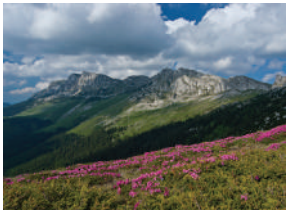
BIOREGIO CARPATHIANS

Integrated management of biological and landscape diversity for sustainable regional development and ecological connectivity in the Carpathians







Programme co-funded by the EUROPEAN UNION

SOUTH EAST EUROPE
Jointly for our common future

IMPRESSUM

Produced by: UNEP Vienna – Interim Secretariat of the Carpathian Convention (ISCC)

Vienna International Centre

PO Box 500

A-1400 Vienna

E-mail: unep@unvienna.org

Authors: Mathilde Köck, Patricia Tudor, Mircea Verghelet, Christian Hoffmann, Filippo Favilli, Marianna Elmi, Mariachiara Alberton, Hildegard Meyer, Jan Kadlecik, Katalin Sipos

Layout: ENOVA, Sarajevo, BiH

Printing: ProPrint, BiH

Printed in: June 2014

Images: Images were provided by the partners of the BioREGIO Carpathians project.

This final publication was elaborated within the BioREGIO Carpathians project, funded by the European Union within the framework of the South East Europe Transnational Cooperation Programme.

Ministero dell'Ambiente
e della Tutela del Territorio e del Mare

TABLE OF CONTENT

CCPA CHM – Carpathian Protected Areas Clearing House Mechanism

CHM – Clearing House Mechanism

CIBIS – Carpathian Integrated Biodiversity Information System

CIMM – Common Integrated Management Measures

ERDF – European Regional Development Fund

EU – European Union

EUSDR – European Union Strategy for the Danube Region

GIS – Geographic Information System

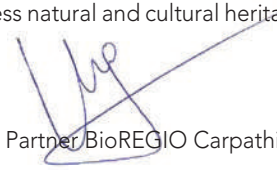
HSM – Habitat suitability model

LCP – Least-cost paths

NP – National Park

PAs – Protected Areas

On behalf of the BioREGIO Carpathians Lead Partner, Piatra Craiului National Park Administration, I would like to thank all the project partners, observers, contributing experts, national and transnational managing authorities whose involvement and constant dedication made this project come to a good end during a 3 years and a half journey. We strongly believe that our joint actions were rewarded with good results thus allowing them to become an inspiration for future projects aiming to preserve a matchless natural and cultural heritage: the Carpathian Mountains.



Mircea Verghelet, Project Manager / Lead Partner BioREGIO Carpathians

---

The Carpathian Convention thanks the EU SEE programme for the support provided by the BioREGIO Carpathians project. The success of BioREGIO has been due to the great efforts of its Project Partners and experts involved.

BioREGIO Carpathians has been developed in the framework of the Carpathian Convention, and the seven Parties of the Carpathian Convention are its observers. The BioREGIO Carpathians project partners are also long-standing partners of and observers to the Carpathian Convention.

BioREGIO Carpathians is relevant for the entire South East European and Danube - Carpathian region, and it has been welcomed by the European Union Strategy for the Danube Region. The project has become a success by helping Parties to implement the Carpathian Convention and its Biodiversity Protocol in a transnational and regional context, in harmony with and support to all applicable EU and relevant national policies.

BioREGIO Carpathians has been a cornerstone in the programme of work of the Carpathian Convention and strongly interacts with other projects developed by the Carpathian Convention, including Access2Mountain (Sustainable Mobility and Tourism in Sensitive Areas of the Alps and the Carpathians), the Alpine Carpathian Corridor and Bigfoot - Crossing Generations, Crossing Mountains, all enjoying EU support. Thereby, the project has cooperated closely with related initiatives in the Alpine Space and in the Dinaric Arc.

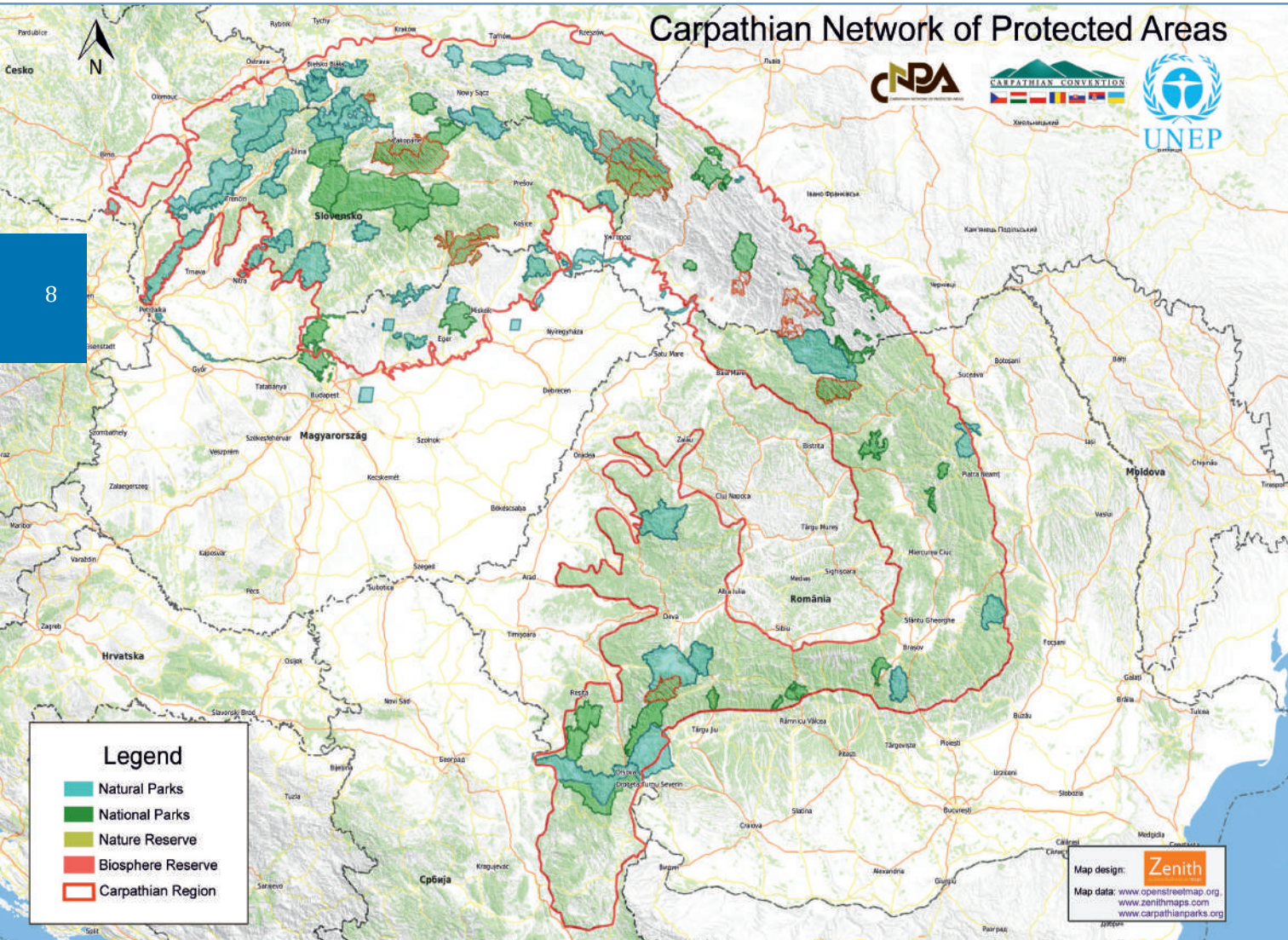
BioREGIO Carpathians has co-financed important action and change from policies at the national level to concrete action on the ground. Beside its direct results, the project has also contributed to build enhanced capacity of partners in region to develop and implement future follow up projects in support of the protection and sustainable development of the outstanding Carpathian region.

Harald Egerer, Head, UNEP Vienna - Interim Secretariat of the Carpathian Convention

BioREGIO Carpathians has enhanced the management of the Carpathian protected areas and natural assets while maintaining the biological and landscape diversity as well as the ecological connectivity in the mountainous space. Protection of biodiversity and natural heritage - a central necessity to cope with the challenges of deforestation, fragmentation and habitat conversion, pollution, overexploitation of resources, migration, etc. – required an integrated approach which beyond protected areas considers high biodiversity areas and corridors as important elements for enhancing the Carpathian mountain range overall attractiveness. International umbrella organizations like UNEP - Interim Secretariat of the Carpathian Convention, various scientific institutions, administrative actors, NGOs and local implementation partners joined forces to demonstrate needs and options for proper action and to develop and implement innovative tools and instruments to further sustainable regional development and protection of biological and landscape diversity. Joint pilot actions involving a multitude of local and regional stakeholders resulted in transboundary agreements for a long-term cooperation. To overcome existing constraints, recommendations have been generated ensuring effective elimination of the main natural, legal, social and economic barriers to ecological connectivity, cross border cooperation and procedural harmonization, improvement of accessibility to financial mechanisms and tools or the capitalization of regional development opportunities of the region. In addition to that, the development of a joint biodiversity geo-referenced web based information system and inventories for the most endangered species and habitats in the region provided solid information basis for the decision makers on national and transnational level. Knowledge transfer and dissemination are guaranteed by the widely ramified structure of partners and the strategic use of networks. Ultimately, the BioREGIO Carpathians project has clearly shown that the essential prerequisite to future life in the Carpathians is the implementation of an integrated management approach which allows both nature conservation and economic development to harmoniously coexist.

Source: Piatra Craiului, Mircea Verghelet

1. Introduction



The Carpathian Mountains are the largest, longest and most twisted and fragmented mountain chain in Europe. They host a unique natural and cultural diversity, exceptional at the European scale. Ongoing socio-economic changes and environmental impacts influence this sensitive ecological system in the region and call for further joint action.

BioREGIO Carpathians was a transnational cooperation EU project co-financed under the 2nd call of the South East Europe Transnational Cooperation Programme, priority area "Protection and Improvement of the Environment". It had a total budget of 2,202,888.77 € of which the European Regional Development Fund (ERDF) contribution was 1,872,455.45 €. In addition to this, the partnership benefited from the contribution of a partner from Serbia whose budget was 200,000.00 € granted by the Delegation of the European Union to the Republic of Serbia. The project duration went from January 2011 till June 2014 and wanted to show how the integrated management of the Carpathians' natural assets can boost sustainable development as well as ecological connectivity. 16 international, national, and local authorities, organizations and scientific institutions joined forces to contribute to the protection and development of the Carpathian mountain region. The seven Carpathian Ministries of the Environment are observers to the project. BioREGIO Carpathians is also a flagship project in the EU Strategy for the Danube Region (EUSDR). The project worked in close cooperation with the Carpathian Convention, with the aim to ensure an adequate follow-up of the project outcomes at the political level.

To find out more about the BioREGIO Carpathians project please visit the project website:

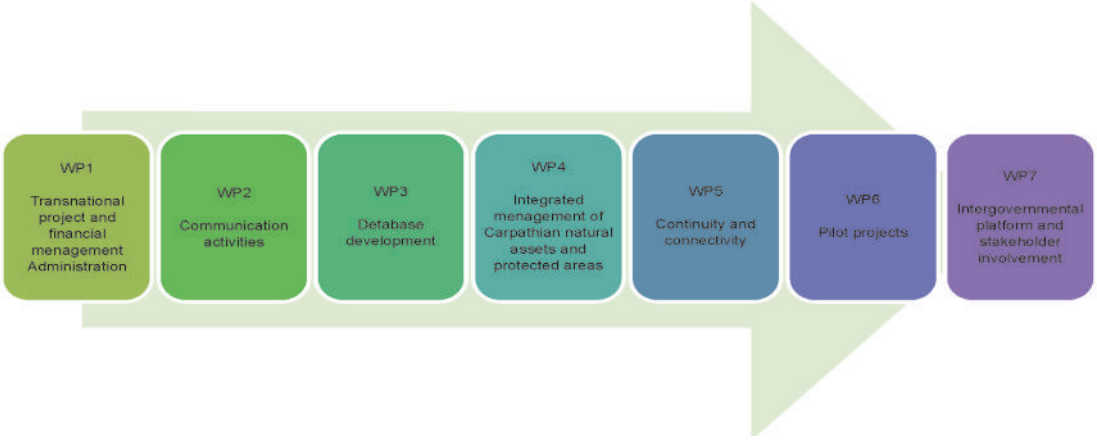
http://www.bioregiocarpathians.eu/

2. About BioREGIO Carpathians Project

Source: WWF, DanDinu, Bucegi Mountains

2.1. BioREGIO work packages in a nutshell and project objectives

The project is divided into 7 work packages.



Within these work packages, the main objectives of the project were:

- the development of the first **Carpathian Red List of Habitats and Species** as well as a List of Invasive Alien Species (see chapter 3.1)
- the development of a geo web based **Carpathian Integrated Biodiversity Information System** (see chapter 3.6)
- the development of a **Common Integrated Management Measures** (CIMM) for natural assets and protected areas (see chapter...) as well as its implementation in three transboundary pilot areas (see chapter 3.4)
- the identification of physical, legal and socio-economic barriers and possibilities concerning **ecological connectivity** in the Carpathians (see chapter 3.5)
- the identification of **regional development opportunities** for protected areas and natural assets (see chapter 3.2)
- the identification of **financial mechanisms and innovative economic tools** for protected areas and natural assets (see chapter 3.3)
- the **experience sharing** with the Alps as well as the **transfer of project results** to the Dinaric Arc and the Balkans. (see chapter 3.8)

2.2. The partnership

A total of 16 partners worked together to achieve the goals of the BioREGIO Carpathians project. The project pursued a holistic approach thus its partnership was characterized by partners who had complementary competencies in nature protection on regional, national and transnational levels (protected areas, administrative bodies, scientific institutions, NGOs. All countries of the Carpathian region were represented, with additional 2 outside partners chosen to increase the impact of the project in the Carpathian region. Piatra Craiului National Park (Romania) was the lead partner, coming from the core Carpathian region with a string experience in project management.

