

Thursday / 14:30 – 15:30

Room: Jupiter

Global wildlife-vehicle conflict reporting systems

Fraser Shilling (University of California, USA); Wendy Collinson-Jonkers (Endangered Wildlife Trust, South Africa); Michal Bil (Transportation Research Centre; Czech Republic); Diemer Vacayie (Natuurpunt, Belgium); Florian Heigl (University of Natural Resources and Life Sciences, Austria); Sarah E. Perkins (Cardiff University, UK); Sandra MacDougall (Red Deer College, Canada)

Supporting the evolution of ecologically sustainable transportation requires collecting and analysing data about road and traffic impacts on natural and human systems. Some of the most visible impacts are the carcasses or injured animals resulting from wildlife-vehicle conflict (WVC). For many wildlife populations, WVC may pose an existential threat through direct mortality of individuals and genetic separation of sub-populations. Vehicles and operators are also at risk from both collision and avoidance of collision with animals of almost any size (but primarily large mammals). Mitigating these impacts requires knowledge of both when (hot-moments) and where (hotspots) WVC is more common than adjacent areas and times. This, in turn, requires rigorous and extensive data collection, management, and analysis by trusted institutions. One approach mostly taken on a national basis is to involve volunteers in collecting data on road-killed animals on a broad geographic range. These data can be combined with data from agencies, or their contractors, collecting carcass observations along roadways, as well as other types of wildlife-related observations to obtain a complete picture of wildlife occupancy, movement, or mortality.

This workshop aims to give an overview of existing monitoring approaches worldwide and to find a way of implementing these approaches in a global

observatory system. This workshop builds upon a similar workshop organised by Fraser Shilling for IENE 2014, entitled “Systematically reporting live and dead wildlife on and near roads”. The group listed above surveyed current smartphone and web-based systems for collecting and managing WVC data to establish common and innovative approaches that are being taken. We have also identified areas of expansion that could be accomplished by taking advantage of current and emerging data collection and technologies. So far, we have concluded that innovative types of data collection can be employed with both volunteers and agencies and that these innovations are critical for solving safety and conservation challenges on transportation-ways. Finally, when extensively, systematically collected, these data may also become essential for investigating other ecological phenomena on national, continental, or global scales.

During the workshop, we will carry out four main activities:

1. Structured introductions among participants: name, affiliation, current related research and interests, key questions and goals for the workshops, and interest in global collaboration.
2. Short presentations by five members of the organising group (5-6 minutes each) detailing fundamental activities and issues worldwide.
3. Round-table discussion of key questions and issues raised by the participant group and the lead group. These will include WVC data collection (getting more observers, technologies), data management and sharing (e.g., through web-systems), data analysis (current spatial and temporal-spatial methods in GIS and geostatistics), visualizations and public-education, affecting policy and management of transportation systems.
4. Collaborative opportunities that all participants can engage in to grow the field and increase rate and extent of data collection. This could include

a follow-up paper, funding proposals, and globally communicating web-systems.

We will focus on surface transportation systems (roads and rail) and vertebrate animals. However, we will entertain other transport modes and animal groups that people bring forward. We will pay special attention to driver-assistance and autonomous vehicle systems that are under development and being tested.

The organising group is currently working on a manuscript that provides an overview of the state of the field, which we will provide to participants. We will also take copious notes that we will give back to participants following the workshop, along with the slide presentations.

WORKSHOPS

Thursday / 14:30 – 15:30

Room: Foyer

De-fragmentising waterways

Dennis Wansink, Mascha Visser (Bureau Waardenburg, Netherlands); Nico Jonker (Province of Noord-Holland, Netherlands)

In general, the focus in studies on the relationship between infrastructure and nature is on (rail)roads. However, the effect of waterways on nature should not be underestimated. Especially, canals and canalised rivers can have detrimental effects on wildlife. Their steep shores form barriers for animals that want to cross the water. They might get into the water but might not get out anymore. Additionally, canalised rivers lack naturally vegetated shores where aquatic animals can live and breed. Canalised rivers also require resting sites for migrating fish.

The EU Water Directive (Directive 2000/60/EC) sets out rules to halt the deterioration in the status of European Union water bodies and achieve 'good status' for Europe's rivers, lakes, and groundwater by 2027. This includes, among others, restoring the ecosystems in and around these bodies of waters. The Dutch Province of Noord-Holland came with the idea to combine the obligations of the EU Water Directive with mitigation measures to de-fragmentise the canals in the province. Because contractors with Design & Construct contracts carry out most projects, they needed guidelines with functional specifications.

In this workshop, we give a presentation of the guidelines, and we want to discuss the applicability of these guidelines in other countries. Of course, any suggestions for improvements to the guidelines are welcome as well. The objective is to come to guidelines to de-fragmentise canals and canalised rivers and at the same time contribute to the implementation of the EU Water Directive. For a successful workshop we need partici-

pants with different backgrounds and from different countries: (1) Scientists: for input of the requirements of (aquatic) fauna and of the requirements for stable canal shores; (2) Waterway managers: for input about tenders and contracts; (3) Waterway engineers: for input about the practical aspects of canal engineering.

The structure of the workshop will be as follows:

1. Introduction

- Short introduction round.
- Short introduction to the goal(s) of the workshop and the discussion methods used.
- Presentation of the guidelines 'Nature-friendly shores for Design & Construct contracts'. The presentation describes the method of systems engineering, how to combine the obligations of the EU Water Directive with nature-friendly shores and measures for animals to leave the water and how these obligations and requirements are translated to functional specifications for D&C contracts.

