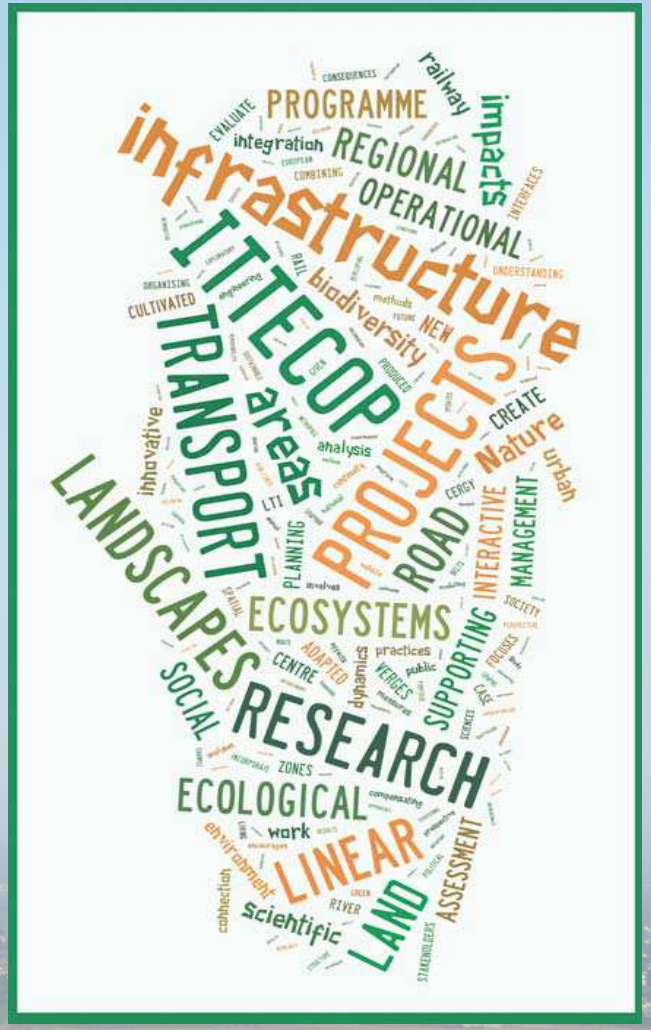
ITTECOP

An institutional framework for integrated research on infrastructure, landscape and biodiversity



Yannick AUTRET,
Ministry of Environment, Energy and Sea
Directorate for Research
France

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RÉPUBLIQUE FRANÇAISE

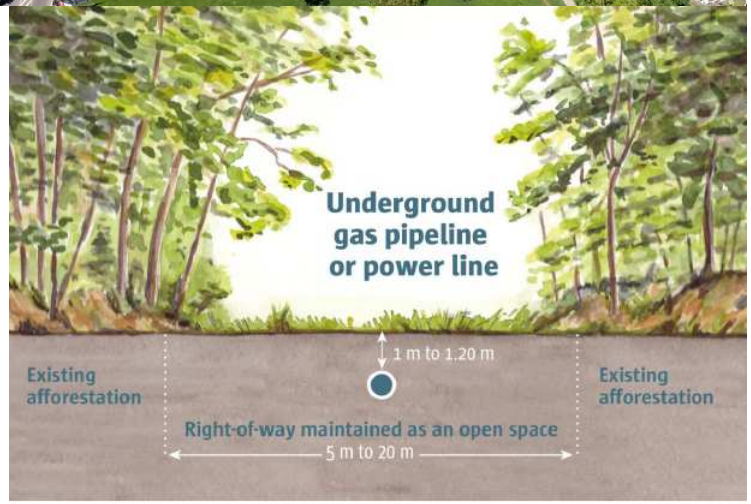
Ministère de l'Environnement, de l'Énergie et de la Mer

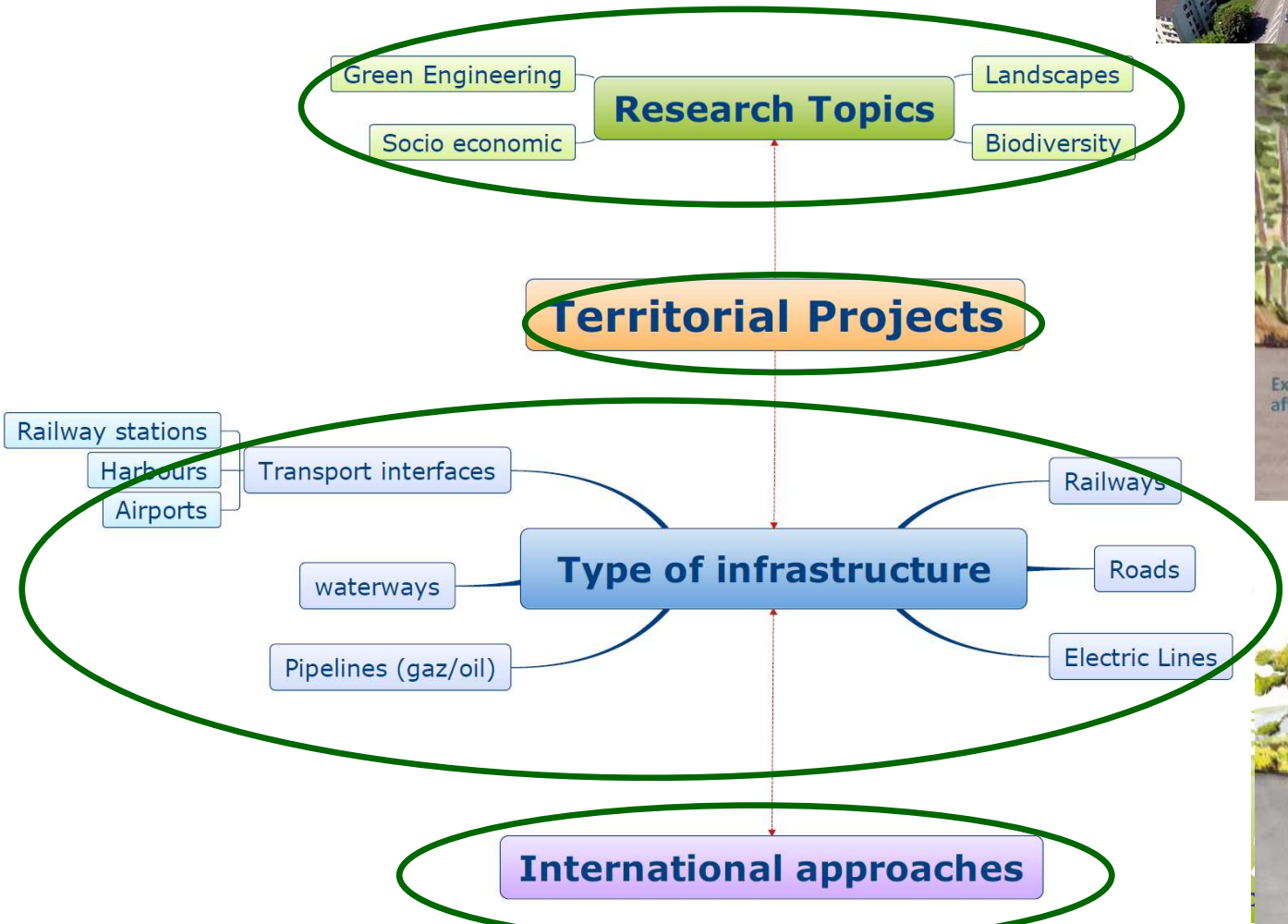
Programme • ITTECOP
Infrastructures de transports terrestres, écosystèmes et paysages


