IENE
Infra Eco Network Europe

Joining Ecology and Transportation for 20 years

History review of
Infra Eco Network Europe.

Linköping, Sweden / 2018


IENE
Infra Eco Network Europe

Joining Ecology and Transportation for 20 years

The history of the Infra Eco Network in Europe (IENE) started more than twenty years ago with, as many successful stories do, a wish; with a desire to prevent animals from being killed by traffic, to allow free movements of wildlife and avoid habitat fragmentation. The idea grew to produce a handbook to help road planners and designers to build ecologically adapted transportation infrastructures. A handful of target-oriented enthusiasts initiated a joint European project, the COST 341 project that in 2003 produced the first handbook on *Wildlife and Traffic, A European handbook for Identifying conflicts and Design Solutions*.

Through cooperation between environmental and infrastructure experts around Europe, the IENE network was established in 1996 and thereby a keystone was set out for the development of a new field of ecology in which IENE played an increasingly important role. By the end of 2016, the overall IENE arena has activate more than 400 members not only from Europe but all over the world, representing 51 countries. Through the IENE activities such as international conferences and their declarations, workshops, seminars, projects and the website, the network has become an irreplaceable cog in the development of a sustainable transport system in the frame of harmonization of Grey and Green Infrastructure across Europe.

Today it is widely known that our way of life produces a series of problems. Continued fragmentation of the Nature, loss of Biodiversity, Climate Change and broken cycles of nature resources endanger the necessary ecosystem services upon which we rely.

The report you have in your hands summarizes the first twenty years of the IENE history. It enlightens the important role IENE has played not only in creating a general awareness about the crucial role of linear infrastructure in causing the present devastating development, but also in creating and disseminating the knowledge and experience necessary to counteract the actual situation and to help experts to find cost effective solutions for the serious problems it faces.

The firm foundation IENE has built up during the past twenty years provides a unique position to help the Society taking the necessary steps towards an ecologically sustainable transport infrastructure system in the oncoming twenty years.

Anders Sjöland

Chair of Infra Eco Network Europe (IENE)

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Cover Page:

Ecoduct Groene Woud over highway A2, south of the city of Den Bosch, the Netherlands (© https://beeldbank.rws.nl , Rijkswaterstaat / Joop van Houdt)

ph.01| Visiting a Green bridge in Hungary during the field trip of IENE 2010 International Conference in Velence (© L. Georgiadis).

ph.02| Finding a road killed snake in Kanchanaburi, Thailand during the field visit of Dawei-Bangkok road project in Myanamar and Thailand in 2015 (© L. Georgiadis).

ph.03| Above tunnel in France during the field trip of IENE 2016 International Conference in Lyon (© L. Georgiadis)

ph.04| IENE 2016 International Conference in Lyon, France (© L. Georgiadis).

Front Pages:

ph.05| Ecoduct Kikbeek in Belgium (© Vildaphoto/Yves Adams)

ph.06| Roads edges are new transport habitats with important role on pollination but they are very vulnerable to alien plant species distribution. Highway A1 in Flanders, near Dutch border, Belgium (© Marleen Moelants)

ph.07| Ecoduct Kikbeek in Belgium (© Marleen Moelants)

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Authors:

Lazaros Georgiadis[1] Biologist, Environmental Consultant, Florina, Greece.

Tove Adelsköld[2] Calluna AB, Göteborg Sweden

Yannick Autret[1] Ministry of Ecology, Sustainable development and Energy, Paris, France.

Hans Bekker Department Public Works; Dutch Ministry for Transport and Water Management; Netherlands

Marita Böttcher[1] Federal Agency for Nature Conservation (BfN), Germany

Elke Hahn[1] Federal Ministry for Transport, Innovation and Technology, Vienna, Austria

Carme Rosell[1] Minuartia, Barcelona, Spain

Tony Sangwine[1] Highways Agency, Bristol, UK

Andreas Seiler[1] Swedish University of Agricultural Sciences, Grimsö Wildlife Research Station, Sweden

Anders Sjölund[1] Trafikverket – The Swedish Transport Administration, Borlänge, Sweden

[1] *Members of the IENE Steering Committee*

[2] *IENE Secretariat*

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Preface **1**
Summary **8**
1. Introduction **10**

2. Background of the development of IENE **16**
2.1 A historical review 17
2.1.1 The establishment of IENE (1995-2003) 17
2.1.2 A period to support implementation of road ecology in the National Road administrations (2004-2008) 20
2.1.3 IENE full reactivity in 2009 23
2.2 Working methodology 24
2.2.1 The goal and the objectives of safe and sustainable transportation infrastructure 24
2.2.2 The basic principles for Environmentally Friendly Transport Infrastructure 28

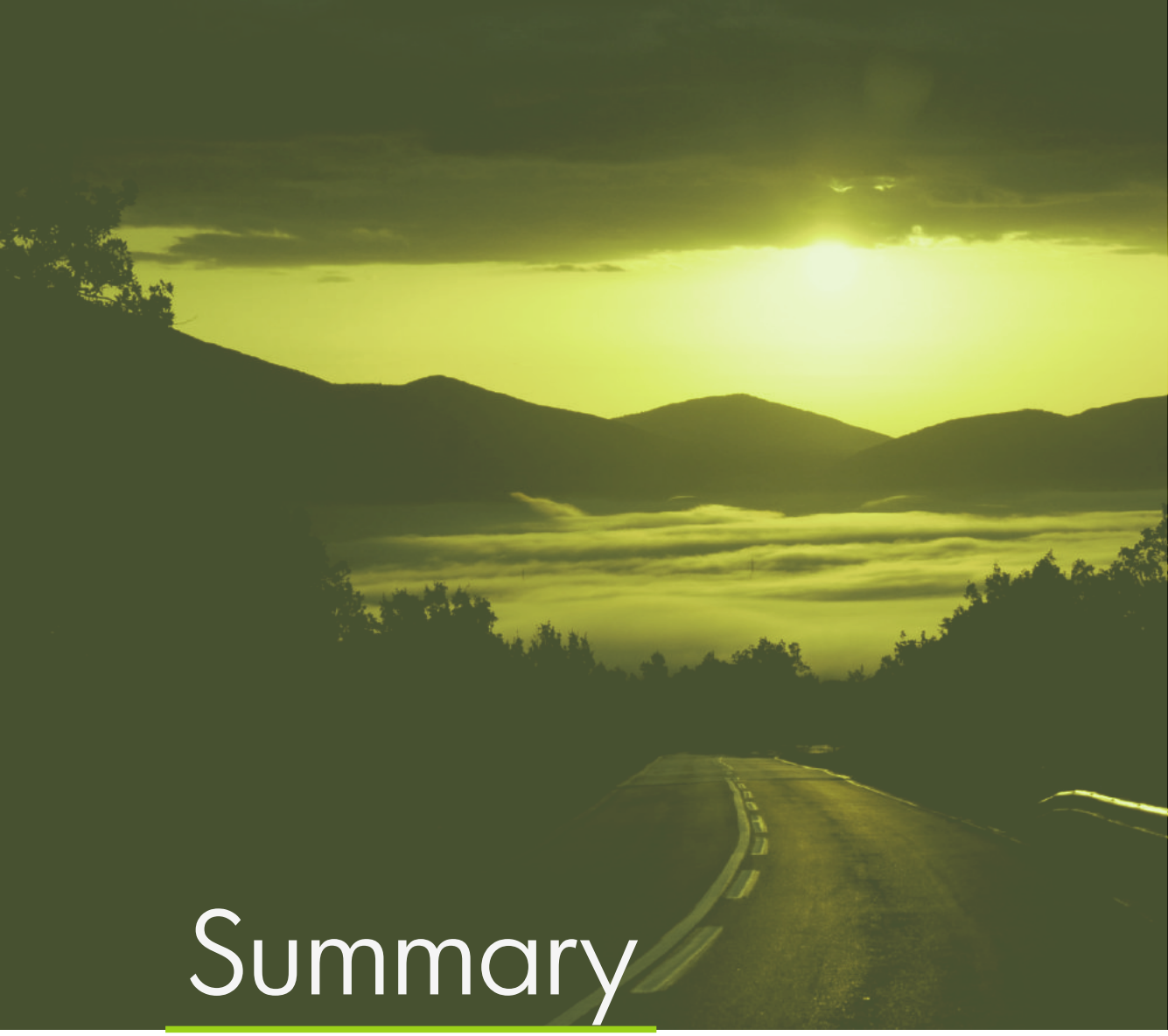
Index

3

3. Results of IENE activities **30**
3.1 Results on making Transport Ecology Policy 30
3.1.1 Results of the first phase (1995-2003)..... 30
3.1.2 Results of the second phase (2003-2008) 37
3.1.3 Results of the third phase since 2009:
The framework of the main actions..... 39
3.2 Measurable results on concrete actions' framework of IENE..... 40
3.2.1 The organization of international conferences..... 40
3.2.2 IENE Declarations..... 44
3.2.3 The organization of workshops, training courses and
special events 45
3.2.4 Participation of IENE in cooperation and
research projects..... 46
3.2.5 Development of cooperation on special topics
with scientific, advisory and consulting bodies 52
3.2.6 Membership, website and dissemination of expertise
and information 56
3.2.7 The IENE Awards..... 64

