ITTECOP

Call for research projects
ITTECOP 2024

Comprehensive approaches of infrastructure at the landscape scale amidst global change and biodiversity decline

Deadline for project submissions

12 July 2024 - 12.00 noon, Paris time

Website: www.ittecop.fr - Contact: apr2024@ittecop.fr

! ENGLISH VERSION !

The text of the call in French is a reference in case of uncertainty

Funding partners of the call for research projects:

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Translation nota: *In the French version, the term "territoire" refers to a geographical, social, political and environmental area. It can be local, regional or even larger. It was decided to translate this term essentially as "Landscape scale". But this English term only represents part of what is meant in French. The dimensions mentioned above must therefore be added.*

Dans la version française le terme de "territoire" utilisé fait référence à un espace à la fois géographique, social, politique et environnemental. Sa dimension peut être locale, régionale voire parfois supérieure. Il a été choisi de traduire ce terme essentiellement par "Landscape scale". Mais ce terme anglais ne représente qu'une partie de ce qui est entendu en français. Il faut alors y ajouter les dimensions pré-mentionnées.

Preamble

This call for research projects (hereinafter referred to as the "RPA"), conducted as part of the Infrastructures, Territories, Transport, Energy, Ecosystems and Landscapes (ITTECOP) programme, is the result of a meeting between the French Ministry for Ecological Transition and Territorial Cohesion (MTECT), the French Agency for Ecological Transition (ADEME), the French Office for Biodiversity (OFB), the members of the linear infrastructure and biodiversity club (CILB - EDF, Enedis, Eiffage, GRT Gaz, LISEA, RTE, SNCF, TEREGA), the Foundation for Research on Biodiversity (FRB), MIROVA and ENGIE. The ITTECOP programme organises the original coordination of some fifteen public and private co-funders and three investigating departments, which coordinate their administrative and budgetary criteria in order to facilitate as far as possible the process of submitting ambitious and original scientific projects.

The aim of this RPA is to fulfil the major ambition of ITTECOP's partners to anticipate and adress future needs in terms of public and private decision support, in today's institutional context, where the third national biodiversity strategy (SNB 2030), the third national plan for adaptation to climate change, the law for the reconquest of biodiversity, nature and landscapes, the law on the orientation of mobility and the law on the acceleration of renewable energy production have taken place.

This RPA affirms the importance of complementarity between research and action, for the integration of issues related to natural ecosystems and landscapes in the design, management and implementation of transport (rail, road, cycle, river, etc.) and energy (networks and production, etc.) infrastructure projects, ensuring territorial interfaces (stations, ports, airports, etc.) or associated development projects, etc. By definition, the generic term "infrastructure" will be used in the remainder of the text. It will focus exclusively on issues relating to terrestrial environments in the broadest sense (for example, in the case of port infrastructures, coastal areas may be studied).

The projects supported by this RPA will be assessed on their willingness to present breakthrough concepts, taking conceptual risks associated with scientific excellence, and not on the teams' initial ability to fill in administrative forms. Collaboration between the teams and the bodies in charge of the ITTECOP programme will also be a key factor in the collective success of the work selected, and the programme's overall management will support this ambition. The results of the winning research projects will be made public and will contribute to the overall research effort.

As well as simply managing research projects and funding, the ITTECOP programme aims to help build a sustainable community of researchers through a very open research-action approach. The aim is also to share knowledge and experience between the transport and energy sectors on subjects of common interest.

Atypical in Europe for its integrated positioning of disciplines, infrastructures and players, the ITTECOP programme aims to promote interdisciplinary, action-oriented research, focusing on spatial, ecosystemic and landscape issues and addressing the entire life cycle of infrastructures, from the emergence of the decision to dismantling, including the financing, design, construction and operation phases.

1. Partners, operational objectives and scientific ambitions of the call for research projects

1.1. A joint objective between public and private partners: to associate the landscape and biodiversity, in all their components, with infrastructures

The ITTECOP programme, referred to as "ITTECOP" in the following text, is a research incentive programme created in 2008 by MTECT, in coordination with ADEME, as part of the first national biodiversity strategy. With six calls for research projects (2008, 2009, 2012, 2014, 2017 and 2020) and more than a hundred research projects to its credit, ITTECOP has contributed to a strong reflection on the integration of ecosystem and landscape issues in the development and implementation of infrastructure projects or the adaptation of existing developments.

ITTECOP looks at land-based infrastructures in all their diversity, whether river, rail, road, cycle, energy networks or renewable energy production, as well as their interfaces with the regions: stations, ports or airports. The effects, design and management of infrastructures and their surroundings are analysed at different scales, from a number of complementary angles: ecological, territorial, social, economic, landscape and heritage, and may concern all phases of the infrastructure life cycle.

The aim of ITTECOP is to improve the relationship between infrastructure, biodiversity and landscapes through an approach linked to the implementation of the green and blue grid, particularly in infrastructure support areas, but also through a broader landscape scale approach. The partners in this RPA, aware of the growing legal, environmental, economic and social challenges in this area, wanted to combine their energies and knowledge to mobilise public and private research, in order to improve the active consideration of biodiversity and landscapes in an integrated landscape scale approach.

For this reason, this RPA draws on the experience gained by ITTECOP on the issue of dialogue between research and operational players in an approach involving public and private partners in an open manner[1] .

Presentation of the partners

MTECT's Research and Innovation Department is responsible for steering ITTECOP. It guarantees the independence of the Scientific Council (SC) and the excellence of the research carried out.

The French Agency for Ecological Transition (ADEME) is a public body under the joint authority of the Ministry for Ecological Transition and the Ministry for Higher Education, Research and Innovation. ADEME helps to implement public policies in the fields of the environment, energy and sustainable development. It makes its expertise and consultancy capabilities available to businesses, local authorities, public authorities and the general public, to help them make progress in their environmental approach. ADEME helps fund projects, from research to implementation, in the following areas: waste management, soil conservation, energy efficiency and renewable energies, raw materials savings, air quality, noise abatement, the transition to a circular economy and the fight against food waste.

