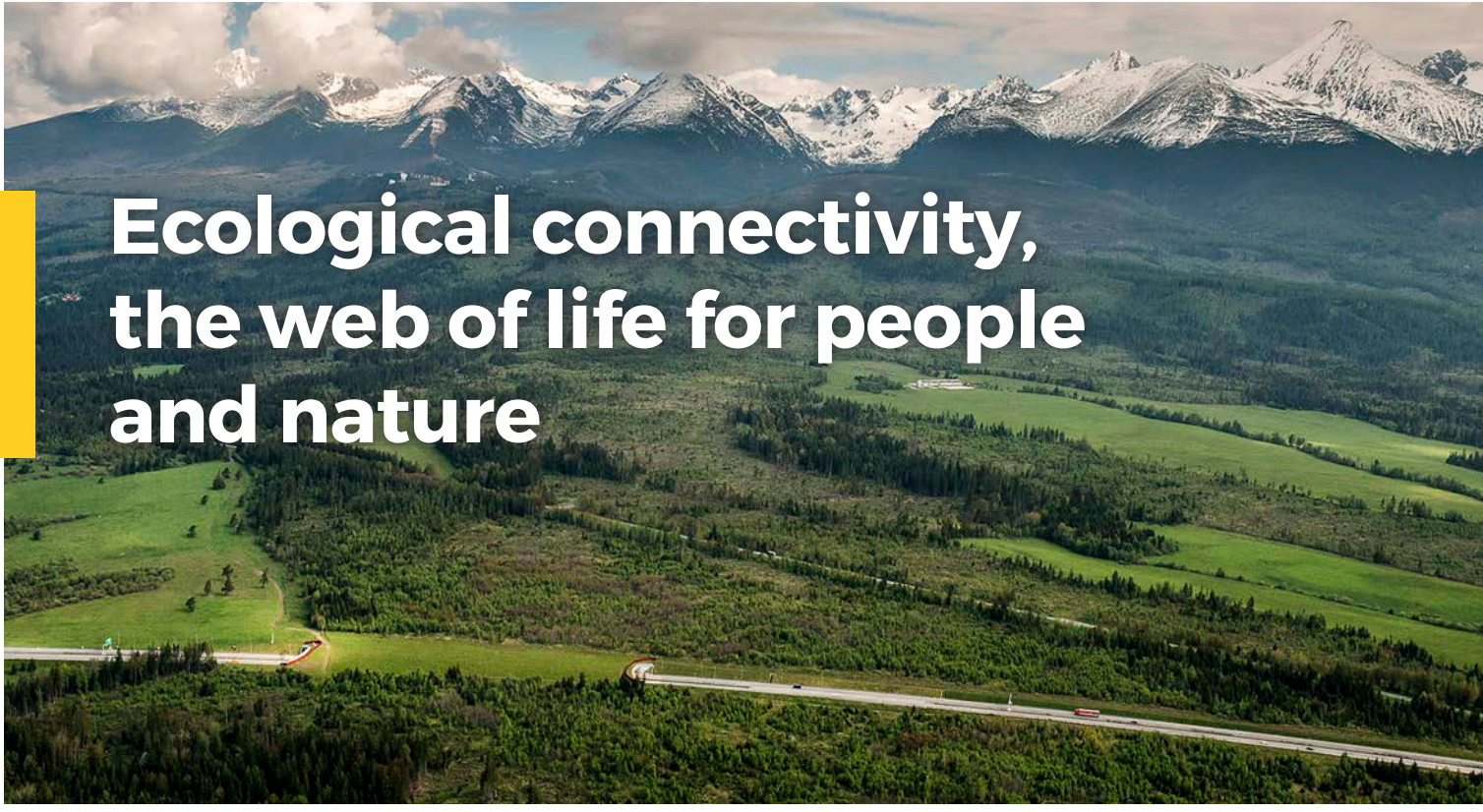
Ecological connectivity, the web of life for people and nature



Interreg
EUROPEAN UNION
Danube Transnational Programme
ConnectGREEN

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

What is **“ecological connectivity”** and why do **we need** it?

