BISON

BIODIVERSITY AND INFRASTRUCTURE SYNERGIES AND OPPORTUNITIES FOR EUROPEAN TRANSPORT NETWORKS

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EU funding opportunities and proposals for cross sectoral topics

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EXECUTIVE SUMMARY

The BISON project is led by a consortium of 45 European members and associated countries. It aims to tackle the integration of biodiversity with the development of infrastructure, including roads, railways, waterways, airports, ports, or energy transport networks.

The BISON project will meet the above aim through the following objectives:

- Identify future research and innovation needs for a better integration of biodiversity with infrastructure.
- Identify the construction, maintenance and inspection methods and materials which are long-lasting and resilient and can be used by different transport modes to mitigate pressure on biodiversity.
- Support European Member States to fulfil their international commitments by engaging all stakeholders into biodiversity mainstreaming for infrastructure planning and development.
- Strengthen European Member States' leadership in sustainability, by showing the way to other countries, including developing countries.

This deliverable (D5.6) is produced in the context of Work Package WP5 - Towards Deployment). The objective of WP5 is to produce the deployment side of the Strategic Research and Deployment Agenda (SRDA), setting the ground for the necessary actions and innovative solutions to take place, for mainstreaming Green & Grey infrastructure across the EU Member States and across the different transport modes. It will identify the topics for potential cooperation of European stakeholders in transferring good practices at policy, legislative and implementation levels. WP5 has the following objectives:

- Assess the maturity level, gaps and needs of the EU Member States in policy, legislative and implementation levels on integrating the provisions of the EU Strategy for Green Infrastructure (EU SGI) into transport infrastructure development for all transport modes.
- Provide concrete innovative instruments and visual tools (i.e. map) for the planning and design stage of the infrastructure life-cycle with respective indicators for identifying conflict points and design solutions on how to avoid and/or compensate for existing fragmentation caused by transport infrastructure and on how to avoid future fragmentation by new constructions and upgrading of infrastructure.

Moreover, key topics, processes and tools to foster the deployment of the recommended practices will be identified for the different transport modes, by considering the entire active life-cycle of a transport infrastructure project (i.e. scoping, planning, designing, constructing, operating & decommissioning). In this regard, WP5 has also the following objectives:

- Prepare for the future by considering emerging trends and uncertainties and developing plausible scenarios and propose research priorities by allocating to these scenarios the most suitable innovative solutions that would address the stakeholders' needs and requirements, based on WP4 outcomes.
- Identify EU funding sources and possibility for cross-thematic/cross-sectoral funding for sourcing the necessary financial resources towards the deployment of the recommended policies and practices at EU level.

Deliverable D5.6 - EU funding opportunities and proposals for cross sectoral topics, constitutes the the first critical mapping of cross-funding of research and innovation in infrastructure and biodiversity. The lack of previous work on the subject has led to the development of very broad analyses of the actors, their operations and the consequences of the fragmentation of funds. The final section devoted to proposals for change puts forward several hypotheses that remain to be debated.

ABBREVIATIONS

Abbreviation	Meaning
ANAS	Italian company deputed to the construction and maintenance of Italian motorways and state highways under the auditing and technical-operative supervision of the Italian Ministry of Sustainable Infrastructures and Mobility
AVC	Animal-Vehicle Collisions
ASFINAG	Autobahnen- und Schnellstraßen-Finanzierungs-Aktiengesellschaft
CBD	Convention on Biological Diversity
CEDR	Conference of European Directors of Roads
CEN	European Committee for Standardization
CENELEC	European Electrotechnical Committee for Standardization
CER	Community of European Railway and Infrastructure Companies
CINEA	European Climate, Infrastructure and Environment Executive Agency
COST	European Cooperation in Science and Technology
COP	Conference of the Parties
CSR	Corporate social responsibility
DACH	The DACH region refers to the three Central European countries of Germany (D), Austria (A), and Switzerland (CH)
EAFRD	European Agricultural Fund for Rural Development
EASME	Executive Agency for Small and Medium-sized Enterprises
EBRD	European Bank for Reconstruction and Development
EEA	European Economic Area
EERA	European Energy Research Alliance
EIB	European Investment Bank
EMFF	European Maritime and Fisheries Fund
ENI	European Neighbourhood Instrument
ENR	Renewable Energies
ERA	European Research Area
ERDF	European Regional Development Fund
ERRAC	European Rail Research Advisory Council
ESF+	European Social Fund Plus
ESIF	European Structural and Investment Funds
EU	European Union
FFG	The Austrian Research Promotion Agency
GDP	Gross Domestic Product
GRW	Verbesserung der regionalen Wirtschaftsstruktur
G20	Intergovernmental forum comprising 19 countries and the European Union (EU)
IAS	Invasive Alien Species
IEEP	Institute for European Environmental Policy

Abbreviation	Meaning
IENE	Infrastructure and Ecology Network Europe
IPA	Instrument for Pre-Accession Assistance
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IGEDD	General Inspectorate for the Environment and Sustainable Development, France
ITTECOP	Terrestrial Transport Infrastructures, Ecosystems and Landscapes
ISO	International Standatdisation Organisation
KPI	Key Performance Indicator
LIFE	EU Financial instrument for the environment
NCFF	Natural Capital Finance Facility
NordfOU	Nordic R&D Co-Operation
NUTS	Nomenclature of territorial units for statistics
OECD	Organization for Economic Co-operation and Development
PF4EE	Private Finance for Energy Efficiency
PIARC	World Road Association
RSi	Rail Sustainability Index
SAP	Standard Action Projects
SBSTTA	Subsidiary Body on Scientific, Technical and Technological Advice
SBSTTA-CBD	Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) to the Convention on Biological Diversity (CBD)
SIP	Strategic Integrated Projects
SLU	Sustainable Land Use
SME	Small Medium Enterprise
SPI	Science-Policy Interfaces
SRA	Strategic Environmental Assessment
SRSP	Structural Reform Support Programme
TRA	Transport Research Arena
WVC	Wildlife-Vehicle Conflict

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1. INTRODUCTION

According to G20, the upcoming investments of more than 94 trillion $ worldwide, in the transport and the energy sectors, represent a major opportunity for the recovery plans like the EU Green Deal. However, the increase of 50% more networks by 2040 is also a major challenge for biodiversity and environment as highlighted by the World Economic Forum.
Biodiversity loss remains difficult to assess from a global point of view because of its multidimensional nature and, unlike climate change which can be measured by the rise in the earth's temperature over long series, there is an absence of a single relevant indicator (IGEDD, 2023). The willingness to act is present in all the countries consulted for the BISON project, but the difficulty in identifying specific investments is real. At the global level, there is an underinvestment in the subject estimated at $440 annually by the World Bank. The OECD estimates that $500 billion of damaging public subsidies are spent each year worldwide, which is 5 to 6 times more than the total spending on infrastructure, but this ratio is probably underestimated, because the OECD's Transport Department estimates that the average annual investment in infrastructure by 2030 will amount to more than $3,500 billion. Such a discrepancy illustrates the difficulty of identifying the issues.

The goal of the BISON project includes a wide range of topics and disciplines, such as nature conservation, environmental planning, infrastructure development, innovation in the field of transports, scientific monitoring, social issues etc. This mapping has identified several funding instruments that can fund at least some aspects of the assessment, monitoring and reduction of the impact of transport infrastructure on biodiversity.
The main goal of this mapping is:

- to investigate where and how projects targeting specific best practices and innovations can be found, for the user to be able to search for more detailed information.
- to get an idea on where and how the main funds have been spent, and where overlaps and funding gaps can be identified. This information could also act as a recommendation for the EU on how the funding schemes could be adapted to reduce silo approach and optimize exploitation of results.

Although the organization of funding for research, innovation and development (RID) on the theme of infrastructure and biodiversity is fairly similar in the various European countries, the subject remains marginal and fragmented. The amounts dedicated to RID remain very difficult to assess because they are often combined with broader environmental actions, making it impossible to target their precise nature. In this very complex framework, dialogue and the pooling of knowledge between the different types of infrastructure is still very incomplete (even if this point is not exclusive to this theme).

The main pitfalls identified in terms of research and innovation fundings are the following:

- Fragmentation of actors and funding in research and innovation.
- Difficulty in implementing an approach that integrates several silos.
- Delay of investments in the operational phases.
- Under-mobilization of private actors in the face of a subject with an uncertain economic model.
- Rarity of actors capable of developing a transversal approach.
- No risk taking that could look forward breakthrough process.

Faced with these challenges, the avenues proposed in the present deliverable are based on a positive dynamic of growing scope, marked by a simultaneous series of initiatives at various national, European and international levels. The will of the stakeholders is asserting itself. The proposed solutions are therefore based on several common factors:

- Optimization of existing tools to increase overall consistency.

- Considering a long-time frame of results within the framework of a common good approach.
- A willingness to support initiatives that are riskier but have greater potential.

2. MAPPING AT THE EUROPEAN LEVEL

The main goal of this mapping is:

- to investigate where and how projects targeting specific best practices and innovations can be found, for the user to be able to search for more detailed information.
- to get an idea on where and how the main funds have been spent, and where overlaps and funding gaps can be identified. This information could also act as a recommendation for the EU on how the funding schemes could be adapted to reduce silo approach and optimize exploitation of results.

The mapping of fundings at the European level was done in two stages.

Part 1 – 1st mapping based on a BISON internal reporting.
Part 2 – 2nd mapping of funding not included in 1st mapping.

Details of the mapping are described below.

2.1. 1st Mapping of fundings at the European level

This mapping of fundings at the European level is based on the internal report developed within the BISON Online Handbook - Good practice for mainstreaming biodiversity on transport and specifically on “Recommendations of practice based on other European projects on the topics”.

The goal of the BISON project includes a wide range of topics and disciplines, such as nature conservation, environmental planning, infrastructure development, innovation in the field of transports, scientific monitoring, social issues etc. This mapping has identified several funding instruments that can fund at least some aspects of the assessment, monitoring and reduction of the impact of infrastructure on biodiversity.

2.1.1. Methodology

As initial step a systematic search of projects was conducted, using specific keywords (see below), of projects under the following funding programmes and databases:

- LIFE programme (data base: https://webgate.ec.europa.eu/life/publicWebsite/search).
- Horizon 2020 (data base: https://cordis.europa.eu/projects).
- Interreg (data base: https://www.interregeurope.eu/discover-projects/. https://www.adrioninterreg.eu/index.php/projects/project-websites/. https://keep.eu/projects/)
- COST (data base: https://www.cost.eu/cost-actions/browse-actions/).

Besides these databases a general search using the most common internet search machines was made for projects dealing with topics that are under the interest of the BISON project.
The search of the databases and of the general web was made with the use of a set of keywords, which have however been adapted to the tool that was used.

The used keywords are roads(s), road mortality, railway, waterways, powerlines, infrastructures, connectivity, fragmentation, corridor while the types of infrastructures taken into consideration are roads, railways, powerlines, waterways, airports, ports, green/grey infrastructures.

Based on this search, a database was compiled with projects containing all completed and on-going projects between 1 January 2000 and 30 December 2020. The summary of each project was checked, and selection made of those related to the impact of infrastructures on biodiversity, or actions on infrastructures that potentially could affect the biodiversity.

It must be noted that, since the different funding schemes are most concentrated on specific topics, the different keywords yielded in some cases no results and in others huge numbers of similar projects which however were too similar in their objectives and implementation to warrant including them in the database.
For example, the keyword “powerlines” in the LIFE database results in almost 200 projects, the great majority of which have the same objectives i.e., reducing the impact of powerlines on birds by installing insulators. A second example is the keyword “infrastructure” which in the CORDIS database resulted in many projects developing research infrastructures.
In suchcases, some examples or the most relevant projects were listed in the database, but not all the projects were not included because this would have led to a much too complex database that does not really provide the desired output.

2.1.2. Outcomes

The following information was collected for each project:

- General project info: code, acronym, name, contacts, URL.
- What the project focused on: biodiversity or transport/species, groups of species, habitats benefiting/ type of infrastructure targeted (Roads, railways, powerlines, waterways, airports, ports, green/grey infrastructures).
- Geographical level: National/international – List of Countries/Regions.
- Summary of the project: brief description of the goal/brief description of technical solutions, especially specific best practices or innovations that were identified.
- Maturity level of the applied techniques: Conceptual, Experimental, Implemented, Verified, Recommendations.
- Links to the output to be reviewed/included.

The table below summarises the different types of projects that were identified.

Table 1. List of identified projects

Topics	Contents of projects	Examples of interventions
• Improvement of connectivity at local/regional/national level • Implementation of green and blue infrastructures	Mainly involving capacity building, recommendations, planning, production of management/action plans or agreements	• Production of best practice manuals • Training • Agreements with/among decision makers
Reduction of animal mortality	• Mitigation of road kills of mammals • Reduction of electrocution on powerlines by birds • Reduction of mortality of amphibians and reptiles	• Installation of road alert panels • Crossing structures • Insulation of powerlines • Alert systems for animals, drivers or both • Tubular screens for reducing bird strike

Improvement of monitoring of impact of infrastructures	Production of databases, research infrastructures, identification of indicators	• Development of data storage and analysis tools • Databases • Development of indexes and algorithms • Mapping of habitats along infrastructures
Adaptation of characteristics of infrastructures	Development of specific features of roads that reduce the impact of roads, reduce noise pollution, reduce road kills	• Solar panels as noise barriers • Specific types of asphalts to reduce impact. • Reduce environmental impact of de-icing
Tools for planning infrastructures	Development of artificial intelligence software to plan infrastructures	Developed for general use, can be used for biodiversity
Habitat restoration	Reduction of impact of artificial water bodies, power line corridors etc. Implementation of green infrastructures	• Vegetation clearing or planting. • Renaturation of riverbanks • Planting in agricultural lands • Vegetation barriers against noise pollution etc.
Awareness raising projects	Campaigns to promote environmentally responsible approach to transport	• Common awareness raising activities • Panels • Workshops
Fighting IAS	Reduction of plant IAS (e.g. Ailanthus altissima) along roads	• Eradication • Management planning

The techniques/methods that can be considered new or innovative are very few, and all of them can be considered to be in a conceptual, experimental, or implemented phase. None are in a verified phase and therefore the definition of best practice to these techniques is questionable.

2.1.3. Conclusions

The performed analysis provides an overview of the most significant projects and project types that have developed or adopted best practices (as considered in the description of the projects) or developed innovative tools to reduce the impact of infrastructures on biodiversity. However, it should not be seen as an exhaustive list of projects, for the reasons mentioned above: for some topics there are over 100 similar projects and listing them in this database would not provide any added value. The listed projects are examples of all the available ones, and one can find information on where the different types of projects and relevant information can be found.

Additionally, the provided information offers a picture of where the EU funding has been mainly concentrated and where funding gaps can be identified:

- There is **no coordinated strategy for research investments** on this cross over topic and a large part of investments are implemented on operational processes.
- A very large number of projects in the **LIFE programme focus on interventions that are commonly considered as best practices in the projects**, such as reduction of impacts for amphibians, reduction of danger of electrocution on powerlines for birds, and habitat restoration activities. **These projects usually are conservative and do not develop new techniques**, and because the LIFE programme requires to foresee the expected results during the planning phase, including innovation and experimentation does not allow to assess the results in a very accurate manner.

- Most projects targeting connectivity and green infrastructures (both in LIFE and Interreg) implement capacity building, recommendations, planning and agreements, whereas **real interventions to reduce fragmentation and enhance connectivity are scarce**. Most likely this is the case because concrete interventions would require much higher costs, time and capacities than are commonly available. **The exploitation period of project results is also often underestimated and poorly funded.**
- The same applies for projects that focus on developing monitoring infrastructure and data storage and analysis (mainly Horizon 2020 but also LIFE). **These projects do not have the capacities to provide a follow-up to the gathered knowledge and potential recommendations**.
- Regarding the reduction of direct mortality of animals due to infrastructures (especially Animal-Vehicle Collisions) **few innovative tools have been experimented** within the LIFE program. However, since **most of the AVCs target species that are not included in the Habitats Directive or other Red Lists**, and the reduction of the impacts of infrastructures is not a preferred theme, projects concentrating more on the development of AVC prevention tools are difficult to get funding for. **The effects are assessed on small territories and on a reduced number of species, and more rarely on larger territorial ecosystems.**
- The **HORIZON 2020** programme includes many projects that developed techniques to innovate and optimize the planning, materials, and construction of infrastructures, but most of them aim at reducing pollution, increasing security for users or optimizing costs. **Very few initiatives aimed at the direct impact on biodiversity**, although in a few cases, it might be possible that the developed techniques could be used for this objective. This needs to be assessed on a case-to-case basis.
- **Projects that aim at raising awareness** of the general public, infrastructure users (e.g. drivers) and of policy makers regarding the importance to reduce the impact of infrastructures on biodiversity, and how to do this, **are extremely scarce**. This is most likely due to a lack of awareness about the importance of developing such activities, but also due to a scarcity of funding opportunities. The LIFE programme has included a specific **"Information" component** for a period, but this **has now been absorbed in the "other" components.**
- Most of the projects focus on roads and powerlines, whereas only few initiatives target railways, water channels, airports, ports etc. This is most likely because the impact of these structures requires more significant interventions, which also require important policy and planning support. This highlights the fact that **there is very rarely a large-scale territorial vision of infrastructure issues.**

A general limitation of some funding tools (e.g. LIFE) is that often the time for a real accurate experimentation of the effectiveness of innovative tools is not sufficient. This could be tackled, for example, by adapting the calls and desired topics accordingly in the different funding schemes. Few examples, but not exhaustive, can be:

- Encourage projects that implement concrete interventions based on previously developed recommendations, plans, databases, information etc.
- Encourage projects that implement new technologies, specifically related to the impact of infrastructures on biodiversity (e.g. add relevant preferred topic in LIFE programme).
- Encourage projects that aim at awareness of the impact of infrastructures on biodiversity at all levels: general public, users, policy makers, the industrial sector etc., both regarding the importance of the impact of the infrastructures and how to address these issues.

As part of the exploitation of the BISON project the development of capacity building tools for policy makers and authorities in the implementation of recommendations is foreseen. This topic will surely aim at increasing the capacities to turn theory (plans, knowledge,

recommendations) into practice, but this might not be sufficient on its own and might need further support also through the different EU funding schemes.

In conclusion, at EU has put in place many different funding tools targeting a wide range of different topics, but a drawback of this is that there is little communication and synergy between the different funding programs. Thus, in several topics the funding opportunities overlap at least partially, which can lead on the one hand to the risk of double funding, and on the other hand there are gaps between the funding programs that leave out specific themes or issues. The creation of an intermediate space for knowledge transfer or the reinforcement of existing ones is an essential condition for success.

2.2. 2nd Mapping of fundings at the European level

2.2.1. Methodology

As mentioned above, the 1st mapping was part of an internal report developed in the framework of another topic in the project. There are several other funding programmes that were not addressed that are essential for the work being here. This 2nd mapping deals primarily with European Union funding programmes that support research and innovation projects. A summary of the activities of these programmes and the conclusions

2.2.2. Funding Programmes

A summary of the objectives of the programmes mapped are presented below.

2.2.2.1 Horizon Europe

Horizon Europe is the EU's key funding programme for research and innovation with a budget of €95.5 billion.

