FROM PROVIDING SINGLE FAUNA PASSAGES TO RECONCILING GREEN AND TRANSPORT INFRASTRUCTURE IN EUROPE

Anders Sjölund[1], Carme Rosell[2], Marita Böttcher[3], Lazaros Georgiadis[4], Miklós Puky[5].

IENE Steering Committee.
[1] Chair of IENE SC. Swedish Transport Administration.
[2] MINUARTIA.
[3] Federal Agency for Nature Conservation (Germany).
[4] ARCTUROS.
[5] Hungarian Academy of Sciences.

IENE
Infra Eco Network Europe

Presentation on behalf of the **IENE Steering Committee**:
Anders Sjölund (Chair), Marita Böttcher, Lazaros Georgiadis, Carme Rosell, Erland Røsten, Tony Sangwine, Andreas Seiler, Elke Spindler, Miklós Puky

Anciently

Roads

1970

Roads and animals
Fauna passages to decrease road kill
And some threatend species

today

Roads and ecology
Transport network adpated to minimize negative impact on ecological connections, the green network

What, Why and whats in future?

IENE

IENE
Infra Eco Network Europe

Contents

- Biodiversity, Green infrastructure,Background
- The IENE network
- Single fauna passages
- Connectivity across a single insfrastructure: Egnatia / Carpathian examples
- The consideration of ecological connectivity in a country/ region

  Czech republic
- Defragmentation Programs in The Netherlands and Germany
- Some general conclussions

IENE
Infra Eco Network Europe

Increasing roadkill

Rapidly growing traffic since second world war with
Incrising numbers of road killed Animals as a consequence
started an debate in England and Netherlands
The viewpoint was mainly ethical

IENE
Infra Eco Network Europe

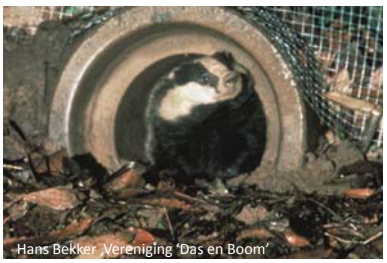
Nature Conservation in 1970:th

- **Focused on protection of areas.**

- **Red List, Threatened species**
  Red list system was first concieved in 1963 and set standard for species listing and conservation assessment efforts
  The International Union for Conservation of Nature (IUCN).

IENE
Infra Eco Network Europe

First actions in Europe: fauna passages

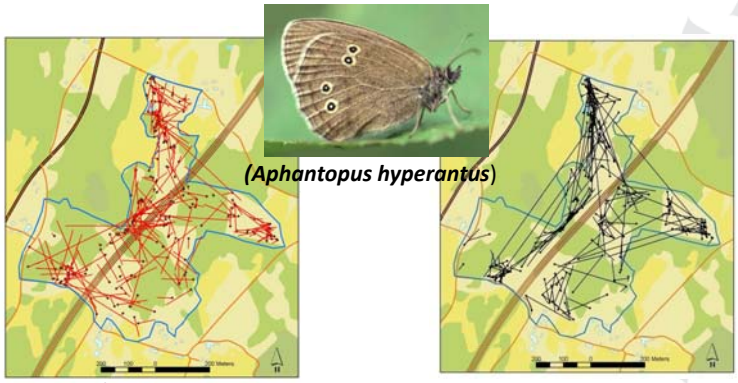

Hans Bekker ,Vereniging 'Das en Boom'

- Fauna passages for Badgers Decade 1970s
- United Kingdom and The Netherlands
- Providing safe passages to reduce road casualties for a single species.
- Badgers often used, the mortality was reduced and the population increased.

Bekker, H. 2009. Defragmentation in the Netherlands. Process and results. Comunicación oral presentada en: *IENE 2009 Open Day*, Évora (Portugal), 24 de abril de 2009. Available in: http://www.cbm.slu.se/iene/openday2009.php.

Not only casualtys

Road E4 Sweden, impact on some butterflies.



(*Aphantopus hyperantus*)

Expected

Registered

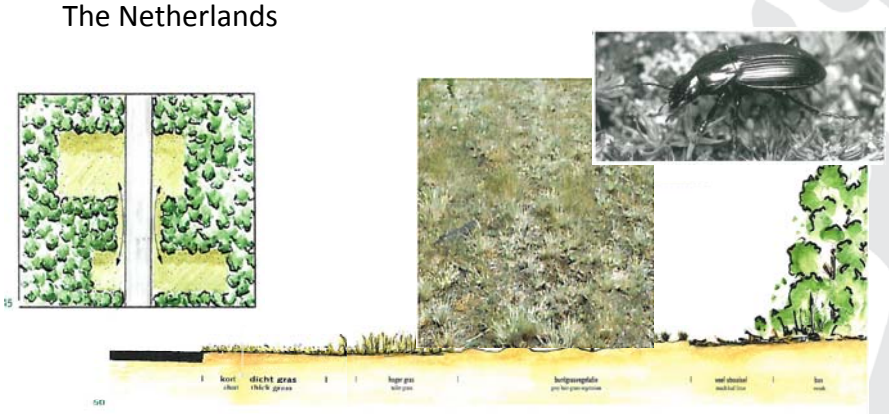
Obviously also barrier effects

IENE
Infra Eco Network Europe

Source: Askling, J., Bergman, K-O., Ignell, H. och Wahlman, H. 2005. Ryggradslösa djur och planering av infra-struktur –dagfjärilar som landskapsekologiska verktyg och modellorganismer. Calluna AB och Linköpings universitet.

