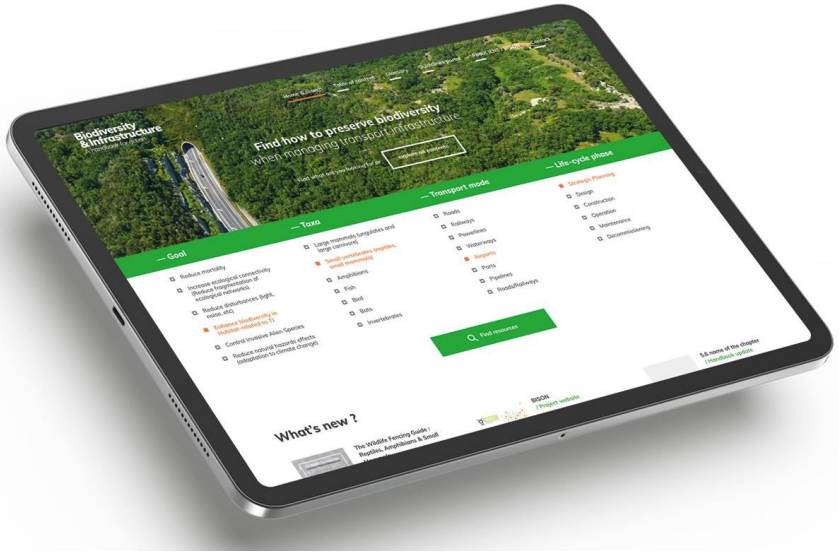


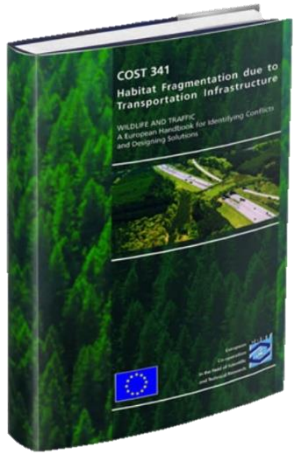

# ‘Biodiversity and Infrastructure. A handbook for action’

Carme Rosell, Luis M. Fernández, Eric Guinard, Sylvain Moulherat
**Infrastructure & Ecology Network Europe (IENE), BISON Consortium**
**Minuartia, CEREMA, UPGE**

# Agenda

1. Introducing the tool
   - Background / ‘Making of’
   - Main features
   - Overview
2. Search examples
3. Chapter’s contents
4. Future development

# Background



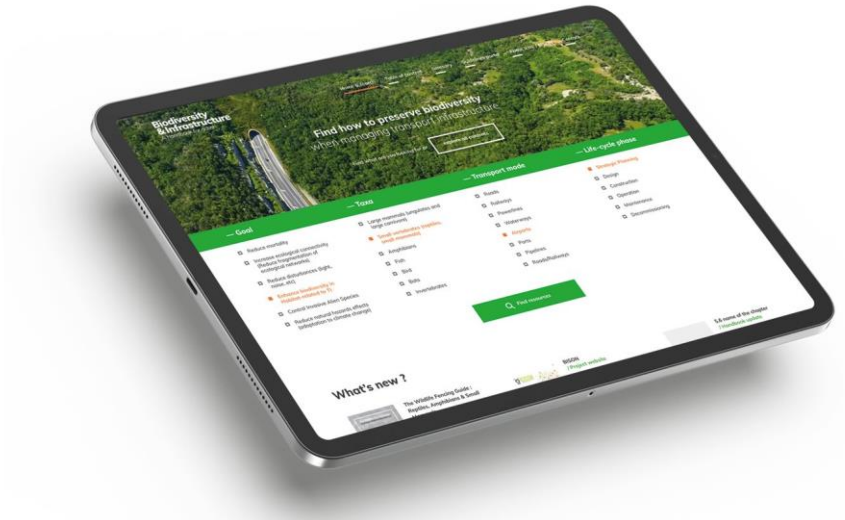

**Based upon**
**‘Wildlife & Traffic’ (2003)**
COST Action 341.
European Commission.
Promoted by IENE, Rijkswaterstaat (NL) and 18 partners.


Update and website development by Infra Eco Network Europe (IENE) Working Group (2020). Swedish Transport Administration, Conference of European Director of Roads (CEDR), French Ministry for Ecological Transition (MTES).

IENE Infrastructure & Ecology Network Europe

BISON BIODIVERSITY AND INFRASTRUCTURE SYNERGIES AND OPPORTUNITIES FOR EUROPEAN TRANSPORT NETWORKS

This project has received funding from the European Union's Horizon 2020 research and innovation Programme under grant agreement No 101006661.




New online handbook

**‘Biodiversity and Infrastructure’ (2023)**

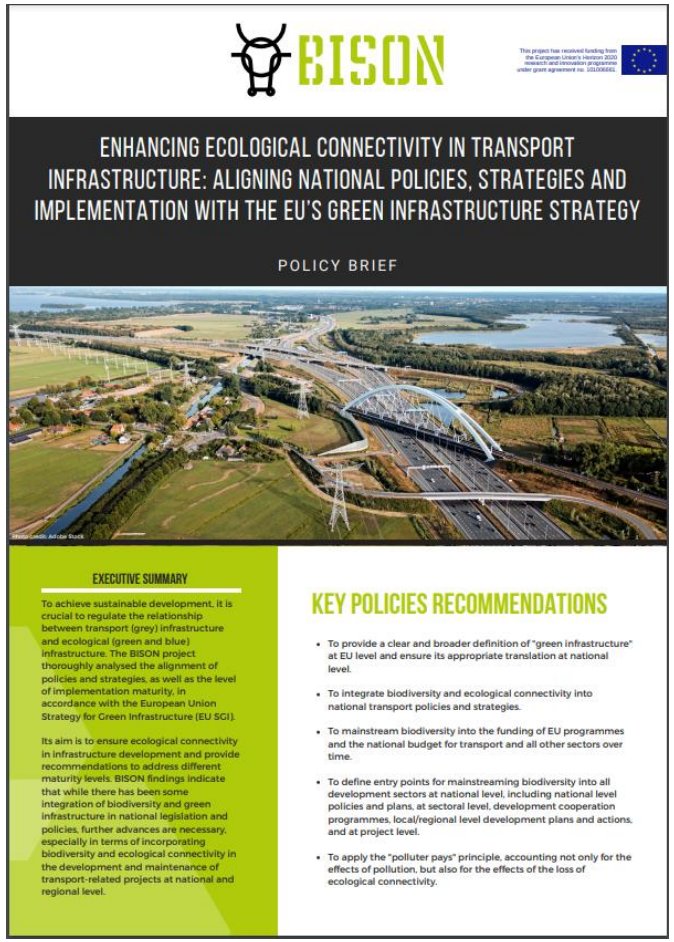
Project Horizon 2020 ‘BISON’
44 partners 16 countries