The three pillars for implementation are shown below (Figure 1).

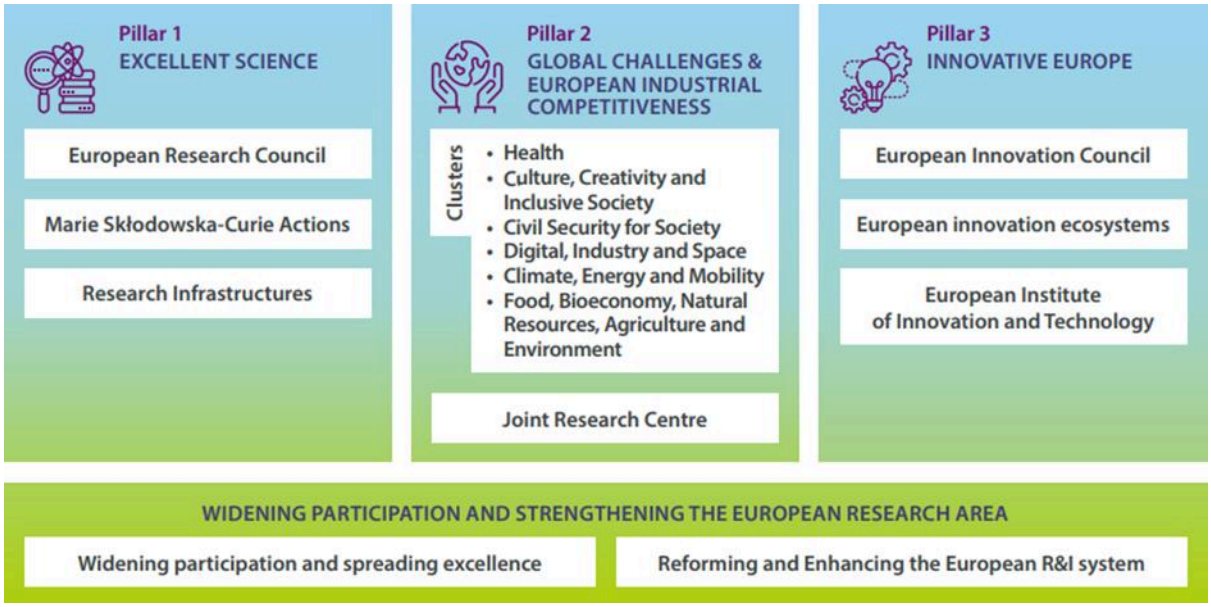


Figure 1. Horizon Europe pillars

With regards to BISON's areas of interest (infrastructure and biodiversity), Pillar 2 is the most relevant and particularly three clusters under the pillar i.e Cluster 5 (Climate, Energy and Mobility) for infrastructure (though infrastructure is also in Cluster 4 – Digital, Industry and

Space) and Cluster 6 (Food, Bioeconomy, Natural Resources, Agriculture and Environment) for biodiversity.

Research and innovation activities under cluster 6 are aimed, among others, at contributing to the objectives of the European Green Deal related to the Biodiversity Strategy to 2030.

The projects funded in these Clusters do not have any cross-cutting topics with biodiversity and infrastructure.

2.2.2.2 EU Missions

EU Missions are a new way to bring concrete solutions to some of our greatest challenges. They are a novelty of the Horizon Europe research and innovation programme for the years 2021-2027.

The EU Missions are as follows:

- Adaptation to Climate Change: support at least 150 European regions and communities to become climate resilient by 2030.
- Cancer: working with Europe's Beating Cancer Plan to improve the lives of more than 3 million people by 2030 through prevention, cure, and solutions to live longer and better.
- Restore our Ocean and Waters by 2030.
- 100 Climate-Neutral and Smart Cities by 2030.
- A Soil Deal for Europe: 100 living labs and lighthouses to lead the transition towards healthy soils by 2030.

Though not explicitly mentioned, it is hoped that biodiversity and infrastructure topics will be included in the Mission on adaptation to climate change.

2.2.2.3 Cohesion Fund

The Cohesion Fund is aimed at EU countries whose gross national income (GNI) per inhabitant is less than 90% of the EU average. It aims to reduce economic and social disparities and to promote sustainable development. The Cohesion Fund supports investments in the field of environment and trans-European networks in transport infrastructure (TEN-T).

2.2.2.4 ERDF - European Regional Development Fund

The European Regional Development Fund (ERDF) aims to strengthen economic, social, and territorial cohesion in the European Union by correcting imbalances between its regions. In 2021-2027 it will enable investments in a smarter, greener, more connected, and more social Europe that is closer to its citizens.

2.2.2.5 Structural Reform Support Programme (SRSP)

The Structural Reform Support Programme (SRSP) is an EU programme that provides tailor-made support to all EU countries for their institutional, administrative and growth-enhancing reforms.

EU Member States can request technical support to:

- implement resilience-enhancing reforms in the context of EU economic governance, such as those arising from country-specific recommendations under the European Semester and by virtue of implementing EU law.
- prepare, amend, implement and revise national recovery and resilience plans under the Recovery and Resilience Facility.
- implement economic adjustment programmes.
- implement reforms undertaken at their own initiative.

2.2.2.6 European Structural and Investment Funds (ESIF)
Over half of EU funding is channelled through the 5 European structural and investment funds (ESIF). They are jointly managed by the European Commission and the EU countries. The purpose of all these funds is to invest in job creation and a sustainable and healthy European economy and environment.
The 5 individual funding programmes are as follows:

- European regional development fund (ERDF)
  See (§ 2.2.2.4).
- European social fund Plus (ESF+)
- Cohesion fund
  See (§ 2.2.2.3).
- European agricultural fund for rural development (EAFRD)
- European maritime and fisheries fund (EMFF)

2.2.2.7 European Partnership for rescuing biodiversity to safeguard life on Earth
The objective of the initiative is to provide an overarching platform connecting national, local, and European research and innovation programmes and combining in-cash and in-kind resources in support of one goal - by 2030 biodiversity in Europe is back on a path of recovery.

2.2.2.8 European Biodiversity Partnership – Biodiversa+
Biodiversa+ is the European Biodiversity Partnership supporting excellent research on biodiversity with an impact for society and policy. It was jointly developed by BiodivERsA and the European Commission as part of the EU Biodiversity Strategy 2030, and will contribute to the ambition that “by 2030, nature in Europe is back on a path of recovery, and that by 2050 people are living in harmony with Nature”.
A core Biodiversa+ activity is to support research & innovation programmes and funded projects.

To roll out its activities and to build on existing efforts and initiatives, Biodiversa+ aims to engage in key collaborations throughout its duration. Key Collaborators are stakeholders engaged in a key and strategic collaboration with Biodiversa+ at the level of one or several activities. One of these collaborators is ALTERNET. In addition, several stakeholder organisations are linked to Biodiversa+ and promote the uptake of Biodiversa+ outputs. An example is Eklipse. A summary of the activities of these two initiatives is described below.

2.2.2.8.1 ALTERNET and EKLIPSE: two complementary actors at European scale?
The stake of taking greater account of biodiversity by operational actors is not new and constitutes a very strong European challenge. The detailed analysis of funding in the previous sections has clearly demonstrated this. This iterative process has made it possible over time to federate and coordinate the actors more closely by fuelling the actions undertaken. However, the discussions held with the various parties involved in BISON only mentioned the existence of Alternet and Eklipse once, which raises questions about the audience of these networks beyond an already structured community.
With the change of status of Alternet, the work of Eklipse, developed within the framework of public programs, seems today to have difficulty adapting to an associative format where funding must now be obtained following calls for proposals. Thus, exchanges with members who have had to work with or from the processes presented have made it possible to identify a difficulty in adapting to the needs of very heterogeneous communities whose codes and needs are not well understood and for which adaptations and an iterative process of definition of needs could have facilitated the enlargement of the audience.
Nevertheless, Alternet and Eklipse have a very strong potential to accompany the actors of the transport world in integrating the issues of biodiversity with a very high degree of scientific requirement. However, this process is not obvious and needs to be developed further.

ALTERNET

Created in 2004 and reorganized in 2019 as an international non-profit organization, Alternet brings together leading institutes from 21 European countries. They share the goal of *integrating their research capability* to: assess changes in biodiversity, analyse the effect of those changes on ecosystem services and inform the public and policy makers about this at a European scale.

Alternet enables integration among its network of partner institutes. Transdisciplinary in nature, partners bring together expertise from both the natural and social sciences and supports platforms for high-impact interactions with policymakers, the scientific community, and the public.

- Facilitating and engaging with the science-policy interface, including through management of the Eklipse mechanism.
- Hosting the Alternet Summer School in Peyresq, which has been *providing training for young researchers in inter-disciplinary approaches to biodiversity and ecosystems research since 2006.*
- Bringing together diverse scientific, policy, stakeholder, and NGO perspectives for bi-annual Alternet Conferences, developed in cooperation with the European Commission.
- Supporting high-impact research on pressing topical issues facing science and society through the AHIA initiative.
- Funding multi-site research projects that take advantage of Alternet's pan-European facilities through the MSR initiative
- Supporting international partner research and exchange through our Mobility Fund.
- Communicating and promoting targeted knowledge transfer with the scientific community, policymakers, and the public.
- Enabling international consortium building and internal sharing of funding opportunities through the Call Exchange clearing house mechanism.
- Supporting research infrastructure, including the LTER-Europe network of Long-Term Ecosystem Research sites (LTER), Long-Term Socio-Ecological Research platforms (LTSER) and LifeWatch; *Alternet was instrumental in developing this major European research infrastructure.*
- Establishing a vibrant international and interdisciplinary ecosystems and biodiversity research community.

EKLIPSE

EKLIPSE aims at bridging the gap between policy and knowledge on biodiversity in Europe. Eklipse was created in 2016 to help governments, institutions, businesses, and NGOs make better-informed decisions when it comes to biodiversity and ecosystem services in Europe. It has a fourfold approach:

- Answering questions from decision-makers by synthesising the best available knowledge.
- Facilitating evidence-based decisions through a transparent, proven, and robust request process.
- Creating a European network of experts and knowledge holders recognised for their work.
- Increasing citizen engagement in science-policy interface activities.
- Link up with international SPIs such as IPBES, SBSTTA-CBD.

EKLIPSE regularly launch calls for requests from policy and societal actors to identify topics requiring in-depth analysis. They then finetune the request question with the requester and use one – or a combination – of 20 synthesis methods to answer it.

Eklipse is an important element of the institutional Science-Policy-Society landscape in Europe. While the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) strengthens science policy at the international level, Eklipse fills a key European-level gap by focusing on the specific knowledge needs and questions of European decision-makers. Ensuring that the most current and relevant scientific knowledge is available to decision-makers is a vision shared by many networks, Eklipse strives to work with them and form a wide network of networks that will increase the reach of all its members. With this shared goal, **the network of networks supports knowledge-based decision-making in Europe,** contributing to enhance the legitimacy and transparency of the science-policy-society interface, and strengthtening collaborative work across countries and knowledge domains.

Requests are categorised in one of the four groups described below, according to the type of procedure for answering the request:

- Horizon Scanning requests.
- Knowledge Synthesis requests.
- Societal Engagement requests.
- Support Initiatives requests.

2.2.3. Outcomes

A scan of projects funded by the above-mentioned programmes was made. It shows clearly that there are many instruments for funding infrastructure and biodiversity topics separately at the European level (even though majority of R&I programmes are still funded at the national level. For example, around 70% of funding for biodiversity related topics in Europe are funded at the national and local levels). **Cross cutting actions of impact of infrastructure on biodiversity at the European level is however practically non-existent.** This is probably due to the following reasons:

- a wrong assumption that biodiversity is included in climate change topics.
- lack of awareness of the relevance of this topic (“what cannot be measured doesn't exist”).
- lack of sufficient “lobbying” from stakeholders.
- insufficient cooperation between the stakeholders of the two sectors that will make “our voices” heard louder where necessary.

2.2.4. Conclusions

It is not too surprising that no cross-cutting projects were found. It seems that the BISON project research call was the first issued at the European level that addressed mainstreaming biodiversity with infrastructure development. This call is therefore the first one issued by the EC on the topic of transport and directly integrating biodiversity issues, while pollution or climate change have already been covered. One of the set objectives of the BISON project, which was one of the last calls under H2020, is to set the ground and upscale research on these topics in the Horizon Europe research framework programme 2021-2027. It is hoped that the results and output of the project will lead to a rise in the awareness about the topic and subsequently to an increase in the funding opportunities made available at the European level.

3. INVESTMENT BANKS

Investment banks at European scale are key actors that can finance programmes on mainstreaming infrastructure and biodiversity.

3.1. European Investment Bank (EIB)

The European Investment Bank is the financing institution of the European Union. It is both the world's largest multilateral financial institution and a leading financier of sustainable development, climate action and environmental sustainability.

3.1.1. General framework – a bank involved in climate change, biodiversity, infrastructure, research and innovation issues

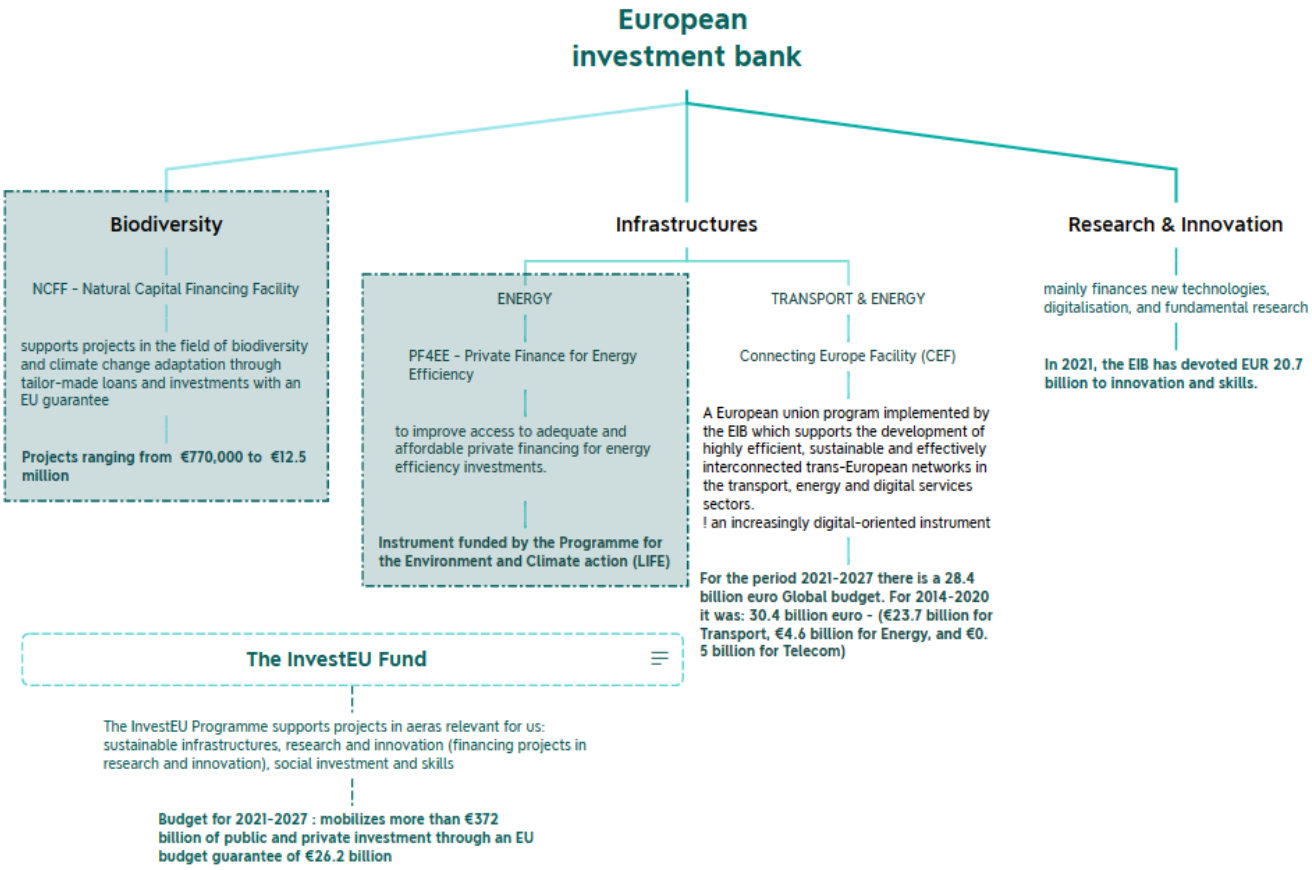


Figure 2. The European Investment Bank`s biodiversity financing programmes

3.1.1.1 The bank's commitment to climate action

According to the EIB Group Climate Bank Roadmap 2021-2025, the European Investment Bank's action is based on raising the level of its support for climate action and environmental sustainability to more than 50% of its total business by 2025, ensuring that "all of its financing activities are aligned with the principles and objectives of the Paris Agreement by the end of 2020" and that none of its activities cause significant damage to the transition. Finally, the roadmap underpins the European Investment Bank's support for sustainable finance.

3.1.1.2 The bank's commitment to biodiversity

Multilateral development banks (MDBs), such as the European Investment Bank, are taking steps to integrate biodiversity considerations into everything they do and increase positive investments for nature.

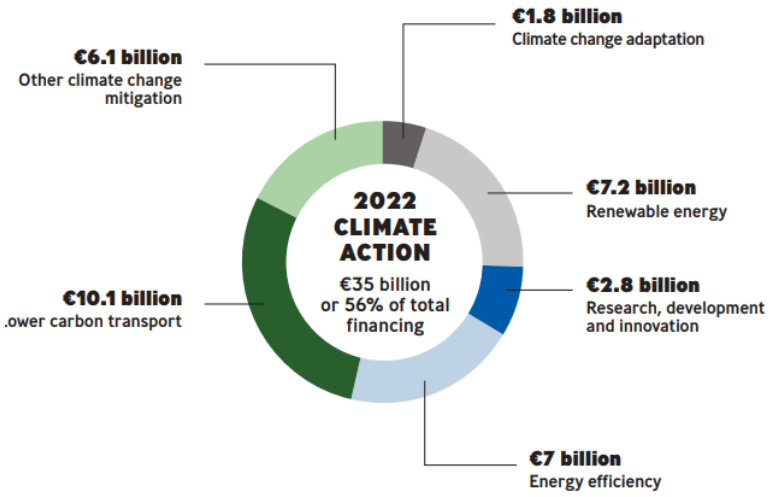
A year ago, MDBs adopted the “Joint MDB Statement on Nature, People and Planet”, in which they collectively committed to step up efforts towards the protection, restoration and sustainable use of nature.

The European Investment Bank is committed to:

- Align operations to support the goals of the post-2020 Global Biodiversity Framework.
- Scale up nature-positive investments through a) mainstreaming biodiversity across policies, investments, and operations; b) assessing nature-related impacts, dependencies and risks; and c) scaling climate finance with nature co-benefits.
- Announce concrete initiatives, programmes and partnerships with commitments to supporting biodiversity investments and/or biodiversity co-benefits.

