BISON

BIODIVERSITY AND INFRASTRUCTURE SYNERGIES AND OPPORTUNITIES FOR EUROPEAN TRANSPORT NETWORKS

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Report on identification of Gaps and Barriers to expand replicability and application of good practice to mainstream biodiversity and transport

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V2	29/04/2022	Final Draft: Éric Guinard (CEREMA)

TABLE OF ABBREVIATIONS

Abbreviation	Meaning
EIA	Environmental Impact Assessment
EU	European Union
GP	Good Practice
IENE	Infra Eco Network Europe association
MS	Member States
NGO	Non-Governmental Organisation
OECD	Organisation for Economic Co-operation and Development
SEA	Strategic Environmental Assessment
STRIA	Strategic Transport Research and Innovation Agenda
TRA	Transport Research Arena

EXECUTIVE SUMMARY

The BISON project is led by a consortium of 39 European members and associated countries. It aims to tackle the integration of biodiversity with the development of transport infrastructure, including roads, railways, waterways, airports, ports, or energy transport networks.

Within the BISON project, WP3 has the overall objective to **identify and describe current good practices** and new technologies including nature-based solutions to be deployed to mainstreaming biodiversity in existing and future transport infrastructures. The identification of new emerging trends to be addressed in the present scenario of climate change and its effects on biodiversity and transport is also envisaged. The compilation of practices and recommendations to guarantee the user's safety and infrastructure resilience as well as contributing to achieve the UN Sustainable Development, the European Green Deal and the EU Biodiversity Strategy for 2030 Goals are the main focus of this WP. Moreover, its outputs will encourage the cooperation between European countries to design and operate transport infrastructures that will avoid or at least reduce impacts on biodiversity through e.g. traffic related mortality, habitat loss and fragmentation and environmental pollution, while enhancing infrastructure green areas to promote ecosystem functions such as creating suitable habitats for biodiversity and reconnecting populations. These relate to the effects of global warming but also to pathogen spread, technical innovations and socio-political and economic constraints that are expected to alter chances to maintain infrastructure efficiency and ecosystem services.

This Deliverable (D3.2): "Report on identification of Gaps and Barriers to expand replicability and application of good practice to mainstream biodiversity and transport" of the BISON project is the second deliverable produced in the context of this WP3 – Existing and future synergy between Infrastructure and Biodiversity. This report presents the methodology and the process used in the BISON project to evaluate and weight all gaps and barriers to the expansion of good and best practises among currently implemented in the participating countries.

The good practices analyses started first in the creation of a glossary dedicated to the main terms used in WP3 and Task 3.1 but also used for the needs of the whole BISON project, while the description of the methodology that is used in the context of this task for the identification of the good practices and the criteria that are going to be applied for narrowing them down to the final list of the best practices (Deliverable D 3.1). In this report, emphasis is given to the method that have been defined and used to identify i) the gaps and ii) the barriers detected in the collection of all good practices extracted from the questionnaire (Sub-Task 3.1.1 deliverable) and from internal BISON experts, their evaluation process by internal and external experts and compared with gaps and barriers proposed in the S-T.3.1.1 questionnaire.

In the following sections, the description of the methodology that is used in the context of this Task for the identification of gaps (Section 2.1) and the barriers (Section 2.2) limiting the expansion of the good and best practices in the European Union. The first results will expose for gaps (Section 3.1) and for barriers (Section 3.2), a preliminary global analysis has been conducted to merge both parameters, followed by a discussion on gaps (Section 4.1) and barriers (Section 4.2) to complete this gaps and barriers analyses ending this report. The next steps are finally described in Section 4.3.

A BISON workshop to complete the gaps and barriers analyses and to discuss a structured list of gaps and barriers with stakeholders, and to identify how to overcome the obstacles was originally scheduled for TRA2022 conference in April 2022. This conference has been moved to December 2022 because of the COVID-19 pandemic. As input from stakeholders is an important part of the report, the BISON project has decided to get their input by organising the following workshops:

1. IENE Conference on Ecology and Transportation, 19 - 23 September 2022, Cluj-Napoca, Romania
2. Transport Research Arena (TRA) Conference, 14 – 17 November 2022, Lisbon, Portugal.

An updated version of this report including the results of stakeholder's contributions will be submitted in December 2022. Files describing Best Practices identified will be also included at this final report.

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1. INTRODUCTION

Europe is connected by an extensive transport network of highways, roads, railroads, waterways, cycling paths, air and sea routes complemented with energy transportation infrastructures such as powerlines and pipelines. These transportation networks compose a common feature of European landscapes, they connect people and provide access to essential services and resources. Transportation promotes economic activity and is often associated with economic development. Improving the connection of a city or a region to a large trade and transportation network can boost the local economy and create new jobs.

However, increasing economic activity is often observed in the main connected zones. It also often comes with the negative environmental impacts of human settlements. The transportation networks not only provide goods and services to people, but also shape and influence the surrounding environment. Usually, once the region achieves a certain level of connectivity, any additional transport infrastructure does not provide the same benefits (i.e. decreasing the economy of the small areas alongside the transport infrastructure and only benefiting to the main urban areas newly connected). But it may have a significant impact on the environment, especially biodiversity, by introducing for example invasive alien species into ecosystems causing wildlife mortality, and creating barriers between natural habitats. Transport networks can also promote development of urban and other artificialized areas to relatively rural and less populated areas in Europe, putting pressure on natural habitats and biodiversity. The construction of large transport projects such as the Suez Canal can change the key characteristics of the entire ecosystem. Since the canal was built, more than 500 alien marine species have been introduced into the Mediterranean Sea (Zenetos et al., 2021).

All man-made infrastructure networks (roads, railroads, waterways, powerlines and pipelines) can create barriers and divide the natural landscape into smaller isolated areas. Multi-lane highways through natural areas provide physical barriers to flora and more particularly to fauna. In addition, it reduces the total area surface available to wildlife, that mainly affects the widest range territory species, and combining with the lack of connectivity between different habitats, it makes these populations more vulnerable. Animals need to move to find food resources or breeding partners, and to adapt their ranges to new conditions created by climate change. They are at risk of being injured or killed when trying to cross roads or rails (the transport network is here considered as a filter and not a barrier to some species). Even fences bordering transport networks to prevent animal road kills, without fauna passages crossing the transport infrastructure, can sequester populations of certain species in ways that limit the gene pool, and eventually increasing their extinction probability.

Transport also generates pollutants that can extend beyond the scope of the transport network (e.g., concentrations of particulate matter, ozone, NOx or heavy metals that can affect humans, plants and animal health). Some areas, such as mountainous areas, coastal areas, wetlands and the sea, can be particularly vulnerable to traffic pollution. Similarly, oil spills and the release of harmful substances into the ocean can cause serious damage to marine life. Recognizing these risks, many measures have been taken at the European and international levels. Noise pollution from transport is another issue, and its impact is not limited to terrestrial ecosystems, ports and maritime circuits in the English Channel or in the Gulf if Genoa producing deep impacts on cetaceans (European Environment Agency, 2016).

Different initiatives regarding different phases of transport infrastructure development, such as better connections through tunnels or bridges, provision of appropriate fauna passages, measures to reduce risk of collisions between wildlife and traffic, etc. should be promoted and undertaken to ease pressure on Europe's biodiversity and ecosystems. In fact, these initiatives can be planned on a much larger

scale than a single infrastructure project involving different stakeholders (planners, investors, citizens, different government-level authorities...).

To this extent, European policies (such as the Green Infrastructure Strategy and the Connecting Europe Facility) promote the integration of biodiversity into the design, construction and operation phases of infrastructure. However, standards for infrastructure are difficult to achieve due to a deficit in knowledge about causal chains, lack of tools, involvement of relevant stakeholders and the broader understanding of infrastructure impacts on ecosystem changes, both national and international (Tinch et al., 2015).

Green infrastructure planning is a proven tool for achieving environmental, economic and social benefits through nature-based solutions. The reliance on "grey" infrastructure can be reduced in the framework of climate change, which can often be harmful to the environment and particularly to biodiversity is expensive to build and maintain.

According to the European Commission, **Green Infrastructure** is a strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services such as water purification, air quality, space for recreation and climate mitigation and adaptation. This network of green (terrestrial) and blue (aquatic) spaces, as well as darkness and soil connectivity that are in project in many European countries, can improve environmental conditions and therefore citizens' health and quality of life. It also enhances a green economy, opens job opportunities and supports biodiversity[1].

Moreover, in 2017, STRIA[2] recognised some of the main challenges concerning the biodiversity barriers, with proposed avenues to manage these, whilst Horizon Europe[3], through the development of research and innovation, aiming to contribute to the Green Deal[4] and the European Biodiversity Strategy[5].

Such recent EU transport policies have significantly increased consideration for nature and biodiversity in transport infrastructure development and operation. These concerns need to be taken into account in the planning phase as early as possible. Transportation infrastructure projects, including those related to the Trans-European Network, help in improving the quality of life across Europe by providing services and public goods to remote areas. At the same time, EU legislation also covers the potential impacts of infrastructure projects taking place outside protected areas, but which can still affect them. This approach can be translated into a variety of actions in the field. For example, in the case of railroads and road networks, there can be changes to the proposed routes to preserve a larger area and avoid landscape fragmentation. Similarly, tunnels, viaducts can be designed and constructed to improve connectivity between protected areas and facilitate the movement of animal populations. EU funds may be withdrawn if the project does not comply with these rules.

National-level efforts and initiatives towards mainstreaming biodiversity in transport are just as important as the interest of people. In many cases, long-term strategies are developed at this level, funding decisions are made, and a place where scalability opportunities are available. Key factors to promote this mainstreaming and enable its implementation include (OECD, 2018):

[1] https://ec.europa.eu/environment/nature/ecosystems/index_en.htm
[2] https://ec.europa.eu/jrc/en/publication/strategic-transport-research-and-innovation-agenda-stria-roadmap-factsheets
[3] https://ec.europa.eu/info/sites/info/files/research_and_innovation/strategy_on_research_and_innovation/documents/ec_rtd_orientations-he-strategic-plan_122019.pdf
[4] https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en
[5] https://ec.europa.eu/environment/nature/biodiversity/strategy/index_en.htm

- mainstreaming biodiversity in relevant transport national plans and strategies;
- ensure coordination and consistency between the Biodiversity and the Transport relevant institutions and clearly define their roles;
- responsibility of the different actors;
- evidence-based generation required for sound decision-making;
- mainstreaming biodiversity in transport also in the national budget.

Although, there are still differences on the alignment level of the EU Member States (MS) to the EU policies, there are relevant developments also at the MS level and stricter environmental regulations, policies and practices are already changing some projects' design. For example, in the case of an inland water transport project to deepen the Weser River in Germany, environmental NGOs criticising the project plan, arguing that deepening the river changes salt content, creating stronger currents and threatening river-dependent wildlife and riverbanks. The European Court of Justice has ruled that the project worsens the water quality of the Weser River and violates the EU Water Framework Directive. As a result, the project has been cancelled (European Environment Agency, 2016).

The BISON project aims to research and address such issues and relevant challenges, focusing on infrastructure development and preservation of biodiversity, respectively, in order to achieve social and economic well-being.

After the first step of identification of good practices and among them the best practices (see the method in D3.1) either on EU or national level towards mainstreaming biodiversity in transport and the definition of their impact and their transferability in other countries and/or other transport modes is crucial to also for facilitating the mainstreaming itself. Another crucial step is to describe the gaps and barriers in the way stand strategies in future actions and research programs. The aim of this report, in the context of BISON WP3, is to describe the gaps and the barriers that delay or even stop the expansion of good and best practices in transport infrastructure in European countries with potential to be replicated and expanded. Two methods are used: indirect method showing gaps where the goods practices are absent or in few number in main topics and in phases of life cycle of an infrastructure of transport project and direct analysis of gaps and barriers extracted from questionnaire.