And connectivity….

The Netherlands

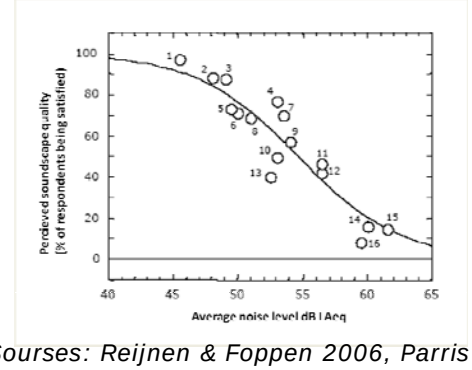


IENE
Infra Eco Network Europe

Source: Natuur over wegen. 1995. Rijkswaterstaat, Dienst Weg- en Waterbouwkunde. Delft.

….And Traffic noise in natural environments is a considerable problem for nature conservation

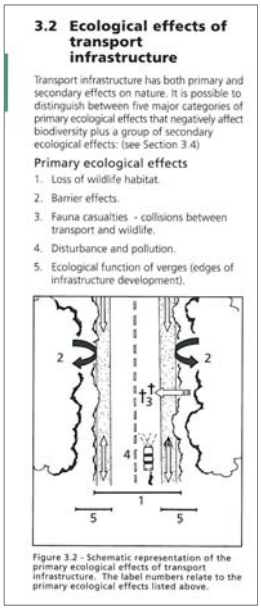
Negative effects of roads on birdlife are well documented:



Sourses: Reijnen & Foppen 2006, Parris & Schneider 2009 and Barber et al 2010, Kociolek et al 2011

IENE
Infra Eco Network Europe

1980:th – 1990:th



3.2 Ecological effects of transport infrastructure

Transport infrastructure has both primary and secondary effects on nature. It is possible to distinguish between five major categories of primary ecological effects that negatively affect biodiversity plus a group of secondary ecological effects: (see Section 3.4)

Primary ecological effects

1. Loss of wildlife habitat.
2. Barrier effects.
3. Fauna casualties - collisions between transport and wildlife.
4. Disturbance and pollution.
5. Ecological function of verges (edges of infrastructure development).

Figure 3.2 - Schematic representation of the primary ecological effects of transport infrastructure. The label numbers relate to the primary ecological effects listed above.

Developed view on ecological effects casued by infrastructure and traffic

Demands for
A new concept:
Adapt new roads to wildlife.

IENE
Infra Eco Network Europe

New Knowledge – New Approach
In road planning and construction

An example from Sweden. 1998

IENE
Infra Eco Network Europe

IENE – Infra Eco Network Europe

- Formalised **network of experts** working with various aspects of transportation, infrastructure and ecology (Since 1996)
- Mainly (but not exclusively) European authorities, institutes and individual experts
- **Non-profit, non-governmental, non-political**
- Providing an independent, **international and interdisciplinary arena** to encourage and enable cross-boundary cooperation in research, mitigation and planning
- Addressing decision makers, planners and researchers as well as the public

IENE
Infra Eco Network Europe

IENE – 1996 -2003

Wildlife and Traffic
Launched in Brussels 2003

State of the Art
Published by many countries during he 2000 decade

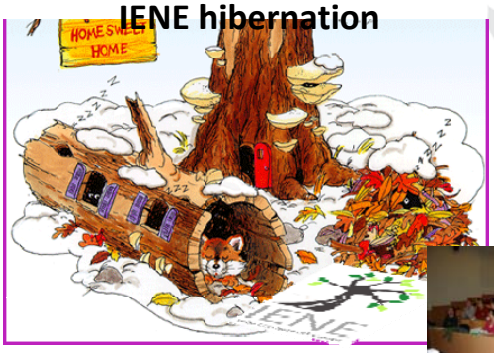
Wildlife and Traffic
Translated to many languages

IENE
Infra Eco Network Europe

IENE: From 2003 to 2009

Wildlife and Traffic
Launched in Brussels 2003

IENE hibernation



IENE
Infra Eco Network Europe

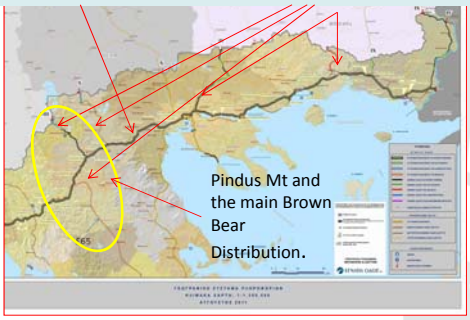
Re-start workshop In 2008 Nyíregyháza, Hungary .
http://www.varangy.hu/category/image-galleries/restartiene

Egnatia Highway, Greece

At the late of 1990ies “Egnatia Motorway” was the first case in Greece discussing:

- natural fragmentation
- disruption of connectivity between important wildlife habitats in Pindos Mountain range
- creation of impermeable barriers in gene flow of wildlife species with the Brown Bear as a key case

Egnatia Motorway and its vertical branches



Pictures: Lazaros Georgiadis

Egnatia Highway, Greece

Intervention by ARCTUROS and other NGOs gave as basic results:

- The changing of the initial alignment of the Highway (AVOID)
- A considerable increased number of mitigation measures as tunnels and bridges (covering almost the 50% of the total length of Egnatia) (MITIGATE)

But:

- Without the construction of the appropriate fence

Pictures: Lazaros Georgiadis

Egnatia Highway, Greece

Inappropriate fencing led to:

- **road mortality of bears as a main human caused mortality factor in Greece**
- **more than 50 car – bear accidents with 30 dead bears recorded**

IENE
Infra Eco Network Europe

Pictures: Lazaros Georgiadis

Egnatia Highway, Greece

New discussions lead to complementary measure as:

- special information signs
- construction of an appropriate fence (started in 2012 and will be completed in 2013)

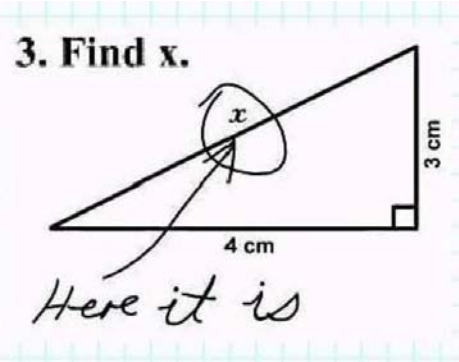
THE FINAL CONCULSION FROM GREECE:

THERE ARE NO SHORT CUTS IN PLANNING AND CONSTRUCTING GREEN – TRANSPORT INFRASTRUCTURE

IENE
Infra Eco Network Europe

Pictures: Lazaros Georgiadis

So, We no what to do then! Problem solved, all good?



Unfortunately not!

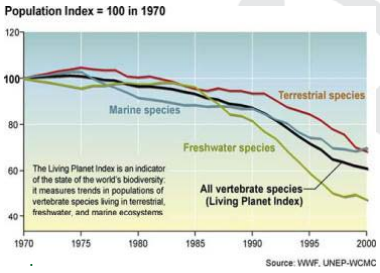
IENE
Infra Eco Network Europe

Protected Areas – Biodiversity decrease

Cumulated area of nationally designated areas over time in 39 European countries

http://www.eea.europa.eu/data-and-maps/indicators/designated-areas/designated-areas-assessment-published-mar-2009

Living Planet Index indicates steady Biodiversity decrease



http://www.natura2000.hr/PageTemplates/PageContent.aspx?pageId=48&langID=2

IENE
Infra Eco Network Europe

Mammals and bird populations are severely affected by infrastructure

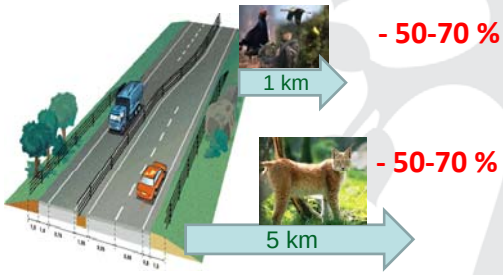
Mammal and bird populations are displaced from infrastructure, and displacement distance depends on the habitat type and on the species.

A decline in species abundance of up to 50-70 %
- **for birds within 1 km**
- **for mammals within 5 km**

From infrastructure

A decline in species abundance of
- **28-36 % for birds within 2 km and**
- **25-38 % for mammals within 5 km**

From infrastructure



Source: Benítez-López, A., Alkemade, R. & Verweij, P.A. 2009. Are mammal and bird populations declining in the proximity of roads and other infrastructure? Systematic Review N. 68. Collaboration for Environmental Evidence.

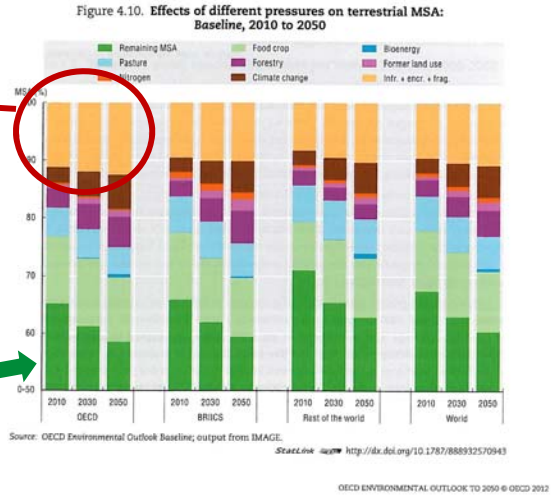
IENE
Infra Eco Network Europe

Infrastructure have a crucial impact in future development of biodiversity

Loss of mean species abundance if business as usual to 2050.

Yellow:
loss doe to infrastructure, enchroachmen and fragmentation
1. Direct Infrastructure effects.
2. Indirect effects of infrastructure through new exploitation
3. Fragmentation by roads and land-use change.