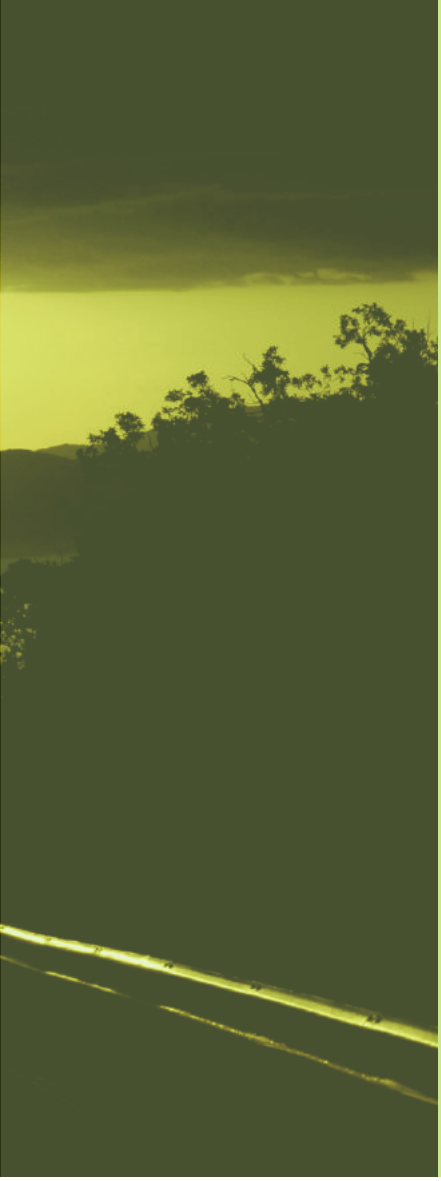
4

4. Epilogue **66**
Funding **69**
Acknowledgments **69**
Bibliography **70**



Summary

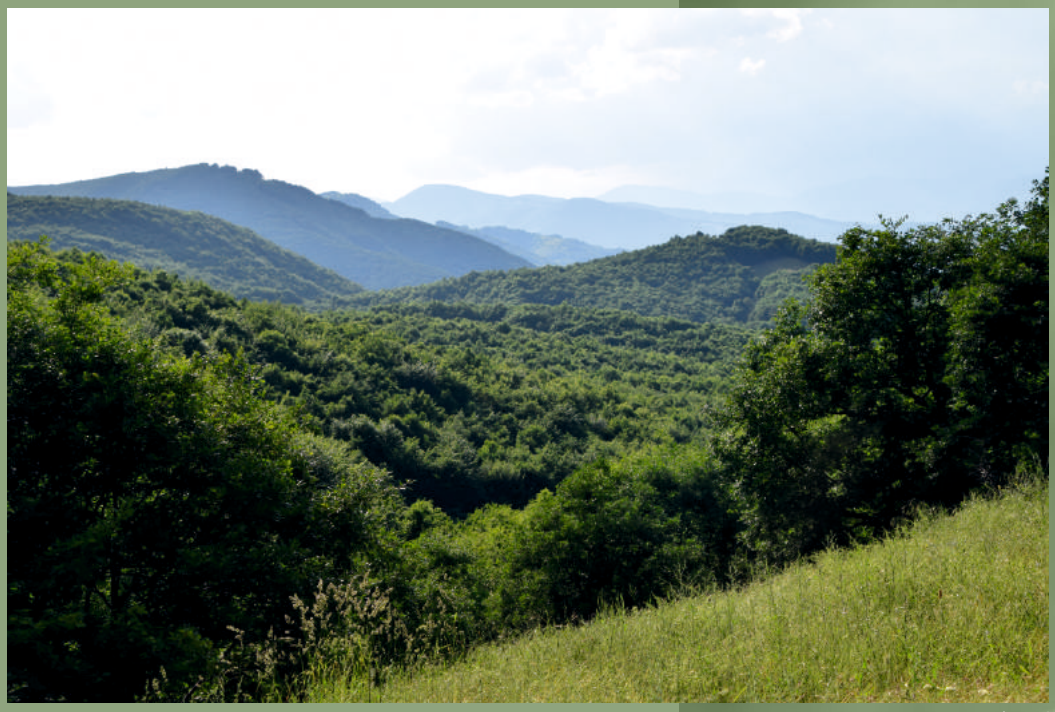
Facing environmental problems at a global level, a variety of different conflicts have arisen between ecology and economic development with the demand for the construction of large transport infrastructure. Focusing on environmental impacts of roads, railways and waterways such as habitat fragmentation, loss of wildlife habitats and their ecological connectivity and an increase in wildlife mortality on roads, Transport Ecology emerged as a new field of study and expertise on sustainable frameworks for planning, constructing and operating linear transportation infrastructure bringing together ecologist (and other environmental scientists) with civil and hydraulic engineers. Infra Eco Network Europe (IENE) was established in 1995 and has through its three development phases played an increasingly important role in developments in the field of transport ecology. This includes both research and dissemination of knowledge to be implemented at design, construction and operation stages.



ph.08 | Sunrise has to give a new dayfor all creatures (© L. Georgiadis)

During the first phase IENE promoted international cooperation thought the COST ACTION 341 that lead to the production of the first European Handbook in Transport Ecology in 2003. The Handbook was not only a compilation of accumulated knowledge but also provided best practice recommendations to be implemented in transportation infrastructure development and it became widely accepted and used in most European countries. In its second phase IENE very much acted through workshops and seminars to support the implementation of sustainable ecological criteria in planning, building and operating transportation infrastructure throughout Europe. After 2009, in the third phase IENE became a globally recognized organisation as an international arena for exchange of knowledge and experience among all interested in transport and ecology, from researchers to practitioners.

Basic indicative results in numbers during the 20 years of activity are the 6 biannual international conferences with totally 1.428 participants, 199 countries' represented, 594 lectures and 256 poster presentations provided, 17 international workshops with totally 1.152 participants, 167 countries' represented, embracing 138 lectures and 40 poster presentations. By the end of 2016, the overall IENE arena has over 400 active members not only from Europe but all over the world, representing 51 countries. Through the IENE international conferences and their declarations, workshops, seminars, projects and the website the network has developed to become an irreplaceable part in the development of a sustainable transport systems globally.



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ph.09, 10*, 11 |
European wildlife needs unfragmented
European ecosystems (© ARCTUROS/L. Georgiadis)
** Wolf in captivity. ARCTUROS' Wolf Sanctuary, Greece.*

1 Introduction

1. Introduction

The loss of biodiversity is one of the most serious challenges to life on earth and it has been recognized officially at a global level since 1992 in Rio De Janeiro, Brazil through the Convention on Biological Diversity led by the United Nations. Halting biodiversity loss is a major challenge for the 21st century and concrete frameworks of goals and targets have been established by the United Nations in Japan with the Aichi Biodiversity Targets for 2010. The EU biodiversity strategy to 2020 (*European Commission 2011a*) is aimed at reversing biodiversity loss and speeding up the EU's transition towards a resource efficient and green economy. It is an integral part of the Europe 2020 Strategy (*European Commission 2010*), and in particular the resource efficient Europe flagship initiative (*European Commission 2011b*). However, it has become evident, that these targets were impossible to reach given the fast growth of new economies and the expanding need for living spaces, natural resources and transportation.

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Towards continuing their lives, animals try to pass through the transport infrastructure... but...

One of the major drivers of the overall loss of biodiversity worldwide is the ever growing transport demand with its expanding infrastructures and growing traffic flows (*Hahn et al., 2016, Van der Ree et al., 2016, Quintero 2016*). In the European Union 30 % of the territory is highly fragmented, affecting the connectivity and health of ecosystems and their ability to provide services as well as viable habitats for species (*European Commission, 2014*). Roads and other transport facilities not only occupy an increasing portion of the land surface, they affect natural habitats directly and indirectly at a much broader scale, causing a dissection of natural linkages, fragmentation of habitats and populations, and a growing depletion of natural resources and values made accessible through expanding infrastructure networks. Millions of animals die annually on roads and railroads; others suffer from pollution and noise or become displaced as alien species invade habitats along transportation corridors. Secondary exploitation following the construction of new infrastructure creates additional pressure on habitats and species and may lead to local as well as regional extinctions (*Iuell et al., 2003*). Roads have been singled out as generating intense natural selection pressures that have important consequences for population conservation (*Brady et al 2017*) while about 80% of Earth's terrestrial surface remains roadless, but this area is fragmented into ~600,000 patches, more than half of which are <1 km^2 and only 7% of which are larger than 100 km^2. Global protection of ecologically valuable roadless areas is inadequate (*Ibisch et al 2016*).

However, there are means to mitigate the impact of transportation infrastructures on nature, reduce its pressure and decouple its adverse effects from the still growing demand for new infrastructure. There are even means to introduce beneficial services for wildlife, as transportation corridors hold a certain potential to provide valuable habitats for a range of smaller species particularly in highly urbanised landscapes. Such measures can and should be implemented as a standard in infrastructure development and maintenance (*Iuell et al., 2003; Van Bohemen et al., 1996; Van der Sluijs et al., 1991*). The knowledge about measure's functionality and efficacy is, however, not always satisfying (*Iuell et al., 2003; Van der Ree, R., 2015*). Technical innovations and new mitigation concepts need to be tested and evaluated. Their functionality and effectiveness also depends on the interplay between the transport sector and other sectors of society. Communication, knowledge transfer, and public education are just as essential as are the legal frameworks, policies, technical development and environmental science.

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Additional to the Aichi Biodiversity Targets under the UN initiative, the EU biodiversity strategy to 2020 (*European Commission 2011a*) and the EU-wide strategy on Green Infrastructure (*European Commission 2013*) are contributing to halting the loss of biodiversity, whilst recognizing the transport sector and transportation facilities as important players in the endeavour towards a greener and more sustainable future, contributing to the current international policies in the field of nature conservation.

The European Union aims at making a considerable contribution at a global level in the reversal of this loss by 2020 supported by the European Biodiversity Strategy. A major threat to biodiversity is the fragmentation and degradation of habitat caused by the construction and use of transport infrastructure (*Forman et al, 2003; Sherwood et al, 2003; Van der Ree et al, 2015*). One concrete target of CBD 2011-2020 Aichi targets (2010) is aiming on natural habitats fragmentation: According the Strategic Goal B, Target 5 "*By 2020 the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduce*". Additionally, the current climate change status and the need to evaluate the natural capital of Green Infrastructures and the ecosystem services toward to safe transportation infrastructures is demanded as the Goal 9 of the UN Sustainable Development Goals (2015) to "*Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation*".

Obviously, the above frame calls for international collaboration in research and practice, for enhanced exchange of knowledge between disciplines, and for the development of harmonized standards and procedures that can be referred to by international actors (*Wagner and Seiler, 2015*). After all, all countries face similar problems and seek to develop similar solutions to reduce the impact on nature and international recognition and protection of roadless areas is urgently needed to halt their continued loss (*Ibisch et al 2016*).

This overall fundamental insight has been valid already in past decades and eventually lead to the foundation of the Infra Eco Network Europe (IENE) in 1996 (*Teodorascu, 2003*). IENE was established as an official network of authorities, institutes, organizations and individual experts working to promote safe and ecologically sustainable transport infrastructure. In its appeal to address decision makers, planners and researchers as well as the public, IENE provides an international and interdisciplinary arena to encourage and enable cross-boundary cooperation in research, mitigation and planning (*Spindler et al, 2014*).

ph.18-20 |

ph.16-20 | "... crossing of roads and railways it is not always successful...Wildlife roadkills emerge the need for safe transportation for both humans and animals"

12*(© L. Georgiadis, C. Rosel, Y. Autret, V. Hlavac, the photo is a common result during a visit in Antelope Island in Salt Lake, Utah, USA after ICOET 2017 conference)
14 (© Miklos Puky),
13, 15-20 (© L. Georgiadis)
16 (© ARCTUROS/L. Georgiadis)

ph. 21 | Excursion in Sweden, 1997.
Lennart Folkeson (S) in badger pipe
(© Hans Bekker)

2 Background of the development of IENE

2. Background of the development of IENE

2.1 A historical review

The past 20 years of IENE history can be distinguished as three clear phases: the initial period of building up the IENE-network from 1996 until 2003 with the COST-341 action as its main activity, a second period with a lower profile of maturing activities (2004-2008) and the third period after the reactivation of the network in 2009 with international conferences and workshops and a broadened membership.

2.1.1 The establishment of IENE (1995-2003)

IENE is a community of practice, a network of experts involved in the field of habitat fragmentation caused by linear transportation infrastructure, especially roads, railways, canals and waterways. The establishment of IENE in 1996 was originally an initiative of the Road and Hydraulic Engineering Division of the Dutch Ministry of Transport, Public Works and Water Management. It was based on the conclusions of the International Symposium on "Habitat fragmentation, infrastructure and the role of ecological engineering" organized by the Road and Hydraulic Engineering Division, Directorate General of Public Works and Water Management of the Ministry of Transport, Public Works and Water Management in the Netherlands in September 1995 (*Bekker H., 2008*). During the conference, 135 participants from more than 25 countries met and discussed the effects of habitat fragmentation caused by infrastructure. In this 1995 Infra Eco Declaration (www.iene.info/international-conferences/iene-2003), the participants proposed the formation of an international network, IENE, in order to jointly address these issues, share resources and find harmonized solutions to the common problems. IENE at this time was a gathering of one-two national assigned coordinators representing the transport and the environmental sector of each member country. Annual meetings and seminars were held to inform the members about new and ongoing projects and initiate new actions in the host countries.

ph.22 | Preparation in August 1998 for meeting in Hungary 1999 with Agnes Simonyi and Hans Bekker (© Arien Bekker)

ph. 23| Excursion in Hungary 1999 (©Hans Bekker)

ph.24 | Excursion in mobile workshop in Maastricht, Netherlands, 1995 (© Hans de Vries)

IENE also promotes international and multidisciplinary research in the field of transportation infrastructure and nature. In this context, IENE promoted the COST 341-project (Habitat Fragmentation due to Transportation Infrastructure) which can be seen as one of the follow-up actions of the conference in 1995 (*Canters et al 1997, Damard T., 2003*). It was a new action in the framework of the COST program (Cooperation in the field of Scientific and Technical research) of the European Commission. This European program aims for coordination of national subsidized research, striving for an exchange of information on international scale. The action started in 1998 and ran for 5 years. The results were presented during the IENE international conference in Brussels in November 2003 (*IENE, 2003*).