This report is a first step in the process of identifying gaps and barriers as a validation by a panel of experts during a working session will be carried out during the next IENE conference in Romania and TRA in Portugal to be held in September and November 2022 respectively. This validation, which requires the participation of experts in person, could not be carried out earlier due to the COVID 19 pandemic.

2. METHODOLOGY FOR THE GAPS AND BARRIERS IDENTIFICATION

Within the scope of the BISON project and more specifically within WP3, the collection of information about relevant technologies, methods, processes, and tools currently applied in each country participating in the BISON project takes place, in order also to identify good practices concerning the mainstreaming of biodiversity on transport and promote its replication.

In order for this to be achieved, enquiries to key actors from both items (biodiversity/transport) in each participating country have been used to collect information while at the same time, criteria and principles have been suggested and described so as to provide tools for the selection – in a second step – of best practices to be applied. Finally, an analysis on the gaps[6] and barriers[7] that create difficulties for the application of these practices will be conducted, also in cooperation with the work and the information processed in WP4 and WP5 to provide solutions based in research and transfer technology allowing to overcome obstacles and to make progress. Main works undertaken for this scope, as well as the previous steps are described in the Figure 1 and in the sections below.

In the following chapters will be detailed the methods applied for 1) gaps and 2) barriers identifications.

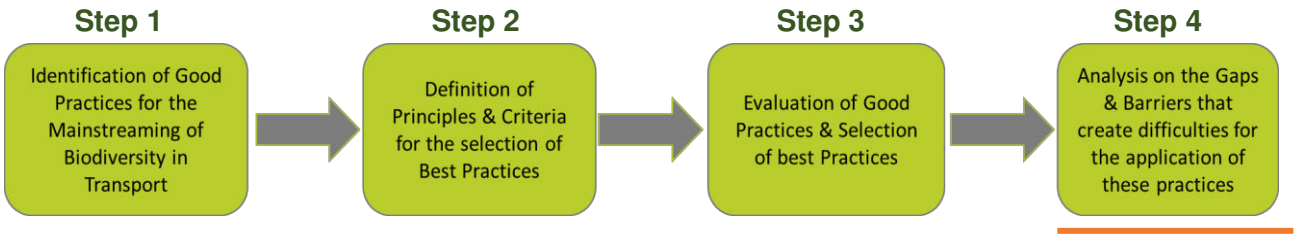


Figure 1: Main steps of Task 3.1 (underlined in orange: Gaps and Barriers identification)

Steps 3 and 4 of the T3.1 methodology (Figure 1) are still on-going. The feedback from external experts (outside the BISON Consortium) is considered to be crucial for the delivery of comprehensive and representative outcomes from these 2 steps. Hence, BISON partners have planned, and are currently organising, different stakeholder consultations in order for this to be achieved.

More specifically, at least two **Gaps and Barriers workshops** will focus on the following topics:

- Presentation and discussion of identified best practices on mainstreaming biodiversity in transport infrastructure.
- Gaps and Barriers for the implementation of Best Practice in mainstreaming biodiversity in transport infrastructure. How to overcome them?'

The results and findings of these Workshops will be integrated in the already obtained preliminary findings of the respective Task 3.1 and will be included in future WP3 reports.

2.1. Gaps identification methods

6 "Gaps: Defined here as the absence or to small number of good practice.

7 "Barriers: Defined here as the elements that create difficulties for the application of the best practice. Any kind of impediment such as a rule, practice, law, policy, knowledge gaps) towards the effective application/implementation of dedicated tools for reducing the impact of various transport modes on the environment and its components (including ecosystem services).

As the first step for the realisation of this work, partners of WP3 in cooperation with the whole BISON consortium have developed a dedicated questionnaire (see WP3 Sub-Task 3.1.1 internal report) in order to collect, good practices and gaps and barriers of dissemination (Figure 2). This questionnaire was accompanied with a specific survey, asking internal BISON Consortium members to complement the collection of good practices (see good practice definition in Table 1 and Chapter 2.1.2 in D3.1 deliverable). Once these processes were completed a descriptive statistical analyses was conducted on good practices categorisation tables.

Two complementary methods have been chosen to analyse gaps from survey data collection:

1. Analyse good practices per mode of transport, after their categorisation into main topics and transportation infrastructure project life cycle phases.

2. Analyse gaps description directly extracted from the questionnaire answers and categories among their primary questions asked during the survey.

A third method has been developed by the Task 5.4 in coordination with Task 3.1 to collect gaps, barriers and opportunities from experts which will not be presented in this report because the task has not been completed, yet.

2.1.1. Good Practices categorisation for potential gaps identification

For this purpose, all good practices should be categorized according to two types of parameters:

i) "successive phases of infrastructure of transport project life cycle"
ii) topics commonly addressed at each phase of a project life cycle during EIA (Environmental Impact Assessment) or during a SEA (Strategic Environmental Assessment).

a. Infrastructure of transport project life cycle phases:

The name and definition of each phase of the life cycle of a transport infrastructure project have been established by the members of Task 3.2 and is summarized in Figure 2 and Table 1 below:

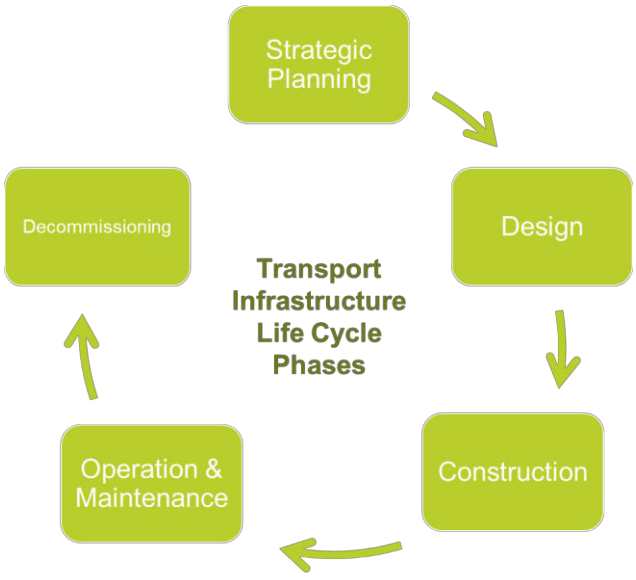


Figure 2: Transport infrastructure project life cycle phases

BISON Consortium Members also suggested to add transversal items to the lifecycle phases:

- Specific ARC item (avoidance, reduction (mitigation), compensation)
- Stakeholders engagements (education, publications, actions…)

Each good practice that concerns one or two phases of the life cycle of a transport infrastructure project has been included in both phases. In the same way, good practices applied for one transport mode that could be applied for others have been considered in both.

Table 1. Resume of main transport infrastructure life cycle phases and subphases (Task 3.1)

Phase	Includes	Environmental process
1. Strategic Planning	**1.1. Transport policy** **1.2. Strategic transport plan** **1.3. Transport area or corridor delimitation** (also called 'Project planning')	SEA
2. Design	**2.1. Site or route selection** (also called 'Concept design' and 'Informative study') **2.2. Procurement** **2.3. Detailed design** (also called 'Constructive project')	EIA
3. Construction	**3.1. Construction**	Environmental Monitoring Programs
4. Operation, Maintenance & Upgrading	**4.1. Operation and maintenance** ***Upgrading****	Ecological asset maintenance Monitoring/Evaluation
5. Decommissioning	**5.1. Decommissioning** **5.2. Repurposing**	Restoration

(*) Upgrading was not included in "Operation & Maintenance" in the original report, but it is here included in "Operation & Maintenance" to ease the analysis. It was decided to be included as a different phase that require new design (sometimes even EIA) and construction

b. EIA / SEA topics

In addition, all good practices are categorised by main topics to be treated in all phases. These topics concern the EIA procedure (Figure 4):

- baseline data collection, including habitats mapping
- impacts (prediction and assessment),
- measures (avoidance, mitigation, compensation and complementary)
- evaluation and monitoring (Bond & Wathern, 1999).

Terminology and definitions :

Environmental processes, evaluation of potential harm or negative impacts of the certain stages from the life cycle of various transport modes (from planning to decommissioning) on the environment and its components (including on ecosystem services).

Environmental assessment is a process that ensures that the environmental implications of decisions are taken into account before the decisions are made.

SEA (Strategic Environmental Assessment) can be undertaken for public plans or programmes on the basis of Directive 2001/42/EC (known as 'Strategic Environmental Assessment' – SEA Directive) According to the Directive, its goal "is to provide for a high level of protection of the environment and contribute to the integration of environmental considerations into the preparation and adoption of plans and programs with a view to promoting sustainable development, by ensuring that, in accordance with this Directive, an environmental assessment is carried out of certain plans and programs which are likely to have significant effects on the environment".

EIA (Environmental Impact Assessment) is a process that focuses on assessing the environmental impacts of projects of a certain kind and scope. The Environmental Impact Assessment (EIA) Directive (2014/52/EU) applies to a wide range of defined public and private projects, which are defined in Annexes I and II. Mandatory EIA refers to all projects listed in Annex I, having been considered to have significant effects on the environment and require an EIA (e.g. for individual projects like long-distance railway lines, motorways and express roads, airports with a basic runway length ≥ 2100 m…). For projects listed in Annex II, the national authorities must decide whether an EIA is needed. EIA shall identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on the following factors: (a) population and human health; (b) biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC; (c) land, soil, water, air and climate; (d) material assets, cultural heritage and the landscape; (e) the interaction between the factors referred to in points (a) to (d).

When SEA is carried out beforehand, the EIA procedure is applied during design and following project life cycle phases. Both processes are very similar (https://ec.europa.eu/environment/eia/sea-legalcontext.htm) and element analysed during SEA can be considered during EIA as well. However, SEA are adapted to strategic programmes level at regional or national scales, including several modes of transportation infrastructures, and interaction between all infrastructures is a key item, as well as legislation and regulation. However, interactions between different modes of transportation infrastructures can occasionally concern EIA as well as legislation / regulation topic.

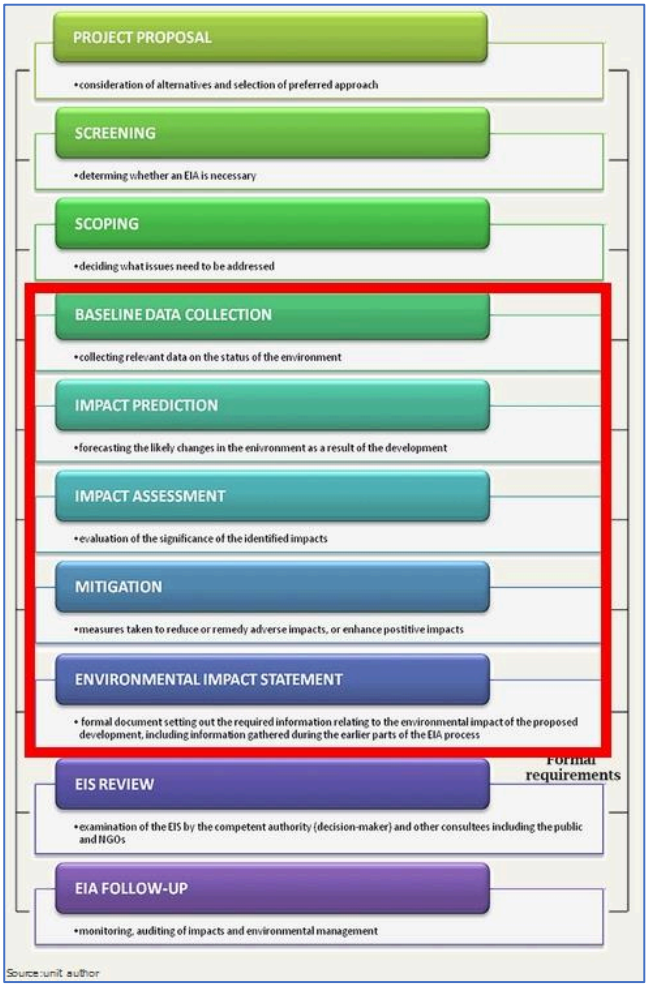


Figure 3: EIA Process stages in UK, and the stages in red square indicating some of the EIA topics use as Good Practices categorization.