Through the EIB Group's new Environmental and Social Policy, the Bank reinforces its commitment to promoting and implementing the objectives of the Convention on Biological Diversity and the Post-2020 Global Biodiversity Framework. Its environmental and social standards ensure that its projects do not cause significant damage to biodiversity and ecosystems. The main change from the previous approach is the shift from "no net loss" to "no loss" of biodiversity, in line with EU policies.

In 2022, the share of EIB investments that went to climate action and environmental sustainability projects rose to €36.5 billion, or 58%.



Climate action and environmental sustainability OVERVIEW 2023

Figure 3. Climate Action and Sustainability Overview 2023, February 2023, European Investment Bank

3.1.1.3 Investments in transportation

The European Investment Bank has traditionally been one of the main lenders to the transport

sector. In 2021, the EIB financed green and innovative solutions in the mobility sector to the tune of EUR 11 billion.

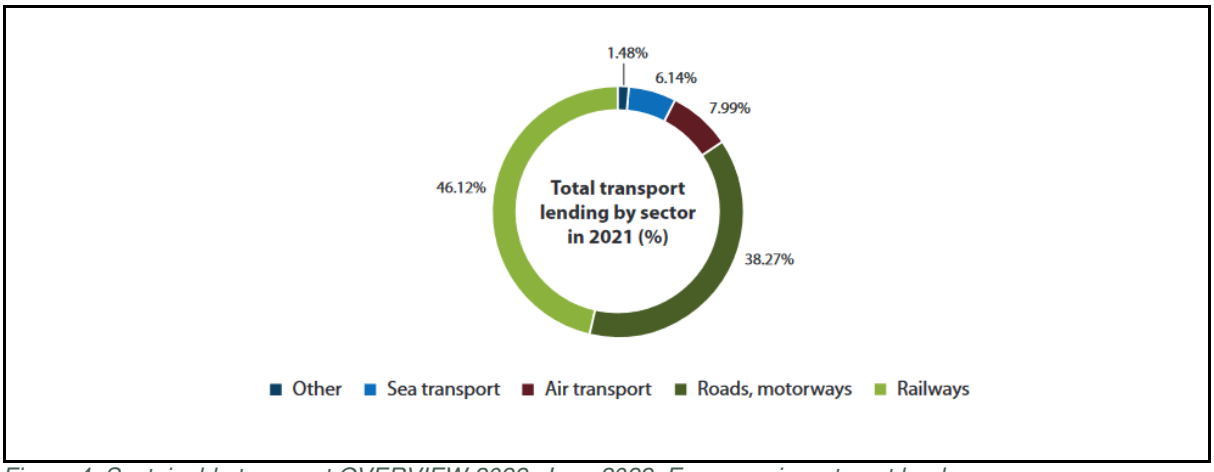


Figure 4. Sustainable transport OVERVIEW 2022, June 2022, European investment bank

Example of projects in Europe:

- The Bank supported Occitanie's Green Hydrogen Plan with a €40 million loan for Corridor H2, a unique project for rolling out hydrogen-based solution.
- The Bank has contributed €100 million to an investment platform to finance the energy transition of bus fleets in France and reduce their impact on the climate.
- The European Investment Bank has supported the municipality of Sofia with a €60 million framework loan to promote sustainable urban mobility and develop a green transport system that includes buses and electric vehicle charging stations.
- January 19, 2023, Spain: EIB and the Valencian Community sign a €50 million loan that will enable FGV to modernize and strengthen public and sustainable rail transport [The loan is the first tranche of a total approved financing of EUR 300 million].

3.1.1.4 Research and innovation component

The EIB Group also invests in research and innovation. It mainly finances new technologies, digitalisation, and fundamental research. One section is directly dedicated to the Climate in general.

Since 2000, the EIB has supported innovation and skills with more than EUR 220 billion of investment. In 2021 alone, the EIB has devoted EUR 20.7 billion to innovation and skills. This support has taken several forms.

3.1.2. Sectoral and cross-cutting instruments for financing biodiversity and infrastructure

According to the EIB Group Climate Bank Roadmap 2021-2025, EIB financing for sustainable development, climate and biodiversity will be allocated to:

- Research and innovation for the development of green technologies.
- Support for new alternative economic models.
- Lowering the long-term cost of capital for capital-intensive green infrastructure such as urban transport, rail and energy networks, waste, and water management networks as carbon sinks.
- Focus on the social development context.

3.1.2.1 Sectorial financial instruments

BIODIVERSITY

NCFF - Natural Capital Financing Facility: The NCFF, a financial instrument set up by the European Investment Bank and the European Commission, supports projects in the field of biodiversity and climate change adaptation through tailor-made loans and investments with an EU guarantee. Projects ranging from €770,000 to €12.5 million.

INFRASTRUCTURE - Energy

PF4EE - Private Finance for Energy Efficiency: The PF4EE aims to improve access to adequate and affordable private financing for energy efficiency investments.

! The NCFF and PF4EE will be replaced by InvestEU.

3.1.3. Cross-cutting instruments

3.1.3.1. Infrastructure and environment

InvestEU: The InvestEU Fund will mobilize more than €372 billion of public and private investment through an EU budget guarantee of €26.2 billion. The InvestEU fund supports financing and investment operations across four EU policy priorities:

- Sustainable infrastructure: energy and transport infrastructure
- Research, innovation, and digitalisation: financing projets in research and innovation
- Small and medium-sized companies
- Social investment and skills

Connecting Europe Facility (CEF): The CEF Debt Instrument was launched in 2015 jointly by the European Commission and the European Investment Bank (EIB) and is currently implemented by the EIB. This European union program supports the development of highly efficient, sustainable, and effectively interconnected trans-European networks in the transport, energy and digital services sectors.

This financing instrument reflects the Bank's commitment to support the inclusion of environmental considerations and activities in infrastructure investments (buildings and transport).

3.1.3.1.1. Research and environment

COP 15, a special commitment for the forest sector:

- In the run-up to COP 15, the EIB published a brochure highlighting the impact of EIB and other public bank financing on the sustainable development of the forest sector.
- This report highlighted the importance of forests in achieving biodiversity and climate objectives.
- Through its Climate Bank Roadmap, the EIB Group is strengthening support for long-term investments in the forestry sector, with a focus on environmental protection, nature conservation and sustainable production of biomaterials and bioenergy.

3.2. European Bank for Reconstruction and Development (EBRD)

The EBRD is owned by 71 countries, as well as the European Union and the European Investment Bank. The EBRD's Transition Concept is a framework that guides the Bank's investments and activities in its countries of operations.

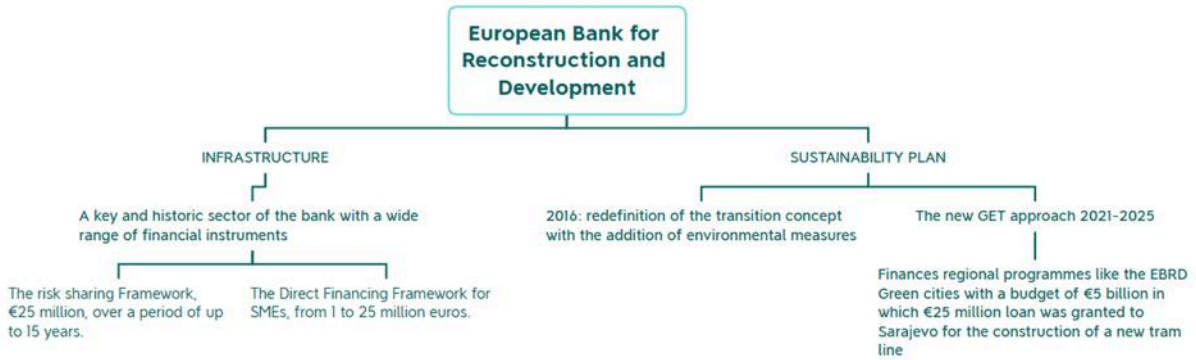


Figure 5. The European Bank for Reconstruction and Development's biodiversity financing programmes.

3.2.1. The transition concept

The EBRD's transition concept identifies the six major desirable qualities of a sustainable market economy:

- Competitive: For a market to function optimally, it must be based on dynamic and competitive markets.
- Inclusive: The opening of economic opportunities to all people regardless of their socio-economic background and gender.
- Well-governed: The EBRD is also committed to improving the quality of public institutions and th private sector and ensuring that they work together.
- Environmentally friendly: The EBRD has integrated the environmental dimension into its basic constitutive document and the transition concept explicitly acknowledges the green dimension of environmental sustainability.
  => Since the launch of the Sustainable Energy Initiative in 2006, the EBRD has financed 12 billion in "green projects".
- Resilient: The markets and institutions that support the market must be able to withstand shocks and must guarantee a certain financial stability. This concerns the issues of energy diversification and food security.
- Integration: Integration is central to the competitiveness of an economy, increasing trade, lowering its costs and increasing its competitiveness.

3.2.2. Infrastructure: EBRD's key and historic sector

One of its key sectors of intervention is infrastructure.
The EBRD has financial instruments to support infrastructure investments such as:

- The risk sharing Framework: This is done in collaboration with local financial institutions to share the risk of lending to SMEs and facilitate their access to finance. This is in the amount of €25 million over a period of up to 15 years.
- The Direct Financing Framework for SMEs: it allows the EBRD to finance SMEs directly with a wide range of financing instruments and features senior and junior loans, loans with performance related remuneration, project finance loans, as well as quasi-equity and minority equity investments. The investment amount varies from €1 million to €25 million, with an average of about €3.5 million.

3.2.3. The sustainability plan of the EBRD: the lack of a fully-fledged biodiversity component

The EBRD has not published exclusively on biodiversity but more broadly on its "environmental and social sustainability overview". The EBRD claims to have integrated climate risk assessments and adaptation measures into its investment operations.

The new GET approach: In the wake of the covid crisis, the EBRD has developed a new approach to help economies and to build a green economy. The GET approach announces to increase the EBRD's green financing to more than 50% of its annual business volume by 2025. It also aims to reach net annual GHG emissions reductions of at least 25 million tonnes over the five-year period.

Initiatives have been taken under the GET approach with the implementation of regional programmes:

- The EBRD Green cities (€5 billion): allows environmental challenges to be identified and prioritised and linked to infrastructure investments. €25 million loan was granted to Sarajevo for the construction of a new tram line.
- Finance and Technology Transfer Centre for Climate Change (FINTECC).
- Near Zero Waste.
- Green Economy Financing Facilities.

While infrastructure investment constitutes a very large part of the EBRD's work, biodiversity issues are sidelined. Moreover, research and innovation are lacking in the EBRD's environmental strategies.

4. MAPPING AT THE NATIONAL AND TRANSNATIONAL LEVEL

Although the organization of funding for Research, Innovation, and Development (RID) on the theme of infrastructure and biodiversity is fairly similar in the various European countries, the subject remains marginal and fragmented. The amounts dedicated to RID remain very difficult to assess because they are often mixed with broader environmental actions, making it impossible to target their precise nature. In this very complex framework, dialogue and the pooling of knowledge between the different types of infrastructure is still very incomplete.

4.1. Methodology

The analysis of the national organization of funding for research and innovation in infrastructure and biodiversity was carried out in the form of semi-structured interviews country by country. These interviews were synthesized and readdressed to the interviewees for completion and validation. In cases where it was not possible to conduct such an interview, the framework was sent and completed by the correspondent in the interviewed country. The summary sheets presented in this deliverable (Section 4.4) are those validated by the interviewees. They are primarily intended to provide a cross-cutting analysis of the dynamics of financing. Additional work following the BISON project would be conducted if it proved necessary to deepen the approach.

The interviews took place from mid-November 2022 (during the TRA2022, Lisbon) to February 2023. The structure of the synthesis from one country to another is globally identical, but depending on the particularities, variations could be made to better reflect the specific issues.

Following these interviews, a complementary analysis of the national transport and biodiversity strategies was carried out (see part 4.3). This keyword analysis aimed to identify the presence of funding for research or innovation in these plans and whether there were cross-cutting issues.

A synthesis of the results combining the national and European results was presented to all participants during the introduction of the workshop held online on January 31, 2023. The

participants were then separated into two groups to work alternately on the national or European hypotheses and to help imagine new solutions to optimize existing funding.

Table 2. Frame of semi-structured discussions

1. Framework for financing actions addressing infrastructure and biodiversity
   - Objectives
   - Organisation
   - Financing (amount, financing rate, duration)
   - Recurrence (annual, multiannual, variable)
2. Outputs and exploitation of results
3. Main difficulties or opportunities
4. Contact and website
5. Other remarks

4.2. Consultation of stakeholders

4.2.1. Austria

4.2.1.1 Framework for financing infrastructure and biodiversity actions

Objectives

Overall, the environmental assessment process according to the different phases of the life cycle is well considered at national level. The new Biodiversity Strategy 2030 lays down stable and organised bases integrating the subject of the relationship between infrastructures and biodiversity. The knowledge developed is therefore focused on emerging or insufficiently addressed topics at this stage. Roads and railways provide the main inputs. Coordinated action between the German-speaking countries is preferred.

The research projects are fully public, and their results are the joint property of the co-funders and the research teams. This ensures greater exploitation and dissemination of the results obtained, particularly to administrations. Funding is aimed at supporting applied research.

Depending on opportunities, participation in European projects is also undertaken, such as the Interreg SaveGreen project or CEDR projects.

Other calls for research projects on more fundamental aspects are also conducted by the Ministry of Research, but their focus is much more general and less related to the specific needs expressed by the technical ministries in charge of infrastructures.

In general, research and innovation collaborations with private companies are very limited. Research related to the focus biodiversity and infrastructure actions in Austria are mostly funded by public institutions. Private companies work as research institutions, but do not fund.

There is done application-oriented research in the form of smaller research projects from the Ministry for Climate Action and the ASFINAG in connection with specific issues related to infrastructure and biodiversity, e. g. a study about amphibian protection in water protection facilities, which was funded by the Ministry of Climate Action, the ASFINAG, Lower Austria and Bonaventura.

Organization
Most of the work is carried out within the framework of a transnational cooperation involving Austrian, German and Swiss ministries, or ministerial representatives: the DACH, under the administrative guidance of the FFG. This cooperation, which began in 2016, launches annual thematic calls with different topics each year: digitalisation, biodiversity, soil, noise, cycle paths, etc.

The organising committee meets on average once a quarter, defines the themes and selects the projects. The FFG is responsible for the technical and administrative organisation. Each call for proposals has an annual fund of approximately €2 to 3 million, with projects funded at 100% up to approximately €300K.

A national research program was “Mobilität der Zukunft” (future mobility), a mission-oriented research and development program to help Austria create a transport system designed to meet future mobility and social challenges by identifying and refining middle-to long-term improvement ideas mainly in the technology sector, biodiverisity can be a side aspect. The research program has already ended.

In the "DACH traffic infrastructure calls" the language has to be German. The calls are open to teams from all countries, provided that the work is carried out in German. Similarly, other funders are welcome to join these actions, but only if the German language is used.

4.2.1.2 Income and exploitation of results
The deliverables produced provide the elements needed to update the guides and doctrines. These are available online on the dedicated websites.

4.2.1.3 Main difficulties or opportunities
No difficulties were encountered. The operation as described satisfies the stakeholders who seek to maintain flexibility of action and reactivity reinforced by strong cooperation between German-speaking countries while being involved in European cooperation.

4.2.1.4 Websites
Austrian Research and Technology Report 2022 (where you can also find the central research and research funding institutions): Österreichischer Forschungs- und Technologiebericht (bmbwf.gv.at)
FFG Projektdatenbank: https://projekte.ffg.at/
DACH Seite: https://www.ffg.at/dach
Biodiversitäts-Strategie Österreich 2030+ https://www.bmk.gv.at/dam/jcr:49476b8f-31b2-4b7a-857b-3cc1b877207f/Biodiversitaetsstrategie_2030_V02.pdf
Austria’s 2030 Mobility Master Plan https://www.bmk.gv.at/dam/jcr:eaf9808b-b7f9-43d0-9faf-df28c202ce31/BMK_Mobilitaetsmasterplan2030_EN_UA.pdf

4.2.2. Czech Republic
4.2.2.1 Framework for financing actions addressing infrastructure and biodiversity
Objectives and organisation
Several national strategies (biodiversity or transport) address the subject of infrastructure and biodiversity in their cross-cutting objectives. However, there is no dedicated coordination in the Czech Republic. These are scattered among several offices that can deal with both basic research and more applied work. The subject needs to be adapted to the different frameworks that support it.

The subject has been supported for several years and, in 2023, it is possible to identify four possible funders:

a- **Transport 2030** (Technology Agency of the Czech Republic) this is a call for projects with an average duration of 3 years and maximal duration of 4 years. They can be applied, experimental or innovative. One of the sub-themes included in the sustainable transport strand concerns the fragmentation of territories. It is the successor to older calls called Transport 2020.

b- **Environment for Life** (Technology Agency of the Czech Republic) carried out by the agency in charge of technologies in partnership with the Ministry of the Environment. It also finances applied, experimental and innovative work. This call, which has already been launched six times since 2019, clearly focuses on public policy aspects, with one of the sub-topics dealing with the relationship between biodiversity, nature and landscape protection.

c- The **Sigma** (Technology Agency of the Czech Republic) call for proposals carried out by the agency in charge of technologies is a very general programme that succeeds an older programme. It integrates support for fundamental research and more applied work that can go as far as pre-commercialisation in order to mature subjects over a very broad spectrum of TRL. It can support international initiatives or more original projects requiring collaboration between junior researchers and companies.

d- The **"Land" programme** managed by the Ministry of Agriculture that runs research the three entries of which are:
   - Environmental management in the broad sense
   - Forest management
   - Food

However, none of these four calls fully covers the subject of infrastructures and biodiversity.

These national calls reserved primarily for Czech research teams and respondents are complemented by other European windows, including Biodiversa+ and the EEA and Norway Grants. The latter fund supports both highly applied operational projects (e.g. wildlife crossings) and small innovative research projects, many of which are related to biodiversity.

4.2.2.2 Outputs and exploitation of results

The research work produced has different objectives:

- Strengthening methodologies
- Development of prototypes
- Publication of reference documents (technical and/or scientific)

4.2.2.3 Main difficulties or opportunities

The research system is well structured, and its action is part of a long-term process but about transport and biodiversity, it is marked by several challenges:

- The difficulty of mobilising private partners and/or application guarantors from the public administration.
- Very low project selection rates (between 10 and 20% maximum), which discourage the development of new initiatives.
- A heavy administrative dimension whose weight seems very/too important compared to the expected benefits.
- A regulatory environment where the "environment" is not a shared priority despite the need for an integrated multi-criteria territorial approach.
- Research investments are concentrated on more "techno push" approaches.

4.2.2.4 Contact

The Czech Innovation Authority, the European Commission's contact point, is also keen to support the development of the subject. A desire to assert the normative dimension is thus supported via the GRI 304 on biodiversity (this Standard is part of the set of GRI Sustainability Reporting Standards (GRI Standards)). Together, these elements should contribute to the creation of a national strategy dedicated to biodiversity, considering the technical and operational issues related to infrastructures.

4.2.3. Denmark

4.2.3.1 Framework for financing infrastructure and biodiversity actions

Objectives and organisation

Roads are the focus of the work on transport and biodiversity interactions. However, collaboration is underway with the rail sector.

5.3MDKr (eq. 720.000 Euro) is invested annually in maintenance and research about biodiversity in the roadsides. A similar amount is invested on the rail side.