From 1996 to 1998, IENE had been financed and coordinated by the Road and Hydraulic Engineering Division of the Dutch Ministry of Transportation, Public Works and Water Management, that also was the initiator of the network and the COST 341-project. During 1998 and 2000, the IENE secretariat was jointly hosted by the Swedish National Road Administration and the Swedish National Rail Authority. In 2000, the Institute of Nature Conservation in Brussels, Belgium, took over the coordination of IENE until the completion of the COST-341 Action in 2003. Over 21 countries had been officially represented in the network at this time (*Forman et al, 2003, Sherwood et al, 2003*).

2.1.2 A period to support implementation of road ecology in the National Road administrations (2004-2008)

In the years following the completion of the COST-341 action, funding for the secretariat ceased and the international network officially remained dormant until 2008. During these years the members of the network, of which many had been active in COST 341 maintained contact and helped each other in an exchange of knowledge and experiences through different activities such as seminars, workshops etc. In April 2008 representatives from 18 European countries met in the Hungarian city Nyíregyhàza to discuss the possibilities to re-activate IENE. It was the unanimously conclusion of the participants that there is a need for a new and more active IENE at European level, especially with respect to the on-going expansion of transport infrastructure in Eastern-European countries and the threat of climate change. With 2008 Nyíregyhàza meeting the second phase of IENE completed and an interim steering committee was formed to establish a new IENE secretariat, update its statutes and website (www.iene.info), and ensure future funding. Thanks to the financial support of the Swedish National Road Administration, the IENE secretariat could be located at the Swedish Biodiversity Centre in the Swedish University of Agricultural Sciences.

ph.25| Field visit in defragmentation workshop in Spain, 2008 (© Carme Rosel)

ph.26 | Restart IENE in Nyiregyhaza, Hungary, 2008 (© Carme Rosel)

ph.27 | IENE team in a monitoring project in Praga, 2007 (© Carme Rosel)

Ph.28 | Restart IENE in Nyiregyhaza, Hungary, 2008 (© Hans Bekker)

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ph.29 | Shiny smiles in the field visit during IENE 2011 Workshop and General Assembly in Kastoria and Nymfeo, Greece (© L. Georgiadis)

ph.30 | Road kill's recording during the field trip of 2009 IENE Workshop in Evora, Portugal (© L. Georgiadis)

ph.31 | IENE 2013 Workshop on effective motorway planning in Lugoj, Romania (© L. Georgiadis)

ph. 32 | Reactivating IENE Workshop in Evora, Portugal, 2009 (© L. Georgiadis)

ph. 33 | IENE 2011 Workshop in Kastoria, Greece (© L. Georgiadis)

ph. 34 | IENE 2011 General Assembly in Nymfeo, Greece (© L. Georgiadis)

2.1.3 IENE full reactivity in 2009

Officially, the new IENE organization was re-activated at the IENE General Assembly in Portugal, April 2009. A new Steering Committee was elected and the General Assembly agreed upon a new Memorandum of Understanding (MoU) (www.iene.info/statutesmou) setting the basis for the new IENE. In contrast to the former IENE, the new network was open to individual members, not only assigned national coordinators. The members would gather annually and later bi-annually at the General Assembly to elect new Steering Committee members, vote about changes to the statutes and engage in new joint projects.IENE remained a formalized network, with the secretariat acting as its legal body, funded since 2009 by the Swedish National Road Administration and later the Swedish Transport Administration. In 2013, the IENE secretariat was transferred from the Swedish Biodiversity Centre to Calluna AB, a private environmental consultant company with long and extensive experience in transportation ecology and close cooperation with the Swedish University of Agricultural Sciences.

2.2 Working methodology

2.2.1 The goal and the objectives of safe and sustainable transportation infrastructure

IENE is a non-profit, non-governmental, non-political, formalized network of experts active in the field of habitat fragmentation due to transport infrastructure. The main goal of IENE is to promote a safe and ecologically sustainable infrastructure through recommending measures and planning procedures to conserve biodiversity, counteract landscape fragmentation, and reduce vehicular accidents and wildlife casualties. To achieve this goal IENE has as a general objective to provide an independent, international and interdisciplinary arena for exchange and development of expert knowledge, experience, policy and data on transportation and ecology. The basic framework of special objectives of IENE includes:

I. Promoting the recognition of fragmentation as a major threat for biodiversity and ecological connectivity of natural habitats and landscape.

II. Supporting the production of knowledge and solutions for mitigating the impact of linear infrastructure on habitat fragmentation.

III. Developing methods to prioritize where and when mitigation measures are needed.

IV. Harmonizing mitigating and compensation measures.

V. Supporting national initiatives concerning environment & transport.

VI. Sensitizing a broader audience, supporting education around the problem of habitat fragmentation due to transport infrastructure.

VII. Highlighting gaps in knowledge and providing input to upcoming national and international research frameworks.

VIII. Stimulating the co-operation between the sectors of environment and transport at both national and at international level.

IX. Promoting international and multidisciplinary cooperation in research and monitoring activities.

ph. 35 | Planting trees during field excursion in IENE 2012 Conference in Potsdam, Germany (© Carme Rosel)

ph. 36 | IENE Steering Committee in IENE 2014 Conference in Malmo, Sweden (© Carme Rosel)

ph. 37 | A beer after finalizing the Declaration of IENE 2012 Conference in Potsdam, Germany (© L. Georgiadis)

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ph. 38 | Introducing IENE in the 2013 Workshop on effective motorway planning in Lugoj, Romania (© L. Georgiadis)

ph. 39 | Field trip after IENE Steering Committee in Stockholm, Sweden, 2011 (© L. Georgiadis)

ph. 40 | Visit at bat bridge during the excursion of IENE 2016 Conference in Lyon, France (© L. Georgiadis)

ph. 41 | Focus on mitigation measures for the Lugoj - Deva Motorway during the IENE 2013 Workshop in Lugoj, Romania (© L. Georgiadis)

ph. 42 | Setting up of the Bangkok – Dawei road project with delegations from Myanmar and Thailand in IENE 2014 Conference in Malmo, Sweden (© L. Georgiadis)

ph. 43 | IENE team working on monitoring project in 2007, Praga, Czech Republic (© Carme Rosel)

ph. 44 | Sending warm greetings from the IENE 2012 Conference in Potsdam, Germany (© M. Boettcher)

ph. 45 | Joining people with different culture is necessary for cross-border working in IENE network. Traditional dances during the gala dinner at IENE 2010 Conference in Velence, Hungary (© L. Georgiadis)

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ph.41-43 |

ph.44-45 |

ph. 46 | Green bridge in Hungary visited during the IENE 2010 Conference in Budapest and Velence (© L. Georgiadis)

2.2.2 The basic principles for Environmentally Friendly Transport Infrastructure

Twenty years of exploration in the field of Transportation Infrastructure and Ecology at local, national and international level, have resulted in important knowledge and experience covering all the phases of linear infrastructure development from the strategic plan to the detailed construction and operation (*Iuell et al., 2003; Roedenbeck et al., 2007; Georgiadis et al., 2015; Van de Ree et al 2016*).

ph. 47 | Integrating transportation in the landscape in France, Field visit during the IENE 2016 Conference, Lyon (© Yannick Autret)

This experience forms a general way of approach which creates a framework of **Principles for Environmentally Friendly Transportation Infrastructure** which includes:

I

"**Strong legal framework":** Establishment and strengthening of a legal framework for sustainable linear infrastructure development.

II

"**Sustainable Strategic Planning":** Sustainable strategic planning for development of any major transportation infrastructure project based on the Hierarchy of priorities: Avoidance – Mitigation – Compensation.

III

"**Ecosystem approach":** Ecosystem approach on crossing points of Grey and Green Infrastructure evaluate the values of Natural Capital and ecosystem services in combination with the "Precautionary" principle.

IV

"**Any case, a unique case"**: Establishment of the "any case, a unique case" estimating any problem as unique problem and evaluating the use of existed solution without the absolute and blind "copy paste" implementation.

V

"**Multi-disciplinary cooperation"**: Establishment of multi-disciplinary cooperation among different professionals such as engineers and environmentalists.

VI

"Civil society involvement": Involvement of civil society in the planning phase of linear infrastructure projects.

VII

"Polluter pays principle": Implementation of the "Polluter pays" principle, after clarifying the ethical and transparency concerns, by including concrete mitigation measures right from the beginning of the planning phase until the tendering and contracting of the building and operating phases.

VIII

"Long life effective maintenance": Inclusion of maintenance of mitigation measures in the budget of the ordinary program for maintenance of the infrastructures under operation.

IX

"Environmental supervision": Inclusion of environmental supervision of technical features of the infrastructure and monitoring of the habitat and wildlife populations' status in all phases of the projects from design to full operation.

X

"Culture of learning": Establishment of a culture of learning to build up and support continuous evaluation and exchange of knowledge and experience between the interested, relevant and authorized organizations and state services.

ph. 48| Field trip group photo of IENE 2016 Conference, Lyon, France (© Yannick Autret)

First phase 1995-2003

3. Results of IENE activities

3.1 Results on making Transport Ecology Policy

3.1.1 Results of the first phase (1995-2003)

The early years of the first phase were very crucial as IENE was an anchor point for a lot of solitary working persons in several countries looking for information and for common understanding of the problems around road ecology. Until then a kind of preliminary activity took place during the 1980-ies with related conferences and workshops on "*Routes et fauna sauvage colloquia*" in France, Switzerland, Germany and other countries which contributed to the emerging idea of IENE in 1995 (*Sétra 1987, Sétra 2006, Reck et al. 2005*).

3 Results of IENE activities

ph. 49 | Long Viaduct in Hungary. Field trip during IENE 2010 Conference (© L. Georgiadis)

ph. 50 | The COST 341 project on habitat fragmentation due to transportation infrastructure as fundamental for identifying conflicts and designing solutions producing a first European Review on the topic and the Wildlife and Traffic Handbook

On an organizational point of view this initial core group of “experts” and countries, was the basis for more new people and countries to become aware of what was possible on dealing with their now widely recognized problems and conflict's points. The need of mutual understanding and encouragement between people in different countries was a necessity. The main challenge was to find a way of possible cooperation between several disciplines and that is reflected in organizations focused on civil engineering and ecology and their common understanding of problems as a tension between linear infrastructure and ecology. So, the first success was that IENE was able to bring together all kinds of disciplines, in all kinds of organizational settings to solve a conflict between mobility, the linear infrastructure and the ecological consequences. Also, one more crucial factor was related to the different organizational status of each country as each country has its own culture, and concrete actions have to be adapted to the national politics and the way the society and the state are organized.

The first and most visible problem for road planners shared by the public was the large number of roadkills of a range of species on highways. In some cases this led to severe population declines (e. g. the badger in the Netherlands). To solve the problem at that early stage a few states like the Netherlands, Austria and the Czech Republic on a national level defined a coherent ecological habitat corridor network. As a planning tool this network was the backbone to plan measures to avoid roadkill at the most important places in the most efficient way.

