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Ilke Marschall (ed.)

Matthias Gather (ed.)



Ecosystems and
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Transport



Environment



an integrative
landscape policy?



Society



Agriculture



Proceedings of the 2nd GreenNet Conference:

How to push the implementation of the European
Green Belt by landscape policy instruments?



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greennet

How to push the implementation of the European Green Belt by landscape policy instruments?

Proceedings of the 2nd GreenNet Conference, 19 / 20 of February 2013, Vienna

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ABSTRACT

IENE – The Infra Eco Network Europe is a formalized network of experts working with various aspects of transportation, infrastructure and ecology. Traffic and infrastructure are requisites for a prosperous economy and society, but they often entail significant habitat degradation and fragmentation; impacts that are recognised among the major threats to biodiversity worldwide.

The main negative impacts on wildlife populations caused by transport infrastructure are the loss and transformation of habitat, edge effects and disturbances, traffic mortality and barrier effects. To prevent further impact, transport planning and ecological concerns need to be approached from a holistic and international perspective. Overcoming negative impacts is possible, necessary means and knowledge is available. Of highest emphasis is the protection of still unfragmented natural areas as found in many eastern European countries, where the threat of exploitation through new infrastructure overwhelming. If avoidance of new infrastructure is impossible, or existing transport corridors already dissect important nature areas, adequate and effective mitigation measures are called for. Many western European countries have started to develop a Green Infrastructure Network as a physical and administrative backbone of nature. Overlapping green and transport infrastructures helps to identify top priority locations for mitigation.

To successfully protect nature and biodiversity while developing transport infrastructure all interests need to compromise, all involved stakeholders need to cooperate and find a sustainable solution together. However, shortcomings in environmental policy, gaps in communication and a lack of sufficient funding impede the achievement of a safe and an ecologically sustainable infrastructure.

IENE aims at enhancing the development and exchange of expert knowledge and at encouraging cross-boundary and interdisciplinary cooperation in research and policy making.

1 INTRODUCTION

To stop the loss of biodiversity is one of the biggest challenges mankind is facing in the 21st century. The European Commission aims at halting this loss in the EU by 2020 and therefore employs the European Biodiversity Strategy. A major threat on biodiversity is the fragmentation and degradation of habitat caused by the construction and use of transport infrastructure [1].

The Infra Eco Network Europe (IENE) seeks to counteract this threat by promoting safe and ecologically sustainable transport infrastructure through recommending planning procedures and mitigation measures to conserve biodiversity, counteract landscape fragmentation and reduce vehicular accidents and wildlife casualties.

2 IENE – INFRA ECO NETWORK EUROPE

IENE is a formalized network of mainly, but not exclusively, European authorities, institutes and individual experts working with the impacts of transport and infrastructure on nature and their mitigation. Since 1996, IENE addresses decision makers, planners and researchers as well as the public, and provides an international and interdisciplinary arena to encourage and enable cross-boundary cooperation in research, mitigation and planning.

2.1 INFRAstructure

A safe, efficient and sustainable transport system is a key to the modern way of life. Economies, markets and societal structures depend heavily on the transport of people and goods, and this at growingly larger scales. In the European Union, traffic between member states is expected to double over the next ten years. In the EU member states transport

infrastructure contains 5.000.000 km of paved roads including over 65.000 km of motorways, over 200.000 km of railways and over 42.000 km of navigable inland waterways. Most of them have been planned and built under national policy premises.

In the White Paper on transport “Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system” [2] the European Commission has therefore presented an overall European vision on Transport 2050. The strategy defines 10 goals and 40 initiatives to develop a competitive European transport system while attempting a reduction of carbon dioxide emissions by 60%.

This unified Trans-European Transport Network (TEN-T) represents an integrative network approach that focuses on the functional needs of entire Europe and develops new projects in response to the identified European needs.

In 2005, 30 priority projects of European interest have been defined and shall be completed in 2020, most of which are railway projects. This entails the establishment of new infrastructure projects in hitherto not highly developed areas, like in the former eastern European countries.