Sous-trame
zones humides
Sous-trame
milieux ouverts
Sous-trame
des landes
Sous-trame
aquatique
Trame
verte et bleue
Sous-trame
forestière

ITTECOP as applied research program

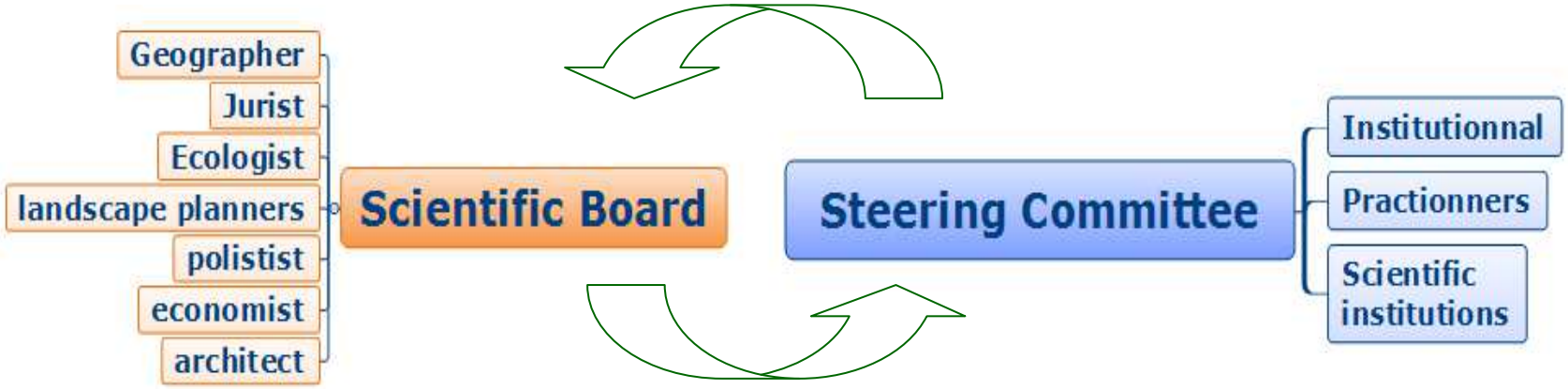
1. **Support public policy**
2. **Scientific and technological knowledge**
3. **Pluridisciplinary and pluri infrastructure approach**





How does it work?

1. Program governance



2. Structuration of the community

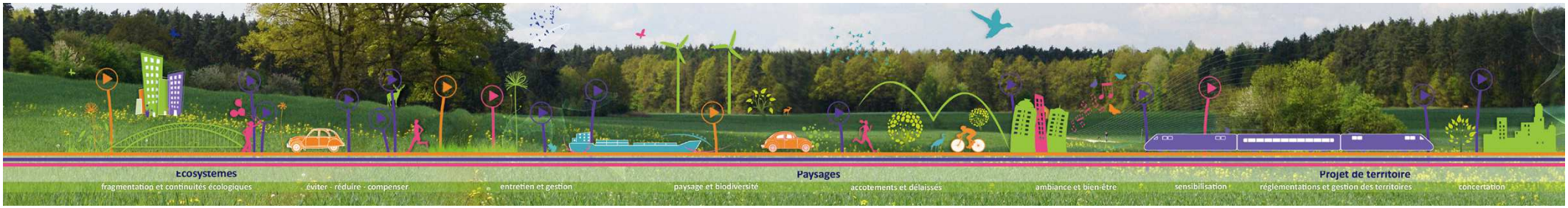
Specifity of ITTECOP issues

Long term analysis of infrastructure effects

Better use of infrastructure verges potential in a large landscape approach

Adaptation of existing infrastructure and prospective

A cross ambition: Improve new ways to share scientific knowledge with practionners and stakeholders until final use on the field



Modelisation tools

Invasive species

Avoid/reduce/ compensate strategy

Roadkill and collisions

Green engineering and pollution

Ecosystemic services on verges

Pollinators and verges management

Landscape ecology and socio-economic hybridation

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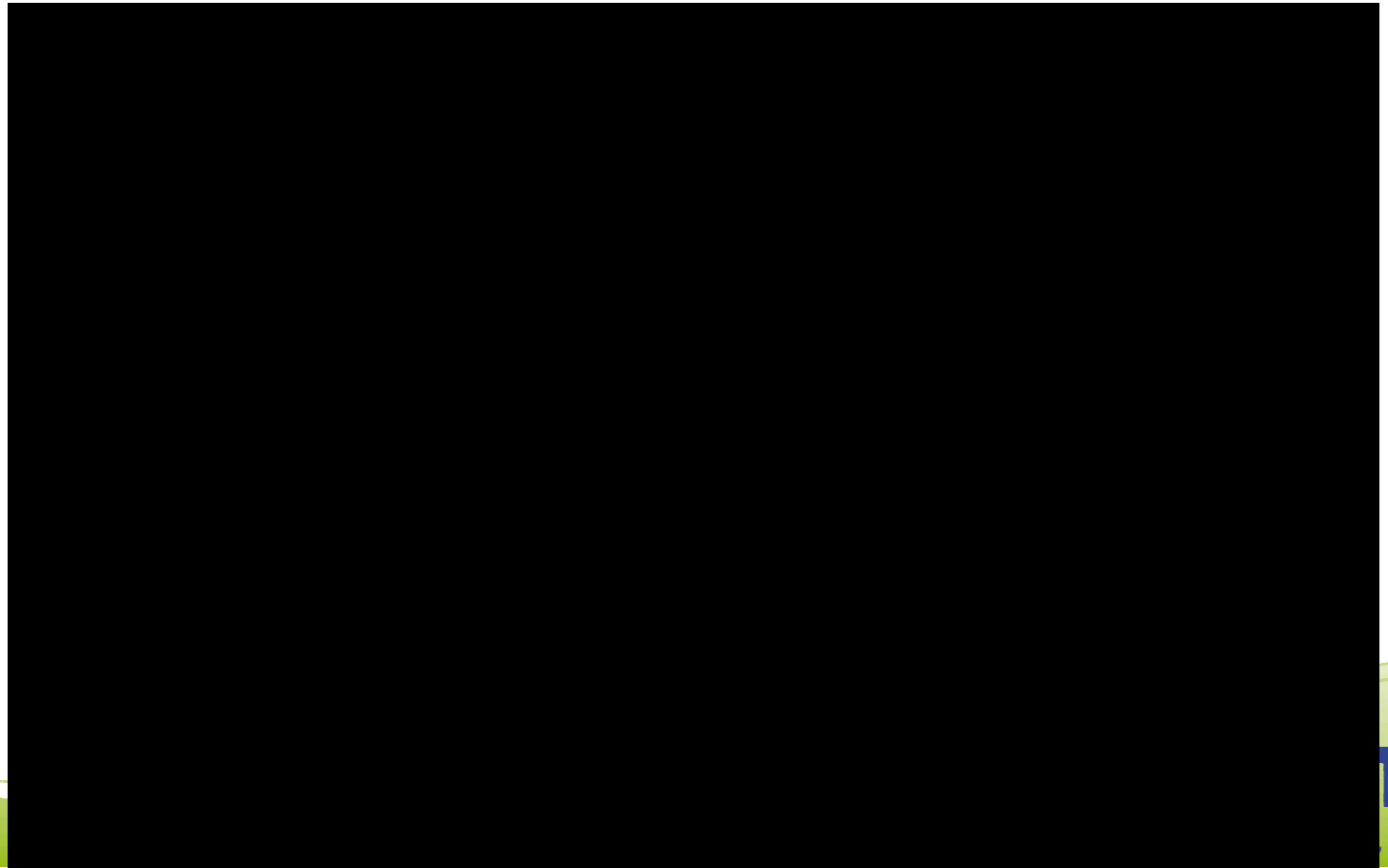
écosystèmes et paysages