Nature, through its ecological and evolutionary processes, provides resources necessary for life and human welfare, such as air, fresh water and soils for food production, sources for medicine and industries, place for recreation, and moreover helps with carbon sequestration and mitigation of climate change. These services depend on a well-connected ecological “web” of high-quality land and on biological diversity. **Maintaining a functional ecological connectivity protects the entire system we humans depend on** in the short and long term.

Connectivity is a fundamental landscape attribute (Taylor et al. 1993[1]). The term “connectivity” is a measure of the extent to which plants and animals can move between habitat patches, as well as the extent to which non-local ecosystem functions associated with soil and water processes, for example, are maintained (Worboys et. a. 2010[2]).

Just as humans need to move freely to carry-out their life and activities, so does wildlife, requiring connectivity within natural areas to fulfil its biological and ecological needs. This **connectivity is essential for species, which require large home territories and ranges** and long-distance movement is part of their biology. In the Carpathians there are three such species: **the wolf, the lynx and the bear**.

Cover photo:
Ecoduct connecting High and Low Tatras, Slovakia.
Photo © Tomáš Hulík, Slovakia

1 Taylor, PD; Fahrig, L; Henein, K; Merriam, G. 1993. Connectivity is a Vital Element of Landscape Structure. Oikos 68:571–573.
2 Worboys, GL. 2010. The Connectivity Conservation Imperative. In Worboys, GL; Francis, WL; Lockwood, M (eds.). Connectivity Conservation Management. A Global Guide. London, England, Earthscan. p. 3–21

The opposite of "connectivity" is "landscape fragmentation" which indicates the presence of obstacles cutting across ecosystems and hindering the natural movement of wildlife. These obstacles are mostly manmade and have been developed throughout history, with little thought given to their impacts on nature.

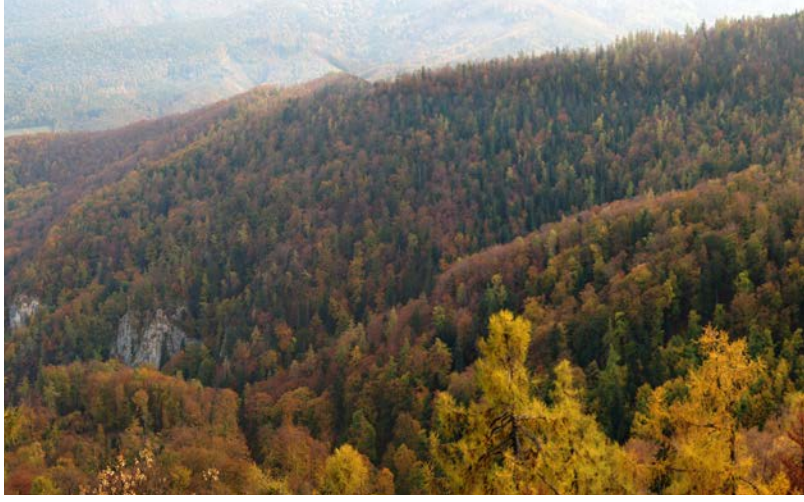
The best way to maintain ecological connectivity is to **"think globally, act locally"** (Patrick Gedders, 1915). We need to see the full picture of a landscape which can spread beyond national borders and act to prevent local threats, in order to preserve the negative consequences at the global level.

Decision making on urban development and transport infrastructure has not taken the value of landscape and biodiversity much in consideration. As a consequence, large patches of wildlife habitat were transformed into smaller, more isolated fragments of habitat which may gradually lose their potential to fulfil their original functions.

Ecological connectivity
in the Carpathian Mountains

The Carpathian mountain range represents one of **the least fragmented areas in Europe**. These mountains harbour natural treasures of great beauty and ecological value, and provide shelter for about one third of the carnivores in Europe.

One of the major threats to the preservation of the unique biodiversity of the Carpathians is the fragmentation of the landscape, caused by the **rapid modernization of the region** (e.g. construction of highways and recreation facilities, urban development). What were once well-connected habitats have deteriorated into isolated islands. This has led to the loss of favourable wildlife habitats, landscape fragmentation, animals being killed while crossing the roads (traffic mortality), noise and light disturbance. In the long run, these developments can have even fatal consequences for wildlife populations, limiting wildlife movement and gene flow between the (sub)populations of the species.