Unfortunately, the imminent threat on nature and biodiversity caused by this transport infrastructure development was not considered in the White Paper, and neither were options to avoid or remedy habitat fragmentation or counteract other negative impacts. The EU Strategy on Green Infrastructure, which is being developed by the European Commission, was equally not referred to in the White Paper on transport. Despite this lack, Gudrun Schulze, Senior Policy Coordinator in the European Commission, Directorate-General for Mobility and Transport in Brussels, clearly stated at the IENE 2012 International Conference [3] that a sustainable transport network should indeed include ecological sustainability although it is not specified in detail in the White Paper. However, it is very much up to the member states to fulfil this challenge when planning and building infrastructure.

2.2 ECOlogy

Fragmentation of natural habitat through infrastructure development with its subsequent adverse effects on wildlife and social life is recognised as one of the major unresolved threats to biological diversity worldwide [1].

The immediate negative impacts of transport infrastructure on wildlife populations are the loss and transformation of habitat, edge effects and disturbances, traffic mortality and barrier effects. Transport infrastructure cuts through habitats of animals and plants, imposes barriers to their distribution and disrupt natural processes such as migration movements. Thereby it interrupts the genetic interchange and leads to declining and degenerated population in a long term perspective. Additionally traffic mortality further weakens and diminishes populations. The use of transport infrastructure produces different emissions like noise, light and air pollution which can affect adjacent habitats and disturb animals and plants even at some distance from the infrastructure. The extent of the impact varies a lot depending on the dimension of the infrastructure, traffic density, the surrounding area and the biology of the affected species [1, 4].

There is an urgent need to integrate ecological concern in transport planning in Europe and thereby to preserve large unfragmented natural areas and re-establish and secure connectivity across fragmented landscapes. Overcoming these negative impacts is possible to some degree; necessary means and knowledge are available. In addition, parts of infrastructure areas can be transformed into a habitat valuable to biodiversity.

Many species are affected by barrier effects and traffic mortality. Road traffic is one of the main causes of mortality for some endangered mammals in Europe such as the European mink (*Mustela lutreola*) and the Iberian lynx (*Lynx pardinus*) [5, 6].

Animal vehicle collisions are also a major threat to traffic safety and incident numbers increase in many European countries. In Europe the total number of ungulate-vehicle collisions was estimated at half a million annually at the end of the 20th century. These collisions were estimated to cause over 300 human fatalities and 30.000 human injuries and over 1 billion dollars in damages [7]. More recent estimates suggest over 1 million accidents caused by ungulates in Europe annually [8]. Animals involved in these accidents are for example the roe deer (*Capreolus capreolus*), wild boar (*Sus scrofa*) and in the northern countries also red deer (*Cervus elaphus*) and moose (*Alces alces*).

Therefore in some European countries motorways and high-speed railways are fenced on both sides to avoid collisions with large mammals. This measure prevents road kills (at least for those species which are not able to pass the fence) but strongly enforces the barrier effect if fences are not combined with fauna passages [9].

On the other hand, inappropriate fencing like at the Egnatia Highway in Greece may rather produce high rates of traffic mortality for endangered and protected large carnivore species as the brown bear (*Ursus arctos*) [10,11,12].

The combination of appropriate exclusion fences and safe fauna passages can successfully avoid road kills and simultaneously overcome barrier effects. Safe passages help to maintain the permeability of the surrounding landscape for larger mammals, as well as for small animals like insects and beetles. In addition plant seeds and small animals benefit from larger species as vectors. [13,14,15]

Species such as amphibians suffer from various multiple threats that cause a world-wide decline [16, 17]. As these species move relatively slowly and typically in large numbers, they are highly exposed to vehicular traffic [18]. Millions of individuals cross roads in spring and a high ratio of them get killed every year. Permanent technical measures can help them to cross over or under roads. The common toad (*Bufo bufo*) is a common road kill victim in Europe from Spain in the south to Sweden in the north. This species can be helped effectively through amphibian tunnels or modified culverts, similarly to e.g. the spadefoot toad, *Pelobates fuscus*, and the fire-bellied toad, *Bombina orientalis*. With other species, such as the European treefrog, *Hyla arborea*, alternative solutions, e.g. digging mitigation ponds to avoid cross-road migration is also needed to safeguard the survival of amphibian populations. Other solutions like temporary drift fences and temporarily closed roads are also part of the European mitigation strategy.

