



# Strategies & Recommendations to sustain, restore & enhance Ecological Connectivity in the Carpathians

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# 1 Recommendations: Ecological Continuum & Connectivity

The recommendations are providing a final assumption of topics touched during the project life time in BioREGIO concerning ecological connectivity. This brief overview should enable a compact knowledge transfer, in which problems, opportunities, threats and strengths in dealing with dispersal of wildlife are focused at, for which the particularities and natural assets of the Carpathians are playing a major role. During the project life time these 10 guidelines derived here as recommendations were indicated as the most relevant ones. They all refer to the initial concept to separate the barriers/possibilities influencing ecological continuum and connectivity into a physical, legal and socio-economic part. The first five recommendations refer to physical barriers/possibilities, while the trans-boundary aspect and the hunting law is more likely touching legal fields. And finally urban sprawl or ecological connectivity beyond protected area as well as compensating wildlife damages cover socio-economic topics. Consequently the guidelines developed in the context of connectivity are enlightening evident deficits concerning landscape fragmentation. And thus, the field around maintaining and restoring ecological corridors is touching task-areas from spatial and land use planning and their various legal directives regulating these aspects.

## 1.1 *New infrastructure, roads & motorways*

Countries in the Carpathians are experiencing a growth of infrastructures since the end of the communism. New motorways are foreseen in Romania, Czech Republic, Hungary and Slovakia and many locations are experiencing an expansion of human settlements. The purpose of road developments is to ensure an effective connection of new-EU states with other EU countries through the Trans-European Transportation Network (TEN-T). In this unprecedented era of urban expansion and road building, the opportunity is given to revisit the design for connectivity, rather than discussing about fragmentation. The question is not focused on “whether to build a road”, but on adopting a different approach to transportation planning that focus on the enhancement, maintenance and re-establishment of ecological connectivity.

The data collected during the BioREGIO project have highlighted that the current road network in the Carpathians do not act as unsurmountable barriers for wildlife but that there is the need to reconcile the notion of mobility in order to (re)imagine the road as a device for (re)connection between humans and wildlife, culture and nature. The foreseen motorways need to be developed following the guidelines for the new TEN-T corridors of the European Union. The guidelines propose a multidisciplinary approach to analyze the impact of the trans-European transport network, posing great emphasis on the safety and environmental friendliness of transport infrastructure by promoting innovative technological developments. In addition to the Habitats and Bird Directives, the EU issued a directive (97/11/EC) that calls for a strategic environmental assessment (SEA) and, for major infrastructure projects, an environmental impact assessment (EIA) to foresee potential environmental problems from plans and projects. Specific guidance for transportation planning is being developed under the COST 341, European

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Handbook project. The goal of the BioREGIO analysis on wildlife connectivity is to assist transportation managers to make strategic and proactive decisions to protect and enhance wildlife connectivity when designing new and expanded road projects.

In case of generated discussions on possible alignments (i.e., Deva – Lugoj Motorway in Romania; M2 motorway in Hungary, new motorways in Czech Republic and Slovakia), it is essential to:

1. Perform a systematic analysis of wildlife presence and dispersal through GIS and field work
2. Develop a framework to identify the ecologically strategic locations for enhancing wildlife connectivity
3. Provide planning level mapping tool highlighting the strategic locations
4. Invite local communities, NGOs and experts for public debating
5. Provide mitigation and monitoring recommendations for areas interested.

#### **Example: case study Lugoj-Deva Motorway (Romania)**

Lugoj-Deva Motorway sector is part of the Pan-European Transportation Corridor no IV (Europe Aid 122273/D/SER/RO ISPA 2004/RO/16/P/PA/002/01; part of TEN-T Corridor IV). The proposed alignment would intersect the last ecological corridor for large carnivores between Western and Southern Carpathians in Romania, isolating the Apuseni Mountains (Western Carpathians) from the rest of Carpathian Range in Romania (Fig. 1).

Large carnivores have been detected in the interested area, although bears are present only during seasonal movements, lynx and wolf are residential. The IENE Network ([www.iene.info](http://www.iene.info)), the greatest European network for ecological connectivity and transportation, organized a workshop in May 2013 about this motorway inviting local stakeholders, road administration and European experts to find mitigation strategies for the maintenance of connectivity.

The main conservation goal is to assure long-term functional connectivity between the Western and Southern Carpathians populations, protecting the main populations at a healthy level, and to allow natural expansion in favorable ranges and safeguard movement/dispersal routes.

From a social and legal point of view, there is the additional need to overcome a series of barriers going from the management and coordination between the various stakeholders, the lack of public awareness, law enforcement and damage/conflict prevention and compensations. The major barrier remains physical, represented by the planned infrastructure developments in the area. Ecological reconstruction may also be needed.