Romania

APNPC, NFA Romsilva – Piatra Craiului National Park Administration

APNMM, NFA Romsilva – Maramures Mountains Nature Park Administration

APNPF, NFA Romsilva – Iron Gates Natural Park Administration

EPA Sibiu, Environmental Protection Agency Sibiu

Austria

UNEP Vienna – Interim Secretariat of the Carpathian Convention

WWF DCP, WWF Danube-Carpathian Programme

Hungary

DINPI, Duna – Ipoly National Park Directorate

SZIU, Szent István University

Italy

EURAC Research, European Academy Bolzano, – Institute for Regional Development and Location Management

Slovakia

SNC SR, State Nature Conservancy of the Slovak Republic

NFC, National Forest Centre

Czech Republic

NCA, Nature Conservation Agency of the Czech Republic

Poland

UNEP/GRID-Warsaw, Environmental Information Centre UNEP/GRID-Warsaw

Serbia

JP NPDJ, Public Enterprise Djerdap National Park

Ukraine

CBR, Carpathian Biosphere Reserve

OBSERVERS: Ministries for the Environment were observers to the project and ensured, through the intergovernmental platform meetings, the dissemination of the project results at national and international level.

Ministry of the Environment of the Czech Republic

Ministry of Rural Development Hungary

Ministry of the Environment, Department of Nature protection Poland

Ministry of the Environment and Forest, Romania

Ministry of the Environment and Spatial Planning, Serbia

Ministry of the Environment of the Slovak Republic

Ministry of Ecology and Natural Resources of Ukraine

Environment Agency Austria

3. Main outcomes

Source: SNC SR

3.1. Red list of species and habitats, and Red list of invasive alien species in the Carpathians

The Lists of threatened species and habitats are widely recognized as the most comprehensive, objective global approach for evaluating the conservation status of plant and animal species, and during the past years also of habitats. The Red Lists are designed to determine the relative risk of extinction or collapse, with the main purpose of cataloguing and highlighting those taxa that are facing a higher risk of extinction, or those habitats that are under threat. These taxa provide also an index of the state of change of biodiversity. The assessment of taxa and ecosystems using Red List Criteria represents a critical first step in setting priorities for conservation action (IUCN 2012[1], 2013[2]).

Carpathians are well-known as the eco-region with very rich and unique biodiversity. Some Carpathian countries have developed their national lists of threatened species of plants and animals and most of them are included in the lists of protected species in their national legislation. Joint efforts between Carpathian countries are crucial for the monitoring, risk assessment and conservation actions for species and habitats.

The elaboration of the proposal of the Carpathian Red List of Species and of Habitats, including endemic flora and fauna species and endangered natural and semi-natural habitat types native to the Carpathians, following internationally recognized principles and criteria (e. g. IUCN Red List Criteria), is the task agreed by the Carpathian countries in the Strategic Action Plan for the Implementation of the Protocol on Conservation and Sustainable Use of Biological and Landscape Diversity to the Carpathian Convention.

Aim

The aim of the regional assessment is

- to identify those species and habitats that are threatened with extinction and in danger of disappearance in their natural range, or have a small natural range following their regression or by reason of their intrinsically restricted area, or present outstanding examples of typical characteristics of the region at the Carpathian level – so that appropriate conservation action can be taken to improve their status
- to use it as an indicator for assessing the condition of ecosystems and to identify areas and habitats that need conservation measures to prevent extinctions
- to contribute to regional conservation planning and to the implementation of the Carpathian Convention and European legislation

- contribute to averting European/global biodiversity loss
- monitor, on a continuous basis the status of a representative selection of species (as biodiversity indicators) that cover all the major ecosystems of the region.

Achievements and encountered difficulties

The development of a red list of threatened habitats was a new challenge as the IUCN Ecosystems Categories and Criteria[3] still is a draft document. There were no relevant data available to use IUCN criteria for any habitat type, therefore it was necessary to develop special criteria for habitats at regional level. Missing exact data on distribution of habitats and trends in most of the Carpathian countries made it even more difficult.


Source: P. Mikolajczyk/UNEP/GRID-Warsaw

Using approaches of former works, a new methodology for Carpathian habitats was developed by the team of experts. The introduction of non-native species has been considered the second greatest threat to biological diversity. Many of introduced plant and animal species are beneficial for humans. However, some of them are harmful and may have significant negative impacts on native biodiversity, economy and even human health. Globalisation processes have created new pathways for the introduction of non-native species to Europe including the Carpathian region. Complete lists of alien flora and fauna or in particular lists of invasive alien species are a helpful tool to address invasive alien species issues on national and regional level. Therefore, in the last decades, detailed catalogues of alien flora and fauna causing impacts on biodiversity, economic activities and human health have been produced from the local to the global level.

The objective of the project was to produce a draft Carpathian Red List of threatened habitats and species, to give a clearer picture on the status of alien species in the Carpathian region and to generate the first List of invasive alien species, as a step towards implementation of the Articles 8., 12. and 13. of the Protocol on Conservation and Sustainable Use of Biological and Landscape Diversity.

The **outputs of WP3** are a set of factsheets available online about basic data, important for assessing threat status of forest habitats, non-forest habitats, vascular plants, vertebrates and selected groups of invertebrates, and the draft regional Carpathian Red List on the status of these groups. Similar fact sheets for the Carpathian List of invasive alien species enable us to prepare the starting point for future studies on the trends of invasive species, and can influence measures taken on regional and national policy level for a better management and impact mitigation measures.

In this project, limited time and resources were available and when gaps in databases and monitoring were identified, only a certain number of selected "flagship" animal groups of invertebrates could be assessed. The studied species were recognized as suitable for the assignment of the IUCN Red List Categories and at the same time included in the annexes of the EU directives and the Bern Convention.

To gain results that would be comparable with the global evaluation and with other regional evaluations and that would be internationally accepted, the status of the species was assessed using the IUCN Red List Criteria (IUCN 2012[4]), which are the world's most widely accepted system for measuring extinction risk. The experts used the *Guidelines for Application of IUCN Red List Criteria at Regional Levels* (IUCN 2012). In the case of habitats, the draft international tool was elaborated and used as a guide.


Source: Maramures Np

	IUCN "threatened" categories				
Groups assessed	**EX, (EX?)**	**RE, (RE?)**	**CR (CR(PE))**	**EN**	**VU**
Forest habitats	0	0	13	10	17
Non-forest habitats	0	0	10	26	69
Vascular plants	(1)	20 (13)	95 (3)	135	219
Mollusca	0	0	1	6	30
Araneae	0	5	8	44	114
Odonata	0	0	0	4	5
Orthoptera	0	0	0	10	10
Lepidoptera	0	2	0	25	27
Petromyzontes, Osteichthyes	0	2	2	7	16
Amphibia	0	0	0	0	6
Reptilia	0	0	1	3	3
Aves	0	1	5	14	8
Mammalia	1	0	2	3	17

Table 1: Threatened categories of habitats and species assessed in the Carpathians

***Legend:** EX = Extinct; EX? = probably extinct; RE = Regionally Extinct; RE? = probably regionally extinct; CR = Critically Endangered; CR(PE) = Critically Endangered (possibly extinct); EN = Endangered; VU = Vulnerable*

According to the **Protocol on Biodiversity to the Carpathian Convention**, each Party shall pursue policies aiming at the prevention of introducing or releasing invasive alien species as well as implementing early warning systems for new invasive alien species. These species are likely to have adverse environmental impacts that could affect the biological diversity, ecosystems, habitats and species of the Carpathians. Each Party shall take measures in their national territory with the objective to prevent the introduction or the release of such species and, if need be, to control or eradicate these.

For the purpose of compiling the Carpathian List of Invasive Alien Species (IAS), already existing flora and fauna databases, catalogues or lists of alien species in the project countries were compiled to establish the Carpathian List of IAS. This list was based on available data and within limited time and resources available in the project there was no ambition to provide a complete list of alien species in the Carpathians with the information on their status. Species identified as invasive in one of the Carpathian countries were assessed as candidates for the Carpathian List only. The List covers vascular plants, vertebrates and selected groups of invertebrates.

Groups assessed	Vascular plants	Mollusca	Malacostraca	Orthoptera	Hemiptera	Lepidoptera	Coleoptera	Osteichthyes	Reptilia	Mammalia
Number of species	37	11	1	1	2	6	4	10	1	4

Table 2: Invasive alien plant and animal species in the Carpathians

Conclusion

The Carpathian Convention Protocol states that Parties to the Carpathian Convention shall pursue policies aiming at conservation, sustainable use and restoration of biological and landscape diversity throughout the Carpathians. The Parties shall take appropriate measures to ensure a high level of protection and sustainable use of natural and semi-natural habitats, their continuity and connectivity, and species of flora and fauna being characteristic to the Carpathians, in particular the protection of endangered species, endemic species and large carnivores.

It is important to stress that according to IUCN guidelines the red lists include only species and habitats in danger of becoming extinct or in risk of collapse and many others were left out due to e.g. lack of data and knowledge. A Red List based on the IUCN Criteria is not automatically a list of priorities for conservation actions. It is important to link immediate conservation measures to the red listed species but there is also a large group of other species, not red listed, which need protection.

So the aim was also to provide a basement for joint efforts in policies aiming at conservation, sustainable use and restoration of biological diversity throughout the Carpathians and to prepare data for compatible monitoring systems, coordinated regional inventories of species and habitats and coordinated scientific research. The collected data will be integrated in the **Carpathian Joint Biodiversity Information System.**

3.2. Regional development opportunities for protected areas and natural assets

Context

The Carpathian Mountains offer manifold natural resources such as rich forests, clean water, beautiful mosaic landscapes, farm land etc. Their biodiversity is outstanding in Europe with many endemic species and species, especially large carnivores that are close to extinction in Western Europe. These facts stem from the history of the area where in general less economic development took place as the mountainous area with the occurence of steep slopes and high altitudes were less favorable for large scale farming and industrialization. Accessibility of the area has always been a problem for rural development. Since the fall of the communism numerous young and educated people have moved to bigger cities or other countries to make their living. Land abandonment and the aging of the local population are the results. The current effects of transition are exacerbated by the financial crisis.

To strengthen prosperity of communities in the Carpathians economic development should be based on sustainable use of natural resources and should go hand in hand with nature conservation. Good conditions are given by the fact that the European Union policies are shifting from strict species and habitats conservation towards participatory nature conservation. Not only land owners and managers such as farmers, foresters are addressed but also members of other sectors are encouraged to run green, pro-biodiversity businesses.

The study "Regional Development Opportunities for Protected Areas and Natural Assets in the Carpathians" developed during the BioREGIO project under Work Package 4 helps future entrepreneurs, responsible authorities for regional development and NGOs how to start up such businesses. It is a useful compilation of opportunities, challenges and examples of solutions using the potential of nature and its services for the good of human society and economy.

The study on 'Regional development opportunities of protected areas and natural assets in the Carpathians' covers six sectors, namely tourism, agriculture, forestry, non-timber forest products, fisheries and energy. The scope of the study is to provide:

- Short analysis of the characteristics of the Carpathians having an impact on regional development in protected areas;
- Outlook on the six sectors and their relation to protected areas and natural assets, including definitions, existing guidance, standards and initiatives; challenges and opportunities;

- Good practice examples of sustainable businesses and initiatives within these six sectors from the Carpathians as well as from the Alps.

The aim is to initiate new, sustainable businesses in these sectors and thus to ensure both the long-term protection of the landscape and natural assets and also the livelihood of local people.

Target groups are local stakeholders, such as entrepreneurs and managers of protected areas and natural resources, NGOs involved in cooperation with stakeholders, but also authorities and policy makers who may support the process of sustainable development.

Method

Basic information was gathered through various channels. The policy review was focused on nature conservation policies, legislation as well as soft policy tools and funding opportunities for pro-biodiversity businesses in Europe and in the Carpathian countries. The literature review covered the reviewing of existing studies and documents on development opportunities building on protected areas and natural assets. Through questionnaires information was gathered on the attitude of locals to nature conservation, existing conflicts and positive examples, etc. from the 16 project partners of the BioREGIO project. Regional stakeholder meetings were held in Hungary, Romania, Serbia and Slovakia, organized by the respective project partners. The aim of these meetings was to involve local stakeholders and to learn about their views and experiences on business operation in protected areas. Stakeholder meetings were structured around two parts. The first dedicated to setting the scene, whereas the second dedicated to workshop discussions with participants split into three breakout groups around sectoral themes.

To fill in gaps for non-EU and less well documented countries, experts were hired by respective project partners for Romania, Serbia and Ukraine who provided additional information. Additionally, interviews with experts on EU nature conservation, on the ecosystem-type of investments and Green Infrastructures, on sustainable agriculture, on sustainable regional development, on socio-economic aspects of biodiversity and nature conservation, and on initiatives to green the EU funds were carried out.

Potential good practice examples from the Carpathians and the Alps for the reason of similarities were collected and assessed whether they fitted to the below-mentioned sustainability criteria and could be applied elsewhere in the ecoregion. Good practice examples for each sector were chosen to be included in this study.

Sustainability criteria used in the study

Sustainability criteria are based on three pillars, nature, people and economy. Good practice examples in the study represent businesses / initiatives that are based on natural assets and at the same time include nature conservation and have been self-sustainable for at least 3 years. The following criteria have been set: The example should be

- A business, preferably private or a result of joint action e.g. with NGOs or protected area managers (i.e. national park etc.), closely linked to protected areas and/or natural assets.
- From one of the sectors of the study.
- Preferably from the Carpathian region; if the example is from outside the Carpathians, the method should potentially be applicable in the Carpathians.
- Sustainable, in line with nature conservational objectives. In case an initiative affects the use of natural resources it should comply with sustainable natural resource management or should be a forerunner in applying new sustainable management methods.

Conclusions

The literature and policy review shows that at European scale there is a clear trend in the shifting from protectionist towards participatory nature conservation. With the spread of the concept of ecosystem services and their values, it is easier to communicate benefits and needs to protect biodiversity. This also helps underpinning the greening of EU policies and funds, e.g. Cohesion Policy calling for spending more on ecosystems and green infrastructures (COM (2011) 17 final), the proposal from the European Commission on the Common Agricultural Policy for 2014-2020 including further greening of the funds, especially on payments for public goods, the Climate Policy clearly targeting sustainability goals. All these embed the necessary involvement of stakeholders in order to achieve sustainable growth in Europe (COM (2010) 2020 final). The tendency carries opportunities for rural people to get engaged in pro-biodiversity businesses, contributing to nature conservation on the one side and also providing sufficient economic and social benefits.

The analysis of the answers to the questionnaires, discussions at stakeholder meetings and the input from national experts for Romania, Serbia and Ukraine highlighted that though the Carpathian ecoregion has great potentials in terms of natural assets, it is a laggard compared to other, Western European countries in using these potentials. This on the one hand may be a remnant of the history of the region with the current financial crisis adding up to the difficulties. We found that although there are some initiatives of sustainable businesses in the Carpathians that are worth to be followed, but there is room for further initiatives. What were most to be heard at stakeholder meetings are the conflicts between nature conservation and local

businesses, the restrictions and difficulties entrepreneurs face because of protected areas and species. When it turned to identification of positive, good examples, it was in some cases even impossible to find any. The same tendency was to be noticed from the answers to the questionnaires. All who filled in the questionnaire could list conflicts and problems with all the sectors they marked as relevant for the region. However, there were only a very few good examples provided through this information source.