The French Office for Biodiversity (OFB) is a public administrative body, created by law no. 2019-773 of 24 July 2019 and placed under the supervision of the environment and agriculture ministries. It was created to protect and restore biodiversity. The OFB is responsible for knowledge and expertise on all aspects of nature. It contributes to the administrative and judicial policing of water, natural areas, wild flora and fauna, hunting and fishing. It assists and supports public bodies in the design, implementation and assessment of their policies, and socio-economic players in their activities to promote biodiversity. It also manages and restores protected areas, marine areas and land-based protected areas.

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[1] See the "ethics"page

The Linear Infrastructure and Biodiversity Club (CILB) is an informal association of France's leading infrastructure operators (EDF, Enedis, Eiffage GRT Gaz, LISEA, RTE, SNCF, TEREGA, ASFA, VNF). The association is made up of members who signed the constituent charter in June 2011[2] . Its objectives are to strengthen its members' commitments to biodiversity and to act as a reference group for external partners. CILB members have taken steps to deepen the shared commitment of independent companies to biodiversity, both in the construction of new facilities and in the operation of existing networks. Several of its members have therefore signed up to the National Biodiversity Strategy and have decided to mobilise their resources for this RPA.

The Foundation for Research on Biodiversity (FRB) is a focal point for the various scientific and operational players working on the theme of biodiversity. It was created by the ministries responsible for research and ecology and eight public research establishments (decree of 3 March 2008). These have since been joined by LVMH, Ineris, the OFB and the University of Montpellier, bringing the number of founding members to 11. Stimulating innovation, promoting scientific projects with links to society and developing studies, summaries and expert appraisals are all actions at the heart of its activities. To date, more than one hundred and sixty organisations, associations, companies, managers and local authorities have joined the FRB with the single aim of meeting the scientific challenges of biodiversity.

A B Corp™ labelled company with a mission, Mirova is a conviction-based asset management company that offers its clients investment solutions that combine the search for financial performance with environmental and social impact.

ENGIE is an industrial group specialising in low-carbon energies and services and positioned across the entire energy value chain in France, Europe and certain other countries worldwide. Its ambition is to reconcile economic performance with a positive impact on people and the planet, based on its core businesses: gas, renewable energies and services.

MTECT, ADEME, the OFB, the members of the CILB (EDF, Enedis, Eiffage GRT Gaz, LISEA, RTE, SNCF, TEREGA, ASFA, VNF), Mirova, Engie and the FRB will be jointly identified as "partners" in the remainder of this RPA.

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[2] https://www.cilb.fr/a-propos

1.2. Expectations regarding research proposals

- **Excellence, scientific development and inspiration**

The approach presented in the research projects must be scientifically rigorous and the methodologies reproducible or transferable[3] . Projects should indicate the expected prospects for scientific exploitation. Results should be published in international peer-reviewed journals, possibly in collaboration with European scientific partners[4] or international partners.

Teams submitting a project are invited to take into account the results of previous projects supported by ITTECOP, with particular attention to the COHNECS-IT triple systematic review. Applicants are also invited to take into account the results of the European BISON project (Biodiversity Infrastructure Synergies and Opportunities for European Transport Networks) and in particular the European Strategic Research and Innovation Agenda[5] .

- **Interdisciplinarity, landscape scale approaches and project management**

The proposed projects will have to ensure a theoretical and empirical relationship between the infrastructures and the challenges of socio-ecological functionalities[6] and be part of a landscape scale approach[7] and multi-infrastructures. They will therefore have to involve partners who are stakeholders in the area, in a more or less direct way, and adopt an action research approach that envisages a transformation of practices. This means that from the outset of the project, the teams must organise the links for transferring or even co-constructing the project in the areas concerned. The selection of applications will take into account the presentation of the effective interdisciplinary approach that will be implemented within the teams, avoiding the simple juxtaposition of scientific disciplines. Cooperation between design offices and research teams would also be welcome. The projects will have to attach importance to the internal scientific management of the project and encourage the integration of research into the decision-making process. Depending on the nature of the research project, a third-party watchdog or facilitator may be appointed to support the transfer or decision-making process.

- **Types of research**

The expected projects must address the themes and issues developed in part 2 of this document.

The research proposed should be based as much as possible on real-life situations, but this is not exclusive. Applicants are encouraged to work with the partners in this RPA and the relevant local authorities. The aim of this request is to integrate research more directly into public policy support by contributing methods, tools or new approaches to thinking. The research will focus on the operational effectiveness of the methods developed and their reproducibility.

Several response formats are possible, including research projects, systematic reviews, exploratory projects and incubation projects. These projects are detailed in §3.2.

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[3] https://www.ouvrirlascience.fr/vers-une-recherche-reproductible-faire-evoluer-ses-pratiques/

[4] IENE - Infra Eco Network Europe: http://www.iene.info/

[5] BISON's strategic agenda is available here and here

[6] See articles 2 and 68 of the law for the reconquest of biodiversity, nature and landscapes of 20 July 2016.

[7] See the definitions provided by the European Landscape Convention - www.coe.int/fr/web/landscape

- **Access to sites**

As part of the research, subject to the application of the safety restrictions imposed by the RPA partners, infrastructure rights-of-way may be made accessible for the purposes of carrying out observations or measurements. The referents for each project, who are members of the ITTECOP Steering Committee (CO), will facilitate access agreements in the vicinity of the infrastructures. The ownership of the data collected will be specified in each project's data management plan.

- **Data and technological building blocks**

The databases and technological building blocks developed during the projects must comply with the FAIR[8] principles (*Easy to Find, Accessible, Interoperable and Reusable*). Projects that do not ensure the openness of data and technological building blocks (as in the case of patent applications, the development of proprietary databases, etc.) will not be eligible. To this end, a brief provisional data management plan including the licences envisaged is expected in the applications. This data management plan (DMP)[9] for the project is a mandatory deliverable to be provided within the first 6 months of the life of the projects selected. This does not apply to exploratory or incubation projects.

Appendix 1 of this RPA sets out this information for each type of project.

- **International cooperation**

Projects with an international cooperation dimension or that take into account the results of the European BISON project[10] will be given special consideration by the bodies involved in this RPA.

If necessary, the bodies involved in this RPA can provide advice to applicants wishing to identify international partners.

This call for proposals is open to all French research teams, regardless of the institution to which they belong or their status (public or private). They may be associated with international research consortia.

International research consortia may submit a proposal under the following conditions:

- involve at least one French research team;
- to have at least one research site in France;
- and to accept the subsidy terms specific to the OFB or the FRB.