Thanks for your attention!

yannick.autret@developpement-durable.gouv.fr

All details on www.ittecop.fr

Discover IENE Network : www.postconf.iene.info



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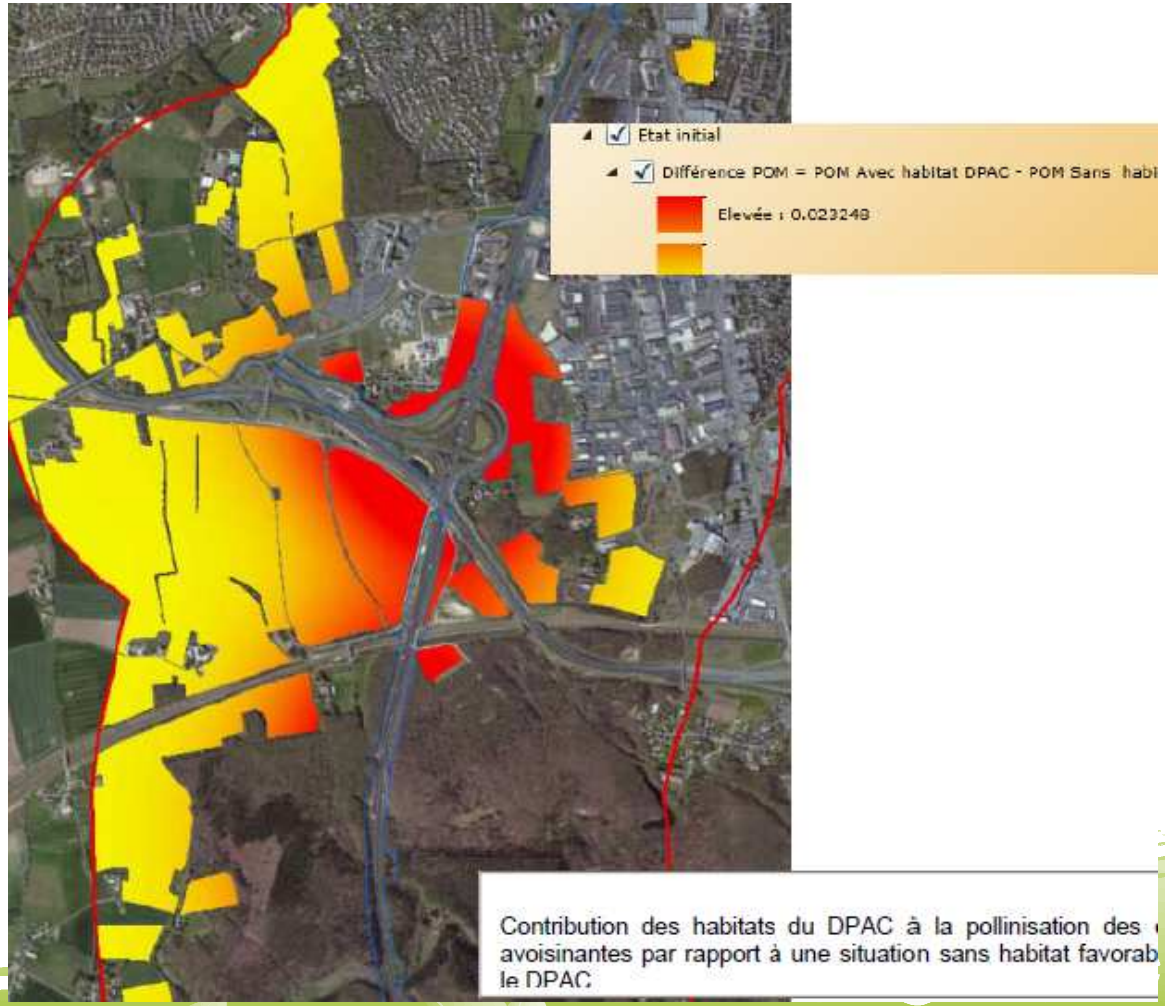
écosystèmes et paysages

SERV-ECO

Can evaluating the ecosystem services of green verges in linear transport infrastructure help when developing biodiversity measures that are adapted to project managers' budget constraints and social uses?

