conflicts

The requirements of ecological connectivity can cause conflicts with existing land-use, such as in ecological corridors for large mammals on pastures or structural connectivity for old-growth forest species in landscapes under intensive forestry. There are a range of voluntary approaches that can be explored and if successful embedded in regional or national policies and legislation. The use of OECMs, conservation easements, land swaps with government owned land, and strategic habitat banking are promising new approaches, in addition to land purchases.

5.3.2. Interventions for sustainable economic development (addressing Pathway 2)

For a well-connected TEN-N it is important to enhance ecological connectivity, but also to prevent further connectivity losses. A precondition for this is a balance of interests, as in the

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long-term ecological connectivity is incompatible with a maximisation of profits in agriculture, maximisation of yield of forestry and unlimited expansion of transport infrastructure.

Engaging farmers and foresters and addressing landowner conflicts

In order to maintain and enhance connectivity on farmland and in forests, active participation of farmers and foresters will be needed, along with other sectors of society. There are several forms of best practice. Targeted agri-environment-climate measures based on landscape level action, long-term commitments and building relations and trust can deliver connectivity on farmland. Conservation easements can deliver connectivity on any privately-owned land, but are particularly relevant for forests as there are many small forest owners that are not utilising the existing funding under the CAP (Haeler et al., 2023).

Farmers receiving CAP funding are obliged to protect linear landscape features, buffer strips along watercourses and stepping stones such as wetlands, peatlands, and grasslands as part of the Good Agricultural and Environmental Conditions (GAEC). National authorities should ensure that these GAECs are well implemented and use their enforcement powers where needed. Under its Biennial Review (Regulation 2021/2115) the European Commission should ask for remedial action when Member States do not ensure the maintenance of landscape features.

Animals migrating through ecological corridors can cause conflicts with landowners, such as crop, livestock or forest damage from large mammals. It is particularly important that any compensation for damage on ecological corridors is adequate and timely with little administrative burden, to reduce conflict with landowners as far as possible.

Strategic planning for infrastructure projects

Strategic planning should be employed for large infrastructure projects. For large linear infrastructure projects such as roads and railways, ecological connectivity should be integrated in project planning, design, construction and maintenance, building on the IENE Handbook (Rosell et al., 2023). For hydropower, strategic planning across river basins should also be promoted to protect the remaining free-flowing rivers. On rivers with hydropower plants full connectivity cannot be achieved in spite of mitigation measures (Moreiro et al., 2024) so a combination of retrofitting of existing hydropower plans and dam removal should be employed.

Integrating connectivity in planning

Integrating ecological connectivity considerations into large infrastructure projects and hydropower can be promoted at the European level by including ecological connectivity in the Do No Significant Harm criterion under the EU Taxonomy Regulation (Regulation 2020/852). At national level, integrating ecological connectivity into the Strategic Environmental Assessment and the Environmental Impact Assessment procedures will promote better planning, project design and mitigation measures.

Society and decision makers should recognise the positive effects of ecological corridors in their lives. Cost-benefit analysis of ecological corridor development could help achieve such perception changes.

Recognizing and assessing non-market benefits of ecological corridors

Ecological corridors are essential not only for preserving biodiversity but they also can provide non-market ecosystem services. For example, by integrating ecological functions with cultural and aesthetic values, ecological corridors promote a balanced approach to conservation that benefits both nature and people’s wellbeing (e.g., recreation, landscape amenities, education, spiritual connection, and tourism). Assessing the non-market benefits of ecological corridors and conducting comprehensive cost-benefit analyses of their development could help shift perceptions and encourage broader societal support.

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5.3.3. Interventions for knowledge and capacity building (addressing Pathway 3)

Enhancing ecological connectivity between protected areas is a complex process, and there are many governments and actors involved. Bringing in ecological expertise throughout planning, design and implementation of ecological corridors, and stepping stones and other interventions is therefore key.

Role of professional networks and institutions

Professional networks, research institutes and government agencies play a crucial role in coordinating, advising and monitoring the connectivity of protected area networks and the effectiveness of interventions. Networks of professionals working on ecological connectivity, such as working groups and platforms can connect all parties in the complex governance structures, and advise land use planners at municipal, regional and national levels. They can also provide input on the drafting of land use and infrastructure policies and on designing agri-environment-climate measures. Strengthening professional networks, research institutes and government agencies institutions by providing them with adequate resources is recommended to further connectivity.

Raising awareness and providing training

To address the lack of awareness by the government actors and the stakeholder groups, more public outreach is needed. In addition to awareness raising, there is need for training, detailed guidelines and standard setting, in which professional bodies, research institutes and government agencies can also play a role. Providing guidelines and setting standards is critical for the deployment of novel instruments, such as conservation easements and the strategic deployment of biodiversity offsets. Guidelines similar to the of the IENE Handbook on biodiversity and infrastructure (Rosell et al., 2023) are necessary to support mitigation and compensation measures in other sectors.