The Carpathian forests, covering over half of this mountain range, are vital link between the forests in the North of Europe and those in the West and South-West of the Europe. The Carpathians are home of the European Union's largest populations of brown bear, wolf, lynx, European bison and imperial eagle, which are endangered species on a global level. carpathianconvention.org

Facts about the Carpathians

Surface: 209.000 km²

Highest peak: 2.655 m (Gerlachovský štít, Slovakia)

Countries: Austria, Serbia, Slovakia, Czech Republic, Hungary, Poland, Romania and Ukraine.

Protected areas – core areas of ecological connectivity:
18% of the Carpathian ecoregion
36 national parks
51 nature parks and protected landscape areas
19 biosphere reserves
200 other protected areas

Home of Europe's wildlife:
Bears: 41% | **Wolves**: 30% | **Lynxes**: 28%

Source: ccibis.org, carpathianconvention.org
interreg-danube.eu/connectgreen

Large carnivores
in the Carpathians

Animals naturally need to move due to different reasons: **search for food, shelter, new home territories, partners or breeding places for their offspring.** The fragmentation of the landscape mostly affects those species that require large natural habitats, especially large carnivores: **grey wolf, Eurasian lynx and brown bear**. Some of these habitats are protected by the EU Habitats Directive as part of the Natura 2000 network of protected areas.

The presence of large carnivores in nature sometimes stirs polarized discussions about possible conflicts with humans, but those conflicts are often just one of the consequences of landscape fragmentation. As the living space of bear, wolf and lynx is shrinking, the number of contacts with people may be increasing. These species are tied to large undisturbed forest areas with no or very little low human presence. Furthermore, long distance movement is a part of their biology.

Large carnivores are called "**umbrella species"**. If they have proper space to move/migrate, it indicates the fact that also smaller species can.

Brown Bear

The Carpathians host the second largest population of bears in Europe: about 8000. Bears have a low reproductive rate and are vulnerable to human-caused mortality and to landscape fragmentation. Motorways and high-speed railways are the most relevant barriers for them. The main migration/ movement reasons of bears are: finding food resources, shelter or denning sites, and mating partners.

Grey wolf

In the Carpathians, the wolf population represents 30% of the European total. Wolves are able to overcome roads or non-forested areas — even those close to human settlements — mainly during the night or in the early morning. Wolves usually tolerate roads and tourism as long as they have safe escape areas. Poaching is among the most significant threats to the wolf.

Photo © Staffan Widstrand, WWF

Eurasian lynx

The largest felid species in Europe needs large forested areas in mountains for survival. During the breeding period, males move long distances (up to 100 km). Outside that period, males and females strictly defend the territory against individuals of the same sex. In spring, the young leave the mother's territory and move long distances to establish their own suitable territory.

Photo © Tomáš Hulík, Slovakia

Movement or migration barriers: Making life **easier for people**, building obstacles **for wildlife**

Movement or migration barriers are natural or man-made structures in the landscape, which disrupt the free movement of animals. Decisions made on transport infrastructure and urban developments have not thoroughly taken the value of landscape and biodiversity into consideration.

The current major **barriers** come, in most cases, as a **result of human activities**. And landscape is composed not only of individual barriers but a mixture of migration and movement barriers.

The cumulative effect of barriers can not only restrict but is able to even stop animal migration and isolate the animals from genetic point of view, with serious effects on population.

