

habitat fragmentation due to transportation infrastructure



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EDITORIAL

Dissemination of monitoring results enables us to identify and promote good practices

We are entering a new stage in the process of incorporating mitigation measures for the habitat fragmentation caused by transport networks. In this stage, we can assess the work that has been undertaken, begin new projects to monitor and assess the effectiveness of existing measures, undertake R+D activities that enable us to fill knowledge gaps, identify measures that really attain their objectives, and distinguish such measures from those that are unnecessary or that can be improved. Thus, we can begin to see whether the financial investment that has been undertaken has attained the proposed objectives and how we can improve performance.

It is encouraging that not only environmental organisations are interested in undertaking monitoring tasks. An increasing number of initiatives are promoted by governments and organisations that are specialised in the design, construction and management of transport networks. The collaboration of those responsible for infrastructure and environmental experts ensures that both perspectives are taken into account, and produces new solutions to the problems that have been identified.

However, there are two obstacles to this process that we should try to overcome. Firstly, appropriate monitoring methods need to be applied, in order to ensure the rigour of the data that are obtained. Specialised professionals and/or experts in the affected species are required to achieve this. However, it is also essential to share the monitoring results with other experts and scientists who are specialised in the subject, so that monitoring truly leads to an improvement in practices to reduce the barrier effect and wildlife mortality and thus ensures that transport networks have less impact and are safer.

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The dissemination of all of this information enables us to share, discuss and make generalisations (or not) about conclusions and to prevent errors from being repeated. This is clearly essential for reinforcing the practices that give successful results and for improving flawed designs.

We would like to take this opportunity to invite all those who participates in monitoring projects to send their comments so that we can use this bulletin to report new publications, projects that are underway, and any news that could be of use to other professions with whom we share an interest in reducing the impact of road networks on biodiversity conservation.



WORKING GROUP

The 11th meeting of the Working Group on Habitat Fragmentation caused by Transport Networks, which is part of the National Commission of Nature Protection, was held in June in the headquarters of the Ministry of the Environment and Rural and Marine Affairs (MARM), Madrid. This meeting was attended by around 50 representatives from the autonomous communities and the Spanish State who are experts in public works and/or transport, traffic, environmental impact assessment and the environment. Participants included Marta García, MARM's Deputy Director-General of Biodiversity.

At the meeting, the activities undertaken during the second half of 2008 and the first six months of 2009 were presented and reviewed. The Secretary of the Working Group, MARM's Deputy Director-General of Biodiversity, also presented the final draft of the third issue in the series *Documents for the Reduction of Habitat Fragmentation*. This document is called *Technical Prescriptions for the reduction of habitat fragmentation in planning and alignment phases*. It is focused on preventing the impact of transport infrastructure, particularly high speed railways. It also describes how to maintain ecological connectivity, and thus halt the loss of biological diversity.

In addition, plans for a fourth issue *Indicators of habitat*

fragmentation caused by transport infrastructures were presented. This document will contain a list of indicators that can be applied at different levels of planning (plans and programmes) and in the various stages of a road project. "Documents for the Reduction of Habitat Fragmentation" are drawn up with the collaboration of scientific research teams and a specialised company and are carefully reviewed by the Working Group.



Representatives of the various departments described the progress that had been made in their own areas in terms of incorporating environmental requirements into planning and sectorial actions. They explained projects that have been undertaken involving various types of wildlife passages and fences and other studies that are currently underway and use different materials and procedures to facilitate the passage of wildlife and deter animals from crossing the roads, and thus ensure road safety in this respect.

In addition, discussion focused on how the efforts of the Working Group had led to the incorporation of recommendations from previous documents into regulations and specifications for construction, impact studies, and declarations of environmental impact.



NEWS

The operation of the Infra Eco Network Europe is consolidated at the General Assembly

The Infra Eco Network Europe (IENE) was formed in 1999 to promote the development of safe and sustainable transport infrastructures by proposing mitigation measures and planning procedures that ensure the conservation of biodiversity and the prevention of habitat fragmentation, and that reduce the risk of accidents caused by collisions with wildlife. Detailed information about the organization can be found on the new [IENE](#) website.



A General Assembly was held in Portugal in April 2009. New statutes for the organisation were approved and the [committees](#) that will lead the organisation were established, as were the secretarial duties, which will be undertaken by members of the Swedish Biodiversity Center in Uppsala, Sweden.