2. Listing issues to tackle

- Short plenary discussion to discover the main problems that the participants expect. When trying to combine ecological and transport functions in canals, one might expect conflicting interests. For example, the shores must be strong enough to withstand the bow waves of the boats, but at the same time be sloping to facilitate animals to get out of the water. Sloping shores can be reinforced with stones, but this is contradictory to the requirements of the EU Water Directive. With D&C contracts it is always challenging to find the balance between describing guidelines and the freedom of the contractor to design and carry out the work his way. How to handle invasive alien species that follow canals? The problems will be grouped on a whiteboard by the different levels of a shore (under-

water, the watermark, and the land).

3. Listing solutions

- The participants will brainstorm in small groups about possible solutions for (a selection of) the main issues listed in the previous session. Each group treats at least two issues.
- Plenary session where each group presents the possible solutions (put together on a whiteboard).
- The participants can react to the ideas for solutions of the others. We will give particular attention to differences between countries (in types of waterways or water management) and the borders between the three levels of a shore.

The workshop will finish with a short discussion about possible follow up actions. These can be, for instance, an article in a water management journal, an additional chapter to the COST 341 handbook, a publication (with downloadable document) on the IENE website, etc. A summary of the outcomes of the workshop will be published on the IENE (conference) website. If the participants decide to elaborate more on the outcomes and prepare a (short) publication, this will also be published on the IENE (conference) website. The Province of Noord-Holland will use the outcomes of the workshop to improve their guidelines and the implementation of these guidelines. Preferably, the workshop will also initiate guidelines for nature-friendly canals in other countries.

Thursday / 14:30 – 15:30
Room: Grand Café

Civil engineering meets ecological engineering in the designing process

Marleen Moelants, Cédric Vaast (Flemish Government, Agency for Roads and Traffic, Belgium)

Good communication between road builders, ecologists, landscapists, and maintainers is essential for creating a good design that will satisfy the needs of all parties involved. Mostly nature measures are implemented at the end of the designing process because the project engineer was not aware of the importance. Sometimes, it is applied only as an obligation in building permits or other permits. Maintenance is frequently neglected in the design as well. Along the way, we learned that ecologists, landscapists, and road builders often work in different ways. They speak another language and have different goals. Therefore, it is essential to bring these three parties together at an early stage of every project. This can happen at every step of the process. Not only for designing new roads but also when roads are rebuilt or adjusted:

- Communication is necessary from the moment a project commences. This way, we can examine the affected natural areas or aspects, the existing opportunities in the current situation, essential elements to avoid fragmentation. As a result, we can make a well-incorporated road with much potential for local flora and fauna, taking into account the management afterward and making proper agreements for maintenance, management, and monitoring;
- As the design is getting more concrete it is essential to implement an optimal realisation of the selected measures;
- During the building process specific components can be adjusted on site;
- Afterward, agreements must organise maintenance, management, and monitoring.

The primary objective of the workshop is bringing together road builders, landscapists and ecologists to discuss their approach and viewpoints. This way, they can try to understand each other and compromise. They will share good and bad experiences. During the designing process of building a new road or rebuilding an existing road, it is a challenge to match civil objectives with ecological or landscape objectives and to reflect on maintenance. While rebuilding an existing road, it is even more difficult than having to start from scratch when building an entirely new road. However, the process of rebuilding an existing road gives the opportunity to restore existing fragmentation.

During the workshop we want to submit one or more potential projects. We will let civil and ecological practitioners work together in small groups to redesign a road that is more integrated in its natural surroundings, with attention to fauna passages and verge design.

The workshop will be structured as following:

- The group will be split into smaller groups with a maximum of five people, while keeping in mind the importance of a good mix of different backgrounds.
- The workshop will start with a short presentation clarifying the objective and approach of the workshop and situating the project. This will be the N19g project that will be visited during an excursion in Flanders. Different project documents of the project will be presented together with additional technical and environmental information:
 - Technical plan of the road;
 - Why will it be (re)build;
 - Vision on the road after (re)building: width, bicycle lanes;
 - Vision on landscape integration (available width, light, trees);
 - Existing transmission lines, sewage system;
 - Landscape elements: topography, water table, crossing watercourses;

- Surrounding nature: type, preservation status, ecological information on fauna and flora;
- Budget;
- Maintenance requirements.
- The groups prepare proposals and note their remarks for a better nature integrated road. The goal is to challenge the different parties to develop their different viewpoints and practical solutions. The starting point is a largely printed plan and different markers to put down their ideas.
- Each group will give a short presentation of their proposal. After each presentation, there will be a discussion.
- Conclusions.

The results of the different proposals can be shown afterward in the public rooms of the conference, linking to the conference app. This way, we hope to facilitate a discussion with the other participants and to demonstrate the plan of the actual realisation of this project. Furthermore, the outcomes of the workshop will be collected and spread after the conference, such as: (1) Good and bad experiences; (2) Points of friction between the civil objectives with ecological or landscape objectives; (3) Viewpoints of maintenance (who is responsible, what will it cost, etc.); (4) Suggestions for missing information or better ways to work together.