Egis Structures et Environnement – Dorothee.labarraque@egis.fr



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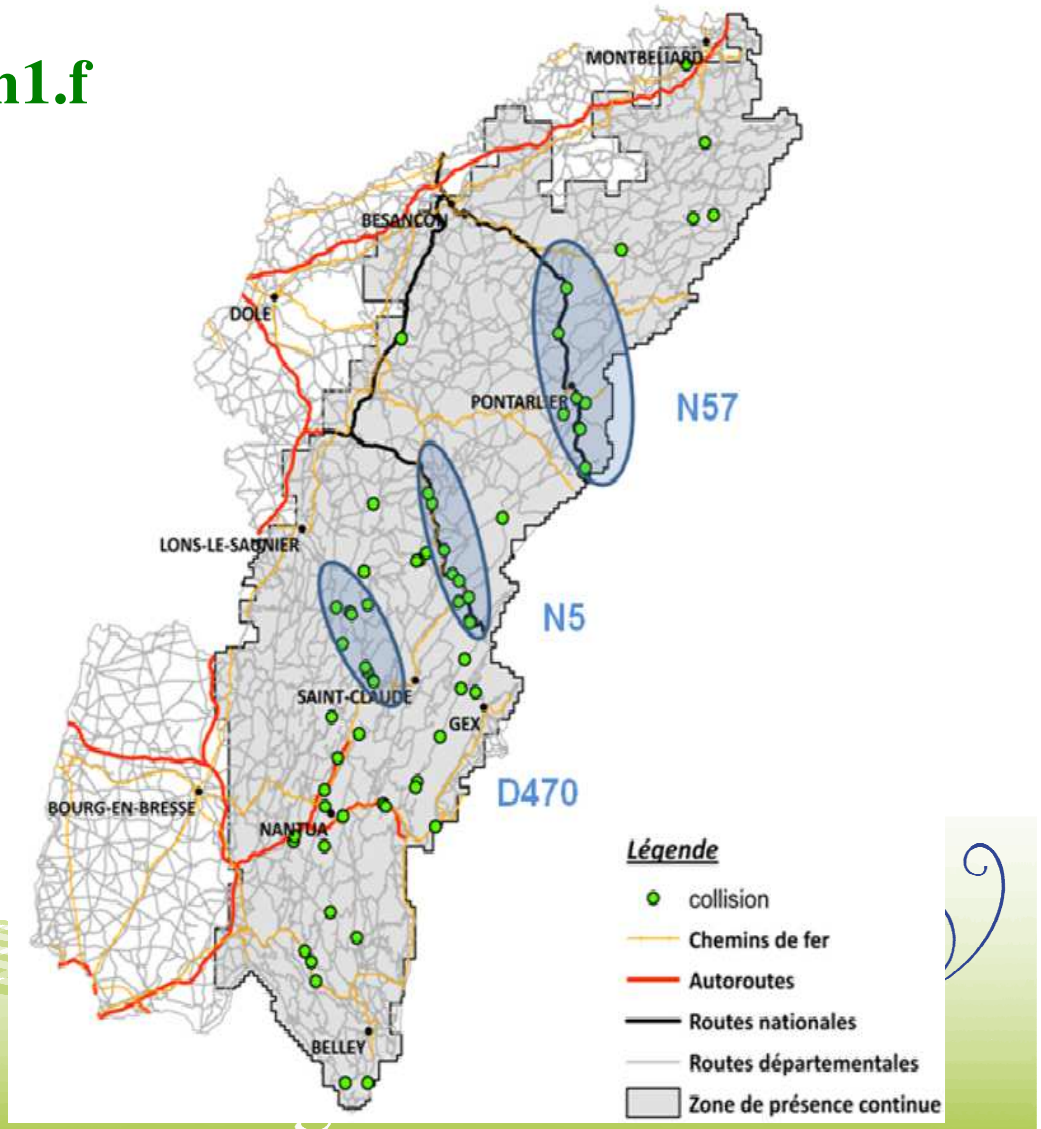
LYNX

Developing a model to diagnose interactions amongst landscape structure, land-transport infrastructure and emblematic species: Case of the lynx in the Jura Mountains.

Contact: gaillard@biomserv.univ-lyon1.f



D-TRANSECT