The search for case-studies shows that there are pro-biodiversity business hot-spots, regions where several good example initiatives exist in parallel or even being interlinked with each other. This suggests that pro-biodiversity businesses and initiatives are good catalysts.

All these led to the conclusion that there is a clear need to assist locals in finding ways to use the opportunities for sustainable businesses in their region. There are three main groups who can drive such changes; one is policy makers, the other is non-governmental organizations and the third being the locals, entrepreneurs themselves.

Source: Maramures National Park

3.3. Financial mechanisms and innovative economic tools for protected areas and natural assets

One of the studies produced under WP4, analysed the financial mechanism and innovative economic tools for protected areas and natural assets. This study aims at providing an overview on the financial situation of protected areas in the Carpathian region, on the basis of available data and information. Furthermore, it reflects on further financial possibilities, taking other regions into consideration.

The current main sources of funding for PAs analysed in the study are national and international public budgets, NGOs, revenues from tourism and the emerging green (organic) markets. The share of private funding sources is still very low in most Carpathian countries which results for PAs to be very dependent on public funds. Too centralised models of management for conservation can often create bottlenecks especially in times of national financial crisis where not all the budget needed to finance the park can be covered. The most important needs for PAs are:

- More funding sources for infrastructure and facilities
- More freedom to contract external providers, also using open bids and auctions
- More freedom and clearer rules on how to manage partnerships with other organisations
- More flexibility in managing staff contracts

The revealing conclusion of the study is that several parks cannot deliver their expected outcomes even under a basic management scenario. A more diverse portfolio of financial source could help ensure the sustainability of PAs in the long term perspective. Achieving a diversification would require changes in the legal and administrative system. But a certain degree of change is attainable through different methods.

First it is important to define the value of the ecosystem services of the protected area, to fully use the potential of the area and benefit from it. Furthermore, the identification of stakeholders benefiting from these services is an important step to a strategic planning. Usually, financial planning is considered to be a specific section within a wider business planning procedure, where it depends on the management objectives (drafted in the business plan) to determine more practice – oriented goals that can also be economically quantified and checked through indicators. Critical in the financial planning of PA, especially after the significant crisis of public funding, as become the identification of proper sources of funding that may substitute classical and centralized streams. These sources have often become recently insecure and difficult to manage.

Financial mechanism proposed for CNPA	State of the art	Remarks
Tourism-based revenues	Ongoing	Fast growing activity but impact on PA may be problematic and distribution of tourism benefits may pose challenges
Natural resources extraction fees	Scarcely developed	Depending on the on-site availability of natural resources. Impact on PA may be problematic. Distribution of revenues might pose challenges.
CO_2 capture and storage	Not developed	Can be managed either through the regulatory market in the countries where it applies, or the voluntary market. Some technical details typically arise when applying specific accounting methods that should assure the respect of the criteria of additionality, permanence, and consider leakage from project implementation. It does require clear legal framework or shared rules to be effective.
Water user fees	Scarcely developed / not present	Particularly suitable for mountain PAs where natural springs exist and water can be directed to several alternative uses. If properly managed, this tool allows both for protecting the ecosystem and collecting money at the PA or community level. Distribution of revenues might pose equity challenges.
Royalties and revenues on sales	Scarcely developed	Suitable especially in bundle with other tourist orientated strategies.
Licenses and permits	Scarcely developed	Potentially growing, quite easy to implement at the local or regional level in the presence of resources to be harvested. Might be supported by funds allocation programs, earmarked on the conservation of the licensed resource. Several experiences are available worldwide, for different types of resources.
Concession fees / leases and rent fees	Scarcely developed	Depending on the on-site availability of natural resources, unique landscapes, tourist attractions, natural and cultural heritage. Impact on PA may be problematic if users flows are not managed properly.
Natural hazard reduction fees	Not present	Potentially interesting, especially in the presence of protection forests and when afforestation policies are undertaken. Require some research and technical activities such as hazard maps and ecological assessment of ecosystems functions and services. Requires a huge stakeholders involvement with both public authorities and private actors.

Timber royalties	Not present	Suitable especially if forests are underexploited and there is some potential to implement sustainable forest management on-site. Very often PAs host inside or within their buffer zones large forested areas. This action should be carefully balanced with the management of "timber royalties" (see above)
Improved forest compensation	Ongoing	Suitable especially if forests are overexploited and there is a need for afforestation policies. Since there is often a partial overlapping of PAs and Natura2000 sites, some EU funds can be employed for PES to forest and land owners implementing specific management practices.
Environmental compensation	Scarcely developed	Mechanism that can provide funds but has to be carefully managed in order to assure ecosystem / landscape functionality. Suitable especially for bordering areas and sometimes buffer zones. Different uses entail different levels of risk.
Corporate grants	Scarcely developed	Growing activity in the region, better suited for productive landscape (e.g. IUCN V). It can be linked to the core-business of the corporate-donor. Might be a short-run measure.
Environmental taxes (PPP)	Occasional / to be adjusted	Classical, centralised activity. Requires well-functioning fiscal system and appropriate redistribution policies. Revenues might enter a national environmental fund (NEF) and be redistributed to environmental ends. Often requires a fiscal reform.
Environmental subsidies (PGP)	Occasional / to be adjusted	Other classical centralised activity. Should avoid to set up perverse subsidies. In the presence of pre-existing policies, they have to be carefully set up and managed aiming at avoiding inconsistencies. Requires a significant knowledge of the policy background.

Table 3: Financial mechanism options for protected areas in the Carpathian Region.

Implementation in the Piatra Craiului National Park

The aim of this study, which is annexed to the study mentioned above, has attempted an assessment of the main lessons learned from the process of the implementation entry fees in the NP. In summer 2013, the Piatra Craiului National Park in Romania started to implement entry fees for visitors and identified other opportunities for a better financial coverage for PAs in general and PCNP in particular such as: partnership for collecting PAs fees (national and local level), development of private business in the area of eco-tourism, cycling and recreational events, promotion of accommodation facilities on PAs web sites, etc. Park visitors have the following options for buying the entrance ticket:

- pay by sending a mobile text message to a specific number;
- pay through a secured internet platform (The internet secured platform is also giving the possibility to donate for certain actions of the PCNP administration areas and to facilitate the trade of other materials such as maps, books, posters etc.);- pay through the cashing machines installed in Zarnesti, National Park visitor centre and Plaiul Foii chalet;
- buy a ticket (through tourism operators as hotels, restaurants and agencies);

The money obtained through the entrance fees will be further used for the maintenance of tourist facilities, for awareness raising and educational activities and materials and for the feed collection mechanism. One important goal was to ensure the full transparency of these funding activities.

The documentation of the entire process was presented to and approved by the Scientific Council as well as by the central authority in charge with environment protection in Romania.

The main actions which are still being implemented at the time of the production of this report are the awareness raising towards the introduction of entry fees, the training of rangers and the adaptation of the site www://pcrai.ro for online payments or donations.

Source: Piatra Craiului, Adrian Ciurea

3.4. Common integrated management measures (CIMM)

What are CIMMs?

As agreed by project partners and experts during the Joint WP4 & WP6 Meeting in Budapest (25-27 June 2012) Common Integrated Management Measures (CIMMs) should be concrete strategic approaches and actions that can be implemented by one or more target groups, directly contributing to the long-term favorable conservation status of biodiversity asset.

CIMMs should be:

- Potentially common to all Carpathian countries, commonly applied across borders.
- Generic enough to be relevant across the entire range of the asset (subject to local variations and adaption).
- Specific enough to be practical, measurable (monitorable) and commonly understood by all relevant target groups.
- Formulated to include examples/case studies of how they have been used and adapted in specific contexts.

In order to ensure that CIMMs are 'integrated':

- Measures should be compatible with each other (i.e. without contradictions and inconsistencies).
- Measures should be compatible (as far as possible) with existing policy frameworks relevant to the region.
- Measures should be relevant and useable across different sectors.

Why do we need CIMMs?

The Carpathian Mountains harbour a wealth of natural treasures. Forest, grassland and wetland habitats are rich in biodiversity; large carnivores and herbivores that are close to extinction in other parts of Europe still range the landscape. The mountain range covers seven countries using different approaches for the use, management and monitoring of natural resources. Five out of 7 countries (Czech Republic, Hungary, Poland, Romania, and Slovakia) are members to the European Union committed and obliged to implement EU Directives, whereas two countries (Serbia, Ukraine) are not, but currently developing EU conform systems for nature conservation and other sectors that are important for the European Union in terms of nature protection and development.

While national legislation and management practices vary from country to country, protected area and natural resource managers face similar problems across the Carpathians. Examples for good solutions for general and specific problems might be found in one country, but may be lacking in others. Migrating species, forested areas or rivers that cover more than one country may be managed sustainably in one country and differently in the other, resulting in an imbalance of species occurrence and habitat structure.

Based on these circumstances, stakeholders of the Carpathian Convention have recognized the need for harmonization of standards and management measures of natural resources within and outside protected areas, in order to guarantee responsible management and development of the region in a way that respects nature, protects biodiversity and supports human well-being. Managers are called upon to cooperate across the borders, supported by the Parties to the Carpathian Convention.

The study "Common Integrated Management Measures for Natural Assets and Protected Areas in the Carpathians"

The study promotes the harmonized management of natural assets and protected areas including Natura 2000 sites in the Carpathians by involving all relevant stakeholders and by building on the existing framework of cooperation of the Carpathian Convention, its Biodiversity Protocol and other related transnational networks and initiatives.

The study was prepared over a period of 18 months by a group of over 50 experts from all participating countries, and through much wider consultation within expert communities in each country and at a number of specialist consultation workshops and regional stakeholder consultation meetings. It includes four main sections related to each of the focal areas (biodiversity assets) of Work Package 4. The assets are:

- Forests.
- High nature value grasslands (HNVF).
- Wetlands.
- Large mammals.

Each of these sections has a similar (but not identical) structure; first, it provides an **overview of the current status of the asset** in the Carpathians, its various subunits, its **values** and the **threats** it faces. It then specifies the **basic strategic framework for future management of the asset** based on the assessment and on the **current policy framework**. Finally, each section specifies a number of **common integrated management measures** (CIMMs) for the asset. These CIMMs are arranged in a similar way for each section. Measures are specified that

1. Contribute to the practical management and protection of the asset by those charged with its day-to-day management at the site and the ecosystem scale (protective measures, active management measures, ecosystem/landscape scale measures).

2. Concern the enabling environment for management; the legal framework, planning measures, administrative arrangements, financing, awareness and capacity development.
3. Relate to research and monitoring.
4. Have a crosscutting nature, based on common issues arising from each of the sections addressing as well the political level.

The study includes a large number of case studies from the region highlighting examples of good practice, major issues faced in the management of species and ecosystems and outcomes of major projects. Most case studies include web references for further investigation and a comprehensive reference list is also provided.

Source: M.Verghelet, Cheile Nerei Beusnita National Park

Results

The recommended measures for each of the 4 natural assets looked at are summarized in the table below.

Measures for forests

Conservation management measures for implementation by protected area and forestry administrations and other forest managers.	
Protection measures. F1. Identify and protect all near-natural, old growth and virgin forests F2. Establish non-intervention zones in all large forest protected areas. F3. Maintain different structural elements in forests: deadwood, hollow trees, microhabitats, rare tree species. F4. Extend the network of Forest reserves (outside the PA system) and establish forest corridors F5. Ensure special protection of the full range of habitats in forest ecosystems F6. Establish fire detection and response systems. **Active management measures.** F7. Intensify efforts to control Invasive species, especially in core zones and sensitive areas.	F8. Increase support for traditional low intensity forest management practices. F9. Adopt and implement close-to-nature forest management more widely in the Carpathians. F10. Regulate and limit sanitary cuttings F11. Extend the forestry road networks where necessary to improve access for extensive forest management systems. **Ecosystem/landscape scale measures.** F12. Ensure the overall maintenance of forest cover. F13. Prioritise maintenance of natural forests. F14. Prevent forest fragmentation and maintain the integrity of forest ecological corridors
Measures related to the enabling environment.	
Planning and designations. F15. Establish a regional model for multifunctional forest management plans. F16. Establish a common, harmonized approach to zonation and management of forest protected areas . **Legal issues.** F17. Strengthen procedures for EIA and assessment in Natura 2000 sites. F18. Ensure full implementation of the EU Timber Regulation (EUTR). **Economic issues.** F19. Institute credible forest certification schemes.	F20. Promote production of high quality timber. F21. Promote local use and processing of wood. F22. Provide compensation for owners for restrictions on use of priority forest areas. F23. Promote recreational use of forests F24. Establish pilot projects for payment of forest ecosystem services. F25. Provide incentives for environmentally friendly technologies for forest management. F26. Establish pilot projects for the regulation and sustainable management of fuel wood and non-timber forest products.
Awareness and capacity development measures	
F27. Improve capacity and awareness among all stakeholders about the value of forests and Sustainable forest management.	F28. Improve access to training for all involved in forest management.
Research and monitoring measures	
F29. Establish regional methods for assessment of forest naturalness. F30. Establish a region-wide long-term monitoring programme of forest biodiversity.	F31. establish a Carpathian-wide network of permanent long-term forest monitoring areas.

Measures for high nature value grasslands

Specific conservation management measures for implementation by protected area administrations and other grassland managers.	
Management of alpine and subalpine grasslands. G1. Adopt non-intervention management for alpine and remote subalpine grasslands. G2. Maintain low intensity grazing in traditionally managed subalpine grasslands. G3. Limit use and development on alpine and subalpine grasslands and conduct restoration in priority areas. **Management of dry grasslands.** G4. Maintain traditional low-intensity grazing on dry grasslands.	**Management of mesic grasslands .** G5. Maintain traditional mowing and grazing regimes. **Management of Nardus grasslands.** G6. Maintain extensive grazing of **Nardus** grasslands (apart from in alpine zones). **Management of wet grasslands.** See Chapter 4 (Wetlands) and, specifically CIMM**.**
General management and planning measures.	
G7. Management prescriptions must be adapted to local conditions and practices. G8. Ensure that grazing is carefully planned and regulated.	G9. Plan for the introduction of cutting, restoration and mulching programmes.
Research and monitoring measures.	
G10. Develop management models which propose appropriate management measures for various types of Carpathian grasslands, based on best practices from different Carpathian and EU countries.	G11. Develop a common typology for grassland vegetation that can be used across the Carpathian region. G12. Identify grassland indicators that are easy measurable and can be used at local and regional levels.
Policy measures.	
G13. Develop a strategy for adoption in all Carpathian countries for the conservation and management of small-scale farms and mosaic landscapes with traditional management practices.	