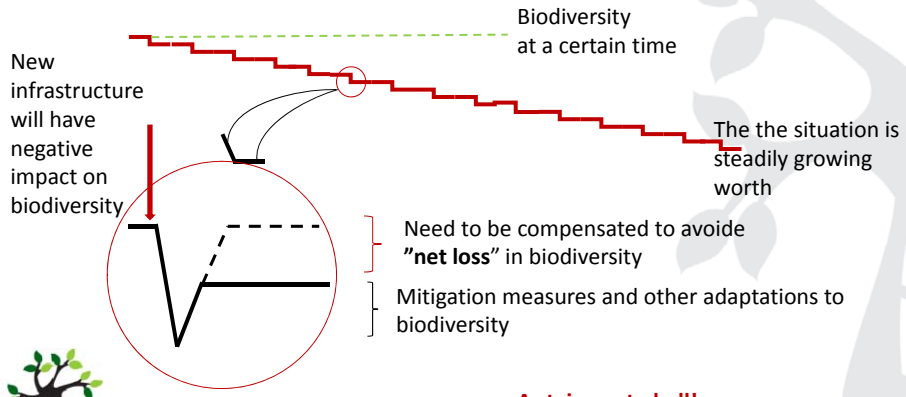
Remaining Biodiversity expressed as Mean Species abundace (MSA)



From: OECD Environmental Outlook to 2050.
The consequences of inaction.

IENE
Infra Eco Network Europe

New roads, railways, urban sprawl… make the situation worse, step by step



A stairway to hell!

IENE
Infra Eco Network Europe

The serious question asked is:

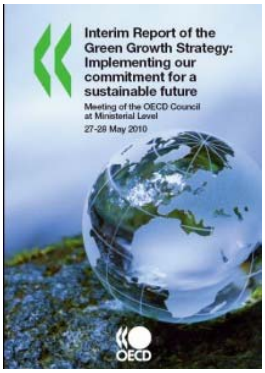
"Can the society survive the ongoing "arm- wrestling"?

IENE
Infra Eco Network Europe

The Organisation for Economic Co-operation and Development

OECD concludes:

"Business as usual is not an option"



IENE
Infra Eco Network Europe

EU: Biodiversity strategy to 2020 "Towards implemantation"

Recognises that infrastructure-building, urbanisation, industrialisation and physical intervention in the landscape in general are among the most significant drivers of the fragmentation of ecosystems and habitats.

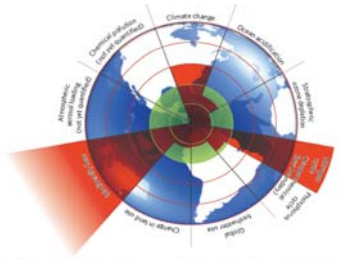


Figure 1 | Beyond the boundary. The inner green shading represents the proposed safe operating space for nine planetary systems. The red wedges represent an estimate of the current position for each variable. The boundaries in three systems (rate of biodiversity loss, climate change and human interference with the nitrogen cycle), have already been exceeded.

Röckström et al. 2009, Nature

IENE
Infra Eco Network Europe

Green infrastructure

By 2020, ecosystems and their services are maintained and enhanced by establishing **green infrastructure** and restoring at least 15% of degraded ecosystems.

Action 6b: The Commission will develop a Green Infrastructure strategy "as contribution to further integrating biodiversity considerations into other EU policies„

Communication on "Green Infrastructure (GI) – Enhancing Europe's Natural Capital" adopted on 6 May 2013

a strong signal towards decision makers, planners and promoters to invest in green infrastructure projects at local, regional, national and cross-boundary level.

IENE
Infra Eco Network Europe

Green infrastructure is, for example

Green bridges and eco-ducts re-connecting natural areas that have been artificially divided, by roads or railway lines

An integral part of urban areas. Properly designed parks, walking paths, green roofs and walls

Many things, inside and outside protected areas, where the latter are the core features and the former are the corridors that connect them up to form a functioning network.

Different types of connecting elements as isolated elements or stepping stones, a group of trees, or corridors that physically connect habitats, like rivers or hedgerows, linking field and forest habitats.

IENE
Infra Eco Network Europe

Green Infrastructure guidance

The Commission will develop technical guidance setting out how Green Infrastructure will be integrated into the implementation of the main policies and their associated funding mechanisms from 2014 to 2020.

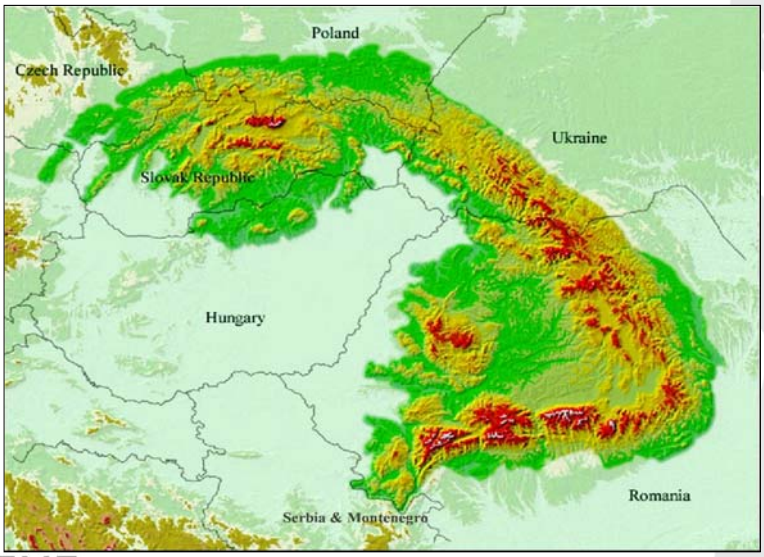
Already available:

- Better environmental options for flood risk management
- **Guidance on connectivity**
- Natural water retention measures (link to adaptation)
- Integration of biodiversity and climate change into SEA and EIA
- Connecting Smart and Sustainable Growth through Smart Specialisation
- Smart guide to multi-benefit investments

IENE
Infra Eco Network Europe

IENE
Infra Eco Network Europe

The Carpathian



IENE
Infra Eco Network Europe

A new Motorway crosses a wildlife corridor of European importance

Inadequate environmental assessment, and lack of mitigation measures caused the halt of building the building

A population of 250 brown bears north to the proposed route is at risk to be isolated from the population in south

The corridor is impornant also to all kins of animals from Lynxs to Amphibians

IENE
Infra Eco Network Europe

Ecological Landscape Analyss reveals wildlife corridors

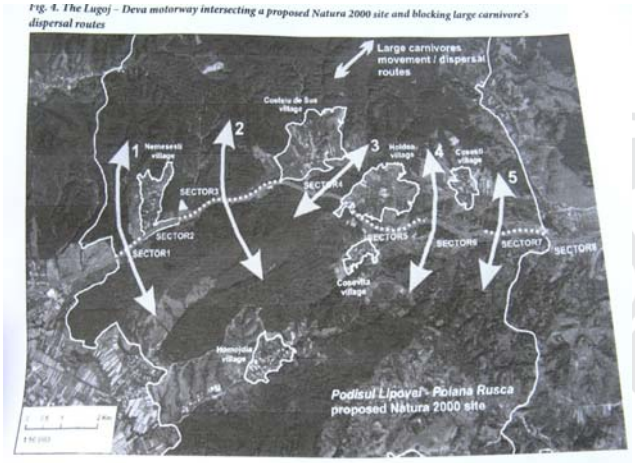


Fig. 4. The Lugoj – Deva motorway intersecting a proposed Natura 2000 site and blocking large carnivore's dispersal routes

The motorway will intersect the Podisul Lipovei – Poiana Rusca proposed Natura 2000 site for a length of 11.7 kilometers [between km 48 + 125 and km 59 + 750 points] of which only five sectors still offer viable large 'carnivores' passage

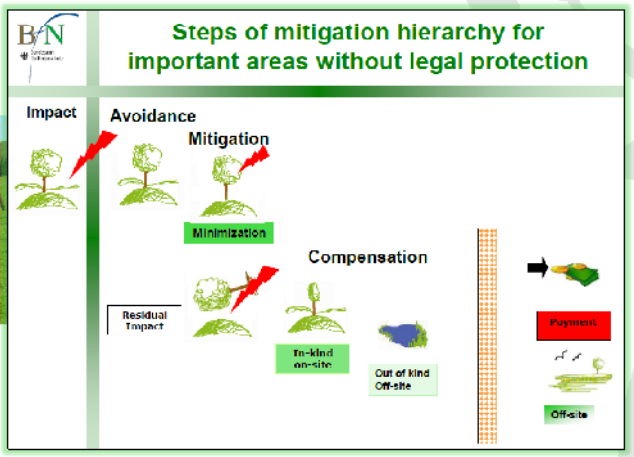
IENE
Infra Eco Network Europe

Green bridges and other fauna passages are suggested

relocating the motorway to the North

IENE
Infra Eco Network Europe

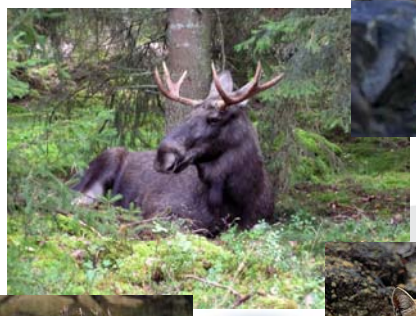
The aim is to promot a sustainable transport infrastructure by using the *”avoidance – mitigation – compensation”* principle

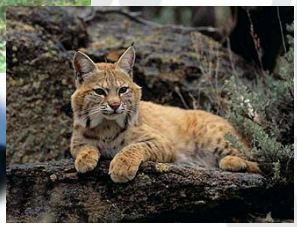


IENE
Infra Eco Network Europe

A new project aiming at identification of real migration and dispersal corridors for large mammals started in 2007

(The Czech Council for Research, Development and Innovations Project No. 2d4/36/08)