Those left behind as a result of the Huveaune Valley crossings: species dispersal, vernacular practices and the mediation of landscapes

Frédéric Poussin, LAREP / Ecole Nationale Supérieure de Paysage de Versailles

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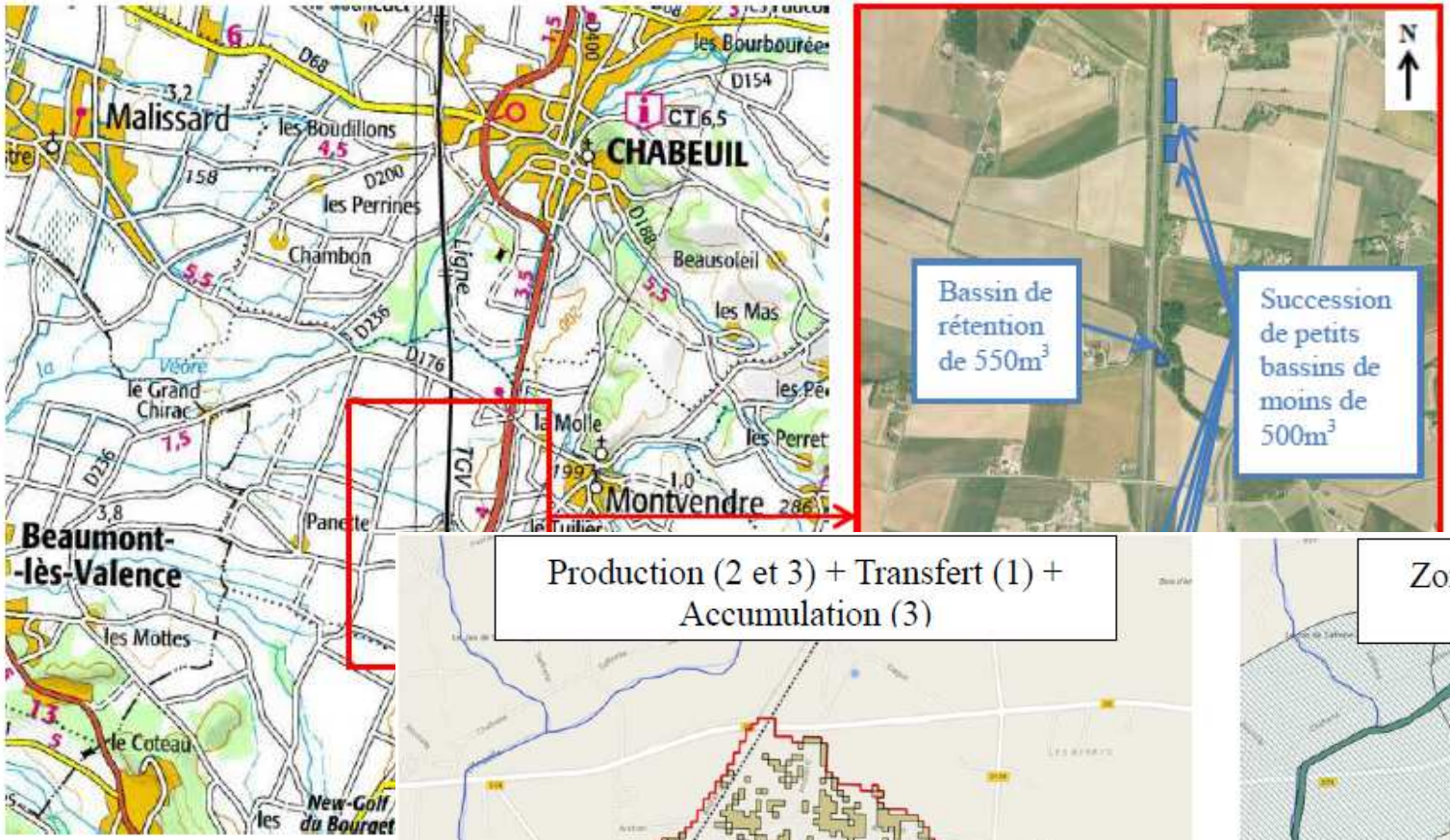
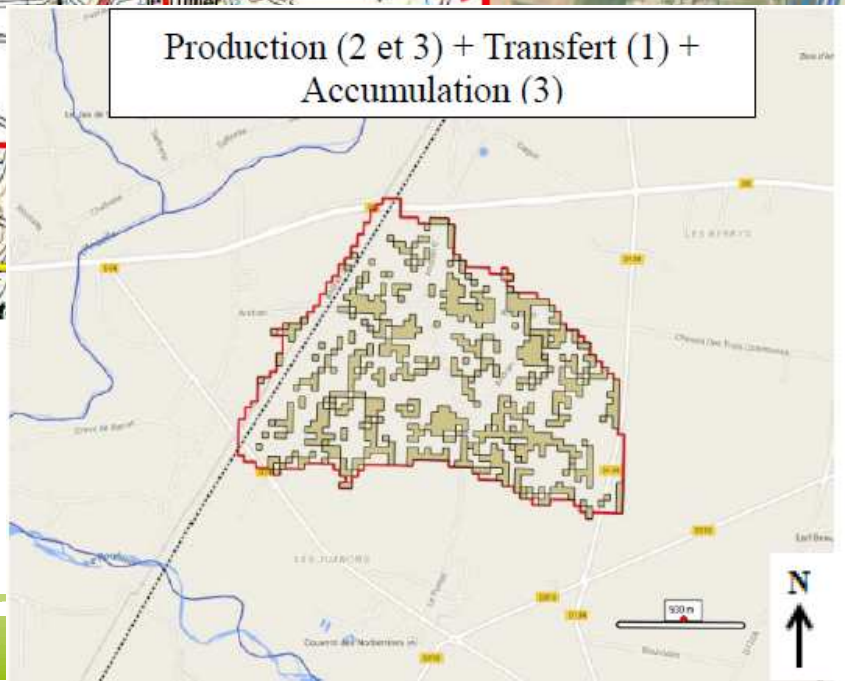
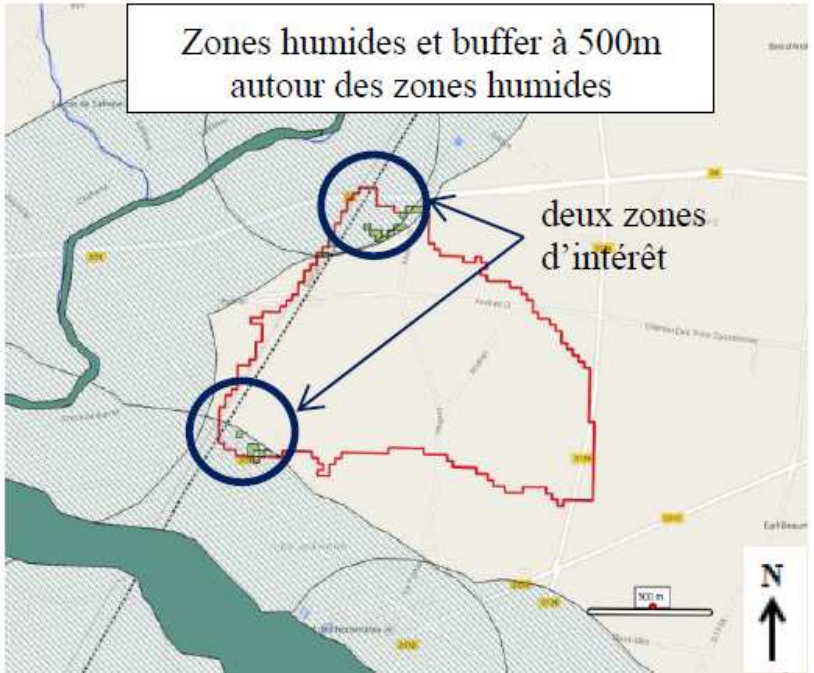
RHIZU