Additional funds are sometimes raised via LIFE projects, but the complexity of the administrative circuits makes them unattractive and too long before operational implementation. The Ministry, which has no resource problems in principle, therefore favours short and reactive circuits. These actions are undertaken in close cooperation with the political authorities, which ensure that the necessary resources are provided for the objectives.

The research work is mainly applied projects. Investments are concentrated on strategic subjects such as the use of artificial intelligence for automatic species recognition (IAS's and WVC's), insect monitoring, etc. Indeed, there is a lack of data to properly evaluate the result and efficiency of the investments. In fact, there are only very few calls. Research is mobilised by placing direct orders on specific subjects.

Collaborations with universities are often carried out, particularly in Aarhus. In the latter case, specific contracts are awarded.

Collaborations with companies are initiated for the operational development and implementation of pilot projects requiring direct investment. Companies working in the field of ecological engineering are especially mobilised during the evaluation phases for all infrastructures. A dialogue is engaged for a regular update of interoperable standards. These standards make it possible to optimise the actions linked to the avoid-reduce-compensate sequence. Post-project evaluations can also be undertaken to assess the effectiveness of measures. In this respect, the role of public procurement in changing practices is decisive. However, it is difficult to capitalise on knowledge, as companies are often small, and few large groups are active on these subjects in Denmark.

These responsiveness and flexibility are reflected in several flagship projects such as the creation of a map organising the national defragmentation plan optimising the positioning of wildlife crossings. This GIS-based map was designed by academics but for direct operational use and cost nearly 3.5MKr.

For certain subjects, regional cooperation with the other Nordic countries is underway (NORDFOU) to optimise research, innovation and application in the road sector. Thus, in 2023, the subject of artificial intelligence is a driving force that will make it possible to mobilise a critical mass of investment. Although biodiversity has not been a major concern at this stage, things are evolving, and topics are developing. NORDFOU facilitates meetings between specialists. The historical link with Germany for over thirty years is also major and several cross-border projects have required in-depth exchanges and have made it possible to develop a better integrated territorial strategy that allows better anticipation of needs and therefore a reduction in final costs.

4.2.3.2 Main difficulties or opportunities

One of the major difficulties today is mobilising private land to combine its potential in terms of ecological connectivity. On the other hand, new collaborations, notably with Poland, are emerging and allow for a handover between experts.
It would be interesting to have a map precisely illustrating the specialities of each administration, allowing for better coordination in order to develop common metrics.

4.2.4. France

4.2.4.1 Framework for financing actions addressing infrastructure and biodiversity

Objectives

Every year since 2020, a few days after the presentation of the Finance Bill (PLF), a report on the environmental impact of the State budget is published. This report contains, among other things, the "green budget", a document that classifies and quantifies the State's spending and appropriations according to their environmental impact for the coming year. The green budget is a new classification of budgetary and fiscal expenditures according to their impact on the environment and an identification of public resources with an environmental character. France is the first country in the world to have a tool for analyzing the environmental impact of its budget by 2020. The goal is to better integrate environmental issues into the management of public policies.

Expenditures in the green budget are classified into three types according to their impact: favorable, neutral and unfavorable.

- Favorable expenditures: This category covers three types of expenses: expenses with a primary environmental objective or directly involved in the production of an environmental good or service, expenses without an environmental objective but with a proven indirect impact, and favorable expenses with a controversial impact in the presence of short-term favorable impacts.
- Neutral expenditures: expenditures with no significant effect on the environment.
- Unfavorable expenditures: these expenditures directly harm the environment or encourage behavior that is unfavorable to the environment.

Expenditures are evaluated according to six environmental objectives:

- The fight against climate change,
- Adaptation to climate change and prevention of natural risks,
- Water resource management,
- The transition to a circular economy, waste management and technological risk prevention,
- The fight against pollution,
- The preservation of biodiversity and the protection of natural, agricultural and forestry areas.

According to the IGEDD 2023 report, spending on biodiversity represents between 0.2% and 0.3% of public spending. After a period of stagnation (2012-2018), public spending in favor of biodiversity will increase slightly between 2018 and 2021, thanks to the stimulus plan and the support of the Green Deal. Direct private funding for biodiversity actions is difficult to identify but remains marginal.
Both the current level and the new financing needs for biodiversity remain much lower than the number of harmful subsidies. Despite France's commitment since 2010 to reduce them, harmful subsidies to biodiversity from the State and the EU remain globally stable and

represent a minimum of €10.2 billion in 2022, i.e. an amount 4.4 times higher than their favorable expenditure. [IGEDD, 2023].
However, it was noted that it is difficult to involve the various ministerial actors whose main responsibility is not biodiversity policy. The rapid implementation of ministerial action plans and interministerial steering are therefore necessary. In this respect, the new General Secretariat for Ecological Planning (SGPE) will have to be in charge not only of strategic and budgetary arbitration, but also of the animation and monitoring of the SNB 2030, in partnership with the business units. The SGPE will also have to facilitate information on the progress of the SNB, particularly for the public.

The main items of government expenditure on biodiversity policies concern the acquisition of knowledge (26.7% of the total) and the financing of protected areas (21.8%). Research is therefore essentially public and is coordinated mainly by the MESRI (Ministry of Research).

In the specific field of infrastructure and biodiversity research, which represents an extremely small share of budgets, the FRB (Foundation for Research on Biodiversity) plays a central role in conjunction with the Ministry of Ecological Transition by ensuring consistency between public and private actors on the subject. This role is old (2013) and growing (transport in 2008, energy 2013 and ENR since 2022). The dedicated national research program (ITTECOP) represents an original organization created to meet the needs of public (ministries, agencies, Cerema) and private (rail, road, river, energy, ENR, SMEs and ETIs of environmental engineering). It aims to optimize public and private funds in shared open research. PPP-type calls (public-private partnerships) are organized on average every three years with an average budget per call of approximately 2 to 2.5 million Euros, allowing for the support of about fifteen projects characterized by:

- full publicity of results,
- Independence of the research teams,
- a combined multi-infrastructure approach,
- a requirement for reproducibility (DMP) and quality,
- An anchoring in the territories,
- an openness to European and international collaborations.

Alongside this structure of coherence, multiple actions have been identified, whether in public organizations or private actors. There is a great diversity of research work undertaken, but most of it is based on theses, internal work, laboratory work and, to a lesser extent, on European projects.

However, the role of research and innovation is limited due to a lack of funds and difficulties in fully exploiting the results or sharing them between the scientific and operational spheres. It is also emphasized that the actors finance research in an opportunistic manner. The research primarily responds to a business need aimed at improving services in relation to customer expectations, to a need for prospective research (development potential of future markets, innovation strategy, scientific prioritization), or is linked to external solicitations.

4.2.4.2 Outputs and exploitation of results

The appropriation of results on the subject is carried out by several actors coordinated by the successive national strategies undertaken since 2001. Since the 1970s, CEREMA has played a major role in this area by drafting a series of specific technical guides. Its role, beyond supporting government services, has gradually expanded to include companies and local authorities. It thus plays an essential role as an overall coordinator.

Its action is now reinforced by the implementation by the OFB of resource centers bringing together communities of actors on technical, scientific, institutional or societal subjects.

In the case of the ITTECOP program, which federates the above-mentioned actors, a central task is devoted to the transfer of research results to operational actors. This is an essential element of the ministerial strategy to mobilize actors on the subject.

4.2.4.3 Main difficulties or opportunities

Research and innovation budgets in the field of infrastructure and biodiversity remain very marginal and are subject to the vagaries of the constitution of critical investment volumes. Research is still perceived as not being central to national strategies or only on an ad hoc basis depending on the urgency of the situation. The transport/biodiversity dialogue remains limited and concentrated on the project phases and environmental assessment.

The mobilization of stakeholders and support for initial or continuing training is a key target. The experience accumulated on the subject over the last ten years has shown that the potential for dialogue between public and private stakeholders offers an opportunity to optimize the results of research work. However, it is certain that the integrated approach to biodiversity in transport policies must be carried out in a flexible and non-siloed way. These should not add an additional administrative layer that would block either funders or research teams. An independent entity led by MTECT, not constrained by the immediacy of producing results and ensuring equal treatment of partners, has proven to be an essential tool for the success of the whole.

Finally, these collaborations at the national level must imperatively be completed by European and international collaborations, again with a view to pooling results and optimizing investments. In this context, collaboration with the European association IENE, hosted by the FRB, is a central element of the research strategy shared by several members of the BISON consortium.

4.2.4.4 Websites

www.ittecop.fr
https://www.cerema.fr/fr/cerema
https://www.fondationbiodiversite.fr/la-fondation/presentation-frb/
https://www.trameverteetbleue.fr/qui-sommes-nous/centre-ressources-trame-verte-bleue
https://www.igedd.developpement-durable.gouv.fr/le-financement-de-la-strategie-nationale-pour-la-a3619.html

4.2.5. Germany

4.2.5.1 Framework for financing infrastructure and biodiversity actions

Objectives

The research landscape in Germany is very complex and heterogeneous. This review can therefore only provide an overview and does not claim to be complete. Funding in general is organised by different administrative Organisations, Associations, Universities and private Institutions.

(see:
https://de.wikipedia.org/wiki/Forschungsf%C3%B6rderung#Staatliche_Forschungsf%C3%B6rderung_in_Deutschland)

a) Ministries

a. Federal Ministry for Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)
b. Federal Ministry for Digital and Transport (BMDV)
c. Federal Ministry of Education and Research (BMBF)

d. Federal Ministry for Economic Affairs and Climate Action (BMWK)

b) Governmental Agencies on behalf of and subordinate to the ministries, e.g.

a. Federal Agency for Nature Conservation (BfN)
b. German Federal Environmental Agency (UBA)
c. Federal Highway Research Institute (BASt)
d. Federal Institute for Hydrology (BfG)
e. German Centre for Rail Traffic Research (DFSZ) which is the research facility of the Federal Railway Authority (EBA)

c) Federal states (Bundesländer); Germany consists of 16 federal states that vary in size and also infrastructure density.

d) Research centres:

Federal Republic Research Centre of Germany: German Aerospace Center (DLR) conducts activities in the field of aeronautics, space, energy, transport, security, and digitalisation (see. www.dlr.de)

The largest **non-university research funding centres** in Germany include the following institutions:

- Fraunhofer-Gesellschaft (FhG): Fraunhofer is committed to application-oriented research in the fields of health, security, communication, mobility, energy, and the environment.
- Helmholtz Association (HGF): The HGF promotes long-term research that addresses important issues in society, science, and industry.
- Leibniz Association (WGL): This comprises 95 research institutions dedicated to social, economic, and ecological issues.
- Max Planck Society (MPG): The MPG is committed to basic research in the natural sciences, life sciences and humanities in 84 institutes and facilities in Germany and abroad.
- Alexander von Humboldt Foundation (AvH): The Foundation promotes international exchange by supporting scientists and scholars from Germany and abroad.
- German Academic Exchange Service (DAAD): The DAAD awards scholarships to German and foreign students, graduates, and researchers.

e) Associations, e.g. DFG (see: https://www.dfg.de/dfg_profil/was_ist_die_dfg/index.html)

f) Universities

g) Private organisations, e. g. Schmidt-Stiftung

Many of the above fund research addressing biodiversity and climate issues, others fund research addressing infrastructure-related themes. There are no institutions that specifically fund research programmes linking biodiversity and infrastructure but in particular BfN and the subordinate research institutions of the Ministry for Digital and Transport (BMDV) such as BASt, BfG and EBA/DZSF coordinate several projects investigating impacts of infrastructure and biodiversity. A thorough presentation of a framework concerning biodiversity and infrastructure in Germany is elaborate and only a short overview is provided here (mainly for road infrastructure).

Organisation

Federal departmental research refers to "the research and development activities of the federal government that serve to prepare, support or implement political decisions and are inextricably linked to the performance of public tasks". Targeted policy can only be pursued if scientifically sound information is available, and federal departmental research operates at this interface. There are more than 40 federal departmental research institutions in total, which work on specific subject areas over an ongoing or very long period of time. (see: https://de.wikipedia.org/wiki/Forschungsf%C3%B6rderung#Ressortforschung).

Examples for federal departmental research

Institutions which promote the departmental research are governmental agencies. They are legally bound to their superordinate ministry. Here two examples are presented:

BfN
The Federal Agency for Nature Conservation (BfN) is the Federal Government's scientific authority for national and international nature conservation. On the basis of the tasks assigned to it by law, BfN supports the Federal Ministry for the Environment (BMU) and performs the research needed for science-based policy advice.
To fulfil its mandate, BfN conducts its own research (intramural research) and prepares research contracts for award to third parties (extramural research). BfN's research focuses on complex environmental and societal issues and thus uses an interdisciplinary and transdisciplinary approach. Addressing societal problems that call for integrative research, it links scientific findings with practice-based needs. The research needs of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) are documented in an annual departmental research plan (REFOPLAN) (for more information see: https://www.bfn.de/en/topic/departmental-research).

BASt
Research projects coordinated by BASt are funded by the Federal Ministry (BMDV) and largely focuses on research related to road infrastructure. In addition, BASt participates or leads projects funded through other national or international funding (e.g. EU projects). Part of the Ministry-funded projects are organised in collaboration with the Road and Transportation Research Association (FGSV). The focus of most projects is on application and operational use. BASt operates very similar to BfN in project assignment.

Financing
Funding programmes for nature conservation measures exist at all levels in Germany, from the EU to federal and state governments and individual municipalities.
International Financing
EU funds are financed, among others, by the "Life" programme, which is specifically oriented towards environmental protection and nature conservation. Important funds for nature protection are available under the European Agricultural Fund for Rural Development (EAFRD). Other funds come from the European Regional Development Fund (ERDF). As a rule, EU funds cannot be applied for directly, but are co-financed by the federal states and allocated within the framework of each funding programmes of the federal states.
Detailed information on EU funding (not only for Natura 2000) can be found in the Natura 2000 Funding Guide (https://ec.europa.eu/environment/nature/natura2000/financing/docs/Natura2000financingHandbook_part2.pdf).

National Funding
BfN
The financing of the e. g. RefoPlan, which is newly drawn up for each year, takes place annually. The budget for this is decided by the German Bundestag.

Information on the funding measures of the BMUV can be found in the Funding section of the BfN website (https://www.bfn.de/foerderprogramme-und-titel-des-bfn).
Further information on a wide range of federal government programmes that directly or indirectly finance nature conservation measures can be found in the BfN funding database or in the funding database of the Federal Ministry of Economic Affairs and Climate Action (BMWK) (https://www.foerderdatenbank.de/SiteGlobals/FDB/Forms/Suche/Startseitensuche_Formular.html?submit=Suchen&filterCategories=FundingProgram&templateQueryString=biodiversit%C3%A4t&cl2Processes_Foerderbereich=infrastruktur). The latter also provides specific information on joint GAK and GRW tasks.

Funding through foundations, donations, sponsorships
In addition to federal departmental funding the potential of private funds for nature conservation and to develop sustainable financing concepts for this purpose can be used. The Nature Conservation Funding Handbook (https://www.bfn.de/extern/finanzierungshandbuch-fuer-naturschutzmassnahmen) provides guidance on all issues of nature conservation funding, in particular on private funding, including foundations, donations, sponsorship and the marketing of nature-friendly products. The following programmes are linked to the page (https://www.bfn.de/kosten-und-finanzierung):

Application and publication of results
BfN
The results of the BfN research projects in the field of road ecology are integrated in guidelines, for example in the German Handbook for building and designing wildlife crosses (Merkblatt für Querungshilfen, MAQ 2022, Reck et al.: Green Bridges, Fauna Tunnels and Fauna Culverts, BfN-Skripten 522). Other important outputs are the Red Lists of Habitats and Species, which must be used in the planning process of infrastructure. Published results can be obtained as book or script; the latter can be downloaded. (see: https://www.bfn.de/en/search?k=script)

BASt
Results from research projects are incorporated in guidelines, standards and regulations for e.g. infrastructure planning, construction, and maintenance. Project results are published in either the journal of BMDV or BASt and can be bought or downloaded at https://www.nw-verlag.de/.

4.2.5.2 Main difficulties or opportunities
In the last 30 years on administrative level, the communication between BAst, BfN, FGSV and federal transport ministries has increasingly adopted a collaborative approach in problem solving. A good example for such a collaboration is the update of the German Handbook for wildlife passages (MAQ 2022), which was coordinated by BASt with main parts of the update conducted by BfN.
Collaborations between institutions within one sector has also benefitted from an improved communication during recent years. Specifically among the subordinate institutions of BMDV, the Network of Experts has been established in 2016 which facilitates collaborative research among those institutions (https://www.bmdv-expertennetzwerk.bund.de/EN/Home/home_node.html;jsessionid=6FAAA6FD02015D33097667F29566CB92.live21303).

The federalism in Germany allows to adapt programs very specifically to local circumstances. Often this is advantageous but is also requires a good dialogue between neighbouring federal states so that measurements are not bound to federal state boundaries. Moreover, this is naturally also important on a European level.

4.2.5.3 Websites

General possibilities of funding (ELER, EFRE, GAK, GRW):
https://www.bfn.de/kosten-und-finanzierung
German Environment Agency (UBA) list of projects:
https://www.umweltbundesamt.de/en/topics/climate-energy/climate-impacts-adaptation/adaptation-tools/projects-studys
Funding programs coordinated by BfN and funded through BMUV:
https://www.bfn.de/foerderprogramme-und-titel-des-bfn
Further funding for nature conversation projects:
https://www.bfn.de/weitere-foerdermoeglichkeiten
BMBF Research Initiative for Biodiversity Conservation (FEdA):
https://www.feda.bio/de/feda/
FONA - Research for Sustainable Development (BiodiWert):
https://www.fona.de/de/massnahmen/foerdermassnahmen/Wertschaetzung-und-Sicherung-von-Biodiversitaet.php
Overview BASt projects:
https://www.bast.de/DE/BASt/Forschung/Forschungsauftraege/Forschungsauftraege_node.html;jsessionid=25453FFC29B3597F6C32824B0893AF99.live21303
Example of Bund database search:
https://www.foerderdatenbank.de/SiteGlobals/FDB/Forms/Suche/Startseitensuche_Formular.html?submit=Suchen&filterCategories=FundingProgram&templateQueryString=biodiversit%C3%A4t&cl2Processes_Foerderbereich=infrastruktur
Nature Conservation Funding Handbook:
https://www.bfn.de/extern/finanzierungshandbuch-fuer-naturschutzmassnahmen
Database Projects and Climate Studies (UBA):
https://www.umweltbundesamt.de/en/topics/climate-energy/climate-impacts-adaptation/adaptation-tools/projects-studys

4.2.5.4 Other remarks

The document is mainly focused on roads. While of course other transport modes do not neglect biodiversity issues, the interviewees´ expertise lies with roads.

4.2.6. Greece

4.2.6.1 Framework for financing infrastructure and biodiversity actions

Objectives

Greece has one of the highest levels of biodiversity in the Mediterranean and the Europe with, at the same time, a very high degree of endemism. Until 2014, there had been no national framework for actions aimed at halting the loss of biodiversity and the degradation of the ecosystem services we depended on, such as food, drinking water, pollination, flood protection, etc.
The conservation of the biological wealth, at national level, is such a basic obligation, as well as an important contribution of Greece, as a Member State of the EU, to the Pan-European and Global efforts preventing the loss of biodiversity.