IENE undertakes management and update

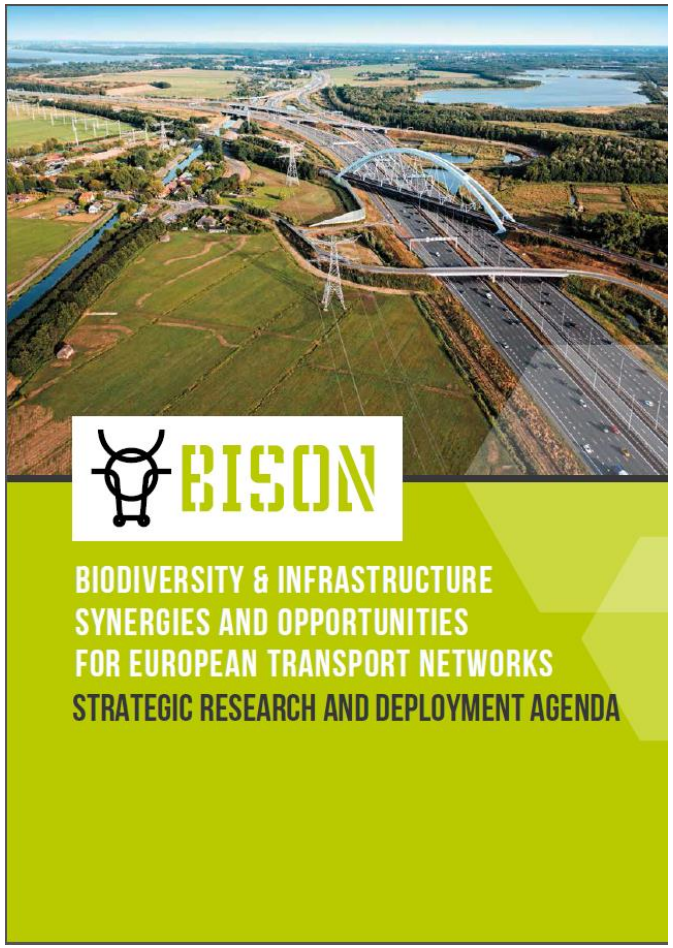
# Find all the BISON project  Outcomes

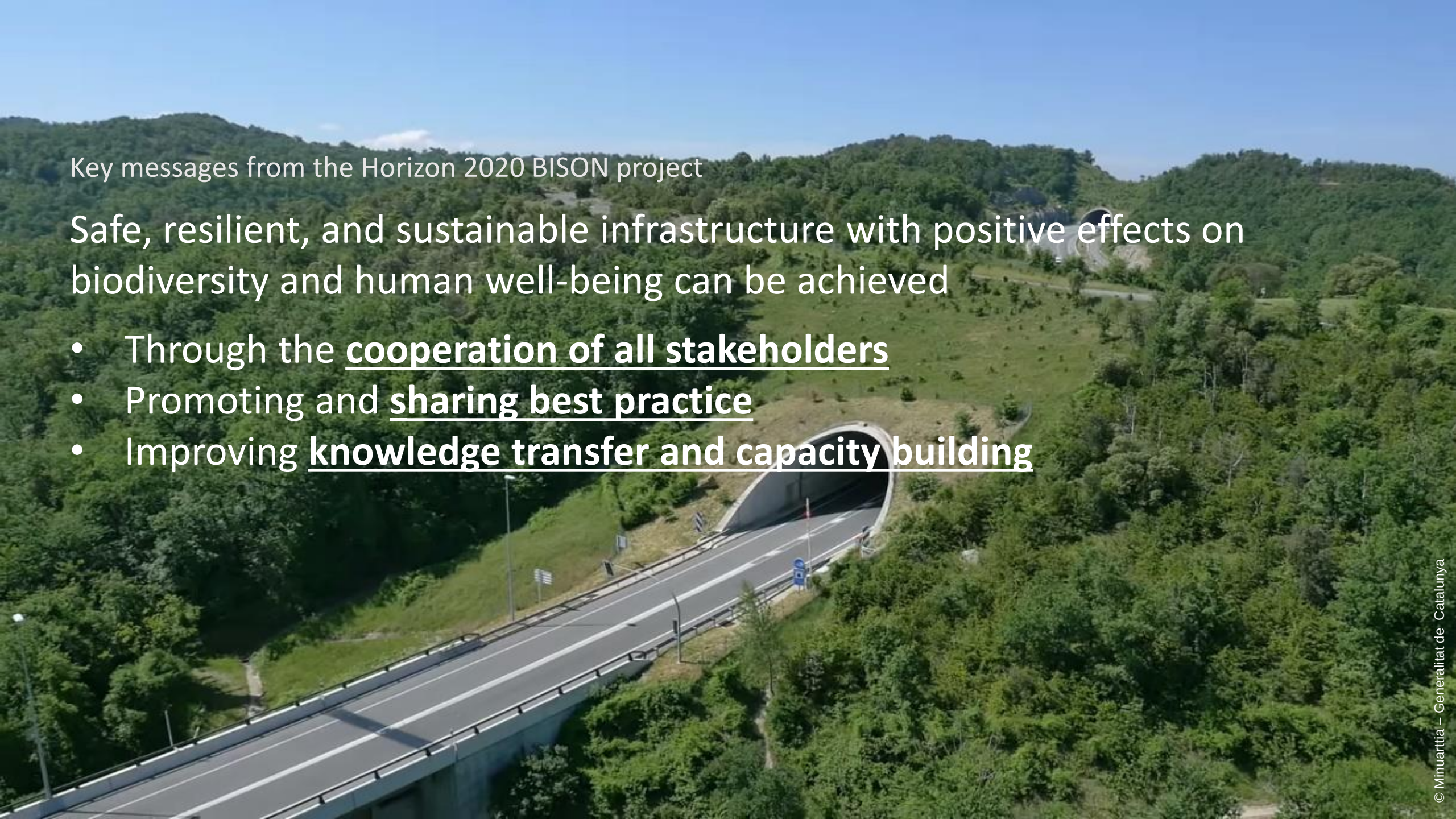
https://bison-transport.eu/

Policy Briefs




Strategic Research Development Agenda





Key messages from the Horizon 2020 BISON project

# Safe, resilient, and sustainable infrastructure with positive effects on biodiversity and human well-being can be achieved

- Through the **cooperation of all stakeholders**
- Promoting and **sharing best practice**
- Improving **knowledge transfer and capacity building**

# The ‘Making of’ – Cooperative knowledge

## 70 people; 15 countries working together (BISON framework)

Main authors: Carme Rosell (MINUARTIA), Andreas Seiler (SLU), Hlavac Vaclav (NCA), Sylvain Moulherat (UPGE), Eric Guinard (CEREMA)

Co-authors: Alain Morand, Alfred Figueres; Alix Aliaga, Allan Rauline, Antonio Righetti, Cécile Eicher, Chloé Desplechin, David Magnier, Dorothée Labarraque, Fabien Claireau, Fabien Paquier, François Nowicki, Heinrich Reck, Jean Guilmain, Joana Colomer, Joanna Gornia, Jules Boileau, Lazaros Georgiadis, Luc Chrétien, Luis M. Fernández, Manon Teillagorry, Marcus Elstrom, Marguerite Trocmé, Marina Torrellas, Marita Böettcher, Michal Bil, Miriam Herold, Nicolas Hette-Tronquart, Olivier Pichard, Ondine Deyrieux, Pia Bartels, Pierre-Yves Belan, Pinar Yilmazer, Radu Mot, Roser Campeny, Silvia Zumbach, Silviu Petrovan, Sophie Bonnin, Sophie Mènard, Stefan Suter, Thomas Schwab & Yannick Autret.

Contributors/Reviewers: Albert Cama; Anders Sjolund; Antonio Mira; Caryl Buton; Cora Cremezi-Charlet; Christophe Girod; Dror Denneboom; Edgar van der Grift; Eugene O´Brien; Elizabeth Losos; Elke Hahn; Jan Olof Helldin; Falko Brieger; Franz Hölker; Hans Bekker; Lisa Garnier; Manisha Bhardwaj; Vincent O´Malley & Wendy Collison.

Editors: Carme Rosell, Diego Juffe Bignoli & Andreas Seiler

English editors: Paul O´Hare (MINUARTIA); Tony Sangwine

Graphic designers: Pep Gaspá (AT Comunicació); François Nowicki (CEREMA); John Alertas (CERTH); Victor Adorno (MINUARTIA), Martin Sombsthay (TerrOïko).