Projects already co-financed by foreign or European funds are invited to indicate this.

- **Continuation of ongoing ITTECOP projects**

Teams already working within the framework of the ITTECOP 2020 RPA are authorised to submit a project provided that the final project report has been submitted and validated by the ITTECOP Scientific Council before the publication of the list of winners scheduled for October 2024. Teams whose projects have not been validated by this date will not be eligible for further funding. For any subsequent project, it will be essential for the team to demonstrate in great detail the value of continuing or embarking on a new phase.

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[8] https://www.ccsd.cnrs.fr/principes-fair/

[9] https://www.ouvrirlascience.fr/plan-de-gestion-de-donnees-recommandations-a-lanr/

[10] https://bison-transport.eu/

2. Scientific ambitions

2.1. General framework

> The infrastructures targeted by this RPA are: road, cycle and motorway networks, railways and inland waterways, cable transport, electricity and gas networks, renewable energy production infrastructures (with a possible comparison with conventional energy infrastructure issues) and territorial interfaces (river or sea ports, stations, airports). The rights of way of these infrastructures are included in the scope of this RPA, and are even particularly problematic for research on these subjects. These infrastructures and their rights-of-way are referred to in the rest of the text as "ITE".

At the interface between infrastructure and the environment, recent research has been marked by a number of developments that point to a profound renewal in society's relationship with infrastructure[11] . These developments, which intersect and interact at an accelerating pace, are of various kinds:

- **Spatial developments** marked by a downward trend in the number of new transport infrastructure projects, but the need to ensure the quality of management of a very large network. The near future will depend on the evolution of mobility and lifestyles, but also on the interplay of scale between centralised or locally distributed governance, for both transport and energy. Social demands will relate both to the ways in which the surroundings or the infrastructures themselves are managed, and to the transformation, redevelopment, dismantling and abandonment of existing infrastructures. Energy networks and renewable energy production infrastructures, for their part, are undergoing major growth, affecting the whole of France and raising questions about the cumulative impacts, both spatial and temporal, at a time when planning is being overhauled.

- **Societal, legal and economic developments marked by the growing pressures of climate change and biodiversity loss.** Practices and regulations relating to the climate, biodiversity and the functioning of ecosystems, as well as the fight against land-take use, are becoming increasingly complex and interrelated, leading to a rise in conflict situations, with greater legal recourse, or to a lack of clarity that makes action difficult.

- **Strategic developments at global, European and French levels are** driving companies' business models to become more sustainable and long-lasting. The European Green Deal is gearing investment towards sustainability, and in particular reinforcing non-financial reporting requirements[12] : greater transparency, quality and accessibility of data, and consideration of the entire value chain. This could have a major impact on the internal organisation of major development companies, and help them to promote externally their activities that have the least impact on the environment.

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[11] See the latest collective work from the Ittecop programme: Bonin Sophie (dir.), 2024. *Infrastructures de transport créatives - Mieux les intégrer aux écosystèmes, paysages et territoires*, published by Quae.

[12] https://entreprendre.service-public.fr/actualites/A16970: European directive requiring large companies to include extra-financial reporting on environmental, social and governance factors in their balance sheets.

- **Changes in public environmental policies:** the French government has set three objectives: (i) the objective of zero net loss or gain of biodiversity, which has applied since 2016 to all new projects, plans or programmes, (ii) the objective of carbon neutrality and (iii) the objective of "zero net artificialisation" of land (ZAN), the last two to be achieved by 2050. At European level, these objectives are extended to the challenges of the Green Deal and the European strategy for biodiversity, with an ambition that goes beyond protected areas.

- **Technical and technological developments**, particularly in relation to the tools resulting from the implementation of digital and energy transitions and their implications in the field of knowledge and decision support, the acquisition of considerable computing and data management capacities, the use of artificial intelligence - all developments that can also be put to the test and lead to environmental or non-environmental improvements. There are many avenues for innovation in vehicles, energy sources and infrastructure.

Faced with these cross-cutting issues, technical solutions cannot be the only answers to the challenges of global change and their local impact. The dynamics of socio-ecosystems influenced by infrastructures also depend on modes of governance, social representations and demands, and regulatory and administrative frameworks. It is therefore necessary to consider the consequences and opportunities offered by these changes on landscapes and the functioning of ecosystems. The role of infrastructures in scientific research is changing as a result. The evolution of uses and spaces, like that of mobility and energy, raises questions. Emerging questions are being posed to researchers, both in the diversity of academic disciplines concerned, and in the engineering professions and those involved in the design and management of spaces.

Mitigating and adapting to climate change, preserving the functionality of (semi-)natural ecosystems and improving or restoring degraded ecosystems, and therefore ecological continuity, the dynamics of urban sprawl in space and time, the agro-ecological transition that recreates links between agriculture and the regions, the digital transition... these are just some of the issues that infrastructure managers now need to address at every stage of the project life cycle, and which call for new research. Against a budgetary backdrop that is increasingly focused on making savings, and at a time when environmental law is becoming ever more precise, infrastructure planners, managers and operators are faced with new challenges.

These changes lead to changes in ecosystems close to infrastructures and their rights-of-way, whether they are modified, disturbed or created by them. But the underlying mechanisms of these changes and their consequences on different timescales still need to be elucidated so that research can feed into, or even propose, appropriate operational tools for managing these ecosystems, on landscape scales that go beyond project logic.

The aim of this RPA is therefore to understand, assess and even propose the development of new environmental, landscape scale and social functions for infrastructures and the areas in which they are located (CO_2 capture, ecological corridors, management of environments, water or air quality, risk management/adaptation, renewable energy production, agroecology, social uses other than transport, governance, etc.). Infrastructure could therefore play a role in the goal of carbon neutrality by 2050 and in the national low-carbon strategy, but not without raising new questions in relation to the objectives of preserving biodiversity and landscapes.

In this RPA, ITTECOP aims to encourage the development of targeted research, likely to concern all or part of the entire life cycle of infrastructures, on the interactions between these structures, ecosystems at different scales, in their biotic (biodiversity) and abiotic (physico-chemical components) dimension, products of history and geography, and

landscapes understood as the relationship between representations, perceptions and materiality. Natural, rural, peri-urban and urban areas are included in this RPA. The general objectives of the projects will be to:

- (1) to improve knowledge (retrospective, present or prospective) in this field;
- (2) to produce a conceptual and methodological framework that can be generalised and disseminated;
- (3) to integrate procedures from the life sciences, human and social sciences and planning disciplines (architecture, urban planning, landscaping) into a coordinated approach.