With these data and in response to the obligations arising from the article 6 of the International Convention on Biological Diversity, of which Greece is a contracting member, Greece has developed its National Biodiversity strategy & action Plan in 2014 and with a duration of 15 years.

In general, one of the priorities of the Ministry of Environment and Energy in the field of environmental policy is the protection of biodiversity, the reduction of the effects of pollution on public health and ecosystems, the rational management of natural resources, taking into

account the predictions of the effects of global climate change and the adoption of a new development model.
The areas of environmental policy include:

- the protection of the natural environment
- waste management and recycling
- the protection of the water environment and the rational management of water resources
- protection from air pollution
- protection from the adverse effects of noise pollution and radiation
- environmental licensing of industrial facilities and protection from industrial pollution.
- risk management
- the environmental management systems
- the management of spatial environmental data
- facilitating public access to environmental information
- the monitoring of the state of the environment

In this context, several actions are implemented targeting to the preservation and protection of biodiversity, such as the ones below (indicatively in 2022):

- A Financial Program has been provided from the Green Fund for the year 2022 under the title: "NATURAL ENVIRONMENT & INNOVATIVE ACTIONS 2022", with a credit allocation of €18.000.000,00 for its implementation, within which there is also the priority axis "BIODIVERSITY CONSERVATION ACTIONS - INNOVATIVE ACTIONS - SMART CITIES - OTHER ACTIONS", with a dedicated budget of nearly €3.000.000,00.

- A Call has opened, which is financed by the Natural Environment and Climate Change Organization, titled «Actions to protect, preserve and promote biodiversity - Endemic field studies, threatened and nationally important species of Greece». The aim of this Call is to support the implementation of targeted field studies for the evaluation of the risk of extinction, the conservation, management and protection of endemic and endangered species of Greece.

Moreover, Biodiversity is included in the National Strategic Smart Specialization (RIS3) for the new programming period 2021-2027 (in particular within the Environment and Circular Economy Sector).

Organisation

Biodiversity is expected to be part of the new Calls that are currently being prepared: (a) the new transnational cooperation projects and (b) the new Research – Create – Innovate action that its calls are expected to be open at beginning or mid of 2023.

There are several approaches and outcomes in the BISON project that can already feed into such initiatives, especially through CERTH/HIT, and serve as inspiration. Several additional avenues are being explored to increase its reach:

- Integration of topics in European calls (Horizon Europe - Cluster 5 in particular)
- Direct collaboration between states can offer interesting solutions but requires upstream coordination to achieve bilateral or multilateral projects.

Income and exploitation of results

Most of the outputs are used for the update of national guidelines and regulations or guides for operational actors.

4.2.6.2 Main difficulties or opportunities

There is still room for improvement in terms of processes to optimise results, while current projects are fragmented and are more related to initiatives linked to a particular project such as the Northern Macedonian Road.

4.2.6.3 Websites

Ministry of Environment and Energy
National Biodiversity strategy & action Plan
Green Fund
National Strategic Smart Specialization (RIS3) for the new programming period 2021-2027
www.imet.gr/
https://gsri.gov.gr/en/research-innovation-strategy-for-smart-specialization-ris3/
https://gsri.gov.gr/en/protovoulies-draseis/research-create-innovate/
https://gsri.gov.gr/en/transnational-cooperations/

4.2.7. Israel

4.2.7.1 Framework for financing actions addressing infrastructure and biodiversity

Objectives and organisation

Netivei manages the works related to the road, rail and airport networks in Israel. The subject of biodiversity has been considered for a long time and has been the subject of much applied research. Topics can address both safety (collision) and ecological reconnection with wildlife crossings (overpasses or underpasses).

The Israel Innovation Authority, the European Commission's contact point, is also keen to support the development of the subject. A desire to assert the normative dimension is thus supported via the GRI 304 on biodiversity. Together, these elements should contribute to the creation of a national strategy dedicated to biodiversity, considering the technical and operational issues related to infrastructures.

Financing (amount, financing rate, duration)

Several types of financing are possible, although the amounts cannot all be listed at this stage:

- Directly carried out by Netivei's R&D department.
- Competitive calls for universities and consultancies.
- Co-financed calls between ministries and the National Park Authority.
- Investments by the Ministry of Environmental Protection.
- Directly by companies, most of which are Israeli.

It should be noted that the clean tech and green tech sector is making strong progress on the subject. Moreover, whereas previously these research subjects were the subject of specific calls, they are now mainly linked to projects.

4.2.7.2 Outputs and exploitation of results

The projects are multiple in nature and can affect both species (lizards) and environments (flora, invasive species, etc.). Technical aspects (e.g. night-time light pollution, maintenance) are the subject of regularly supported work.

The results are made available via dedicated procedure guides and sites capitalising on the results (https://tevabiz.org.il).

4.2.7.3 Websites

https://tevabiz.org.il/lets-talk-business/

https://tevabiz.org.il/wp-content/uploads/2021/06/8-tevabiz-assessment-exec-summary-and-part-of-the-full-report-final-270521.pdf
https://www.globalreporting.org/standards/media/1011/gri-304-biodiversity-2016.pdf
https://www.globalreporting.org/standards/standards-development/topic-standard-project-for-biodiversity/

4.2.8. Italy

4.2.8.1 Framework for financing actions addressing infrastructure and biodiversity

Objectives and organisation

With "infrastructures and biodiversity" we refer here to the question of how transport infrastructures can negatively affect or instead foster biodiversity.
The proposed subject, is therefore, very broad and difficult to define because biodiversity itself is not, in Italy as in other countries, the subject of a defined public policy but is, on the contrary, at the convergence of several policies such as climate, pollution, agriculture, civil engineering with noise and hydraulic components, etc.

As per the governance, there is no specific cross-cutting national structure dealing with the subject of "infrastructures and biodiversity" which is instead addressed by different Institutions/Bodies that deal with one or more of the aspects concerned among them:

- National Ministries (for infrastructures and transport, for the environment)
- National agencies
- Private foundations (Fondazione Cariplo, Swiss re, Fondazione, Capellino...)
- National scientific research centre (as the CNR)
- Thematic research centres (as the ANAS Road – Experimental Research Laboratory...)

The business sector dealing with this subject is difficult to grasp and there is no way of determining its exact scope a priori. The situations are, as for the financiers, very variable and reflect a pragmatic approach of matching the internal skills of companies (SMEs, ETIs or large groups) to the regulatory requirements on the issue. It should be noted that there are also strong silos between the different types of infrastructure and even between the operators of the same type of infrastructure who do not necessarily see the need to collaborate on these issues.

- Type of infrastructure (transport, energy, ENR, other...)
- Final targets
- Research, innovation (TRL?), application, mixed, other
- Phases of the infrastructure life cycle (strategic analysis, environmental assessment, project, management...)
- Call for projects, investment plan, dedicated structure ... (Public - ministry, agency...-, private or PPP)

Financing (amount, financing rate, duration)

The financing of the subject of "infrastructures and biodiversity" in Italy – again as in other countries - is to be scouted in larger national funding programmes and instruments and in extensive European funding Programmes to which Italy is eligible such as LIFE, ERDF/Interreg, Horizon Europe, CEF.

The use of European funding (LIFE in particular), which is essential, has specific rules which require the applicants to have both:

- Skilled personnel to prepare the applications and manage the financial agreements signed with the EU.

- The national funds to co-fund the projects (as the EU normally does not cover the full cost of the projects).

This limits the mobilisation capacity and automatically reduces the number of applicants capable, both financially and administratively, of participating with success to the EU calls for proposals and have to co-fund such projects with national funds only or postpone of cancel them from their investment pipeline.

4.2.8.2 Outputs and exploitation of results

Anas has been and is coordinator, partner or stakeholder of several EU projects.
Among them, with reference to biodiversity:

- Life Wolves
- Life SafeCrossings
- Life Polline work (right-of-way maintenance and pollinator support; submitted to the EU, under evaluation)

Anas is trying to approach the issue of the impact of infrastructures on the environment in an organic way, defining a "green road" model, i.e. an approach to road maintenance where the combined use of the best technical solutions and methodologies could minimize the environmental impact.
The first phase of the project will start in 2023, with the implementation of the "Anas Green Road" concept on the SS 148 - Pontina state road, which connects Rome with Terracina.

4.2.8.3 Main difficulties or opportunities

Although marked by a difficulty in allocating specific investment funds, the theme is a priority in Italy. Also following recent EU initiatives and legislations (as the European Green Deal) the national commitment to the protection of biodiversity when impacted by transport infrastructures has been included in more cross-cutting environmental policies implemented by all actors involved.

As per further areas of improvement and opportunities, see previous reference to the green road model.

4.2.8.4 Websites

www.stradeanas.it
https://www.mase.gov.it/pagina/strategia-nazionale-la-biodiversita-2020
https://www.mase.gov.it/pagina/strategia-nazionale-la-biodiversita-al-2030
https://www.mit.gov.it/sites/default/files/media/notizia/2021-09/Ambrosetti-Presentazione.pdf
https://www.fsitaliane.it/content/fsitaliane/it/sostenibilita/tutelare-l-ambiente/salvaguardia-del-territorio/territorio-e-biodiversita.html
https://www.stradeanas.it/it/sostenibilit%C3%A0/i-principi-della-sostenibilit%C3%A0/tutela-dellambiente

4.2.8.5 Other remarks

In BISON, Anas is a partner with no funding. As it has allocated some of its funds to study and works activities dedicated to the protection of biodiversity it is available to participate to further EU projects financially committing to its WPs.

4.2.9. Netherlands

4.2.9.1 Framework for financing infrastructure and biodiversity actions

Objectives

Historically, the Netherlands began a multi-annual defragmentation programme in 1999, which ended in 2018: the MJPO (https://ontsnippering.nl/). This ensured inter-administration coordination and synergy of funds. It achieved an 86% resolution rate of conflict points. However, the continuation of this action has not been undertaken and the actors involved are no longer as closely coordinated, which poses major concerns in the face of emerging needs: the arrival of the wolf, which disrupts the strategies put in place for herbivores, and invasive species.

Organisation

In the Netherlands, most of the research and innovation work is carried out by the RWS, with close collaboration with the rail company ProRail. Actions also involve the provinces and regional authorities. These actions are combined until they are implemented operationally, considering the advanced decentralisation on the subject.

The ministry in charge of nature and agriculture is also involved and pays particular attention to meeting European commitments. In conjunction with the RWS, which manages the water and infrastructure aspects, interministerial coordination is regularly conducted on these subjects. These relations are based on the performance obligations of the RWS, which mobilises university networks and ensures direct implementation.

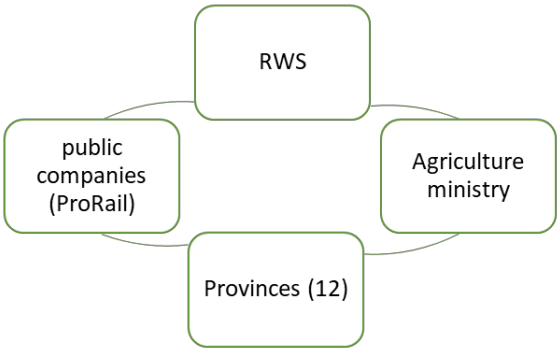


Figure 6. Research and innovation work in the Netherlands

For research, the ways of proceeding are varied. There may be calls for thematic projects (e.g. mowing products). There may also be direct orders to universities, with the sub-directorate dedicated to knowledge.

4.2.9.2 Income and exploitation of results

The MJPO has done most of the mainstreaming of the results by aligning national policy on the subject.

4.2.9.3 Main difficulties or opportunities

The dynamic held for 20 years with the MJPO has not been maintained afterwards. It is therefore very important to renew the steering and the community of practice to update public policies. This need is further increased by the development of new infrastructures, especially energy.

This observation highlights the need to work with new players on the subject. Universities are taking on an increasing role, but also dedicated research institutes or the research centres of the companies themselves. The focus at this stage is on nature conservation.

A link must be established with the Delta Plan, with an essential role for investment banks and particular attention to public procurement, which are the first building blocks on which to base a structured policy well upstream of the construction of the infrastructures themselves. One of the challenges remains the possibility of effectively measuring biodiversity with objective data. This point can be addressed, at least in part, through ecosystem services. At the same time, a

different way of conducting public works must be undertaken with a more inclusive approach to environmental issues. However, such a transition is bound to be long and complex, not to mention, from a very practical point of view, the development of new field equipment that requires a large enough market to be profitable.

4.2.10. Slovak Republic

4.2.10.1 Framework for financing actions addressing infrastructure and biodiversity

There are 3 possibilities to finance actions addressing infrastructure and biodiversity in Slovakia from national resources:

- Using State research grant agency APVV under the umbrella of the Ministry of Education - the grants use to be up to 400000 EURO.
  Regularilly one time per year they open the call for application, mostly with our any thematic preferences, so the subject dealing with infrastructure and diversity like our team can apply.
- Using the budget from sectorial ministry - Ministry of Environment and Ministry of Transport (both very limited), but it depends on the decision of Minister which topic should be addressed, the grants are very small, several thousands of Euro only seldom over 100 000 Euro.
- Using the budget from transport bodies e.g. Motorway company, Railway company or Self-governmental Regions which can procure some actions, but in practice they finance only actions directly required by law e.g. SEA or Building code - starting from survey, via construction of ecobridges up to the monitoring.

Serious systematic research and actions addressing infrastructure and biodiversity is possible only as a part of EU funded project. e.g. involvement in the project Alps-Carpathian bio-coridor dealing with harmonisation of the transport axes and biodiversity in the space between Vienna and Bratislava, Transgreen, Savegreen, Connectgreen dealing with harmonisation of the transport axes and biodiversity in the space in Carpathian mountains all from Interreg. Such projects were initiated by us or our foreign partners and not by national bodies.
More systematic research is on biodiversity itself, but not related directly to infrastructure development.

So, there are not any prospectively defined Objectives or systematic organisation of such actions, no special budget for them, no rules for capitalisation of their outputs.
It is just action from project to project, rules defined by donor.

4.2.10.2 Website
https://faolex.fao.org/docs/pdf/slo163413.pdf

4.2.11. Spain/Catalonia

4.2.11.1 Framework for financing actions addressing infrastructure and biodiversity

Objectives and organisation

One of the main challenges of the Sub-Directorate General of Terrestrial and Marine Biodiversity of the Spanish Ministry for the Ecological Transition (MITERD) today is to foster the deployment of the European green infrastructure at the national level. The interconnections of this Sub-Directorate General with the Ministry of Transport, responsible of the National Road and Railroad Network and the links with the infrastructure sector are limited. Furthermore, according to the organization of competences in Spain each autonomous region has its own competencies on infrastructure and biodiversity. However, on certain topics autonomous regions can apply national guidelines on their territories.

In terms of research, the funds dedicated to research on the subject are mainly public or at least developed by public research centres.

The Sub-Directorate General of Terrestrial and Marine Biodiversity (MITERD) provide funds and produce documents of technical prescriptions for the reduction of fragmentation caused by transport infrastructures to be applied at the national, regional and local level. Another important project funded by MITERD that should be highlighted is the elaboration of the National Plan for Defragmentation of Linear Transport Infrastructures.
The guidelines and the National Defragmentation Plan are produced within the framework of the Spanish Working Group on Habitat Fragmentation caused by Transport Infrastructures. It integrates around 100 representatives of the transport, natural environment and environmental impact assessment administrations of the State, Autonomous Communities, Provincial Councils and Island Councils. Its main objective is to contribute to the knowledge and reduction of the effects of habitat fragmentation caused by transport infrastructures.

TRAGSA and INECO are two of the main public companies that work for the Government on the biodiversity and infrastructure sectors, respectively. These and other public companies also work at the regional level and develop most of the projects dealing with the topic. It should be noted that, in addition to transport infrastructures, a growing part of the work is dedicated to the effects of energy and renewable networks.
Many small private companies develop studies and monitoring hired directly by Authorities or by these big public companies.

Projects to monitoring and evaluate mitigation measures are also undertaken by public or private companies (e.g. ADIF for HSR), when these activities are mandatory because they are included in the 'Environmental Impact Declaration' (Environmental Assessment process).
In **Catalonia**, research on BISON's topics is mainly promoted by Environmental Authority (Directorate General of Environmental Policies and Nature, Ministry -Department- of Climatic Action, Food and Rural Agenda of the Catalan Government) but with a *modest* budget. Some examples are: increasing knowledge of land use of night raptors in their crossing roads in order to detail the mitigation measures for avoiding mortality; favouring pollinators in restoration works with the use of a specific plants and schedule pattern adaptations in maintenance of road banks, and increasing the knowledge of road amphibian mortality. Nevertheless, also some research has been carried out by Transport Authority (mostly on animal-vehicle collision prevention). Generally, universities, research centres and expert companies are hired to develop those contracts.

The Green Infrastructure Programme includes some road defragmentation projects (over a 40 points). Currently, Infraestructures.cat is the public company which is in charge to carry out the tender and hiring procedure. Some research work aimed at supporting the operational deployment of recommendations. Transport Authority also promotes a few defragmentation projects, as the construction of a specific fauna passage when it's necessary (reduce mortality of endangered species, etc.). In addition, some studies and research on Animal-Vehicle Collisions has been promoted by Transport Authority hiring expert companies.
The subject of renewable energy production centres, both wind and photovoltaic, and the associated power lines is also becoming increasingly important. Some research has been done in this field (bird and bat vulnerability due to windmills, as an example).

Among the other Spanish regions, the **Basque Country** stands out for its investments in defragmentation mainly in the subject of adaptation of drainages to reduce risk of mortality of the European mink and other endangered species. In **Andalousia** actions to reduce road mortality of Iberian lynx and to enhance connectivity between the populations the species are developed in coordination with the Spanish Ministry (MITERD) and other autonomous

communities. Many actions and studies are developed in the framework of LIFE Nature Projects.

Financing (amount, financing rate, duration)
The Sub-Directorate General Terrestrial and Marine Biodiversity of the Spanish Ministry for the Ecological Transition funds available for 2023-2024 for research, planning and implementation work on green infrastructure, restoration and ecological connectivity amount is aprox 600K€ and come exclusively from public funds. So far, the public foundation « Fundacion Biodiversidad » also has published two calls for proposals financed via COVID stimulus fund with a total budget of 4.5M€.
CDTI provides funds for research to private companies.
It is also possible that part of the revenue from taxes, the 0.5% allocated to associations, could be channelled to associations working in this field.
In addition, actions linked to national action plans such as the Lynx plan (€2.5M) directly associate the subject of transport and the dedicated ministry.
Other important funds are linked to the topic are:

- European LIFE program.
- FEDER.
- Natura 2000 Priority Action Plan.
- Plans to Promote the Environment for Adaptation to Climate Change (funds via Carbon Emission Market).
- Recovery, Transformation and Resilience Plan.

Finally, a significant volume of funding comes from the implementation of Environmental Impact Assessment compensatory measures by private companies, but these are operational measures, not research or innovation a priori.