As a next step more questions were raised about the way of construction and design, of monitoring and the general management behind all these processes. Thereafter the questions related to the effectiveness of the measures, their cost-efficiency management at landscape level rather than just the road itself, while more recently attention has focused on the maintenance of the mitigation elements as constructed. Today it is clear that the importance of the pioneer period between the start of IENE and the start of COST 341 (1996 - 1998) can't be underestimated, it was a very intensive period with the 5 important meetings in which the core group of IENE started to become a real organization. During this period the bridge was established between civil engineers and ecologists, between scientists and practitioners, a common mutual understanding of the necessity to cooperate increased and the first necessary step to become a credible network was made. These meetings took place in 1996 (Donau-Delta, Rumania) in 1997 (Höhe Küste, Sweden and Moscow, Russia) and in 1998 (Brig, Switzerland and Budapest, Hungary).

ph. 51 | Visiting a culvert for amphibian communication during the field trip of IENE 2010 Conference in Hungary (© L. Georgiadis)

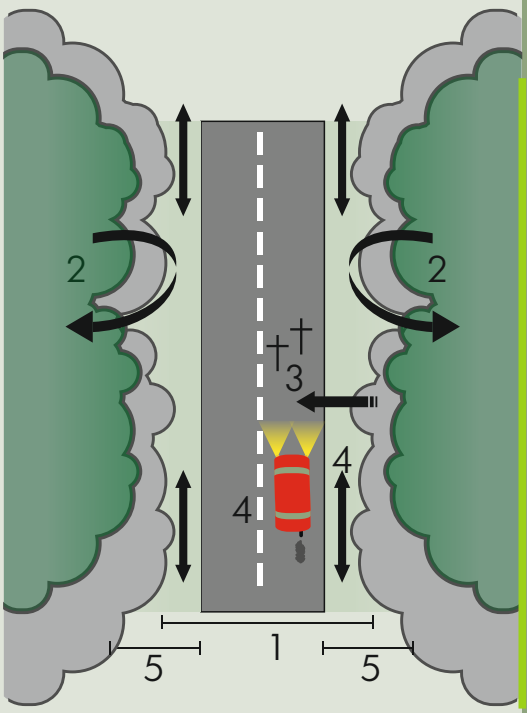


***Figure 1**. Schematic representation of the primary ecological effects of transport infrastructure.*

Label numbers:
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).

From: (Juel et al, 2003. Wildlife and Traffic. A European Handbook for Identifying Conflicts and Designing Solutions. Prepared by COST 341)

ph. 52 |
Signing is appropriate measure for unfenced roads in zones that they cross throuth ecological corridors
(© Yannick Autret)

ph. 53 |
Outside of an underpass water crossing in France during the Field visit in IENE 2016 International Conference in Lyon
(© L. Georgiadis)

*The overall results of the first period of IENE are included in COST 341 publications and can be found in the IENE website (*www.iene.info):

- The European Review with the results of the current situation with regard to habitat fragmentation and de-fragmentation in Europe (*Trocmé et al 2003*).
- The European Handbook which presents best practice guidelines, methodologies and measures for avoiding, mitigating against and compensating for the fragmentation effect (*Iuell et al, 2003*).
- A database containing information on relevant existing literature, projects and mitigation measures related to habitat fragmentation.
- A final report describing the entire project and the implementation of its results.
- This outputs where complemented by several national reports (some of them published) that were drafted in the participant countries.

These results produced by the national working groups, gave an idea of the full scope and extent of the habitat fragmentation problem across Europe and identify and exchange the range of effective solutions which are currently used to address it. It also provided the basic background and heritage of the main framework of IENE activities in the current stage.

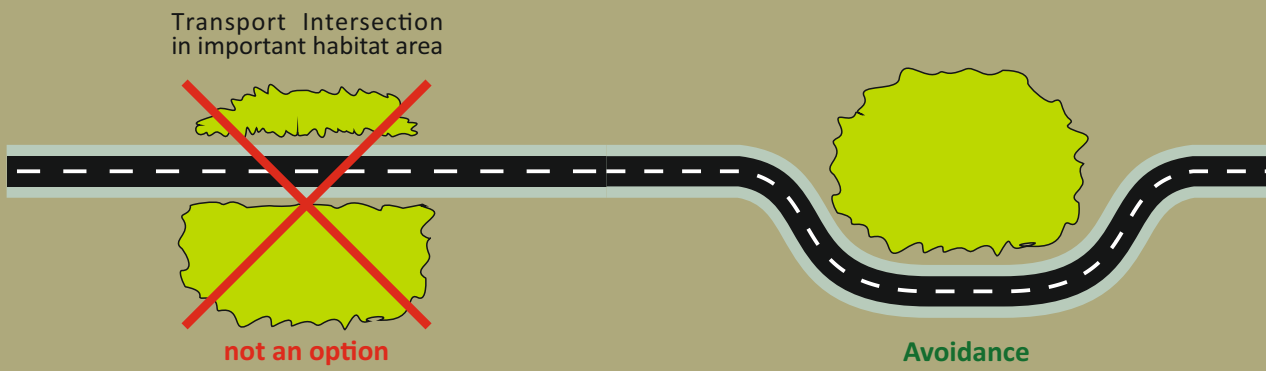
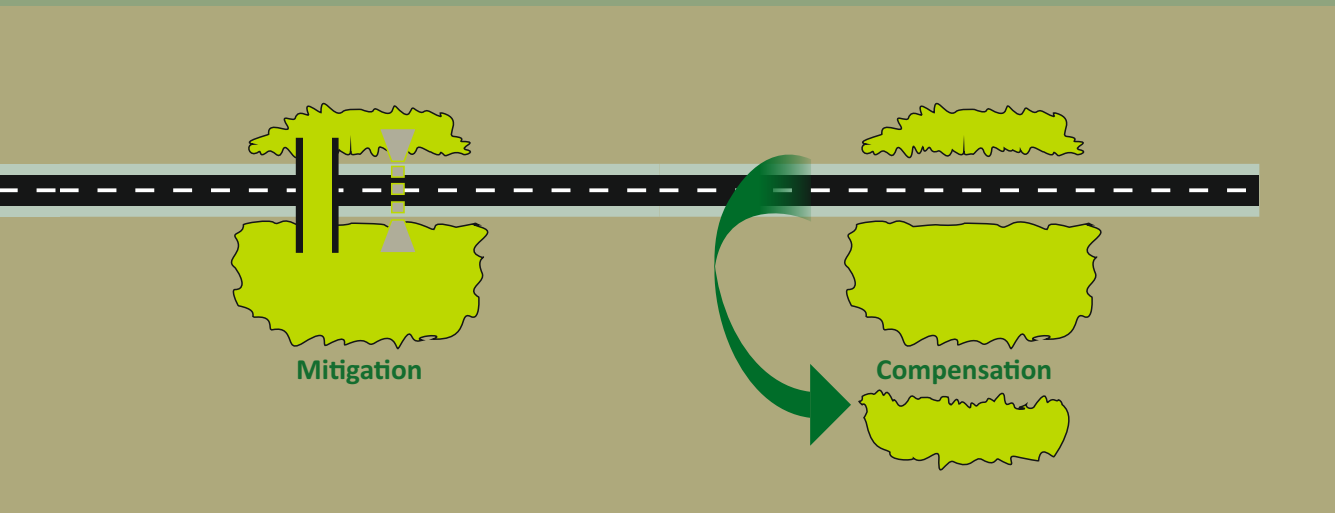


Figure 2. *Avoidance – Mitigation - Compensation Hierarchy of solutions on Strategic Planning*

From: (Juel et al, 2003. Wildlife and Traffic. A European Handbook for Identifying Conflicts and Designing Solutions. Prepared by COST 341)

ph. 54 | Inside of an underpass water crossing in France during the Field visit in IENE 2016 International Conference in Lyon (© L. Georgiadis)



2nd phase
2003-2008

3.1.2 Results of the second phase (2003-2008)

Based on the concrete framework of the results of the initial phase of IENE with practical deliverables on hand and special guidelines on specific topics, the second phase was more a basic background working period with a low profile secretariat but substantial activity. Special meetings, workshops and seminars were organized all over Europe in this period as in Poland and in Germany (Vilm) and bilateral contacts in Baltic countries as well as special deliverables as "The Rauischholzhausen agenda for road ecology" in 2007 (Roedenbeck et al 2007). In Spain the national working on habitat fragmentation due to Transport Infrastructures established during the Cost 341 Action and coordinated by the Ministry of Environment maintained the activity with periodic meetings and conferences is still active today. Also, there was much activity in the form of a variety of constant personal contacts and provision of advice between the initial IENE working group members and scientists, policy makers, administrative staff and practitioners. Additionally IENE during this period established an open and continuous communication and cooperation with the similar Transport Ecology group in the USA: the International Conference on Ecology and Transportation (ICOET).

ph. 55 | Ecoduct Groote Heide over highway A2 south of the city of Eindhoven, the Netherlands (© Jacob Van Den Borne)

Summing up the second phase of IENE the following fundamental steps were accomplished and communicated as a heritage and a set of tools deriving from the COST 341 Handbook:

- The recognition of the Minimizing the Impact of Infrastructure on Nature as a challenge.
- The recognition of habitat fragmentation as a problem.
- The emerging of the hierarchy Avoidance – Mitigation – Compensation as a framework to be used in planning for implementation of ecological adaption.
- The adoption of the need of identifying concrete conflicts and designing specific solutions.
- The recognition of the need for a permanent multidisciplinary cooperation between engineers, environmentalists and policy makers based on solid scientific knowledge.
- The emerging of the need for acting and taking initiatives in the form of IENE as an initial anchor point for a lot of solitary working persons in few countries at the beginning and involving new countries afterwards.

3.1.3 Results of the third phase since 2009: The framework of the main actions

3rd phase since 2009

Since the reactivation of IENE in 2009, a concrete framework of activities took place at a variety of different levels spreading the idea and implementing the practice of Transport Ecology both in Europe and Internationally.

The IENE activities and initiatives that established in the third period as its core group of actions include:

I. The organization of biannual international conferences.

II. The production of declarations on specific themes of environmental policy related with transportation and ecology as an international debate during the conferences.

III. The organization of workshops, training courses and special events.

IV. Participation and support of projects with concrete goals, objectives and deliverables on promoting environmentally sustainable transportation.

V. Development of cooperation on special topics with scientific, advisory and consulting bodies and organizations.

VI. Producing scientific papers, reports and publications.

VII. Produce websites and newsletters and disseminating professional information and expertise to the members.

VIII. Providing IENE Awards for international recognition of persons and project with important contribution on Transportation and Ecology.

The overall picture of IENE with results and measurable details of the all these actions are described in the next chapters.

3.2 Measurable results on concrete actions' framework of IENE

3.2.1 The organization of international conferences.

The IENE conferences are International, organized every two years and are specialized on ecology and transportation to provide a recurring interdisciplinary forum for the exchange of current research, knowledge and practical experience between the sectors of environment and transport, between scientists and practitioners, in Europe and worldwide. Each international conference develops its specific thematic focus and special declarations emphasizing emerging important and innovative topics, but it also keeps and allows discussions on a broader spectrum of topics from within the general scope of IENE.

Including the first conference in 2003 and the last conference in 2016, IENE have organized five international conferences so far: 2003 in Belgium, 2010 in Hungary, 2012 in Germany, 2014 in Sweden and 2016 in France. Totally 1.428 delegates have participated at the conferences with 199 countries represented, with 594 presentations of lectures and 256 posters, while 39 specific workshops have been organized. The results with numbers are presented in the ***Table 1*** while more details such as programme, abstracts, proceedings etc. for each of them can be found in IENE website. The future planned conferences include three conferences to be held in Netherlands (2018), in Portugal (2020) and Ireland (2022).