Research could include infrastructure engineering, ecological engineering (including agro-ecology and forestry) and spatial design approaches. Collaboration with infrastructure operators and local authorities will be encouraged. Comparisons between European countries or other regions of the world will be welcome, while remaining within the context of developed, industrialised countries, i.e. those already well endowed with major infrastructures.

2.2.ITTECOP 2024 RPA research areas: Comprehensive approaches of infrastructure at the landscape scale amidst global change and biodiversity decline

The development of the general framework into axes and sub-axes below is neither exhaustive nor restrictive in terms of the acceptable projects that research teams could submit. Cross-disciplinarity is encouraged, and proposals outside the main areas are possible and may be assessed on the basis of their scientific quality and their innovative, interdisciplinary or transdisciplinary nature. This part of the RPA reflects the expectations and issues expressed by the Scientific Advisory Board, in dialogue with the Steering Committee.

AXIS 1 - Integrating infrastructure into living environments

A. Sustainable management and coherent public policies

CHALLENGES: The signal of the effects of recent climate change on biodiversity (infra-specific, populational, multi-specific) is being blurred by the even more rapid expansion of transport and energy production infrastructures and by landscape scale reorganisations linked to adaptation policies. Some of these TIEs (particularly linear ones) affect changes in landscape connectivity. They may allow species to accompany the changes, or conversely hinder their ability to escape. For other (non-linear) ITEs, local modification of habitats can lead either to a loss or to the establishment of conditions favourable to new assemblages of living beings, particularly in relation to human activities. But sustainable management of these areas in transition is not just about landscape connectivity. From a functional point of view, environmental management strategies in crisis situations may have to **embrace new paradigms: the need to also protect ordinary biodiversity**, a **focus on maintaining functionalities/services** (system viability) rather than heritage wealth, acceptance of new assemblages, some of which may include introduced/invasive species. During their life cycle, ITEs can also provide opportunities to reduce impacts by creating refuge areas for threatened species or by establishing **functional "hotspots"** (Without risking to develop ecological traps).

> **Key words :**
- Dynamics of landscape connectivity (physical, biological) - Effects of ITE depending on the local context and the design of the structures - Coordination/regulation/adaptation mechanisms between climate constraints and landscape scale development;
- Resilience - long-term adaptation to major climatic events - management of plant cover (fire risk) - sealing (flood risk) ;
- Reconciling regulations - litigation and operational application - societal pressure - local/national/European/international strategies ;
- Nature-based solutions (interest, acceptability, feasibility and effectiveness) ;
- Invasive and exotic species ;
- One health" approaches: the effects of infrastructures from the point of view of public health and the health of ecosystems and living organisms as a whole.

B. Planning, landscape scale and temporal strategies - reconciliation with operational management

CHALLENGES: The new infrastructures associated with the energy transition or the development of transport are raising new issues of social acceptance, ownership by the public or by the host regions, as well as questions about their multi-scalar environmental effects. This particularly concerns renewable energy production facilities or new energies (e.g. hydrogen), but also the adaptation or improvement of networks or associated facilities (in connection with the development of mobility in particular, with sobriety, or with carbon storage strategies). We are also seeing more decentralised and local forms of transport and energy production infrastructure that add to and combine with existing ones, perhaps opening up prospects for better integration. Comparative cost-benefit analyses and research into local situations are awaited. Conflicts linked to these developments, environmental mobilisations, and conflicts of interest between stakeholders and researchers, offer relevant and important subjects for research.

> ➢ **Key words :**

- Soil - permeability of infrastructure and rights of way ;
- Land: achieving the triple O (zero emissions/zero artificialisation/zero net loss) - decision-making process - conflicts of use and objectives - role of AFAFEs (Agricultural, Forestry and Environmental Land Management);
- Conflicts and controversies surrounding facilities (projects, conversions, development) ;
- Ownership of ITE projects by local residents and users, in relation to the integration of various environmental issues (climate, biodiversity);
- Management and development of rights of way in relation to the areas and populations concerned: interactions with agricultural and forestry environments - greening of urban or agricultural landscapes ;
- Green and blue grid and planning - synergies, cumulations [and contradictions] between transport and energy/ENR - local-national-European combination ;
- Increasing complexity of decision-making processes - support for decision-making (assessment tools, governance) - conflicts of interest - economic impact of technical options.

C. Thinking about/integrating biodiversity into the financing and legal aspects of infrastructures

CHALLENGES: Throughout their lifecycle, infrastructures generate financing opportunities that favour biodiversity and the achievement of the ZAN objective (at the landscape scale of the ITE): from the environmental assessment, the design of the structure (by applying the avoid/reduce/compensate (ARC) sequence), the operation (site management, maintenance and land management), to the end of life during dismantling or reconversion. The aim of this area is to encourage the emergence of projects using a variety of economic and legal mechanisms, taking advantage of the financial sector's growing awareness of the risks associated with nature and the importance of ecosystem services in business models[13] , and in line with the objective of achieving a net gain in biodiversity.

> ➢ **Key words :**

- Economic and legal mechanisms (environmental bonds, payments for environmental services, natural compensation, restoration and renaturation sites, labels, standards, biodiversity certificates, nudges, etc.);
- Corporate sustainability reporting directive (CSRD) - Task force on Nature-related Financial Disclosures (TNFD) - non-financial reporting, "green" funds, "green taxonomy";

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[13] 42% of the amount of securities (shares and bonds) held by French institutional investors at the end of 2019 are issued by companies that are directly highly or very highly dependent on at least one ecosystem service (Banque de France report, Svartzman et al., 2021).

- Public contracts - Concessions - Public procurement (taking the environment into account in specifications) ;
- Costs and benefits of biodiversity, ecosystem services and restoration in infrastructure projects, including the ERC sequence. Ecological accounting;
- Quality Infrastructure Investment (QII) ;
- Insurance against environmental damage.