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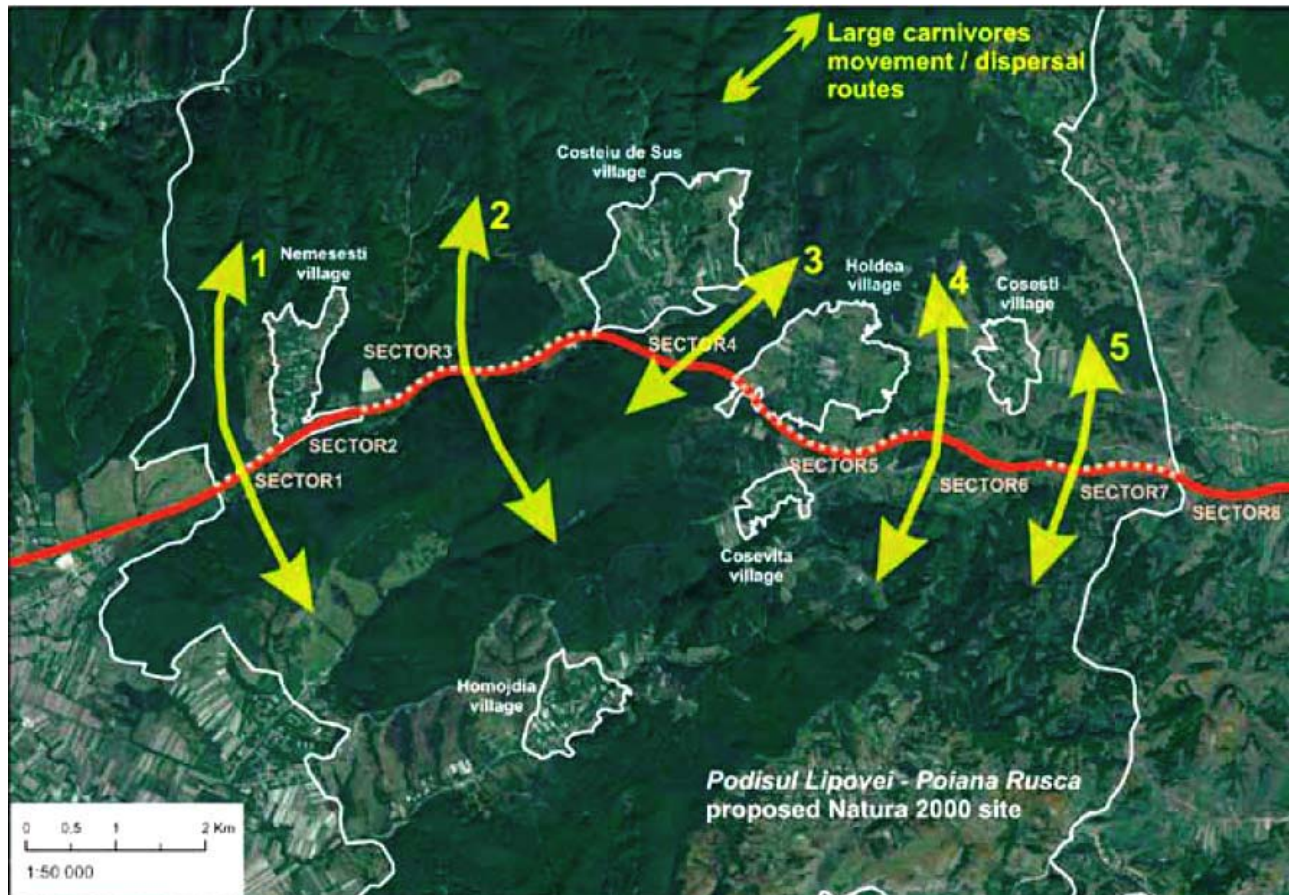


Fig. 1. The Deva-Lugoj alignment and the intersection with a NATURA 2000 site and wildlife dispersal routes (Fauna and Flora International, WWF Danube-Carpathian Programme, Greenlight Services, Romanian National Environment Guard, Romanian Forest Research and Management Institute, Faculty of Silviculture and Forest Engineering Brasov, Carpathian Wildlife Foundation, The European Nature Trust)

**Final considerations**

In order to analyze correctly the different alignments of a foreseen motorway concerning ecological connectivity, it is fundamental to provide:

- Site location and site plan. Locations, types and sizes of ecological connections close to the foreseen infrastructure.
- A list of the wildlife species identified
- The location of the main core areas and most probable passage sites.
- According to the species present in the location, the kind of ecological infrastructures/connections that may be required.
- A list with location of new dedicated connections for wildlife (bridges, culverts, fences).
- 3D rendering of the project with the dedicated crossing structures for public debating.



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A multidisciplinary study considering the environmental, social and legal issue should join the engineering one in order to detect all the potential and future barriers for connectivity and to identify new and dedicated wildlife crossing structures and protective fencing if needed.

In current roads, existing culverts and fencing structures that may be in-kind, retrofit, or structurally deficient, damaged, obsolete, insufficiently sized, or otherwise inadequate should be replaced.

### **1.2 Animal-Vehicle Collision (AVC)**

The phenomenon of Animal Vehicle Collision (AVC) or Road Kill is interesting all the European countries with an increasing rate due to a natural return of many wildlife species (ungulates but also carnivores) in locations from where they were almost disappeared.

The AVC phenomenon interests also the Carpathians countries. Many animals are routinely struck and killed by vehicles in the most basic quest for survival. Since few years, many institutions and research centers have started to collect data on the involved species, on the costs (for biodiversity, for the economy and human health) and on the locations at higher risk of collision in order to get a clear picture of AVC in their countries and provide solution for the mitigation.