Managing heavy runoff around a rail network to help create wet zones with ecological potential





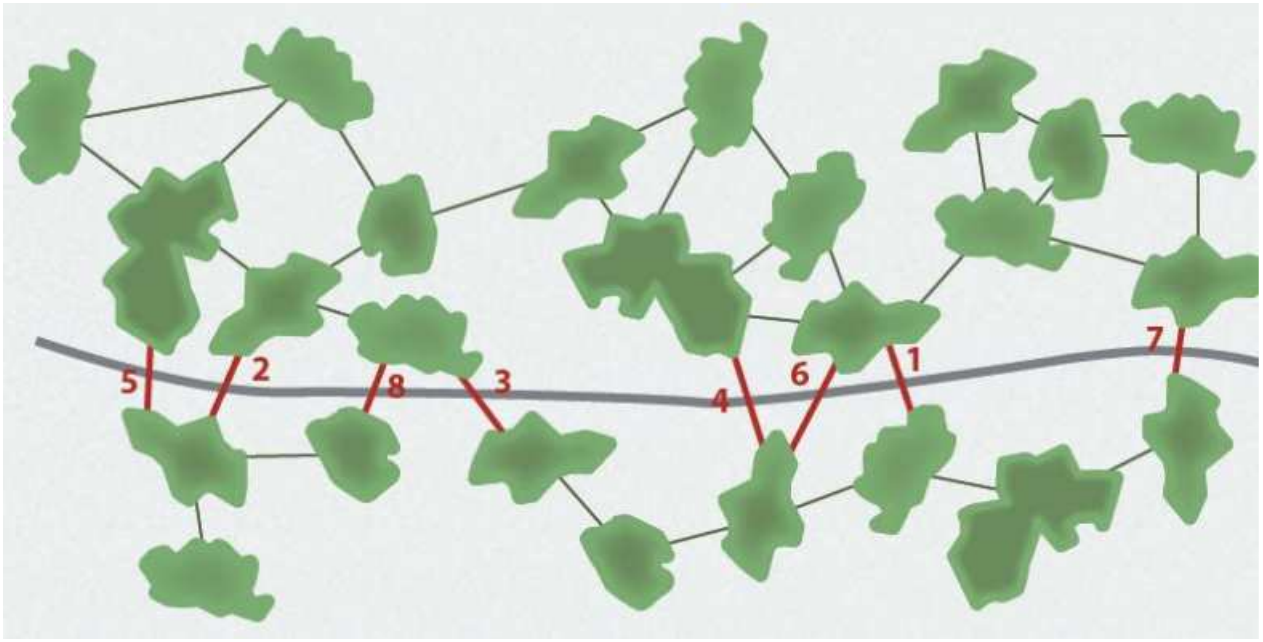


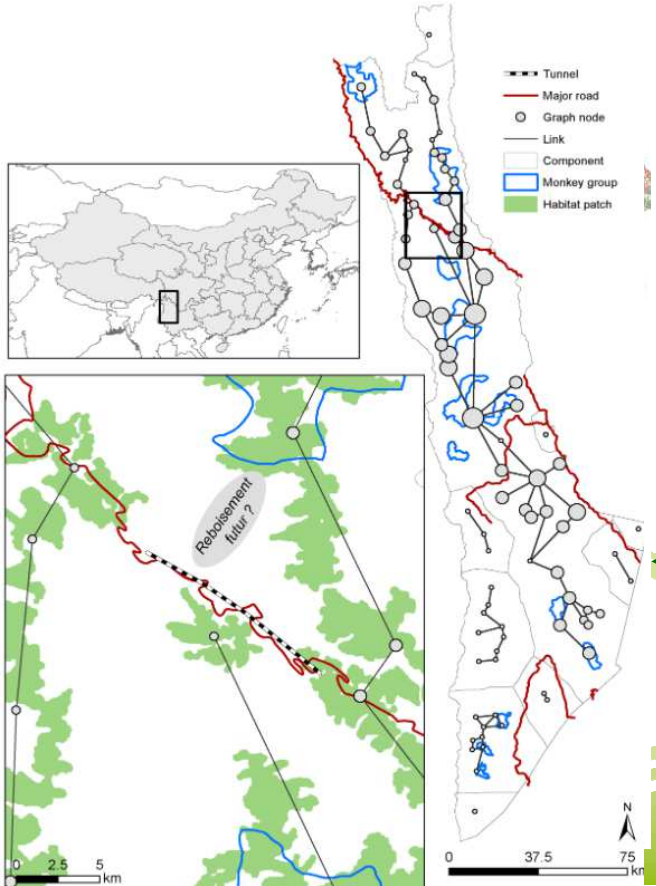
Graphab

Using Landscape graph to evaluate and mitigate the impacts of major transport infrastructure on species

jean-christophe.foltete@univ-fcomte.fr

A tool to help stakeholders to spare time, money and preserve biodiversity at the same time





A reliable and reproductible process based on graph theory and landscape genetics

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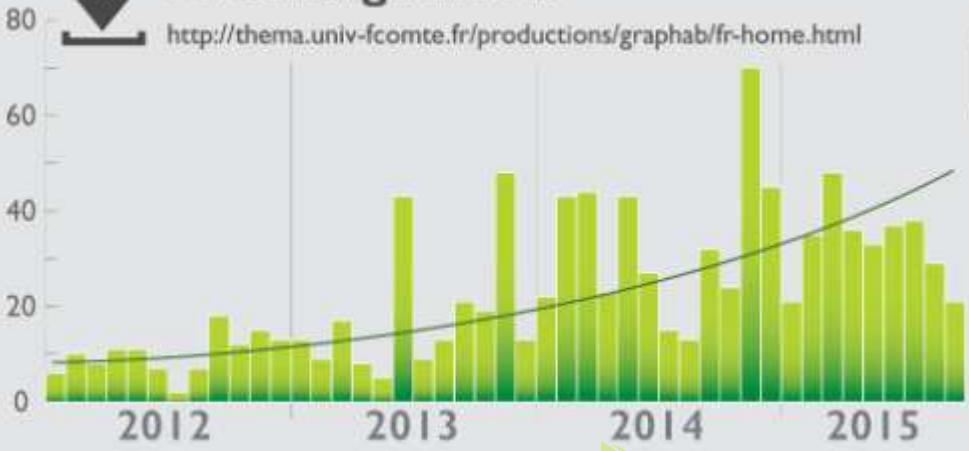
graphab

Téléchargements

http://thema.univ-fcomte.fr/productions/graphab/fr-home.html



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18 publications internationales

Landscape Ecology
Biological Conservation
Environmental Impact Assessment Review
Landscape and Urban Planning
Revue Internationale de Géomatique
Environmental Modelling & Software
Journal of Environmental Management
Community Ecology
River Research and Applications
Journal for Nature Conservation
Ecological Indicators
European Jou… (W… …esearch

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CIFER - Cumulation of transportation Infrastructure and Functional Ecological Relationship

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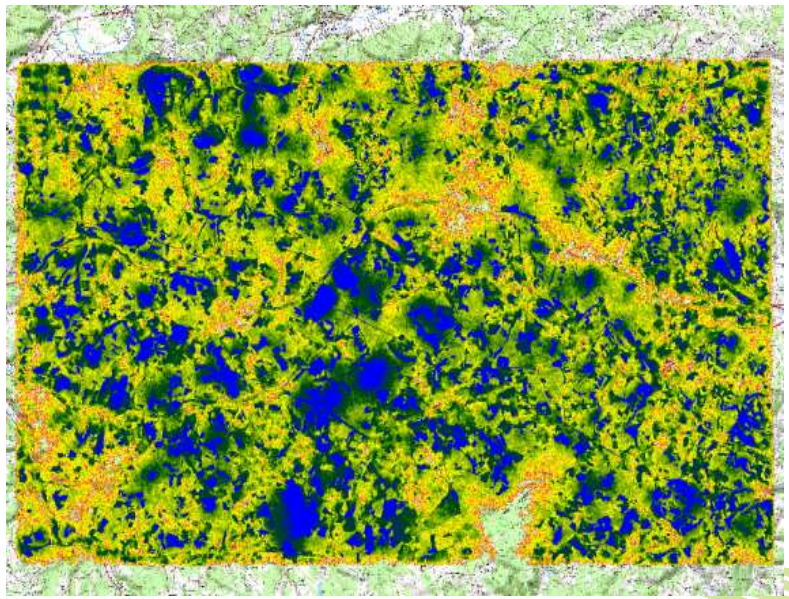
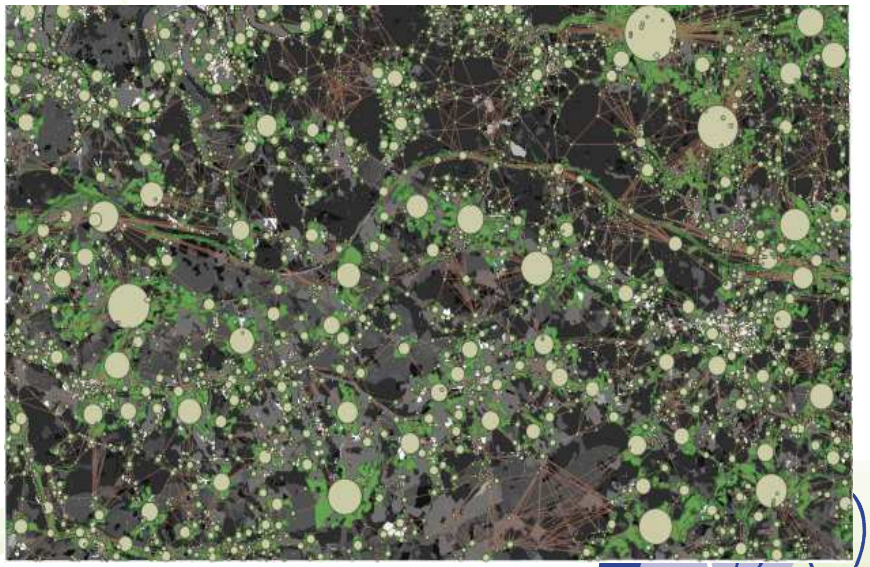
During my project life cycle what kind of tool may I use to limit my development impact? With which level of realism?

What are the most relevant tools given my development phase?