Measures for wetlands

Specific conservation management measures for implementation by protected area administrations and other wetland managers.	
Protective measures. W1.Adopt passive (minimal intervention) management for suitable sites (e.g. wetland forests, raised bogs, swamps). W2.Establish wetland buffer zones. W3.Regulate and manage water abstraction and use. W4.Manage sewage, waste water and surface water pollution. W5.Develop guidelines and introduce measures to regulate the hydroenergetic use of rivers and to limit and mitigate its impacts. W6.Limit peat exploitation. W7.Protect karst area sby restricting intensive agriculture. W8.Restrict afforestation of wetlands (especially wet grasslands and peatlands). W9.Exclude or restrict grazing around springs and on sensitive wetland sites.	**Active management measures.** W10.Maintain and extend mowing and grazing of wet grasslands. W11.Introduce mulching on an experimental basis as an alternative to grazing and cutting. W12.Remove trees and shrubs on non-forest wetland habitats. W13.Manage peatlands sustainably and Restore them after use. W14.Develop measures and Introduce programmes to Remove or control invasive species. W15.Restore hydrological regimes and river dynamics. W16.Prevent sedimentation.
Ecosystem/landscape scale measures.	
W17.Introduce and extend integrated water resources management. W18.Establish ecological networks and restoration of river and wetland connectivity.	W19.Incorporate conservation considerations into flood mitigation measures. W20.Introduce regional (Carpathian Wide) measures for improved wetland management.
Legal, planning and administrative measures.	
W21.Strengthen the policy environment for wetlands in the region. W22.Designate and establish new wetland protected areas. W23.Improve and extend conservation management planning for wetlands.	W24.Introduce land purchase for the most sensitive wetland sites. W25.Improve regulation and land use planning in order to protect wetlands. W26.Strengthen EIA and Natura 2000 assessment for wetland sites.
Economic measures.	
W27.Promote and implement cross-compliance rules and measures for wetland management. W28.Mobilise payments for wetland management from rural development programmes. W29.Introduce compensatory measures to support wetland restoration.	W30.Implement conservation and restoration projects on wetlands. W31.Introduce market-based instruments to protect water and wetland ecosystem services. W32.Seek new markets for products from sustainably managed wetlands.
Awareness and capacity development measures.	
W33.Improve cross sectoral training of wetland managers and stakeholder groups. W34.Provide up to date guidance on wetland management across the region.	W35.Conduct wetland awareness campaigns. W36.Promote ‘soft tourism’ activities in wetlands.
Research and monitoring measures.	
W37.Mobilise support for standardised inventories and management oriented research. W38.Improve monitoring of wetlands.	W39.Improve information management and availability.

Measures for large carnivores and herbivores

Specific conservation management measures for implementation by protected area administrations and game and wildlife managers.	
Intensifying and coordinating efforts in the field to stop poaching. LM1. Increase cooperation between protected area administrations, law enforcement authorities, police, judiciary and border guards. LM2. Encourage cooperation of local people in anti poaching activities and other measures. LM3. Standardise and tighten legal procedures concerning illegal killing (poaching).	**Improving species management.** LM4. Plan a coordinated extension of the bison breeding and reintroduction programme. LM5. Establish reliable and common damage mitigation, estimation, and compensation systems. **Improving ecosystem and habitat management.** LM6. Identify priority areas for threatened species and apply special protective measures. LM7. Establish an ecological corridor system based on habitat use and species occurrence data.
Legal measures.	
LM8. Increase penalties for poaching, especially of protected species.	LM9. Strengthen legal provisions for intersectoral coordination of protection and management.
Planning measures.	
LM10. Agree on regional species management strategies to provide an overall common framework for the conservation and management of large mammals. LM11. Develop national multisectoral species management plans.	LM12. As a priority, establish a special regional project for lynx conservation.
Awareness and capacity development measures.	
LM13. Conduct programmes to improve the image of carnivores.	LM14. Build capacity for large carnivore protection and management.
Monitoring, research and information management.	
LM15. Establish reliable and common monitoring systems at the regional and national levels. LM16. Develop new methods for monitoring. LM17. Establish a network of long-term monitoring sites in order to monitor the impact of the measures.	LM18. Establish a regional data centre for large mammals. LM19. Encourage research projects.
Financial support.	
LM20. Secure funding for large mammal conservation	

Source: WWF, HMeyer

Source: WWF, Popp Hackner, Tatras SK

Source: WWF, Popp Hackner, Tatras SK

3.5. Continuity and Connectivity

Ecological connectivity is 'the degree to which the landscape facilitates or impedes daily wildlife's movements among resource patches'. Landscapes are the setting for all human and wildlife activities, providing the basis of human welfare and the resources necessary for all the other life forms.

Source: Ravazzoli, NP Djerdap 22.07.2013

As humans need to move freely to assure continuation of their activities, also wildlife needs connected landscape structures for continuous exchange of genetic resources. In recent decades, humans have often shaped landscapes with little thoughts to the cumulative impacts and at a pace that is unprecedented. Decision making on transport infrastructure and urban development has not taken much in consideration the value of landscapes. Biodiversity and landscape quality are often marginalized.

Source: Apdency

The fast modernization of the Carpathian countries may increase the risk of landscape fragmentation, limiting dispersal and the genetic exchange of wildlife species. These artificial and often insurmountable barriers along traditional dispersal paths raise also the risk of collisions with cars. Ecological connectivity between large natural and protected areas is essential for species, which require large habitats, have low densities of occurrence and react sensitively to landscape fragmentation.

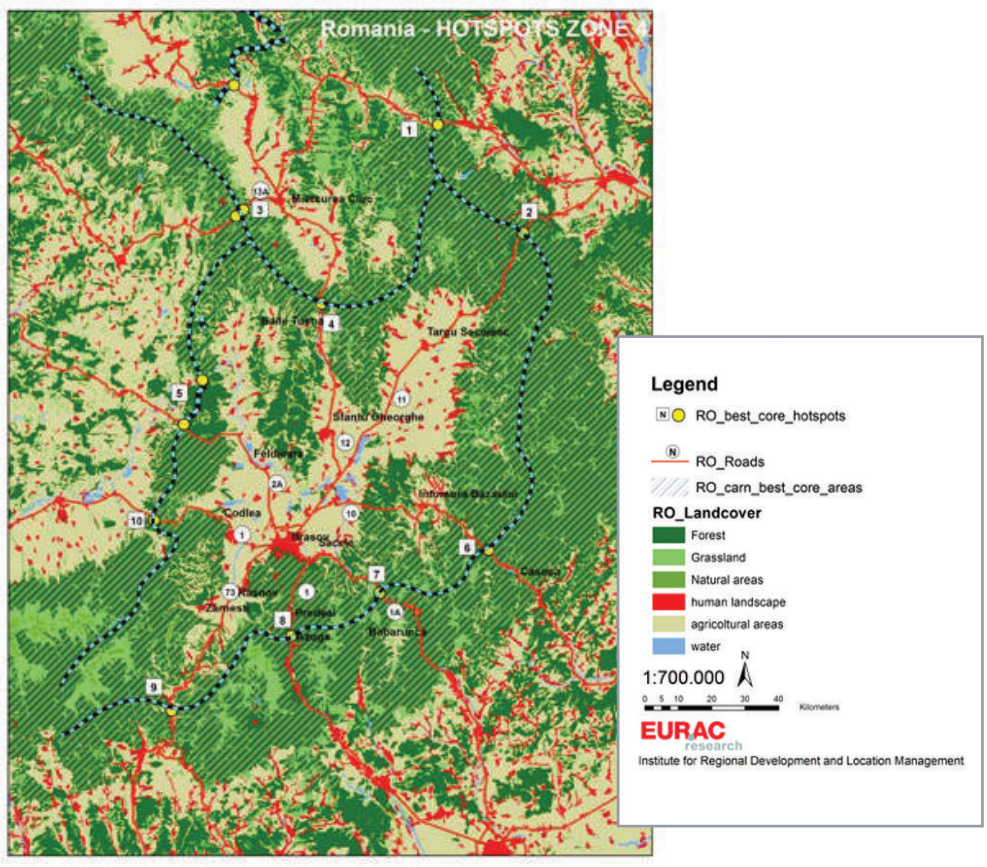
Ecological corridors can provide a solution to fragmentation, since they are "landscape elements which serve as a linkage between historically connected habitat areas". Ecological connectivity is not only fostering the welfare of wildlife populations, but represents also an indispensable value for human society and the economy, as it plays a central role in ecosystem functioning.

Physical barriers/possibilities

Ecological connectivity focuses on conserving areas that facilitate dispersal and on awareness-raising concerning the human-wildlife coexistence. Nevertheless, connectivity can be interrupted by areas of human facilities that impede movement. Physical barriers are thus landscape or artificial features that impede dispersal paths between ecologically important areas. To map properly the best dispersal paths it is fundamental to analyze the territory's permeability, the preferred habitat types of wildlife species to detect the barriers that most strongly affecting connectivity. Many techniques are available to restore pristine ecological connectivity by removing fences or installing highway underpasses for wildlife etc.

From an ecological context, barriers are inverse to ecological corridors. They are distinguished in impermeable features and those partially hindering dispersal. The impermeable once are mostly human-made like roads, fences, or urban areas. Only sometimes natural features as rivers, canyons or huge agricultural fields also become impermeable. In contrast, there are land cover types or facilities partially hindering dispersal relative to ideal conditions but not disabling connectivity totally. Following traditional connectivity concepts, the impact each barrier has differ among species and should be evaluated considering how it reduces connectivity through behavioral inhibition, increased mortality, or other means.

Source: Hoffmann, motorway Velka



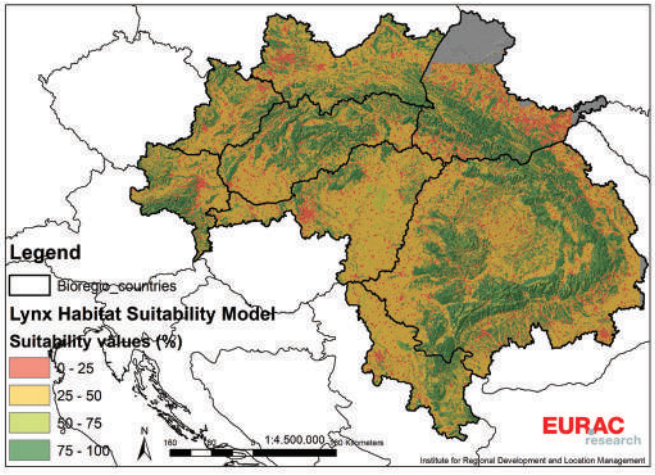
In BioREGIO the analysis of connectivity is based on a GIS model completed by site visits in pilot areas. The visits aimed to validate the identified corridors and barriers blocking movements crucial for ecological and evolutionary processes. The species requiring large habitats are more affected from barriers concerning transportation infrastructures (current or foreseen), illegal urban sprawl, road kills due to the absence of fences or mitigation structures on motorways and from low ecological awareness among authorities and local people. Additional barriers, with different effects in different countries have been identified in habitat transformations, the shifting from extensive to intensive agriculture, poaching and hunting and in intensive forestry practices. A cost-benefit analysis would be necessary to integrate connectivity restoration into systematic conservation planning analyses aimed at optimizing conservation investments. Knowing where barriers have the greatest impact would help practitioners to decide where and how to invest scarce conservation resources to conserve and enhance connectivity.

Eurasian Lynx


Source: Marcus Piet

The Eurasian lynx (*Lynx lynx* Linnaeus, 1758; order Carnivora; family Felidae) is the largest felid found in Europe. The lynx's diet consists of different prey species, the major part (80%) of roe deer, red deer and chamois. The lynx is a very sensitive mammal, highly influenced by the presence of the human society. The preferred habitat consists of mixed forests between 700 and 1500 m a.s.l. with home ranges between 10.000 and 300.000 ha. Lynx inhabits also lowland areas – as long as there is a big and relatively old forest complex present. Within BioREGIO, this specie was assessed to be potentially present through all Carpathian mountains.

The facts collected during the project and with the interviews carried on during the site visits, have identified the main threats for this species in the Carpathians. Local farmers and hunters do not perceive this species as a competitor; on the contrary, they are used to its presence and it is seen as an ally in keeping the ungulate populations under control.



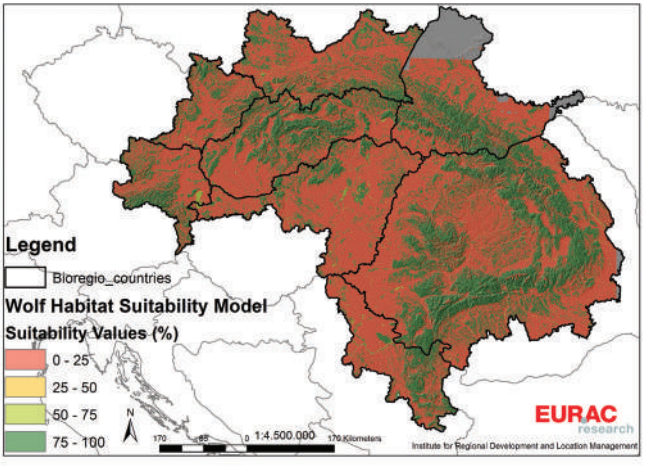
The main identified threats for this species' connectivity are the loss of habitat due to habitat conversion and increase of human disturbance and fragmentation (development of new motorways). The loss of prey due to decline of ungulates and other local threats may drastically reduce the size of suitable habitat for this species only to remote mountain areas and have a dramatic effect on the distribution of this species.

Grey Wolf


Source: Daniel Mott

The grey wolf (***Canis lupus*** Linnaeus, 1758; order Carnivora; family Canidae) is the second largest predator in Europe, after the brown bear. The wolf is a true generalist that feeds opportunistically on what is most available in its habitat. Its distribution, geographic range and seasonal variations depend on the relative abundance of potential prey, as well as their accessibility and availability. Habitat quality should then be interpreted in terms of human disturbance, prey densities and range size.