Road kill is a concrete result of the conflict between the needs of humans and animals. The humans' need to get anywhere safely and quickly is a basic expectation of modern society. Yet wild animals need connected landscapes: they must cross roads in search of food, mates, and shelter. The road kill problem is not only related to wilderness, but it is a problem affecting everyone. Growing numbers of animal-vehicle collisions are leading to higher levels of personal injury and property damage, and with this, rising insurance premiums. Many countries miss a compensation program to refund the damages caused by AVC. While human deaths are not high compared with other accidents, AVC have increased significantly. This represents a significant danger to human safety and to wildlife populations. Animal-vehicle collisions are also increasing as a proportion of the total roads' accidents. Even if not physically hurt or economically affected by a collision, many people report feeling traumatized after hitting an animal. Alongside these obvious concerns for motorist safety are serious implications for wildlife. Road mortality is documented as one of the major threats to the survival of many species listed threatened or endangered. On a much larger scale, conventional road building results in significant losses of habitat for wild animals. Road networks fragment our landscapes into ever-smaller, disconnected patches in which wildlife must live and move, faced with declining genetic fitness as populations become separated and isolated. Road kill is not simply "bad luck" or an unfortunate consequence of driving; it is an avoidable cost and a preventable loss. AVC is not only a matter of physical road effects but also of the driving behavior. An increase in the ecological awareness is fundamental to allow the mitigation structures to work properly.



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There is then the need to rethink our dominant model of mobility and our awareness to understand that both humans and wildlife share a common need to move. Based on these premises, the opportunity is to redesign the roads to provide safe passage for all.

During the BioREGIO project, EURAC collected data concerning AVC from Romania, Hungary, Slovakia and Czech Republic in order to identify an additional impact of road infrastructures on wildlife connectivity. Road kills do not appear, at present moment, as one of the main threats for Carpathians' ecological connectivity. However, the foreseen expansion of roads, motorways, and interchanges that is interesting all the Carpathians' countries creates the conditions for a higher impact of this phenomenon, both on wildlife and on humans.

### Example: AVC in Serbia

**Location: road 25-1.** The road 25-1 runs along the Danube River at the northern border of Djerdap National Park (Fig. 2). In many locations (red dots), the road cuts the access to water for wild animals in an environment rich in wildlife species and individuals. The road is a 2-lanes national road, narrow and very curvy. The speed limit is 80 km/h. The road is used also by many bike tourists but there are no specific bike routes. The normal attitude in Serbia and Romania is to drive very fast.