Main types of barriers

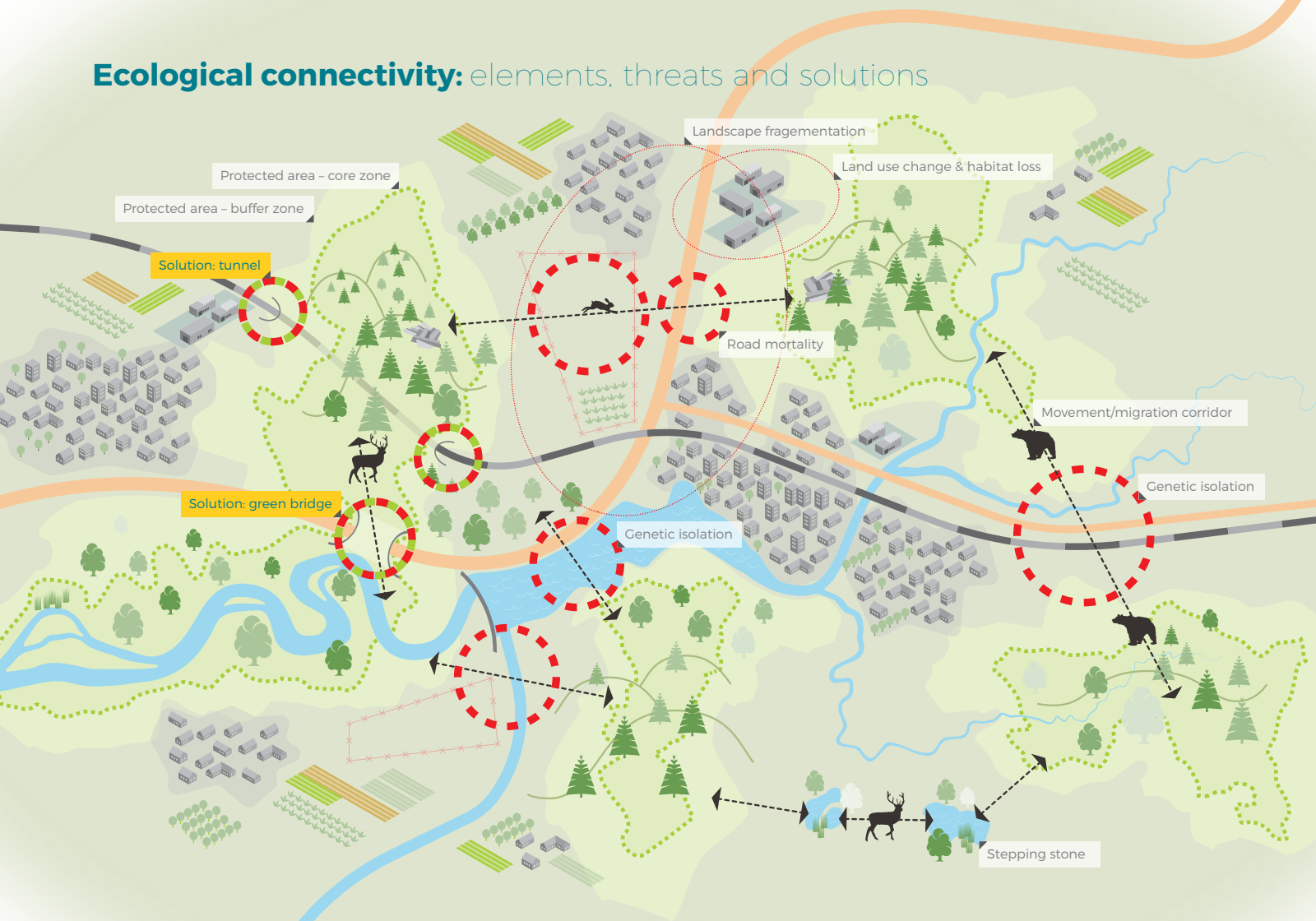
Linear infrastructure (roads, highways, railways): Roads and Railways are not only barriers, but also a direct cause of mortality. Other negative impacts are noise and light disturbance.

Settlements (living areas, commercial and industrial zones, often fenced, recreation facilities, etc.): Represent an impermeable barrier. The density of settlements is often so high that it is impossible for wildlife to move from one large natural habitat to another.

Fences: Encompass game enclosures, vineyards, pastures etc.