The most important result is that the IENE International Conferences have been established as a cornerstone of IENE activities and provide a recurring and acknowledged arena for transportation ecology in Europe and the rest of the world. One reason for this is that they have been widely acclaimed among researchers and practitioners, proved by the impressive number of attendees and speeches etc. and the big interest in organizing future IENE conferences.

ph. 56 | Monitoring of badgers' underpasses as essential tool ofimproving effectiveness of mitigation measures in France (© Vinci autoroutes/Philippe Chavaren)

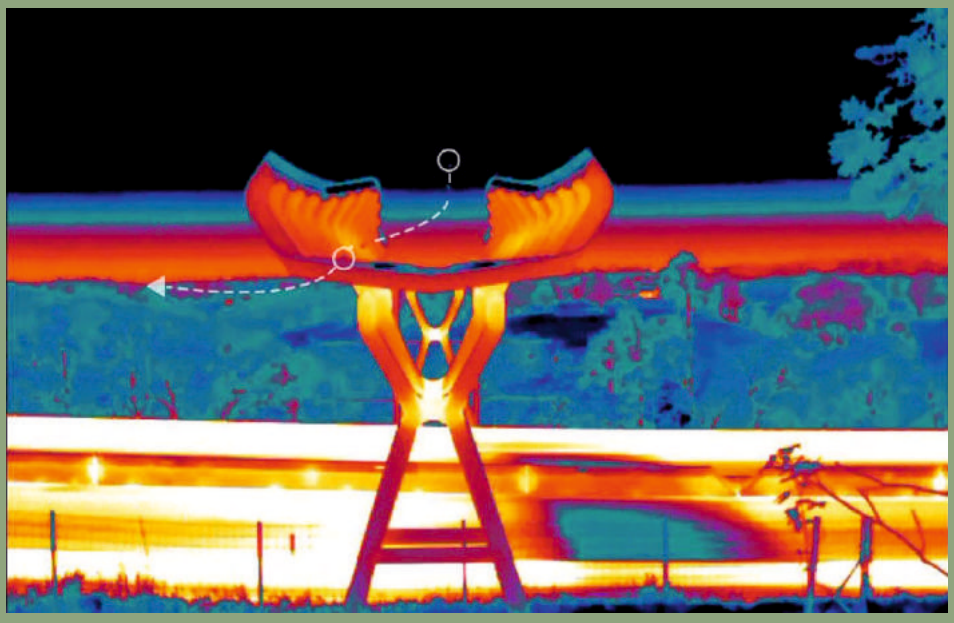
ph. 57 | Field visit during IENE 2014 Conference in Malmo, Sweden (© Carme Rosel)

ph. 58 | Wildlife escape door in motorway in Denmark during the field visit of IENE 2014 Conference in Malmo, Sweden (© L. Georgiadis)

ph. 59 | Complex of canal and road under bridge visited during the field visit of IENE 2014 Conference in Malmo, Sweden (© L. Georgiadis)

	Place	Theme	Participants	Countries	Lectures	Posters	Workshops
1995	NETHERLANDS, Maastricht & Hague (17–21 Sept. 1995)	Habitat Fragmentation & Infrastructure	215	31	46	0	3
2003	BELGIUM, Brussels (13–15 Nov. 2003)	Habitat fragmentation due to transport infrastructure & COST-341 action	187	27	53	20	1
2010	HUNGARY, Budapest & Velence (27 Sept –1 Oct. 2010)	Improving connections in a changing environment	179	30	74	53	5
2012	GERMANY, Berlin & Potsdam, (21-24 Oct. 2012)	Safeguarding ecological functions across transport infrastructure	260	39	117	65	13
2014	SWEDEN, Malmö (16-19 Sept. 2014)	Life for a greener transport infrastructure	214	35	127	38	5
2016	FRANCE, Lyon, (30 Aug. - 2 Sept. 2016)	Integrating transport infrastructure with living landscapes	441	43	177	80	12
2018	NETHERLANDS, Eindhoven (11-14 Sept. 2018)	Crossing borders for a greener and sustainable transport infrastructure					
2020	PORTUGAL, Evora	In planning					
2022	IRELAND, Dublin	In planning					
		TOTALS:	1.428	199	594	256	39

Table 1. *Basic statistic figures of IENE International Conferences*



ph. 60 | How bats use the bats' bridges (© Vinci autoroutes/Philippe Chavaren)

ph. 61 | Ecological engineering on defragmentation of railway fragmented habitat, Netherlands (© ProRail)

3.2.2 IENE Declarations

Since 2012, a Declaration has been produced at each conference, focusing on a topic that requires particular attention from transport and nature stakeholders. The message is agreed among all participants and addressed to decision makers, planners, technicians and researchers as well as the general public, and calls actions that will contribute to finding solutions to old or emerging conflicts, to address gaps in knowledge and to reduce the pressures that transport infrastructure exerts on nature. Further back in time in 1995 the first Declaration of IENE was the result of the conference "*Habitat Fragmentation, Infrastructure and the role of Ecological Engineering*" held in Maastricht, declaring the need of a network for issues within ecology and infrastructure. This was the start of IENE.

The declarations of the last three IENE conferences ware focus on:

2012: Habitat fragmentation by artificial barriers as one of the most serious threats to European biodiversity. The title of the declaration was "***Overcome Barriers – Europe-wide and now***"

2014: Areas that still lack roads or railroads, power lines or other technical intrusion and possess specific qualities that have been lost elsewhere and that may provide ecosystem services significant for sustainable development and conservation of biodiversity. The title of the declaration was "***Protect remaining roadless areas***"

2016: Habitats related to Transport Infrastructures include road verges, trees, retention ponds, wildlife bridges and other areas typically managed by transport authorities for multiple purposes. The title of the declaration was "***Ecological design and maintenance for habitats related to transport infrastructures***"

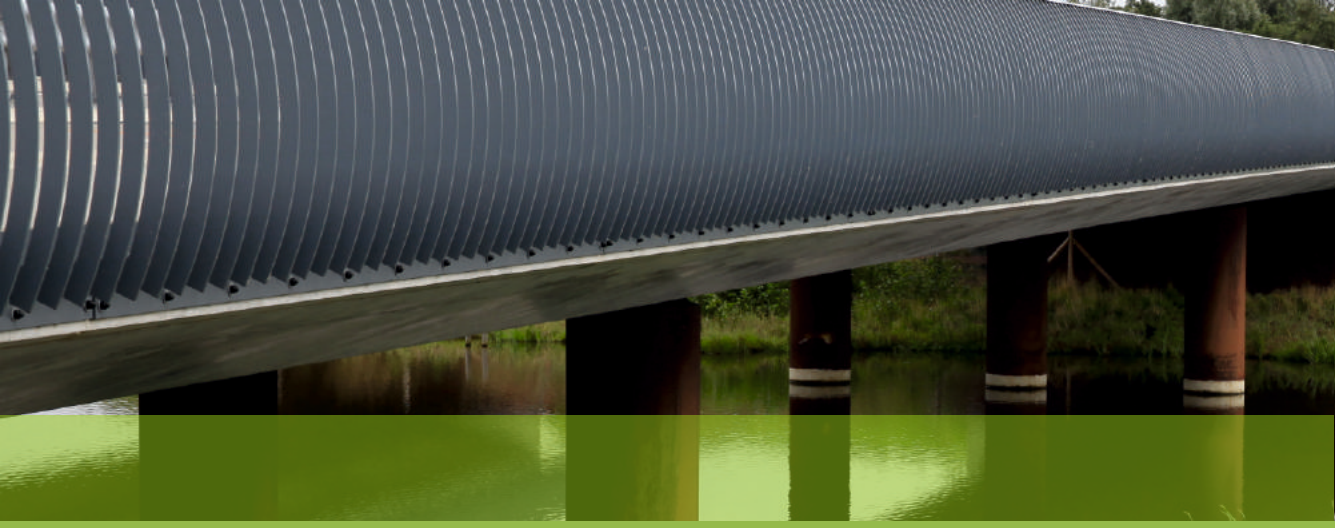
ph. 62 |
Presenting IENE in IENE 2016 Workshop in Budapest, Hungary (© L. Georgiadis)

ph. 63 |
The participants of IENE 2016 Conference in Lyon, France (© Yannick Autret)

3.2.3 The organization of workshops, training courses and special events.

IENE arranges scientific or technical workshops and meetings, before 2008 called "*IENE Open Day*", on the initiative of a respective host country or organization. Such workshops give the opportunity for national experts, stakeholders and the public to meet with IENE international experts and discuss specific problems or projects. Until 2015 seventeen (17) International IENE Workshops have been organized and an overview of the results with numbers is presented in the ***Table 2***.

From the above table it's seems that during the first phase of IENE, the workshops, as "*Open Days*", had more a political meetings character, engaging different dimensions and disciplines, digesting difficulties and going to a first synthesis scale and the actual setting up of IENE. During the second phase, a baseline of exchange of knowledge, experience and know-how at a European level was already established. On a national level there are several countries that have promoted transport ecology and implemented a lot of IENE activities such as the Netherlands, Germany, Spain, Austria, France, UK, Hungary and Italy, and especially Sweden organizing the national Swedish IENE network.



3.2.4 Participation of IENE in cooperation and research projects

IENE projects are educational, research or information activities that are not part of the core activities of the secretariat, but are authorized by the Steering Committee and directed by a respective Working Group. The projects are conducted through the collaboration between different IENE members. There are also external projects, initiated by or associated to IENE, which are owned and conducted by a third party but may refer to IENE as a back-up, collaboration partner or source of information, receiving support from IENE in any kind. Funding, management and administration of these associated projects is not under the responsibility of IENE. Such basic projects are the following:

A.

The **COST 341 Action**. The COST 341 Action "*Habitat Fragmentation due to Transportation Infrastructure*" as already described was promoted by IENE. Working groups from 19 European countries cooperated within the framework of the COST program (Cooperation in the field of Scientific and Technical research) of the European Commission. COST is a European network for the coordination of national subsidized research striving for an exchange of information on international scale.

B.

The **COST 341 products** have been translated into more than 30 countries internationally and are known worldwide.

C.

The "**Roads and Wildlife**" CEDR projects. CEDR is the Conference of European Directors of Roads. It is a non-profit organization, created in 2003. The report "*Mobility for humans and wildlife – cost-effective ways forward*" is the outcome of the work of the CEDR Project Group "*Wildlife and Traffic*" in collaboration with IENE. CEDR invited scientists and practitioners to a transnational research program "*Roads and Wildlife*" focusing on cost-efficient road management and mitigation strategies for roads and wildlife in 2013 (http://www.cedr.fr/) The call was developed in dialogue with IENE and is funded by Austria, Denmark, Germany, Ireland, Norway, Sweden, Netherlands , Sweden, Netherlands, and UK.

The program aims at solving the conflict between wildlife and roads through developing cost-efficient methods for design and maintenance of mitigation structures such as fauna passages. Under the *"Roads and Wildlife"* project three subprojects are implementing during the period 2014-2016:

- "***SAFEROAD***" – Safe roads for wildlife and people – Cost-efficient mitigation strategies and maintenance practices (http://www.saferoad-cedr.org/)
- "**HARMONY**" – Procedures for the design of roads in harmony with wildlife (www.harmony-project.net)
- "**Safe Bat Paths**" – Fumbling in the dark: Effectiveness of bat mitigation measures on roads (http://bios.au.dk/ominstituttet/organisation/faunaoekologi/projekter/safe-bat-paths/)

In the framework of these projects recommendations for minimizing the effects of roads on wildlife have developed, while the effectiveness of existing and newly developed mitigation measures have optimized. The project findings and recommendations will be compiled in a CEDR Wildlife and Traffic Manual, which is a complement to the existing COST 341 Handbook on Roads and Wildlife. Additionally the three projects provide a platform for practitioners, experts and policy-makers to evaluate these research results and their potential implementation in different countries across Europe.

ph.64 |

ph.65 |

D.

