Ecological Restoration and Transport Infrastructure

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Conclusions

Ecological restoration and reduction of habitat fragmentation contribute to the preservation of biodiversity, enhancement of ecosystem services provision and supporting climate change adaptation, improving human well-being. As a result, they have been included as key objectives to achieving the main European and national global biodiversity strategies.

From the knowledge and experiences presented during the conference, the following aspects are highlighted as fundamental to mitigate the fragmentation effects of linear infrastructure:

- Habitat defragmentation includes **actions to strengthen ecological connectivity and reverse biodiversity loss. It is crucial to facilitate adaptation to climate change** by reducing the vulnerability of ecosystems and improving the resilience of infrastructure. Transport infrastructure is one of the main drivers of habitat fragmentation and defragmentation includes measures to mitigate the full range of its effects, including reducing wildlife mortality risk, disturbances to or side effects that infrastructure generates for adjacent habitats.

- International experience has shown that **defragmentation plans are a fundamental tool in the promotion of actions which restore ecological connectivity**. These must be approached using a global perspective, including all elements that make up biodiversity and covering not only clearly threatened vertebrates, such as the lynx, but also other elements that have traditionally been forgotten, such as invertebrates or soil organisms. Furthermore, the actions must be carried out with the cooperation of the different stakeholders involved in the management of the territory.

- Defragmentation must be approached from a holistic perspective, with an **integral vision of the landscape**, considering both distribution of protected areas and the territorial matrix as a whole. Every element which creates fragmentation, such as roads, railways, power lines, hydraulic canals, or urbanised spaces, must be integrated.

- **Identifying and protecting ecological corridors** is essential to ensuring the long-term functionality of defragmentation measures.

- Territorial analyses should include the identification and **preservation of areas with null or low infrastructure density** ('roadless areas'). The decommissioning of disused roads and subsequent land restoration should be part of defragmentation.

- **Climate change induced effects** need to be integrated into defragmentation analyses. Global warming is already having noticeable effects on ecosystems with changes in species ranges, dispersal of invasive alien species and variations in hydrological or sediment flows. It also affects infrastructure; **risk assessments of transport infrastructure to catastrophic events associated with climate change** (storms, floods, landslides, etc.) are being carried out and offer opportunities to incorporate measures that benefit biodiversity and to apply nature-based solutions.

- **Identifying areas to defragment is the starting point for optimising the cost-benefit balance of actions.** Different modelling tools are available to identify these priority sites for action. For these models to be efficient, it is necessary:

    - To have high quality information on the biology of the target species.
    - To complement this information with aspects of the distribution and ecology of the species, which are also undergoing change due to environmental effects, so this process of information gathering must be continuous and constant.
    - To constantly update the models, taking into account new practices constantly being developed in the scientific field.

- In addition, the information derived from these models can be used to identify potential roadkill hotspots, both for existing infrastructure and future projects.

- Actions to mitigate identified roadkill hotspots should be a priority in order to reduce the mortality of the species involved, as high roadkill rates can have a direct impact on the demography of their populations. A wide range of effective measures exist that can be applied based on the characteristics of the identified hotspot. Attention should be paid to new technological options currently being developed which may provide more efficient solutions in certain cases. Research and development of technological options should be encouraged.

- The **application of new technologies opens up new perspectives** but requires long-term monitoring, standardised protocols and effective validation. Digitisation (use of BIM and other tools) can contribute to the integration of infrastructure and biodiversity data, helping to facilitate cooperation between both sectors.

- The **design of the measures** to be applied must be based on quality information on biodiversity and the set of parameters analysed. Diagnosis is key and proposed solutions must be based on evidence and scientific knowledge. To this end, research programmes related to defragmentation should be promoted, encouraging interdisciplinarity and provided with adequate budgets.

- Each project to improve existing transport infrastructure, to build new infrastructure or to carry out urban development in a territory is an **opportunity to contribute to** habitat **defragmentation** and ecological restoration. The inclusion in new projects, from their

conception and design phase, of measures that favour defragmentation and minimise mortality is essential and efficient in cost-benefit terms.

- The implementation of defragmentation measures and their long-term maintenance requires **coordination with land planners and managers**. It is necessary to establish synergies between all stakeholders managing infrastructures that generate fragmentation, as well as with local agencies and interested parties.

- Promoting awareness and communication between infrastructure and biodiversity sectors, and to the public, is fundamental in achieving the objectives of defragmentation and ecological restoration.