Adaptation by the CEREMA of a figure in: https://www.soas.ac.uk/cedep-demos/000_P507_EA_K3736-Demo/unit1/page_14.htm

All good practices previously collected are distributed in a table among the life cycle phase(s) and the main topics for each transport mode of their concern (Figure 4). A cell includes only one good practice, and each item and phase life cycle can include at least one to several cells.

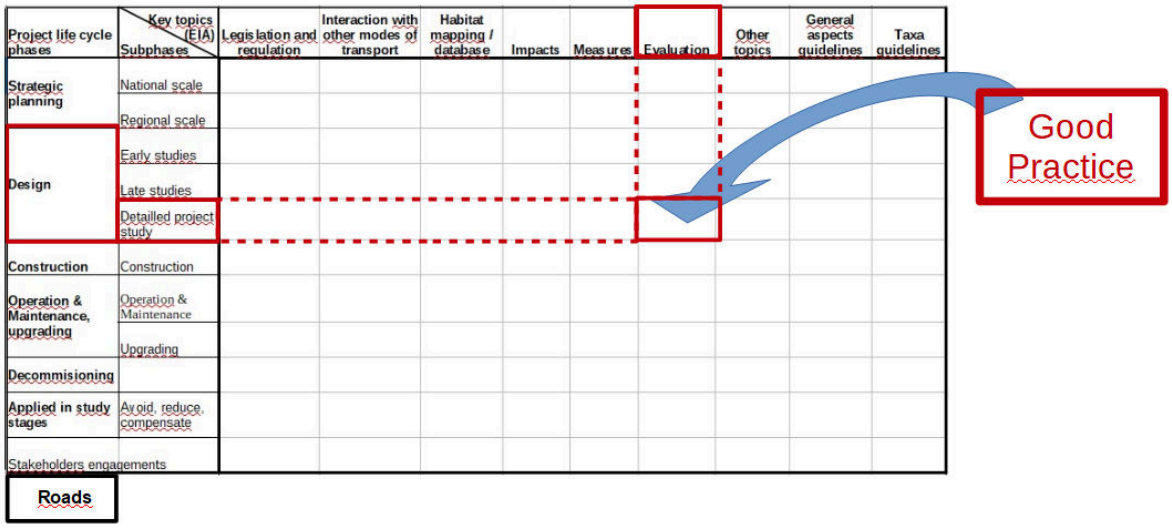


Figure 4: Good practices distribution in a double entry table concerning roads mode of transport.

Good practices are spatially distributed in a more or less heterogeneous way in the table, the number of columns of an "EIA topic" varying from one to a maximum observed (i.e. from 1 to 11 columns; some of the phases of the life cycle of a project concentrate a big number of good practices. For the same "EIA topic" column, cells in another phase may not show up to any good practice (Figure 5).

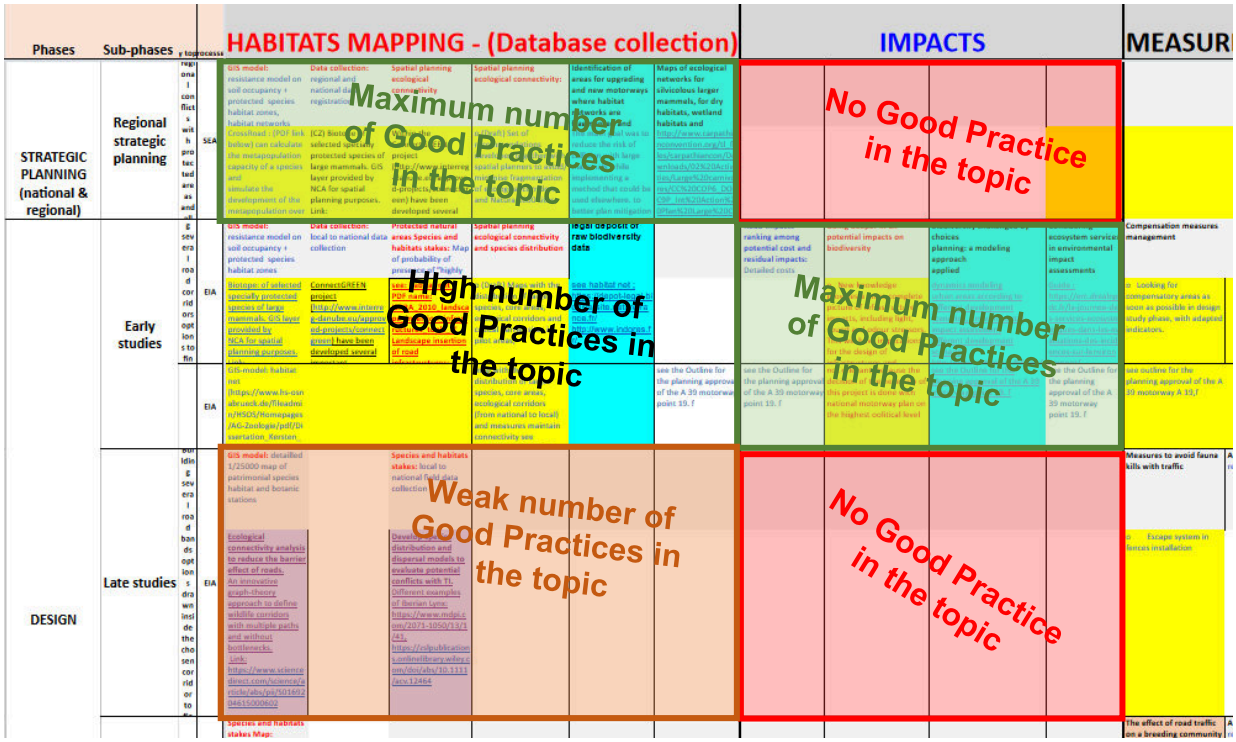


Figure 5: Spatial heterogeneity in good practices distribution in a part of the roads table

This heterogeneity in good practices distribution in the table will provide to the next step of the method. This brings the information of which of EIA topic and which of life cycle phase has an important number of Good Practices and which of other parameters show a strong lack of Good Practices that will be considered in the last case as a **Potential Gap in Good Practices.**

These potential gaps will be determined with a descriptive statistical analysis method that is described in the following chapter.c. Descriptive statistical analyses in detail

Data of good practices distributed in different life cycle phases and main EIA topics will be screened for abundance and absence. The main objective is to compare the number of Good Practices (N(GP)) collected with the total amount of cells available (N'(AllCells)) (Figure 6), considered for each Life cycle phase and EIA topic as follows:

Abstract of the method:

The aim of this method is to see which items (i.e. impacts, evaluation) and which of life cycle phases of the infrastructure of transport project (i.e. strategic planning to decommissioning phases) show no or few good practices, considering that these "empty" items and phases show gap in good practices. It is comparable as a foot print. To do so, we compare the ratio "number of good practices / number maximal potential number of good practices" in each items and phases to the one of all the items and phases, comparing a single case with a number of good practices to the global mean of number of good practices of the set of all cases. The cases below the global mean are considered as showing gaps inn good practices.

Detailed method:

1) $W_1 = N(GP)_{xy} / N'(AllCells)_{xy} = 1$; $N = N'$

with x corresponding to a Life cycle phase (row) and y corresponding to an EIA topic (column).

This is the optimal situation, with a maximum of Good Practices available for a Life cycle phase and an EIA topic.

2) $W_0 = N(GP)_{xy} / N'(AllCells)_{xy} = 0$; $N = 0$

with x corresponding to a Life cycle phase (row) and y corresponding to a EIA topic (column).

This is the situation without Good Practices available for a Life cycle phase and an EIA topic. Then, $W_0 \leq W_n \leq W_1$

3) $W_{total} = N_{total} / N'_{total}$

Where, for each mode of transport, W_{total} is the total number of GP N_{total} present in the table divided by the total number of cells available N'_{total}, W_{total} being considered as the median for comparison inside the table. W_n is compared to W_{total}:

If $Wn \geq W_{total}$, there is a number of GP sufficient for a Life cycle phase and an EIA topic.

If $Wn < W_{total}$, there is a lack of GP available and considering that these is a Potential Gap for a Life cycle phase and an EIA topic.

4) The index W_{total} by row ($W_{total-x}$) and by column ($W_{total-y}$ (respectively project life cycle phases and EIA Topics W index) are compared to the all table W_{total} index

and if: **$W_{total-x}$ or $W_{total-y} < W_{total}$ the project life cycle phases or the EIA Topic shows a Potential Gap in Good Practices.**

5) Finally, all tables 3 (Figure 7) per mode of transport are altogether compared to detect eventual common potential gaps to several modes of transport.

Then, internal BISON Consortium experts from CEREMA have checked in a fast review, the gaps underlined in Table 3 to detect some potential mistakes.