Other external organisations

# Bridging research and practice
# A tool to provide … and to gather knowledge

www.biodiversityinfrastructure.org

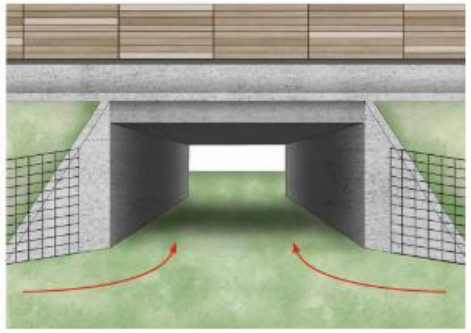

- Knowledge
- Needs for innovation and research ('non-mature' measures and technologies)

→

- Gather comments from users
- Compile new guidelines
- New knowledge and resources

←

# Biodiversity and Infrastructure. A handbook for action



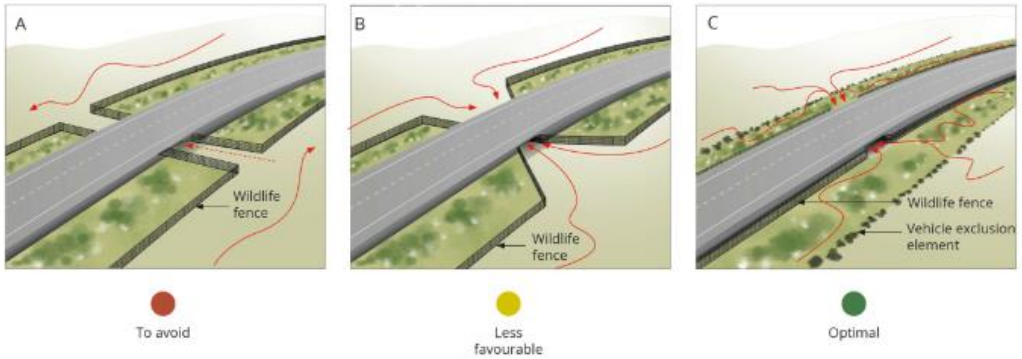
Source: Rosell et al., 2023

## Knowledge

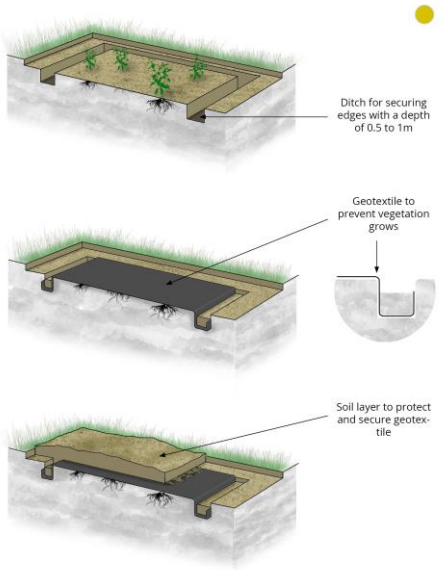
- ✓ Evidence-based
- ✓ Oriented to action
- ✓ Feasible and effective
- ✓ Innovative
- ✓ Useful for training

# Biodiversity and Infrastructure. A handbook for action

## Fostering application of best practice




Rosell et al., 2023 (adapted from Cerema, 2021).



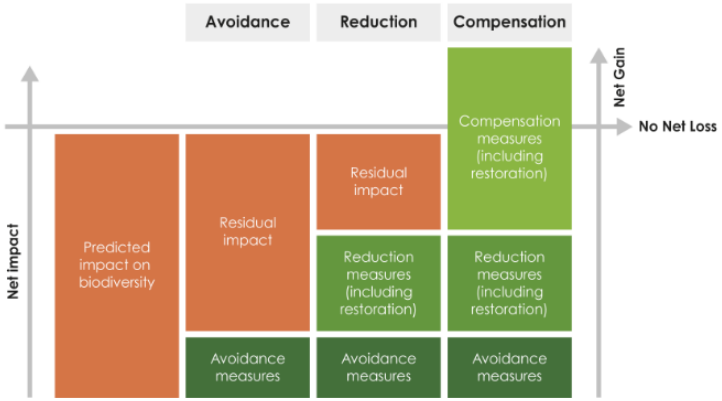

Rosell et al., 2023 (adapted from Bernd Walser, Regierungspräsidium Freiburg).

- To avoid
- Less favourable
  More research required
- Optimal

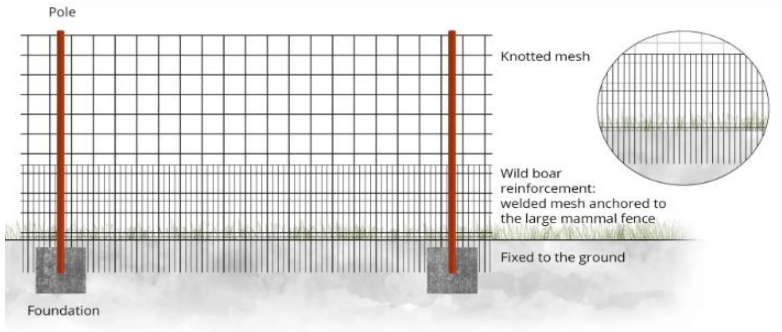
- ✓ Stop using ineffective measures
- ✓ Promote research to evaluate effectiveness
- ✓ Promote research to complete knowledge gaps

# Biodiversity and Infrastructure. A handbook for action

## 300 pictures and 120 technical drawings and infographics




Source: Moulherat et al., 2023; adapted from BBOP, 2012




Source: Rosell et al., 2023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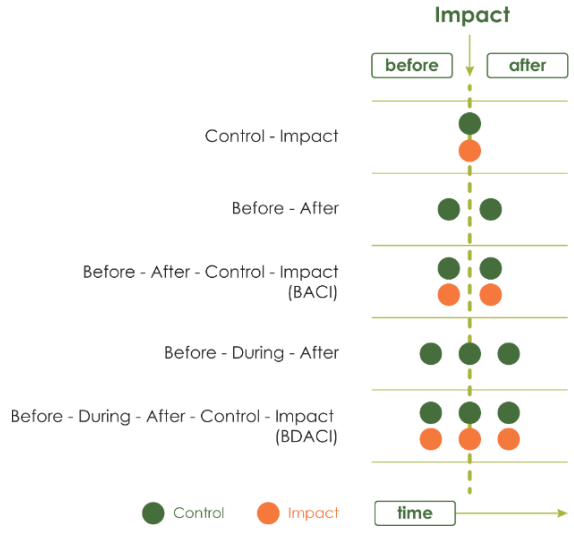



Source: Guinard et al., 2023; adapted from Sordello et al., 2019

# Online handbook overview: 7 Chapters

www.biodiversityinfrastructure.org



Provides knowledge, solutions, and innovative measures to reduce the ecological impact of infrastructure and traffic.

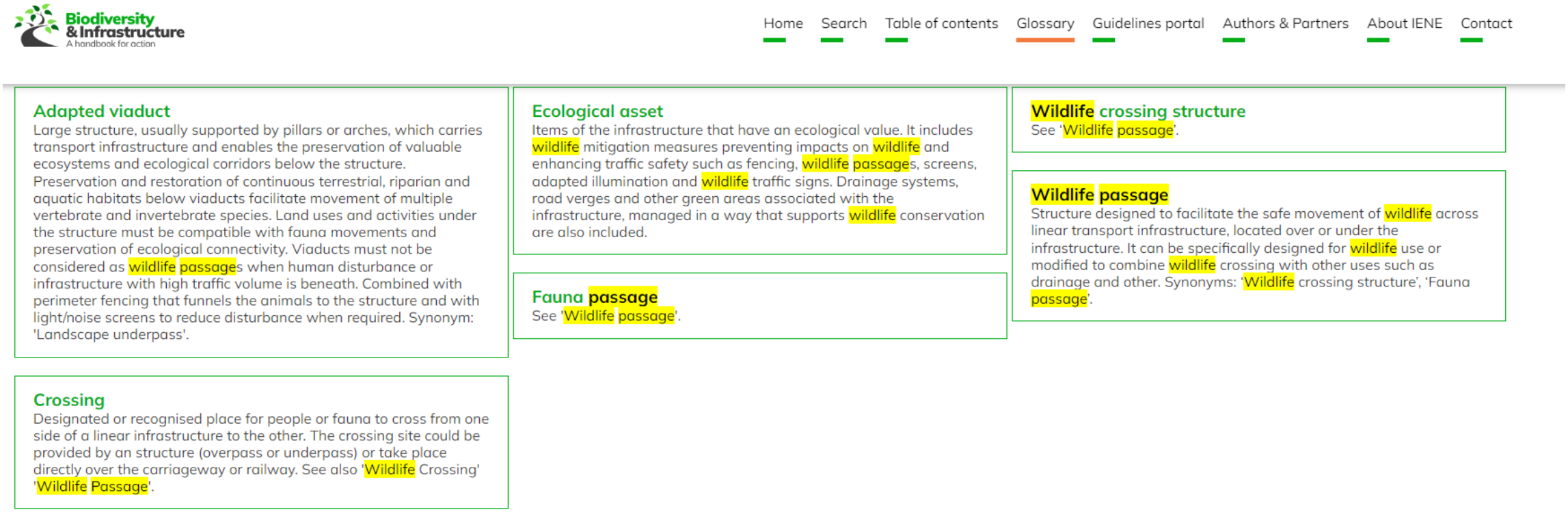
Promotes the application of Nature-Based Solutions and encourages to reduce habitat fragmentation, enhance Green Infrastructure and restore nature.