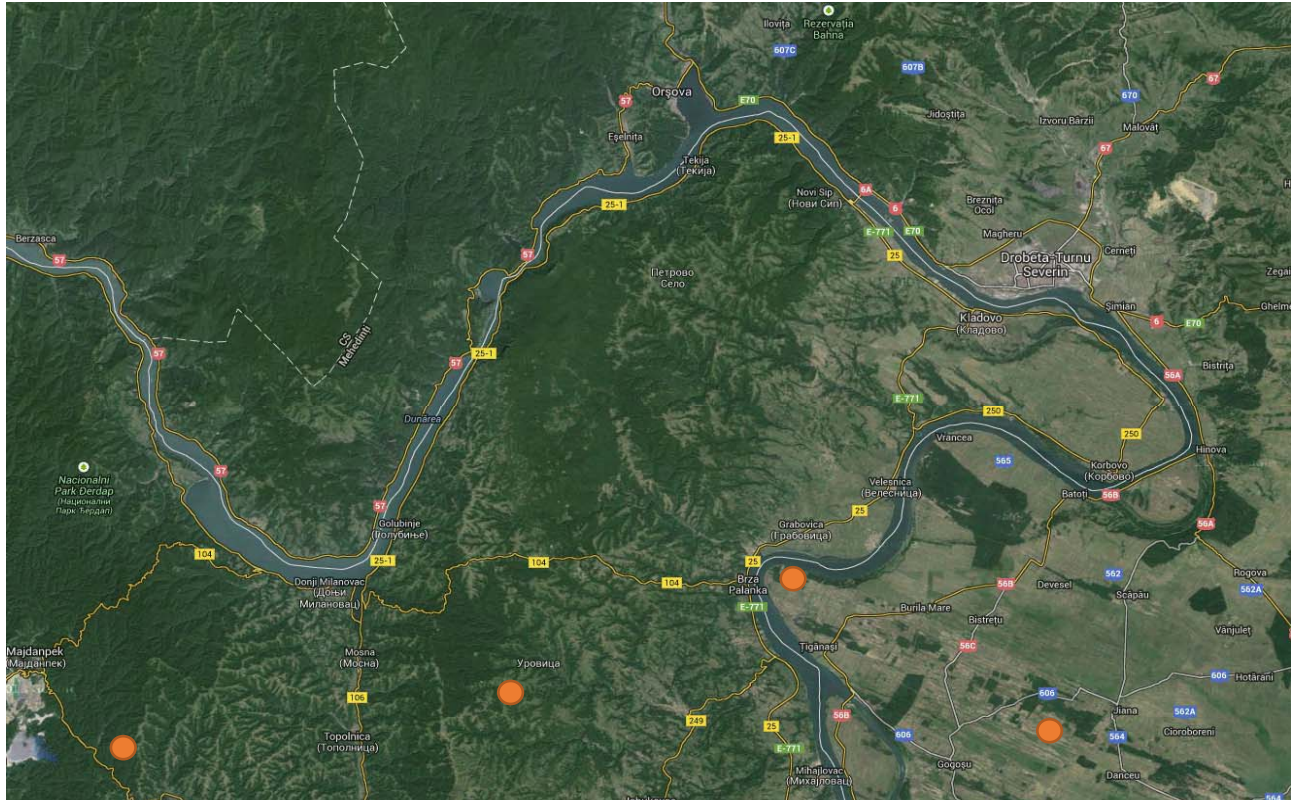
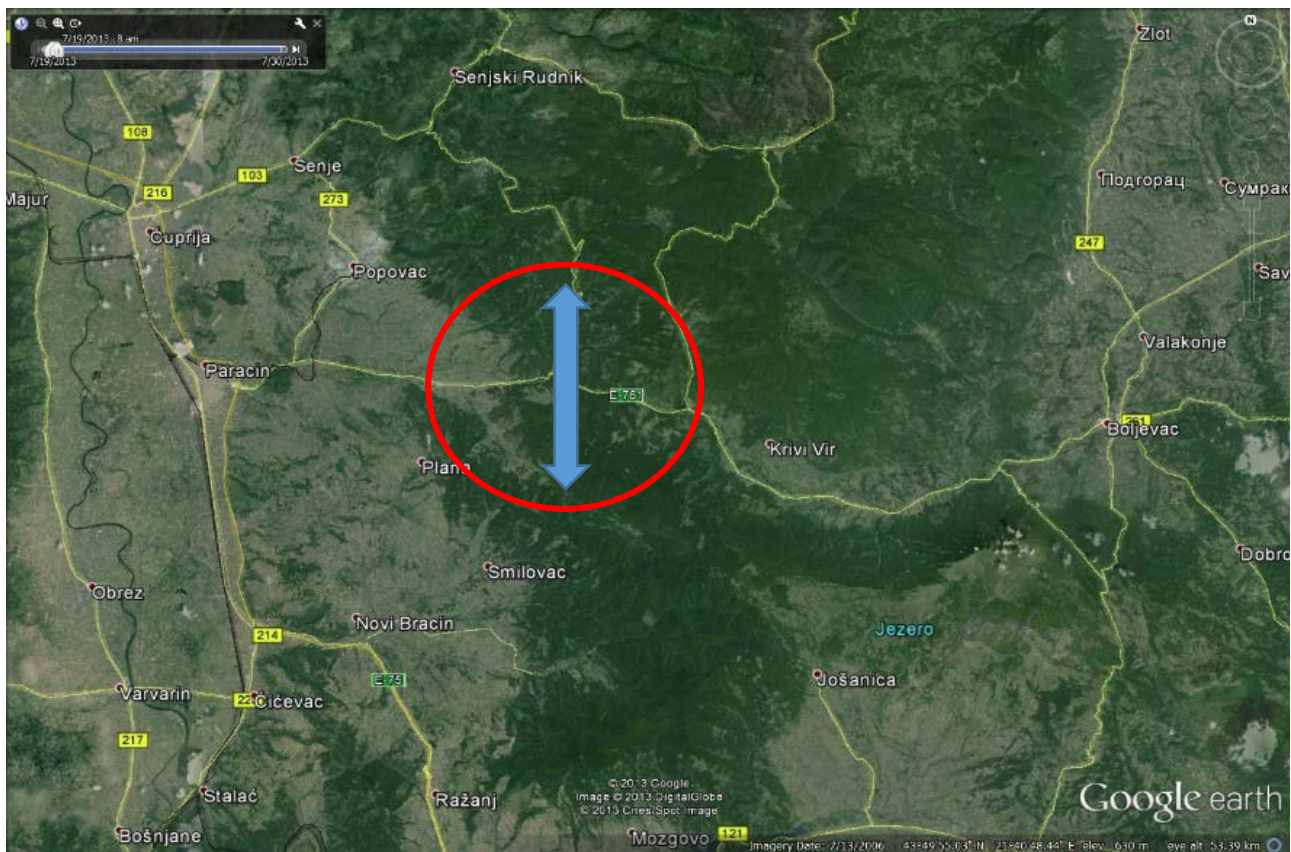


Fig. 2. The road 25-1 in Djerdap National Park (Serbia) and locations of road kills hotspots.

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The major problem is represented by the cumulative effects given by the high speed of the cars, by the scarce visibility and by the absence of fences, signals and mitigation structures. The main areas of wildlife crossing, identified by direct observation and by wildlife carcasses, occur in scares-visibility locations, i.e., just after a blind curve. There is no detection system to identify the road killers and no information are available concerning the real numbers associated with this phenomenon. The driving behavior and the absence of remote speed control are probably the main obstacle for reducing this phenomenon.