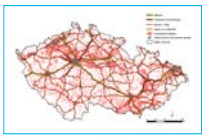




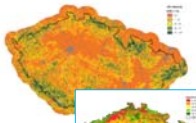
IENE
Infra Eco Network Europe

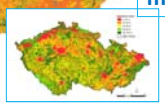
Sources and Results

Distribution data



Barrier analysis



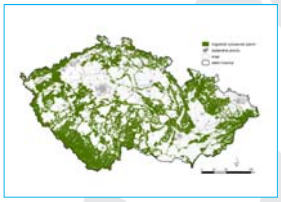


Habitat suitability models

SOURCES

RESULTS

Important Migration Areas



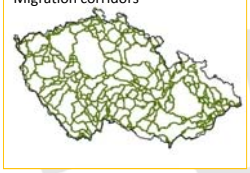
Long Distance Migration Corridors

Field verification of real permeability

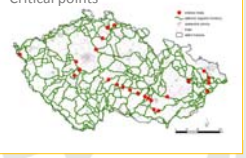
Parameters of migration corridors

- width of corridors - generally 500 meters (in critical places such as crossings with linear barriers minimally 50meters)
- total length - 10.000 km (6,5 % of whole territory of the Czech Republic)
- 85% of the total lenght of corridors is located in forests, 15% in agriculture landscape
- Currently, there are 28 points on the corridors net that are impermeable (especially crossings with the transportation infrastructure) – these points are proposed to be solved in the near future (building of new green bridges etc.)
- there are another 176 sections , where passing through is very difficult. The spatial protection and restitution of the permeability in the long term horizont are the proposed solutions for this places

Migration corridors



Critical points



Nearly critical points

IENE
Infra Eco Network Europe

Defragmentation Programmes

Germany:

- Network of German Habitat Corridors
- German Defragmentation Programme
- Ratified in February 2012
- 93 priority areas for defragmentation measures

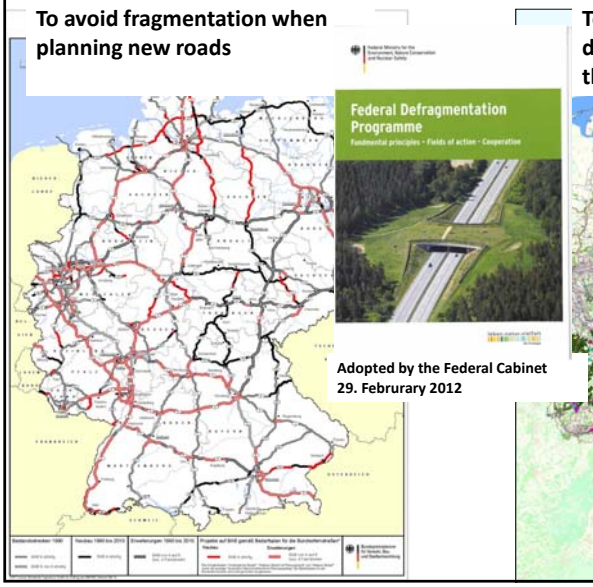
IENE
Infra Eco Network Europe

Netherlands:

- Dutch National Ecological Network
- Long Term Defragmentation Programme
- Ministry for Transportation and Ministry for Environment
- 2005 - 2018
- 215 conflict points, 602 measures

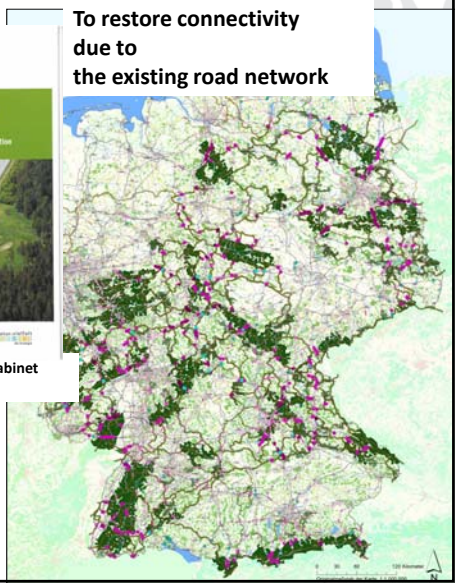
The German Defragmentation Program two main goals