In the past, the IENE had coordinators in each of the member countries. Now, it will be opened up to organisations (governments, research centres, companies, NGOs, etc.) and individuals who work in the same field as the Network. In addition, a [subscription](#) list has been created for those who wish to receive a newsletter about the Network's activities.

Participants at the Assembly also agreed on the next International [Conference on Ecology and Transport](#), which will be held in Hungary in Autumn 2010. This conference is to bring together European professionals who are interested in this topic. The conference follows in the wake of the [ICOET conference](#), which is held every two years in the United States.

The IENE meeting, which was held in the University of Évora, was followed by a workshop that was open to the public. This workshop was attended by 201 people from 18 different countries. The slogan for the meeting was: *Transport infrastructure of the 21st century: connecting people and wildlife*. Two aspects were highlighted, as they help to obtain the goals of conservation and reestablishment of ecological connectivity: the importance of the work of professionals from different disciplines; and the establishment of cooperation networks between people from different countries.

Author: Carme Rosell (IENE).



The effect of roads in Mediterranean wetlands is the subject of an R+D project undertaken in Aiguamolls in the Empordà area, Albufera in Valencia and Marjal in Pego-Oliva

The Mediterranean corridor contains extremely dense road and rail networks, which are due to be expanded in the near future. However, the land on which these networks have been built includes coastal areas of singular interest in terms of biodiversity conservation, such as wetlands that are part of the Natura 2000 Network and have been designated Special Protection Areas (SPAs) or RAMSAR areas.



Therefore, care must be taken to prevent irreversible effects of infrastructure that threaten the conservation of the natural value of these sites. Experimental projects in areas in which the impact of infrastructure is already clear enable conclusions to be drawn that can help to reduce the pressure of road infrastructure on wetlands and reduce their effects as much as possible.

Consequently, a project has been undertaken that was funded by the National Programme for Experimental Development Projects, in the framework of the Ministry of the Environment and Rural and Marine Affairs' National Plan for Scientific Research, Development and Technological Innovation, 2008-2011. The aim of this project was to assess habitat fragmentation and the effects on wildlife of transport infrastructure in Mediterranean wetlands. Research has been undertaken in three protected natural areas: the Parc Natural dels Aiguamolls in the Empordà, the Albufera in Valencia and the Marjal in Pego-Oliva. The objective of the project was to use empirical results to design methods to minimise the impact of road networks on Mediterranean wetlands and to draw up a handbook of actions to reduce or eliminate habitat fragmentation in these areas and to re-establish ecological permeability.

The project has been carried out by the Technical University of Valencia and the consultancy company Minuartia. The Parc Natural dels Aiguamolls in the Empordà has also been involved.

Font: Vicent Benedito (Universitat Politècnica de València).



Detection of the passage of Iberian lynx through transverse habitat defragmentation structures in Doñana

In the framework of the Life-Nature project *Conservation and reintroduction of the Iberian lynx in Andalusia, 2006-2011*, efforts have been made to genetically enrich the Doñana population of the Iberian lynx through the transfer of specimens from the Sierra Morena to the Doñana population. The sites of the releases were evaluated and selected to ensure that the animals would have safe dispersal routes for movements in their new habitats.



In conjunction with the Autonomous Government of Andalusia's Ministry of Transport, since the end of the 1980s, measures have been implemented to correct the habitat fragmentation caused by asphalted roads in the district of Doñana. In total, 38 medium sized-large wildlife passages have been created (from 3 to 7 metres wide and 1.5 to 2.5 m high). The two oldest passages are nearest to the place where "Caribú"—the lynx that was moved to the district at the end of 2008—was released. As these two passages were constructed a long time ago and are located in a suitable position, they are ideal for the movements of carnivores in general and lynx in particular.

"Caribú" has a collar that enables him to be located. As a result, the technicians who are in charge of monitoring him observed that once he began to move, he used the passage next to the lake that is crossed by the regional road A-483. Footprints showed that the lynx used the passage on three occasions. Footprints of another specimen were also found in the same structure.

This wildlife crossing, which is three metres wide, has three different platforms inside it: two one-metre wide platforms situated at different heights and a one-metre wide base that may flood. In addition, the access to the passage has fences to channel the animals and increase efficiency. As the passage was constructed 20 years ago and is in an area that is very close to the aquifer, plants have grown that guide wildlife into the passage. Consequently, the accesses to the passage are very natural.