In **Catalonia**, the Directorate General of Environmental Policies and Nature has the competences on promoting projects and initiatives of research, technological development and innovation (R+D+I) in environment, sustainability and also biodiversity. The total amount of the 2022 budget for studies and resarch has been around 200.000 euros, but only a part adressed to biodiversity and infrastructures).

The budgets allocated by the European Union to the sustainability framework are limited and are essentially exploratory funds intended to support the alignment of multi-annual investment plans. Under the cross-cutting activities of the Shit2Rail JU, some sustainability related issues that were not addressed, except for noise and energy issues, have been addressed during the creation of the EU-Rail and important steps have been taken to provide support. Under Flagship 4 activities, projects in the Rail4Earth call aim to explore green and sustainable railway systems. More support is needed in terms of conducting the necessary discussions and communicating the needs to include biodiversity issues in the new calls to be launched under EU-Rail. In this context, cross-collaborations between UIC, CER, EU-Rail, in particular through ERRAC, are planned to better mobilise the biodiversity issue, which is not addressed in the Rail4Earth's first call, to be included in future calls.
The resources for the Green Infrastructure Programme come from:

- Department own resources.
- European Regional Development Fund.
- CO^2 tax, for which part of the funds collected are allocated to biodiversity.

For the railway stakeholders, the subject on the external financing is becoming increasingly important in discussions with institutional investment banks (primarily the EIB and similar). This process can also be observed in the discussions following the COP climate and biodiversity and relayed with organisations such as the IEEP. The subject can be financed, but this must

be anticipated. In this respect, 2023 will see the launch of a new call that could integrate this subject, but this will have to be discussed with ERRAC.

Other funds come from the requirements of Environmental Assessment. In Strategic Environmental Assessment (SEA). A specific (and unique until the moment) example is the SEA procedure of a Vallès County Mobility Plan promoted by the Catalan Government. The Strategic Environmental Statement required a 5% of the Plan budget addressed to defragmentation actions (improving the permeability of existing roads), in addition to mitigation measures for the new ones. This sum represents approximately over a €20 million totally.

Other funds are provided by Transport authorities to promote innovation in the topic of reduction of accidents involving animals.

4.2.11.2 Outputs and exploitation of results
Most of the outputs are used to develop regulations and guides for operational actors.

4.2.11.3 Main difficulties or opportunities
Whether in Catalonia or in Spain in the broadest sense, it is difficult to support fundamental research or an active innovation component on the subject, as most of the resources are devoted to operational adaptation actions and daily management.
At the Spanish level, the development of research projects is very complex and requires a great deal of effort in a timeframe that is not necessarily compatible with operational needs, while at the same time legal obstacles and disputes are multiplying, slowing down the development of infrastructure networks and their improved environmental management.

Public companies and research centres as instrumental medium at the service of the State and Regional Administrations role as a technical centre of excellence can also paradoxically create a bottleneck by reducing the number of R&I contracts on the subject available for other Spanish companies. In fact, many of the companies working in the field of environmental engineering are small or very small local companies.
The companies undertaking RDI activities on the topic must work at international level to receive funds. Funds in Spain are mainly addressed to Universities, Research centers and big public companies. There are very few options for private companies to participate in Calls.

In general

- Cross-sector, interdisciplinary research involving biodiversity and infrastructure experts is very scarce (practically inexistant). There is an opportunity to provide funds encouraging cooperation between both sectors and also public-private partnerships. RDI Calls should also be open to companies that have expertise and publications in the topic.

- Authorities and companies operating infrastructure are reluctant to apply new technologies. Funds to promote innovation and application of new measures on the topic are required.
- Monitoring and evaluation of mitigation measures applied in infrastructure to reduce impacts in biodiversity are not a common practice. There is a need to apply monitoring, to integrate and develop meta-analyses to promote the application of effective measures.
- Upgrading existing infrastructure (also to adapt to climate change) is an opportunity to apply Nature Based Solutions and to mainstream biodiversity actions (e.g. new fauna passages, new management for road verges). Funds are required to encourage such actions and the cooperation of both sectors.

- Maintenance of ecological asset on infrastructure needs to be promoted. Funding must be provided by the organisations operating the infrastructure but there is a lack of legislation or guidelines to apply it.
- The new EU legislation on ecological restoration provides the opportunity to include defragmentation actions to restore ecological connectivity and reduce impacts of infrastructure on biodiversity.

4.2.11.4 Websites
Public companies mentioned in the text:
https://www.tragsa.es/es/Paginas/default.aspx
https://www.ineco.com/webineco/

4.2.11.5 Other remarks
https://www.miteco.gob.es/es/biodiversidad/temas/ecosistemas-y-conectividad/infraestructura-verde/Infr_verde.aspx
https://www.miteco.gob.es/es/biodiversidad/temas/ecosistemas-y-conectividad/conectividad-fragmentacion-de-habitats-y-restauracion/fragm_habitats_causa_transp.aspx

https://mediambient.gencat.cat/web/.content/home/ambits_dactuacio/avaluacio_ambiental/infraestructura_verda_serveis_ecosistemics/infraestructura_verda/20170825-Llibret-web-en.pdf
https://mediambient.gencat.cat/web/.content/home/ambits_dactuacio/patrimoni_natural/estrategia_patrimoni_biodiversitat/Estrategia_patnat_biodiversitat_EN.pdf

4.2.12. Sweden

4.2.12.1 Framework for financing infrastructure and biodiversity actions

Objectives

Trafikverket (TRV) is responsible for most of the Swedish research and innovation work on transport infrastructures. Starting with roads and rail, which constitute the core of the work, TRV mobilises an average annual budget of SEK 500 million. In total 8.2 billion SEK is invested over a twelve-years periodstartin in 2023. Focus is put on three inputs that all are partly related to biodiversity:

- Planning
- Design and construction
- Maintenance

  In a new staking special funds have been set aside by the Government for an investment in research on electric aviation and to increase the cooperation within ther Europe´s Rail.

Of this sum, 7 to 10 million SEK are invested in biodiversity. Additional funds are also being sought in parallel. The sums obtained are distributed among three multi-year applied research programmes:

- Triekol - biodiversity in the broad sense (2 million SEK) - this programme is an umbrella for the other two and ensures the integration of the results.
- Trias - invasive species (3 million SEK)
- Pollinators (2 to 3 million SEK)

TRIEKOL started 2009 and are now (2023) finishing its third stage. A fourth stage TRIEKOL IV is about to start 2023/2024. The first step concluded what negative impact should be addressed, the second stage supported the production of the Ecological and cultural heritage standards document, which states the criteria to be fulfilled in order to achieve an ecologically sustainable infrastructure. The third stage has manly supported production pf technical rules on how to fulfil the ecological criteria.

The fourth stage will continue these efforts focusing on small animals including insects.

The projects supported have a cost of between 1 and 2 MSEK.
The prospects are multiple, and the work carried out usually involves environmental consultancies and internal expertise. Which ensure the development of new and increasingly relevant applications and thereby facilitates the transfer phases from research to operational use.

The R&D aspect for airports is carried out by Swedavia, which works a lot on the green areas of airports, which are often biodiversity hot spots. On the other hand, little is being done on ports if they are not connected to the railway. Other types of infrastructure, particularly energy, are the subject of other work, mainly under the leadership of the Ministry of the Environment and in cooperation with the Svenska kraftnät (an authority that is operated in the form of a state-owned enterprise), which has a limited budget for this subject, though.
Research regarding wildlife accidents on railways are performed in Nordic cooperation (*Ruralis, NIBIO, HINN, BaneNor, Norske Tåg, Vytåg, SLU, EnviroPlanning, SJ, Trafikverket)* supported by INTERREEG.

4.2.12.2 Income and exploitation of results
Research results are published not only in papers but also in technical reports (www.triekol.se). Furthermore, the results and conclusions are discussed at conferences, workshops, and seminars.
Many of the transfers are carried out at online events or conferences to coordinate projects and to help draft procedural guides, which are initially drafted by the researchers and finalised by the TRV.
Dedicated working groups exploit the results and ensure the transfer to applicable solutions explored in successive workshops (often two). The TRIEKOL III programme holds its final conference in March 2023.
Finally, after having hosted the secretariat of the European research network IENE for ten years, a specifically Swedish mirror structure has been created, The Swedish IENE network, to serve as a space for dialogue and exchange. This structure promotes cooperation with the agencies in charge of research in Sweden (Vinova, MISTRA, DRIVE SWEDEN and others) as well as with various companies (Railway Sweden, Volvo, etc.) consultant companies and entrepreneurs, including the area of vehicles and not just infrastructure.

4.2.12.3 Main difficulties or opportunities
The difficulties will in the future be concentrated on niche projects (wildlife accidents (railwais) vibrations, noise, insects, invasive alien species) for which it is difficult to find funds, which requires opening to international cooperation. Maintenance issues are also important because the methods are often old and not very up to date, whereas innovations could allow greater efficiency.

It should also be noted that the economic fabric and the size of the market limit the capacity of national companies to respond to the needs expressed and reduce or slow down the potential for the implementation of disruptive innovations.

Life-type credits could be mobilised, but the administrative complexity and the very restrictive framework limit the use of these funds, which, moreover, do little to address the subject of research. The IENE, as an association, could play this role by involving private companies in a more flexible way.

4.2.12.4 Websites
https://iene.se/
https://triekol.se/

4.2.13. Switzerland

4.2.13.1 Framework for financing actions addressing infrastructure and biodiversity

Objectives, organisation and fundings

Research, innovation, and deployment actions in Switzerland are clearly separated and are most often linked to infrastructure upgrading actions. There are regular exchanges with the rail authorities and common projects are set when “opportun”. Both road and rail are represented in standardisation committees.

FEDRO manages the road research budget. It represents 8 to 10 million SF per year. There is not a specific budget for the biodiversity component. Now tire abrasion, biodiversity and road runoff are the main environmental research topics.

The funds invested come exclusively from the federal budget.

4.2.13.2 Outputs and exploitation of results

The projects supported, which have a strong applied research dimension, make it possible to update national manuals and guidelines, usually under the aegis of the VSS, the standardisation agency. The cantons and other local authorities are associated or consulted.

The companies (SMEs, ETIs or large groups) responsible for implementing these recommendations are almost exclusively Swiss due to specific national regulations and the need to master real operational bilingualism. In order to provide them with more support, continuous training methods (MOOCs, podcasts, etc.) are being explored, which would enable the knowledge of those working in the field to be regularly updated.

4.2.13.3 Main difficulties or opportunities

Support for research and innovation projects is made particularly difficult by a highly administrative system that can slow down the innovation process. Moreover, the choice of themes depends very much on the direct expression of needs.

4.2.13.4 Website

https://www.vss.ch/fr/

4.2.13.5 Other remarks

Cooperation is underway with Germany and Austria (DACH) on two joint projects on mowing systems and machines for both compensation areas. This work is being carried out in German and will be translated at least partially into French and English with open dissemination at the end.

4.2.14. UIC – CER – Europe’s Rail

4.2.14.1 Framework for financing actions addressing infrastructure and biodiversity

Objectives

Railways offers a sustainable mobility solution and UIC advocates for a systemic transformation while promoting a global vision of a future railway. With its “Vision of Rail 2030 (link), endorsed by UIC members in five continents, UIC notably encourages the railway sector, priorities the implementation of innovative and disruptive projects at regional, national and envisages a better future by

- Transforming cities and connect communities.
- **Using clean energy, technology, and innovations.**
- Promoting intermodality and seamless connections.
- Transforming customer experience.

UIC works towards connectivity that contributes to healthy and sustainable lifestyles and economies on every continent - for a railway that is zero emissions, resource efficient, a

community hub, accessible for all, and is both biodiverse and a good neighbour. Moreover, UIC is officially recognised as the voice of railways by the United Nations and has 'observer' status, meaning it is permitted a delegation in the COP each year. UIC has five key focus area:

- Promote rail transport globally.
- Further develop UIC as the technical platforms to address members' needs.
- Create innovation through projects.
- **Promote sustainable, carbon free transport.**
- Efficient, transparent management for benefit of 'our' members

To date, 38 UIC members have committed, through the UIC Railway Climate Pledge (link), to achieving net-zero emissions by 2050 as well as contributing to the United Nations Sustainable Development Goals. Moreover, UIC signs memorandum of understanding to forge links between railway sector and other stakeholders.

CER represents European Railways and advocates in European Union activities. Within the CER Environment group, CER integrates biodiversity and land use into the cluster of environmental issues, but since it does not carry out technical work, it coordinates its activities with UIC Sustainability and includes UIC technical work in the position papers and other documents it publishes.

Europe's Rail Joint Undertaking (EU-Rail) aims to deliver, via an integrated system approach, a high-capacity, flexible, multimodal, sustainable, reliable and integrated EU railway network for European passengers and cargo.

Organisation

UIC provides focus and leadership for the environmental and social sustainability agenda in the global railway community. Furthermore, UIC maintains and develops its rail technical expertise while carrying out technical projects in line with members' requirement for the benefit of their business. UIC is today organised around 4 major streams of activities, namely:

- Passengers
- Freight
- **Sustainability**
- Rail system

UIC, together with its members, work through a century to demonstrate how rail can be part of the solution to the challenge of sustainable development. The UIC Sustainability provides secretariat for the platform & five technical sectors:

- Air Quality
- Circular Economy
- Energy & CO_2
- Noise and Vibration
- **Sustainable Land Use**

The UIC Sustainability convenes the community through events, technical working groups, exchange of best practice and lessons learnt. Through collaborative knowledge sharing and research projects, the UIC Sustainability Platform (SP) helps the community to develop strategies and new ways of working to reduce its impacts on the environment. The work programmes and objectives are established in the framework of general assemblies and allow to cover emerging issues. The Sustainable Land Use (SLU) Sector provides a mechanism for the exchange of knowledge within railways and external parties in the domain of sustainable land use and promote the importance of habitat management in the railway sector. Biodiversity issues is addressed in this sector within UIC Sustainability. Within the sector activities, UIC launches technical global projects and collaborates to the external financed projects (i.e., European financed).

The budgets allocated by the European Union to the sustainability framework are limited and are essentially exploratory funds intended to support the alignment of multi-annual investment plans. Under the cross-cutting activities of the Shit2Rail JU, some sustainability related issues that were not addressed, except for noise and energy issues, have been addressed during the

creation of the EU-Rail and important steps have been taken to provide support. Under Flagship 4 activities, projects in the Rail4Earth call aim to explore green and sustainable railway systems. More support is needed in terms of conducting the necessary discussions and communicating the needs to include biodiversity issues in the new calls to be launched under EU-Rail. In this context, cross-collaborations between UIC, CER, EU-Rail, through ERRAC, are planned to better mobilise the biodiversity issue, which is not addressed in the Rail4Earth's first call, to be included in future calls.

Financing

Within UIC and CER, the finance is provided by membership fees, divided into active, associate and affiliate members. In addition, UIC seeks external financing as well as collective funding from members for specific projects. The funding amounts vary according to the project content, the topics and the members involved. Over the last five years, an average budget of EUR 0.5M has been allocated for the implementation of three major technical projects on habitat management for railway infrastructure managers and operators, which are open only to UIC members within the UIC Sustainability Platform.

For the railway stakeholders, the subject on the external financing is becoming increasingly important in discussions with institutional investment banks (primarily the EIB and similar). This process can also be observed in the discussions following the COP climate and biodiversity and relayed with organisations such as the IEEP. The subject can be financed, but this must be anticipated. In this respect, 2023 will see the launch of a new call that could integrate this subject, but this will have to be discussed with ERRAC.

4.2.14.2 Outputs and exploitation of results

With support from member experts, the SLU sector publishes technical reports which set out a series of strategies and action guides to support habitat management is embedded at every level of the railway business, alongside reliable and safe infrastructure, and operation. It also organises workshops and public events to help its members to discuss and share best practices and case studies. The management of UIC projects requires a strong dimension of exchange and upstream discussion. In this regard, the most recent project of UIC SLU Sector help the community to convey its messages and showcase best practices and disseminate the results and barriers.

Table 3: UIC SLU sector projects

• HERBIE (2018-2019)	Focus on the existing vegetation control and management for railways including the ranking system for selecting the best method 1. UIC Guideline for Integrated Vegetation Management 2. State of the Art Report of Vegetation Control and Management for Railways (including Guidelines and Integrated Assessment)
• TRISTRAM (2019-2020)	Focus on the transition strategy on vegetation management from conventional chemical herbicides to alternative methods 1. UIC Strategy on the Future Vegetation Control 2. Future vegetation control of European Railways (State-of-the-art report)
• REVERSE (2020-2023)	Focus on setting the collective vision for protecting and enhancing the wildlife value of the European rail network 1. European Railways: Strategy and Actions for Biodiversity 2. Guidelines
• ECOV4R (2023-2026)	Focus on the valuation of ecosystem services provided by habitats and wildlife associated with the railway network and aims to demonstrate how they contribute to our lives and the European economy.

One of the objectives of the SLU Sector is the development of international railway solutions (IRS) for railway activities. Technical aspects of vegetation control and tree risk management

are given in IRS 70743 (link) as a guidance for global infrastructure managers. All the above-mentioned reports and documents have been reviewed and approved by the members of the UIC SP before being made public. They can therefore feed into or inspire the work of organisations such as CEN-CENELEC or ISO. In addition, certain co-operations with other stakeholders continue to be developed, for example, a Memorandum of Understanding was signed with WWF-CEE in 2020 within the REVERSE project.

4.2.14.3 Opportunities and main difficulties

European railways are expected to have a bright future, being core to the delivery of the commitments to protect and enhance nature laid down in the EU Biodiversity Strategy 2030 and, more widely, supporting the green recovery of the continent as part of the EU Green Deal. Therefore, it is expected that railways will play a much more important role in the European transport sector.

One of the difficulties identified is that activities shall be supported and showcased together with innovative steps by national authorities. Incentives for further development by national authorities are needed, along with support and demonstration of activities. Implementing an approach that covers different types of infrastructure again needs to be done by national and international authorities and is complex and difficult.

There are several opportunities for railway corridors to become even more biodiverse and with growing digitalisation capacity railways will be able to map and monitor changes. UIC showcases the possible existing solutions including recommendation that should be implemented using robust and repeatable approaches. Therefore, UIC reports, and recommendations are expected to inspire the global community for how each actor can contribute to the protection and enhancement of green corridors to the benefit of railways, neighbours, customers, and the planet. Further extension of the European network and increases in transport capacities will have to be managed in line with biodiversity conservation goals and will even reduce the overall pressure on nature and ecosystems.

"Solutions exist; others have to be enhanced":

- Public-Private Partnerships have now paved the way for railway development in many countries. A combination of investment from national and state governments, private sector debt and equity, as well as external financial assistance from development banks, finance projects. There is a need to develop and increase jointly dedicated efforts so that this can be more widely promoted through international organisations such as UIC, CER etc.
- Public authorities and financial institutions must be well-informed about possible technical solutions in order to play their role with full knowledge and conviction. The exchange of information should be promoted through technical publications and conferences where railways can further communicate their work on biodiversity.
- Railway companies and the wider stakeholders should more collaborate and benefit from their expertise in regards of the nature conservation. It is therefore essential to involve institutions, universities and other recognised specialists to support railway business and enable the actions devised to be optimised.
- Innovation is also needed in financial instruments and resources. Therefore, the introduction and launching of specific European funded projects should be encouraged, especially those proposing solutions for railways.
- Enhancing existing case studies and introducing more holistic solutions: This work therefore feeds into the process of defining KPIs (as some of them recommended in the REVERSE project) without resolving the intrinsic difficulty of obtaining calculable references.
- The UIC Rail Sustainability Index (RSi) is a new tool designed for and with the global railway community. By adapting the data collected through harmonised KPIs to the UIC RSI, it will be possible to improve access to green bonds and sustainable finance instruments.