D.   Data and monitoring: decision-making tools

CHALLENGES: Despite the sustained development of work on biodiversity data and habitat mapping at increasingly varied scales, there are still blind areas, gaps in knowledge and many unknowns. ITTECOP will therefore support work aimed at improving the characterisation and assessment of the dynamics of ecosystems in relation to infrastructures (modelling, creation of scenarios), in innovative directions (standardisation, effectiveness of biodiversity measures, biodiversity potential on the scale of large linear routes), and at the same time questioning the way in which these data and their monitoring can be improved and transferred to the ways in which operators or administrations involved in these subjects work. How can standardised and non-standardised data be mobilised and used? How to make decisions with incomplete or heterogeneous data? In relation to digital technologies, and in particular the use of artificial intelligence: what is their role, or what could be their role, at the landscape scale integration of infrastructures, in the pooling and sharing of actions?

> **Key words :**

- Reference states, standards, protocols ;
- Taking into account and measuring the cumulative impact of infrastructure ;
- Innovative sensors/metrology (development - adaptation - diversion, etc.) ;
- Digital twin, artificial intelligence.

AXIS 2 - Transformations and life of projects

A.   Transforming infrastructure over the long/short/emergency period

CHALLENGES: While major new transport infrastructure projects have become relatively rare in Western European countries, many infrastructure conversion, dismantling and even renaturation projects are underway. For new energy production infrastructures, the question of analysing their life cycle and end-of-life or reversibility can also be raised. In the case of transport infrastructure, it is sometimes the age of the infrastructure that can pose maintenance or conversion problems (in the case of bridges, for example, as we are regularly reminded by accidents). These contexts offer opportunities to contribute to the "restoration of nature" (cf. draft European regulation on the restoration of nature[14]), or risks for biodiversity or landscapes.

> **Key words :**

- Reconversion, end-of-life, dismantling and ageing;
- Renewable energies and network developments (white hydrogen, multicoloured hydrogen, etc.) ;
-Demobility scenarios- post-oil: the role of infrastructures and the consequences for them ;
- Life cycle analysis applied to infrastructures ;
- Uses/enhancement of converted areas - contribution to the ZAN objective ;

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[14] https://environment.ec.europa.eu/topics/nature-and-biodiversity/nature-restoration-law_en

B. Temporality of infrastructures and biodiversity - managing the ERC sequence

ISSUES: The measures associated with the Avoid, Reduce and Compensate (ERC) sequence are taken in a specific context of time and space, typically at the time of the impact study and in relation to the landscape and ecosystems at that time. However, from a long-term perspective that takes into account the dynamics of the area, avoidance, reduction and compensation measures could be considered differently. In order to ensure that they are effective from the point of view of biodiversity and landscapes, and that they are sustainable and/or long-lasting, what should be taken into account in the future? What should be encouraged or avoided? What methods, knowledge and governance are needed to ensure long-term monitoring in a context of global change? Avoidance and reduction measures require renewed attention, to better understand what is really being achieved. What factors encourage avoidance decisions, and how effective are reduction or compensation measures over the long term?

> ➤ **Key words :**

- ERC over time - regulatory constraints - social expectations and ecological requirements - changes over time - acceptance - compatibility of uses and resilience ;
- Diverging transport and energy trajectories; link (or not) between carbon offsetting and ecological offsetting ;
- Interactions between ecological, climate, agricultural and forestry compensation or reduction measures to ensure their sustainability and compatibility ;

C. Complementarity and conflict of actions for biodiversity and green and blue grids, for the energy transition and the climate. The role of people's aspirations

CHALLENGES: Spaces associated with infrastructure (green and blue areas) can be managed in such a way as to prioritise different uses such as biodiversity conservation, decarbonisation, energy production (biofuel, photovoltaics) and others, while preserving safety for users of the infrastructure itself. There can be complementarities and even synergies, enabling the development of a positive, social and ecological multifunctionality. Changes of scale can provide more comprehensive solutions (thinking in terms of development and inter-municipal planning, for example, and not just in terms of energy production or the direct rights of way of the infrastructure). There may also be competition for the use of these areas, or an accumulation of negative impacts. Environmental or social management requires spatial conditions that are not always met. What are the choices, configurations and management methods that contribute most to improving ecosystems and their benefits for society? ITTECOP will be paying particular attention to the measures taken for the energy transition and carbon neutrality: how can we prevent them from accelerating the loss of biodiversity? How can they form part of a landscape project serving local areas? In the sobriety-efficiency-renewable energy production sequence, what are the exemplary methods and successes in terms of biodiversity and carbon balance or independence from fossil fuels? Are the existing biodiversity and landscape measures for transport infrastructure the same as those for energy infrastructure, or can they be adapted?

> ➤ **Key words :**

- Synergies, cumulations and contradictions between transport and energy planning measures and strategies (production and development of networks linked to renewable energies) - landscapes/biodiversity VS climate;
- Environmental struggles and citizen mobilisation;
- Effects (observation) and impacts / assessment methods for transport/energy infrastructures ;
- Sobriety of territories / landscape scale (ex land take use) and changes in lifestyles: infrastructures as levers or brakes ;
- Assessing the effectiveness of nature-based solutions from the standpoints of biodiversity, landscape, decarbonisation and climate.

D. Sustainable landscape scale innovation

CHALLENGES: The ERC sequence and other environmental policy doctrines present difficulties and a sometimes disappointing record from the point of view of the initial environmental objectives. One way forward is to improve the territorial anchoring of development projects and the associated modes of governance, in order to encourage the development of innovative projects: involvement of users and all stakeholders in all phases of the development project design process, methodologies for evaluating and monitoring experiments. The aim is therefore to support the development and evaluation of innovations that serve the ecological transition of local and regional areas, in a more global or cross-disciplinary way. Research projects could look at these issues in pilot areas (as in the case of living labs) and examine how they can be transferred to other areas through networking.

> ➤ **Key words :**

- Governance of landscape scale innovation, evaluation ;
- Feasibility, viability, replicability and sustainability of innovations;
- Demonstrators / living labs ;
- Experimentation (transitional urban planning in favour of biodiversity, third places, etc.);
- Industrial ecosystems SMEs-ETI-Large groups - indicators (e.g. global biodiversity score GBS...).