Therefore an integrative approach against negative environmental impacts is needed and further measures like wildlife over- or underpasses have to be built to mitigate barrier effects on adjacent habitats.

Due to the importance of this topic and its Europe wide dimension, IENE initiated the COST Action 341 and produced "A European Handbook for Identifying Conflicts and Designing Solutions concerning Wildlife and Traffic - Habitat Fragmentation due to Transportation Infrastructure" in 2003 [19]. This handbook was used in many countries inside as well as outside Europe as a basis for the development of national guidelines in many cases.

In most European countries, it is state of the art to mitigate the negative impacts of new transport infrastructure on animal and plant populations. Many countries do have guidelines and regulations defining which mitigation measures need to be carried out for different types of negative impacts. In some countries they are obligatory, at least for motorways, like in Germany and Austria for example, while in most countries they are merely recommendations.

During the last decade many successful projects have been realised that proved that the preservation as well as the re-establishment of connectivity can be achieved by installing appropriate measures. To safeguard the connectivity of green (habitat) corridors they need to be incorporated in spatial and landscape plans and they need to be supported by all concerned stakeholders.

In modern landscapes, many different interests compete for a rapidly decreasing space. Human settlements, industrial areas, transport and other infrastructure as well as agriculture often overrule nature conservation interests. To successfully protect nature and biodiversity all interests need to compromise, all involved stakeholders need to cooperate and find a sustainable solution together.

A lack of economic incentives as well as insufficient resources and shortcomings in environmental policy often impede the development of a safer and an ecologically sustainable infrastructure. Landscape values – such as habitat connectivity – need a general and legal recognition that provides the necessary tools for decision makers to consider biodiversity right from the start of a project.

In many European countries, landscapes are already very densely cut through by transport infrastructure. Large undissected areas are rare but they still do exist as in the eastern European countries like Poland, Romania, Bulgaria, Russian Federation, Ukraine as well as in the areas of the green belt. . These areas, especially if still naturally stocked, should receive top priority in nature conservation. The protection and conservation of roadless areas has to be considered as one of the important aims in the 21st century for science, politics and nature conservation. [20]

Therefore major emphasis needs to be put to the Green Belt Europe, which connects a large number of ecologically valuable areas representing a cross section of all European biogeographical regions and which could be the backbone of a Pan-European ecological network.

The Carpathians region, one of the largest contiguous habitats in Central Europe, with expected rapid development of transport infrastructure, will be a main topic of the upcoming IENE scientific workshop Romania and in the Czech Republic in 2013. Also the IENE International Conference 2014 in Oslo will deal with the preservation of large unfragmented natural areas.

2.3 Network

All over the world and especially in Europe, already a dense network of transport infrastructure exists, that combined with urban development and industrial land use (e.g. mining, but also intense agriculture and forestry) leads to a significant depletion of natural habitats.

The negative effects of transport infrastructure on nature are well acknowledged [1], and are referred to in various regulations, conventions and strategies. For example, the Bonn Convention and the Bern Convention aim at protecting wild flora and fauna and are to a big extent incorporated in the Habitats-Directive and the Birds Directive by the European Union.

To integrate concern for nature in planning processes, the European Union established directives such as the Environmental Impact Assessment Directive (EIA) and Strategic Impact Assessment Directive (SEA). Additionally, the European Commission released the European Biodiversity Strategy (EBS) with the aim to halt the loss of biodiversity in the EU by 2020. Target 2 of the EBS declares that ecosystems and their services shall be maintained and secured by restoring at least 15% of degraded ecosystems and establishing a green

infrastructure as a conservational backbone. Improved knowledge of ecosystems and ecosystem services shall help to accomplish no net loss of biodiversity.