To avoid fragmentation when planning new roads



Adopted by the Federal Cabinet 29. Februrary 2012

To restore connectivity due to the existing road network



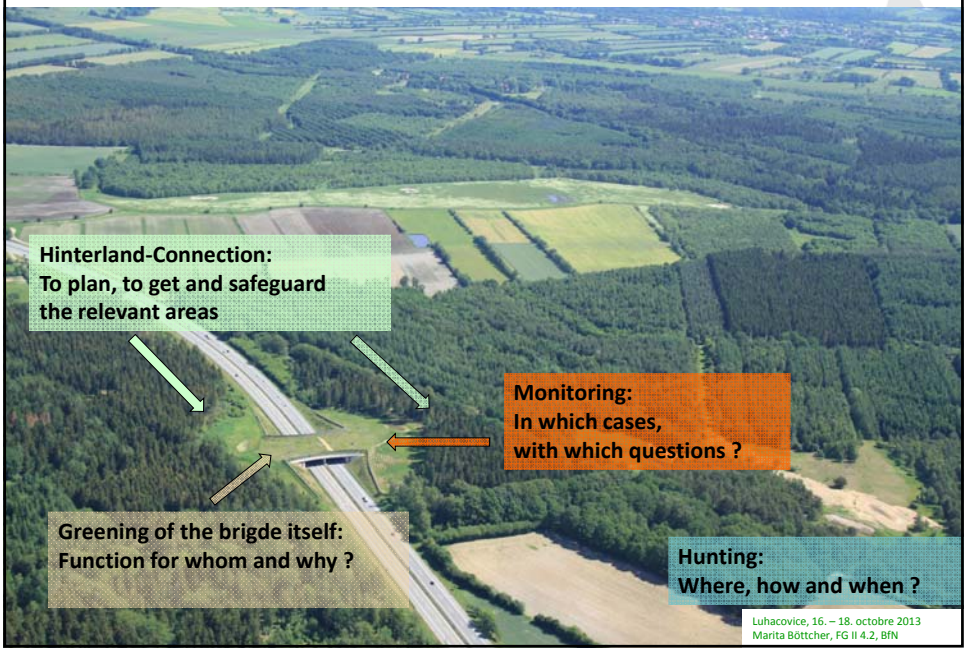
Concrete Actions to restore connectivity due to the existing road network

Defragmentation concepts of the Federal states	Biological Diversity concept of the Federal states	Greenbridges built under the economic stimulus package II	Other measures	Monitoring	Balance between the national defragmentation concept and the concept of the Federal states
6 completed 2 work in progress	9 completed 2 work in progress	17 (+2) Greenbridges	17 (e. g. Amphibiantunnels, wildlife warning system)	5 (most of them by camera-systems)	8 Federal states

Problem:
to get money for the construction of Greenbridges and other measures

Further solutions:
To publish the most important results of scientific investigations together with the concepts of the Federal states

Restoration of Connectivity: next tasks



Some General Conclusions from Germany

Wildlife passages should be understood as an important element of Green Infrastructure but **must be link to natural habitats and wildlife corridors.**

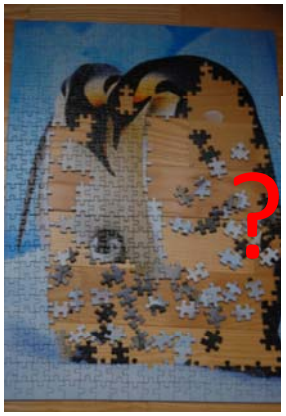
Wildlife passages must be better integrated with the surrounding landscape. It is especially important for restoring and maintaining the populations of invertebrates and other small fauna.

In cases of wildlife corridors for larger mammals **it might be necessary to restore wildlife corridors in big areas**: Cooperation between diferent countries is needed.

Monitoring of the measures must include habitat quality and the presence of indicator species in the passages and their surroundings.

IENE
Infra Eco Network Europe

We´re on the way but……..

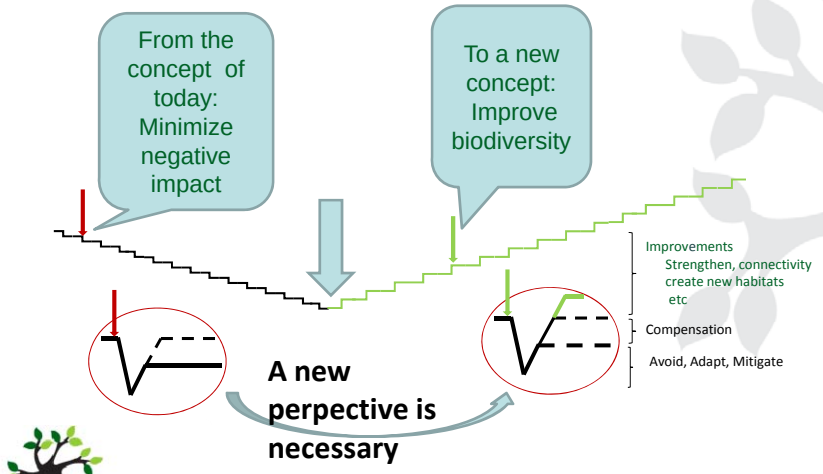


We have still a lot to achive !

So far strong focus is on barrier effects and connectivity but what about the rest?

IENE
Infra Eco Network Europe

The trend must be changed



IENE
Infra Eco Network Europe

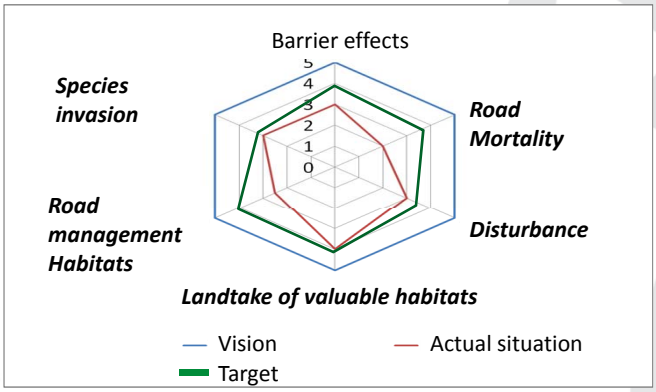
Ecological Performance Indicators

The problem

Transportation entails a number of qualitatively different impacts on nature and biodiversity

The Task

to develop a conceptual model of the impacts of transport infrastructure on biodiversity, that could help getting the required overview of the field.