In the Carpathians countries, the wolf population represents around 30% of the total European one and it is mainly distributed in Romania, Ukraine, Poland and Slovakia. All four countries have signed the Bern Convention, but effective legislation for the protection of wolf has been adapted to local situations. The species is strictly protected only in some countries (e.g., Poland), where compensation for the damage they cause is offered by conservation agencies, whereas in others (e.g., Ukraine) it is still considered a pest and bounties are paid for its removal.

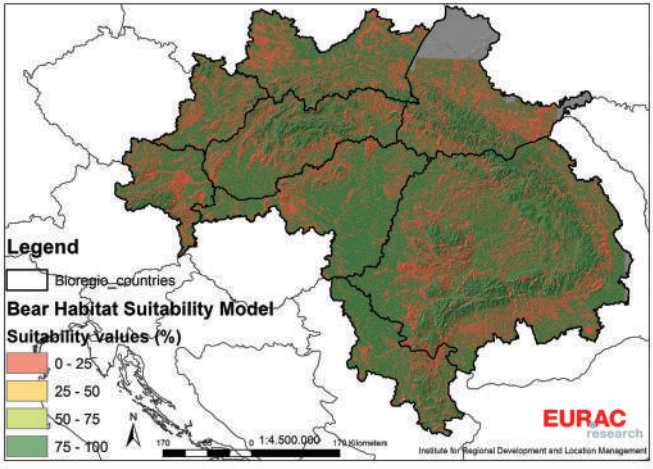


The main threats are then intended at local/national level. Poaching and human encroachment are the most significant threats to the wolf's habitat and survival. Competition with hunters is often a reason for eliminating wolves. Wolves usually tolerate disturbance by roads and tourism as long as they have safe retreat areas to escape human pressure. Although wolves may survive in the most diverse types of habitat, vegetation cover and availability of some food resources are at least two limiting environmental factors.

Brown Bear

The brown bear (***Ursus arctos*** Linnaeus, 1758; order Carnivora; family Ursidae) is the most widespread bear in the world, with a Holarctic distribution in Europe, Asia, and North America, ranging from northern arctic tundra to dry desert habitats. The Carpathians are home to about 8,000 brown bears in Slovakia, Poland, Ukraine and Romania. Bears are important management indicators (umbrella species) for a number of other wildlife species. The bears' preferred habitats are usually mixed and open forests between 500 and 1500 m a.s.l, but they can easily adapt to lower altitudes if food sources are available. Bears are very adaptable to changing habitats and have home ranges up to 30000 ha.

The brown bear, in periods of food shortage in spring and fall, prey upon wild animals and domestic stock, invade cultivated agricultural areas damaging fruit trees and stripping bark from tree trunks. Generally only isolated bears prey on cattle. The brown bear is not only an interesting and beautiful animal but it is particularly esteemed as a trophy animal. The Carpathian bear is one of the best subject for sport hunting. Hunting (in different quotas) is allowed in Romania, Ukraine and Slovakia. Brown bears have a low reproductive rate and are very vulnerable to human-caused mortality, to habitat changes and to landscape fragmentation.



Motorways represent here the most relevant barriers to the bear. Although being road-killed does not represent a threat for conserving this species, the planning of motorways in the Carpathians should consider the large habitat requirement of the Carpathian brown bear. Additional, identified threats, as poaching and decrease of suitable habitat due to the expansion of human society, may increase the risk of conflicts with this species and have to be investigated locally. As for the wolf and the lynx, a Carpathians-wide management plan would be needed.

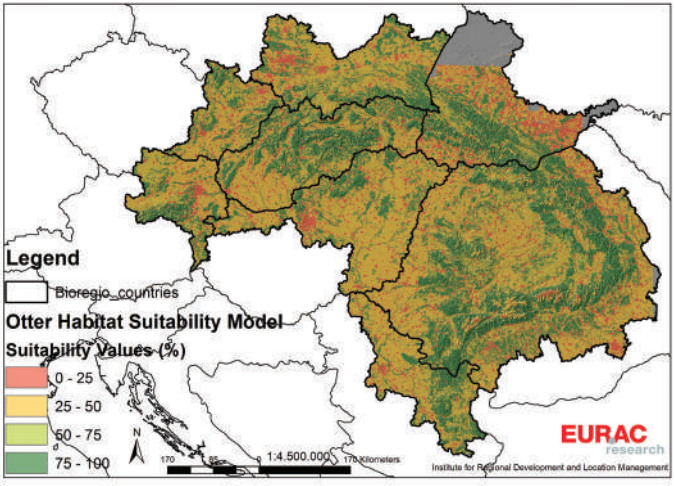
Eurasian Otter


Source: National Geographic

The Eurasian Otter (*Lutra lutra*, Linneus 1758, order Carnivora, Family Mustelidae), is a semiaquatic carnivore whose habitat is usually linked to freshwater, available shelter (riparian vegetation, rocky structures) and abundant prey. Individual's territory vary between one and 40 kilometers along river catchments. Fish is the major prey as it exceeds more than 80% of the otter's diet.

This species is an important environmental indicator because it is extremely sensible to water pollution and human habitat transformations.

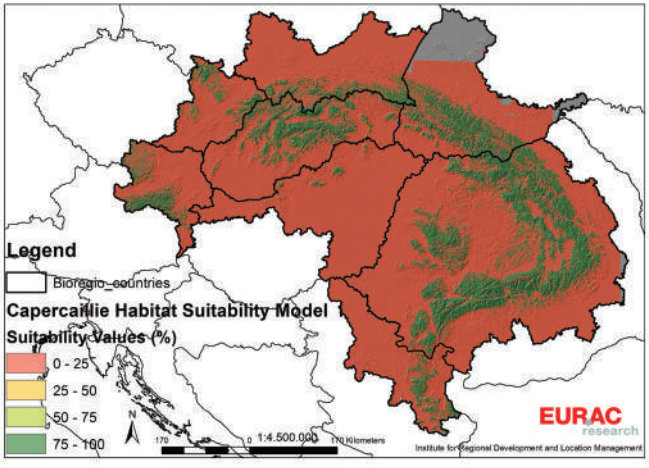
Identified core areas in the Carpathians range from north to south along the hydrographical systems. In most areas, its occurrence is correlated with bank side vegetation. BioREGIO's connectivity analyses of the landscape, along linear features took in consideration both: the longitudinal (otters moving within one river system) and lateral (dispersal movements toward neighboring rivers as well as the maintenance of gene flow among populations living in different river basins) connectivity. As river catchments can be considered as closed systems, the longitudinal connectivity can be simply evaluated through the distribution of suitable habitat patches. Besides, the lateral connectivity must also consider the resistance (permeability) of the land matrix to dispersal by otters between catchments plus the physical barriers the species may encounter. During BioREGIO's site visits, the main identified threats and barriers for the this species were due to intensive agriculture, canalization of rivers, removal of bank side vegetation, dams, draining of wetlands, aquaculture activities and associated anthropic impacts on aquatic systems. The otter is endangered from road kills when passing from one river catchment to another. In specific cases (i.e., Slovakia) some mitigation structures (underpasses) to protect the movements of the otter have been put in place. Aside local poaching and river pollution are additional threats.



Western Capercaillie

The Western Capercaillie (*Tetrao Urogallus*, Linneus 1758, Order Galliformes, Family Phasianidae), is the largest among the grouse family. Found across Europe and Asia, it is renowned for its mating display ("lek" - ("dances" used by male birds to strut their stuff in the hope of getting a mate). It is a large ground-nesting grouse species with precocial chicks inhabiting in small isolated populations in mixed spruce-beech-fir or mountain spruce forests between 500 and 2000 m a.s.l. Potential Capercaillie egg and chick predators are corvid birds, hawks, golden eagle and large bodied owl. Among mammals, there are red fox, mustelids, wild boar, brown bear and lynx. Capercaillie is an important element of the natural heritage of Carpathian Mountains since its habitat is closely related to the mountain primeval forests. The Capercaillie is an umbrella species, since it is an indicator of healthy community of mountain forests, which includes other rare and protected species.

These forests underwent radical changes from natural regime to managed system especially in the course of the last century. Continuous multi-aged forests were transformed to a mosaic of even-aged stands. Poor management practices, often triggered by socioeconomic and institutional change, are the main causes of loss of these forests. Large-scale logging and deforestation are widely spread across such areas and resulting in the habitat fragmentation, having a considerable negative impact on Capercaillie numbers. The most of the lek centers situated in fir-beech forests have disappeared, due to habitat alterations. Although the general suitability for this species in the Carpathians is high, the existing suitable Capercaillie habitats are represented in many areas only by straps of forest stands under the upper timberline.

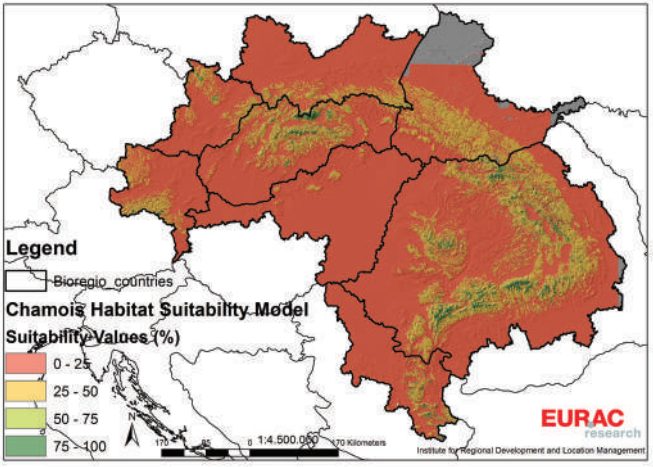


Chamois


Source: Paul Hermans

The chamois (*Rupicapra rupicapra*, Linneus 1758, order Artiodactyla, Family Bovidae) is a goat-antelope species native to European mountains. In the Carpathians, the species is currently distributed in the Tatra Mountains (*Rupicapra rupicapra tatrica*) with around 1000 individuals. Other scattered populations of *Rupicapra rupicapra carpatica*, occurr throughout the Transylvania Alps and the Carpathians. The main habitat types include alpine meadows, cliffs, ridges, ravines, boulder fields and dwarf pine (occasionally). Chamois eat various types of vegetation, including highland grasses and herbs during the summer and conifers, barks and needles from trees in winter. Common causes of mortality can include avalanches, epidemics and predation. The main predators of Chamois are Eurasian Lynxes, Grey Wolves and humans.

Chamois' preferred habitat is usually far from human settlements, but nonetheless they are steadily subjected to human impact. Many studies and direct observation reported that chamois are usually tolerant to human presence but they react differently within a distance of 200 m. Therefore, the transformation of habitats, grazing of high densities of domestic sheep in summer and the presence of mountain lodges that are opened all-year round for summer and winter outdoor sports, represent the main threats for their survival as it is currently happening in the Tatra Mountains and in the Transylvanian Alps. The modeled spatial distribution of locations of target species (chamois, bear, wolf and lynx) and their possible connectivity, allow an indication of habitat overlaps. Therefore, the presence of large predators may affect the chamois distribution and habitat use.

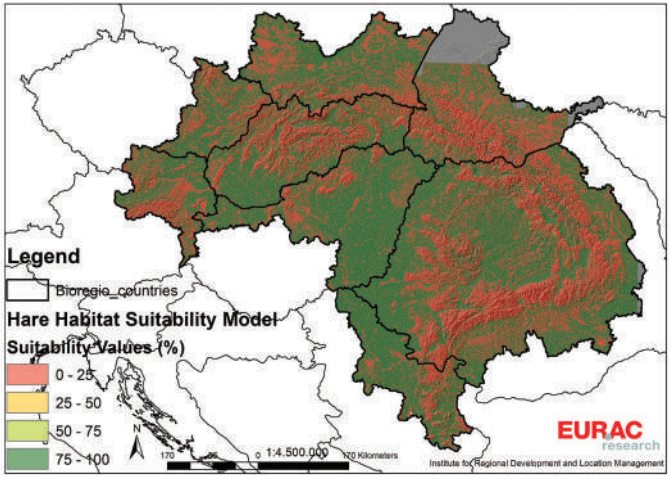


European Hare


Source: Schiermonnikoog

The European Hare (*Lepus europaeus*, Pallas 1778, Order Lagomorpha, Family Leporidae) also known as the brown hare, is a species of hare native to Europe and western Asia. It is a mammal adapted to temperate, open country. Hares are herbivorous and feed on grasses, herbs, twigs, buds, bark and field crops. Their natural predators include hawks, falcons, wolves, bears and lynxes. This species is native in all the Carpathians countries and can be found at elevations ranging from sea level up to 2,300 m a.s.l. As visible from the Habitat Suitability Map, the species is widespread through all the Carpathians range except in high mountain areas and apparently does not suffer of any connectivity problem. Its selection as an umbrella species was due to its relation with the agricultural transformation that are taking place in all the Carpathians countries and being one of the favorite prey of the selected carnivores, whose presence may affect hare's distribution.

Lepus europaeus is a highly adaptable species that can persist in any number of habitat types. To detect the most suitable habitats and to evaluate the effects of agricultural transformation, the GIS model took in consideration the positive association between hare abundance and habitat diversity (e.g., Shannon Index). Anthropic and natural factors greatly influence the presence and densities of hares.



The natural predation and deliberate killing, human presence, natural and artificial barriers (rivers and roads), may all greatly affect their mortality rate. The population is in decline in all the Carpathians countries, as a direct result of agricultural intensification, increased application of fertilizers, landscape homogeneity and mechanization.

Legal barriers/possibilities

Lacking legal coherence across national borders, legal acts proposed and never enforced or if anchored in legal frameworks they are sometimes not administrated. Legal gaps dealing with these problems indicated here should reveal the necessity to design applicable solutions to safeguard biodiversity and the large carnivores and herbivores in the Carpathians. Some legal instruments already adopted can be considered as stepping-stones for being transferred and further developed in favour of ecological coherence. The awareness for the need of ecological continuity and connectivity, to design trans-boundary solutions, to solve the inconsistency among the administrative units within the countries and to sustain biodiversity, have already been considered in some policies and legal instruments[5]. Despite the effort to intervene on various legal levels, significant progress is still lacking, yet.

Main critical aspects are:			
International level	**EU level**	**State level: Carpathian countries[6]**	**Cross-border level**
Obligations are defined broadly, leaving a wide margin of discretion to the state parties	Environmental law and policies, bio-diversity and specific fundings (LIFE and LIFE+) were applied. Aside, national implementation and enforcement pose problems.	No reference to ecological connectivity or networks in Constitutions; No reference in most of ordinary law; No reference in sectorial legislation Reference to strategic documents are not binding. Lacking protection of countryside beyond protected areas (PA) Environmental law is mainly centralised at state level, while administrative tasks/powers are often diluted and not coordinated among public bodies. Creation and management of PAs: although an autonomous right to local authorities is foreseen, their role in practice is quite limited. Several protected areas are missing valid management plans. Lack of national/local funds to protect and manage natural areas	Similar category names of PAs are applied to sites diverging in terms of protection regime. Common standards and management measures are lacking in cross-border protected areas.