Ensuring adequate funding and resources

Adequate funding at EU level should be ensured to establish advanced scientific solutions e.g. from the Horizon Europe programme. Creating maps of ecological corridors and monitoring those areas needs both funding and detailed knowledge. Training programmes, integrating ecology in university curricula for spatial planning and relevant engineering fields, peer-to-peer visits and good practice exchange all help increasing awareness and dedication of stakeholders. CAP programmes currently have few successful collaborative schemes where farmers work together at the landscape level with conservation experts to restore ecological networks and corridors; this option could be introduced in all programmes, linked to ecological network spatial planning, and supported by farmer advice, knowledge exchange, and payments for ecosystem services. ERDF and CF hold considerable untapped potential to fund larger-scale and more effectively targeted nature restoration and ecological connectivity projects, but large biodiversity projects face considerable barriers. Synergies could be gained by linking requirements to linear infrastructure investments such as roads and rail, or to investments in water management.

Raising awareness on the available funding options

It is important to increase the awareness of finance options for ecological connectivity among potential beneficiaries. LIFE funds are the most common instrument to finance connectivity and nature conservation in Europe but to fully finance a coherent TEN-N other types of funds will have to be used. This will be a mix of other public finance (mostly EU funds such as Interreg or Cohesion Funds), private finance (in the form of investments), philanthropic sources (in the form of grants) and blended finance a mix of the three. Yet, often the recognition that several funding sources and types are available is very limited. Note that NaturaConnect is developing

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a series of fact sheets on public and private sources of finance to raise the profile of little-known solutions to relevant stakeholders.

Building business and economic skills in the professional community

To unlock innovation in funding connectivity action, it is strategic to employ experts with business and economic skills. The lack of dedicated human resources with the capacity to create new funding opportunities and pilot new nature-based business models is a clear barrier to access new funding. The nature conservation community in Europe (protected area managers, NGOs, universities etc.) has little to no human resources with training and/or background in economics or business. People who speak the language of private investors, who have a business mindset to problems and that can help unlock new funding sources. In order to fully fund the TEN-N and meet EU 2030 biodiversity targets and increase in the number of people with skills and studies in business and economics in the nature conservation sector needs to increase.

5.3.4. Interventions for stakeholder and public engagement (addressing Pathway 4)

Empowering civil society for ecological connectivity

Empowering civil society working for ecological connectivity (NGOs, environmentally friendly-farmers and foresters, other green entrepreneurs, urban grassroots) and improving conflict management can be a pathway to enhancing ecological connectivity at local and landscape levels. This involves working bottom-up through creating a policy environment that is inclusive and open to change, providing initial financing and developing a common vision. Ecosystem services, in particular flood protection and carbon sequestration and storage, can play a key role by widening the community of stakeholders. Finding a common idea that captures the essence of the connectivity challenge and inspires a wide community of stakeholders to take action can create momentum for connectivity. Local champions such as mayors, NGOs, National Park Directorates, and transmission system operators and other agencies managing linear infrastructure can drive the connectivity agenda if provided with adequate resources and an opportunity to challenge the current practices.

Increasing stakeholder engagement

It is necessary to increase engagement of different sectoral stakeholders at national but also transboundary level e.g. by proactive communication, organising consultations, sharing information, establishing cross-sectoral networks. For example, landowners should be clearly informed about land use restrictions and human-wildlife conflicts, and previous misconceptions should be clarified.

Importance of conflict management and collaborative learning

Conflict management is a crucial measure. While not all conflicts can be avoided, adequate and easily accessible financial compensation can reduce conflict substantially. Conflicts based on past communication failures should be mitigated. As an alternative, collaborative learning can also be successful. This involves a long process of stakeholders working as equals and developing a joint vision in an environment with little regulations and carefully tracking the outcomes, adjusting where needed.

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Conclusion

This report underscores the complex interplay between historical legacies, governance structures, and political economy dynamics that shape land use and conservation policies across the Trans-European Nature Network (TEN-N). The analysis reveals that while there are significant challenges to implementing cohesive and effective conservation strategies, there are also opportunities for improvement through targeted policy interventions and stakeholder engagement.

The historical context in the Danube-Carpathian region demonstrates that past governance practices continue to influence current land management and conservation outcomes. These legacies often lead to fragmented land ownership, inconsistent policy enforcement, and a disconnect between national and local governance, which in turn hampers the effectiveness of conservation efforts.