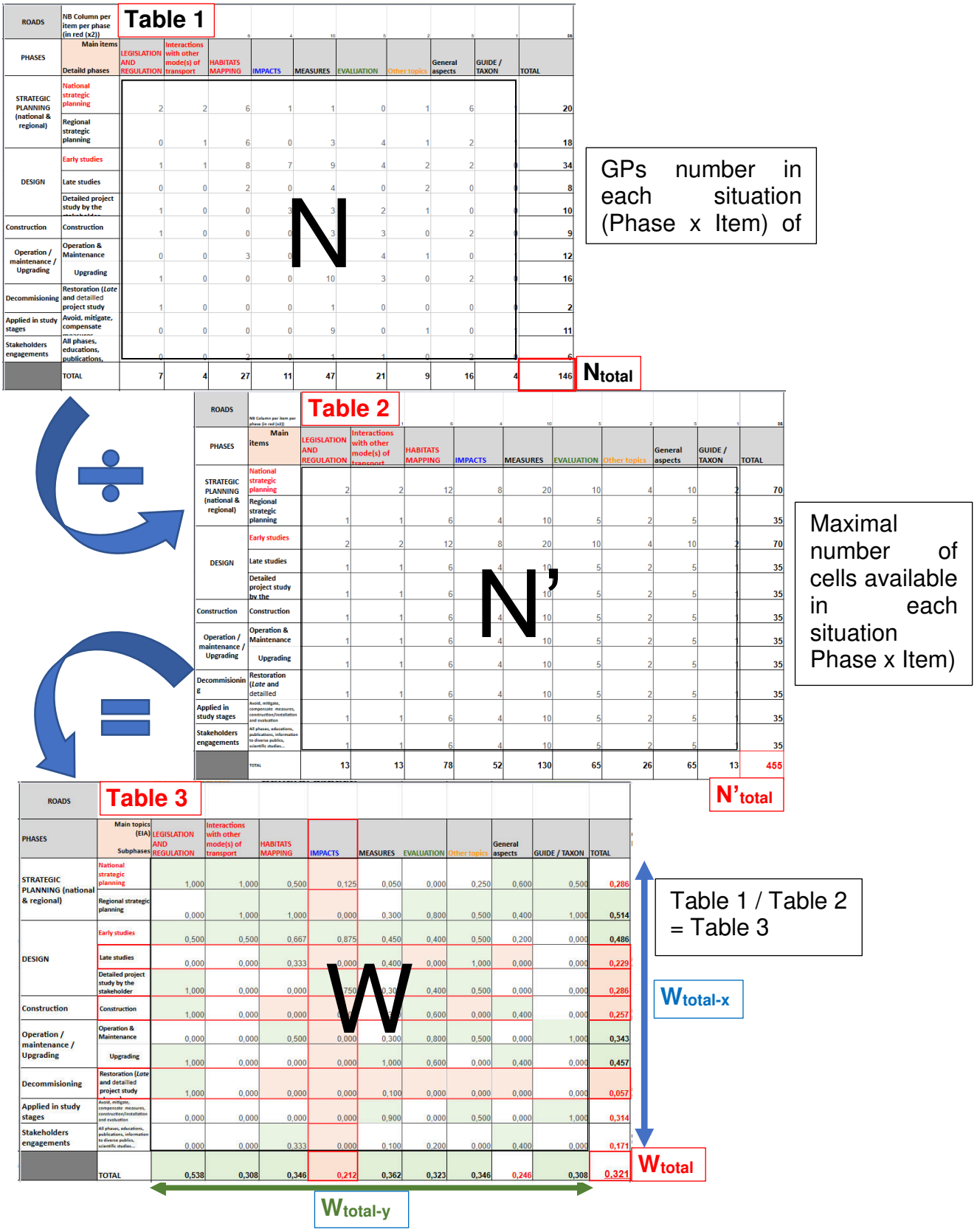
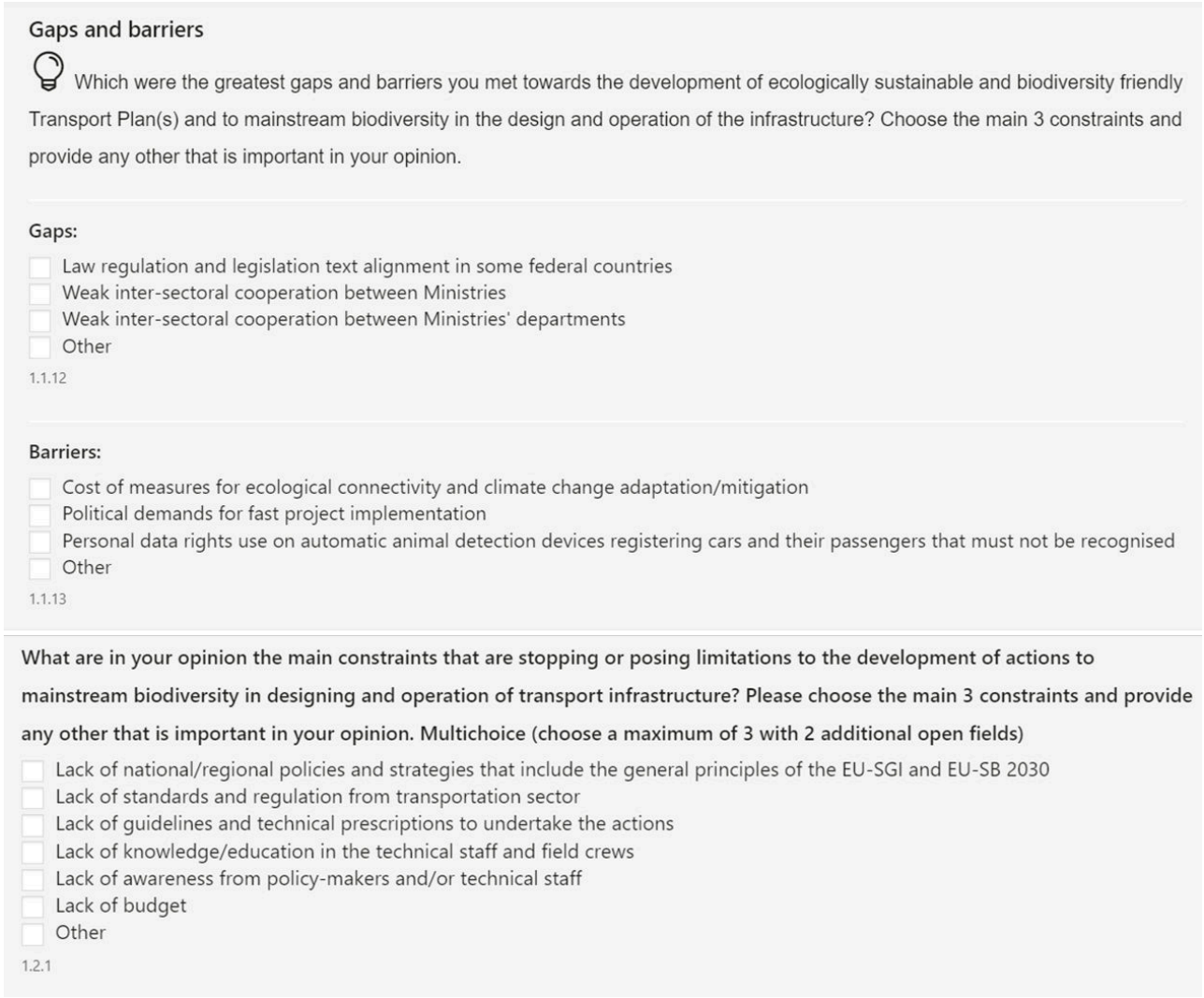


Figure 6: successive steps of the Gaps statistical analysis
[(W = $N(GP)_{xy}$ / $N'(AllCells)_{xy}$ with N: number of Good Practices and N': number of all cells available].

2.2. Gaps and barriers extracted from the questionnaire

The other source of information about gaps and barriers comes directly from the stakeholders who have answered to the questionnaire. The questions are detailed in Figure 7.


Gaps and barriers

Which were the greatest gaps and barriers you met towards the development of ecologically sustainable and biodiversity friendly Transport Plan(s) and to mainstream biodiversity in the design and operation of the infrastructure? Choose the main 3 constraints and provide any other that is important in your opinion.

Gaps:

- Law regulation and legislation text alignment in some federal countries
- Weak inter-sectoral cooperation between Ministries
- Weak inter-sectoral cooperation between Ministries' departments
- Other

1.1.12

Barriers:

- Cost of measures for ecological connectivity and climate change adaptation/mitigation
- Political demands for fast project implementation
- Personal data rights use on automatic animal detection devices registering cars and their passengers that must not be recognised
- Other

1.1.13

What are in your opinion the main constraints that are stopping or posing limitations to the development of actions to mainstream biodiversity in designing and operation of transport infrastructure? Please choose the main 3 constraints and provide any other that is important in your opinion. Multichoice (choose a maximum of 3 with 2 additional open fields)

- Lack of national/regional policies and strategies that include the general principles of the EU-SGI and EU-SB 2030
- Lack of standards and regulation from transportation sector
- Lack of guidelines and technical prescriptions to undertake the actions
- Lack of knowledge/education in the technical staff and field crews
- Lack of awareness from policy-makers and/or technical staff
- Lack of budget
- Other

1.2.1

Figure 7: Example of questions regarding gaps, barriers and constraints in BISON questionnaire.

This questionnaire about gaps and barriers includes mainly questions about strategic and general aspects.Including more questions about technical items has not been done because it would have added to many questions to the questionnaire considered after construction as very (too) big, stakeholders would certainly not answer to all questions.

2.3. Gaps and Barriers identification methods

The aim of the work that is implemented within Sub-Task 3.1 is to gather gaps and barriers against good and best practices expansion. The main source of barriers, like gaps, has been collected with an questionnaire. Barriers have been completed with constraints[8] that will not be detailed in this report. The

8 Constraint definition: parameters that are stopping or posing limitations to the development of actions to mainstream biodiversity in planning, designing and operation of transport infrastructure (proposed in the Task 3.1 Questionnaire)

questionnaire proposed questions about gaps and barriers intoseveral categories (see questions in Figure 7).
For the purpose of this document and to better understand the concepts, we have defined the main terms we are working with.

2.3.1. Method for Questionnaire Gaps analysis

All gaps proposed by diverse stakeholders have been first extracted from questionnaire answers, dispatched in several categories and numbered.

There are four categories concerning gaps detailed in Question Q1.1.12 (Figure 7):

- Law regulation and legislation text alignment in some federal countries
- Weak inter-sectoral cooperation between Ministries
- Weak inter-sectoral cooperation between Ministries' departments
- Other

2.3.2. Method for Questionnaire Barriers analysis

All barriers proposed by diverse stakeholders have been first extracted from questionnaire answers, dispatched in several categories and numbered..

These barriers have been distributed in 4 categories (see Table 7):
- Cost of measures for ecological connectivity and climate change adaptation/mitigation
- Political demands for last project implementation
- Personal data rights use on automatic animal detection devices registering cars and their passengers that must not be recognised
- Other

Descriptive statistical analysis which has been applied for "barriers" was also used for "gaps" analysis.

3. RESULTS

3.1. Potential Gaps from Good Practices analysis

For all modes of transport, the results are shown in the Table 3 (Figure 7). A light expertise has been realised by internal BISON Consortium experts from Cerema to avoid any major mistake. In all following tables (Table 2 to Table 9), the green cells correspond to: $W \geq W_{total}$, the white cells to: $W < W_{total}$ and the red rows and red columns: project life cycle phase and EIA topic being considered with potential gap in good practices (GPs).

.As a general result, few GPs are available for ports and airports. Furthermore, the number of stakeholders who responded to the questionnaire and who are involved in ports and powerlines, let alone pipelines, is low (Number (N) of experts interviewed [source: BISON Internal Report Questionnaire]: $N_{ports} = 49$, $N_{powerlines} = 41$ and $N_{pipelines} = 22$, compared to $N_{roads} = 130$, $N_{railways} = 109$ and $N_{waterways} = 69$))

Nota: "Legislation and Regulation" and "Interactions with other mode(s) of transport" topics, concerning qualitative analyses, are considered differently than the other topics because they mainly concern the strategic planning.

3.1.1. Potential Gaps on Roads

Table 2. Good practices applied on roads projects, categorized and ranked among project life cycle and among EIA topics

PHASES	Main topics (EIA) / Subphases	LEGISLATION AND REGULATION	Interactions with other mode(s)	HABITATS MAPPING	IMPACTS	MEASURES	EVALUAT	Other top	General aspects guides	GUIDE / TAXON	Wtotal (phases)
STRATEGIC PLANNING (national & regional)	National strategic planning										0,286
	Regional strategic planning										0,514
DESIGN	Early studies										0,486
	Late studies										0,229
	Detailed project study by the [illegible]										0,286
Construction	Construction										0,257
Operation / maintenance / Upgrading	Operation & Maintenance										0,343
	Upgrading										0,457
Decommisionin g	Restoration (*Late* and detailled project study phases)										0,057
Applied in study stages	[illegible]										0,314
Stakeholders engagements	[illegible]										0,171
ROADS	Wtotal (topics)	0,538	0,308	0,346	0,212	0,362	0,323	0,346	0,246	0,308	0,321
	Legend:	Phase or topic with high number of good practices		Phase or topic with a medium number of good practices		Phase or topic with a lack of good practices		Phase or topic considered as a Gap			General Ratio (W_{total}) used as reference for comparison

The number of GPs is N_{total} = 146 and the total amount of available cells is N'_{total} = 455. Several phases are concerned by potential gaps. The Decommissioning phase shows the smallest $W_{total-x}$, followed by the "Stakeholders engagements" and by the construction phases.

"National strategic planning" subphase and "Applied in study" $W_{total-x}$ index being slightly smaller than W_{total}, they are not considered to have potential gap. "Late studies" and "Detailed project studies by stakeholders" subphases $W_{total-x}$ index are smaller than W_{total} whereas "Early studies" subphase W index is higher than W_{total}. Design GPs have been mainly recorded for all modes of transport on only one studies subphase, but are usable for all Design phase. Then are merged all studies subphases, $W_{total-x} = N_x/N_x'$

= 52/140 (see Tables 1 and 2 in Appendix 1.1), $W_{total\text{-}x}$. = 0,371, which is higher than W_{total}. Design phase is then not considered to have any potential gap of GP.

Concerning EIA topics, the Impacts and "General aspects guides" $W_{total\text{-}y}$ index are smaller than W_{total}, and are fully concerned by potential gaps. "Interaction with other modes of transport" $W_{total\text{-}y}$ index being nearly equal to W_{total} and "Legislation and Regulation" $W_{total\text{-}y}$ index being higher than W_{total} there are not concerned by potential gap.