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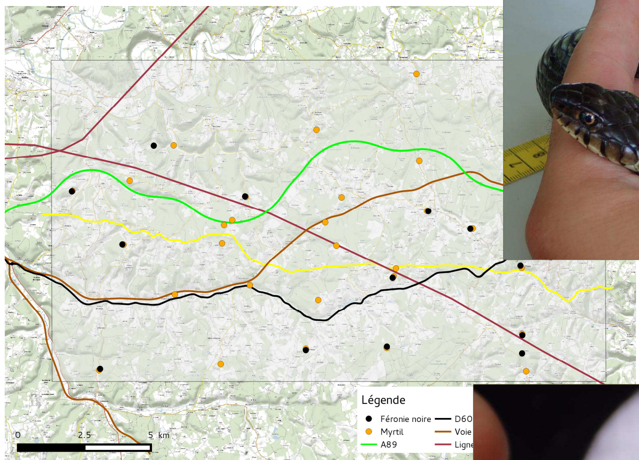
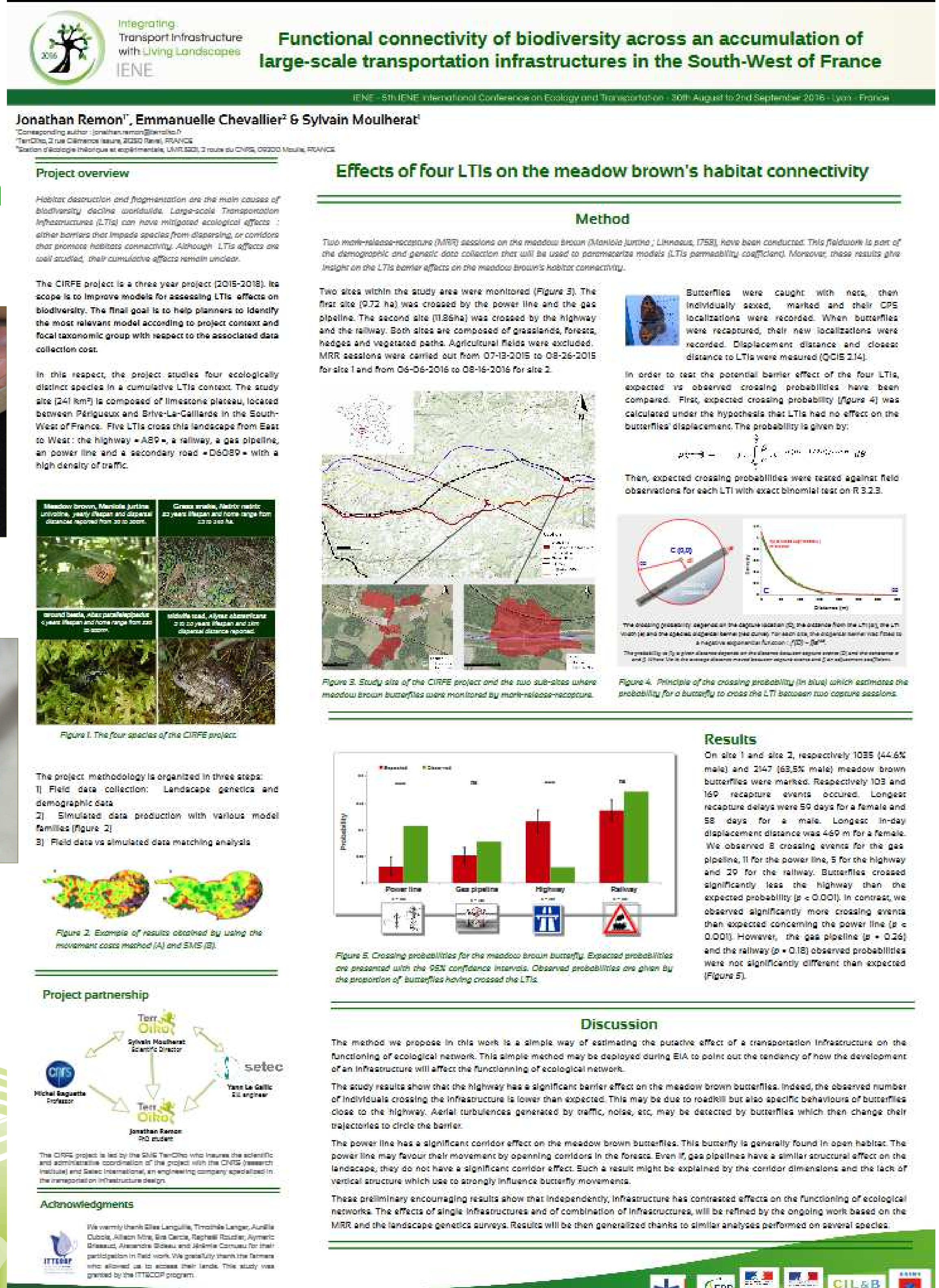
dolog
y

Building a large data set of measured biological indicators of metapopulation functioning in a BIM approach



First results

Main lines of the methodology and preliminary results presented during the IENE 2016 (Poster J. Remon et al.)



Integrating Transport Infrastructure with Living Landscapes IENE

Functional connectivity of biodiversity across an accumulation of large-scale transportation infrastructures in the South-West of France

IENE - 5th IENE International Conference on Ecology and Transportation - 30th August to 2nd September 2016 - Lyon - France

Jonathan Remon[1*], Emmanuelle Chevallier[2] & Sylvain Moulherat[1]
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[2]Station d'écologie théorique et expérimentale, UMR 5321, 2 route du CNRS, 09200 Moulis, FRANCE

Project overview

Habitat destruction and fragmentation are the main causes of biodiversity decline worldwide. Large-scale Transportation Infrastructures (LTIs) can have mitigated ecological effects : either barriers that impede species from dispersing, or corridors that promote habitats connectivity. Although LTIs effects are well studied, their cumulative effects remain unclear.

The CIRFE project is a three year project (2015-2018). Its scope is to improve models for assessing LTIs effects on biodiversity. The final goal is to help planners to identify the most relevant model according to project context and focal taxonomic group with respect to the associated data collection cost.

In this respect, the project studies four ecologically distinct species in a cumulative LTIs context. The study site (241 km²) is composed of limestone plateau, located between Périgueux and Brive-La-Gaillarde in the South-West of France. Five LTIs cross this landscape from East to West : the highway « A89 », a railway, a gas pipeline, an power line and a secondary road « D6089 » with a high density of traffic.

Figure 1. The four species of the CIRFE project.

The project methodology is organized in three steps:
1) Field data collection: Landscape genetics and demographic data
2) Simulated data production with various model families (figure 2)
3) Field data vs simulated data matching analysis

Figure 2. Example of results obtained by using the movement costs method (A) and SMS (B).

Project partnership

Sylvain Moulherat, Scientific Director
Michel Baguette, Professor
Yann Le Gallic, EIL engineer
Jonathan Remon, PhD student

The CIRFE project is led by the SME TerrOïko who insures the scientific and administrative coordination of the project with the CNRS (research institute) and Setec International, an engineering company specialized in the transportation infrastructure design.