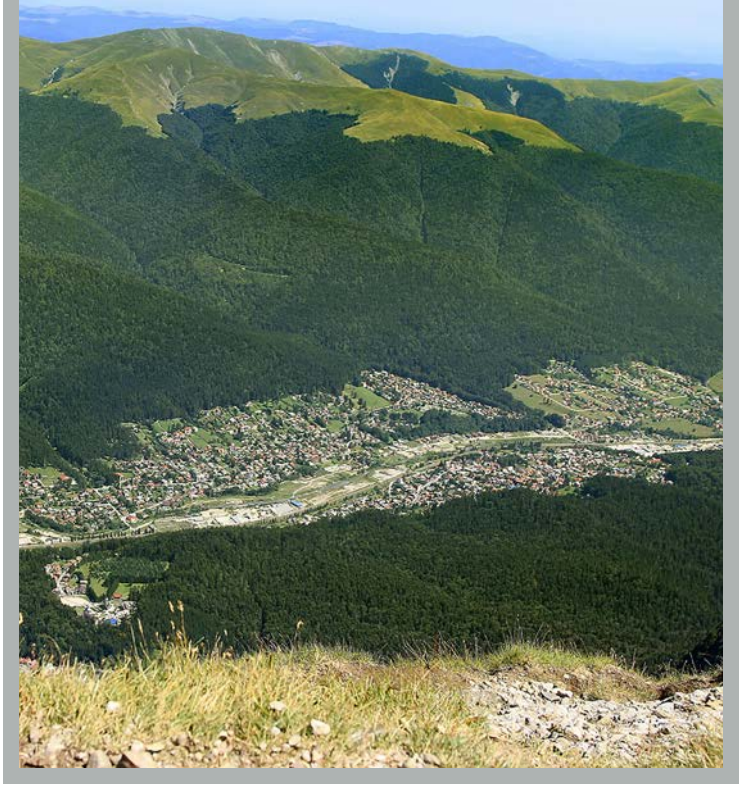
Unsuitable biotopes (large treeless areas, agricultural lands, etc.): Significant barriers for large carnivores who instinctively tend to avoid open spaces, especially during the day.

Ecological connectivity: elements, threats and solutions



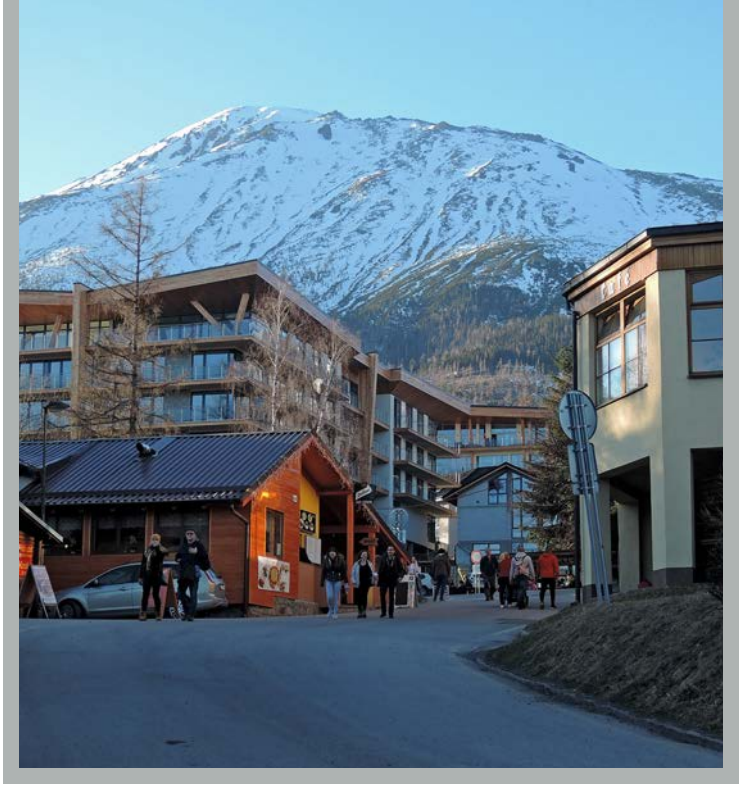
Highways, agriculture land, rivers, settlements and industrial zones: example of the cumulative effect of movement barriers.

Photo © National Motorway Company, Slovakia.