*Fig. 3. The road E-771 between Boljevac and Paracin (Serbia)*

**Location: road E-771:** The same situation happens in the road E771 between Boljevac and Paracin (Fig. 3). This road is highly frequented, with a speed limit of 70km/h. The road cuts a forested area surrounded by agricultural fields. Also in this location, there are no official data on wildlife road kills but evidences are clear (leftovers) and many direct observations are available.

The area has been detected by the BioREGIO GIS analysis as a probable passage sites for wildlife connecting the Danube part of Serbia with the Balkans in Bulgaria. Direct observation by local people and researchers



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have confirmed this hypothesis. The presence of forest, agriculture and of edge habitats provide an ecological diversification that attract many different wildlife species and individuals.

Unfortunately, this national road has a total absence of mitigation / prevention infrastructures and no signals inform the drivers that they are inside of a highly frequented wildlife area with a high risk of road crossing. Also along this road, due to the absence of remote speed control, drivers are used to drive over the speed limits. Many accidents happen between cars and wildlife but still no decisions has been taken to mitigate this situation.

Fences are present in some parts of the road (figure 4-left) but their height, size and length does not represent a barrier for wildlife crossing.

Just as a comparison, the fences in figure 4-right, are those used in Hungary on the Motorways to avoid car-wildlife accidents.



*Fig. 4. Fences along the road E-771 in Serbia (left); and fences along a Hungarian motorway (right) (photos by Filippo Favilli and Elisa Ravazzoli)*

### **Final considerations**

The situation briefly described for Serbia find analogies also in many other locations of the Carpathians' countries (Romania, Hungary, Slovakia, and Czech Republic). There is then the need to find new solutions to wildlife crossing infrastructure to reduce the costs and to tailor each type of crossing to the specific species in various landscape contexts. In this new modernization era of Carpathians' infrastructures, there is an increasing need to repair existing and often crumbling transportation infrastructure. There may be opportunities to reuse adaptively some structures for wildlife crossing purposes, whereas new structures may test alternative and emerging sustainable materials at lower lifecycle costs. New solutions to the construction approach and material of crossing structures must also be considered in the context of long-

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term ecosystem change. The new structures should be adaptable to changing wildlife movement patterns due to changes in habitats, climate, or other factors that become apparent over time. This implies a continuous monitoring of the wildlife species present in a certain area interested by the AVC phenomenon. It is important to emphasize that this is not a new idea. Providing crossing infrastructure at key points along transportation corridors has been shown to improve safety, reconnect habitats, and restore wildlife movement. Throughout Europe, Asia, Australia, and North America, hundreds of crossing structures, or “ecoducts,” have already been implemented with demonstrable success. These include underpasses and overpasses that have been constructed in a variety of sizes and designs. Although wildlife underpasses are generally less costly to build and more commonly used by a wide diversity of species, wildlife overpasses are preferred by certain wide-roaming and iconic species-at-risk, such as lynx, bears, and wolves, for example. 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.

### **1.3 Hunting procedures**

The Carpathians landscape is dominated by forest and game species (mainly ungulates but in some countries also bears, lynxes and wolves). The forest is an important link in the connectivity of the landscape and has a high significance as a habitat. 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.

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.

The information gathered during the BioREGIO site visits have highlighted several regional differences concerning the role of hunters for the promotion and restoration of ecological connectivity.

In some Carpathians’ countries, hunting is a large business. The protection of a landscape for the creation of an ecological corridor has to face with all the related economic interests. Conservation is less economically attractive than forestry and hunting.

The high numbers and densities of game species attract many foreign hunters. Hunters may pay up to 7000 € for shooting a bear in Romania. The economic income generated by the game species’ trophies is much higher than the one coming from conservation. Due to that, carnivores can be seen as competitors by the hunters (i.e., Hungary), because they reduce the number of game individuals.

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The idea of competition and that carnivore species are “a pest” for game management, stimulates the “protection” of the game species for the economic income they provide. Although protected, carnivores are killed by hunters and poachers. The high presence of hunters and their negative relation with carnivores, in some countries, may push carnivores to other locations that are not highly suitable to their ecological needs and are not good enough for connectivity.

Hunters and game managers have on one hand the view only on the economic income generated by game species, not allowing the promotion of a strategy that may stimulate a cooperation among the different actors and interests. On the other hand, in other countries, hunters feel the presence of big carnivores (especially Lynx) as an ally in keeping game population under control.

The big challenge comes from the harmonization of the different and often contradictory interests among hunters, ecologists, gamekeepers and the local populations.

In some locations, due to an (estimated) oversize of game populations, farmers and foresters complain about the damages they create. Hunting offices managing a certain hunting area have to compensate the damages that in some cases may be extremely high.

The establishment of feeding points is a highly used technique to attract game species out of the forest in order to provide to paying hunters (mainly foreigners) a safe shoot. The presence of feeding point is helpful for the hunters, because it generates “easy preys”; it rises the economic income and keep game species far from the economic activities.

Big carnivores are themselves attracted by feeding points for obvious reasons. The provision of food out of the most suitable territories, can change their behavior, making them use marginal areas and to get used to food provided by humans and to be more exposed to hunting and poaching.