Currently, the European Commission is developing an EU Green Infrastructure strategy which is expected to be released in 2013. Green infrastructure is a strategically planned and functionally linked network of high-quality ecosystems [21]. Several measures and actions are foreseen to connect existing and re-establish already lost ecosystems. The Green Infrastructure network shall represent a multifunctional resource capable of delivering a wide range of benefits and services for both people and nature. In that, the concept of Green Infrastructure combines multiple benefits for both humans and nature.

A propositional map of existing and planned green infrastructure can provide a highly valuable basis for impact assessment and mitigation of new infrastructure projects as well as for defragmentation programmes on existing transport networks. This concept has already been successful in Germany, where a network of wildlife habitat corridors has been established [13] of which the green belt constitutes an important link. This network enabled the development of the German Defragmentation Programme [22] which was ratified in February 2012. In the programme, over 90 priority areas for defragmentation measures have been identified.

In the Netherlands a Long Term Defragmentation Programme (MJPO) has been established, with a focus on existing highways, railroads and canals [23]. The MJPO is made possible through interdepartmental collaboration between the Ministry of Transportation and the Ministry of Environment. Overlaying the Dutch National Ecological Network with the existing network of infrastructure, 215 conflict points were defined and 602 measures were developed to mitigate these conflicts. The programme started in 2005 and will be accomplished in 2018. At the end of 2012, the identified problems at 59 conflict points were solved, at 44 sites measures have been realised partly. A total of 213 mitigation measures has been realised by the end of 2012.

In Austria, a similar defragmentation program was established by overlapping the most important wildlife corridors with the motorway network [24]. The program identified 20 top-priority conflict sites where motorways cut through major wildlife migration routes and formed an insurmountable barrier for animals. The defragmentation programme was released in 2007 and those 20 identified conflicts shall be mitigated by green bridges until 2027 [25]. Already two bridges have been built and three more are in the planning process.

A major problem in successfully implementing mitigation measures is the cooperation between different stakeholders and the necessary compromise between adverse interests. Mitigation measures along transport infrastructure are expensive and are normally paid for by transport administrations. Such costly investments can only be effective and operative on a long term basis, if they are well embedded in a protected ecological and legal framework.

Spatial or landscape planning is often the responsibility of a different administration than infrastructure planning. Therefore, the good-will and cooperation of both parties is needed to implement long-term sustainable solutions. The instruments of spatial and landscape planning vary a lot between countries and even municipalities, but good solutions can always be found if all involved parties try to reach the same goal.

There are several good examples found across Europe (for example in the Austrian province of Styria) where this cooperation works very well, but in general it remains a huge challenge.

2.4 Europe

Experiences from the past have proved that mitigation carried out by an individual approach can work at a small scale but to successfully reduce the on-going degradation and loss of Europe's natural areas and biodiversity an integrated and coherent approach over large areas is essential to carry out spatially effective environmental policies. To reach long-term sustainable solutions, it requires integrated planning instead of sector planning.

The framework of the EU Green Infrastructure policy, the Convention on Biological Diversity, and the European Habitats Directive (with a specific article (10) about ecological coherence of the Natura 2000 network) as well as the Birds Directive, call for the realization of a functionally linked network of high-quality ecosystems in the near future.

To successfully implement green infrastructure at Europe-wide scale, individual initiatives need to be co-ordinated, stakeholders need to collaborate, political will and expert's knowledge need to be combined. To foster this is one of the main goals of the IENE network. IENE provides a forum where experts of different domains can meet, interact and develop sustainable solutions. IENE provides an independent, international and interdisciplinary arena for the exchange and development of expert knowledge with the aim to promote a safe and ecologically sustainable pan-European transport infrastructure. IENE encourages cross-boundary cooperation in research and practise. IENE is organized according to statutes adopted by a biannual assembly and lead by an elected steering committee. At present, IENE has some 180 registered members from 44 countries and 41 organizations. Further details about the network, current activities of IENE and information about habitat fragmentation and ways to mitigate can be found at www.iene.info.

IENE arranges biannual International Conferences on Transport and Ecology. Smaller scientific workshops are held in between to deal with specific problems or questions.