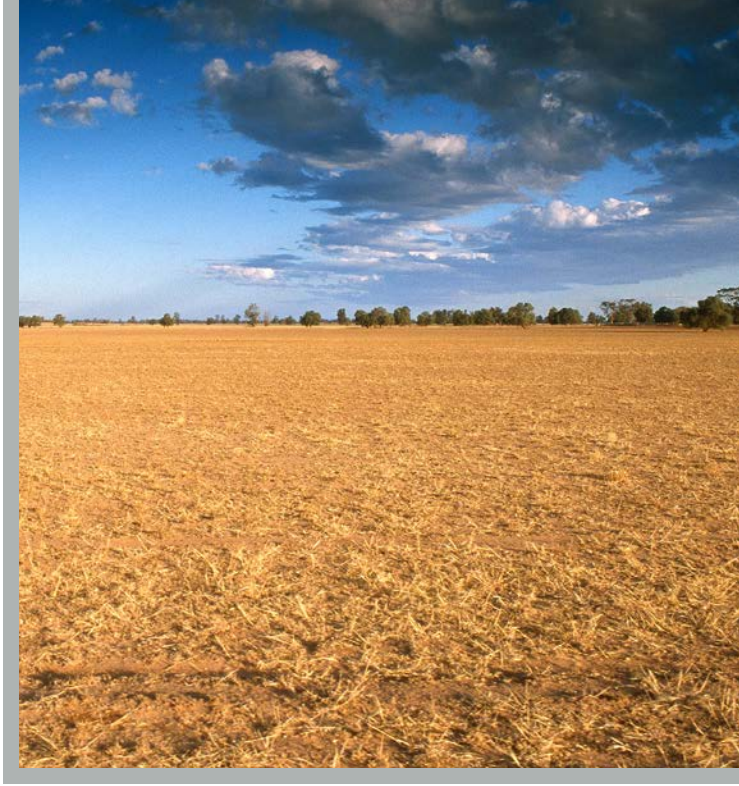
Urban built-up areas are generally considered as critical impermeable barrier. Specifically, unfavourable in terms of fauna movement in the Carpathian conditions is the urban sprawl in the valleys and scattered character of settlements at foothills.

Photo © Ivo Dostal, Transport Research Centre, Czech Republic



Number of recreational facilities in the mountainous areas with new access roads is increasing. These centres, as well as leisure time activities (e.g. off-road driving), cause additional disturbances. According to the Carpathian Convention the number of hotels in the Carpathians has increased by nearly 60% in the last ten years.

Photo © Barbara Immerová, WWF Slovakia.



Human-altered landscapes are thought to reduce habitat quality for many species. Some omnivorous species, among them bears, therefore may regularly take advantage of human-related foods, such as garbage or crops on fields, sometimes not necessarily when natural food source is scarce (easy food means less energy spent on feeding).

Photo © Adam Oswell, WWF

The artificial adjustment of river banks (stones, supporting walls with steep slopes) and the width of the water surface (water reservoirs) are considered as barriers.

Photo © Peter Drengubiak, The State Nature Conservancy of Slovak Republic

But the obstacles for wildlife movement or migration are more than just physical barriers. Nature is impacted by **socio-economic factors**, such as little awareness of local communities regarding the needs of wildlife or economic pressures, and **legal** deadlocks or ambiguities regarding the ownership and usage of the land.

Brown bear above Malatina village in Slovakia..

Photo © Tomáš Hulík, Slovakia

What measures do we use **to maintain the animal movement** demands?

The key for maintaining the ecological connectivity is an **integrated management of the land surrounding the potential barriers** which ensures that animals have enough suitable space to move around the barriers and that they are lead in the direction of the special structures designed for animal crossing, such as ecoducts.

This can be achieved if all key players who have a say in the spatial planning process – the nature conservationists, spatial planners, and land use managers – join forces and make concerted efforts to keep the functionality of ecological corridors/connectivity.

In the case of transport infrastructure, applying these solutions is very important not just for animals but also for humans, in order to increase **traffic safety.** Collisions with animals are very dangerous for vehicle occupants as well.

Different types of measures exist, based on whether we want to allow animals safely cross the infrastructure (wildlife passages), prevent them to enter infrastructure, warn animals of transport infrastructure or warn drivers about risk of accident.

Wildlife passages, known as well as **ecoducts** are mostly built over roads with high traffic intensity and over high-speed railways. There are numerous types of these **"green bridges"**. Some of them can be designed for the use of both humans and wildlife (f.e. part of the bridge is covered not by concrete or asphalt but has natural surface and vegetation). But the most effective are the green bridges which can facilitate the movement of invertebrates, small vertebrates, carnivores and ungulates.

Another solution is to build **viaducts** over wide valleys or watercourses. With this solution a natural surface under the bridge allows the connection between the surrounding habitats.