4.2.14.4 Website
https://uic.org/sustainability/sustainable-land-use

4.2.14.5 Other remarks
Further discussion should be held with CER, which has joined the European Biodiversity Platform. This meeting should also involve the representatives of Shift2Rail. The latter do not include funding for biodiversity, which is a concern because LIFE projects do not have sufficient research and innovation components to be able to compensate.

4.3. National Transport and Biodiversity strategies: overview and challenges

As the IGEDD report (IGEDD, 2023 reminds us, national biodiversity strategies are not perfectly integrated into a tangle of texts and commitments at the international, European, and national levels. Despite their role as strategic documents for biodiversity policies, these strategies often simply recall the existence of the various texts, without integrating their measures or proposing a real articulation of the whole. This highlights two recurring difficulties, particularly marked at the interface of transport and biodiversity:

- a lack of coordination between the objectives set and the actions proposed.
- a lack of levers and means to meet the ambitions set.

This makes it very difficult to target investments precisely.

National strategic plans for biodiversity lack precision when it comes to the financial resources needed to finance the measures for biodiversity.

To get a holistic view of the state of biodiversity financing, we proceeded with a comparative analysis of national biodiversity strategies. This analysis makes it possible to map the state of biodiversity funding at the European level and thus constitutes an interesting basis for assessing the place of research, innovation and transport in national biodiversity plans.
To gain in precision, we carried out a parallel study of the national mobility plans, which allows us to carry out a more exhaustive inventory of the consideration of biodiversity issues in the transport sector.

Methodology:
After a first overall **reading of the national reports for biodiversity** in each country, we proceeded to a search by keywords: ""transport", "infrastructure", "research", "innovation". Their frequency is a first indicator of the level of treatment of these issues.

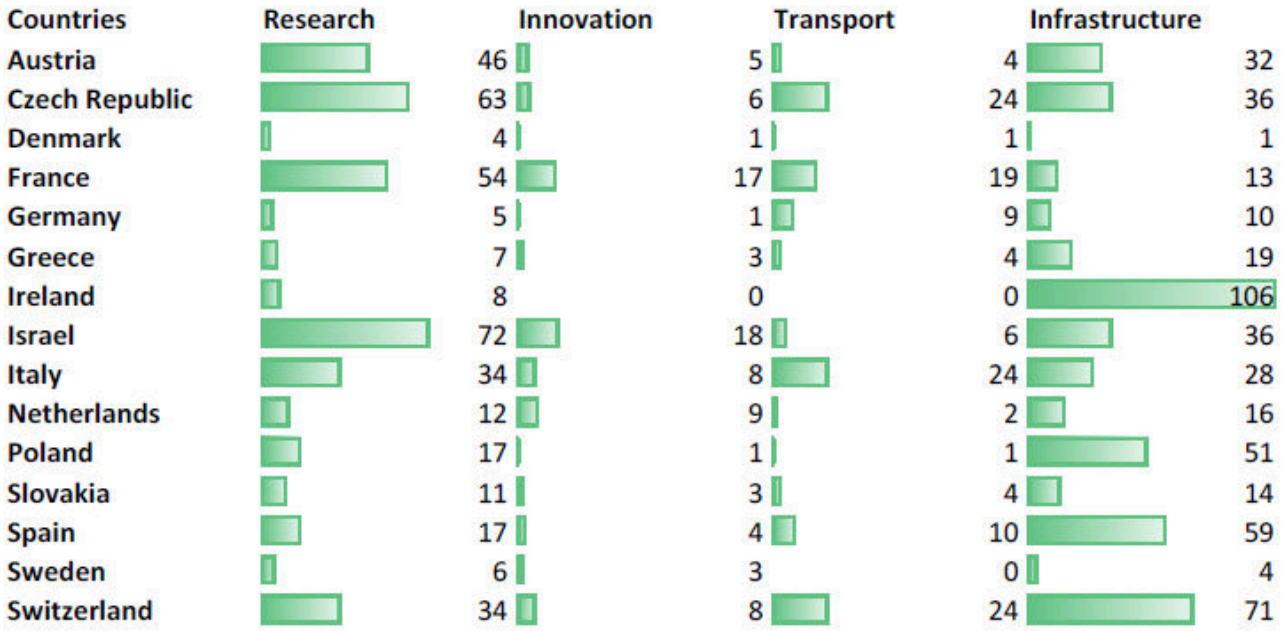


Figure 7. National biodiversity strategies, frequency of key words

Secondly, we looked specifically at the financing part of each biodiversity plan. Finally, we analyzed the mobility and transportation national plans, and more specifically, its climate and biodiversity commitments. However, data collection on biodiversity and financing remains a complex exercise due to the lack of common indicators and amounts explicitly allocated to biodiversity conservation.

The parallel **study of the national mobility plans** enables us to carry out a more exhaustive review of the way in which biodiversity issues are dealt with. We have therefore first conducted a search using the keywords "climate", "environment", "research" and "innovation", and then carried out a comparative analysis of these national plans in order to identify the main trends that emerge.

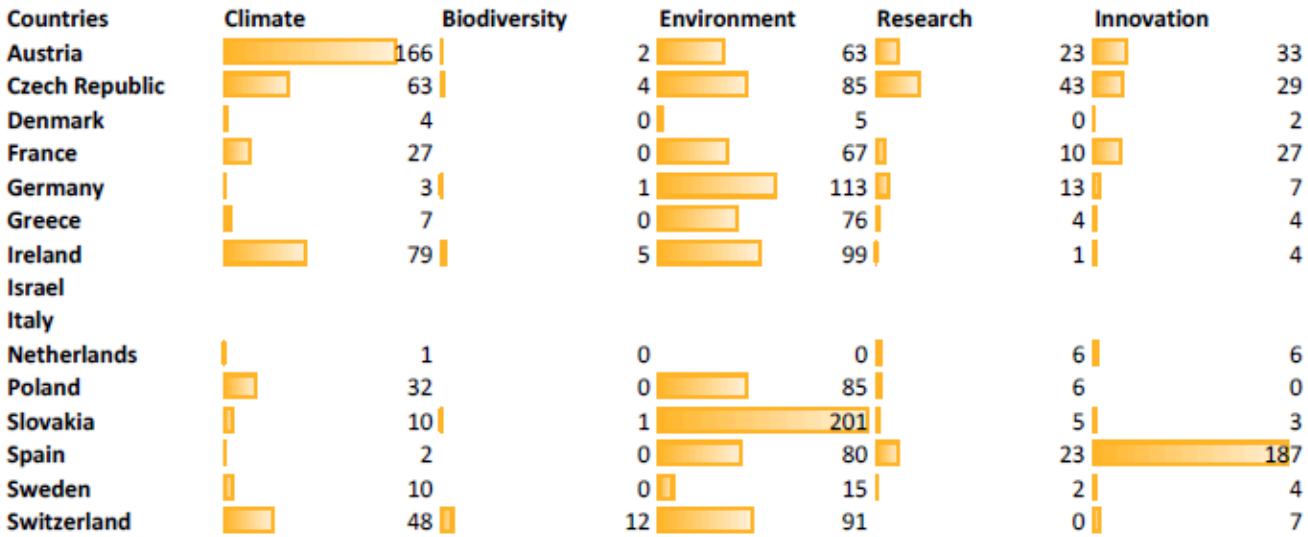


Figure 8. National Transport strategies, frequency of key words

This study is also based on interviews with specialized national actors specialized in the transport sector or on biodiversity issues.

Cross-sectional analysis of biodiversity funding

Developing a national biodiversity plan is a new and experimental exercise for which states have very little material on which to base their needs, define their actions and evaluate their budget. However, financing is an essential component of the implementation and application of a public policy on biodiversity. Although this issue is addressed in each of the biodiversity plans, the financial aspects of the national biodiversity plans are characterised primarily by an increased **search for sources of funding rather than by the specification of amounts**. Indeed, the national biodiversity plans do not manage to establish the amounts associated with their objectives but identify the national or European public funds that allow the financing of biodiversity protection measures. Thus, it is understandable that national biodiversity plans have little success in identifying the amounts associated with their objectives.

Table 4: Analysis of national biodiversity strategies in terms of funding.

States	National biodiversity funding	European funding	Future plans for funds	Types of activities funded
Austria	National Biodiversity Fund Forestry background	Life programme Horizon Europe Common Agricultural Policy European Structural and Investment Funds (ESIF)	**Compensation** funds for non-market ecosystem services. Introduction of a **landscape protection tax** in the Länder	**Applied projects:** Conservation and restoration of biodiversity
Czech Republic	Taxation instruments in the field of nature protection	Life programme European Structural and Investment Funds (ESIF)	Willingness to create an interdepartmental **concept of multi-source financing of nature and landscape care**. Analysis of the damage of **compensation system**.	**Applied projects:** Conservation and restoration of biodiversity through operational programmes
Denmark	The Danish Nature Fund Danish rural development program River Basin Management Plans Nature Package Finance Act The Danish agricultural agency	Natura 2000 Common EU agricultural policy		**Applied projects:** Conservation and restoration of biodiversity through the funding of operational projects and grants for the management of natural areas. Renaturation projects

States	National biodiversity funding	European funding	Future plans for funds	Types of activities funded
France	Supporting business innovation in biodiversity: dedicated ADEME fund; PIA4; CIFRE grants.	Natura 2000 Common Agricultural Policy European Maritime, Fisheries and Aquaculture Fund (EMFAF) Life programme	Tax incentives Interest-free loans Need to increase payments for environmental services! Mobilise private finance through greater mobilisation of private investment flows and the use of innovative schemes, integrating climate and biodiversity objectives (low carbon label carbon label; integrated offset mechanisms)	**Applied projects:** Conservation and restoration of biodiversity through the funding of operational projects and grants for the management of natural areas.
Germany	"chance.natur" federal funding scheme for nature conservation	Natura 2000 European Agricultural Fund for Rural Development	Develop mechanisms for **financial remuneration for specific nature conservation services**.	**Applied projects:** Conservation and restoration of biodiversity
Greece	Green Fund Blue Fund	Life programme		**Applied projects:** Conservation and restoration of biodiversity
Ireland	Annual exchequer allocation Funding for biodiversity research	Natura 2000 Life programme Horizon 2020 Interreg	Develop a financial plan, with work programme and budget, to implement the Biodiversity Action Strategy Development of funding mechanism for community and NGO biodiversity projects as part of OPW programmes in flood risk management, heritage and property sectors	**Applied projects:** Conservation and restoration of biodiversity **Research:** Funding of research on biodiversity-related matters
Israel	Fund for Open Areas Conservation Quarries rehabilitation fund Funding from the MoEP, the MoAG, the Ministry of Science, the NPA, and		Develop a strategy on the subject of green economy which includes aspects of new economic tools reflecting costs and benefits of environmental and social impacts, mitigation of climate change and energy dependence, climate change adaptation capacity, creation of new engines for economic growth nd	Funding for monitoring, research, and protected areas management.

States	National biodiversity funding	European funding	Future plans for funds	Types of activities funded
	several private foundations are dedicated to biodiversity related research.		sustainable consumption and production.	
Italy	no specific instrument for biodiversity	Natura 2000 Common agricultural policy Eu rural development policy	Payments for ecosystem services "National Foundation for Biodiversity" that can collect donations to co-finance	**Applied projects:** Conservation and restoration of biodiversity
Netherlands	Innovation Acceleration Fund National fund for rural areas			
Poland	National Fund for Environmental Protection and Water Management Provincial funds for environmental protection and water management	Life programme Horizon 2020 The Infrastructure and Environment Operational Programme 2014-2020 The Programme for the Rural Areas Development for 2014-2020 regional operational programmes for 2014 - 2020	Willingness to implement the concept of digital data exchange and information on the costs of activities implemented in the field of nature protection	**Applied projects:** Conservation and restoration of biodiversity
Slovakia	no specific instrument for biodiversity	Natura 2000	The objective is to use finances to implement measures that will bring multiple benefits for several sectors through the integration of biodiversity Facilitate the use of private sources of funding from voluntary instruments and from innovative mechanisms of biodiversity financing through public-private partnerships.	**Applied projects:** Conservation and restoration of biodiversity

States	National biodiversity funding	European funding	Future plans for funds	Types of activities funded
Spain	local and regional authorities collect environmental taxes and levies which in 2020 amounted to almost 20 billion euros (1.8% of GDP)	Natura 2000 Life Programme		
Sweden	no specific instrument for biodiversity	Natura 2000	Economic **incentives** that have a direct impact on biodiversity and ecosystem services assessed on the basis of the value of ecosystem services Development of the **polluter pays principle.**	**Applied projects:** Conservation and restoration of biodiversity
Switzerland	The programme agreements are a federal subvention instrument for joint tasks in the environment			**Applied projects:** conservation and restoration of biodiversity. Plans to fund research, education and training and data management.

Sources of funding:
The role of public authorities in financing biodiversity protection is decisive. The latter relies almost exclusively on the public budgets of the States. Secondly, the European Union is heavily involved in financing the protection of biodiversity. Initially via European funds such as the European Regional Development Fund (ERDF) or the European Agricultural Fund for Rural Development (EAFRD). Secondly, the European Union finances applied projects via funding programmes such as the Life programme which aims to accompany the implementation of the "habitats" and "birds" directives, Horizon 2020 and Interreg. Finally, European policies that are not primarily dedicated to biodiversity help to finance it, such as the Common Agricultural Policy and the Common Fisheries Policy.

Some states are implementing innovative financing solutions: tax deductions in Denmark, allocations of assistance between municipalities, targeted environmental taxes in Spain. However, Private funding is almost absent from national biodiversity plans.

Finance activities:
The funding allocated to biodiversity and the actions planned in the national biodiversity plans are primarily devoted to the implementation of concrete conservation actions (national parks, Natura 2000 network). The funding of research is approached in a heterogeneous way

depending on the country. In some countries, research and innovation are barely mentioned, while other countries have a genuine biodiversity research policy. For example, Israel devotes a large part of its budget to research, while the other countries only mention it in passing. Biodiversity funding is thus short and medium term rather than long term.

Transport and Biodiversity:
The national transport plans are characterised by a relative similarity and several trends can be identified.

Firstly, **the national mobility plans focus on the need to reduce greenhouse gas emissions caused by the transport sector.** Transport appears to be the main cause of emissions in some of these countries (e.g. Switzerland).

To reduce greenhouse gas emissions, governments want to reduce the density of vehicles on the roads. To this end, the modal shift is primarily promoted and takes shape in the modernization of rail transport infrastructures. To a lesser extent, the construction of bicycle paths is mentioned as well as the digitalisation of uses to reduce travel. The transport plans are also characterised by a desire to improve the public transport supply.

The national transport plans also mention the challenge of electrifying modes of transport, which will also help to reduce greenhouse gas emissions. The desire to build additional infrastructure for recharging electric cars is often mentioned.
Faced with these common trends that emerge from the study of the various transport plans, it is nevertheless necessary to underline the discontinuous level of precision that exists between these plans. The term environment has different meanings in the different national plans and allows for an increase in generality, losing sight of its real meaning.

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We also notice that CO2 emissions are the central variable around which environmental policies in the transport sector are structured.

Finally, it is noteworthy that issues related to biodiversity are almost entirely absent from transport plans. No data or policy mentions the common issues that exist between biodiversity and transport issues.

To sum up, the cross-analysis of the national biodiversity plans and the national transport plans highlights a lack of precision in the terms used. The term "environment" or "sustainable" is sometimes used to encompass the terms "climate" and "biodiversity", sometimes only to refer to solutions to climate change. A clarification of the terms used therefore seems necessary. **We also note that biodiversity is a new public policy issue where knowledge and skills for implementing this type of policy are still lacking.** This is especially true when we talk about their financing, which is still unclear and therefore lacking in relation to the issues at stake. This is despite the fact that funding remains the central and essential element in the implementation of a public policy.

Moreover, little funding is devoted to biodiversity research. The latter are mainly allocated to conservation or renaturation projects. This can be understood by the

conflict of temporality that exists between the urgency of action and the long timeframe of research. However, this leads to gaps in knowledge and innovative solutions for nature. Finally, the cross-analysis of the transport and biodiversity plans highlights the fact that there is very little inter-silo and multidisciplinary research. However, biodiversity, like climate change, should be systematically considered in sectoral public policies.

4.4. Analysis of the interviews and putting them into perpective

4.4.1. Governance and funding of research and innovation

Biodiversity loss remains difficult to assess from a global point of view because of its multidimensional nature and, unlike climate change which can be measured by the rise in the earth's temperature over long series, the absence of a single relevant indicator (IGEDD, 2023). The willingness to act is present in all the countries interviewed for the BISON project, but the difficulty in identifying specific investments is real. This situation is also found at the global level where underinvestment in the subject has been estimated at 440 billion dollars annually by the World Bank. The OECD estimates that $500 billion of damaging public subsidies are spent each year worldwide, which is 5 to 6 times more than the total spending on infrastructure, but this ratio is probably underestimated because the OECD's Transport Department estimates that the average annual investment in infrastructure by 2030 will amount to more than $3,500 billion. Such a discrepancy illustrates the difficulty of identifying the issues.

As summarized by the OECD in its 2014 report on biodiversity finance-: ”*these benefits are not fully reflected in market prices and are therefore undervalued and underrovided. Private decision makers do not always consider the social costs and benefits of natural resources and ecosystem conservation and sustainable use, but rather generally focus only their own private costs and benefits. As a result, biodiversity continues to be under-valued and lost*”.

In fact, funding for biodiversity remains structurally insufficient. For example, at the global level, the additional costs of achieving the twenty Aïchi objectives over the 2010-2020 period are estimated at between $150 and $440 billion per year. **In this context, the intervention of public actors remains the most decisive and reliable tool for action on biodiversity.** Private funding for biodiversity remains limited. However, it is surprising to note that public authorities, the main investors in research, are almost absent as targets of the work. It is as if, in a way, the administration tended to forget itself and was only an "administrative vehicle" with an incomplete vision of its own needs but also of its own resources.

Public operators sharing risks with the private sector have developed significant financing systems for the climate transition, but little for biodiversity. The subject is marked by an enormous difficulty in apprehending the financial volumes related to biodiversity, even in countries that have adopted the use of a "green budget" like France. As a result, it is difficult to clearly formalize objectives or means in a strategy, whether it be research, institutional or industrial (see section 4.3). These traits are common to almost all of the actors interviewed (see section 4.4) and are consistent with the OECD's analysis that funding of "out of the box" topics is most often a secondary objective (OECD, 2021) (see deliverable 4.2: BISON - Strategic Research Agenda).

Without having similar figures for the different countries, the analysis carried out by the Inspection des Finances in France shows that the main items of government expenditure on biodiversity policies concern the acquisition of knowledge (26.7% of the total) and the financing of protected areas (21.8%). These elements also came up regularly during the discussions. The investments made are concentrated in two main categories linked to the application of the avoid-reduce-compensate sequence: the remediation of existing effects or the reduction of future damage.