Thursday / 14:30 – 15:30

Room: Saturn

How to address barrier effects of railways? Impact factors and guild specific impact assessment due to different types of railways

Heinrich Reck (Institute for Natural Resource Conservation, Kiel University, Germany); Marita Böttcher (German Agency for Nature Conservation, Germany); Henning Nissen (Institute for Natural Resource Conservation, Kiel University, Germany); Cindy Baierl, Kersten Hänel (Kassel University, Department of Landscape and Vegetation Ecology, Germany)

Different morphological or ecological groups of species are expected to show a guild specific reaction to barriers caused by railways. The respective active factors, such as substrate types, verge vegetation, railway width, type of cable runways or curbstones, fences, noise, or habitat contrast and many more (including their combinations) are supposed to cause a wide variety of guild-specific effects. However, most effects seem to be unclear and difficult to assess. While road effects on species are extensively studied, railways effects are poorly investigated. Even the most critical barrier factors of railways are not clearly defined, which is especially true for the small fauna and traits of new railway techniques. Nevertheless, for impact assessment, mitigation and compensation it is necessary to have at least a common understanding (or conventions) for the impact severity of each relevant factor of railway design features and operating characteristics. Therefore, the workshop shall stimulate and enable a robust compilation of expert knowledge and opinions to achieve a significant improvement for practical impact assessment, mitigation, and compensation. Ecologists on the one hand and engineers and planners on the other can place their knowledge on impact factors, species responses, risk probabilities and risk assessment.

In the workshop we will discuss a previously via internet forum developed tabulation about relevant barrier features, respective guild specific species responses and impact risks. Furthermore, we will work on the compilation of: (1) a list of the relevant impact factors (current and expected future features of railways), and (2) a list of different types of acceptors (defined ecological response guilds of sensitive species and best fitting indicator or flagship species for different eco-regions). This will allow us to make up: (1) a balanced cross table with a guild specific rating of risks caused by the particular impact factors by expert hypotheses on the guild-specific severity of each factor; (2) the compilation of references - if existing - for each rating in the crosstable (mainly by using the pre- and post-conference platform for related ecological knowledge), and (3) the prioritisation of most important research to evaluate hypotheses that seem to be most potent for environmental planning and operation of railways.

In addition to the provisionally via a pre-conference internet forum prepared information, the workshop discussion will be further facilitated by illustrations from case examples. Each topic will be dealt with by the same procedure:

1. A presentation of working hypotheses (= results of the pre-conference internet forum) (2-3 min);
2. A concise discussion and annotation and complementation of the hypotheses (8-10 min);
3. A debate about consequences for railway ecology and risk mitigation along railways and stimulation of further discussion groups or participation in the post-conference internet forum (5 min).

All findings – especially the expected verified risk assessment for relevant guilds – and post-comments will be summarized after the workshop. These findings will be published via the previously established internet forum that will be hosted by the German Agency for

Nature Conservation (BfN) or Kiel University or – if possible – by IENE and cared for by the universities of Kiel and Kassel until autumn 2020. Both institutions will further provide a literature review and a related practical analysis of at least the German railway features with respect to the German habitat networks and a case study about the activity of ground-dwelling insects and small vertebrates on railways which is supported by the German Agency for Nature Conservation and granted by the Federal Ministry for the Environment.

Thursday / 14:30 – 15:30

Room: Dome, Ring 4

Going off-road: New partnership arrangements towards biodiversity-friendly management practices for green verges

Denis François (IFSTTAR, France); Bas Pedroli (Wageningen University & Research, Netherlands)

Managers of land transport infrastructure (LTI) are increasingly aware of the importance of Green Verges, such as roadsides, banks, and power line corridors, for biodiversity (species and habitat conservation, connection to green and blue corridors). They are willing to embark on new management arrangements for these spaces. Currently, the implementation of more biodiversity-friendly practices for Green Verges is being considered primarily through the development of managerial knowledge and by adopting knowledge from external expertise (raising awareness of the staff, staff training, learning from practical handbooks). Appreciating the importance of such efforts, this approach has temporal, economic and social implications that are neither necessarily within reach of all managers, nor are they the best answer to all situations encountered in the field. This workshop aims to discuss options from across Europe that go beyond the development of internal competencies by land transport infrastructure managers for biodiversity enhancement, to take into consideration the ecological and organisational opportunities provided by the particular landscape context on which the transport infrastructure is superimposed.

Specific new collaborative governance modes are at stake when taking such local potential into due consideration. Indeed, all over Europe, numerous and diverse competent local actors have developed expertise in the management of natural or semi-natural environments, supporting national or local authorities

or Non-Governmental Organisations, and can carry out or organise the action on the field. For land transport infrastructure managers, taking advantage of the skills and knowledge of these local stakeholders in nature and landscape management could be an efficient and pragmatic way to achieve their wish of implementing biodiversity-friendly practices in the management of Green Verges, both concerning nature protection and enhancing ecological connectivity. Such collaborative action and social learning do exist from place to place, but generally, it remains occasional, poorly known and rarely enduring. As a result, the possibility for replication in another context (i.e. a combination of natural environment and a specific type of land transport infrastructure) remains hard to realise, thus probably underrated.

In this workshop participants are invited to report their experiences, contributing to a first overview of state of the art and its inherent diversity across countries and land transport infrastructures. From their knowledge and experience, a rapid assessment of success and failure factors of partnership-based management will be carried out. Lastly, the relevance and opportunity for international cooperation intended to improve the feasibility of this contextual ecological management of Green Verges will be considered. The target participants of the workshop are professionals, researchers and representatives of non-profit organisations involved in the management of Green Verges or natural environments, with a background varying from ecology, nature management, and law, to landscape architecture and the humanities (governance, socio-economy).