To prevent traffic accidents, **fences** are currently the main measures used to reduce collisions on roads and some of the high speed railways. While it can save lives, fencing can also increase the barrier effect and it is thus necessary to make them lead animals towards wildlife passages. In the case of absence of wildlife passages, such fences represent a barrier on huge distances.

Other solutions are focusing on warning animals (optical or acoustic devices, e.g. lights, mirrors, devices with noises activated before passing a train) or drivers (warning signs and warning systems) about the risk of accident.

Research has shown that drivers do not pay much attention to warning signals and do not reduce their speed. Wildlife warning signs without speed reduction are ineffective tools.

Photo © Peter Orolín, Slovakia.

Project ConnectGREEN: solutions for **wildlife movement** and **migration**

Even though there are some solutions, which can help animals overcome the barriers and decrease landscape fragmentation, the problems reside in their implementation. First of all, it is crucial to anchor the requirements into legal strategic documents, as well as in the process of spatial planning and land use management (agriculture, forestry). And these measures need to be planned responsibly, with adequate participation and communication among investors, developers, spatial planners and nature conservation experts.

But still, the reason why these measures have to be taken is due to the urbanisation and infrastructure development which do not consider their impacts on animals and nature. What is still absent is a pre-emptive approach: **instead of thinking about how to build a green bridge, let's think of ways to avoid the need to build it in the first place**. This Precautionary Principle has been already recognised by the European Commission.

ConnectGREEN project is aligned to this "broader context" approach. The project is focusing on **responsible spatial planning** and strengthening the position of spatial planning in grey infrastructure construction projects.

Information about wildlife populations in the surroundings of barriers and about changes induced by human infrastructure is critical for proper decision-making. A large number of methods can be used to collect this information, from recording road and railway casualties, through monitoring of movement and dispersal routes and wildlife passages to telemetry.

Photo © Radu Mot, Zarand Association, Romania

One of the important requirements is that green bridges simulate vegetation and environmental factors of the connected habitats, such as soil type, humidity, light. E.g. connection between forests requires elements of similar forest habitat on the overpass. Green Bridge in Velký Újezd, Czech Republic.

Photo © Martin Strnad, Nature Conservation Agency of the Czech Republic

What do we do in ConnectGREEN?

The ConnectGREEN project aims to cope with the fast habitat fragmentation in the Danube-Carpathian region, as well as **to improve ecological connectivity** between natural habitats — especially NATURA 2000 sites and other protected areas of transnational importance.

Very few spatial planners have the knowledge and experience to ensure that conflicts between development and nature conservation are minimized as they develop new plans. More importantly, legally binding mechanisms taking into consideration the requirements of functioning ecological corridors are poorly implemented, mainly because of the lack of reliable data.

Therefore the main aims of ConnectGREEN are:

- Develop innovative guidance to identify ecological corridors in more detail and in a harmonized way across the Carpathian eco-region.
- Engage conservationists, spatial planners and other stakeholders in an integrated approach for strengthening the capacity to identify and manage ecological corridors.
- Maintain or restore ecological corridors which secure a viable population of large carnivores in the Carpathians and maintain one of the largest biodiversity hotspots and functioning ecosystems on the continent.

ConnectGREEN project emphasizes the change of approach and proper spatial planning in urban development and transport infrastructure projects. High Tatras, Slovakia.

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

Project partners:

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

Austria: WWF Central and Eastern Europe

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

Hungary: CEEweb for Biodiversity · Szent Istvan University

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

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

Associated Strategic Partners

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

Hungary: Bükk National Park Directorate

Romania: Ministry of Environment of Romania

Serbia: Ministry of Agriculture and Environmental Protection of the Republic of Serbia

Slovakia: Ministry of Transport and Construction of the Slovak Republic

Ukraine: Ministry of Ecology and Natural Resource of Ukraine

Austria: Danubeparks – Danube River Network of Protected Areas

France: Alpine Network of Protected Areas – ALPARC

Montenegro: Parks Dinarides – Network of Protected Areas of Dinarides

Pilot Areas

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

Budget

Project co-funded by European Union Funds (ERDF, IPA)

Overall Budget: ..... 2,462,923.53 €

ERDF Contribution: ..... 1,920,592.41 €

IPA Contribution: ..... 172,892.55 €

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