Table 4: Legal impacts enabling and impeding ecological connectivity

Main strengths/recommendations are:			
International level	**EU level**	**State level: Carpathian countries**	**Cross-border level**
Aarhus Convention: an instrument to give opportunities for 'public' or 'public concerned' access to environmental information, participation in the decision-making process and litigation	Environmental concerns need to be included substantially at the legislative level EU infringement procedure give support for avoiding implementation failures. EU Directives enable access to 'public concerned' environmental information and participation in decision-making processes; Horizontal measures, like (strategic) environmental impact assessments (SEA & EIA), the assessments of Natura 2000 sites, or the prevention and remediation of environmental damage (ELD), contribute to avoid ecological fragmentation.	Environmental acts were adopted or revised to consider new obligations to protect biodiversity The directive for Birds and Habitats strengthened the protection of PAs and endangered species. National courts have a key role, as several judgments are issued in favour of ecological connectivity. References to ecological connectivity or networks are anchored in environmental and sectorial laws. Nearly no limiting exemptions for applying EIA/SEA Promotes the countryside protection beyond PA (landscape or historical forms of land-use, etc.); Promotes the coordination of administrative authorities at horizontal and vertical levels. Promotes the participation of society in environmental matters at policy, legislative, executive and enforcement levels	The European Grouping of Territorial Cooperation (EGTCs) could be further developed and adopted by public authorities to promote cooperation in favour of ecological connectivity

Table 5: Legal impacts enabling and impeding ecological connectivity ad different administrative units.

Socio-Economic Barriers

The expansion and the limitation of ecological connectivity is not only a matter of physical barriers. Besides, economic and social aspects have a significant impact too. This is particularly true for the Carpathian countries, which are currently experiencing quick social and economic transformation processes. Additionally, the attitude and awareness of local population towards protected areas and wildlife presence enhances significantly the effective implementation of connectivity measures. These aspects are underestimated in research and in the development of concrete connectivity initiatives as well: Due to this reason, an analysis on socio – economic potentials and barriers has been carried out, besides the legal and physical barriers analysis. Therefore, an "on-field" approach has been chosen, combining interviews with researchers and professionals working in Carpathian-wide. They were interviewed during a series of site visits at selected hotspots identified by the ecological corridor model applied for particular umbrella species in the Carpathians. The analysis highlighted that various economic sectors affect ecological connectivity. The identified sectors in figure 1 are public, private or mixed and are composed of different stakeholders with different priorities concerning connectivity.

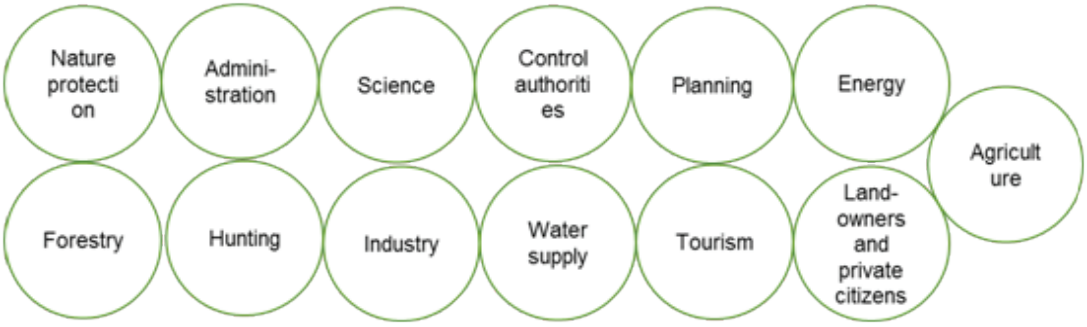


Figure 1: ***Involved stakeholders and economic sectors***

Main objectives in order to intervene for the reduction of social and economic barriers are, on the one hand, the development of actions for **promotion of ecological connectivity** and, on the other, the **prevention and avoiding of human – wildlife conflicts**. Mostly this is the result of lack of planning and monitoring for coordinating the co-existence between human activities and wildlife.

The site visits allowed identifying four main fields of intervention in which it is necessary to intervene on economic and social activities:

1. Planning:

The concept of ecological connectivity should be already considered in the planning phase – particularly for new transportation infrastructure or urban expansion, but also for the extension of agriculture or forestry activities. The availability of subsidy means for connectivity–friendly measures in these fields could support a preventive approach to reduce conflicts between human and wildlife.

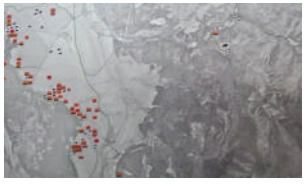
2. Intervention:

A quick and clear response in case of an emergency deriving from the interaction between human activities and wildlife can have a positive impact on the attitude of citizens towards ecological connectivity. Nevertheless, there is currently still little engagement in the Carpathians for the development of clear and homogeneous compensation measures for private farmers or landowners, for example in case of damages caused by wildlife.

3. Awareness:

Stakeholders have different and contrasting levels of influence and awareness towards ecological connectivity. The analysis in BioREGIO showed that the scientific community is aware concerning the necessity and priories for ecological connectivity, although its influence can be evaluated as low. On the other hand, there is still the need to raise the awareness among all relevant stakeholders, mainly of those involved in infrastructure planning, urban expansion and policy development at different levels.

4. Monitoring:



Monitoring is essential for assessing the effectiveness of measures. The analysis has shown the potential in strengthening data collection at Carpathian level and in involving local population for the monitoring wildlife presence, applying simpler, clear structured and efficient reporting system of damages.

3.6. Data collection in the Carpathians

CIBIS Carpathian Integrated Biodiversity Information System- the tool

The need for information exchange on nature conservation data has been identified as a priority within the Carpathian Convention. A Memorandum of Understanding among important players have been signed which represents the willingness of the partners to share and exchange data developed or gathered across the Carpathians in spring 2014.

Therefore, the existing Clearing House Mechanism developed under the Protected Areas for a Living Planet project supported by the MAVA Foundation between 2009 and 2012, has been extended and transformed into the Carpathian Integrated Biodiversity Information System. This mechanism facilitates information exchange not only among PA professionals, but also among other relevant stakeholder groups. The CIBIS includes information on protected areas, biodiversity, tourism, successful projects, case studies and best practices, guidelines as well as funding opportunities and more. The CIBIS is accessible at different levels for the general public, protected area workers and teams or individuals who use, develop/compile and print the interactive maps for their work.

Structure and functions of the CIBIS

A Geographic Information System (GIS) has been set up to support the Carpathian Countries Protected Area Clearing House Mechanism. This system allows conservation related data management for the Carpathian Protected Areas. The system is web-oriented, i.e. the interface with the users is a webpage that allows consultation and introduction of data / information. Data are being stored in a relational database.

The user has the possibility to:

- View data in the form of a map or as text
- Add new data – the user needs to be registered
- Query the database with specific conditions, and view the queried data (reports) as text and on the map
- Correlate information between major categories: biodiversity, tourism etc.
- Generate reports and export maps, with an option to build up the user's own maps with details introduced by the user (without using sophisticated and expensive mapping software).

Organizations that agree to contribute with data have the possibility to add/maintain and update their database easily as their data will be kept on their servers. The ownership of data is visible on the website

as well as on the printed maps. The CIBIS is an open system, ready to incorporate further spatial data and other information from scientific, institutional or NGO partners! Thus, it will be easy to join the CIBIS as a new partner even after the lifetime of the project.

Source: Piatra Craiului, Mircea Verghelet

Detecting ecological connectivity for wildlife species in a natural and anthropic environment is not straightforward. Every wildlife species has its own ecological preferences and reacts to the human presence differently. Many landscape features have to be considered in order to detect the preferred location of wildlife occurrence, and to evaluate the effects of human infrastructures being potential barriers for animals. The BioREGIO Carpathian approach focuses on the ecological preferences of seven selected wildlife species and their reaction to human influence. The therefore applied geographic information system (GIS) model calculated the potential suitable habitat for each species' occurrence and movements. Different kinds of GIS data were requested to perform this kind of analysis. They were collected from the BioREGIO Carpathians partners in their countries or from free available data sets. To identify the areas of species' occurrence, the project considers the physical, socio-economic and legal barriers to derive

the most probable corridors. Therefore, different types of geo-data, local knowledge and legal aspects were integrated:

Qualitative Data	The qualitative data were derived from an online questionnaire submitted to relevant stakeholders from the Carpathians. Besides, conferences and partner meetings in BioREGIO as well as the site visit were taken as opportunities to lead interviews with local stakeholders to include also the local problems and knowledge from the pilot regions. This information create the basis for the recommendations on the socio-economic barriers and possibilities.
Legal Data	Based on specific questions on legal aspects, selected national legal experts reported on the particular legal framework concerning ecological connectivity in their Carpathian countries. Thereof a Pan-Carpathian synthesis report is elaborated.
Geographic Data	The geographical data were collected for the GIS analysis to produce thematic maps. They consist mainly of vector data (e.g. shapefiles of road, rivers or settlement) and raster data (e.g. CORINE land cover, Digital Elevation Model) as well as of orthophotos and Land Use Satellite Images focusing on the project pilot areas. All the geographic data applied are essential to visualize the landscape structure and to identify the ecological preferences of each selected species
Geo-data	Geo-data were collected either through open-access databases or with the help of the project partners. Based on them ecological corridors and habitat suitability for the umbrella species are identified' and thereof physical barriers were detected. Wildlife presence and distribution: Knowledge about presence and distribution of selected umbrella species (and/or related species – like direct preys or predators) is importance for the validation of the GIS model. Since every species selects its best habitat based on the availability of resources, breeding opportunities, rest and passage, the general species' ecology cannot justify local habitat selections, which are due to local characteristics and human presence. Punctual, reliable and recent data on animals' presence and distribution are therefore desirable. Nevertheless, this type of data is often missing or only partially reliable and in general difficult to obtain. Human Infrastructures: Shape files of human infrastructures (i.e., settlements, roads, planned roads, railways etc.) provide useful information on the potential barriers hindering animals' dispersal. Coupling core areas and ecological corridors with information on potential barriers allows performing detailed analyses and enables the elaboration of specific recommendations.

GIS application

to define habitat suitability and ecological corridors for selected umbrella species

The GIS analysis has to consider all the environmental features *(factors)* that may contribute to the habitat selection by a certain species. These factors are the landcover (i.e., forests, agricultural fields, water bodies, human settlements, grasslands etc.), the altitude, the slope, and the influence of human presence. According to the species' ecological selection, each factor will have a suitability percentage value from 0 to 100, where zero identifies a non-suitable habitat and 100 the best one. The GIS system put together all the factors and their values and calculate a *Habitat Suitability Model* for the selected umbrella species. Subsequently, the model identifies the most probable ecological corridors that are keener to be chosen for dispersal *(Least Cost Paths)*.

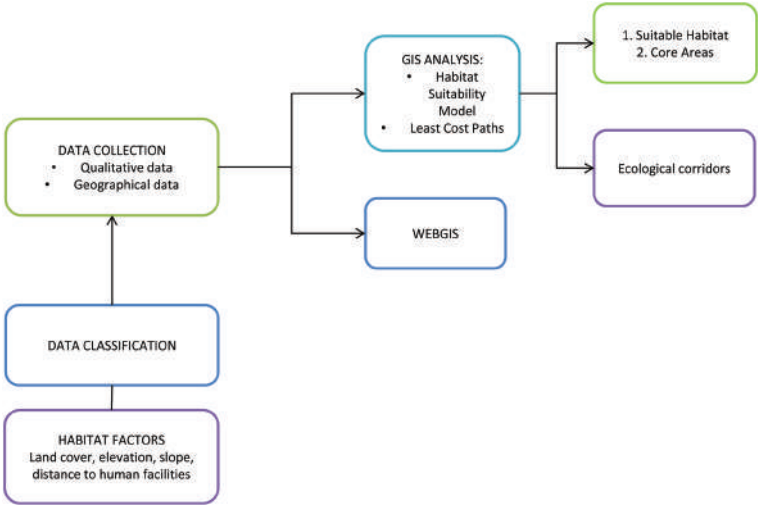


Figure 2: Technical steps for applying the ecological corridor model

Habitat Suitability Model (HSM): The HSM, obtained by applying the ArcGIS 10.0 tool *Corridor Designer,* allows assessing the quality of habitat for a selected species. This probabilistic model serves as basic layer on which identify the most probable corridors (least-cost paths). Once the suitability model is created, those areas having the highest suitability and certain ecological characteristics (i.e., size, abundance of a prey species) are selected as *core areas* (best habitat patches with the highest probability of occurrence).

Least-cost paths (LCPs): Once the core areas are detected, it is necessary to identify the most probable paths for wildlife dispersal. The identification of probable connectivity is perused by applying the ArcGIS 10.0 tool *Linkage Mapper.* The tool identifies adjacent core areas and creates maps of least-cost corridors

between them. The application *of linkage mapper* requires a map of core areas, and the creation of a resistance map. Resistance values are defined as the opposite of the suitability and they reflect the energetic cost, difficulty, or mortality risk for a certain species to move across a certain landscape. The basic assumption of the model supposes that animals moving away from specific core areas tend to disperse where the landscape provides less resistance.

The result of the application of the *GIS tools is* a **network of least-cost paths** that connects core areas. The resulted value of each grid cell expresses the level of connectivity between core areas and indicates which routes encounter more or fewer features that facilitate or impede dispersal for the umbrella species in the study area.

Web-GIS are interactive GIS applications on the web to manage a large extent of geographical information. Compared to desktop GIS solution a WebGIS application enables the distribution of information among a large audience. Within the framework of the BioREGIO project, a WebGIS was designed with the attempt to spread the results of the research project, allowing people to know more of the structure of the Carpathians ecological network and its functionality. The WebGIS contains both raster and vector data and is fully accessible (everywhere, anytime and by anyone). As concerning the design, it is structured into three main components: an information window; a real time maps browser with different layers containing general information concerning both the landscape and the connectivity specifically and a search engine. The following suitability map represents core areas and least cost paths for the Lynx in the Carpathians.