# Online handbook overview: a Glossary

‘Using a common vocabulary is the basis to undertake interdisciplinary cooperative work’

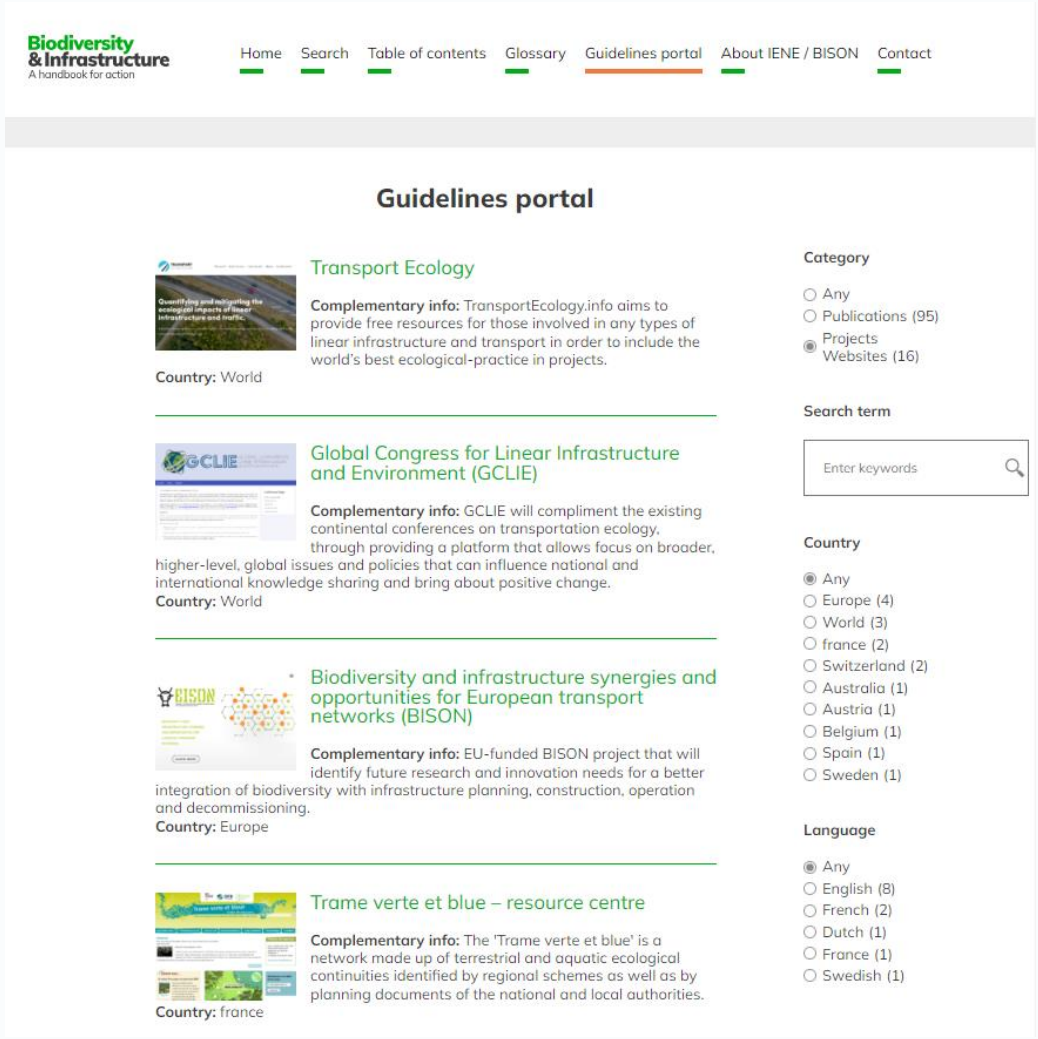
Cooperation with

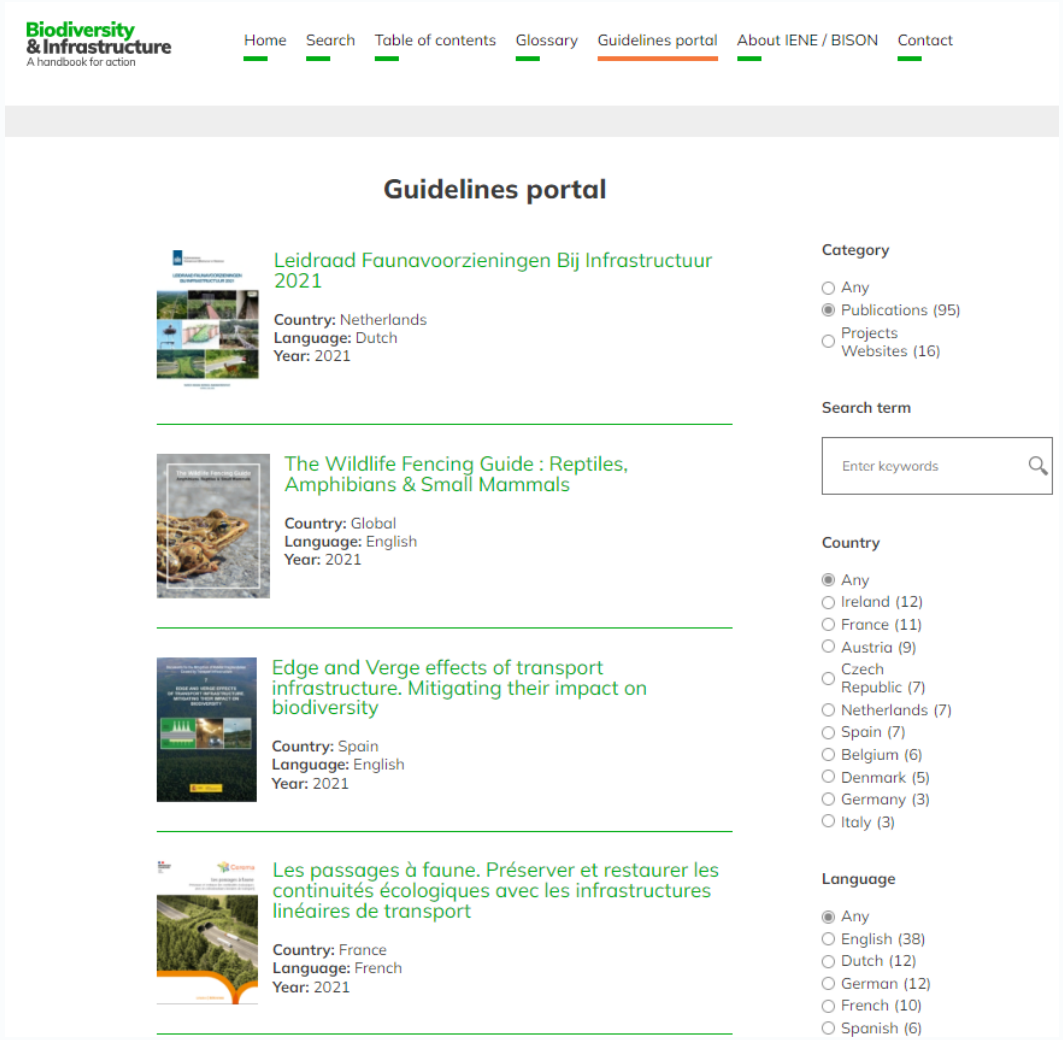
- PIARC: Biodiversity Group & Technical Committee 3.4
- ISO TC 331 Working Group on Biodiversity.
- French Ministry for Ecological Transition