Although the organization of funding for Research, Innovation and Development on the theme of infrastructure and biodiversity is fairly similar in the various European countries, the subject remains marginal and fragmented. The amounts dedicated to RID remain very difficult to assess because they are often mixed with broader environmental actions, making it impossible to target their precise nature. In this very complex framework, dialogue and the pooling of knowledge between the different types of infrastructure is still very incomplete, even if this point is not exclusive to this theme.

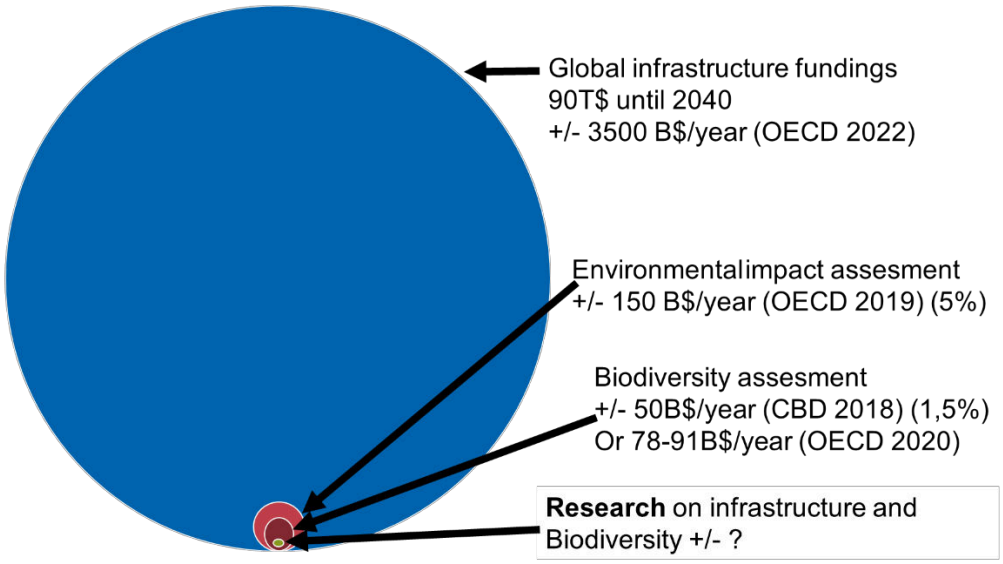

Figure 9. Global ratio of investments in infrastructure and biodiversity

4.4.2. Unbalanced, fragmented and insufficient funding for R&I.

The difficulty in mobilizing funds for Research and Innovation results from several combined factors:

- **The necessary interdisciplinarity of the subject is carried out primarily by a few intermediary actors in the public sector**, which means that the research sector has little or no interest in it and that it is very difficult to assess the volume of funds invested (see figure n°7 - Research and innovation on transport and biodiversity - schematic organisation of the disequilibrium).
- **The mobilization of private actors is difficult and heterogeneous.** Private research centers are rare and focus on more downstream subjects. Several elements make the effective integration of biodiversity into private economic choices complex:
    - As a common good, biodiversity generates collective benefits that cannot be captured by private actors, unless a market price is assigned to them.
    - Assigning a price or monetary value to biodiversity is theoretically difficult and of limited interest because of the multiplicity of data and indicators to be considered as well as the diversity of possible scales of value.
    - The practical implementation of the measurement of benefits, risks and impacts around biodiversity remains incomplete and complex, in particular because of the multiplicity of ecosystems and their interactions.
      Once measured and possibly monetized, the benefits of biodiversity preservation are felt over the medium and long term, which makes them difficult to integrate into investment choices.

- **The applicative and operational dimension** is the primary objective, with a focus on certain infrastructures or local territories rather than on a more global approach, which also reduces the base of researchers capable of responding to expectations and needs. This point directs the available investments more towards particular case studies or follow-up observations than towards research.
- **The fear of instrumentalization (greenwashing)** on the one hand, or the desire to block on the other, can also help to clarify the difficulties encountered.
  It is otherwise difficult to integrate **the "fluctuating and dynamic" aspects of biodiversity (stochasticity) into transport or energy policies,** as opposed to climate issues with which they are often mixed under the terms of environment or nature, which does not contribute to establishing a consolidated vision of the challenges.
- **The limited national use of European funds,** which can offer an interesting avenue for financing, is often affected by administrative red tape, not to mention the fact that these funds also suffer from a segmented approach (see details in part 2.2).

The research and innovation ecosystem are unbalanced by a clear predominance of operational actions. Innovation or applied research, with a fairly high TRL level, is favored, especially in the "project" stages of the infrastructure life cycle. Upstream research or research of a strategic nature is very rare, often isolated, and makes it difficult to gain perspective on the entire process at the territorial level. Much greater weight is given to the financing of technical solutions to the detriment of socio-economic or socio-political approaches, resulting in a loss of global vision of objectives in favor of a specific use.

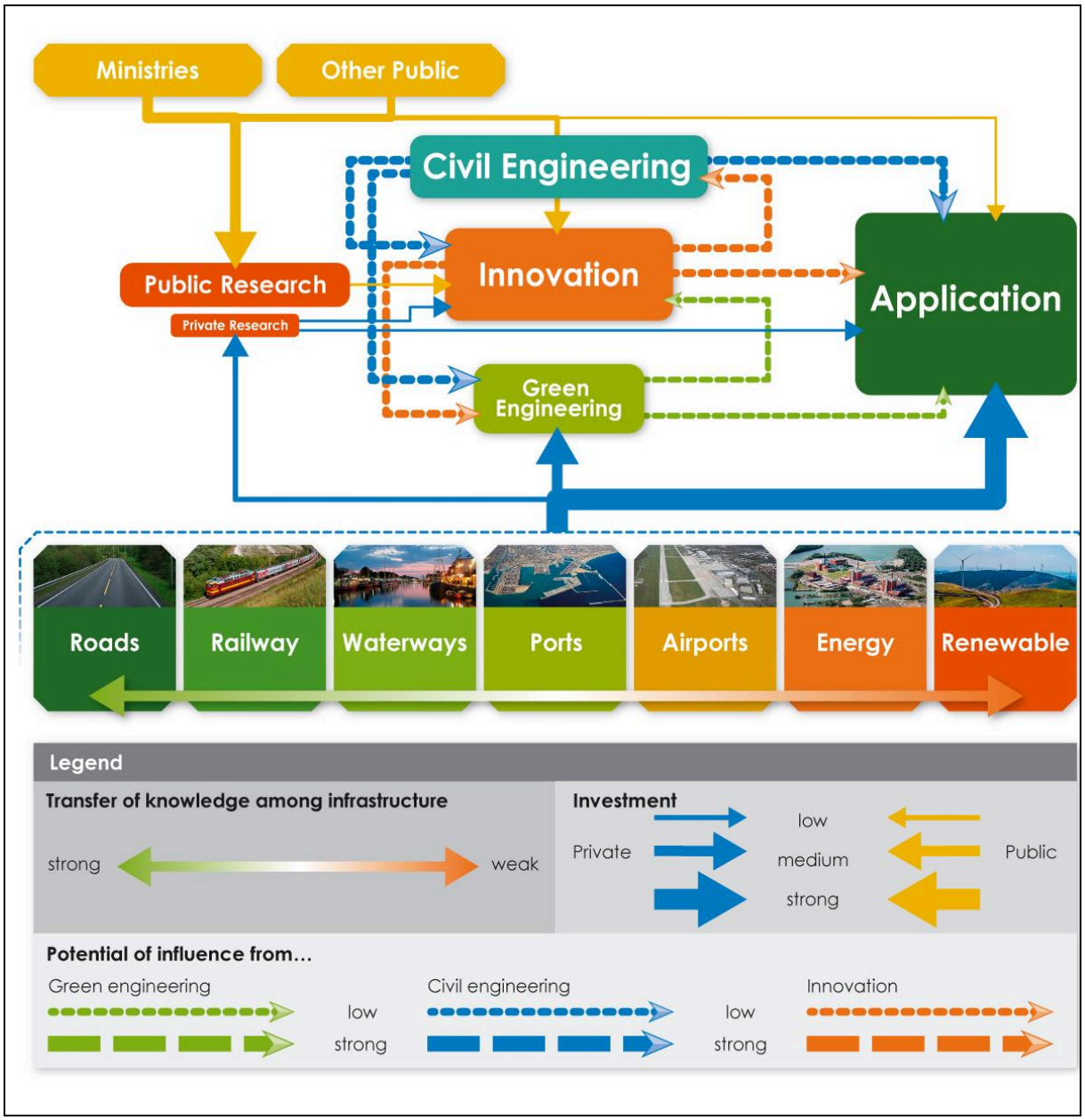

Figure 10. Research and innovation on transport and biodiversity - schematic organisation of the disequilibrium

From an operational point of view, the weakness of research has several consequences, marked in particular by the weakness of the industrial fabric capable of responding to the needs and its almost fractal fragmentation in the various member states. The economic models that would support the strengthening of a structured sector are also weak. This weakness is reinforced by insufficiently demanding specifications, which does not encourage the introduction of more innovations. Preference is therefore given to tried and tested processes and tools that are either old, not having been updated with the latest scientific findings, or implemented in a manner that is too fragmentary to have a real effect. Collations of good practices are therefore favored over possible meta-analyses that would bring stronger evidence based ressources (this point will be further developed on its origins and consequences in the following section).

4.4.3 Perspectives of evolution

However, several recent changes have been observed. All the above points must be qualified by other factors that are, at first glance, more positive.

Mobilizing private financing on the scale needed requires greater knowledge of the risks and effects of economic activities on biodiversity. The specific characteristics of biodiversity make direct private financing of biodiversity unlikely in the short or medium term. Biodiversity is a common good that is difficult to value. Despite their positive externalities, preservation or restoration actions are very rarely profitable for private actors. Only a very limited number of projects, most often related to the climate transition and carbon offsetting (nature-based solutions), are currently the subject of private financing that is theoretically beneficial to biodiversity but remains in its infancy and concentrated in developing economies.

However, it has been noted that private players are increasingly asserting the need to develop the RID sector to support the development of obligations linked to CSR and to take into account the effects of developments on biodiversity. It is indeed necessary for both private and public actors to have performance indicators that integrate biodiversity into the management of strategies, the evaluation of risks linked to the consideration of these issues and, in the long term, to allow their integration into the investment decisions of private actors in projects that are less harmful to biodiversity [IGEDD, 2023].

A reexamination of knowledge needs further upstream in the life cycle of infrastructures shows a desire to anticipate difficulties linked to artificialization (prevention rather than cure); currently, a few specialized public entities such as CEREMA in France, Expertennetzwerk with BAST in Germany, or TRAGSA in Spain are playing this growing role of knowledge support. But if countries of this importance manage to reach a "critical mass", it remains difficult to maintain elsewhere.

The various post-covid recovery plans (EU-Green Deal) have also had clear effects in directing the "greening" of funds, accentuating the convergence of national, European and international objectives. These actions have had an important effect by requiring the active convergence of funds on cross-cutting policies, even though situations may vary from one country to another. The temporal dimension of long-term investment strategies is also developing with a growing desire to prevent and anticipate as much as possible. The coordinated and optimized use of the various European funds can, in this respect, constitute a real opportunity.

5. PROPOSALS FOR NEW FUNDING TOOLS

5.1. Introduction

The joint analysis of European funding, the interviews and the discussions held during the workshop on January 31, 2023, have made it possible to propose several possible avenues for development. During the writing of this deliverable, it appeared important to underline that what exists at both national and European level today offers a strong potential to better support the subject.

The main pitfalls identified in terms of research and innovation funding are the following:

- Fragmentation of actors and funding in R&I.
- Difficulty in implementing an approach that that transcends silos.
- Delay of investments in the operational phases.
- Under-mobilization of private actors in the face of a subject with an uncertain economic model.

- Rarity of actors capable of developing a transversal approach.

Faced with these challenges, the avenues proposed below are based on a positive dynamic of growing scope, marked by a simultaneous series of initiatives at various national, European and international levels. The will of the stakeholders is asserting itself. The proposed solutions are therefore based on several common factors:

- Optimization of existing tools to increase overall consistency.
- Considering a long-time frame of results within the framework of a common good approach.
- A willingness to support initiatives that are riskier but have greater potential.

We propose three complementary levels of intervention marked by deep interactions with the global potential for action in this field.

Figure 11. Complementary levels of intervention

5.2. At the European Level

As analyzed in parts 2 and 3, Europe has developed highly specialized funding to meet the specific needs of different specialties. However, in recent years it has become apparent that there is a need to develop different approaches to cross-cutting issues, such as the COARA initiative. These tools correspond to a need for coherence in the face of complex issues that cannot be addressed through the usual channels.

A general limitation of some funding tools (e.g. LIFE) is that often the time for a real accurate experimentation of the effectiveness of innovative tools is not sufficient. This could be tackled, for example, by adapting the calls and desired topics accordingly in the different funding schemes. Few examples, but not exhaustive, can be:

- Encourage projects that implement concrete interventions based on previously developed recommendations, plans, databases, information etc.
- Encourage projects that implement new technologies specifically related to the impact of infrastructures on biodiversity (e.g. insert relevant preferred topic in LIFE programme).
- Encourage the Horizon 2020 programme projects that develop new transport technologies with the specific aim to reduce the impact on biodiversity.
- Encourage projects that aim at awareness of the impact of infrastructures on biodiversity at all levels: general public, users, policy makers, the industrial sector etc., both regarding the importance of the impact of the infrastructures and how to address these issues.

As part of the exploitation of the BISON project the development of capacity building tools for policy makers and authorities in the implementation of recommendations is foreseen. This topic will surely aim at increasing the capacities to turn theory (plans, knowledge, recommendations) into practice, but this might not be sufficient on its own and might need further support also through the different EU funding schemes.

EU has put in place many different funding tools targeting a wide range of different topics, but a drawback of this is that there is little communication and synergy between the different funding programs. However, in several topics the funding opportunities overlap at least partially, which can lead on the one hand to the risk of double funding, and on the other hand to gaps between the funding programs that leave out specific themes or issues.

We propose different possible paths:

1- **Strengthening the partnerships by creating a cross-functional workspace** to ensure the coherence of issues and to support cross-cutting subjects, even when their "profitability" is not assured.
2- This role could also be played at the level of the **"Missions"** by ensuring coherence between subjects and multiple funding: research, innovation, operational.
3- development of tools to better link the actions of the different actors involved in research, innovation or operational implementation (ie "knowledge brokers" - see detail in deliverable 4.2).

For these three developments or adaptations of pre-existing frameworks, one of the major challenges will be the ability to maintain a sufficiently low administrative complexity and a sufficiently high openness to risk (OECD, 2021).
From an organizational point of view, such an evolution will have to integrate the identification of transversal experts capable of appreciating the particular added value of the hybridization of knowledge.

A third evolution could also be in the capitalization of funded knowledge. During the interviews, in addition to the fact that the projects dealing with infrastructure and biodiversity were spread over a multitude of different windows, we realized that the results of many projects were not or no longer accessible a few years after their completion, resulting in a loss of knowledge, sometimes major. It is indeed crucial to be able to capitalize on what has been learned in order to ensure an increase in generality.

5.3. At the international level

National resources are highly fragmented and can be strengthened at two levels:

- **Support the role of resource centers or centers of expertise and their networking.** Centers such as CEREMA in France, BAST in Germany with the Expertennetzwerk, TRAGSA in Spain, or their equivalents in different countries are very specific spaces that are required to integrate multiple public policies to achieve their missions. In this context, they must develop a **"knowledge broker"** role (Sutherland et al., 2022), which is essential to support essential cross-cutting research or innovations on the subject of infrastructures and biodiversity. Finally, they occupy a special place between public and private actors because of their ability to better analyze needs that are not necessarily clearly formalized. This also allows them to be key players for transitional actions.
  The centers of expertise can also play a key role in ensuring the coherence of national strategic plans, which at this stage are still struggling to fully interact.

- **Support the creation or strengthening of research foundations to increase the mobilization of private actors**. Research foundations have become key players to better support private companies and better coordinate private funds. The actions carried out in Italy show how effectively they can complement the actions carried out by the public sector. - They provide the operational flexibility necessary for the coordination of private actors who are not necessarily used to extensive cooperation.

Moreover, this tool also represents a flexibility to integrate more distant actors such as investment banks (example of the Global Infrastructure Basel association or the Sustainable Infrastructure Foundation).

5.4. At the trans-national or inter-professional level

A key issue in the financing of research and innovation is the transition between the national and European or even international levels.

Three circles seem to be emerging at this stage:

- **The strengthening of language-based cooperations such as DACH** (Germany, Austria, Switzerland) or Nordfou (Denmark, Sweden, Norway, Finland and Iceland) which offer a synthesis between national specificities and transnational issues allowing to overcome language barriers such as English which remains a major barrier for a vast majority of professionals. Initiatives between French or Spanish/Lusophone countries have also been identified. Such initiatives can more easily carry out joint calls for projects such as systematic reviews and exploit the results.
- **European professional or institutional networks** such as CEDR or CER are very directly able to optimize their members' investments in the subject, even if at this stage their own resources remain limited. Their strength lies in their specialization and their central role vis-à-vis the member public authorities.
- Finally, **support for transversal research networks such as FEHRL or IENE**, originally created in the 1990s to address the common needs of ministries of transport in biodiversity management. These associations, intermediaries between the national and European or international levels, can play an increasingly central role as "knowledge brokers". Like centers of expertise, these networks can better coordinate public and private actors in an approach that is optimized both financially and from the point of view of knowledge production.

6. CONCLUSIONS

A better knowledge and measurement of the effects and risks of economic activities linked to biodiversity should make it possible to better direct public and private financing by prioritising the reduction of harmful investments. For that objective, the role of research and innovation will be critical to invent new tools aiming at creating new bridges between communities that remain strongly siloted.

Some of the pitfalls identified in terms of research and innovation funding are the following:

- Fragmentation of actors and funding in R&I.
- Difficulty in implementing an approach that that transcends silos.
- Delay of investments in the operational phases.
- Under-mobilization of private actors in the face of a subject with an uncertain economic model.
- Lack of actors capable of developing a transversal approach.

The report highlights proposals for new funding tools. They are:

<u>EC level</u>

- Strengthening partnerships by creating a cross-functional workspace to ensure the coherence of issues and to support cross-cutting subjects, even when their "profitability" is not assured. This role could also be played at the level of the "Missions" by ensuring coherence between subjects and multiple funding: research, innovation, operational.

- Development of tools to better link the actions of the different actors involved in research, innovation or operational implementation.

International level

- Support the role of resource centers or centers of expertise.
- Support the creation or strengthening of research foundations to increase the mobilization of private actors.

Transnational level

- The strengthening of language-based cooperations such as DACH (Germany, Austria, Switzerland) or Nordfou (Denmark, Sweden, Norway, Finland and Iceland).
- European professional or institutional networks such as CEDR or CER are very directly able to optimize their members' investments in the subject, even if at this stage their own resources remain limited.
- Support for transversal research networks such as FEHRL or IENE, originally created in the 1990s to address the common needs of ministries of transport in biodiversity management.

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