The political economy analysis highlights the need for a more nuanced approach to policy implementation – one that accounts for the diverse economic interests, power relations, and degrees of regional autonomy that characterize the TEN-N landscape. Without addressing these underlying dynamics, conservation policies risk being undermined by local realities that prioritize short-term economic gains over long-term environmental sustainability.

As the project progresses, continued monitoring and adaptation will be necessary to respond to the evolving political, economic, and environmental landscape. By addressing these challenges head-on and leveraging the unique strengths of the region, the TEN-N can move closer to achieving its goal of a connected, resilient, and sustainable network of natural areas across Europe.

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Software MAXQDA: https://www.maxqda.com/

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7. Appendices

Appendix 1: Review of EU and Danube-Carpathian countries' laws, regulations and governance, and finance mechanisms related to the establishment of the Trans-European Nature Network (TEN-N)

See separate document:

https://naturaconnect.eu/wp-content/uploads/2025/01/D2.1-PEA-in-the-Carpathians-Appendix-1.pdf

Appendix 2: Literature review indicators table

Search string for the literature review:

(all 'spatial*' OR 'plan*' OR 'poli*' OR 'govern*' AND ('infrastructur*' W/5 'green' OR 'infrastructur*' W/5 'blue') AND ('habitat' W/5 'connect*' OR 'habitat' W/5 'fragment*') OR ('species' W/5 'turn*over') OR ('species' W/5 'move*' OR 'isolat*') AND PUBYEAR > 2010 AND PUBYEAR < 2023) OR (ALL ('connectiv*' OR 'fragment*' OR 'species' w/5 'turn*over' OR 'move*' OR 'isolat*') AND ('infrastructure' w/5 'green') OR ('infrastructure' W/5 'blue') AND ('poli*' OR 'govern*' OR 'admin*') OR ('spatial*' OR 'plan*') AND PUBYEAR > 2010 AND PUBYEAR < 2023) AND (LIMIT-TO (AFFILCOUNTRY,'Germany') OR LIMIT-TO (AFFILCOUNTRY,'France') OR LIMIT-TO (AFFILCOUNTRY,'Italy') OR LIMIT-TO (AFFILCOUNTRY,'Sweden') OR LIMIT-TO (AFFILCOUNTRY,'Spain') OR LIMIT-TO (AFFILCOUNTRY,'Portugal') OR LIMIT-TO (AFFILCOUNTRY,'Netherlands') OR LIMIT-TO (AFFILCOUNTRY,'Poland') OR LIMIT-TO (AFFILCOUNTRY,'Belgium') OR LIMIT-TO (AFFILCOUNTRY,'Denmark') OR LIMIT-TO (AFFILCOUNTRY,'Finland') OR LIMIT-TO (AFFILCOUNTRY,'Austria') OR LIMIT-TO (AFFILCOUNTRY,'Hungary') OR LIMIT-TO (AFFILCOUNTRY,'Czech Republic') OR LIMIT-TO (AFFILCOUNTRY,'Greece') OR LIMIT-TO (AFFILCOUNTRY,'Romania') OR LIMIT-TO (AFFILCOUNTRY,'Ireland') OR LIMIT-TO (AFFILCOUNTRY,'Serbia') OR LIMIT-TO (AFFILCOUNTRY,'Latvia') OR LIMIT-TO (AFFILCOUNTRY,'Slovakia') OR LIMIT-TO (AFFILCOUNTRY,'Undefined') OR LIMIT-TO (AFFILCOUNTRY,'Bosnia and Herzegovina') OR LIMIT-TO (AFFILCOUNTRY,'Lithuania') OR LIMIT-TO (AFFILCOUNTRY,'Slovenia') OR LIMIT-TO (AFFILCOUNTRY,'Ukraine') OR LIMIT-TO (AFFILCOUNTRY,'Croatia') OR LIMIT-TO (AFFILCOUNTRY,'Cyprus') OR LIMIT-TO (AFFILCOUNTRY,'Estonia'))

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Appendix 3: MAXQDA Code System

Code System	Frequency
Code System	1359
Word/PDF Text Highlight	0
Black	0
Green	1
BLUE	6
GREEN	1
RED	26
MAGENTA	3
YELLOW	13
WHAT IS THE PROBLEM	0
Barriers around PA (+)	0
Marine P.A. differences	4
Lack of capacities	15
Lack of capacities for local communities	1
Lack of technical capacities (equipment)	1
Lack of expertise	4
Lack of monitoring / investigation	9
Low law enforcement	1
Corruption risks	3
Decentralization of plans of physical plans	0
Negative impact	1
Lack of comprehensive vision	5
Incremental impact of fragmentation	4
Political context	27
Lack of political will	4
Wested interests as obstacle	8
Democracy shrinking	3
Prospects	0
The situation stays the same	6
The situation is getting worse	4
The situation is getting better	25
Lack of coordination	21
Issues with federal states	4