Planning and Applying Mitigating Measures to Green Transport Infrastructure in Myanmar and Thailand. This is a project that was implemented from January to March 2015 by IENE and WWF. Based on the need of support, international cooperation and exchange of knowledge and experience, IENE and WWF developed a short term project in Southeast Asia and it was focused on the planning of the Dawei road, which will connect the cities of Dawei in south Myanmar with Bangkok in Thailand. This project gave the basic framework for the development of the IENE principles for Environmentally Friendly Transport Infrastructure (*Georgiadis et al 2015*).

ph. 64 |(page 46-47 & 48) Ongoing banks under a local bridge near the city of Ankeveen, the Netherlands (© unknown)[1]

ph. 65 | Scalable slope in a canal in the province of Brabant, the Netherlands (© Hubert van Beusekom)

ph. 66 | Field visit in IENE 2016 Conference in Lyon, France (© Marleen Moelants)

[1] Photo used in the IENE 2018 Conference website. Authors tried but didn't find the copyright owners. Owners who feel addressed can to contact the IENE secretariat.

ph.66 |

E.

Developing global best practices in ecologically-adapted transport infrastructure as framework of "*International Guidance on Environmentally sustainable Linear Infrastructures"* (**IGELI**). In collaboration and consultation with colleagues in Africa, Latin America, Asia and the Pacific, IENE, with WWF, ANET and other partners aim to develop a framework of globally-relevant best-practice guidance and to ensure that the linear infrastructure we build today is as ecologically sensitive as possible. In 2016 the project started its preparatory stage, and the first approaches and their relevant demonstrations presented at the IENE 2016 Conference in Lyon, France (*Van de Ree et al 2016*), the IUCN 2016 Congress in Hawaii, USA (*Hahn et al 2016*) and the ICOET 2017 conference in Salt Lake City, USA (*Georgiadis et al 2017*). More information will be presented as the overall schedule will be developed and completed, in special workshop organized in the 2018 IENE conference in Eindhoven, Netherlands. The Workshop at IENE 2018 will be organized in cooperation with the IUCN/Connectivity Conservation Specialists Group/Transport Working Group aiming to develop recommendations for the parties to the Convention on Biological Diversity as the mainstreaming biodiversity in the infrastructure sector is considered the priority theme at the CBD Conference of the Parties in November, 2018.

In the website of IENE (www.iene.info) more analytical information and details about these projects are given. In addition to these projects, it's necessary to mention that there is a permanent procedure of preparing small or larger projects, special activities and events such as workshops but could not be completed or where not funded.

No	Year	Country	Them
1	**1996**	ROMANIA	The first IENE meeting
2	**1997**	SWEDEN	The second IENE meeting
3	**1997**	RUSSIA	The third IENE meeting
4	**1998**	SWITZERLAND	The fourth IENE meeting
5	**1999**	HUNGARY	The fifth IENE meeting
6	**2000**	SPAIN	The sixth IENE meeting
7	**2001**	BELGIUM	The seventh IENE meeting
8	**2002**	PORTUGAL	The eight IENE meeting
9	**2003**	BELGIUM	Habitat fragmentation due to Transportation Infrastructure
10	**2008**	HUNGARY	Re-establishing IENE
11	**2008**	SPAIN	Defragmentation of habitats affected by transport infrastructures.
12	**2009**	PORTUGAL	Transport infrastructure of the 21st century: connecting people and wildlife
13	**2011**	GREECE	Highways and wildlife: How do they coexist?
14	**2013**	ROMANIA	Effective motorway planning and securing conservation interests during the planning, construction and operational phases of development
15	**2013**	CZECH REPUBLIC	Infrastructure and wildlife corridors – learning from experience.
16	**2013**	SPAIN	Conectividad Ecológica y Vías de Transporte (Ecological connectivity and Transport Infrastructures)
17	**2016**	HUNGARY	LINEAR INFRASTRUCTURE AND ENVIRONMENT: Impact Assessments, Mitigation measures, Monitoring
			Totals:

Participants	Countries	Lectures	Posters
20	11	11	-
20	12	-	-
50	12	-	-
40	16	-	-
90	14	-	-
120	20	-	-
110	-	14	-
-	-	-	-
-	-	-	-
-	18	-	-
100	3	12	0
201	18	14	17
75	14	16	12
29	6	7	0
68	12	28	7
97	5	14	0
152	6	22	4
1.152	**167**	**138**	**40**

Table 2.
Basic description figures of IENE Workshops

ph. 67, 68 | Environmental education exhibition on ecological connectivity in IENE 2012 Conference, Potsdam, Germany (© Carme Rosel)

3.2.5 Development of cooperation on special topics with scientific, advisory and consulting bodies

In the framework of spreading the ideas, concerns and practices of Transport Ecology, IENE is collaborating with other organizations and networks and participating in advisory and consulting bodies, while additionally is generating and promoting special studies, publications and activities.

Examples are:

a. CEDR as has already described and as fundamental cooperation in IENE 20 years history.

b. ICOET (The International Conference on Ecology and Transportation). ICOET conferences are the go-to conference for transport ecology scientists and practitioners, as well as for transportation engineers and policy experts interested in seeing the cutting-edge research in the field. The ICOET tends to mostly focus on American continent issues, but always includes an international contingent and is well-connected to the IENE conference and organizers. A member of IENE Steering Committee is always member in the organization committees of ICOET while a member of ICOET is always member in IENE Steering Committee.

c. ANET is the Australasian Network for Ecology and Transportation activated in Australia and Asia and there is a permanent open dialogue with IENE exchanging knowledge, experience and best practices (www.ecologyandtransport.com) Result of cooperation of ANET and Unevirsity of Melbourne with more than 100 specialists most of them members of IENE was the “Road Ecology Handbook” in 2015.

d. CBEE, the Brazilian Road Ecology Centre (http://cbee.ufla.br) which organize conferences and taking activities on promoting Ecology on Transportation in Brasil and other countries in Latin America.

Also, European Union is a basic interlocutor and co-operator of IENE in shaping the strategic approaches, the legal framework and implementing concrete schedules in practice.

ph. 69 |
Supporting the dialog with the local society in IENE Chanchnaburi seminar during the Dawei project in Thailand, 2015 (© L. Georgiadis)

ph. 70 |
Group photo after the 4th Green Economy Green Growth Forum in Nai Pi Taw during the Dawei project in Myanmar, 2015 (© L. Georgiadis)

ph. 71 | Opening the IENE 2012 Conference in Potsdam, Germany on Safeguarding Ecological Functions Across Transport Infrastructure (© L. Georgiadis)

Special cases of cooperation in an additional, complementally and potential level are cooperation with:

1. International Conventions as Bern Convention.
2. Ministries as:
   - Federal Ministry for Transport, Innovation and Technology of Austria
   - Ministry of Ecology, Sustainable Developmen and Energy (MEDDE) of France
   - Ministry of Environmental Conservation and Forestry and Ministry of Construction of Myanmar
3. National organizations as:
   - Swedish Transport Administration (Trafikverket)
   - Agency for Roads and Traffic Belgium/Flanders
   - Highways England
   - Rijkswaterstaat, Netherlands
   - CEREMA – Centre d'études et d'expertise sur les risques, l'environnement, la mobilité et l'aménagement, France
   - German Federal Nature Conservation Agency (BfN)
   - Transport Research Centre, Czech Republic.
   - Swedish International Development Cooperation Agency (SIDA)
   - Ministry of Agriculture Foods and Environment (Spain)
4. MTA Centre for Ecological Research, Danube Research Institute in Hungary. Except of the IENE workshops and the Conference in Hungary, a special children's drawing contest organized by MTA in 2010.
5. International Organizations such as WWF and IUCN.
6. Scientific Magazines and Editions such as:
   - North-Western Journal of Zoology (http://biozoojournals.ro/nwjz/index.html)
   - Nature Conservation (http://natureconservation.pensoft.net)
   - Frontiers in Ecology and Evolution (http://journal.frontiersin.org/journal/ecology-and-evolution/section/urban-ecology).
7. Universities such as Swedish University of Agricultural Sciences.
8. Consultant companies (such as Minuartia, wildlife consultancy in Spain, Calluna AB in Sweden, Alterra in The Netherlands, EURAC in Italy, etc.), NGOs and researchers and special consultants all over the world.
9. Several European or International projects for several backgrounds like nature conservation (LIFE), scientific research (HORIZON 2020) or trans-bounder cooperation (INTERREG).
10. Other International Networks and initiatives as the MIR initiative in METR Region (Middle East, Europe, Turkey, Russia) and other special groups working on transport ecology outside Europe like in Japan, Korea, Myanmar, Thailand, China, India, South-Africa and other countries (*Seiler et al., 2015, Collinson W., 2015*).

3.2.6 Membership, website and dissemination of expertise and information

IENE is a community of practice and exists through its members. Membership is today only individual and free of charge. At the start of 2017 (February 2017), IENE contained 383 members worldwide (*today, during summer 2018, the members are more than 400*), representing 51 countries (***Figures 1 and 2***). The number of members has been increasing since the reactivation of the network in 2009 (***Figure 3***).