# Online handbook overview: a Guidelines portal

Access to projects, guidelines and standards on the topic



# Agenda

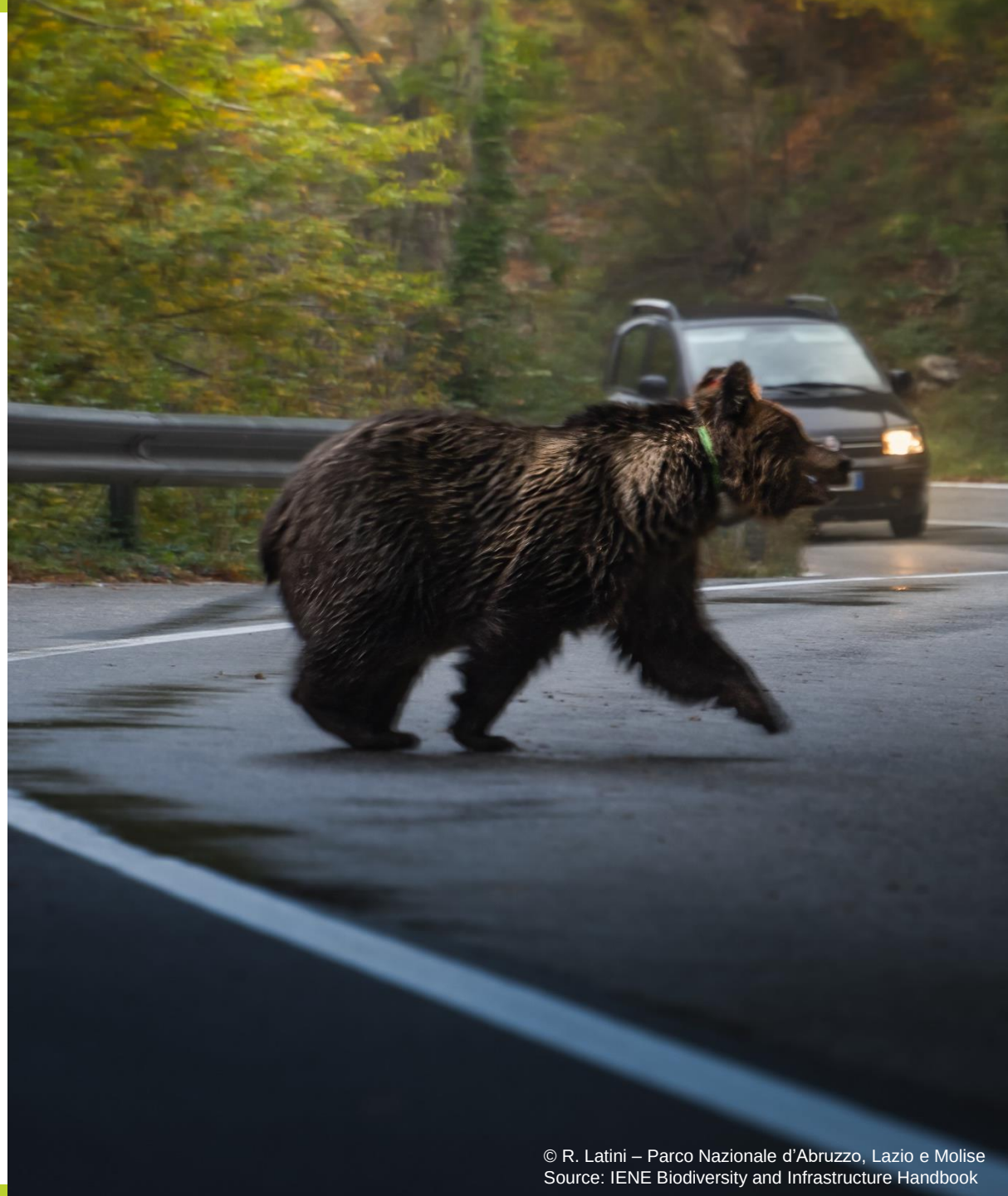
1. Introducing the tool

2. Search examples

   - How to reduce amphibian mortality?
   - What measures are available to protect bats?
   - What should be considered at the ‘Design’ phase?
   - How to provide feedback about a specific measure?
   - What term must be used for a specific type of wildlife passage?
   - Are there any guidelines in my language?