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Only bottom-up approach	1
Lack of communication from the state	3
Lack of continuity	5
Top-down approach	1
Conflict of interest	5
PA management problem (paper parks, etc.)	27
Absence of evaluation of P.A. management plans	1
Opposite to paper parks term	1
Lack of funding/financing	26
Lack of funding mechanism for local level	3
Funding is better for national level	1
Compensation issues	16
Lack of staff	9
Law salaries in the ministries	1
Staff fatigue	2
Conflict with other sectors	21
Ecological connectivity (4)	0
Lack of data	1
Lack of stakeholder participation	3
Absence of government actions	1
NGO exclusion	1
Marine P.A. differences	1
Slow realization	2
Prospects	0
The situation stays the same	2
The situation is getting worse	2
The situation is getting better	5
Lack of awareness of importance	12
Misunderstanding	3
Lack of coordination	6
Lack of finance	2
Lack of legislation	14
Absence of legislation	5
Design issues	13
Implementation issues	21
Transnational connectivity barriers (7)	0

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NATURA CONNECT

Example of failed cooperation	4
Not yet part of EU	1
Lack of coordination on national level	3
Lack of stakeholder engagement	2
Lack of cooperation internationally	5
Many development interests	4
Lack of staff	5
Lack of capacity	7
Lack of communication from regional bodies	1
lack of proactive position from regional bodies	1
Lack of effectiveness	2
Just for cooperation visibility but no effect in place	1
Political context	5
Lack of financing tools	3
Not proper monitoring	1
Socio-cultural differences	5
Legislative differences	9
Legislative gaps	2
Governance differences	4
Lack of comprehensive vision	4
Transnational connectivity enablers (7)	0
Coordination / cooperation	7
Bottom-up approach	1
Meetings and knowledges exchanges	9
Platforms	1
Common projects	20
EU initiatives	2
Transboundary protected areas and network	13
FOUNDATIONAL FACTORS	0
Geopolitical situation	1
EU Instability	1
Tendency to bigger farms	0
State acquisition failure	1
Absence of intensive farming	1
Negative side	4
Positive side	3

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Country structure	0
Agricultural activities are main economic factor	1
Type of ownership	3
Private ownership	2
Increasing complexity	1
Mixed ownership	5
Public ownership	3
Public ownership of majority of forests	1
Cooperatives emerging	1
Federal structure	6
Positive aspects	2
Internal instability	5
War in Ukraine	8
Geography	0
Biogeographical regions	21
Preserved ecosystems (VS western countries)	3
High biodiversity	9
Carpathians mountains?	1
History	0
Problems due to the war	1
Change of value of the land	1
Land ownership tradition	5
Communist heritage	7
Burden of soviet perception	1
Land restitution	5
Giving back lands with P.A. restrictions	1
Small farmers (positive experience)	1
Nature isolation perception	1
Collectivisation	6
Collectivisation from big land owners only	1
Large agricultural farms	4
Contact with the land is lost	2
Small percentage of P.A.	1
PA on private lands without asking	2
EU accession	4
Demography	0

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Dense population	1
Small farmers ownership	4
Underdevelopment	1
Rural population	0
High percentage of rural population	1
Aging rural population	1
Tourism	14
Positive shift	1
Migration from urban to rural areas	1
Depopulation	5
Migration from rural to urban areas/ emigration to Western Euro	1
Socio-economic structures	0
Nature = sources	14
Strong link people-land ownership	3
Negative side (endless usage)	1
Lack of wild nature appreciation	1
Threat of economic development	6
Social inaction	2
Strong link people-nature	32
Importance of nature protection	8
Importance of national production of groceries	1
State vision	3
Land ownership unclarity	2
RULES OF THE GAME (2, 3)	0
Transboundary level	0
Absence of legislation	1
Ecological connectivity, regional mapping	4
International level (GBF, ...)	6
UN	4
Regional bodies	2
EU policies and legislation	6
Unhelpful/ no results	1
National gov conflict with EU	3
Unequal funds for CAP and P.A.	2
Conflict with energy legislation	2
Helpful	17