Work has begun to systematically monitor the use of the defragmentation measures considered in the same project, which is coordinated by the Autonomous Government of Andalusia's Ministry of the Environment. Monitoring takes place through the installation of cameras and the detection of trails.



The location and the connection of entrances with the surrounding vegetation are of key importance to the use of wildlife passages

The use of 24 wildlife passages and adapted drains (most for small vertebrates) has recently been monitored in various roads that have been widened or improved in the districts of Girona and Barcelona. In addition, the effectiveness of discontinuous perimeter fences and three cattle grids introduced to prevent wild boar from getting onto the road were assessed.



Notably, it was found that most of the passages have appropriate structural characteristics for the passage of wildlife. Extensive use of these structures by small and medium-sized vertebrates was observed. Otters, genets and stone martens, among other species, are frequent users of the wooden or concrete side platforms designed to facilitate the passage of wildlife through drains that are totally or partially flooded for long periods of time.

The correct location of structures and the design of their entrances help to ensure that they are used by wildlife. The structures that are used most are situated in areas that have been identified as of interest for connectivity and that have been appropriately incorporated into the network of habitats around the roads. In contrast, obstacles in the accesses or revegetation that does not establish a suitable connection with the surrounding scrubland or woods leads to a significant reduction in the use of the structure as a wildlife passage.

The conclusion that can be drawn from the results of this monitoring programme are as follows. Wildlife passages that are incorporated into project designs may meet the established technical prescriptions and be constructed with the prescribed materials and dimensions. However, the proposed objectives will not be attained if the structures are positioned incorrectly or if the connection between their entrances and the surrounding natural habitat is lacking.

These studies were undertaken on behalf of the public company GISA and the Directorate General for Roads, which is part of the Autonomous Government of Catalonia's Ministry of Town and Country Planning and Public Works. Collaborators included a company that has extensive experience in wildlife management and the companies that hold the contracts to maintain the roads and undertake the environmental monitoring.

Font: Mònica Laje (GISA, Gestió d'Infraestructures SAU).



Monitoring the preventive and corrective measures for wildlife in operational stretches of the High Speed Railway

For three years, the ADIF will monitor the state and efficiency of preventive and corrective measures for wildlife undertaken in the following stretches of the high speed railway: Madrid-Segovia-Valladolid and Córdoba-Málaga. These stretches are 200 and 150 km long, respectively, and have been operational since 2007. In addition, the Lleida-Barcelona and Madrid-Toledo lines will continue to be monitored. The planned studies include monitoring the functioning of wildlife passages and other existing adapted structures.



In the Madrid-Segovia-Valladolid, Madrid-Toledo and Lleida-Barcelona stretches, protective measures for ditches, shafts, and longitudinal drainage channels that prevent small vertebrates from falling and dying will be monitored. In addition, the effectiveness of the perimeter fence that prevents animals from getting on the tracks will be assessed, as will other measures to stop birds and bats from colliding with trains. Collisions and electrocutions of wildlife on the overhead power cables and other electrical elements will also be evaluated.

In the stretch between Córdoba and Málaga, the impact of the railway's substations on birds will be analysed, as well as the incidence of death of birds in viaducts, in order to assess the influence of the screens. In addition, the effectiveness of the anti-collision screen for bats will be assessed. This screen has been erected next to a significant colony of cave bats.

The studies constitute the first attempts to monitor the effects on wildlife of the operational high speed railway in Spain and to provide information on the effectiveness of the measures that have been undertaken to reduce mortality and the barrier effect that the railway has on wildlife.

Font: Rosa María Matas (ADIF, Administrador de Infraestructuras Ferroviarias).



Initial results of monitoring the anti-collision screen for bats installed in the Córdoba-Málaga stretch of the High Speed Railway

In May 2009, it was carried out by ADIF the first of three planned monitoring programmes to assess the effectiveness of an anti-collision screen for bats erected alongside part of the High Speed Railway between Córdoba and Málaga. The screen is situated along a stretch of the tracks that crosses a ravine on an embankment between two tunnels. It is close to a mine that houses a large colony of bats of the genera *Miniopterus*, *Rhinolophus* and *Myotis*.