Besides, it has to be considered that at many locations, carnivores and ungulates’ species have started to spread in territories where local people are not used to their presence. A higher wildlife presence creates fear among local people justifying the intervention of hunters for their safety. Elsewhere, where rural people are used to co-exist with wildlife, hunting has not that economic weight and the presence and damages by carnivores and ungulates are more accepted. As for other issues, the low awareness and education concerning the benefits coming from a restored ecological connectivity, pose a serious barrier.

The core areas and least-cost paths identified in the project BioREGIO could be used, on one hand, to identify the stripes of land necessary for the establishment or maintenance of the ecological network. On the other hand, it could be misused revealing to poachers and hunters where these species tend to pass. Hence the proposal to dedicate stripes of forestland for the establishment of an ecological network has to be coordinated with the economic interests of the game management authorities.

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Hunters may take 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.

#### **Example: Feeding points in Romania**

The presence of feeding point is a help for hunters because bears get used to them and they reach areas they would not use normally, but it may change the behavior of bears, make them choose marginal areas and make them more used to food provided by humans (Fig. 5).



*Fig. 5. An observation/hunting structure close to a feeding point (Brasov area, photo by Filippo Favilli).*

Poaching in many locations in Romania is under control by the game managers and hunters try not to shoot to bears because they should have to pay for it.

Connectivity is considered to determine the occurrence of hunting species (also bears) and to share the information among the different hunting units. Bears' quotas can be shared among the different hunting units. Hunters analyze the area and identify the passage sites for wildlife. There are no studies on connectivity in many areas but only local observation. In the area close to the city of Sibiu, hunters monitor NATURA 2000 sites, either because hunting is allowed in these areas and to prevent poaching. An estimation of bear number is done every year, at the same time in two neighboring hunting units using the feeding points and signals of presence. Some studies on genetic of populations of bears gave contradictory results, unrevealing whether the bears living in the two sides of the valley belong to the same population.

In areas interested by a motorway planning, local hunters may contribute to collect data on wildlife passage sites and to cooperate with road agencies to evaluate the real impact coming from the planned

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infrastructure. Hunters may then help in the identification of hunting ban areas, game protection and quiet zones and of game reserves, contributing to the harmonization of the interests.

#### **Final considerations**

The role of hunters in relation to ecological connectivity has to be derived from the social attitude towards big mammals' species: 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.

#### **1.4 Forest**

**FOREST MANAGEMENT AND ECOLOGICAL CONNECTIVITY:** 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 still low in many locations, initiatives would be required. Hereby protected areas are playing a key role, although their territorial contribution to connectivity could be of fewer relevance. Thus foresters and forest managers have to enhance their joint-up thinking to which they are used in terms of silvicultural treatments at different forest stands concerning different relevant functions. But besides, they have to include the demands and requirements of other “users” like people seeking for recreation as well as hunters and game managers, too. Their partly contradictory interests are hereby most crucial. If e.g. agricultural land is affected from game damages or afforestation, conflicts are programmed as this reduces their income. Apart the knowledge transfer process, these economically driven conflict are more likely solved with politically granted subsidies to compensate the territorial loss and to initiate a rethinking of farmers.

**NATURE CONSERVATION VERSUS ECONOMIC INTEREST IN FOREST AREAS:** To raise awareness and to maintain the population of large carnivores, the two-annual reports to the EU on NATURA 2000 species is an instrument to put pressure on the hunting and forest management sector. Contradicting to that is the common responsible ministry that nature conservation, forestry and hunting are sometimes sharing. The economic interests of forestry and hunting are hence traditionally on a higher priority as mainly in the Carpathians the majority of forest areas are state owned. The rural society is still convinced that only forestry creates jobs and income to local people, while nature protection is not able to. Hereby it is a disadvantage that only a low percentage of protected areas have management plans but not enough money to implement them, though the subsidies coming from the EU. That may be one of the main reasons of the persistency of illegal



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hunting and logging. Additionally, it is well known that legal prosecution to uncover the offenders is nearly impossible. In contrast city-people are strongly supporting the conservation approach and have herein a strong voice to claim for conservation measures and management plans to maintain an ecological continuum. Maintaining ecological structures is the main purpose in the Carpathians, whereas in Western European countries and the Alps the restoration of ecological corridors to reduce landscape fragmentation is of greater importance.

**FOREST VERSUS GAME MANAGEMENT:** Due to economic interests we have to face here contradictory interests among hunters and gamekeepers versus forest and protected areas managers. Particularly game-keeping in forested areas requires to protect animals with fences from predators or on the other hand forest stands foreseen for economic use are fenced to protect them from game species. Both realities may interrupt dispersal paths and thus connectivity. On the opposite legal restrictions are also harming economic interests in harvesting trees - particularly when animals like lynx, wolf etc. are thereof protected. Here forest management becomes the main threat for these animals as they have to be “removed” before harvesting that forest stand. Hence foresters are here collaborating successfully with the hunting community as the predators are still seen like “pests” for game species. And in general the results of the connectivity model plays hence a contradictory role, as the most probable pathways delineated for carnivores makes their hunting easier.

**PREVENTION FROM ROAD & RAILWAY KILLS:** 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 safe 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.