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Mixed	2
Mixed CAP effect	3
National level	3
Ownership	5
P.A. and Ecological connectivity, general	26
E.C.	9
P.A.	18
Misunderstanding between ministry / NGO	2
Not yet established	7
Low quality of the draft	1
Funding	17
EU funds	1
Funding for Natura2000	1
State budget	1
RRF	1
US-AID	1
Transparency and Coordination	2
Ministry perspective	10
Examples of bad coordination	8
Absence of ecological connectivity	1
Examples of good coordination	19
Transboundary positive examples	3
Ecological corridors	0
Good examples	5
PA used as corridors	2
Existing network	3
Mention/definition in the legislation	1
Cross-sectoral collaboration	7
Positive cooperation	4
Lack of function	1
Implementation in other sectors	7
Related to Nature	6
PA management plans	3
ACTORS AND INCENTIVES (5,6)	0
Env CSO	0
Strong position	1

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National Ministries	0
National Parks	0
Weak position	1
Ministry of Env	0
Weak position	1
Church	0
Conflictive (church)	2
Cross-sectoral situations	0
Cooperation between ministries of Env and Spatial Planning	1
Energy-agriculture conflict	1
Spatial planning	1
Conflictive (spatial planning)	4
Collaboration	0
EU	1
Unrealistic plans	2
Environmental sector	2
Agriculture	2
Conflictive (agriculture)	31
Collaboration	5
Forestry	2
Conflictive (forestry)	23
Concrete example	1
Connectivity in the forest	2
Collaboration	4
Transport	0
Conflictive (transport)	7
Collaboration	5
Water management	2
Conflictive (water management)	9
Collaboration	3
Build-up / urban areas	0
Conflictive (built-up / urban areas)	6
Energy sectors	4
Cooperation	2
Neutral	1
Conflictive (energy sector)	12

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Tourism	0
Collaborative	1
Conflictive (tourism)	5
Fisheries	0
Conflictive (fisheries)	3
Industry	1
Conflictive (industry)	10
Local authorities	2
Conflictive (local authorities)	6
Collaboration	0
Local landowners/communities	3
Collaboration	3
Conflictive (local landowners/communities)	22
The case of harm of RSE for local community	1
Oligarchs	0
Conflictive (oligarchs)	2
Collaboration	0
Hunting	0
Conflictive (hunting)	5
Collaboration	2
Regional bodies (6)	0
Lack of capacities within ministries	2
Absence of regional bodies	4
Lack of stakeholder involvement	2
Lack of CSO involvement from the government	1
Lack of awareness	2
Lack of national representation	1
Projects with results	16
Key role	16
Important tool	7
Soft tool / weak	17
Slow realisation	1
Unclarity	2
Guidance	4
Pressure to do something	2
Space for discussion	10

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HOW CAN CHANGE HAPPEN?	0
Decrease of human population	1
Capacities increase	10
More staff	4
Psychological support for NC staff	1
More financing	5
Financing for landowners	1
Financing redistribution - less reliance on activities	1
Mild collaboration	7
Small scale approach	1
Intersectoral approaches	10
Commercial approach	1
Awareness raising	7
Pressure for the government from CSO	1
Legislation and policy revisions	11
EU frameworks not only for EU members	1
General framework for the country	1
Making the directives binding on a national level	1
Permanent perception and resources	2
Scientific needs	3
Common methodologies	1
Transboundary monitoring	0
Common understanding or guidance	1
Shared/joint database	1
Paraphrased Segments	0

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Appendix 4: Breakdown of interviews according to stakeholders' type

Country	Number of interviews	Stakeholders
Austria	3	Ministry Government Agency NGO
Bosnia and Herzegovina	2	Ministry NGO
Bulgaria	3	Ministry NGO
Croatia	2	Ministry NGO
Czech Republic	3	Ministry Government Agency NGO
Germany – Danube-Carpathian case study	2	Government Agency NGO
Hungary	2	Ministry NGO
Moldova	4	Government Consultant Academia NGO
Montenegro	3	Ministry NGO
Poland	1	NGO
Romania	3	Ministry NGO
Serbia	2	Government Agency NGO
Slovakia	3	Ministry Government Agency NGO
Slovenia	3	Ministry Government Agency NGO
Ukraine	3	Ministry Professional Association NGO
Transnational organisations	4	Intergovernmental Organizations NGO
TOTAL	67	

(w) means the answers to the questions in written form (n=7)

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Appendix 5: Interview questions

General

1. What are the key elements of the governance and financing model for Natura2000 in your case study? If not yet available, are you planning to develop such an overview or do you know papers that tackle this topic?

Governance

2. Do you have specific policies and/or strategies which influence the designation of protected areas in your case study (national, regional and local levels)?
3. Does your country or region have a strategy or policy to ensure ecological connectivity between protected areas?
4. What are the main barriers (socio-economic, legislative gaps) for the implementation of a well-connected protected area network in your case study? Do you have any ideas or good examples of projects or programmes on how to overcome them?

Ecological connectivity

5. Are there any initiatives for ecological connectivity between protected areas covering the following ecosystems in place in your country/region?