The workshop structure is as follows. After a short introduction of the organisers, we will invite a round of 3-minute 'elevator pitches' from each participant (representing as many countries as possible) to report on the experience of collaborative Green Verge management; noting fundamental characteristics. After

maximum 20 minutes, this will yield the first overview of state of the art and the diversity of experiences, as reported by the participants. The second step of the workshop (25 minutes) is focussed on bringing structure in the collected observations. For different kinds of land transport infrastructure (roads, railways, power lines, waterways - the size of the list will be adapted to the experience gathered by the participants), the various possible modes of partnership-based management of GVs are considered: ecological conservation (species); agro-ecology (grazing, mowing, specific crop), ecological corridor (connection); green activities (hiking, biking, riding), water activities (canoeing, sailing, fishing). The general discussion aims to clarify which modes have the highest potential in which cases, regarding ecological relevance and main difficulties encountered. The organisers will facilitate this step, filling with all the participants a summarising table *Land transport infrastructures versus management modes*, with, in each box, the identification of success and failure factors of partnerships (considering ecological, juridical, and socio-economic points of view). Based on the questions and opportunities raised as a result of the previous general overview, the last step (15 minutes) will be dedicated to conclude on the motivations and justifications for an inter

Thursday / 14:30 – 15:30

Room: Neptune

Worldwide knotweed: A blueprint for preventing or terminating knotweed

*Ellen Boontje (ProRail, Netherlands);
Florence van den Berg (Iv-Infra, Netherlands)*

Worldwide knotweed doesn't need much introduction with ecologists; biodiversity is at risk, and the functionality of ecoducts and wildlife crossing structures will be reduced if it is not treated. However, in some countries, landowners and infra administrators are not familiar with knotweed and the danger it causes to infra. They are not aware that the roots of this weed can cause significant damage to stone and even concrete structures, not to mention the difficulties to terminate knotweed. Most of all, knotweed doesn't hold at borders of land or even countries, what makes it in an ironic way very appropriate to the theme of this conference: Crossing Borders. And that is the biggest challenge of all because the level of policies and regulations about knotweed vary dramatically between countries. For example, the policies and regulations in the United Kingdom are very tight. However, the European Union and the Netherlands have none at all.

In this workshop, we would like to draw a blueprint of a set of policies and regulations based on the experiences of the attendees with knotweed. This blueprint will be helpful for every landowner, infra administrator and many others who have to start preventing or terminating knotweed. It could help with providing information for budget, cooperation with other stakeholders, etc. Additionally, we would like to set up a mailing list of the attendees enabling the exchange of experiences, advice, and questions.

The workshop attendees preferably have some experience with knotweed, because we will spend only a little time

on the introduction of knotweed, we will spend most of the time on debate. But a few people who would like to be introduced with the plant are welcome as well. We aim for about 20 attendees (4 groups of 5 people). The program of the workshop will be:

- For starters, we introduce the subject and ourselves briefly. Plenary, we'll ask the attendees, how much knowledge they have of knotweed, by raising hands.
- With raising the hands we split the group into four groups of five people with four stickers with different colours. The groups should be a mix of people with no knowledge, a little knowledge and a lot of knowledge.
- We will have group debates. We'll provide the attendees with sheets for their data and open space for notes. The sheets will contain four questions that we want to get the answer to during the debates. The questions will be:
 1. When and how did you first found out about knotweed? What problem(s) did the knotweed cause?
 2. How did you try to solve the problem? Were you successful?
 3. Which regulations were working for you? Were there regulations in the way of solving the problem? Were there regulations missing?
 4. Do you have recommendations of any kind?
- Each group will briefly discuss the results of one question.

Finally we will summarize what has been discussed. We will ask the attendees to tick a box on the sheet if they would like to keep being updated. We will take in the sheets, and after the workshop, we will compose a set of rules and recommendations useful for the attendees and send them by email. In the email, we will also ask if the attendees would like to join an international expert panel.

Friday / 11:30 – 12:30

Room: Dome, Ring 4

Helping communities connect with their local wildlife / Involving citizens to monitor and create support for wildlife crossings

*Bas van den Dries (Arcadis, Netherlands);
Mark van Heukelum (oak consultants,
Netherlands)*

Wildlife crossings help to protect the lives of thousands of animals every year. In order to know how the crossings function and which, when and how many animals use these crossings, it is essential to monitor wildlife crossings. But processing monitoring data is a lot of work. Additionally, it is a challenge to translate or communicate (positive) results to citizens, to create general support for wildlife crossings. To meet these challenges we involved citizens in monitoring wildlife crossings, by creating an online platform called Wildspotter.nl.

In the Netherlands, Arcadis developed an innovative concept for monitoring wildlife crossings. Capturing videos from over 100 crossings and sharing them online with the public through an online monitoring platform: www.wildspotter.nl. Built as an interactive platform with gamification – an increasingly crucial digital engagement tool – people can watch monitoring videos and identify the animals they see, helping with categorizing and logging the variety of species. Dozens of users identify every video, so the video is analysed based on ‘crowdsourcing’. Users can motivate and discuss their answers with other users and share videos on social media. This improves the data quality, makes it possible to learn from each other and increases the level of involvement. So far the site has had over 17,000 visitors, from which 2,250 visitors participated in the video analysis. Generating a lot of media attention, it has helped to dispel criticisms that wildlife crossings do not work and, more importantly, create more support for

constructing and monitoring wildlife crossings. The interactive platform also showed how the public could support the execution of projects by contributing to data analysis, such as identifying animals, saving organisations time, resources and money. So far, over 1,500 videos have been analysed. To compare the reliability of the data produced by Wildspotter.nl, we compared the identifications from the public with those made by an ecological expert. As it turned out, the general public identified a number of 98% from the 973 videos from 2016 correctly. This analysis shows the strength of the concept and that involving citizens in data analysis can be highly effective.