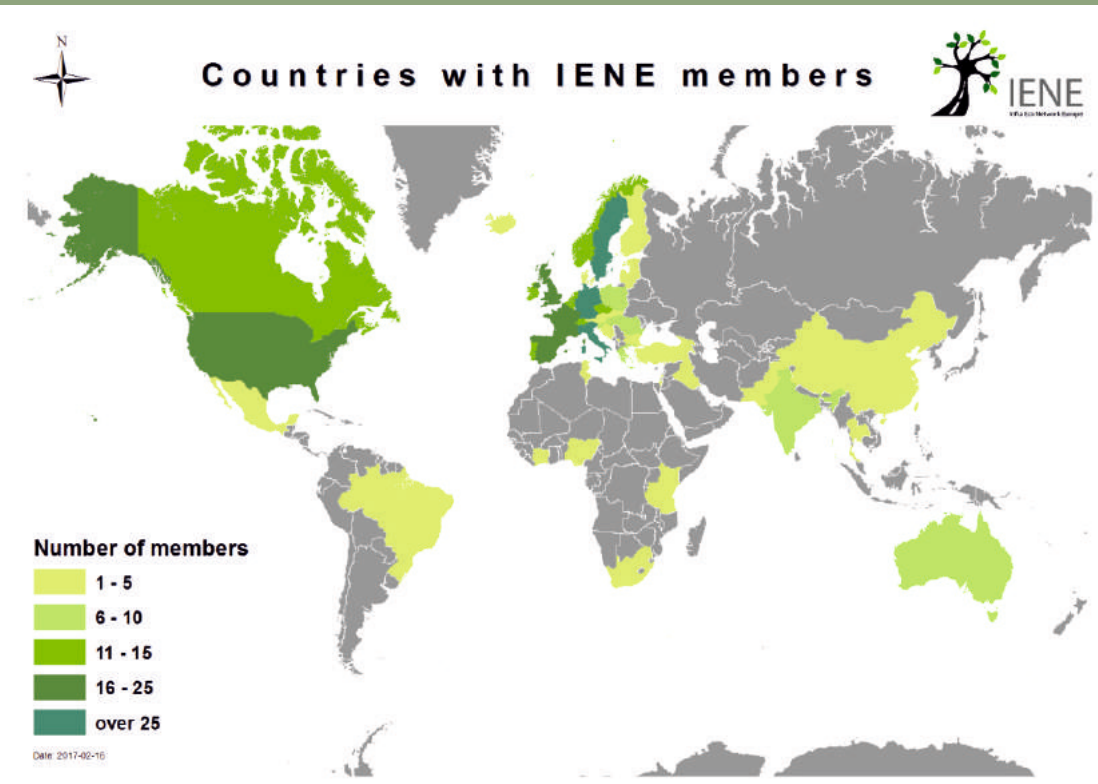


Figure 1. *Map with IENE members distribution per country in global level*

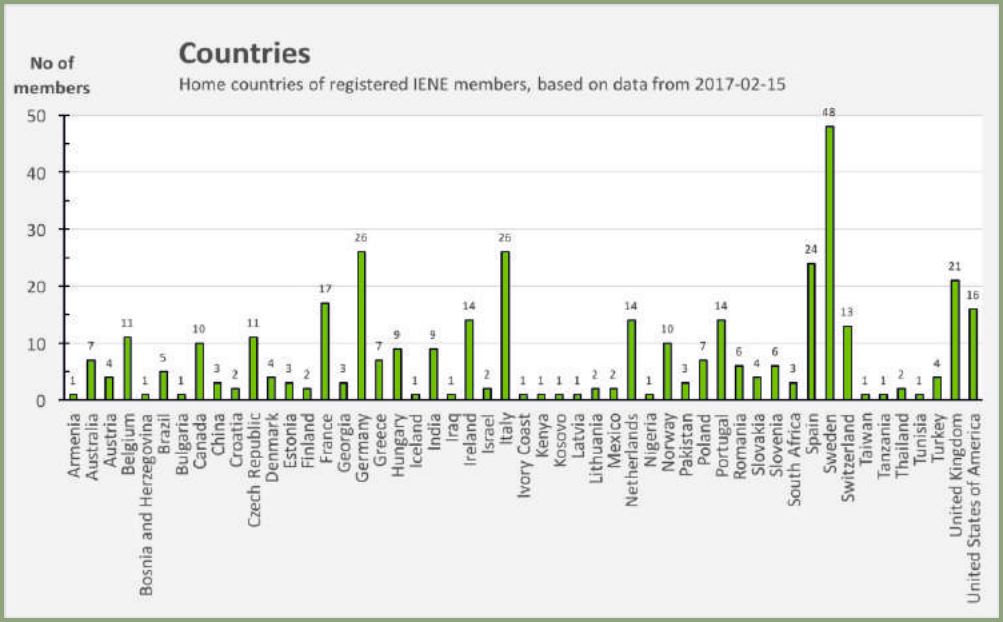


Figure 2. *IENE members per country*

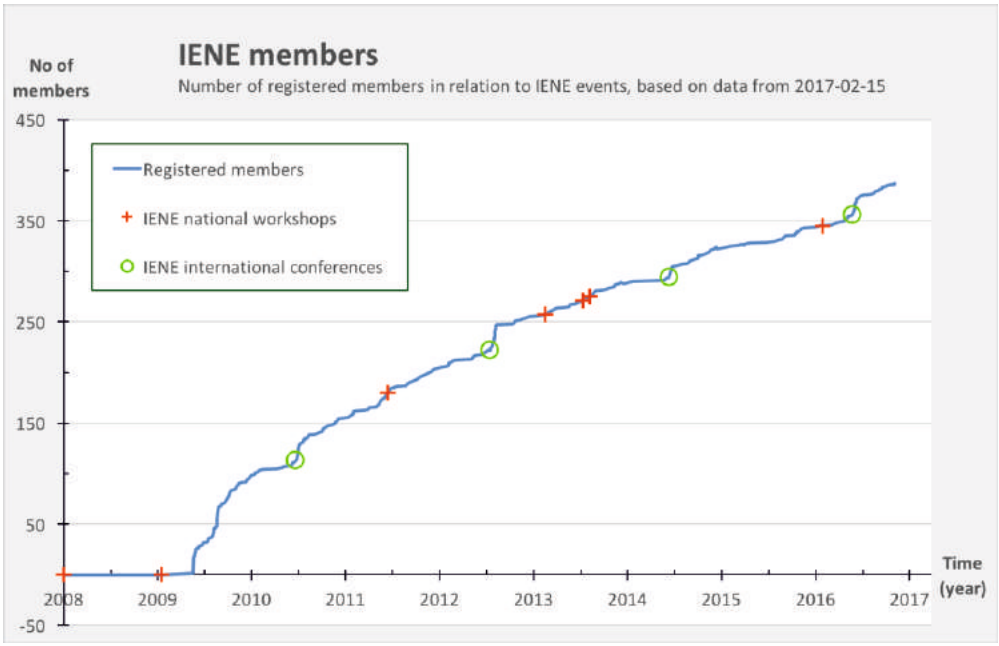


Figure 3. *IENE members in time*

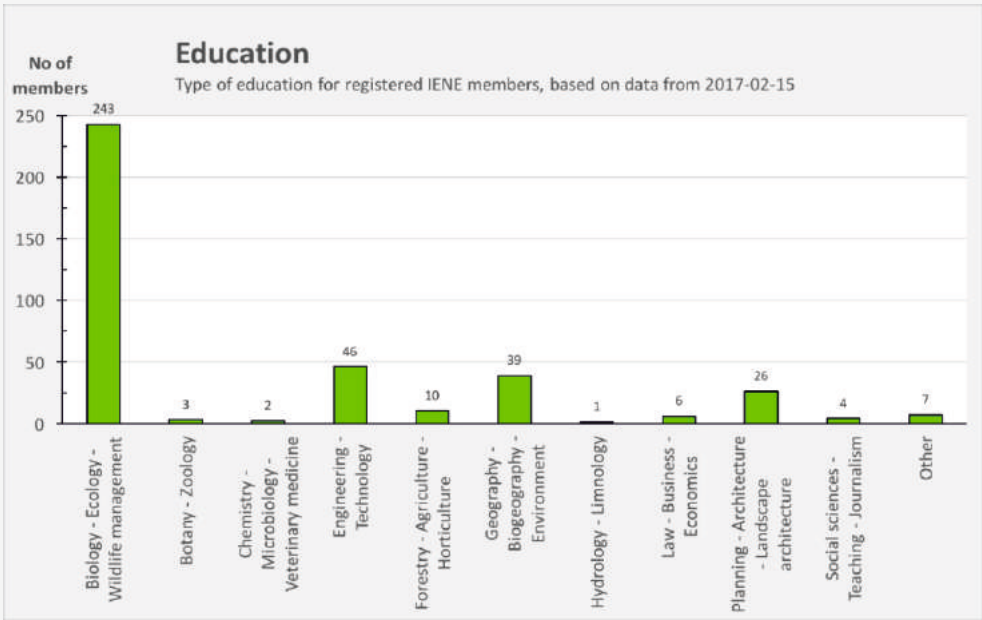


Figure 4. *IENE members and their education background*

Most IENE members mainly have their educational background in biology – ecology - wildlife management. There are also several members with education in engineering - technology, geography – biogeography - environmental studies or planning – architecture - landscape architecture (***Figure 4***). The members come from different types of organisations, mainly private companies and universities, but also NGOs, transport and environmental administrations and research institutes (***Figure 5***). Most of the members have a professional function as researchers or specialists - practitioners within their organisations (***Figure 6***).

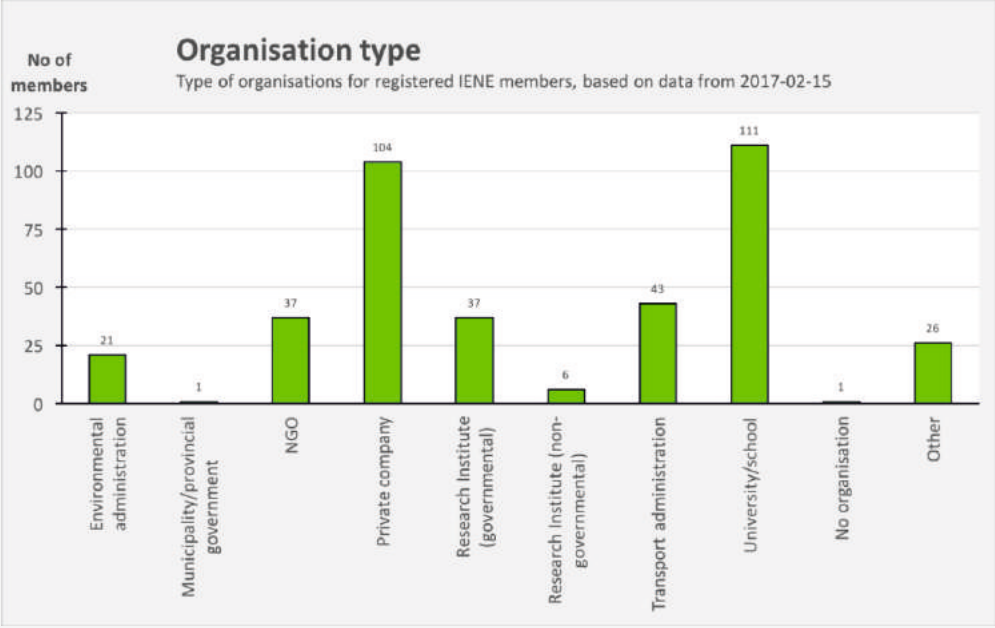


Figure 5. *IENE members and their organization type*

Main area of communication and a permanent framework of information, projects and actions presentation is the IENE website in combination with a mailing list to all members, used for news updates from the Steering Committee, the Secretariat and open for communication between members on any related matter. The website had around 23.000 visits (sessions) during 2016 (41,4 % returning visitors, 58,6% new visitors).