3. Chapter’s contents

4. Future development




Source: IENE Biodiversity and Infrastructure Handbook

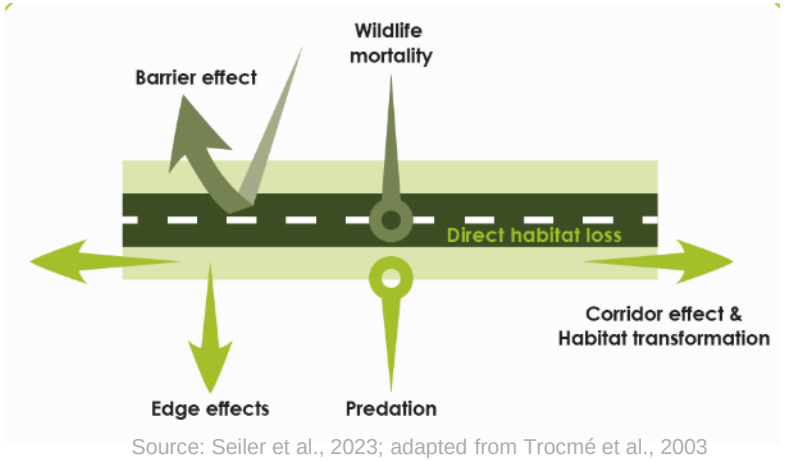
Agenda

1. Introducing the tool
2. Search examples

3. Chapter’s contents

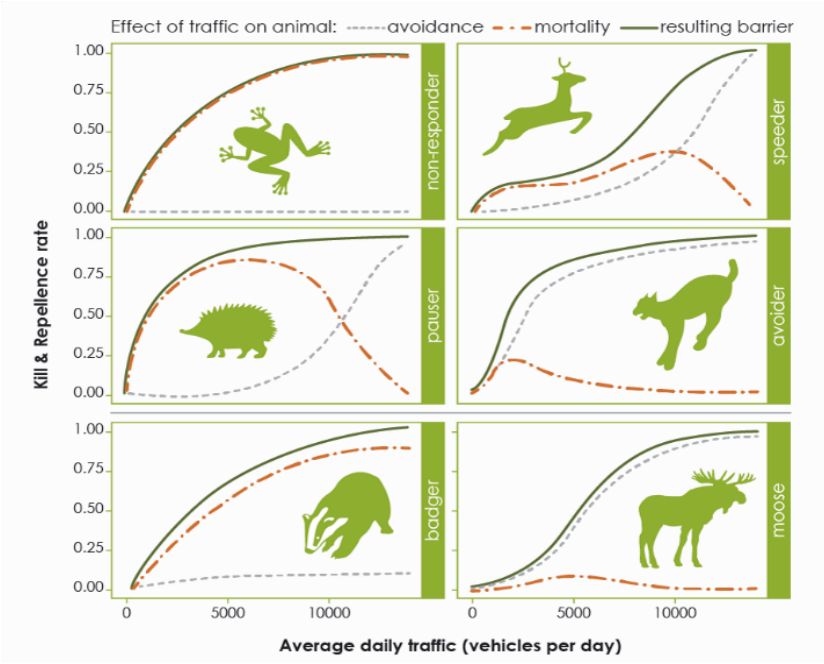
4. Future development

# Ch 1. Ecological effects of infrastructure



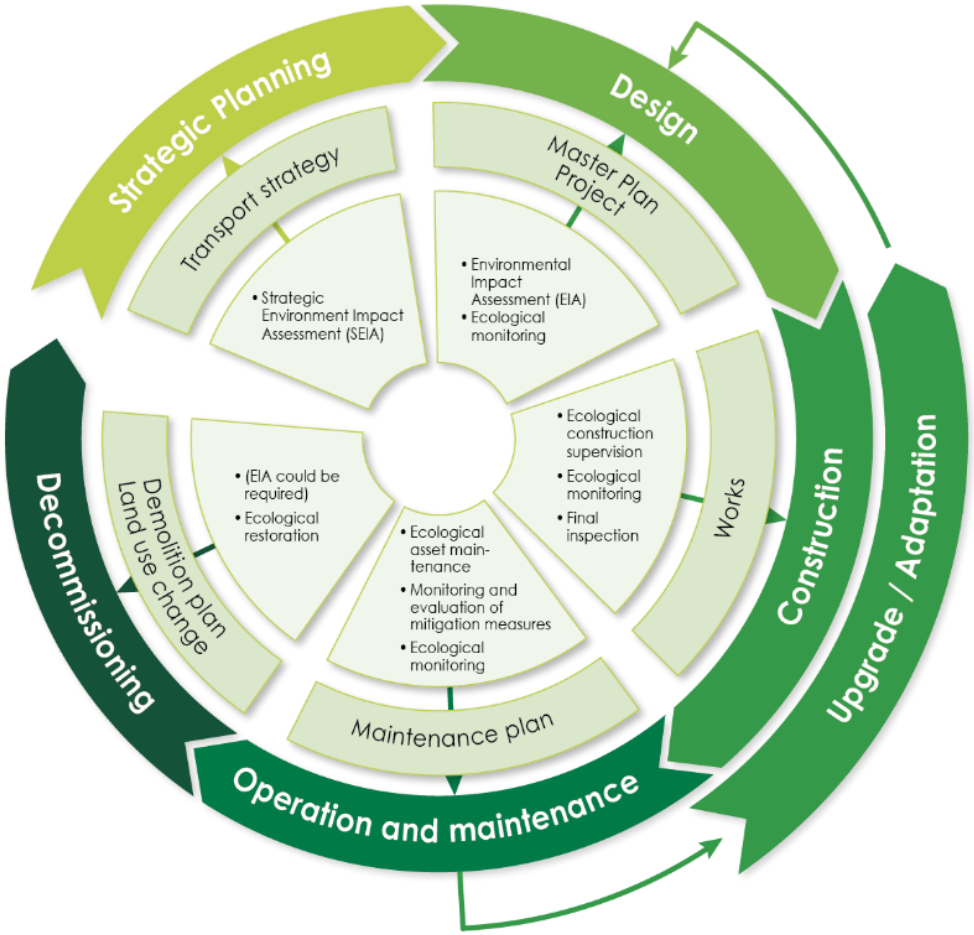

Source: Seiler et al., 2023; adapted from Trocmé et al., 2003


- Basic concepts
- Primary effects (Habitat loss; Wildlife mortality; Barrier effect; Edge effects; Habitat transformation
- Secondary effects (Landscape fragmentation; Cumulative effects)
- References




Source: Seiler et al., 2023; adapted from Seiler et al 2016

# Ch 2. Policy, strategy and planning

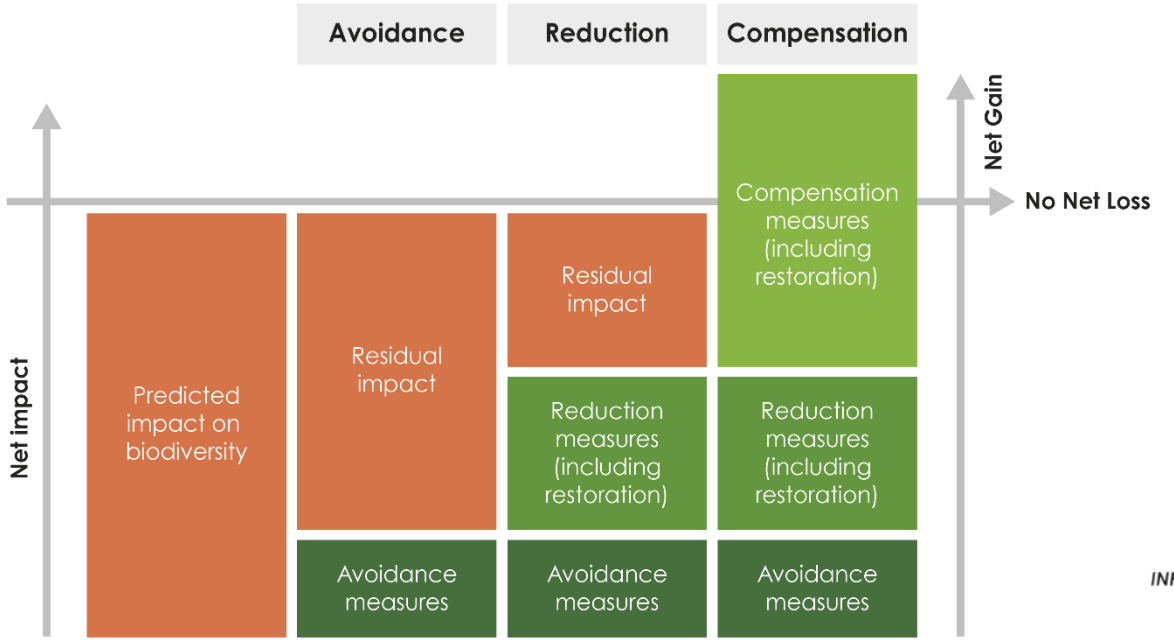



Source: Hlavac et al., 2023

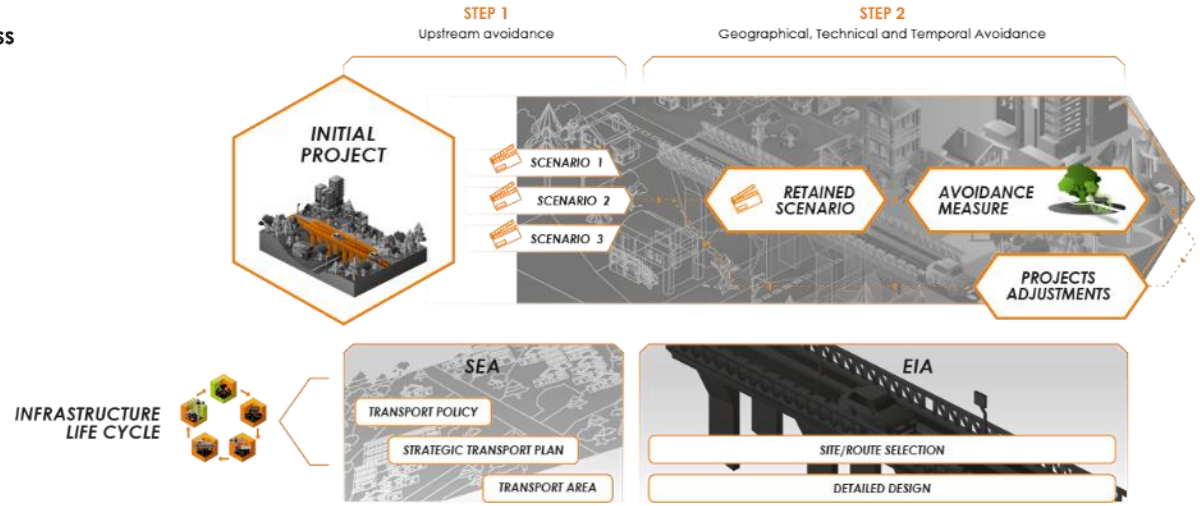
- Biodiversity within infrastructure life cycle
- Strategic planning
- Design
- Construction
- Operation and maintenance
- Decommission
- Upgrade/Adaptation

# Ch 3. The mitigation hierarchy

- Concept, regulation and practice
- Avoidance
- Reduction
- Compensation
- Cumulative effect management