AXIS3 - New knowledge for field action

A. Knowledge transfer and co-construction within the transport and energy sectors

CHALLENGES: landscape scale issues require a multidisciplinary and hybrid approach, combining theoretical knowledge and practical experience. The aim here would be to understand how the dynamics specific to the transport sector could inspire the energy sector, and vice versa. The projects could also look at the acceptability of solutions and stakeholder buy-in, with a view to creating more impactful knowledge, as well as exploring the training solutions needed to increase the skills of those involved. This approach would enable innovative, cross-disciplinary solutions to be explored, capable of meeting the contemporary challenges associated with landscape scale management.

> ➤ **Key words :**

- Co-construction of knowledge; local knowledge/trade knowledge, transdisciplinarity ;
- Training and mobilising players - changing professions, increasing skills ;
- Ethics and conflicts of interest.

B. Embedded research practices and the creation of knowledge through projects

CHALLENGES: Recent developments in research, such as embedded research, action research and project-based research, are broadening our conception of science and scientific knowledge. These methods are crucial for understanding local and regional issues and for generating new knowledge that can influence practices. However, these new paradigms raise questions about their relevance, robustness, ethics and applicability. If these innovative approaches are to be fully accepted and integrated, it is essential to carry out in-depth investigations into the way in which new knowledge is generated, evaluated and disseminated. This area aims to encourage the emergence of projects in which the research methods themselves are the subject of investigation: what practices for what objectives? An introspective approach would make it possible to better understand and make better use of the research tools available, thus contributing to enriching the knowledge base and stimulating innovation in the field of landscape scale research.

> ➢ **Key words :**
- Training and research; appropriation processes for complex systems;
- Knowledge brokers/action research - Taking risks in research - Coalition for Advancing Research Assessment (COARA) ;
- Ethics and conflicts of interest between planners and researchers ;
- Financing, integrating results into operations.

C. Technological methods and uses, changing professions

CHALLENGES: Transport infrastructure and biodiversity are two complex interacting systems whose resilience may be antagonistic or synergistic. Consequently, it is difficult to make relevant decisions if there is a major imbalance in the ability to assess the resilience of each system and their interactions. The widespread use of Building Information Modeling (BIM) approaches combined with the development of tools capable of managing Geographic Information Systems (GIS), BIM and digital twin approaches in the biodiversity management sector would make a major contribution to the integration of biodiversity into transport infrastructures. However, such convergence requires the development of a common working culture supported by appropriate training and skills enhancement.

To ensure an effective transition, hybrid approaches between technological and non-technological solutions need to be developed. In addition, the information technologies developed and deployed to integrate biodiversity into transport should be considered as part of the externalities of the project, but the methods for assessing these externalities have yet to be developed.

> ➢ **Key words :**
- GIS-BIM-digital twin convergence ;
- Digitisation of businesses, cybersecurity, business processes ;
- Digital ethics, biodiversity and infrastructure ;
- Digital twin, artificial intelligence and law (digital procedures, use of sensor data and protection of privacy, etc.).

3. Submitting projects

3.1. Timetable for the call for research projects

> ## Call for research projects closed
>
> ## 12 July 2024, 12.00 noon Paris time
>
> ## Projects should be sent to the dedicated address:
>
> ## http://ittecop.fr/apr2024

- Publication of the list of selected projects: 1 October 2024

- Project launch seminar: from 6 to 8 November 2024 at Sophia Antipolis

- Agreements signed by early 2025

> ## Exchange meeting
>
> A meeting to present this RPA and to discuss it with applicants and the RPA bodies is being offered to interested parties on
>
> ## 14 May 2024, from 10.00 am to 12.30 pm
>
> **Online registration at** http://ittecop.fr/apr2024
>
> The meeting will be organised in several stages:
>
> 1. Joint presentation by the Scientific Council (SC) and the Steering Committee (SC) of the key points of the RPA, followed by a question and answer session;
>
> 2. Flash presentations of pre-projects by teams who have asked for feedback from the OC and SC (5 minutes and two slides maximum);
>
> 3. proposals or search for partnerships by research project leaders (5 mins and 5 slides maximum).
>
> Questions can be sent in advance to apr2024@ittecop.fr. A compilation of questions and answers will be produced and posted online.

3.2. Types of projects expected

Three possible types of response, defined below, are open in this RPA and may be combined in the proposal:

- research projects ;

- exploratory or incubation projects;

- summaries of data or knowledge (systematic reviews).

The RPA has a budget of around **€4 million**. It aims to support around twenty research projects. The estimated funding amounts are consistent with the aim of supporting projects that include European partners or doctoral or post-doctoral students.

> **Projects are not assessed on the basis of the teams' initial ability to fill in administrative forms**, and original and additional documents will only be requested from selected projects at the end of the selection phase. However, it is imperative that the budget projects have been validated by the responsible administrative bodies and that the partner teams have signed the declarations of commitment to carry out the projects. For each project selected, grant agreements will be drawn up with a single legal entity, barring exceptions. In the case of consortia, which is strongly recommended for research projects, particular attention will be paid to the quality of scientific coordination.

A. Research projects

Research projects have a standard duration of three years and must meet the various scientific and administrative criteria of this thematic RPA.

- Duration: 12 to 36 months; Projects are expected to have a maximum duration of 4 years (3 years of research and one year of post-project development). If a longer duration is required, applicants must justify their request in terms of the project's scientific and technical objectives.

Approaches proposing a research area requiring longer durations are possible subject to the agreement of the funding bodies (such as an observatory or *living lab*).

B. Exploratory or incubation projects

The aim of **exploratory projects is to** produce analyses of emerging subjects with no previous experience, which should be forward-looking or linked to innovative subjects. This type of project clearly encourages project teams to take risks in order to renew research themes based on weak or emerging signals.

The expected outcome of the project will be the production of a short technical report (around 20 pages), identifying :

- the main key points of the discussion ;
- the progress of research on the subject in national and international literature;
- Outlook ;
- the main recommendations based on the work carried out;
- potential applicability to operational action on different networks.

For **incubation projects,** the aim is to provide financial and scientific support to enable projects to be submitted to the ANR or Horizon Europe, for example. The payment of funds is conditional on the actual submission of applications to one of these bodies. Any applicant whose project has been selected by one of these bodies undertakes to participate, for the duration of the project, in its development within ITTECOP and to share the experience gained with other teams.

The maximum duration of these projects is one year after notification, for research, exploratory or incubation projects. The grant budget is limited to a maximum of €10k net of tax.