- Rivers and floodplains (Yes/No/Don't know)
- Peatlands (Yes/No/Don't know)
- Farmland (Yes/No/Don't know)
- Woodland and forests (Yes/No/Don't know)
- Coasts (Yes/No/Don't know)
- Seabed (Yes/No/Don't know)
- Mountains (Yes/No/Don't know)
- Nature in and around cities (Yes/No/Don't know)
- Other ecosystems (short-answer text)

Finance

6. Are the following sources of funding used for designating and managing Natura 2000 sites or other protected areas in your case study?

- EU funds for projects – LIFE, Interreg, European cohesion and structural funds
- Common Agricultural Policy
- National and/or regional funds
- NGOs and/or private or philanthropic funds
- Biodiversity offsets or compensation measures
- We have no funding

If yes, are they working properly? Are there major or minor problems?

If not, do you think the use of funding should be integrated in your case study, through WP2 for example?

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7. Are the following sources of funding used for ecological connectivity in your case study?

- EU funds for projects – LIFE, Interreg, European cohesion and structural funds
- Common Agricultural Policy
- National and/or regional funds
- NGOs and/or private or philanthropic funds
- Biodiversity offsets or compensation measures
- We have no funding

If yes, are they working properly? Are there major or minor problems?

If not, do you think the use of funding should be integrated in your case study, through WP2 for example?

8. We aim to produce factsheets detailing both public (EU) and private financing instruments, how to access them and the challenges and barriers to access them.

Do you think that in the implementation of TEN-N lack of knowledge about available financial instruments is a key problem?

Would you be happy to review the factsheets once they are ready?

Stakeholder mapping

9. Have you already conducted, or do you plan to conduct a stakeholder analysis regarding the implementation of TEN-N* in your case study?

Do you already have a (rough) list of relevant stakeholders regarding the expansion of protected areas, expansion of strict protection and ensuring ecological connectivity?

* With implementation of TEN-N we are referring to the design of the network (if any) and the specific challenges in expanding the protected areas / strict protection and ensuring ecological connectivity between protected areas.

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Appendix 6: Survey questions for the nature conservation sector

The survey targeted professionals within the nature conservation sector to assess policies, strategies, and practices related to ecological connectivity between protected areas. Below are the questions included in the survey:

1. Affiliation
2. Country (and sub-national region, if relevant)
3. Position
4. Does your country have a national strategy or policy to ensure ecological connectivity between protected areas?
    - If yes, please provide a link.
5. Does the strategy identify corridors for habitats or species?
6. Are there any initiatives for ecological connectivity between protected areas covering the following ecosystems in place in your country/region?
    - Rivers and floodplains
    - Peatlands
    - Farmland
    - Woodland and forests
    - Coasts
    - Seabed
    - Mountains
    - Nature in and around cities
    - Other
7. Do you have a particularly successful example of connecting protected areas in your country?
    - If yes, please provide a weblink or short description.
    - If yes, which of the following factors would you consider critical in its success?
        - o Planning and design
        - o Funding
        - o Stakeholder engagement
        - o Tenure rights
        - o Financial incentives for landowners
        - o Subsequent management
        - o Cross-border cooperation
        - o All of the above
8. Is there a designated administrative body in charge of ensuring the ecological connectivity of protected areas?
    - If possible, kindly provide the link.
9. Is ecological connectivity reflected in the following sectoral planning instruments in your country?
    - Transport policy
    - Renewable energy and electricity grid policy
    - Urban planning
    - Spatial planning
    - Water policy
    - Agricultural policy
    - Forestry policy
    - Marine spatial planning
    - From the above list, do you have a particularly economic sector in your country that was particularly successful in integrating ecological connectivity in their planning?

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o If yes, please provide a weblink or a short description.

10. What are the main enablers for the implementation of a well-connected Protected Areas (PA) network?
    - Legislative changes
    - Cross-sectoral collaboration
    - Compensation measures
    - Cross-border cooperation
    - Other
11. What are the main barriers for the implementation of a well-connected PA network?
    - Lack of funding
    - Lack of legislation/legal status
    - Lack of coordination between authorities/ no functional administrative authorities
    - Intensive agriculture/primacy of agricultural profits
    - Presence of Linear infrastructure
    - Lack of data/Lack of monitoring
    - Non-secure tenure rights for connectivity
    - Land abandonment and vegetation succession
    - Lack of awareness
    - Other
12. In case of barriers, do you have any suggestions on how to overcome them?
13. Can you think of any other policy (not necessarily related to Protected Areas) that we could learn from to enable better ecological connectivity across Protected Areas?
14. Does your country have a legal or policy mechanism to protect privately owned land outside protected areas? For example, through a stewardship agreement, conservation easement, tax break, or any other designation for privately protected areas.
    - If yes, what is it? Is it being used successfully?
15. What is the main source of funding for ecological connectivity in your country?
    - EU funds for projects – LIFE, Interreg, European cohesion and structural funds
    - Common Agricultural Policy
    - National and/or regional funds
    - NGOs and/or private or philanthropic funds
    - Biodiversity offsets or compensation measures
    - We have no funding
16. We are planning to conduct a follow-up on our research. Could we contact you again if we have further questions to you?
    - If yes, please, add your email below.
17. Would you like to receive information and updates from NaturaConnect?
18. If you agree to receive information and updates from NaturaConnect, we will include your information in the project's contact list, so that you can always be kept up to date. You can unsubscribe at any time.
    - If yes, please, add your email below.