3.1.2. Potential Gaps on Railways

Table 3. Good practices applied on railways projects categorized and ranked among project life cycle and among EIA topics

PHASES	Main topics (EIA) / Subphases	TION AND REGULA TION	ons with other mode(s) of	HABITAT S MAPPIN G	IMPACTS	MEASUR ES	EVALUAT	Other top	General aspects guides	GUIDE / TAXON	Wtotal (phases)
STRATEGIC PLANNING (national & regional)	National strategic planning										0,594
	Regional strategic planning										0,688
DESIGN	Early studies										0,594
	Late studies										0,281
	Detailed project study by the										0,250
Construction	Construction										0,313
Operation / maintenance / Upgrading	Operation & Maintenance										0,656
	Upgrading										0,344
Decommisioning	Restoration (*Late* and detailled project study phases)										0,031
Applied in study stages	Avoid, mitigate, compensate measures, environmental/spatial plans and policies										0,375
Stakeholders engagements	Interviews, discussions, publications, information to diverse publics, sensibilis										0,250
RAILWAYS	Wtotal (topics)	0,182	0,182	0,364	0,182	0,496	0,424	0,500	0,394	0,545	0,398
	Legend:	Phase or topic with high number of good practices		Phase or topic with a medium number of good practices		Phase or topic with a lack of good practices		Phase or topic considered as a Gap			Global Wtotal (W_{total}) used as reference for comparison

The number of good practices is N_{total} = 140 and the total amount of available cells is N'_{total} = 352. Several phases are concerned by potential gaps. Decommissioning phase has the smallest $W_{total\text{-}x}$, followed by "Stakeholders engagements" and by Construction phases.

Upgrading subphase is below W_{total} and can be considered to have any potential gap. Late studies and "Detailed project studies by stakeholders" subphases $W_{total\text{-}x}$ are smaller than W_{total} and Early studies subphase $W_{total\text{-}x}$ is higher than $W_{total\text{-}x}$. When are merged all studies subphases, $W_{total\text{-}x} = N_x / N_x' = 36/96$

(see Tables 1 and 2 in Appendix 1.2), $W_{total\text{-}x}$. = 0,375, which is, as well as "Applied in studies stages", close to W_{total}. Design phase is then not considered to have any potential gap of GP.

Habitats mapping and "General aspects guides" W index, are close to W_{total}; these topics are not considered to have any potential gap of GP.

Concerning EIA topics, the Impacts topic shows potential gaps $W_{total\text{-}y}$ index being smaller than W_{total}. "Legislation and Regulation" and "Interactions with other mode(s) of transport" $W_{total\text{-}y}$ index are smaller than W_{total}, However, these topics concern mainly Strategic Planning Phase on which are recorded enough GPs. In this case, they are not considered to include any gap of GP.

3.1.3. Potential Gaps on Waterways

Table 4. Good practices applied on Waterways projects categorized and ranked among project life cycle and among EIA topics

PHASES	Main topics (EIA) / Subphases	LEGISLATION AND REGULATION	Interactions with other mode(s) of transport	HABITATS MAPPING	IMPACTS	MEASURES	EVALUATION	Other topics	General aspects guides	GUIDE / TAXON	Wtotal (phases)
STRATEGIC PLANNING (national & regional)	National strategic planning										0,364
	Regional strategic planning										0,409
DESIGN	Early studies										0,591
	Late studies										0,318
	Detailed project study by the										0,182
Construction	Construction										0,318
Operation / maintenance / Upgrading	Operation & Maintenance / Upgrading										0,682
Decommisioning	Restoration (*Late* and detailled project study										0,045
Applied in study stages	Avoid, mitigate, compensate measures, consultation/initial talks, realisation										0,045
Stakeholders engagements	All phases, consultancy, publications, information to diverse publics,										0,091
WATERWAYS	Wtotal (topics)	0,200	0,100	0,325	0,233	0,333	0,400	0,300	0,350	0,200	0,305
	Legend:	Phase or topic with high number of good practices		Phase or topic with a medium number of good practices		Phase or topic with a lack of good practices		Phase or topic considered as a Gap			General Ratio (W_{total}) used as reference for comparison

The number of good practices is N_{total} = 67 and the total amount of available cells is N'_{total} = 220. Several phases and subphases are concerned by potential gaps. The subphases with the smallest $W_{total\text{-}x}$ are the Decommissioning and the "Applied in the study stages" phases, followed by the "Stakeholders engagements" phase.

Upgrading subphase is for this mode of transport merged into the "Operation / maintenance / upgrading" phase. "Detailed project studies by stakeholders" subphase is smaller $W_{total\text{-}x}$ than W_{total}, Early and Late

studies subphases $W_{total-x}$ being higher than W_{total}. When are merged all studies subphases, $W_{total-x}$ = N_x/N_x' = 24/66 (see Tables 1 and 2 in Appendix 1.3), $W_{total-x}$. = 0,364, which is higher than W_{total}. Design phase is then not considered to have a potential gap in GP.

Concerning EIA topics, the "Legislation and Regulation", "Interactions with other modes of transport" W_y index show potential gaps (at regional scale) as well as "Other topics" and "Guide / Taxon" $W_{total-y}$ index being smaller than W_{total}.

3.1.4. Gaps on Airports

Table 5. Good practices applied on Airports projects categorized and ranked among project life cycle and among EIA topics (Yellow rows and columns are without good practice)

PHASES	Main topics (EIA) / Subphases	LEGISLATION AND REGULATION	Interactions with other mode(s) of transport	HABITATS MAPPING	IMPACTS	MEASURES	EVALUATION	Other topics	General aspects guides	GUIDE / TAXON	Wtotal (phases)
STRATEGIC PLANNING (national & regional)	National strategic planning										0,56
	Regional strategic planning										0,28
DESIGN	Early studies										0,44
	Late studies										0,17
	Detailed project study by the stakeholder										0,17
Construction	Construction										0,22
Operation / maintenance / Upgrading	Operation & Maintenance / Upgrading										0,56
Decommisioning	Restoration (Late and detailled project study phases)										0,00
Applied in study stages	[illegible]										0,17
Stakeholders engagements	[illegible]										0,11
AIRPORTS	Wtotal (topics)	0,10	0,10	0,27	0,00	0,32	0,45	0,10	0,45	0,00	0,267
Legend:	Phase or topic with high number of good practices		Phase or topic with a medium number of good practices		Phase or topic with a lack of good practices		Phase or topic considered as a Gap		Phase or topic without good practice		General Ratio (W_{total}) used as reference for comparison

The number of good practices (N_{total} = 48) is low (nearly 10% of all good practices collected), the total amount of available cells being N'_{total} = 180, but the impacts of airports concerns mainly birds and the surface anthropised is not as important as roads or railways. We will then analyse the gaps concerning airports. Several phases are concerned by potential gaps.

It must be noticed that by the Decommissioning phase and the Impacts and "guides / taxon" EIA topics do not include any good practice.

Upgrading subphase is in this table merged to the "Operation / maintenance" phase. The "Detailed project studies by stakeholders" subphase $W_{total-x}$ is below W_{total}, Early and Late studies subphases being higher than $W_{total-x}$. When are merged all studies subphases into Design phase, $W_{total-x}$ = N_x /N_x' = 14/54 (see Tables 1 and 2 for airports in Appendix 1.4), $W_{total-x}$. = 0,259, which is, as "ARC Applied in studies stages"

$W_{total-x}$ index, very close to W_{total}. Design and "ARC Applied in studies stages" phases are not considered to have any potential gap in good practice.

Concerning EIA topics, the "Legislation and regulation", "Interactions with other modes of transport" show potential gaps (at regional scale) as well as "other topics", their $W_{total-y}$ index being below W_{total}.

3.1.5. Potential Gaps on Powerlines

Table 6. Good practices applied on powerlines projects categorized and ranked among project life cycle and among EIA topics

PHASES	Main topics (EIA) / Subphases	LEGISLATION AND REGULATION	Interactions with other mode(s) of transport	HABITATS MAPPING	IMPACTS	MEASURES	EVALUATION	Other topics	General aspects guides	GUIDE / TAXON	Wtotal (phases)
STRATEGIC PLANNING (national & regional)	National strategic planning										0,300
	Regional strategic planning										0,450
DESIGN	Early studies										0,700
	Late studies										0,050
	Detailed project study by the stakeholder										0,200
Construction	Construction										0,250
Operation / maintenance / Upgrading	Operation & Maintenance										0,250
	Upgrading										0,050
Decommisioning	Restoration (*Late* and detailled project study phases)										0,000
Applied in study stages	[illegible]										0,100
Stakeholders engagements	[illegible]										0,100
POWERLINES	Wtotal (topics)	0,182	0,091	0,242	0,09	0,234	0,333	0,00	0,364	0,00	0,223

Legend: Phase or topic with high number of good practices | Phase or topic with a medium number of good practices | Phase or topic with a lack of good practices | Phase or topic considered as a Gap | topic without good practice | General Ratio (W_{total}) used as reference for comparison

The number of good practices (N_{total} = 49) is low (nearly 10% of all good practices collected), the total amount of available cells being N'_{total} = 220) but the impacts of powerlines concern mainly birds and woodland habitats, limiting the number of possible of available good practices. We will then analyse the gaps in powerlines. Several phases are concerned by potential gaps: Upgrading phase has the smallest $W_{total-x}$ followed by the "Stakeholders engagements" and the "Applied in the study stages" project life cycle phases.

"Detailed project studies by stakeholder" $W_{total-x}$ is below the W_{total}, Early and Late studies subphases being higher than the $W_{total-x}$. When are merged all studies subphases altogether, $W_{total-x} = N_x/N_x' = 19/60$ (see Tables 1 and 2 in Appendix1.5), $W_{total-x}$. = 0,317, which is close to W_{total}. Design phase is then not considered to have any potential gap in good practice.

Concerning EIA topics, the “Legislation and regulation” and especially “Interactions with other modes of transport” and Impacts $W_{total-y}$ index are smaller than W_{total}, and show potential gaps.

It must be noticed that by the Decommissioning phase and the “Other topics” and “guides / taxon EIA topics do not include any good practice.

3.1.6. Potential Gaps on Ports and Pipelines

The tables 7 and 8 illustrate the lack of good practices proposed for ports and pipelines

Table 7. Good practices applied on ports projects categorized and ranked among project life cycle and among EIA topics

PHASES	Main topics (EIA) / Subphases	LEGISLATION AND REGULATION	Interactions with other mode(s) of transport	HABITATS	IMPACTS	MEASURES	EVALUATION	Other topics	General aspects guides	GUIDE / TAXON	Wtotal (phases)
STRATEGIC PLANNING (national & regional)	National strategic planning										0,33
	Regional strategic planning										0,13
DESIGN	Early studies										0,53
	Late studies										0,07
	Detailed project study by the stakeholder										0,20
Construction	Construction										0,53
Operation / maintenance / Upgrading	Operation & Maintenance / Upgrading										0,47
Decommisioning	Restoration (Late and detailled project study phases)										0,00
Applied in study stages	Avoid, mitigate, compensate measures, consultation/finalisation, evaluation										0,07
Stakeholders engagements	All phases, education, publications, information to diverse public,										0,07
PORTS	Wtotal (topics)	0,20	0,00	0,15	0,20	0,36	0,35	0,10	0,30	0,00	0,240

Legend:	Phase or topic with high number of good practices	Phase or topic with a medium number of good practices	Phase or topic with a lack of good practices	Phase or topic considered as a Gap	Phase or topic without good practice	General Ratio (W_{total}) used as reference for comparison

Table 8. Good practices applied on pipelines projects categorized and ranked among project life cycle and among EIA topics (Yellow rows and columns are empty of good practice)

PHASES	Main topics (EIA) / Subphases	LEGISLATION AND REGULATION	Interactions with other mode(s) of transport	HABITATS	IMPACTS	MEASURES	EVALUATION	Other topics	General aspects guides	GUIDE / TAXON	Wtotal (phases)
STRATEGIC PLANNING (national & regional)	National strategic planning										0,31
	Regional strategic planning										0,38
DESIGN	Early studies										0,62
	Late studies										0,08
	Detailed project study by the stakeholder										0,23
Construction	Construction										0,38
Operation / maintenance / Upgrading	Operation & Maintenance										0,08
	Upgrading										0,00
Decommisioning	Restoration (*Late* and detailled project study phases)										0,00
Applied in study stages	Avoid, mitigate, compensate measures, combination/installation and evaluation										0,08
Stakeholders engagements	All phases, consultations, publications, information to diverse publics, scientific studies...										0,15
PIPELINES	Wtotal (topics)	0,09	0,09	0,27	0,00	0,39	0,27	0,00	0,27	0,00	0,210

Legend:											
	Phase or topic with high number of good practices		Phase or topic with a medium number of good practices		Phase or topic with a lack of good practices		Phase or topic considered as a Gap		Phase or topic without good practice		General Ratio (W_{total}) used as reference for comparison

3.1.7. Synthesis for all modes of transport

In this chapter, a comparison is carried out to detect common trends in all modes of transport. On the global analysis table (Table 9) we pooled altogether all modes of transport, we find the same gap as found for Waterways, concerning EIA topics, the “Legislation and Regulation”, “Interactions with other modes of transport” W_y index show potential gaps (at regional scale) as well as “Other topics” and “Guide / Taxon” $W_{total\text{-}y}$ index being smaller than W_{total}. The topic concerning Taxon/guide is not exhaustive, there are many guides produced in Europe (see the website Transport Ecology Guidelines Portal: https://handbookwildlifetraffic.info/transport-ecology-guidelines-portal/).