C. Data synthesis, systematic reviews

Systematic reviews are based on a massive, codified analysis of the scientific and grey literature. They assess the quantity and quality (confidence) of the knowledge available in order to draw objective and transparent conclusions.

In the case of a project for a systematic review (type of project: knowledge synthesis), applicants are asked to describe the advantages of the systematic review approach, to indicate the question(s) to which the project is intended to provide an answer, and to provide information about a prior bibliometric analysis, known as "scoping", which should

make it possible to estimate the number of publications in the corpus to be covered by the project. Applicants should also indicate the bibliographic search engine(s) or other data sources they use to access publications.

Their duration varies from 1 to 3 years depending on their nature. This type of project can be led by French or European teams.

NOTE: All the themes identified in the axes are open, but a systematic review of the interrelationships between cycle routes and biodiversity is particularly welcome.

3.3. Documents to be provided

The application must include all the information required for a scientific and technical assessment of the project. The elements required, depending on the type of project submitted, are detailed in appendix 3 under "Administrative set-up". The model application can be downloaded at the following address: http:**//ittecop.fr/apr2024**

The file will contain the following documents:

- **Project summary sheet**

The summary form should be completed online at http://ittecop.fr/apr2024. For incubation projects, the consortium and proposal sections should be more fully developed.

- **Commitment letter**

For research projects, the letter of commitment must be signed by each of the project partners. It must be countersigned by the director (or one of his/her delegates) of the institution to which the applicant belongs.

- **Scientific project**

For research projects, the presentation of the project (20 pages maximum + appendices) must highlight its originality and its scientific contribution in relation to previous work, in particular :

✓ Scientific position: objectives, state of the art, hypotheses, possibly technical and economic context, links and complementarities with other projects or programmes: max. 7 pages (max. 24,500 characters including spaces).

✓ Organisation of the project: interest in cooperation between teams, partners, stakeholders and regions; organisation of the consortium, project management, conditions for organising research and internal scientific management (3 to 4 pages: max. 12,000 characters including spaces) - Please note: the presentation of the consortium partners should be appended.

✓ Scientific description of the project: justification of tasks and work breakdown, methods planned for each task, expected results, timetable for intermediate and final achievements (research reports), expected scientific and/or operational applications (10 to 12 pages: 35,000 to 42,000 characters max. including spaces).

Attached:

✓ List and brief presentation of consortium partners (relevant to the proposal) ;

✓ Data management plan,

✓ List of contacts and the person in charge of administrative or financial monitoring of the project

✓ Financial appendix: summary presentation of the overall amount of research (requested/nature of other funding) and its use and distribution among the consortium partners. This appendix detailing the project's budget must be signed by the person authorised to commit the institution to which the applicant belongs.

Once the project has been selected and the budget has been finalised at the time of agreement, no additional budget will be granted.

3.4. Evaluation criteria and selection process

At the end of the submission period, each project will be scientifically appraised and evaluated by the members of the Scientific Advisory Board (SAB). These assessments, carried out in line with the principles proposed in COARA[15] with the main aim of maximising the quality and impact of the research, will enable a ranking list to be drawn up of the projects according to the qualities expected and listed below. The resulting analysis will be provided to the Steering Committee, which will *ultimately* decide which projects are selected:

- **Relevance :**
  o with regard to the RPA themes;
  o supporting the definition and implementation of public policies;
  o relations with stakeholders at different levels: local, national, European or international ;
- **Scientific qualities :**
  o approach and methodology, quality of the state of the art ;
  o reproducibility of the approach or conditions for transferability of the approach ;
  o scientific interest and innovative nature of the questions and hypotheses ;
  o scientific skills and interdisciplinarity of the team and any partners ;
- **Organisation of the project :**
  o quality of in-house scientific leadership to encourage interdisciplinary dialogue :
  o feasibility (matching resources and planning to objectives, identifying risks) ;
  o international, national and regional dimensions (subject, partners, etc.) ;
  o the planned use of the project by the scientific community and operational players.
- Where appropriate, identification of the project's environmental impact, particularly in the case of projects with a strong digital component. *Green IT* approaches are generally expected, and projects with a strong computational component (digital simulation, *deep learning*, etc.) are expected to propose the most frugal approaches possible[16] .

On the basis of the expert reports drawn up by the SC, the OC will decide on the ranking of projects according to the strategic objectives of ITTECOP and this RPA. The OC will also ensure that there is a balance between the types of infrastructure proposed in the projects. A final list of research projects selected for funding will be published after the OC meeting on 1er October 2024.

Substantial modifications to proposals may be requested by the call authorities, CO or CS, before finalising the funding decision. In addition, these same bodies will reserve the right to negotiate or group projects together if this proves appropriate.

All teams that have submitted a research project will receive a letter setting out the results of the OC's decision.

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[15] Coalition for Advancing Research Assessment - https://coara.eu/

[16] https://www.green-algorithms.org/

Successful applicants will have one month from receipt of this letter to submit all the supporting documents required for the contract. After this deadline, and even though they have been selected, they will no longer be eligible for funding.

3.5. Valuation

The results of the projects, in terms of knowledge, methods and tools, will be used in a number of ways:

- Interim and final reports assessed and validated by the BoG ;
- Articles in peer-reviewed international scientific journals (submitted and final versions will be provided);
- Oral and poster presentations at conferences;
- Contribution to events organised as part of ITTECOP's scientific activities;
- Helping to disseminate knowledge and share it with practitioners;
- Training and educational activities may also be provided;
- Online, with free access to the data produced.

The final assessment of the projects by the Scientific Council will also cover all the activities carried out (web, training activities, final work, publications, etc.).

APPENDICES

Appendix 1: Drawing up a forward-looking data management plan

In line with the national plan for open science, the coordinator and partners undertake, in the event of funding, to :

- when submitting the first progress document within six months of the start of the project, provide a data management plan (DMP) in accordance with the ANR's model based on the model proposed by Science Europe available on the Opidor portal[17] or the winner's model if available, as well as a version of the plan updated to the end date of the scientific project to be submitted with the final report;

- deposit the scientific publications (full text) resulting from the research project in an open archive, either directly in the HAL open archive, or via a local institutional archive, under the conditions of Article 30 of the Law "For a Digital Republic" (Article L. 533-4 of the Research Code);

In addition, ITTECOP and the partners in this RPA recommend that priority be given to publication in journals or books that are natively open access.