Source: Moulherat et al., 2023; adapted from BBOP, 2012




Source: Moulherat et al., 2023

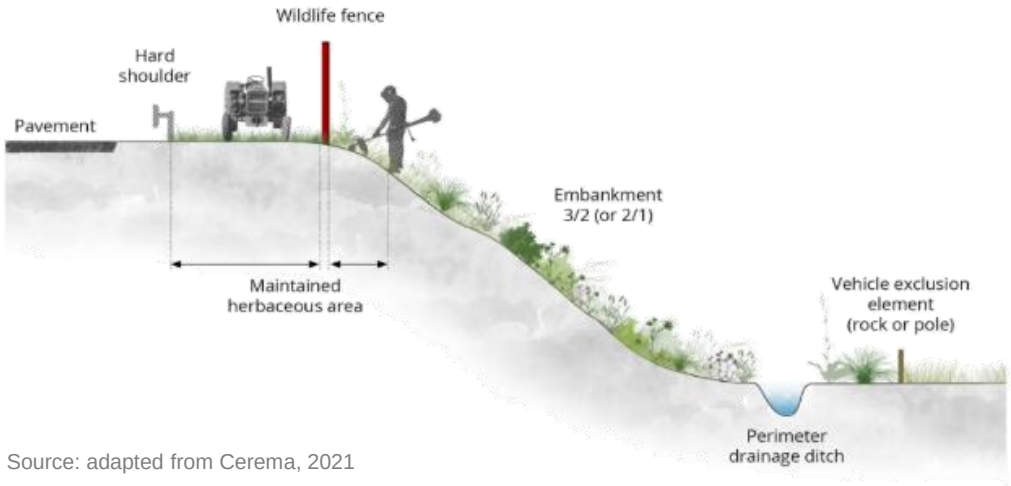
# Ch 4. Integration of infrastructure into the landscape

**Interconnection among main international sustainability goals concerned by transport infrastructure**


Source: Moulherat et al., 2023

- Integrated landscape management
- Management at landscape scale
- Technical solutions to integrate transport infrastructure into the landscape

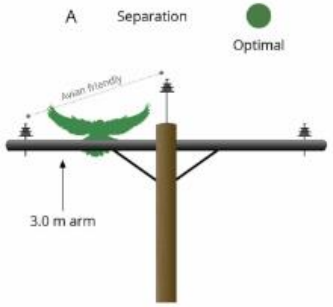
# Ch 5. Solutions to mitigate impacts and benefit nature

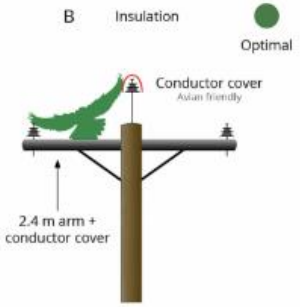



Source: adapted from Cerema, 2021

- Fencing
- Driver warnings
- Wildlife deterrents
- Wildlife passages
- Measures to reduce disturbance
- Habitat related to transport infrastructure
- Invasive Alien Species (IAS)
- Adaptation of infrastructure to climate change: risks and opportunities for biodiversity
- Measures to reduce impacts from other transport modes

Source: Rosell et al., 2023



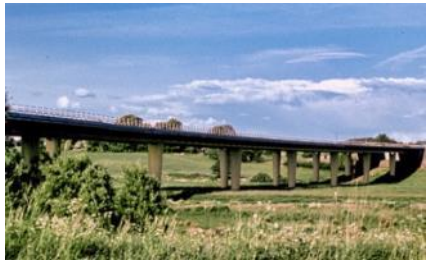




# Ch 5. Solutions to mitigate impacts and benefit nature

## Key measures contributing to preserve and restore ecological connectivity

© Minuartia

Landscape overpass
Ecoduct
Green bridge



© A. Seiler

Adapted viaduct
Landscape underpass

© Cerema

Wildlife overpass
Fauna overpass

© C. Boschi

Wildlife underpass
Fauna underpass

© F. Nowicki

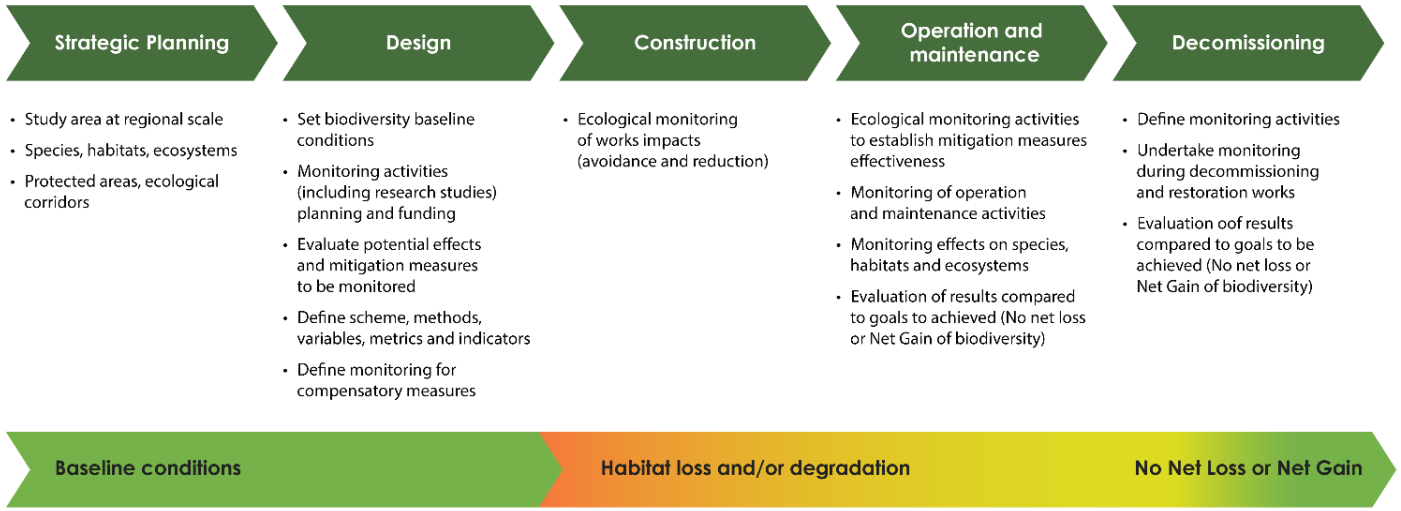
Multiuse overpass

© Minuartia

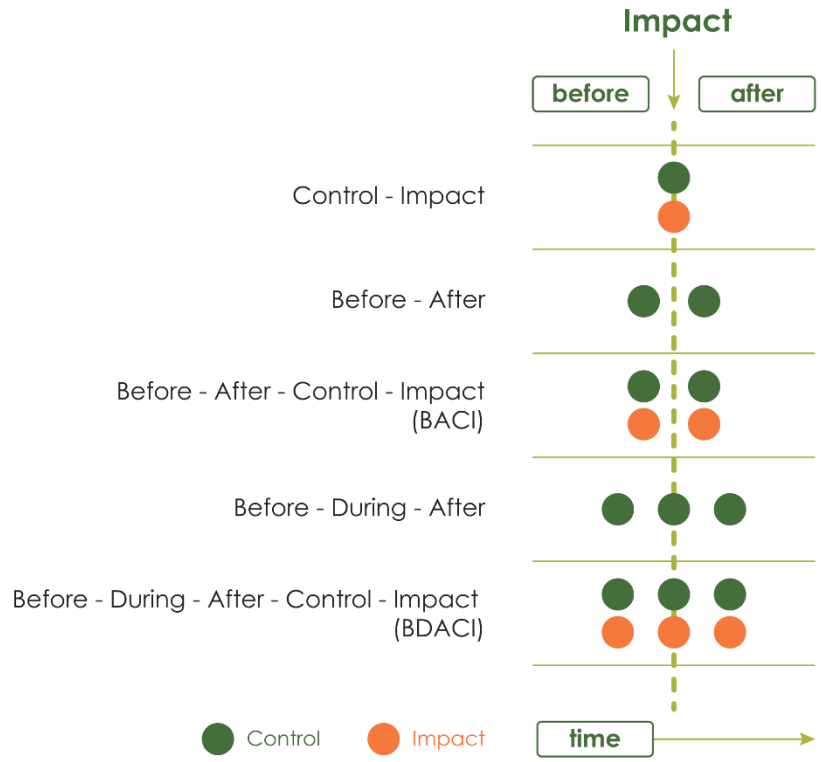
Multiuse underpass

# Ch 6. Evaluation and monitoring

- General principles
- Monitoring plan
- Field techniques




Source: Guinard et al 2023, Adapted from CEREMA unpublished




Source: Guinard et al 2023. Adapted from Sordello et al., 2019

# Ch 7. Maintenance

From: ‘Wildlife and Traffic’ Ch 10.
Produced in cooperation with CEDR

- Developing adaptive maintenance of ecological assets
- Maintenance requirements
- Maintenance tasks sheets

## Maintenance of fencing: meshes and poles

**INSPECTION TASKS To check**

- ☐ Poles are well-fixed to the ground and stable.
- ☐ Mesh is not broken or deformed.
- ☐ Mesh is well-fixed to the ground or to the protection against digging.
- ☐ Mesh is well-fixed to the crossing structure walls or to screens.
- ☐ Reinforcing mesh is well-anchored to the main mesh.
- ☐ Intersections of fences with perimeter drainage ditches are well-protected to stop animals from entering.
- ☐ Branches or other vegetation elements are not damaging the fence.