Two phases with a gap are common to all transport modes: "Decommisioning" and "Stakeholders engagements", with a gap are with $W_{total\text{-}x} < 0.150$. “Applied in study stages” and more particularly upgrading phase are lower but close to $W_{total\text{-}x} = 0.300$, considering that there are gap concerned need further examinations.

The only topic common to all modes of transport with potential gap is "Impacts".

Table 9. Good practices applied on “All modes of transport” projects categorized and ranked among project life cycle and among EIA topics (Yellow rows and columns are empty of good practice)

PHASES	Main topics (EIA) / Subphases	LEGISLATION AND REGULATION	with other mode(s) of transport	HABITATS MAPPING	IMPACTS	MEASURES	EVALUATION	Other topics	General aspects guides	GUIDE / TAXON	Wtotal (phases)
STRATEGIC PLANNING (national & regional)	National strategic planning										0,379
	Regional strategic planning										0,452
DESIGN	Early studies										0,547
	Late studies										0,194
	Detailed project study by the stakeholder										0,226
Construction	Construction										0,310
Operation / maintenance / Upgrading	Operation & Maintenance										0,458
	Upgrading										0,280
Decommisioning	Restoration (*Late* and detailled project study phases)										0,026
Applied in study stages	Avoid, mitigate, compensate measures, construction/installation and evaluation										0,200
Stakeholders engagements	All phases, education, publication, information to diverse public, scientific studies...										0,148
PIPELINES	Wtotal (topics)	0,218	0,132	0,308	0,172	0,367	0,359	0,250	0,326	0,158	0,300
	Legend:	Phase or topic with high number of good		Phase or topic with a medium number of		Phase or topic with a lack of good practices		**Phase or topic considered as a Gap**			General Ratio (W_{total}) used as reference for

Comparison between modes of transport

In Table 10, Roads and Railways GPs have altogether the half of all GPs, Inland waterways having only 13% of all GPs. Below 13% of all GPs collected, the number of topics/phases with a potential gap increases by 50%, which underlines the fact that the analyses carried out for airports and powerlines, which otherwise have a $W < W_{total}$ index, are partly biased and potentially partial, thus requiring further validation. It strengthens also the conclusion to avoid GPs analysis for Ports and Pipelines, each one including below 7% of all GPs.

It should be noted that the percentage and total number of cells available for the GPs (Table 10), compared by each transport mode to the number of GPs, allows the detection of the level of heterogeneity in the distribution by topics and by phases. Thus, for an equivalent number of GPs, roads have more available GPs than railways. This means that many GPs may have been positioned for particular topics and phases (such as Measures topic during the Maintenance phase) and that there may be more gaps than for railways which have a more regular distribution in the GP table and a proportionally more complete level of information than roads.

Table 10. Synthesis of good practices analysis for all modes of transport

Modes of transport	ROAD 8	RAILWAY 8	WATERWAY 8	AIRPORT 8	POWERLINE 8	PORT 8	PIPELINE 8	TOTAL (all transport modes)
Total Number of GP* (N)	146	140	67	48	49	36	30	516
Total Number of available cells (N°)	455	352	220	180	220	150	143	1720
W total index	0,321	0,398	0,305	0,267	0,223	0,240	0,210	0,300
Comparison of transport modes Means with Total global mean	>	>	=	≤	<	<	<	-
% GP / each mode of transport	28,29%	27,13%	12,98%	9,30%	9,50%	6,98%	5,81%	100,00%
% "cells available" / each mode of transport	26,45%	20,47%	12,79%	10,47%	12,79%	8,72%	8,31%	100,00%
Gaps number in life cycle phas	3	3	3	4	4	-	-	Common phases gaps
list of gaps for project life cycle phases	- Construction - Decommisioning - Stakeholders engagemt	- Construction - Decommisioning - Stakeholders engagemt	- Decommisioning -Applied in studies - Stakeholders engagemt	- Construction - Decommisioning - Applied in studies - Stakeholders engagemt	- Upgrading - Decommisioning - Applied in studies - Stakeholder engagemt	-	-	- Decomminssioning - Stakeholders engagemt
Number of Gaps in EIA Topics	1	3	3	5	5	-	-	Common topics gaps
list of gaps for EIA Topics	- Impacts	- Impacts - Legislation - Interaction	- Impacts - Legislation - Interaction	- Impacts - Legislation - Interaction - Other topics - Guides/taxon	- Impacts - Legislation - Interaction - Other topics - Guides/taxon	-	-	- Impacts

(*) GP = Good Practice

3.2. Gaps from questionnaire results

A descriptive analysis applied on gaps extracted from the questionnaire answers provide the following results (Figure 8):

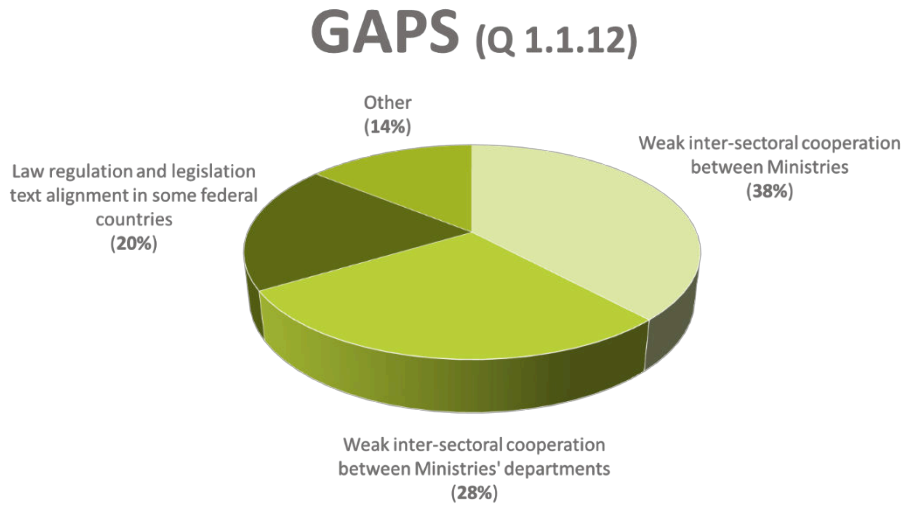


Figure 8: Gaps descriptive statistical analysis results

The most identified gaps are within “inter-sectoral cooperation between Ministries” categories followed by “inter-sectoral cooperation between Ministries’ departments”, “Law regulation…” and finally “Other” categories.

A detailed list of answers provided under 'Other' is provided below and these other gaps in the Table 11 below can be categorised into 5 items

Table 11. Gaps in Good Practice from the questionnaire and categorized into 5 items

Gaps items	**Gaps extracted from the questionnaire**
Interest in effects of infrastructures of transport on biodiversity	- Lack of interest - Lack of political will
Lack of funding	- Lack of funding - Lack of channelling budgets for this matter - Economy has more priority than ecology (nature protection) - Many provisions on paper only
Transport economic sector lobbying	- Lobbying of industry - Policy on ecologically sustainable and biodiversity friendly Transport
Lack of coordination between administrations	- Lack of coordination among regional governments - Weak cooperation between ministries and local / regional state services Lack of coordination between authorities in charge of biodiversity management - Lack on the strategic level implementation - Gap between the objectives of the policy and the local political pressures not to implement them properly
Awareness and education	- Low level of knowledge across stakeholders - Lack of awareness at high political level, particularly from Transport Sector - Low level of awareness of employees of transport policy sector in EU-SGI, EU - SB issues

3.3. Results on Barriers

A descriptive analysis applied on barriers extracted from the questionnaire answers provide the following results (Figure 9):

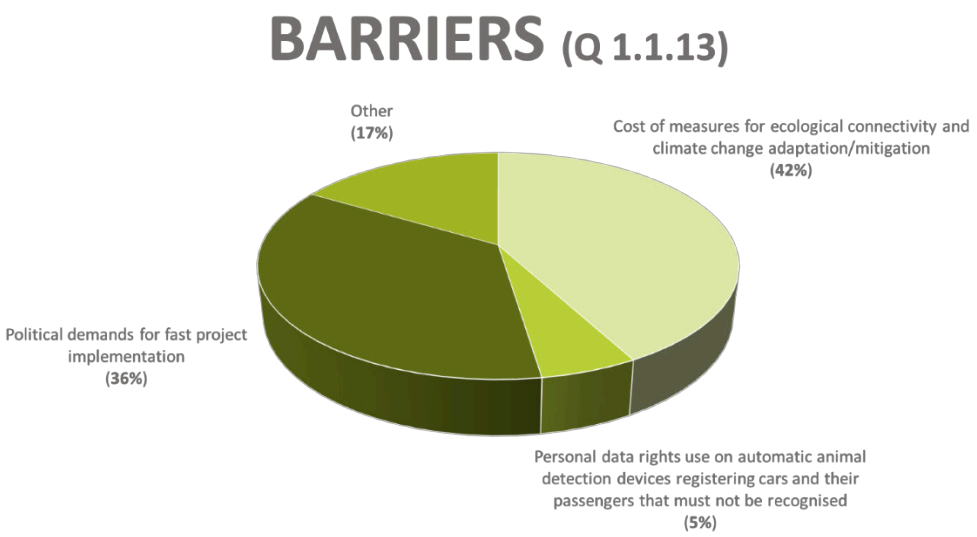


Figure 9: Barriers descriptive statistical analysis results

The "cost of measures" barrier is the most cited one, the second most cited being the "political demand for fast project implementation, "personal data rights" being the less cited. A detailed list of answers provided under 'Other' is provided in Table 12 below. Some of these items are close to the two main categories of barriers ("economical trends" with "cost of measures", and "will and enthusiasm of actors" with "political demand for fast project implementation").

Table 12. "Other" barriers in Good Practices from the questionnaire and categorized into 5 items

Barriers items	**"Other" barriers extracted from the questionnaire**
Knowledge availability	• Lack of knowledge • Lack of clear guidelines about what measures to apply. • Lack of baseline data on biodiversity and connectivity
Will and enthusiasm of actors	• Unwillingness of actors for changing traditional solutions • Capacity and enthusiasm in developers. • Lack of political will
Administration organisation	• Environmental externalities are not sufficiently integrated into decision-making process. • Lack of specialists in key positions. • Regional services are pressured and don´t have enough resources (time notably) to do their job properly
Economical trends	• Private ownership of adjacent land • Economy has more priority than ecology (nature).
Awareness	• Understanding the importance of biodiversity protection and safeguarding ecological connectivity. • Lack of (ecological) awareness during the design phase.