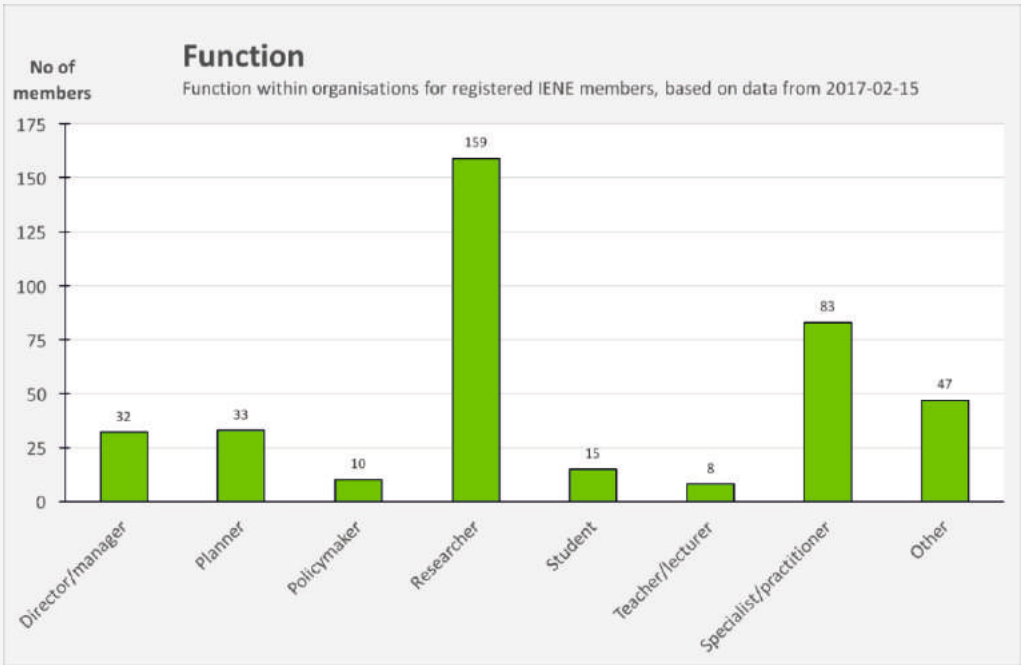


Figure 6. *IENE members and their function within organizations*

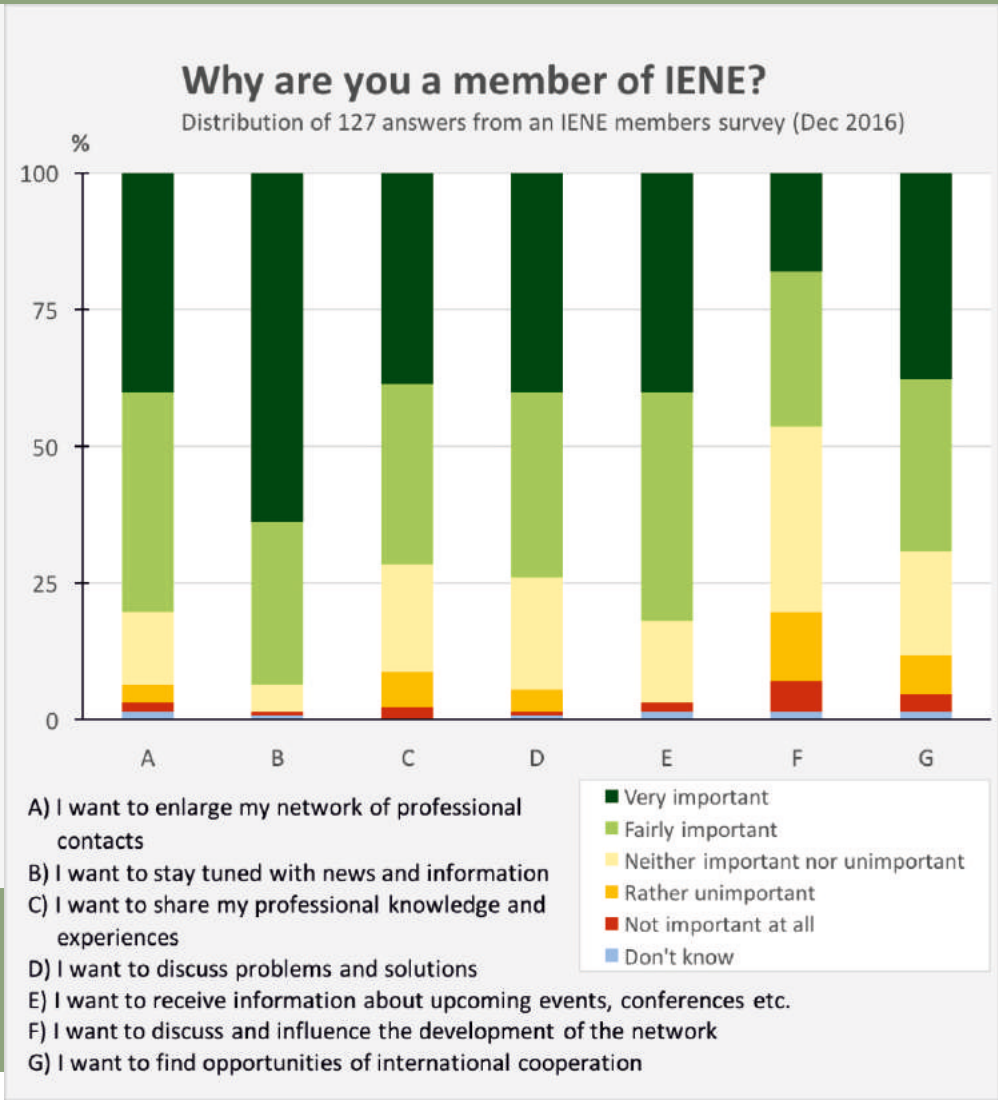


Figure 7. *IENE members and their reason for their membership*

At the end of 2016 all IENE members were invited to participate in an online survey regarding IENE as a network, how well the present functions, services and activities meet the needs and wishes from the members, and how the network could be developed in the future. About 1/3 of the members replied to the survey. One of the main results was that the respondents were members of IENE mainly because they "*want to stay tuned with news and information*" (**Figure 7**). Other reasons for being a member of IENE was e.g. to enlarge their network of professional contacts, discuss problems and solutions and receive information about upcoming events, conferences etc.

Year	Name	Specialization	Institution	Country
2016	Lars Nilsson	- Biologist	Swedish Transport Administration	Sweden
2015	Jean Carsignol	- Environmental Engineer	Ministry of Ecology, Sustainable Development and Energy (MEDDE) of France	France
2015	Dr Miklós Puky (†)	- Biologist - IENE SC Member	MTA, Centre for Ecological Research, Danube Research Institute	Hungary
2014	Wendy Collinson	- Road Ecologist	Endangered Wildlife Trust	South Africa
2013	Marguerite Trocmé	- Biologist and Environmental Engineer	Ofrou	Switzerland
2012	Dr Djuro Huber	- Biologist	Professor in Veterinary Faculty of Zagreb	Croatia
2011	Carme Rosell	- Biologist, - IENE SC Member	Minuartia	Spain
2010	Hans Bekker	- Nature engineer, - Initiator of IENE in 1995 - Chairman of IENE SC - Chairman of COST-341 action on Habitat Fragmentation due to Transport Infrastructure ICOET SC Member	Traffic and Navigation Centre (DVS)	Netherlands

Table 4. *Winners of IENE personal awards*

ph. 72 | Visit an underpass during the field visit in IENE 2014 Conference in Malmo, Sweden (© L. Georgiadis)

ph. 73 | Field visit on Lugoj – Deva area in Western Warphathians where a railway and a motorway are developed in parallel.
IENE 2013 Workshop in Jugoj, Romania (© L. Georgiadis)

3.2.7 The IENE Awards

The IENE Awards has become an appreciated tradition within the IENE network. It comprises a public recognition and does not include any grants or scholarships. The winners are announced to the network e-mail list, on the website and at the upcoming IENE conference, workshop or General Assembly. The award is given in two categories:

- The IENE Personal Award appreciates outstanding engagement and special achievements made by individuals.
- The IENE Project Award appreciates extraordinary work accomplished by initiatives, activities or plans.

Through the IENE Awards, IENE recognizes and appreciates outstanding efforts made to reduce the detrimental effect of transport infrastructure on nature and to enhance the positive influences caused by construction, use and maintenance of transport infrastructure. Such extraordinary efforts may include, for example, impact assessments, mitigation plans or technical measures at local, regional or national scale, research achievements, or information, education and promotion activities. Since 2010, 5 project and 8 personal awards have been given (***Tables 3 & 4***).

ph. 74-75 | Presentation of the personal and project awards during IENE 2012 Conference in Potsdam, Germany (© L. Georgiadis)

Year	Project	Contributors
2016	The Handbook of Road Ecology	- Dr Rodney van der Ree, University of Melbourne Co-editors: - Dr Daniel Smith, University of Central Florida and - Dr Clara Grilo, University of Lisbon Co-authors: - 114 authors from over 25 countries
2014	The Ecoduct Kempengrens (A cross-border cooperation between Flanders and The Netherlands)	- Rob van Ruremonde, Province of North-Brabant, The Netherlands - Katja Claus, Departement of Environment, Nature and energy, Flemish Government, Belgium - Liesbet Van Lae, Agency for Nature and Forest,Flemish Government, Belgium - Marleen Moelants, Agency for Roads and Traffic, Flemish Government,Belgium
2012	The Alpine Carpathian Corridon Project (A cooperation between Austria and Slovakia).	- Brigitta Mirwald, Government of Lower Austria, Nature Protection - Sylvia Hysek, Weinviertel Management, Austria - Milan Janák, Daphne / Centre of Applied Ecology in Slovakia
2011	Landscape fragmentation in Europe	- Prof. Dr. Jochen A.G. Jaeger & Dr. Luis F. Madriñán, Concordia University in Montreal in Canada - Tomáš Soukup, GISAT s.r.o., Czech republic - Christian Schwick, Die Geographen schwick+spichtig, Switzerland and - Prof. Dr. Felix Kienast, Swiss Federal Research Institute for Forest, Snow and Landscape (WSL), Switzerland
2010	Resolving conflicts between ecological connectivity and transportation infrastructure in Poland	- Włodzimierz Jędrzejewski, Krzysztof Niedziałkowski, Dorota Ławreszuk, & Marcin Górny Mammal Research Institute, Polish Academy of Sciences - Sabina Nowak, Robert W. Mysłajek, Association for Nature "Wolf"

Table 3. *Winners of IENE projects awards*

ph. 76 | Artists impression of ecoduct over highway A1 near the village of Kootwijk and fauna tunnel under the railway between cities Amersfoort and Apeldoorn, the Netherlands (© ProRail)

Epilogue

Twenty years ago the idea of joining ecology with transportation was still only some quite vague thoughts of a few people with environmental concerns. They realized the scale of the changes in the natural world brought about by humans in the creation of their own artificial world and its enormous effects on biodiversity. IENE has contributed to transform this idea to real actions, a huge variety of texts have been written, numerous meetings and discussions have taken place, scientific articles have been publicized, books have been edited, agreements have been signed and laws have been implemented all over the world. After 20 active years the IENE members who have shared a contagious enthusiasm by so many experts both from the ecological and the transport sectors, still feel though that this is not enough and as Anders Sjolund the Chairman of IENE Steering Committee use to say **…***spreading the idea or the "infection" with the Transport Ecology virus*… has to be continued and strengthened. Definitely there is a level of satisfaction and there are examples of improvements in some countries, but the enormous changes with negative influences on the natural environment through fragmentation and effects on ecological connectivity due to extensive transport infrastructures will always be on the board… and this "*infection*" needs a response by joint forces of a multi-disciplinary nature and quantitative and qualitative results on an international level.

Today the “arena” of IENE is an international place for the fermentation, deep digestion of existing experience and knowledge and a process of productive synthesis. In this arena, the virus of Transport Ecology has taken its own evolutionary path and the development of procedures with all the changes in the global level of development since the 1990-ies. Trying to evaluate the contribution of IENE during its relatively “short history” we can conclude that there is a clear development from recognition of the problem in the 1980-ies and first individual mitigation measures in the early years, to regional and national defragmentation programs and national schemes (Switzerland, Austria, Netherlands, Germany, Poland, Czech Republic, Sweden, Spain, Bulgaria, France) in the mid-terms, till to global guidance for developing ecologically adapted infrastructure based on internationally exchanged experiences (Hahn et al 2016, Van de Ree et al 2016, O'Brien et al 2016, Collinson et all 2016, Quintero 2016). However, after of 20 active years, IENE people feel that they are at a beginning.

Twenty years after the IENE was established, there is still a long way to be travelled, as there are already 64 million km of roads existing on earth – enough for 83 return-trips to the moon, an additional 25 million km will be constructed by 2050, according to the existing plans; 90% of which will be in non-OECD countries (*Dulac 2013*). Much of this infrastructure will occur within and around areas currently managed for biodiversity and ecosystem service values, thereby undermining past, current and future conservation investments. It's obvious that individual mitigation measures are the subject for refinement, new innovative measures will always be required and research will need to produce more and more knowledge. Also, from being ignored by politicians for a long time, the transportation and ecology movement has finally started to become recognized, but has still a long way to go before it is widely acknowledged. It seems that the reality is far from a perfect vision of a sustainable world. IENE members feel that the “*Think Tank*” that the network has become has to be updated to become a fully effective international Transport Ecology Laboratory.

In 2018, the year of the finalization and edition of this 20 years history of IENE a new era of the next 10 years is under a process with the French Foundation for Research on Biodiversity (FRB), supported by the Ministry for the Ecological and Solidarity-Based Transition of France. FRB is getting ready to host the secretariat of IENE, turning it into an Executive Secretariat in order to take activities up to the next level, with an increase of science-related activities. Many things have to be improved and more effective products have to be introduced in the coming years. As always there is a need for renewing the old, to distinguish the good from the better and go from the better to the best.

ph. 77 | Mitigating of cumulative impact of different infrastructures on landscape is of a great challenge. Budapest-Vienna Motorway, Austria (© L. Georgiadis)

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