In this workshop, we want to share our (and your) experience on involving citizens in ecological monitoring, using digital platforms to facilitate participation and communication and on how to create support. We will mainly focus on involving large groups of people using digital tools. We will discuss the dos and don'ts, look for (other) ways to involve citizens, and we will explore how citizen participation can become part of your projects and initiatives. We want to share our positive experience with involving citizens in monitoring activities; both for the benefit of performing better and more efficient research, as for the need to create more support. We believe that involving citizens can benefit the development and monitoring of wildlife crossings, but also to (re)connect citizens to nature in their ‘backyard’. We will use the online platform wildspotter.nl as a showcase:

- To show the potential success and benefits involving citizens can have on developing and monitoring wildlife crossings;
- Sharing experiences on involving citizens with digital platforms. We are also keen to hear about the experiences of the workshop participants involving citizens in general;
- Explore other ways and benefits in involving citizens or more specific groups of volunteers, preferably with

example projects or initiatives from the workshop participants;

- Discuss the data quality, risks, and benefits, when involving citizens;
- Also, we would appreciate any feedback on Wildspotter.nl or on engaging citizens in general;
- People involved in developing or monitoring ecological corridors and that are willing to explore the benefits of involving citizens in the process. Researchers, project developers, and policymakers.

A summary of the outcomes of the workshop will be made and sent to the interested participants. We will use the feedback to improve Wildspotter.nl and other platforms. We hope to inspire and motivate participants to start involving citizens more actively and to gather specific information to make the first steps.

WORKSHOPS

Friday / 11:30 – 12:30

Room: Jupiter

Evaluation of international policy on environmentally sustainable transportation infrastructure in an era of rapid global expansion

Lazaros Georgiadis, Andreas Seiler, Anders Sjolund, Elke Hahn, Carme Rosell, Yannick Autret (IENE, Greece/Sweden/Austria/Spain/France); Kate Newman (WWF US, USA); Rodney van der Ree (ANET - Australasian Network for Ecology and Transportation / Ecology and Infrastructure International Pty Ltd, Australia); Rob Ament (IUCN Connectivity Conservation Specialist Group, Transport Working Group, USA)

The global demand for the construction of roads in the 21st century is enormous while the rate of biodiversity loss is well above historical averages. Much of the new transportation infrastructure will be developed within and around areas currently managed for biodiversity and ecosystem service values, thereby undermining past, current and future conservation investments. Roads and other 'grey' linear infrastructure, such as railways, waterways, and pipelines, are essential for sustainable development. However, often these roads have deleterious impacts on species, communities, and ecosystems, including human and wildlife injury and mortality, deforestation, barrier effects, carbon emissions, wildlife poaching, and land clearing. Impacts can extend for kilometres from the transport infrastructure itself and continue to develop for years, thereby affecting ecosystems and their services across the landscape. On the other hand, maintaining healthy ecosystems, particularly in the warming climate scenario, can both protect 'grey' infrastructure by reducing potential damage from hazards such as landslides, flooding, and erosion - and provide 'green' infrastructure that can protect communities from harm.

In collaboration and consultation with colleagues in Europe, Africa, Latin

America, Asia and the Pacific, IENE, WWF, and ANET have been working together to build a coalition of partners interested in developing a globally relevant best-practice guidance to ensure that the linear infrastructure we build today is as ecologically sensitive as possible. The coalition evolved from experience gained in a project to advise on how to address the ecological challenges of a road project through the biologically rich trans-border area of Myanmar and Thailand. This collaboration has been gaining partners and momentum since it was first presented at the ICOET 2015 International Conference in Raleigh, North Carolina, USA.

The framework of the "International Guidelines for Environmentally Friendly Linear Infrastructure" (IGELI) project focuses on developing countries as more environmentally vulnerable countries and increased demands for development, which includes two parts. The first is to prepare a review of the existing international policies on ecological connectivity, transportation, and development covered by four International Conventions: a) the Bonn Convention on Migratory Species (1979); b) the Convention on Biological Diversity (CBD) (1992) 2011-2020 Aichi targets; c) the UN Sustainable Development Goals (SDG) (2015) and d) the UN Framework Convention on Climate Change Paris Agreement (2015). In the second part, an international discussion on guidance has been underway through special sessions and workshops at international meetings, including the IENE 2016 International Conference (Lyon, France), the IUCN World Conservation Congress (Hawaii, USA, September 2016), the ICOET 2017 International Conference (Salt Lake City, USA), the International Forum on Sustainable Infrastructure (Hanoi, Vietnam May 2017), and the International Workshop on Sustainable Harmonization of Green with Grey Infrastructure in South Eastern Europe (Faget, Romania, October 2017). During these events, special presentations and discussions took place on linear

infrastructure guidance, defining the needs, concepts, tools, and strategies for an international policy that could be included in guiding the development of environmentally sustainable linear infrastructure projects globally. Participants at these events covered a wide range of topics, including specialists in ecology, engineering, policy making, international finance and economics and representing environment and transport sectors, government ministries, banks, universities, international institutions, and NGOs from all over the world.

The workshop at IENE 2018 will aim to develop recommendations for the parties to the Convention on Biological Diversity this year as they consider the priority theme of mainstreaming biodiversity in the infrastructure sector at the CBD Conference of the Parties in November of 2018. The workshop will include three sections:

- a) Short presentation of the results of the policy review of the four international conventions and the conclusions to date of the on-going international discussion on linear infrastructure guidance;
- b) Discussion of these results and conclusions and formulation of recommendations in small groups of 8 to 10 participants;
- c) Presentation of the group recommendations defining the overall final feedback.

The results of the workshop will be included in the final report and the deliverables of the IGELI Project. At the same time, the framework of the recommendations for the CBD will be further developed by the organisers in cooperation with other international organisations, such as IUCN (Connectivity Conservation Specialist Group/ Transport Working Group), to as input in CBD Conferences of Parties Egypt in November 2018 and China in 2020.