4. DISCUSSION

This deliverable presents and describes the methodology used in the context of Task 3.1 for the identification of gaps and barriers in GPs currently applied to mainstream biodiversity in transport and their evaluation. This deliverable will help to establish interaction with WP4 and WP5 a SRDA about infrastructures of transport effects on biodiversity.

4.1. Potential Gaps of Good Practice and Gaps from questionnaire

The common assumption that tools and practices are more abundant for roads as it has been reported for number of publications for diverse studies in ecology such as the recent systematic reviews on potentiality of verges to constitute natural habitats (Villemey et al., 2019; Ouédraogo et al., 2020) is verified in this study. Railways have far fewer GPs than roads and GPs are even fewer in the context of waterways. Airports and ports provide only a few GPs because, as waterways, new constructions of this type of infrastructures are rare or non-existent in Europe and in the countries of the European Union (Eurostat and EGM, Table 13). They represent only a small area (Table 13) of built-up land compared to other modes of transport such as roads and railways, even though they indirectly generate a significant volume of traffic on the various linear transport infrastructure networks (roads, railways and waterways) and the impacts associated with this traffic. This limits the likelihood of acquiring a sufficient and usable number of GPs.

Table 13. Estimations of length and surface occupied in European Union by main roads, railways, waterways, ports and airports
(Surface of roads, railways and waterways are based on a crude estimation of their width)

Infrastructures of transport in EU (year)	**Main Roads (2020)**	**Railways (2019)**	**Inland waterways (2019)**	**Ports (2021)**	**Airports (2018)**
Total Length (km) or number (ports - airports)	3 874 709	323 034	41 891	935	391
Total Surface (km²) (Infrastructure Width (m))	77 500 (20)	4 875 (15)	628 (15)	805	2725
***Sources** – (date of data)*	*Length and number of infrastructure (except Ports) Eurostat + diverse databases. Number of Ports: EGM - https://geoservices.ign.fr/egm (31/12/2021)*			*Surface for Ports and Airports: Corine Land Cover (2018)*	

Powerlines and pipelines have mainly permanent impacts on the forest habitats they cross as they require clearing (LIFE Elia RTE – ITTECOP (2015)) to prevent the tree canopy from touching the powerline cables and causing power outages or the root system of the tree vegetation from piercing and damaging the pipelines, which are usually buried in Europe. Impacts can sometime be positive for

landscape and biodiversity (i.e. for some insect species that benefit of the open habitats inside woody areas) but are generally negative and are most significant during the construction phase, and remain significant during the commissioning of the powerlines for flying organism due to potential collisions with power lines. The small variety of impacts on these two modes of transport, as for ports and airports (see Table 13), implies a potentially small number of GPs compared to roads and railways.

4.1.1. Common Potential Gaps to all modes of transport

a. Impacts and other topics

The impacts of transport infrastructures are not well known for all taxa, especially on invertebrates (Jakobson et al., 2018), vegetation and soil (Ballantyne & Pickening, 2015). Disturbances such as noise (Sordello et al., 2019) and light impacts (Secondi et al., 2020; Sordello et al., 2022) that are deeply investigate still show important knowledge gaps. The gaps concern also the limits in accuracy of impacts evaluations, such as bird mortality evaluation due to collision with powerlines (Borner el al., 2017). Two important gaps, among many others, is the lack of consistent knowledge about the intensities of all impacts of each (type) project life cycle phase especially from construction to decommissioning on all taxa and habitats (Guinard et al., 2016) and how to improve cumulative impacts assessments (Mokany et al., 2019). However, this impacts (topics) GPs under-representation may be biased by the fact that impacts items are generally pooled with mitigation measures and even with their evaluation. So many Impacts GPs may be included into these two last topics.

“Legislation and regulation” as well as “Interaction between other transport modes” topics are, for all other modes of transport except roads, common topics revealing potential gaps of GPs. “Legislation and regulations” have for all transport modes the number of GPs N_y = 19 GPs and “Interaction between other transport modes” have the number of GPs N_y = 10 GPs. These topics concern mainly strategic planning phase and they are de facto under-represented compared to the other GPs’ topics (“legislation”: 3.68% and “Interaction”: 1.94%). “Interaction between other transport modes” GPs are particularly not frequently observed and show significant gap. During this phase, analyses of interactions conducting to the creation of a coordinated strategic planning between a project of new airport, railways and roads have been reported in Spain. A project of motorway circumventing Bordeaux (that has been stopped for now) used Mérignac airport more as a justification of construction of this motorway, arguing a strategic interest of connection of this motorway to the airport, than a real coordination with diverse urban modes of transport (bud, tramway…).

b. Transport infrastructure project life cycle phases

Decommissioning (phase) of infrastructure occurs rarely in Europe and even outside Europe, explaining why it shows potential gap in GPs, this point being confirm buy CEREMA experts for airports and ports. Stakeholders engagements should be far more frequent but only 11 % of the persons who answered to the Task 3.1 questionnaire were from private companies involved in construction or are operators.

Based on internal waterways reports by CEREMA expert added examples to the list of GPs available of certain works of calibration, dredging and modernisation of docks. The low numbers of stakeholders contacted could also explain this deficit (see above). All concerning ARC “Applied in studies stages” are globally slightly below the W_{total} index of all modes of transport (Table 10), $W_{total\text{-}x}$ is only higher to W_{total} for roads and railways. Upgrading shows potential GPs gap: it could be because upgrading is a recent item (except for Western Europe) and only roads and railways do not have gaps of GPs in the phase of

upgrading. It could be linked with a low number of stakeholders for some modes of transport such as waterways: a waterway expert from CEREMA reports examples of GPs missed that need to be added like certain works of calibration, dredging and modernization of docks and it needs to be deeply investigated in following steps.

Potential gaps of GPs concerns “Applied for studies stages”. It could be explained by the fact that phase can be another version of Design phase, and GPs has not been positioned in the both “sister” phases.

c. Complementarity of potential gaps analysis with gaps from the questionnaire

The gaps from the questionnaire indicate the global context in the EU, the GPs detailing more the gaps in technical domains. But the first method results can bring supplemental information to the results observed in the questionnaire The most frequent gaps cited in the questionnaire (Figure 11) are about national and local administrations coordination and organisation, the second item being the lack of legislation gaps are also an important These gaps are mainly controlled by the Political strategies in the Ministries of transportation and of environment, these two topics in some countries being pooled in the same Ministry (i.e. France). It is somehow in links with the lack of funding and of interest in effects of infrastructure s of transport in biodiversity that could be also linked to gaps in awareness and education. This last gap is confirmed by the potential gap in stakeholders engagements “phase” nearly observed in all modes of transport in the GPs distribution analysis (Table 9). All these items are in direct interactions, and the motivation of all main actors is crucial.

Conversely, the potential gap observed on "interactions between several modes of transport" in the strategic planning phase would tend to indicate a lack of coordination between departments of the same ministry or even between several ministries involved in projects. It will be necessary in the further analysis process to determine which countries are more particularly impacted by this potential disorganisation of administrations, bearing in mind that France accounts for more than a quarter of all the responses to the questionnaire, thus biasing the analysis.

The gaps in scientific knowledge on infrastructures of transport on biodiversity, currently reported in the scientific literature do not appear in our gap analyses, in part because it concerns all items and all phases to varying degrees. It concerns both the knowledge of impacts (i.e. cumulative impacts (Jaeger, 2015) and among many other items, the impacts on animal populations persistence (Barrientos et al., 2021), which is an obvious gap according to the results obtained. But these gaps in knowledge concern also the assessments of impacts and all types of measures, which despite the abundance of GPs, still require further study in terms of scientific knowledge (i.e. the sensitivity of the various animal and plant species to the various pollutions and nuisances at each phase of a transport infrastructure project and for each modes of transport (Guinard et al., 2016)). The WP4 and WP5 teams have the task of drawing up an assessment of the scientific knowledge gaps. Scientific knowledge was mainly perceived as a barrier by the interviewees (Table 11).

4.2. Barriers on Good Practice

Comparing the results of the categorisation of barriers with those of the gaps, we find almost the same types of barrier categories but in different proportions (Figure 12), with political strategies remaining important but financial considerations being perceived as the most important barriers. The right to use personal data is a minor but noteworthy issue. We find the same types of categories as for the gaps in "other" barriers, except for lobbying of the economic sector of transport, which is not found in the barriers, which, in contrast to the gaps, mention the lack of available scientific knowledge.

The lack of funding, the will of politicians and administrations, which lack coordination in governance, and finally education & communication on the interactions between transport infrastructures and biodiversity are indeed unavoidable themes for both barriers and gaps. This situation is similar to the description of the main barriers by Tinch and his collaborators (2015), adding an "…insufficient capacity at the national level to implement laws and policies…".

These results provide the main gaps and barriers but there is a need of deeper analysis because….

4.3. Next steps for gaps and barriers analyses

The next step will be to analyse more deeply which are main gaps and barriers posing obstacles to the application of good practices to mainstream biodiversity in transport infrastructure development and maintenance.WP5 will contribute with data about legislation and regulation (Task 5.1) and explore with other methods to identify gaps and barriers (Task 5.4).

Files describing most relevant good practices are under preparation (Task 3.1). This compilation will be presented and a structured list of gaps and barriers will be discussed with stakeholders (Task 3.2.). Main goal will be to identify the constraints and limitations that are slowing or hindering the application of best practice goal to mainstream biodiversity into the transport infrastructure sector, as well as it is crucial to have feedbacks from experts and stakeholders about the best practices previously selected. This task will be developed in two workshops applying 'World Café method' to be held at the IENE Conference on Ecology and Transportation and the Transport Research Arena (TRA) Conference to be held September and November 2022. An updated version of this report including the results of stakeholder's contributions will be held by December 2022.

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BIODIVERSITY AND INFRASTRUCTURE SYNERGIES AND OPPORTUNITIES FOR EUROPEAN TRANSPORT NETWORKS

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APPENDIX 1.1

Table 1 for the collection of Good Practices distributed among mains items and life cycle phases of road projects for gap analysis

PHASES	Main items / Detaild phases	LEGISLATION AND REGULATION	Interactions with other mode(s) of transport	HABITATS MAPPING	IMPACTS	MEASURES	EVALUATION	Other topics	General aspects	GUIDE / TAXON	TOTAL
STRATEGIC PLANNING (national & regional)	National strategic planning	2	2	6	1	1	0	1	6	1	20
	Regional strategic planning	0	1	6	0	3	4	1	2	1	18
DESIGN	Early studies	1	1	8	7	9	4	2	2	0	34
	Late studies	0	0	2	0	4	0	2	0	0	8
	Detailed project study by the stakeholder	1	0	0	3	3	2	1	0	0	10
Construction	Construction	1	0	0	0	3	3	0	2	0	9
Operation / maintenance / Upgrading	Operation & Maintenance	0	0	3	0	3	4	1	0	1	12
	Upgrading	1	0	0	0	10	3	0	2	0	16
Decommisioning	Restoration (*Late* and detailled project study	1	0	0	0	1	0	0	0	0	2
Applied in study stages	Avoid, mitigate, compensate	0	0	0	0	9	0	1	0	1	11
Stakeholders engagements	All phases, educations, publications,	0	0	2	0	1	1	0	2	0	6
ROADS	TOTAL	7	4	27	11	47	21	9	16	4	146

Table 2 for the number of cells available for collection of Good Practices distributed among mains items and life cycle phases of road projects for gap analysis