During the 2012 IENE International Conference in Potsdam the first IENE Declaration was released with the title "Overcome Barriers – Europe-wide and now". The declaration calls for the development of an integrative European Defragmentation Programme.

3 DISCUSSION

The negative impacts of linear transport infrastructure on nature and biodiversity are well acknowledged, as are the means to overcome these impacts. Successful examples of mitigation projects are to be found throughout Europe. Many countries have guidelines defining the planning and mitigation processes; some already conducted successful defragmentation programmes.

Nevertheless, too many infrastructure projects lack adequate mitigation measures, too many transportation networks lack defragmentation programmes. Major obstacles are often economic constraints which are due to shortcomings in environmental policy and exclusion of ecological concern from decision making processes. The concept of ecosystem services may counteract this problem to some extent. Development of a sustainable transport network requires the development of decision-making tools to include more than only economic concerns.

Other obstacles are found within the physical planning process: the lack of adequate knowledge and standpoints regarding important habitats for animal migration, insufficient inventories and data analyses, as well as failed communication between infrastructure planners and ecologists. Landscape qualities – such as habitat connectivity – need a general and legal recognition that provides the necessary incentive for decision makers to consider

biodiversity right from the start of a project. The Green Infrastructure Strategy tries to emphasise the multiple benefits for both people and nature. Although many European directives and strategies highlight the importance of biodiversity protection the defined aims cannot be reached.

In most European countries road and railroad planning is strictly performed within the transport sector. A big challenge in successfully implementing mitigation measures is the necessary cooperation between stakeholders and the compromise between adverse interests. It is very important to protect the green corridors that lead to the crossing structures by nature conservation tools or by spatial or landscape planning instruments. It is only through successfully integrated planning instead of sector planning that long-term sustainable solutions can be implemented in the European transport network.

The EU White Paper on transport does not include details about ecological sustainability of transport infrastructure; it is only generally mentioned as an overall aim. The responsibility is to a great extent laid in the hands of the member states. This in turn demands cooperation between countries in many aspects, in everything from knowledge to measures.

The IENE-Network aims to enhance international cooperation and improve interdisciplinary exchange of knowledge in all political and planning levels with the goal to integrate the avoidance and mitigation of impacts caused by infrastructure in the relevant political documents, strategies and directives in the EU and the national states.

4 CONCLUSIONS

- European Directives and Strategies (Habitats Directive, SEA and EIA) were released to maintain or to restore connectivity and biodiversity. According to these requirements the European Handbook Wildlife and Traffic [19] and many related national guidelines and planning handbooks were established to better mitigate the impacts of transport infrastructure on nature and biodiversity. Best practise examples can be found throughout Europe.
- IENE encourages international cooperation and exchange of knowledge between experts of transport and ecological infrastructure.
- Interdisciplinary exchange and cooperation is necessary to successfully implement mitigation measures and to find sustainable solutions. Cooperation between nature conservation, infrastructure planning and spatial planning is needed. To ensure the functionality of mitigation measures such as crossing structures for wildlife, the adjacent wildlife corridors need to be legally protected and well managed.
- Major efforts are needed to protect hitherto unfragmented natural areas from degradation through infrastructure development.
- Conflict points between transport and green infrastructure need to be mitigated to re-establish habitat connectivity. Many countries are in the process of defining a Green Infrastructure network. This can serve as a basis for the identification and mitigation of conflict points with existing and planned transport corridors.
- The No Net Loss of biodiversity and ecosystem services should be ensured. Therefore an impact regulation system should be developed to maintain the connectivity of habitats and wildlife populations in the wider landscape when planning new infrastructure. Coherent measures to strengthen the NATURA 2000 - network as the backbone of Green Infrastructure must be developed and monitored. Also important areas between these NATURA 2000 areas (in the wider landscape) need to be considered.

- There is a need for an integrative European Defragmentation Programme, which supports the Strategy of Green Infrastructure.
- To improve measures and their effectiveness follow up studies are necessary. Adequate follow up studies are very costly and time consuming. Only international cooperation and similarity in performance can give significant results within reasonable cost and time frames.

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