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Appendix 7: Survey questions for other sectors than nature conservation

The survey targeted professionals from multiple public sectors to assess how ecological connectivity, including the Trans-European Nature Network (TEN-N) and its integration under the EU Water Framework Directive, is reflected in sector-specific strategies and projects. Below is a generalized format of the questions included in the survey:

1. Country
2. Affiliation
3. Position
4. Please, select your sector
    - Agriculture
    - Forestry
    - Water management
    - Spatial planning and urban spatial planning
    - Transport infrastructure
    - Energy sector (renewables, electricity grids etc.)

General Survey Questions (Adapted for Each Sector)

5. Does your country or region integrate protected areas and/or ecological connectivity and/or TEN-N in [sector] strategies or projects?
    - If yes, please give more details.
6. Does ecological connectivity/TEN-N appear in [related sector] management plans?
7. Could you provide us the documents even in national language (link or name of the document)?
8. From your point of view, what are the biggest enablers for integrating ecological connectivity in the [related sector] planning and strategies of your country or region?
    - Legislative changes
    - Compensation measures
    - Cross-sectoral collaboration
    - Cross-border collaboration
    - Other
9. Do you know of any formal or informal structures of cross-sectoral cooperation in the planning of [related sector] or other activities that facilitate the integration of ecological connectivity/TEN-N at the national level?
    - If yes, can you give an example (link or text)?
10. Do you know of any formal or informal structures of cross-border cooperation in the planning of [related sector] or other activities that facilitate the integration of ecological connectivity, both at national and transnational level?
    - If yes, can you give an example?
11. Do you know of any plans for legislative changes to better integrate ecological connectivity/TEN-N into [related sector] planning in your country?
    - If yes, can you give an example?
12. Do you know of any compensation measures to maintain/protect/create ecological connectivity in [related sector] planning in your country?
    - If yes, can you give an example?
13. From your point of view, what are the biggest barriers for integrating ecological connectivity/TEN-N into [related sector] planning and strategies of your country or region?
    - Lack of funding
    - Lack of legislation/legal status

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- Lack of coordination between authorities/ no functional administrative authorities
- Intensive agriculture/primacy of agricultural profits
- Presence of linear infrastructure
- Lack of data/lack of monitoring
- Non-secure tenure rights for connectivity
- Land abandonment and vegetation succession
- Lack of awareness
- Other

14. How do you think the situation can be improved?
15. We are planning to conduct a follow-up on our research. Could we contact you again if we have further questions to you?
    - If yes, please add your email below.
16. Would you like to receive information and updates from NaturaConnect in the form of a newsletter?
    - If you agree, we will include your information in the project's newsletter contact list, so that you can always be kept up to date. You can unsubscribe at any time.
    - If yes, please add your email below.

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Appendix 8: Workshop details

In total, three workshops were held as part of the analysis, with the main objective to introduce the project to the participants and gather opinions and ideas around the implementation of TEN-N, barriers and enabler including financing. Each workshop was designed to foster collaborative engagement and in-depth discussions among the participants. To ensure a comprehensive exploration of challenges for connectivity in Europe and identify best practices and governance tools, a structured format was employed. In all workshops, participants worked together in small groups of around 5 persons and each session was carefully designed to encourage diverse group discussions and the exchange of ideas. Some workshops used the Appreciative Inquiry (AI) method (Cooperrider, D.L. and Whitney, D., 1999), which focused on identifying and building on existing successes rather than just discussing problems. This approach encouraged positive, strengths-based discussions.

Participants were encouraged to share best practices from their experiences in nature conservation and deliberate on the most effective governance tools that could facilitate the establishment of a Trans-European Nature Network. Participants included representatives from governmental bodies, environmental organisations, academic institutions, local communities, and other relevant sectors were invited to provide a holistic perspective on the challenges and strategies.