PHASES	Main items	LEGISLATION AND REGULATION	Interactions with other mode(s) of transport	HABITATS MAPPING	IMPACTS	MEASURES	EVALUATION	Other topics	General aspects	GUIDE / TAXON	TOTAL
STRATEGIC PLANNING (national & regional)	National strategic planning	2	2	12	8	20	10	4	10	2	70
	Regional strategic planning	1	1	6	4	10	5	2	5	1	35
DESIGN	Early studies	2	2	12	8	20	10	4	10	2	70
	Late studies	1	1	6	4	10	5	2	5	1	35
	Detailed project study by the	1	1	6	4	10	5	2	5	1	35
Construction	Construction	1	1	6	4	10	5	2	5	1	35
Operation / maintenance / Upgrading	Operation & Maintenance	1	1	6	4	10	5	2	5	1	35
	Upgrading	1	1	6	4	10	5	2	5	1	35
Decommisioning	Restoration (*Late* and detailled	1	1	6	4	10	5	2	5	1	35
Applied in study stages	Avoid, mitigate, compensate measures, construction/installation and evaluation	1	1	6	4	10	5	2	5	1	35
Stakeholders engagements	All phases, educations, publications, information to diverse publics, scientific studies...	1	1	6	4	10	5	2	5	1	35
	TOTAL	13	13	78	52	130	65	26	65	13	455

APPENDIX 1.2

Table 1 for the collection of Good Practices distributed among mains items and life cycle phases of railways projects for gap analysis

PHASES	Main items / Detaild phases	LEGISLATION AND REGULATION	Interactions with other mode(s) of transport	HABITATS MAPPING	IMPACTS	MEASURES	EVALUATION	Other topics	General aspects	GUIDE / TAXON	TOTAL
STRATEGIC PLANNING (national & regional)	National strategic planning	1	1	6	2	2	1	2	3	1	19
	Regional strategic planning	2	1	6	0	6	1	2	3	1	22
DESIGN	Early studies	0	0	5	1	7	3	1	1	1	19
	Late studies	0	0	2	0	2	2	1	1	1	9
	Detailed project study by the	0	0	0	0	5	2	1	0	0	8
Construction	Construction	0	0	0	0	5	3	0	2	0	10
Operation / maintenance / Upgrading	Operation & Maintenance	1	0	2	3	11	1	2	1	0	21
	Upgrading	0	0	1	0	8	1	0	0	1	11
Decommisioning	Restoration (*Late* and detailled	0	0	0	0	1	0	0	0	0	1
Applied in study stages	Avoid, mitigate, compensate	0	0	0	0	10	0	1	0	1	12
Stakeholders engagements	All phases, educations,	0	0	2	0	3	0	1	2	0	8
RAILWAYS	TOTAL	4	2	24	6	60	14	11	13	6	140

Table 2 for the number of cells available for collection of Good Practices distributed among mains items and life cycle phases of railways projects for gap analysis

PHASES	Main items	LEGISLATION AND REGULATION	Interactions with other mode(s) of	HABITATS MAPPING	IMPACTS	MEASURES	EVALUATION	Other topics	General aspects	GUIDE / TAXON	TOTAL
STRATEGIC PLANNING (national & regional)	National strategic	2	1	6	3	11	3	2	3	1	32
	Regional strategic	2	1	6	3	11	3	2	3	1	32
DESIGN	Early studies	2	1	6	3	11	3	2	3	1	32
	Late studies	2	1	6	3	11	3	2	3	1	32
	Detailed project	2	1	6	3	11	3	2	3	1	32
Construction	Construction	2	1	6	3	11	3	2	3	1	32
Operation / maintenance / Upgrading	Operation & Maintenanc	2	1	6	3	11	3	2	3	1	32
	Upgrading	2	1	6	3	11	3	2	3	1	32
Decommisioning	Restoration (*Late* and	2	1	6	3	11	3	2	3	1	32
Applied in study stages	Avoid, mitigate, compensate measures, construction/installa	2	1	6	3	11	3	2	3	1	32
Stakeholders engagements	All phases, educations, publications, information to	2	1	6	3	11	3	2	3	1	32
RAILWAYS	TOTAL	22	11	66	33	121	33	22	33	11	352

APPENDIX 1.3

Table 1 for the collection of Good Practices distributed among mains items and life cycle phases of waterways projects for gap analysis

PHASES	Main items	LEGISLATION AND REGULATION	Interactions with other mode(s) of transport	HABITATS MAPPING	IMPACTS	MEASURES	EVALUATION	Other topics	General aspects	GUIDE / TAXON	TOTAL
STRATEGIC PLANNING (national & regional)	National strategic planning	1	1	2	1	1	0	1	1	0	8
	Regional strategic planning	0	0	3	1	2	1	1	1	0	9
DESIGN	Early studies	0	0	4	1	4	2	1	1	0	13
	Late studies	0	0	2	0	2	1	0	1	1	7
	Detailed project study by the	0	0	0	0	1	2	0	0	1	4
Construction	Construction	0	0	0	0	3	3	0	1	0	7
Operation / maintenance / Upgrading	Operation & Maintenance / Upgrading	1	0	2	3	6	3	0	0	0	15
Decommisioning	Restoration (*Late* and detailled	0	0	0	1	0	0	0	0	0	1
Applied in study stages	Avoid, mitigate, compensate	0	0	0	0	1	0	0	0	0	1
Stakeholders engagements	All phases, educations, publications,	0	0	0	0	0	0	0	2	0	2
WATERWAYS	TOTAL	2	1	13	7	20	12	3	7	2	67

Table 2 for the number of cells available for collection of Good Practices distributed among mains items and life cycle phases of waterways projects for gap analysis

PHASES	Main items	LEGISLATION AND REGULATION	Interactions with other mode(s) of	HABITATS MAPPING	IMPACTS	MEASURES	EVALUATION	Other topics	General aspects	GUIDE / TAXON	TOTAL
STRATEGIC PLANNING (national & regional)	National strategic planning	1	1	4	3	6	3	1	2	1	22
	Regional strategic planning	1	1	4	3	6	3	1	2	1	22
DESIGN	Early studies	1	1	4	3	6	3	1	2	1	22
	Late studies	1	1	4	3	6	3	1	2	1	22
	Detailed project	1	1	4	3	6	3	1	2	1	22
Construction	Construction	1	1	4	3	6	3	1	2	1	22
Operation / maintenance / Upgrading	Operation & Maintenance / Upgrading	1	1	4	3	6	3	1	2	1	22
Decommisioning	Restoration (*Late* and detailled	1	1	4	3	6	3	1	2	1	22
Applied in study stages	Avoid, mitigate, compensate measures, construction/install	1	1	4	3	6	3	1	2	1	22
Stakeholders engagements	All phases, educations, publications, information to	1	1	4	3	6	3	1	2	1	22
WATERWAYS	TOTAL	10	10	40	30	60	30	10	20	10	220

APPENDIX 1.4

Table 1 for the collection of Good Practices distributed among mains items and life cycle phases of airports projects for gap analysis

PHASES	Main items / Detaild phases	LEGISLATION AND REGULATION	Interactions with other mode(s) of transport	HABITATS MAPPING	IMPACTS	MEASURES	EVALUATION	Other topics	Guides General aspects	Guides taxon	TOTAL
STRATEGIC PLANNING (national & regional)	National strategic	1	1	2	0	3	1	1	1	0	10
	Regional strategic	0	0	3	0	1	0	0	1	0	5
DESIGN	Early studies	0	0	0	0	4	2	0	2	0	8
	Late studies	0	0	0	0	1	1	0	1	0	3
	Detailed project	0	0	1	0	0	1	0	1	0	3
Construction	Constructio	0	0	0	0	2	2	0	0	0	4
Operation / maintenance / Upgrading	Maintenanc e	0	0	1	0	6	2	0	1	0	10
Decommisioning	Rehabilitatio n (Late and	0	0	0	0	0	0	0	0	0	0
Applied in study stages	Avoid, mitigate, compensate measures,	0	0	0	0	2	0	0	1	0	3
Stakeholders engagements	All phases, educations, publications , information	0	0	1	0	0	0	0	1	0	2
AIRPORTS	TOTAL	1	1	8	0	19	9	1	9	0	48

Table 2 for the number of cells available for collection of Good Practices distributed among mains items and life cycle phases of airports projects for gap analysis

PHASES	Main items / Detaild phases	LEGISLATION AND REGULATION	Interactions with other mode(s) of transport	Habitats mapping	IMPACTS	MEASURE	VALUATIO	Other topics	Guides General aspects	Guides taxon	TOTAL
STRATEGIC PLANNING (national & regional)	National strategic	1	1	3	1	6	2	1	2	1	18
	Regional strategic	1	1	3	1	6	2	1	2	1	18
DESIGN	Early studies	1	1	3	1	6	2	1	2	1	18
	Late studies	1	1	3	1	6	2	1	2	1	18
	Detailed project study by the	1	1	3	1	6	2	1	2	1	18
Construction	Construction	1	1	3	1	6	2	1	2	1	18
Operation / maintenance / Upgrading	Maintenance	1	1	3	1	6	2	1	2	1	18
Decommisioning	Rehabilitation (Late and	1	1	3	1	6	2	1	2	1	18
Applied in study stages	Avoid, mitigate, compensate measures, construction/inst	1	1	3	1	6	2	1	2	1	18
Stakeholders engagements	All phases, educations, publications, information to	1	1	3	1	6	2	1	2	1	18
AIRPORTS	TOTAL	10	10	30	10	60	20	10	20	10	180

APPENDIX 1.5

Table 1 for the collection of Good Practices distributed among mains items and life cycle phases of powerlines projects for gap analysis

PHASES	Main items / Detaild phases	LEGISLATION AND REGULATION	Interactions with other mode(s) of transport	HABITATS MAPPING	IMPACTS	MEASURES	EVALUATION	Other topics	Guides General aspects	Guides / Taxon	TOTAL
STRATEGIC PLANNING (national & regional)	National strategic planning	1	0	1	0	2	0	0	2	0	6
	Regional strategic planning	0	0	3	0	3	1	0	2	0	9
DESIGN	Early studies	0	0	2	0	7	3	0	2	0	14
	Late studies	0	0	0	0	0	1	0	0	0	1
	Detailed project study by the stakeholder	0	0	1	0	1	2	0	0	0	4
Construction	Construction	1	0	0	0	2	2	0	0	0	5
Operation / maintenance / Upgrading	Operation & maintenance	0	0	0	0	2	2	0	1	0	5
	Upgrading	0	1	0	0	0	0	0	0	0	1
Decommisioning	Restoration (Late and detailled project study phases)	0	0	0	0	0	0	0	0	0	0
Applied in study stages	Avoid, mitigate, compensate measures & evaluation	0	0	0	1	1	0	0	0	0	2
Stakeholders engagements	All phases	0	0	1	0	0	0	0	1	0	2
POWERLINES	TOTAL	2	1	8	1	18	11	0	8	0	49

Table 2 for the number of cells available for collection of Good Practices distributed among mains items and life cycle phases of powerlines projects for gap analysis

PHASES	Main items / Detaild phases	LEGISLATION AND REGULATION	Interactions with other mode(s) of transport	HABITATS MAPPING	IMPACTS	MEASURES	EVALUATION	Other topics	Guides General aspects	Guides / Taxon	TOTAL
STRATEGIC PLANNING (national & regional)	National strategic planning	1	1	3	1	7	3	1	2	1	20
	Regional strategic planning	1	1	3	1	7	3	1	2	1	20
DESIGN	Early studies	1	1	3	1	7	3	1	2	1	20
	Late studies	1	1	3	1	7	3	1	2	1	20
	Detailed project study by the stakeholder	1	1	3	1	7	3	1	2	1	20
Construction	Construction	1	1	3	1	7	3	1	2	1	20
Operation / maintenance / Upgrading	Operation & maintenance	1	1	3	1	7	3	1	2	1	20
	Upgrading	1	1	3	1	7	3	1	2	1	20
Decommisioning	Restoration (Late and detailled project study phases)	1	1	3	1	7	3	1	2	1	20
Applied in study stages	Avoid, mitigate, compensate measures & evaluation	1	1	3	1	7	3	1	2	1	20
Stakeholders engagements	All phases	1	1	3	1	7	3	1	2	1	20
POWERLINES	TOTAL	11	11	33	11	77	33	11	22	11	220