The aim is to reduce the number of bats killed by collisions with the trains. The screen consists of a metal chainlink fence of 5.5 x 5.5 cm. It is 5 m high and 220 m long, and is held up by posts that are 6.5 m high, situated every 3 m.

The results were obtained through night filming to record the behaviour of the bats. This method was combined with ultrasound detection techniques. Although the results are only preliminary, the anti-collision screen appears to effectively prevent collisions between trains and bats flying over the tracks. Thus, out of a total of 1273 detected specimens, 494 crossed the tracks either above a false tunnel adjacent to the mouth of one of the tunnels or through an underpass at the bottom of the ravine, under the embankment. Films of the behaviour of 70 bats that approached the screen show that 50% flew parallel to the tracks until they reached a safe place to cross, 36% increased the altitude of their flight until they had crossed the tracks above the overhead power cables, 10% turned around and only a small proportion (4%) were exposed to a risk of collision as they crossed the tracks below the overhead power cables. In subsequent studies, the function of vegetation in the areas next to the tracks will be analysed in more detail, as it may help to guide the bats to safe crossing places. The [literature](#) states that this factor is of key importance for guiding the flight of some bat species.

Font: Rosa María Matas (ADIF, Administrador de Infraestructuras Ferroviarias).




PUBLICATIONS

Prescripciones técnicas para el seguimiento y evaluación de la efectividad de las medidas correctoras del efecto barrera de las infraestructuras de transporte. This is the second edition in the series *Documents to reduce habitat fragmentation caused by transport infrastructures*. It is focused on the tasks of monitoring and assessing the effectiveness of measures to reduce the barrier effect of road infrastructure. The document proposes actions that can be undertaken in the framework of Environmental Vigilance Plans, in the following stages of road projects: before construction work begins, during construction, and when the roads are operational.



Most of the information is contained in files that describe various techniques for monitoring the use of wildlife passages, collisions with wildlife, maintenance of perimeter fences, etc.

Reference:

Ministerio de Medio Ambiente y Medio Rural y Marino. 2008. *Prescripciones técnicas para el seguimiento y evaluación de la efectividad de las medidas correctoras del efecto barrera de las infraestructuras de transporte. Documents to reduce habitat fragmentation caused by transport infrastructures*, number 2. O.A. Parques Nacionales. Ministerio de Medio Ambiente y Medio Rural y Marino. 138 pp. Madrid. It can be obtained through the Library and Publications Service of the Autonomous organism of the National Parks of [MARM](#). You can download a PDF version of the document [here](#)  (2 MB).



Eficacia de los pasos para fauna en el tramo segoviano de la línea de alta velocidad Madrid-Valladolid. This book presents the results of the work they have undertaken their authors with the support of the Social Work of Caja Segovia. Over a year has monitored a total of 38 wildlife passages and other structures transverse (drainage and multifunctional steps) using two methods: recording tracks on a base of marble dust and imaging cameras through connected to infrared sensors. The authors have reported 18 different species or groups using the structures, highlighting the rabbit and hare. Could not detect the movement of wild boar or deer.



From the results, the authors conducted a series of

recommendations for conducting future monitoring, to correct deficiencies identified in the study reach and to improve the design and location of wildlife passages.

Reference:

Llorente, J. y Díez, A. (2008). *Eficacia de los pasos para fauna en el tramo segoviano de la línea de alta velocidad Madrid-Valladolid*. Colección Naturaleza y Medio Ambiente. Obra Social y Cultural. Caja Segovia. Madrid, 235 pp. It can be obtained at the offices of Caja Segovia.



EVENTS

19th Conference of the Society for Ecological Restoration International: Making Change in a Changing World. Perth (Australia), 23 to 27 August. Organized by the Society for Ecological Restoration (SER) International. One of the topics of the conference is ecology in relation to transport infrastructure and restoration.

International Conference on Ecology & Transportation: Adapting to Change. Duluth (Minnesota, United States), 13 to 17 September 2009. Organized by ICOET and the Minnesota Department of Transportation.

Workshop on the use of roads and the environment. Madrid, 22 October 2009. Organized by Asociación Española de la Carretera.

Fourth conference of civil engineering, the region and the environment: the coast, planning and models for the future. Málaga, 17 to 19 February 2010. Organized by the Spanish Association of Civil Engineers.