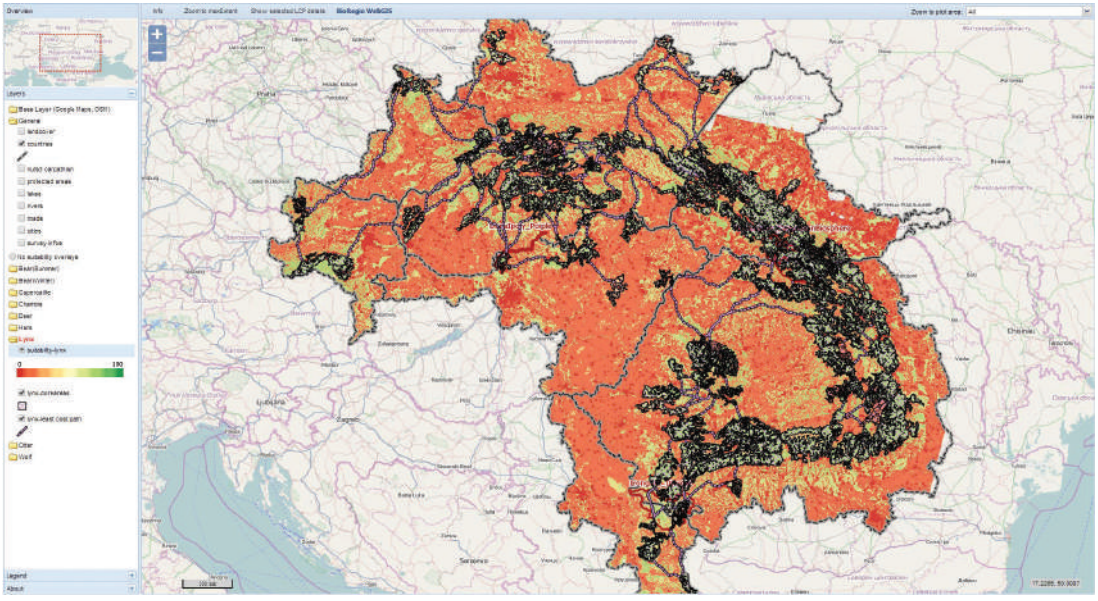


Figure 3: Suitability map, core areas and least cost paths for the Lynx in the Carpathians.

3.7. Transboundary management plan and pilot actions: Duna Ipoly/Poiplie NP, Iron Gates/Djerdap NP, Maramures/Carpathian Biosphere Reserve

Common management measures and harmonized strategies are of high importance in case of transboundary ecosystems, where adjacent habitat types and nature values have to be preserved under different legal, social and economic circumstances. The Carpathian Region has several locations where bilateral nature management is crucial. The following parks were selected as pilot regions for the BioREGIO Carpathians project:

- Duna-Ipoly National Park: Ipoly-valley (HU) / Poiplie Ramsar site (SK)
- Iron Gates Nature Park (RO) / Djerdap National Park (SRB)
- Maramures Mountains Nature Park (RO) / Carpathian Biosphere Reserve (UKR)

The following actions carried out within the pilot areas may serve as good practices to bilateral transboundary cooperations.

Common management plan

Using the recommendations of CIMM for wetlands, the management strategies and measures were discussed, harmonized and documented on Duna-Ipoly National Park/ Poiplie. The hierarchy between different levels of planning is particularly important: CIMM determines the management measures on a Carpathian-wide level, the common management plan selects all relevant measures of CIMM to the particular target site, while the national management plan work out these measures in practical details in line with the national legislation. Concerning the Maramures / Carpathian Biosphere Reserve, national management plans were already compiled, in this case a revision and a posterior harmonisation of measures was done on the basis of CIMM. An overview map is an important part of all common management plan, since it clearly shows the spatial and ecological connections between target sites, moreover it helps to communicate this integrity to decision makers.

Bilateral cooperation agreement:

The formalization of transboundary cooperation is not only an administrative action, it also anchors the need of collaboration in the mid- and long-term, despite of the changing social, political and economic

circumstances. Within the BioREGIO project, the management bodies of all target sites declared their common strategies and management activities in cooperation agreements signed by authorized representatives. A ceremonial approval of the agreements served to raise the awareness of the public.

Contribution to the Ramsar Convention

The Convention on Wetlands of International Importance, called the Ramsar Convention, places strong emphasis on transboundary Ramsar sites, especially because transboundary wetlands frequently belong to the same water catchment area. The initialization of the designation of a new bilateral Ramsar site on the Iron Gates / Djerdap target area, is one of the long-term results of the BioREGIO Carpathian project. The compilation and submission of documentation including the determination of common goals, strategies and measures was carried out by the collaboration of relevant Romanian and Serbian protected area managers. The Ipoly-valley /Poiplie site was qualified as a transboundary Ramsar site in 2007, thanks to the efforts of relevant project partners focused on the common revision and update of the Ramsar standard dataform.

Contribution to the Man and Biosphere Program

The Man and the Biosphere Programme of UNESCO aims to promote and enhance interdisciplinary approaches to conservation, research and education of ecosystems since 1971. Sites designated according to this initiative, form the World Network of Biosphere Reserves in which transboundary cooperations are highlighted- similarly to Ramsar wetlands. Within the framework of the BioREGIO Carpathian project, the Carpathian Biosphere Reserve located in Ukraine assisted their transboundary partner, Maramures Mountain Nature Park in Romania to join this network, to prepare the designation documents and initiate a new integrated and bilateral biosphere reserve in the region.

Environmental education and ecotourism

Ecotourism and environmental education is one of the most important fields in transboundary collaboration. Capacity building, programme development and the promotion of tools and ideas may improve the status of tourism and attract visitors from both countries. Hungarian and Slovakian partners established a new transboundary nature trail in the Ipoly-valley / Poiplie, crossing the river on a pedestrian bridge. The infrastructure development was connected with guided tours for teachers, the distribution of a promotion leaflet and the organization of a family day opened to the media.

Transboundary monitoring

In case of transboundary ecosystems management, the comparability and common analysis of research data needs the harmonization of targets, methods, timing, evaluation and data management equally. The BioREGIO Carpathians project pilot actions focused on bilateral data collection on large carnivores and bark beetle attack in Carpathian Biosphere Reserve / Maramures Mountains Nature Park, migrating water bird population in Ipoly-valley / Poiplie. For the latter in March 2014, bilateral census was carried out for the first time, being a start for annual, common long-term monitoring that also helps the state assessment of the specific Ramsar site. A special goal of common monitoring can serve as an early warning tool for threats like fire. For example Iron Gates / Djerdap pilot area established integrated anti-fire camera system and purchased terrain car to enhance prevention.

Source: Radimír Siklienka, gray wolf

3.8. Transferability of the project results to the Dinaric Arc

Overview of the region

Within this study, the main results of BioREGIO, which have relevance for the Dinaric Arc and other mountain regions, have been synthetised and analysed to identify their transferability to the Dinaric Arc mountain region. The Dinaric Arc in south-eastern Europe covers around 100,000km^2. It stretches from the eastern Adriatic coast from Trieste in Italy to Tirana, Albania covering Slovenia, Croatia, Bosnia and Herzegovina, Serbia, FYR Macedonia, Montenegro and Albania.

Figure 4: *Map of the Balkan and Dynaric Arc*

Some of the most relevant conservation values and favorable conditions for conservation along the Dinaric Arc include:

- Large and well-preserved forests with high flora diversity of species and a high rate of endemism (10-20% of all the plants are endemic to the region)
- Unique karst ecosystems and cave habitats with a diversity of invertebrates, fish, amphibians, and reptiles
- The Dinaric mountains harbor important populations of large carnivores — lynx, brown bear, wolf, jackal — that use them as a crucial ecological corridor between the Alps and the mountains of south-eastern Europe
- The numerous wetlands and freshwater habitats host important nesting populations of endangered bird species, and are an important stop over and wintering site for migrating birds
- The variety of coastal and marine habitats — which include shallow reefs, Posidonia meadows, small rocks and archipelagos, high coasts, and caves — are feeding and breeding grounds for cetaceans, sea birds, and marine turtles
- The eastern Adriatic is one of the richest fishing grounds of the Mediterranean. It also hosts the most diverse commercial marine species in the Basin
- The presence of many nature-friendly, traditional economic activities, traditional forestry, and small scale fisheries form a valuable basis for the sustainable development of the rural and natural regions of the Dinaric Arc
- A high diversity of crop varieties and local livestock breeds still exist, and are maintained thanks to typical and traditional farming and production systems.

Southeast Europe has historically been a rich ensemble of cultures and religions, and this unique background is reflected in a wide and varied cultural heritage. However, over the last twenty years the countries of the Dinaric Arc have experienced periods of high instability, conflicts, economic crises and transition towards a market economy and European integration. Environmental policies and institutions have suffered a long period of eclipse and are now being rebuilt, although with varying results. The whole region is currently undergoing rapid economic development, and the need to generate income and improve living standards, especially in rural areas, is leading to the growing exploitation of natural resources. Among the major current and future threats are: illegal logging, deforestation, poaching, river damming and diversion, unregulated coastal development, unregulated exploitation of marine resources, unsustainable use of agricultural land and pastures. A complex governance system, the unsatisfactory level of enforcement of existing laws, and a widespread lack of capacity are limiting factors and additional challenges to the sound development of the region.

Transferability of the BioREGIO results

Since the preservation of the wealth and integrity of the Dinaric Arc relies on support to initiatives for the conservation of its biological diversity and the sustainable management of its resources, the region could benefit highly from the BioREGIO project results. Good cooperation among the countries in the field of natural resource management would contribute to stability and prosperity of the region. Geographic and social circumstances of the Carpathians and the Dinaric Arc do not differ in such way to prevent transferability of the project results. Nevertheless, political flux in some of the region's countries and general lack of environmental financing could hinder such efforts if the risks are not properly and timely assessed.

Result 1: Database of a Carpathian Red List of Species and Habitats can offer valuable lessons to conservation authorities in the Dinaric Arc bioregion. Only several countries of the region have completed their national Red Lists following internationally recognized principles and criteria, while none have a red list of threatened habitats. Also, the region suffers from a lack of databases on alien and invasive species, which were also addressed in the BioREGIO WP3. The Dinaric Arc Red List of threatened habitats and species, including at least basic data on flagship species and most important habitats as was the case in the BioREGIO project, would serve as an important step forward in assessing the state of the rich biodiversity of the Dinaric Arc and its conservation.

Transferring **Result 2: Regional development opportunities for protected areas and natural assets**, a BioREGIO project study which covers six sectors: tourism, agriculture, forestry, non-timber forest products, fisheries and energy, to the Dinaric Arc developmental reality would be an important step towards achieving participatory nature conservation in the region. As elaborated in the above description of the conservation values of the area, all of these six sectors play an important role in the region and greatly affect nature conservation efforts.

A weak state of region's protected areas call for **Result 3: Financial mechanisms and innovative economic tools for protected areas and natural assets** to be appropriately implemented in the Dinaric Arc as well. Many protected areas suffer a major lack of government support in both direct financing and developing opportunities for sustainability. Values of the ecosystem services have not been assessed properly in any of the Dinaric Arc protected areas yet, and financial planning is usually done in a non-participative manner. New financial mechanisms and tools for managing protected areas in a self-sustainable way are needed, as well as policy and regulatory framework adaptation to the realities of a new era in nature conservation practice.

Since one of the major threats to habitats and species and main causes of the decline in biological diversity in the region of the Dinaric Arc is the fragmentation and isolation of habitats, the continuity and connectivity of habitats and protected areas require transboundary linkages, ecological corridors which link protected area networks of neighboring countries. In this sense, **Result 4: Continuity and Connectivity** offers a fine example of how the current obstacles in the Dinaric Arc could be addressed and properly diminished for both physical and legal barriers in nature conservation. The analysis of connectivity of habitats based on a GIS model done in the BioREGIO project could easily be implemented in selected pilot areas in the Dinaric Arc as well, for several flagship species, which would be of great importance for conservation planning in the region and enhancing connectivity. Socio-economic barriers to conservation are also significant in the Dinaric Arc. The transition towards market economy and post-conflict issues regularly challenge nature protection and negatively influence connectivity. As suggested by the findings of the BioREGIO project, promotion of ecological connectivity and, on the other, the prevention and avoiding of human – wildlife conflicts are the only ways in which these barriers can be minimized.

Result 5: Geographic Information System (GIS) that has been set up to support the Carpathian Countries Protected Area Clearing House Mechanism by the BioREGIO project for an Integrated **Biodiversity Information System** might seem as a long stretch for the Dinaric Arc, considering a general lack of biodiversity data in the region and lack of capacities of conservation authorities, but describing and connecting existing databases and improving current national CHMs to get a better perspective of a regional context might prove a good way forward.

A number of potential transboundary protected areas in the Dinaric Arc have already been identified and initiated through the Environment and Security Initiative (ENVSEC-SEE). Therefore, **Result 6: Transboundary management plan and pilot actions** would be more than welcome in the region, having in mind that several protected areas along borders expressed interest in cooperating in this sense (namely in the Prokletije mountain range).

4. BioREGIO beyond the project & future challenges

Source: Creasta Refugiu Apus

The three and a half years of sharing experiences and implementing different studies has opened the door to many new opportunities. The cooperation among Carpathian countries on sustainable regional development has still a long way to go. The project created a solid basis for future projects to fill the gaps in the different fields.

It is important to mention that the work of such projects can face important challenges that need to be considered and addressed in future. The main challenges are as follows:

- Time limitations: especially regarding the data collection and analysis, which can create fragmentations in the database coverage
- Financial limitations: some activities may cost more than previously planned. Furthermore it is often difficult for partners to find the co-financing budget money.
- Communication: the language barrier as well as the personal motivation can have impacts on the communication between partners.
- Administrative issues. Internal as well as external administrative procedures can create bottlenecks and hinder activities. For example, related to the implementation of new financial mechanism, legal and administrative procedures can delay the process extensively.

Therefore, the recommendations listed below, for the establishment of future projects and activities, have been summarised from the different studies produced through the project.

5. Recommendations and Conclusion

Source: Mircea Verghelet

Project partners established a list summarizing important recommendations for a better implementation of future projects and activities. These recommendations have been divided into different thematics. A set of more detailed recommendations can be found in the different studies.

MEASURES FOR ECOSYSTEMS

Improve the **efficiency of the ecosystem management** for the Carpathian region. This requires improved collaboration on regional, national and international level as well as improved planning and management methods. Establish a **management focus** on key species and specific ecosystems as for example on virgin forests.

Include the concept of **ecological connectivity** also in local spatial planning, in order to adequately address land – use change phenomena. Planning systems need to recognize protected areas as key areas for ecological networks.