## **1.5 Agriculture**

**FARMS AND CARNIVORES:** The size of intensively use 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. Besides, the application of technical harvesting machines as well as the application of herbicides and pesticides has to follow standardized rules to minimize the killings of dispersing animals. Such farm types are rather typical for the foothills and the fringes of the Carpathians, whereas the families in the Carpathians applying subsistence and semi-subsistence farming are more common. Concerning large carnivores they are used to them and live in a good coexistence. Losses of breeding-animals or damages at bee-houses are avoided by holding

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dogs and the permission to shoot these animals if they attack human facilities. Anyway farmers are advised to fence their territory preventively, as this is a precondition to claim compensation-payments for damages from carnivore attacks. 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.

**FARMING AND GAME-KEEPING:** Usually this is not *per se* contradicting. Only in the case of game-keeping the overpopulation of game species for economic reasons causes damages in agriculture, what makes conflicts unpreventable. The operators and their hunting guest are often not residents or even from abroad and are thus less caretaking in nature conservation. Normally they are not interested in carnivores but rather on their prey-species (wild boar, red or roe deer) carrying hunting-trophies. Damages to farmers are compensated by those hunting clubs directly. As farmers are becoming even less tolerant to the damages their attitudes towards ecological connectivity is not positively driven. To cope with these problems in the long run and to gain trust among the farmers, two solution variants are discussed: Either these hunting clubs are restricted to fenced private land what is even negative to ecological connectivity or as long as they operate on state owned territory responsible authorities have to supervise these hunting activities and have to limit these activities with particular permissions.

**WIND-FARMS AND FLIGHT PATHS OF BIRDS:** Wind farms are obviously disturbing the flight paths of birds and are moreover impacting the habitat-attractiveness for large animals negatively. The allocation of these wind parks should thus concisely consider in an SEA or EIA the effects of the rotors and the produced noise on the fauna and biodiversity.

**NEW PLANNED INFRASTRUCTURES AND FARMING:** If the 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. For those cases the land is not intensively cultivated or the proprietors even don't have any relation to their agricultural land anymore, these (new) farmers 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. 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 safe 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.

### **1.6 Trans-boundary issues:**

Both strategic environmental impact assessments (SEA) and environmental impact assessments (EIA) of projects having a significant impact on environment, as well as assessments of the impact on Natura 2000 sites, can provide the comprehensive warranty for the protection of natural values. Both assessments take into consideration both the findings of environmental impact study and the results of consultation with specialized environmental authorities and the public, before authorizing a plan or a project. The environment and/or Natura 2000 impact study should, however, stress biodiversity and ecological connectivity-related issues, thus ensuring a sound implementation of Natura 2000 legislation and an effective national biodiversity and ecological connectivity protection; exemptions should be limited and granted on a stricter basis; public participation in the procedure should be enhanced especially in trans-boundary context.

Management plans are key management documents for protected areas. They provide the basis for ensuring ongoing management of protected areas or their buffer zones and for protected areas of international importance. Only a few protected areas approved valid management plans. Thus protected areas do not have clear and concrete rules on how to restructure and organize their territories . At the same time, protected areas apply simultaneously other plans or programs, which influence them – like: forest management plans or municipal and regional land-use plans. Thus, both at national and cross border levels, it is recommended to integrate all approved and applied management plans for each of the protected areas into one management plan to avoid their mutual competition and use protected areas in accordance with their original purpose.

In different Carpathian countries, similar category names of protected areas 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 trans-boundary areas

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 favor of ecological connectivity.

## 1.7 Hunting laws

Hunting Law Acts are commonly approved at state level, however they often contain (e.g. Poland) express authorization to local organs to adopt sub-national acts, which may constitute a derogation from the national law and lead in fact to a diminished protection of some species. Thus, derogations should be limited and granted only under strict conditions: preventing that at local level species are not protected.

In some of the Carpathian countries, hunting laws are only in fragmentary compliance with the EU legislation, in particular with the EU Bird Directive. Some infringements procedures have been already initiated by the EU Commission against Carpathian countries (e.g. Infringement procedure against Slovakia - No. 2012/4003- for inappropriate implementation of Art. 2, Art. 7.1, 3 and 4 and Art. 9. 1 and 2 point. b), c) and d) of Directive 2009/147/EC on the conservation of wild birds. The reason is the lack of protection of selected bird species and discrepancy in the Nature conservation regulations and the Hunting regulations, especially the fact of missing the so called 'non-hunting zones' in some Special Protected Areas) and the EU Court of Justice has already delivered Judgements against some of the Carpathian countries to this regard (e.g. European Commission vs. Republic of Poland, Case C-192/11, in which the Court declares that by not applying national conservation measures to all species of naturally occurring birds in the wild state in the European territory of the Member States, which are entitled to protection under Directive 2009/147/EC on the conservation of wild birds, and also by not correctly defining the conditions to be complied with in order to be able to derogate from the prohibitions laid down by that directive, the Republic of Poland has failed to fulfill its obligations under Articles 1, 5 and 9(1) and (2) of that directive). Thus, national legislators shall integrate without delay (if not done yet) hunting laws with the Natura 2000 legal framework and authorities shall improve their enforcement both at national and local level.