2010 IENE International Conference on Ecology and Transportation. Improving Connections in a Changing Environment. Velence, Hungary, 27 September to 1 October. Organized by the Infra Eco Network Europe.

Events that have already taken place, for which conference notes are available

European Landscapes in Transformation: Challenges for Landscape Ecology and Management. European IALE Conference 2009. Salzburg (Austria), 12 to 16 July 2009. Organized by the International Association for Landscape Ecology (IALE). Further information is available [here](#).

First European Conference on Local Implementation of the European Landscape Convention. Nove Hradý (Czech Republic), 27 to 30 May 2009. Further information is available [here](#).

Transport infrastructure of the 21st century: connecting people and wildlife. IENE Open day. Évora (Portugal), 24 April 2009. Organized by the Infra Eco Network Europe. University of Évora. The papers can be downloaded [here](#).

Workshop 'Towards a green infrastructure for Europe'. Brussels (Belgium), 25 and 26 March 2009. Organized by DG Environment, European Commission. The conference notes can be downloaded [here](#).

9º Congreso Nacional de Medio Ambiente (CONAMA). Madrid, 1 to 5 December 2008. Organized

by the CONAMA Foundation. The area of work Infrastructures and transport included a technical symposium titled "*Sustainable planning of transport infrastructures. Indicators*". The papers and other documents can be downloaded [here](#).

De-fragmentation of habitats affected by road infrastructure. Albufera Natural Park in Valencia, 25 and 26 November 2008. Organized by the Ministerio de Medio Ambiente y Medio Rural y Marino and Consejería de Medio Ambiente, Agua, Urbanismo y Vivienda de la Generalitat Valenciana. The papers and conclusions of the symposiums can be downloaded [here](#).

Workshop Ways to diversity - harmonizing transport infrastructure with the landscape. Uppsala (Sweden), 7 to 9 October 2008. Organized by the INCLUDE Programme (Integrating ecological and socio-cultural dimensions in infrastructure management). The papers can be downloaded [here](#).



DOCUMENTS OF WORKING GROUP AND PRODUCTS ACTION COST 341

Within the framework of the European project and the Working Group, which has given continuity to the project, various materials have been generated which contribute to the knowledge and reduction of the effects of habitat fragmentation caused by transport infrastructures. Specifically, the following documents have been published:

- **COST 341. La fragmentación del hábitat en relación con las infraestructuras de transporte en España.** Revision of the State of the Art published in 2003.
- **COST 341. Fauna y Tráfico. Manual europeo para la identificación de conflictos y el diseño de soluciones**  (8,4 MB). Published in 2005; translation of the document *Wildlife and Traffic* editat el 2003 as colophon of the project.
- **Prescripciones técnicas para el diseño de pasos de fauna y vallados perimetrales**  (1,8 MB) Published in 2006 and constitutes the first in the series **Documents of the reduction of habitat fragmentation**.
- **Prescripcions tècniques per al disseny de passos de fauna i tancaments perimetrals** Published in 2008 by Departament de Medi Ambient i Habitatge (Generalitat de Catalunya); translation of the document in spanish edited in 2006.
- **Prescripciones técnicas para el seguimiento y evaluación de la efectividad de las medidas correctoras del efecto barrera de las infraestructuras de transporte**  (2 MB) Published in 2008; second issue of the series **Documents for reduction of the habitats fragmentation**.

Further information on the products drawn up in the Framework of the COST 341 project and the Working Group on Habitat Fragmentation caused by Transport Infrastructures can be found at [MARM](#) website and the [IENE](#) website.



- This publications comes within the framework of the Fragmentation Habitat Due to Transportation Infrastructure Project. It is promoted by the Dirección General de Medio Natural y Política Forestal of the Ministerio de Medio Ambiente y Medio Rural y Marino. The technical secretary's office of the project runs in charge of MINUARTIA. They have collaborated in this number Carles Flaquer (Museu de Ciències Naturals de Granollers), Joan Borrell y Teresa Serra (EGAM) y Yolanda Casanovas (ACSA).
- The information in this bulletin can be reproduced and used, but for commercial purposes, and always naming the source of information: Bulletin 'Habitat Fragmentation Due Transportation Infrastructure' (Dirección General de Medio Natural y Política Forestal, Ministerio de Medio Ambiente y Medio Rural y Marino, number 7, august 2009).

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