Friday / 11:30 – 12:30

Room: Foyer

Data for conservation: Towards the exchange of roadkill and wildlife observations in Europe

Dennis Wansink (The Habitat Foundation, Netherlands); Diemer Vercayie (Natuurpunt vzw, Belgium); Glenn Lelieveld (Zoogdiervereniging, Netherlands); Michal Bil (Transportation Research Centre, Czech Republic)

Roads form barriers for traveling and commuting animals. If animals try crossing a road, they might end up as road casualties. Many measures are invented to diminish these conflicts between human and animal commuting routes. To be effective, these measures have to be constructed in the right places. We need data, e.g., about hotspots of road casualties among animals to find the right places. Data about road casualties can also help to evaluate the effectiveness of measures taken: do they solve the problem or do they create new hotspots?

Currently, citizens are involved in recording sightings of animals in several European countries, in some cases with a particular focus on road kills. In Belgium, the Netherlands, Austria, and the UK citizen scientists record road kills on a continuous basis. Other countries, such as Sweden and the Czech Republic, base road kill monitoring systems on car crash data and make efforts to combine this with citizen science data from national nature observation platforms. However, many European countries don't monitor road kills, despite the many advantages of research and mitigation of road effects on wildlife and increasing driver safety. Existing monitoring systems differ. Some record incidental sightings of road kill, some record sightings along regularly travelled transects, and other countries do both. Earlier, data collected by drivers in the UK and the Netherlands lead to the identification of hot spots. The data could also be used to evaluate the effect

of roads on the viability of local species populations.

To learn more about the effects of roads on animal species, by identifying hotspots as well as by evaluating mitigation efficacy, we want to upgrade the citizen science projects on road casualties to a European wide level. Ideally, we plan to have a wildlife registration system in every European country in a couple of years. The systems can differ per country but the data collected should enable research on a European level. For example, to analyse differences between road kill hotspots, mitigation solutions, or scientific questions connected with the EU Green Infrastructure Strategy. In essence, the systems should collect more than just road kill data because the effects of roads on species populations extend further into the landscape than the road itself.

In this workshop, we will discuss the practical aspects of implementing registration systems in countries without such a system. It will also explain the exchangeability of the data from these systems to answer European wide road ecological questions. The aim is to come to road kill and wildlife observation systems in all European countries that deliver data for road ecology research on a European level. For a successful workshop we need participants with different backgrounds and different nationalities: (1) Scientists: for criteria to get useful data for scientific studies; (2) Volunteer managers: to suggest ideas for recruiting and motivating volunteers; (3) Tool builders: to discuss tools that facilitate the collection and sharing of data; (4) Road managers: for road management criteria; (5) Road authorities: for funding criteria.

The workshop will be structured as following:

1. Introduction

- Short introduction round.
- Short introduction to the goal(s) of the workshop and the used discussion methods.

- Presentation of 'Dieren onder de wielen' (road kill monitoring in Belgium). The presentation describes the registration system, fundamental success factors, the people involved and the scientific questions that can be answered with the data.

2. Listing issues to tackle

- Short discussion in small groups to find the main problems that the participants expect in (1) the establishment of national wildlife registration systems used by citizen scientists and (2) the exchange of data at a European level. The discussion will focus on practical aspects of setting up a national system. For example, whether to create a new registration platform (website and app) or to adopt an existing one, establishing a user community (citizen scientists), keeping citizen scientists engaged, guaranteeing the reliability of data, warrant the exchangeability of data, collecting enough data for statistical analysis, the cooperation of national road authorities, multiyear funds to keep the systems operational.
- In a plenary session, we create two lists of primary issues to tackle based on the feedback of the groups: one for national systems, one for research with data from different observation systems.

3. Listing solutions

- The participants will brainstorm in small groups about possible solutions for (a selection of) the main issues listed in the previous session. Each group treats one issue.
- Plenary session where each group presents the possible solutions.

The participants will be asked to take part in a project group. The project group will use the outcomes of the workshop to set up a strategy for the establishment of national observation systems and the use of the data for European wide scientific questions. The first two actions of the

WORKSHOPS

project group will be to find organisations that want to participate in the implementation of the strategy and to find funds to make this possible.

The results of the workshop, for example, the onset of a strategy plan, will be published on the IENE (conference) website and on the websites of the organisations that take part in the follow-up and implementation of the strategy. It will also be published on social media, including the LinkedIn and Facebook pages of IENE. Follow up activities might be organised under the umbrella of IENE, such as supported workshops and meetings, which will be announced on the IENE website and in emails sent to the members.

The goal at the end of the workshop is to create a team of people that will elaborate and carry out the strategy to come to a road kill and wildlife observation registration system in every European country that delivers data for research on (green) infrastructure and its effect on wildlife (populations) in Europe. Most likely the two first steps after the workshop will be:

1. Finding organisations that want to collaborate in as many European countries as possible;
2. Finding funds.

Friday / 11:30 – 12:30

Room: Venus

KDE+ workshop: New approaches to WVC hotspot identifications

*Michal Bíl, Jiří Sedoník, Richard Andrášik
(CDV – Transport Research Centre, Czech Republic)*

The first KDE+ workshop was held in Lyon during the IENE conference in 2016. The idea behind this second KDE+ workshop is to allow the attendees to receive information on new developments with this software and test it on actual data. This event is planned as a practical exercise for researchers equipped with their laptops. A concise overview of the theoretical background will be provided, but we encourage the attendees to study the very basics of the KDE+ method in advance (www.kdeplus.cz). We want to present the recent developments of the method to existing and new KDE+ users. This workshop is opened for everyone interested in both theoretical and practical approaches of WVC hotspots identification using KDE+.