Appropriate **hunting activity** is extremely important in the context of ecological connectivity, as it may help to preserve a near-natural forest and create the ideal conditions for the propagation of the widest possible spectrum of species. Areas with no or limited hunting can be used by sensitive animal species as core zones or stepping stone biotopes. Habitat restoration measures can also be taken to support this.

LEGAL and GOVERNANCE MEASURES

Policy and decision makers have significant impact on the life and business of locals. Therefore, they should ensure proper stakeholder involvement throughout policy development and decision making processes to ensure that certain decisions will have an effect and have the opportunity to improve policies with a bottom-up approach.

- First and foremost, policy makers shall maintain a stable legal framework for sustainable business operation.
- They are asked to ensure proper funding for sustainable development, and to use the most opportunities to do so provided by EU funds. Running a sustainable business should in an ideal world, for its social and environmental benefits, be at least as profitable as a business not fitted to sustainability criteria. Biodiversity proofing of funds would eliminate payments harmful to biodiversity. Damage caused by protected species must be compensated.

- They should support assessment of ecosystem services and their values, properly incorporate into strategies, funding schemes and accounting.
- With policy tools they shall help the creation of local, pro-biodiversity brands, labelling, the cooperation of sustainable businesses etc. Also, in some areas special banking products like low-interest micro-finance would help sustainable businesses.

Resolving **incompatibilities** between the **national regulations** of the Carpathian countries that have negative impacts on nature protection and biodiversity protection. Especially in transboundary protected areas to improve their enforcement for species protection and for example regarding hunting regulations where integrating hunting laws with Natura 2000 within the legal framework would be beneficial.

As for cross-border natural areas, besides bilateral/multilateral and international agreements, other instruments, such as the European Grouping of Territorial Cooperation (EGTCs) Regulation, should be further developed and adopted by Member States, regional authorities, local authorities and/or bodies governed by public law to facilitate and promote specifically **cross-border, trans-national and inter- regional cooperation** in favour of ecological connectivity

Improve the transparency and promotion of **compensation mechanisms**: a clear communication to private citizens should be promoted, in order to clarify who can be the beneficiary of the compensation system, the amount, the conditions, and which are the steps in order to receive the compensation. Specific attention should be given by the local authorities to the information and promotion of forms of damages prevention and related schemes (i.e., insurances).

Adapt legislation to enhance the promotion of **sustainable practices in agriculture or forestry**.

Ecological connectivity

Promote the enforcement of spatial planning regulation and the integration of different levels of planning. Promote inter-municipal plans for municipalities belonging to the same geographical areas (for example, a valley), in order to functionally share big infrastructures, to effectively locate critical areas (such as garbage disposal areas) and to be able to design ecological corridors at inter-municipal level.


Source: EURAC

The size of intensively used agricultural fields are for most species a barrier and even a dangerous trap for dispersal and ecological connectivity. Hence monoculture fields would require at least some landscape structures as stepping stones for covering and for orienting. As farmers in rural areas are sometimes less experienced with legal restrictions and bureaucratic procedures, it is highly recommended to install an **advisory-service center** to throw lights on policy measures and legal restrictions to enable those remote located farmers at least the possibility to access public funds to reimburse the created damages. A clear system of **complaint management** should be set up and fostered, in order to increase the trust of citizen in the responsible local institutions. Another way to cope with these problems in the long run and to gain trust among the farmers would either be to restrict hunting clubs to fence private land which has a negative impact on ecological connectivity or if they operate on state owned territory responsible authorities, they have to supervise hunting activities and have to limit activities through particular permissions.

ECONOMIC MEASURES

Adapt European **funding mechanisms** more specifically to the conservation needs of the Carpathians to enable a maximum benefit of conservation and sustainable agriculture funds.

Improve the reach of EU funding especially for non- EU members of the Carpathian region (Serbia and Ukraine). There is a need to develop funded models for sustainable management and restoration of critical Carpathian habitats in these countries, possibly with EU funding and cooperation with neighboring Member States.

Implementation of Financial Mechanisms for PAs

- Assess financial value of ecosystem services and establish payment mechanisms for income generation.
- Adapt financial mechanism for protected areas to the local needs and possibilities.
- Disseminate the need for funding for nature conservation through different channels. Announcements have to be accompanied with a strong campaign mobilizing possible visitors in helping the park administration in their efforts to ensure the sustainability of the park.

Take into consideration the long administrative process for obtaining the necessary approvals to implement changes.

Adequate **incentives** should be allocated to private landowners and firms in order to promote an integrated management and adequate prevention and compensation measures for damages should be developed. Improve the governance of compensation mechanisms: a positive coordination among all the authorities responsible for an intervention in case of damage should be promoted, for example through regular exchanges and meetings.

In this framework, a reliable and clear **system of compensation** of damages caused by wildlife is essential, since it can strengthen the trust of the local communities in the authorities responsible for nature preservation and wildlife management. This can also lead to a more positive attitude towards initiatives aiming at promoting ecological connectivity.

Regional development opportunities for entrepreneurs

Entrepreneurs are all locals and businesses that run economic activity in the region. These may be for example individuals or families running a farm or provide accommodation, but also smaller or larger companies having a factory in the area etc.

First and foremost, it is suggested considering the dependency of the entrepreneur's activities on biodiversity (e.g. on pollinators, clean water, wood). Along this, they should

- Identify the negative impacts of their activities on biodiversity.
- List all the risks your activities/business may suffer from the loss of biodiversity.

- Think of and search for good practices to eliminate these risks. From among these solutions, they should list the ones that could be applied in their activities/business. These may not need major investment, but in case yes, entrepreneurs should also identify possible funding sources.
- Entrepreneurs can always turn to external assistance for help. NGOs and professional advisors are usually good in business development and financing. Joining or at least contacting an association or wider initiative already running planned activities is often a good way to save entrepreneurs from the first difficulties and they may well be able to give good advices and help.
- Diversify activities, which proved to be a good approach to increase stability of the business. This may be diversification within a certain business (e.g. a tour operator traditionally providing guided tours visiting urban cultures, starting up wildlife watching tours; or a narrow-gauge train used for transportation of wood in addition used for tourists) or starting an alliance of separate businesses (e.g. a family providing accommodation buying breakfast ingredients for the guests from a local, small-scale pro-biodiversity farmer and advertising the products of the farmer).
- Prepare a feasibility study investigating both social, economic and environmental impacts of his/her investment especially in a protected or a Natura 2000 site. Should he/she ask for project co-funding (e.g. European Union funds) or a bank loan, he/she will necessarily be asked to provide a feasibility study. It is the best tool to conduct an objective and rational analysis of the strength and weaknesses of the project idea. It will help the entrepreneur to evaluate the technical, economic, legal and operational feasibility, to identify risks and their solutions and also to set up a rational time schedule for the implementation.

RESEARCH AND MONITORING

Set up a system of database management and maintenance, interlinking among various existing resources enabling the synergy of initiatives and outputs. Develop basic **common monitoring indicators** and systems that are compatible for the entire region. For example, regarding the similar **category names** of protected areas which are applied to sites that diverge in terms of the protection regime, thus a harmonization of definitions and related protection regime should be promoted especially in transboundary areas. The common indicators and definitions will avoid a complex system and ease the communication between experts.

Establish a network for **long-term monitoring** for ecosystems in the Carpathians, which will help to improve the access to data.

Set up a demand driven **research approach**.

The revision of the compiled **red lists and the list of invasive alien species** is expected to be done every twelve years[7], but it is recommended however for some groups to have more frequent reviews. It is strongly recommended to involve from the very beginning relevant data holders (scientific institutions and experts) with scientific approach and good motivation for the most comprehensive results and using of the as complete data as possible. It is recommended to elaborate a comprehensive study on the Carpathian endemic taxa.

COOPERATION & COMMUNICATION MEASURES

Enhance cooperation between the different stakeholders of the Carpathian countries. For example by establishing networks (CNPA – Carpathian Network for Protected Areas).

Regional development opportunities for NGOs

Well organized and scientifically sound green non-governmental organizations are traditionally great catalysts of sustainable development and nature conservation. They assist both policy makers in establishing the necessary legal and funding structures and local people in accessing funds, starting up projects, initiatives and investments. The awareness raising role of NGOs is key in communicating environmental goals and viable solutions to the people.

NGOs shall further engage in

- Awareness raising and the assistance of policy and decision makers.
- Boosting sustainable development in their region; they are encouraged to offer professional advisory services to businesses/locals. They are often perfectly situated to help locals/businesses in identifying their dependence on biodiversity and ecosystems as well as opportunities and methods, but also to access funding.
- Becoming the link between nature conservationists and locals, helping the good working together.
- Using their capacities and knowledge not only for initiating change but also for the monitoring of the outcomes.

CAPACITY DEVELOPMENT MEASURES

Improve the access to learning opportunities in the region for different stakeholders. Increase the curricula of universities as well as the cooperation between them. Support the regional capacity building facilities.

An increase in the **ecological awareness** is fundamental to allow mitigation structures to work properly and to rethink our dominant model of mobility to understand that both humans and wildlife, share a common need to move.

Hunters may have a very important **role** in the preservation of ecological connectivity, helping in identifying the actual least cost paths used and reducing the hunting pressure at local level.

In countries where hunting has a high economic weight, the concept of ecological connectivity needs more time to be accepted. The preservation of ecological corridors from hunting and forest works can be obtained only through a long process of awareness raising among the local populations, highlighting the benefits coming from a maintained ecological network.

Forest workers, mainly hunters and foresters, may act as promoters of its importance, and contribute actively to the establishment of an ecological network. They can theoretically contribute to the promotion of a sustainable use of the forest resources and contribute to the awareness raising among the population.

MEASURES FOR AGRICULTURAL MANAGEMENT AND INFRASTRUCTURE MANAGEMENT

Infrastructures should be well i**ntegrated** into existing ecological structures like stepping stones and linear corridors. The opportunity is to redesign the roads to provide safe passage for all, to reduce the costs and to tailor each type of crossing to the specific species in various landscape contexts. This implies a continuous monitoring of the wildlife species present in a certain area interested by the AVC phenomenon. Providing crossing infrastructure at key points along transportation corridors has been shown to improve safety, reconnect habitats, and restore wildlife movement. These structures should be joined by a large campaign of environmental awareness to underline that the best prevention system is always a correct driving behavior.

Adaptation of forest management measures in silviculture and harvesting practices can improve the habitat quality for particular umbrella species and thus the appropriateness for ecological connectivity. Particular linear afforestation strips to connect large forested areas or improve the heterogeneity of landscape can ease dispersal for wildlife. As the awareness among the foresters to apply measures that promote the maintenance of ecological connectivity is lacking, initiatives would be required. Hereby protected areas are paying a key role, although their territorial contribution to connectivity is of fewer relevance.

Along infrastructures like roads and railways the task of forest management is to prevent the animals from crossing roads or railways. Therefore it is required to create intelligent guidance systems with natural and artificial fodder-grounds that guarantee a save landscape dispersal. On the other side forest management has to take responsibility to share or to cover the costs for installing and maintaining fences along roads and railways touching forested areas to protect animals from getting killed. Besides fences at the edge of forest areas or accompanied with hedges are also leading the animals to green infrastructures like eco-ducts or subways to cross infrastructures safely.

If new territory where new infrastructure facilities are planned is covering agricultural land, an agreement on selling prices has to be found, which usually varies between utilized agricultural area and industrial territory. Often, proprietors who don't work their agricultural land anymore are most likely interested in selling their land. On the other hand, those farmers economically addicted to agricultural production and who are often strongly integrated in the local network, are not willed to abandon the management of their agricultural land. This requires the development of alternative variants or other compromises.


Source: EURAC

To sustain ecological connectivity, eco-ducts or subways along these new infrastructure facilities are installed as this is required in the SEA and EIA to offer save crossing-passages to wildlife and to avoid road kills. These infrastructures should be well integrated into existing ecological structures like stepping stones and linear corridors. As along this ecological networks agricultural damages cannot be avoided, legal regulations (contracts on nature conservation) have to be defined to reimburse the incidental damages through wild boar, red deer or carnivores from public funds.

[1] IUCN, 2012a. IUCN Red List Categories and Criteria: Version 3.1. Second edition. Gland, Switzreland and Cambridge, UK: IUCN. Iv + 32 pp.

[2] IUCN, 2013b. Standards and Petitions Subcommittee. Guidelines for Using the IUCN Red List Categories and Criteria. Version 10. Prepared by the Standards and Petitions Subcommittee. Downloadable from http://www.iucnredlist.org/documents/RedListGuidelines.pdf.

[3] IUCN, 2014. Red List of Ecosystems http://www.iucnredlistofecosystems.org

[4] IUCN, 2012. Guidelines for Application of IUCN Red List Criteria at Regional and National Levels: Version 4.0. Gland, Switzerland and Cambridge, UK: IUCN. Iii + 41 pp.

[5] For an in-depth analysis see: Alberton M., (Ed.),'Toward the Protection of Biodiversity and Ecological Connectivity in Multi-Layered systems', (NOMOS, 2013).

Important links:

BioREGIO Carpathians website: http://www.bioregio-carpathians.eu/

CNPA website: http://www.carpathianparks.org/

Carpathian Convention website: http://www.carpathianconvention.org/

EURAC GIS: http://webgis.eurac.edu/bioregio/

CIBIS: http://www.ccibis.org/

BioREGIO publications:

- Carpathian Red List of Habitats and Species
- Common Integrated Management Measures in the Carpathians
- Regional development opportunities for protected areas and natural assets
- Study on financial mechanisms and innovative economic tools for protected areas and natural assets
- Transferability of the BioREGIO results to the Dinaric Arc study

Produced by: UNEP Vienna – Interim Secretariat of the Carpathian Convention (ISCC)

Vienna International Centre

PO Box 500

A-1400 Vienna

E-mail: unep@unvienna.org

Authors: Mathilde Köck, Patricia Tudor, Mircea Verghelet, Christian Hoffmann, Filippo Favilli, Marianna Elmi, Mariachiara Alberton, Hildegard Meyer, Jan Kadlecik, Katalin Sipos.
The BioREGIO Carpathians project partners would like to thank all the experts who successfully contributed to the final results of the project.

Layout: ENOVA, Sarajevo, BiH

Printing: ProPrint, BiH

Printed in: June 2014

Images: Images were provided by the partners of the BioREGIO Carpathians project.

Programme co-funded by the EUROPEAN UNION

BioREGIO carpathians

SOUTH EAST EUROPE
Jointly for our common future