Additionally, the workshops were adapted as needed based on factors such as the number of participants, time constraints, and participant demographics. The format emphasized group discussions and brainstorming, and the structure of the workshops aimed to be flexible to accommodate varying workshop goals, objectives, or topics. The participation list can be found in the NaturaConnect stakeholder analysis here.

NaturaConnect session at the BirdLife International (BLI) Partnership meeting (Edinburgh, UK, 17 May 2023)

This workshop took place during the Nature and Climate Task Force (NCTF) a permanent working group within the BirdLife Europe and Central Asia Partnership aiming to actively solicit feedback from 36 participants representing 22 countries. The primary focus of the workshop was to gather knowledge on key governance challenges related to connectivity in Europe.

Three structured discussion rounds were conducted: In identifying challenges, participants identified primary governance challenges for connectivity. In exploring Solutions, solutions to address the challenges and successful examples were discussed. The last round was focused on envisioning necessary steps, and participants deliberated on the required actions by BirdLife and civil society to actualise solutions. This approach facilitated in-depth discussions and enabled the gathering of diverse perspectives on connectivity governance, contributing valuable insights to this deliverable.

Danube-Carpathian region

In the frame of the Carpathian Convention, the project organised two workshops, which brought together ministerial representatives of the seven Carpathian countries, representatives of the Convention on Biological Biodiversity, IUCN, and UNEP as well as observers working in science or on related projects, NGOs, consultants and others. Altogether we engaged approximately 70 people from 13 countries.

Both events had the same structure. First, we created the context, presented the project to the participants and led a Q&A session. Second, we divided the participants into smaller groups of 5-10 people and discussed and collected ideas and opinions on flipcharts.

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NaturaConnect workshop at the 14th Meeting of the Carpathian Convention Working Group of Biodiversity (Vsetín, Czech Republic, 22-24 May 2023)

A one-and-a-half-hour workshop on the NaturaConnect project was held at the 14th Meeting of the Biodiversity Working Group of the Carpathian Convention (Vsetín, Czech Republic, 22-24 May 2023, 30 participants).

The Carpathian Convention Working Group on Biodiversity and its observers discussed the following:

- What are the main **barriers** (socio-economic, legislative gaps, sectors) and **enablers** for the implementation of a well-connected protected areas network in and between the countries of the region?
- Are you aware of **good practices** in particular to stakeholder engagement for the implementation of a well-connected protected area network between the countries of the region? How do these countries work together and how is this work **financed**?

NaturaConnect stakeholder session at the 7th Carpathian Convention Conference of the Parties (Belgrade, Serbia, 11 October 2023)

The one-and-a-half-hour stakeholder consultation at the 7th Carpathian Convention Conference of the Parties (Belgrade, Serbia, 11-13 October 2023) brought together 50 participants from national authorities, public institutions, research entities, NGOs and the private sector.

WWF-CEE, together with IIASA, conducted consultation session during this high-level event, discussing in small groups how the Carpathian Convention can foster collaboration on the implementation of the ecological network based on the Carpathian Biodiversity Framework.

The participants at the COP7 Stakeholder Consultation discussed the following:

- What are the needs of the Parties to the Carpathian Convention to foster the development of a functional ecological network in the regional context?
- How can we use the Carpathian Convention cooperation mechanisms such as working groups to contribute to filling in the gaps?

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More information about the project:

NaturaConnect has 22 partner institutions: International Institute for Applied System Analysis (project lead; Austria); German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig (project co-lead; Germany); Associação Biopolis (Portugal); BirdLife Europe (Netherlands); Birdlife International (United Kingdom); Centre National De La Recherche Scientifique (France); Doñana Research Station - Agencia Estatal Consejo Superior De Ivestigaciones Cientificas (Spain); EUROPARC Federation (Germany); Finnish Environment Institute (Finland); Humboldt-University of Berlin (Germany); Institute for European Environmental Policy (Belgium); Netherlands Environmental Assessment Agency (Netherlands); Rewilding Europe (Netherlands); University of Evora (Portugal); University of Helsinki (Finland); University of Natural Resources and Life Sciences, Vienna (Austria); University of Rome La Sapienza (Italy); University of Warsaw (Poland); Vrije University of Amsterdam (Netherlands); WWF Central and Eastern Europe (Austria); WWF Romania and WWF Hungary.

NaturaConnect aims to design and develop a blueprint for a truly coherent **Trans-European Nature Network** (TEN-N) of conserved areas that protect at least 30% of land in the European Union, with at least one third of it under strict protection. Our project unites universities and research institutes, government bodies and non-governmental organizations, working together with key stakeholders to create targeted knowledge and tools, and build the capacity needed to support European Union Member States in realizing an ecologically representative, resilient and well-connected network of conserved areas across Europe.

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