Although there are no limitations to the number of participants, we encourage the participants who would like to work actively with the software to register at gis@cdv.cz. Do not hesitate to bring along data. We strongly encourage the attendees to have their data ready for the analyses. Only road network data and WVC data are necessary. Inform yourself in advance if your data are suitable for the analyses. The workshop organisers are ready to check the data quality in advance. It is no problem if you do not have data. The organisers will provide you with sample test data. Do not forget to bring your computer.

The KDE+ method has been implemented into two forms: a standalone JAVA app that will run on both Windows or Apple platforms and an ArcGIS Toolbox. In the latter case, you have to have ArcGIS 10.1 – 10.5 installed. The

JAVA app requires input data being in CSV files or shape files. The ArcGIS Toolbox process only shapefiles. The workshop is intended for users who can work with a GIS or with spatial data in general. However, other users, for example, practitioners, field workers, and decision makers are also welcome to attend the workshop.

The workshop is planned to take one hour only, but feel free to ask the workshop organisers during the conference. We recommend the prospective workshop attendees to send us their data before the workshop so we can check its quality. Time needed for hotspots computation varies according to the number of roads and WVC data. It is not necessary to have analysed the entire country during the workshop, only a few selected roads or a small region would be enough to obtain an idea of how the software works and how to interpret the results.

Friday / 11:30 – 12:30

Room: Grand Café

Avenues and other trees in rural landscapes: How to maximise their ecological and social benefits as Green Infrastructure

Piotr Tyszko-Chmielowiec (Foundation for Sustainable Development, Poland)

In the past, roads and other transportation infrastructure have been perceived only as a barrier for many organisms. However, their role as green infrastructure for biological diversity is increasingly appreciated. Trees are an essential part of many traditional European landscapes, both urban and rural. In these anthropogenic environments, they help to maintain biodiversity and ecological equilibrium as habitats and ecological corridors. Insects, birds, lichens, fungi, and mammals (e.g., dormice) use avenues and other trees in open environments. EU and national regulations protect many of the mentioned organisms. However, trees are also among the least appreciated elements of the green infrastructure, often taken for granted by both society and tree managers. The management of trees is often ineffective in European countries. As a consequence, the resource becomes impoverished. Roadside trees have been disappearing in recent decades from European countries, due to hasty road modernisation and mismanagement. Replanting is rare. The growing trees are often subject to improper care practices, which reduces their life expectancy and impacts public safety, generating criticism of trees in media. How to reconcile the presence of trees with other types of infrastructure, such as roads, railways and canals are particularly challenging. Using synergies between the green, grey and blue infrastructures will maximise the trees' benefits. At the 2016 IENE conference in Lyon, there was a separate session on tree avenues as ecological corridors. The final declaration called to "Recognise the importance of trees in HTI for the ecosystem services

they provide in cultural landscapes as well as their role as habitat for small fauna".

The goals of this workshop are: (1) To explore how trees in rural landscapes, particularly roadside trees, contribute to ecological connectivity - being a backbone of biodiversity in rural landscapes and providing numerous benefits to society, including climate change mitigation and providing life quality; (2) To explore threats to trees and discuss how they can be preserved (good practices); (3) To formulate recommendations for management of trees as green infrastructure to maximise the benefits to nature and society. Emphasis will be put on roadside trees (avenues). However, other settings will also be considered, such as trees along waterways, urban trees, trees in agricultural fields. Target groups for the workshop are: (1) Biologists researching ecosystems of road verges; (2) Conservationists working to protect traditional landscapes; (3) Infrastructure managers and designers.

The workshop will be structured as follows:

- Introduction and discussion to define the role of trees in Green Infrastructure;
- Reviewing threats to trees;
- Exchanging best practices;
- Formulating recommendations - for management and policy.

The outcomes of the workshop will contribute to the final declaration of the conference. The complete outcomes will be used in the framework of the LIFE project "Trees for Europe's Green Infrastructure" in working groups elaborating specific recommendations. They also will be disseminated through seminars in Brussels (planned for the year 2019), Germany, and Poland. The products of the project will be presented at next IENE conference in 2020.

Friday / 11:30 – 12:30

Room: Saturn

Crossing borders between ecological planning and engineering technology to achieve faster approval procedures and better species and habitat protection

Sven Reiter (*Landesamt für Straßenbau und Verkehr M-V, Germany*); Jörg Borkenhagen (*Bosch & Partner GmbH, Germany*)

Measures of landscape planning - especially in the field of species and habitat protection – need to be directly effective (without a scientific doubt) under European law. The commonly used measures of landscape planners dealing with the planting of vegetation are often not adequate (plantings are susceptible to interferences, only have long-term and limited spatial effects). Therefore, measures for species and habitat protection have to become more technical-oriented; especially to avoid time lags. Sometimes, a kind of particular vegetation technology is necessary. The realisation of an infrastructure project is often dependent upon the most creative and useful application of particular technical solutions for the protection of species or habitats. Nevertheless, many projects suffer from the lack of adequate technical solutions. Sometimes projects fail, or projects are delayed because no (technical) solution was found. The workshop gives better understanding and stimulates a better cooperation between landscapers and engineers and aims to identify and discuss best practice examples of timely solutions.

The content and the strategy for the workshop are presented using five examples.