In some Carpathian countries (e.g. Slovakia) sensitive species (e.g. *Canis Lupus* L.) are not protected species, and can be hunted. Thus, legislation should grant protection to these species as they do not longer exist in most of the countries of the European Union.

## **1.8 Urban sprawl and settlement expansion**

Not only the construction of big infrastructural projects, such as motorways, but also small intervention at local level have an impact on ecological connectivity; this is the case of the expansion of settlements and urban sprawl. Two contrasting factors have an impact on this issue:



*Fig.5: A “bear-safe” garbage-collection-place (Băile Tușnad, photo by Filippo Favilli).*

On the one hand, the rapid socio – economic transformation are resulting in the willingness of local communities to expand dwelling areas. In this context, there is often an underestimation that even minor changes in the local settlement expansion, such as the allocation of garbage collection place, can have an effect on the behavior of selected species (such as bears), especially in rural areas. Parallel to this process, urban sprawl and (illegal) settlement extension can be driven also by the expansion of specific sectors.



*Fig.6: Example of urban sprawl in a peripheral zone in the Carpathians*

One example is the tourism sector, where growth often underlines the subsequent expansion of the hospitality and leisure infrastructure. Legislation and planning procedures are the main instrument of intervention in order to discipline the phenomenon; nevertheless, especially at the levels of small

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communities, the regulatory framework and the enforcement can have a low effectiveness. Moreover, shared approaches to spatial planning among different municipalities are still not widespread; this results in a fragmented planning also in small areas. Finally, the spatial planning regulation at local, regional, national and Carpathian level does not integrate the concept of ecological connectivity and ecological corridor.

Impacts are multifold: on the one hand, the penetration of urban features into the landscape can affect important areas for feeding or breeding; on the other hand, the expansion of settlement can change the behavior and the movements of selected species due to fencing or disturbance. Finally, fragmented planning among municipalities or provinces can result in a loss of connectivity.

While the drivers of this expansion (such as the creation of new touristic attractions or new dwellings) are positive signals of economic diversification for local communities, there is the need to intervene in a planning phase in order to avoid negative impacts of the phenomenon.

Possible recommendations regarding this field of intervention should address the following points:

- A concept of ecological connectivity also in local spatial planning, in order to adequately address land – use change phenomena.
- The enforcement of spatial planning regulation and the integration of different planning levels.
- The promotion of inter-municipal plans for municipalities from the same geographical area (for example, a valley), functionally building a unit, to share infrastructures commonly (like garbage disposal areas) and to be able to design ecological corridors at inter-municipal level.

### **1.9 Ecological connectivity: beyond protected areas.**

One of the main obstacles that can be highlighted in the promotion of ecological connectivity is the diffused perception among different stakeholder groups that a protected area is needed in order to make an ecological corridor. As the site visits in the overall Carpathians have shown, this perception is widespread among different actors at local, regional and national level, even among actors that are responsible for protected areas and conservation.

While the legislative aspect remains essential for the establishment of protected areas and nature parks, which constitute the essential ecological structure whose connection ecological corridors must protect, the preservation of corridors themselves can be achieved also through a combination of legislation and practices of sustainable integrated management.



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This is particularly relevant where economic activities, such as forestry and agriculture, are in place. Here corridor development strategies can be combined with adequate incentives to land owners for the sustainable maintenance of these zones according to connectivity criteria. One main advantage of such integrated management is that it could also be advantageously carried out at transnational level, where the presence of different legislations could be a main barrier.

Possible recommendations regarding this field of intervention should address the following points:

- It is essential to highlight through reliable models potential ecological corridors, in order to highlight the areas where a sustainable integrated management should be fostered.
- Legislation should be combined with sustainable practices in agriculture or forestry.
- Adequate incentives should be allocated to private landowners and firms in order to promote an integrated management.
- Adequate prevention and compensation measures for damages should be developed.

#### ***1.10 Compensation of damages***

An effective approach to ecological connectivity should address the different steps in which conflicts between human activities and wildlife can arise, starting from the planning, through implementation up to the management of possible conflicting events. 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.



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There are several factors that hinder an effective application of compensation mechanisms: one of these is the lack of transparency and clarity regarding compensation. Often, local stakeholders have not a clear idea of who can benefit from compensation, what can be compensated and how to access the compensation scheme. Moreover, this situation is influenced by an uncertain governance of the management of damages caused by wildlife in specific case, for example those caused to cars in a road collision. In this case, the different authorities involved may not have regular structures of dialogue (e.g. regular meetings or exchange) and often there is a lack of coordination in the intervention after a damage occurs. This affects the recipients of compensations, especially in case of a scarce coordination between the authorities that should evaluate the entity of the damage and the ones that should compensate the damage.

A situation of uncertainty could discourage the application for damages compensation and could foster a negative attitude towards measures for ecological connectivity and the coexistence between wildlife and economic activities. Moreover, a lower rate of report of damages by private citizen can also represent a negative aspect in the monitoring system of wildlife presence and associated damages, which could profit from precise and updated information.

Recommendation on this aspect should therefore address three main points:

- Improvement of 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.
- Improvement of 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).
- 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.