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[17] https://opidor.fr/

Nota Bene: These tables are the result of the coordination of around fifteen public and private co-funders and three instructing departments, who have coordinated their administrative and budgetary criteria in order to facilitate the project submission process as much as possible. Only the winning projects will be required to provide all the final administrative documents. The research projects or systematic reviews selected in this RPA may be financed by the FRB, ADEME or the OFB according to their specific rules. Exploratory, incubation and CESAB projects will be funded exclusively by the FRB. The amount allocated to projects will be that decided at the end of the OC selection meeting.

Appendix 2: Purpose and organisation of projects

	Research project	Exploratory or incubation project	Knowledge synthesis - systematic review	Comments
Project objects				
Multi-infrastructure	Mandatory	not compulsory	not compulsory	
Search sites	at least one site in France	France	NA	
Project organisation				
Maximum duration	3 years (+ 1 year dedicated to disseminating results) - If projects involve a research territory, the duration may be adjusted	1 year (+ 1 year dedicated to valuing results) Incubation project: project to be submitted within 3 years	Systematic review : 1 year for mapping + 1 year / 18 months for critical analysis + 1 year 36 months for meta-analysis + 1 year	
Authorised consortium	Yes	No	Yes	Only one contractor per project supported (min 10% of the aid application)
Portage by a foreign team	Possible	No	Possible	If "yes", at least one partner and one research site in France are required - OFB and FRB possible – under condition for ADEME
Final report language	FR	FR	FR - GB	
Language summary (500 words)	FR - GB	FR- GB	FR - GB	Other languages available: German and Spanish
Language long summary (2 or 3 pages) for non-scientists (brief) following submission of the final report	FR - GB	FR- GB	FR - GB	Other languages available: German and Spanish
Database	Forward-looking data management plan (FDP)	NA	NA	A detailed version of the SMP must be provided within 6 months of the start of the project.

Appendix 3: Summary of budget items

Budget	Research project	Exploratory or incubation project (financed by the FRB)	Synthesis of knowledge (systematic review)
Average amount of aid per project **(indicative)**	Matching project costs to objectives	10 k€ max	mapping: approximately €50,000 critical analysis: around €70,000 meta-analysis: around €90,000
Thesis or post-doctorate funding	Yes	No	Yes
Mobilisation Cerema	Possible		
Maximum subsidy rate, excluding State aid, in relation to eligible expenditure (supporting document that may be requested: declaration that the partner has no economic activity within the scope of the project).	80%	100% up to a maximum of €10k	80%
Maximum subsidy rate in the case of state aid, based on eligible expenditure	covered by the de minimis State aid scheme under European regulation (EU no. 2023/2831): 70%, provided that the total amount of de minimis aid granted to a single structure does not exceed €300,000 over the last 3 financial years; and/or under the notification-exempt framework scheme for aid for research, development and innovation (No. SA. 111723), for "industrial" research projects within the meaning of the framework scheme: - Small company (<50 employees and turnover/balance sheet < €10,000,000): 70%. - Medium-sized company (50 to 249 employees and turnover/balance sheet < €50,000,000): 60%. - Large company (≥249 employees and turnover/balance sheet > €50,000,000): 50%.	not concerned (because funding does not come from the State)	covered by the de minimis State aid scheme under European regulation (EU no. 2023/2831): 70%, provided that the total amount of de minimis aid granted to a single structure does not exceed €300,000 over the last 3 financial years; and/or under the notification-exempt framework scheme for aid for research, development and innovation (No. SA. 111723), for "industrial" research projects within the meaning of the framework scheme: - Small company (<50 employees and turnover/balance sheet < €10,000,000): 70%. Medium-sized company (50 to 249 employees and turnover/balance sheet < €50,000,000): 60%. -Large company (≥249 employees and turnover/balance sheet > €50,000,000): 50%.
Permanent staff costs of public bodies	Not eligible		
Permanent staff costs for private structures (permanent contracts)	Taken into account in proportion to the time spent on the project		
Non-statutory staff or fixed-term contracts	- Up to a maximum of €80,000 per fixed-term contract per year (several fixed-term contracts are theoretically eligible) - Trainee expenses	Eligible	- Up to a maximum of €80,000 per fixed-term contract per year (several fixed-term contracts are theoretically eligible) - Trainee expenses

Capital expenditure	Only **the depreciation** of equipment over the life of the project is eligible, not the total cost of the investment.		
Services	Eligible		
Travel expenses	Up to 5% of total direct project costs	Eligible	Up to 5% of total direct project costs
Related expenses/management costs	15% of the project's direct eligible expenditure, with the exception of sub-activities. For national public establishments, the ceiling is set at 15% of total direct project expenditure.	Eligible	15% of the project's direct eligible expenditure, with the exception of sub-activities. For national public establishments, the ceiling is set at 15% of the total direct expenditure for the project.

Appendix 4: Administrative details

Download the file and send it to http://ittecop.fr/apr2024

Administrative set-up	Research project	Exploratory or incubation project	Synthesis of knowledge (systematic review)
Documents to be submitted with the application **(using the application form -** http://ittecop.fr/apr2024 **)**	✓ Scientific project Summary sheet ✓ Signed financial appendix ✓ Signed letter of commitment	✓ Summary sheet Financial appendix signed ✓ Signed letter of commitment	✓ Scientific project Summary sheet ✓ Financial appendix signed Letter of commitment signed
Maximum number of pages scientific dossier	20 + appendices	2 pages for exploratory project 4 pages for incubation project	20 + 10 for annexes
Documents to be provided at the agreement stage (in electronic format only)	all the supporting documents required to draw up the agreements, depending on the needs of the various departments involved (FRB, ADEME or OFB). The precise list will be sent with the letter notifying the selection of the project.	all the supporting documents required to draw up the agreements according to the FRB's needs. The precise list will be sent with the letter notifying the selection of the project.	all the supporting documents required to draw up the agreements, depending on the needs of the various departments involved (FRB, ADEME or OFB). The precise list will be sent with the letter notifying the selection of the project.
	The OFB's intervention programme can be freely consulted at the following address: https://www.ofb.gouv.fr/documentation/programme-dintervention-2023-2025		