1. Mobile protective walls as a measure of damage limitation and preventive measures (for a lot of impacts in Natura 2000 Areas) like crossing aids for birds and bats, barriers to prevent animals from entering the construction area;
2. Technical protection of lizards (e.g.,

Lacerta muralis, *Lacerta agilis*) against predators as a part of the relocation of populations (continuous ecological functionality measures, CEF measures);

3. Installing of technical markers on wires of existing power lines as „favourable conservation status“, FCS measures to compensate bird strikes (directly effective mitigation measure for collision risk at a bridge for the same population of birds);
4. Transplanting of large trees to protect populations of xylobiont beetles (e.g., *Osmoderma eremita*);
5. Construction of Benjes hedges to reach directly useful structures (relinking, breeding or hunting habitats for birds).

A lot of relevant species and habitat protection measures can be realised in certain cases by directly effective and most innovative technical solutions. The relevance of the best technical solution to solve ecological problems is presented in case studies from the poster session of the FGSV (see below). The aim is to motivate participants to create posters for the best practice collection of the FGSV. The discussion will be structured as follows:

1. The participants are expected to comment on the solutions presented.
2. Discussion:
 - How can we achieve directly effective measures regarding damage limitation or mitigation?
 - How can we use all possibilities of technical potential to get the best result, which means to speed up projects and reach legal security?
 - How do we need to optimise the application of engineering technology in the field of species and habitat protection?

During the discussion, the participants should briefly present other cases of best practice examples of their own country or experience. Additional information on the best practice collection can be found on the website of the Forschungsgesellschaft für Straßen- und Verkehrswesen (FGSV, Cologne (<http://www.fgsv.de/gremien/strassenentwurf/landschaftsgestaltung/296-landschaftspflegerische-kompensationsmassnahmen.html>)).

www.fgsv.de/gremien/strassenentwurf/landschaftsgestaltung/296-landschaftspflegerische-kompensationsmassnahmen.html).

The organiser of the workshops will create posters of the workshop results and upload them to the FGSV platform. Posters and other input papers of the participants will be uploaded as well. So far, the collection contains about 140 posters. The poster sessions are already internationally organised (in German and English). Beside various German examples the following countries are involved: Austria, Switzerland, Luxemburg, Poland. The website is operated professionally and will be updated on a regular basis. Therefore, long-term documentation of the findings is ensured. The poster sessions have been used in a research project of the „Bundesanstalt für Straßenwesen, (BASt)“. Based on the research project, some guidelines of German infrastructure planning (concerning risk management and mitigation in particular) have been developed or updated. The results of the IENE workshop will be part of updates or intended guidelines of the FGSV and will be published in national („Straße und Autobahn“, „Straßenverkehrstechnik“) and international journals.

Friday / 11:30 – 12:30

Room: Neptune

Challenges for assessing mitigation effectiveness: Is there an ideal study design?

Fernanda Z. Teixeira (Graduate Program in Analysis and Modelling of Environmental Systems, Federal University of Minas Gerais / Road and Railroad Ecology Group, Federal University of Rio Grande do Sul, Brazil); Kylie Soanes (School of Ecosystem and Forest Science, The University of Melbourne, Australia); Rodney van der Ree (School of BioSciences, The University of Melbourne, Australia); Scott Findlay (Department of Biology, Institute of Environment & Institute for Science, Society and Policy, University of Ottawa, Canada); Jochen A. G. Jaeger (Geography, Planning and Environment Department, Concordia University, Canada); Edgar van der Grift (Wageningen University and Research, Netherlands)

In order to mitigate road impacts, a variety of mitigation measures have been implemented on roads worldwide. The costs vary widely according to the type of measure, but expenses associated with mitigation implementation and maintenance can be an important part of a road budget. Although impressive efforts are invested in mitigation, proportional investments do not follow these in assessing mitigation effectiveness. Recent literature has pointed out that little is known about what types of measures are most effective and if mitigation measures are actually mitigating road effects at all. A common problem in these mitigation studies is that study designs employed are usually inadequate to assess the effectiveness of mitigation measures.

This workshop aims to discuss how monitoring studies can be improved to better assess mitigation effectiveness and generate knowledge that can be applied to other roads. The workshop targets an audience of researchers and practitioners, including both road

managers and environmental consultants. The workshop will be 60 minutes in length and structured in three different moments: a short presentation, discussion in small groups, and a general discussion with all participants. The organisers will present a few study designs that ideally would be applied to assess mitigation effectiveness. This will be a brief introduction about the challenges of assessing mitigation effectiveness, where ideal study designs required to answer important questions about effectiveness will be presented to participants as topics for discussion. Then, the audience will be divided in small groups where they will be asked to list positive and negative aspects, as well as feasible and impractical aspects of each study design. Finally, a discussion involving all participants will be facilitated in the third moment of the workshop with the goal of first sharing the discussions taken within each group and latter synthesizing the ideas.

The facilitator will lead the discussion using participatory tools, first by gathering the ideas from participants of each group and then using stacking rounds to encourage the involvement of all participants. Seating arrangements will be made to allow maximum interaction between attendees. Tracking will be used to follow important elements of the topics being discussed and to synthesize the main topics. Expected outcomes of this workshop are the identification of any gaps in understanding, in expectations, and in feasibility about mitigation studies. We seek to identify barriers to the implementation of satisfactory study designs from the perspective of road planners and managers. The main findings of the workshop will be a synthesis about positive and negative, and feasible and impractical aspects of each study design for monitoring mitigation effectiveness based on researchers and practitioner experience, with recommendations about study designs for the assessment of mitigation effectiveness. These findings will be communicated in

an opinion paper to be written after the workshop where we will discuss how studies can be improved to counteract negative and unfeasible aspects while guaranteeing good designs, as well as presenting the opportunities and challenges for their implementation. By integrating researchers, road planners, and managers in an interactive way, this workshop can help to decrease the gap between the questions about mitigation effectiveness that need to be answered and the efforts necessary for answering them.