IENE
Infra Eco Network Europe

Success!?

Well understood by planners and decisionmakers
Resoursel allocated for measures taken with respect to All this different aspects of ecological impact in

The Swedish National Infrastructure plan 2014 - 2025

For this purpose around 600 milion Euros is allocated

IENE
Infra Eco Network Europe

Far from finished but we have some results so far from this concept
Money for measures in existing roads end railroads (tSEK).
From from ***the Swedish National Infrastructure plan 2014-2025***

Land-scape

Nature

Landskap	**Permeabla transportkorridorer**. Åtgärder för att göra transportkorridorer permeabla, t.ex. barriäråtgärder för fisk, groddjur, utter och hjortdjur	Väg	5 225000	5 800000	*Barrier effect*
		Järnväg	575000		
Landskap	**Säker infrastruktur.** Åtgärder för säker infrastruktur, t.ex. viltstängsel, viltvarningssystem, säkra passager och "elskydd för fåglar"	Väg	50 000	100000	*Road mortality*
		Järnväg	50 000		
Landskap	**Störningsfria livsmiljöer.** Åtgärder för att minska störning i livsmiljöer, t.ex. åtgärder för buller och andra störningar för fågelmiljöer, friluffts- och rekreationsområden.	Väg	10 000	10000	*Disturbance*
		Järnväg	0		
Landskap	**Bevarade livsmiljöer.** Åtgärder för att bevara artrika miljöer som t.ex. vägkanter, stationsområden, trädsäkringszoner, Alléer och Vägträd.	Väg	2 100 000	2150000	*Landtake of valuable habitat*
		Järnväg	50 000		
Landskap	**Skapade naturvärden.** Nyskapande av artrika miljöer, t.ex. miljöer för ökad konnektivitet i landskapet, artrika vägkanter, lekmiljöer för fisk, fågelholkar, alléer, vägträd och stationsmiljöer	Väg	20 000	25000	*Verge management of valuable habitat*
		Järnväg	5000		
Landskap	**Naturlig fauna & flora**. Åtgärder för att begränsa invasiva oönskade arter	Väg	1 000	2000	*Invasive Alien spicies*
		Järnväg	1000		
Landskap	Strukturer och samband i kulturlandskapet. Gestaltnings- och landskapsvårdande åtgärder som utvecklar/stärker strukturer och samband	Väg	0	0	
		Järnväg	0		
Landskap	**Värdeområden kulturmiljö.** Åtgärder som utvecklar/stärker värden i kulturmiljön riktade mot t.ex: alléer, kulturvärden i järnvägsmiljöer, kulturvägar mm	Väg	55 000	65000	
		Järnväg	10 000		
Landskap	**Infrastrukturens byggstenar kulturmiljö.** Åtgärder för bättre skötsel för att bevara, restaurera, utveckla, begränsa skador av kulturvärden, t.ex.: kulturvägar, kulturbroar, milstenar, järnvägsmiljöer (t.ex.: stationshus, parker, murar, perrongtak och andra historiska element)	Väg	152 000	162000	
		Järnväg	10 000		
Vatten	Miljöanpassningsåtgärder avseende fysisk påverkan såsom åtgärda vandringshinder, skapa meandring, strömsättning, nytt bottensubstrat, erosionsskydd osv.	Väg	20 000	30000	
		Järnväg	10 000		
	Summa per Trafikslag	Väg	7 578000		
		Järnväg	711 000		
Totalt Landskap			8 344000	8 344000	

IENE
Infra Eco Network Europe

Knights of the Biodiversity Order

IENE
Infra Eco Network Europe

Join the force, become an IENE member! Visit www.iene.info and sign up!

IENE Members

More than 200 registered members

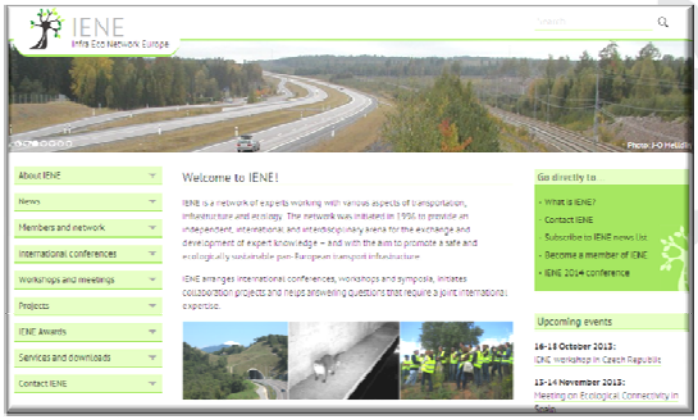
From almost 50 countries

and over 40 organizations

IENE
Infra Eco Network Europe

More information at

www.iene.info



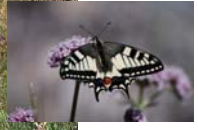
IENE
Infra Eco Network Europe

Thank you!

On behalf of the IENE Steering Committee

Don´t forget to always keep an eye on:

www.iene.info



IENE
Infra Eco Network Europe