**SPECIFIC MAINTENANCE TASKS To do**

- → Change any pole that is broken or damaged and fix any unstable posts.
- → Repair or replace broken or deformed meshes. Replace any anchorages to fix the mesh to the poles and/or to the ground that are corroded or broken.
- → Install reinforcement meshes or protection against digging by wild boar, rabbits or other target species when required. Anchor reinforcing elements to main fence and bury their bottom section into the ground.
- → Consider replacing the existing fence when its design or materials are inappropriate, and it requires considerable effort and cost to maintain.
- → Restrict access and/or educate and inform local stakeholders in case of repeated damage caused by people.
- → Regularly mow and prune bushes or tree branches to avoid fence damage. Maintaining a narrow corridor along the fence free of trees and bushes allows field crews to undertake maintenance tasks.

**SCHEDULE**

- Minimum: once a year, just before seasonal migrations or periods when target species movements are increased.
- Mowing and pruning vegetation should be scheduled according to local conditions.
- More frequent inspection may be required in sections that are repeatedly damaged.
- Additional inspections should be planned following floods, strong winds, snow or other adverse weather events.

Biodiversity and Infrastructure Handbook. Ch 7 Maintenance of ecological asset on transport infrastructure.

## Maintenance of landscape, wildlife and multiuse overpasses

**INSPECTION TASKS To check**

- ☐ Materials and drainage of the surface are appropriate.
- ☐ No human misuse of the structure is found.
- ☐ In multiuse overpasses, provisions to make human and wildlife uses compatible (guiding fences, informative panels, etc.) are appropriately maintained.
- ☐ Fences are continuous and anchored to wildlife passage entrances or to lateral screens.
- ☐ Any components of the screen remain stable and have not been damaged or stolen, and that there is good continuity with fences.
- ☐ Vegetation height, composition and patch design is consistent with the standards.
- ☐ No Invasive Alien Species are found.
- ☐ No debris or other objects pose obstacles or prevent the appropriate use of the wildlife passage.
- ☐ Any refuges for fauna such as stumps or stone rows are in good condition and in accordance with standards provided.

**SPECIFIC MAINTENANCE TASKS To do**

**Structural features and uses**

- → Maintain or restore entrance areas to ensure these are free of obstacles to fauna movements and appropriately connected with the surrounding habitats.
- → Replace any elements damaged by vandalism.
- → In wildlife overpasses where no human use is planned, maintain appropriate state of the structures located at the entrances to avoid access of people and vehicles (large rocks, tree trunks or any other barrier).
- → Periodically clean, fix, repair or replace any informative panels and no entry signs.

**Fences and screens** > see Sheet 7.4.1

- → Replace broken or deformed meshes and repair any damage on screens.
- → Reinforce the anchorage of the mesh to the ground and poles when needed. If a reinforced mesh is already present, ensure it is well attached to the lower part of the fence.

Biodiversity and Infrastructure Handbook. Ch 7 Maintenance of ecological asset on transport infrastructure.

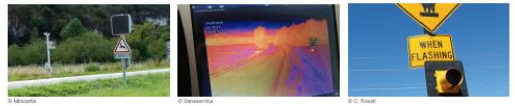
## Maintenance of signs activated by Animal Detection Systems (ADS)

**INSPECTION TASKS To check**

- ☐ Signs are clean and well fixed.
- ☐ Signs are installed at hazardous road sections according to information provided in the maintenance plan.
- ☐ Signs are working correctly according to the below periodic tests:
  - Sensors to detect movement are in line with the target animal size.
  - Position and orientation of sensors is correct.
  - Sensors are not blocked by obstacles (e.g. rocks, vegetations or other objects) which impede the detection of the approaching animals.
  - Solar panels, batteries and connections function appropriately.
  - LED lights function appropriately when a detection event occurs.
  - The signs remain activated for the correct period depending on the target species' behaviour and crossing time.

**SPECIFIC MAINTENANCE TASKS To do**

- → Clean the signs. Repair or replace when damage is detected.
- → Replace batteries, solar panels or any other elements damaged by vandalism or theft.
- → Keep the detection area and zones between the sensors and sign receivers free from branches, bushes or tall grass vegetation. Accumulation of snow during winter requires additional maintenance tasks.
- → To save time checking the correct system function, consider ADS systems which allow remote control and testing.
- → Add panels to inform drivers how the ADS system functions, warning them when sign is active, indicates the immediate danger of collision with an animal close to or on the road.
- → After re-evaluation of AVC hazard risk, signs which no longer indicate the correct location of the hazardous stretch should be removed and/or relocated.




Biodiversity and Infrastructure Handbook. Ch 7 Maintenance of ecological asset on transport infrastructure.

Agenda

1. Introducing the tool
2. Search examples
3. Chapter’s contents
4. Future development



Source: IENE Biodiversity and Infrastructure Handbook

# What's next?

- IENE undertakes maintenance and update

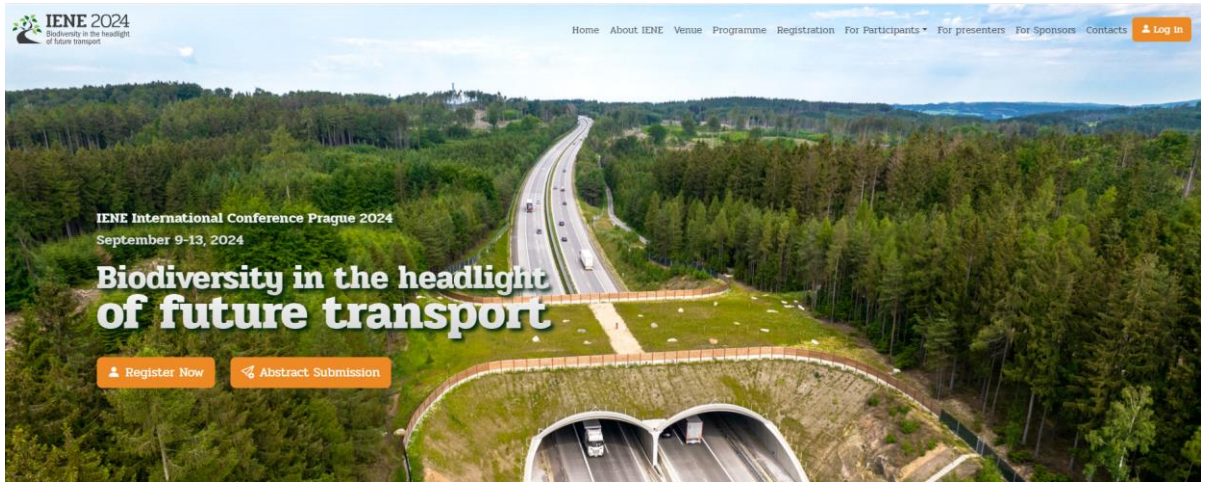
- Handbook Working Group reactivates
  IENE members are invited to join / Volunteers
  Meetings:  online (6 month) – presential at the IENE Conference

- Future works
  - **Continue the contents' update**. New topic: waterways, energy production
  - **Continue developing the Glossary**. Cooperation PIARC, UIC and other
  - **Website maintenance**. Include new guidelines, other resources
  - **Translation**. France already initiated (Glossary)
  - **To develop IENE Training Seminars**. Next one at the IENE Conferences 2024
  - **Search for funding**. Apply to new Calls; sponsorship

# Any idea to improve future handbook development and cooperation is welcome. Thank you!

Access the handbook at https://www.biodiversityinfrastructure.org/

## Join us at the IENE 2024 Conference on Ecology and Transportation (Prague Sep 9-13, 2024)




IENE - BISON project - Minuartia - Cerema - UPGE