Acknowledgments

We warmly thank Gilles Languille, Timothée Langer, Aurélie Dubois, Allison Mira, Eva Garcia, Raphaël Routier, Aymeric Grisseaud, Alexandre Bideau and Jérémie Cornuau for their participation in field work. We gratefully thank the farmers who allowed us to access their lands. This study was granted by the ITTECOP program.

Effects of four LTIs on the meadow brown's habitat connectivity

Method

Two mark-release-recapture (MRR) sessions on the meadow brown (Maniola jurtina ; Linnaeus, 1758), have been conducted. This fieldwork is part of the demographic and genetic data collection that will be used to parameterize models (LTIs permeability coefficient). Moreover, these results give insight on the LTIs barrier effects on the meadow brown's habitat connectivity.

Two sites within the study area were monitored (Figure 3). The first site (9.72 ha) was crossed by the power line and the gas pipeline. The second site (11.86ha) was crossed by the highway and the railway. Both sites are composed of grasslands, forests, hedges and vegetated paths. Agricultural fields were excluded. MRR sessions were carried out from 07-13-2015 to 08-26-2015 for site 1 and from 06-06-2016 to 08-16-2016 for site 2.

Butterflies were caught with nets, then individually sexed, marked and their GPS localizations were recorded. When butterflies were recaptured, their new localizations were recorded. Displacement distance and closest distance to LTIs were mesured (QGIS 2.14).

In order to test the potential barrier effect of the four LTIs, expected vs observed crossing probabilities have been compared. First, expected crossing probability (figure 4) was calculated under the hypothesis that LTIs had no effect on the butterflies' displacement. The probability is given by:

Then, expected crossing probabilities were tested against field observations for each LTI with exact binomial test on R 3.2.3.

Figure 3. Study site of the CIRFE project and the two sub-sites where meadow brown butterflies were monitored by mark-release-recapture.

Figure 4. Principle of the crossing probability (in blue) which estimates the probability for a butterfly to cross the LTI between two capture sessions.

Results

On site 1 and site 2, respectively 1035 (44.6% male) and 2147 (63,5% male) meadow brown butterflies were marked. Respectively 103 and 169 recapture events occured. Longest recapture delays were 59 days for a female and 58 days for a male. Longest in-day displacement distance was 469 m for a female.

We observed 8 crossing events for the gas pipeline, 11 for the power line, 5 for the highway and 29 for the railway. Butterflies crossed significantly less the highway than the expected probability ($p < 0.001$). In contrast, we observed significantly more crossing events than expected concerning the power line ($p < 0.001$). However, the gas pipeline ($p = 0.26$) and the railway ($p = 0.18$) observed probabilities were not significantly different than expected (Figure 5).

Power line | Gas pipeline | Highway | Railway

Figure 5. Crossing probabilities for the meadow brown butterfly. Expected probabilities are presented with the 95% confidence intervals. Observed probabilities are given by the proportion of butterflies having crossed the LTIs.

Discussion

The method we propose in this work is a simple way of estimating the putative effect of a transportation infrastructure on the functioning of ecological network. This simple method may be deployed during EIA to point out the tendency of how the development of an infrastructure will affect the functionning of ecological network.

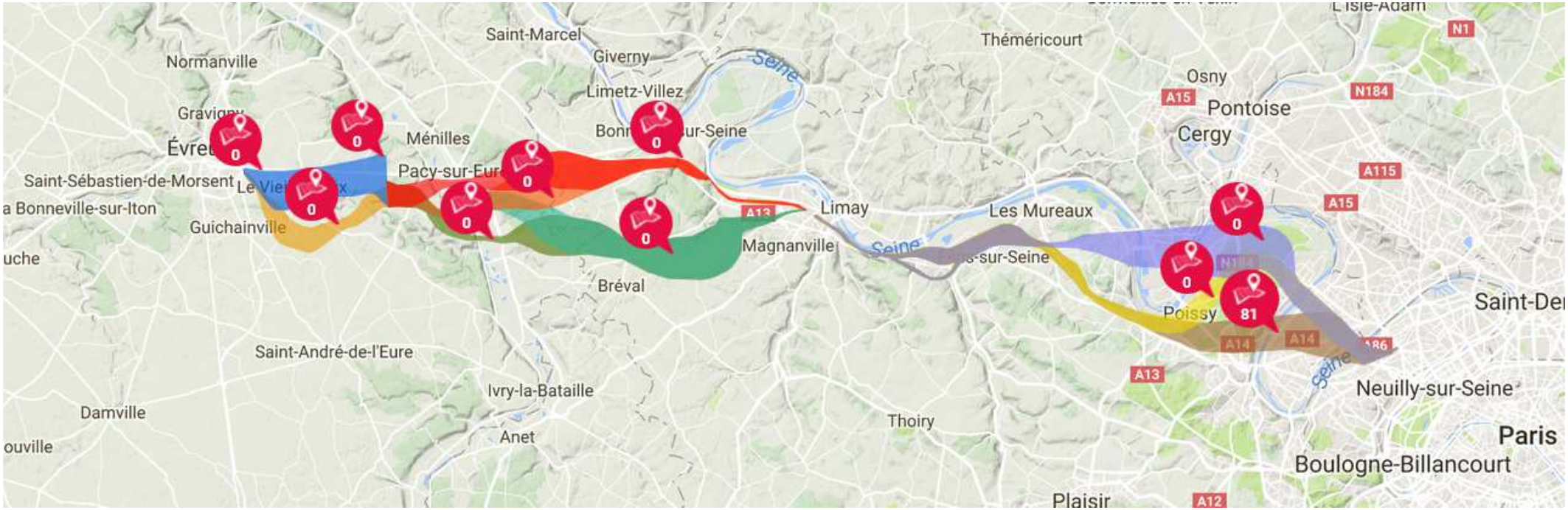
The study results show that the highway has a significant barrier effect on the meadow brown butterflies. Indeed, the observed number of individuals crossing the infrastructure is lower than expected. This may be due to roadkill but also specific behaviours of butterflies close to the highway. Aerial turbulences generated by traffic, noise, etc, may be detected by butterflies which then change their trajectories to circle the barrier.

The power line has a significant corridor effect on the meadow brown butterflies. This butterfly is generally found in open habitat. The power line may favour their movement by openning corridors in the forests. Even if, gas pipelines have a similar structural effect on the landscape, they do not have a significant corridor effect. Such a result might be explained by the corridor dimensions and the lack of vertical structure which use to strongly influence butterfly movements.

These preliminary encouraging results show that independently, infrastructure has contrasted effects on the functioning of ecological networks. The effects of single infrastructures and of combination of infrastructures, will be refined by the ongoing work based on the MRR and the landscape genetics surveys. Results will be then generalized thanks to similar analyses performed on several species.

COMPILSA – Compensation and linear infrastructure: strategies and scenario for action

(fanny.guillet@mnhn.fr)



Avoid → Mitigate → Compensate

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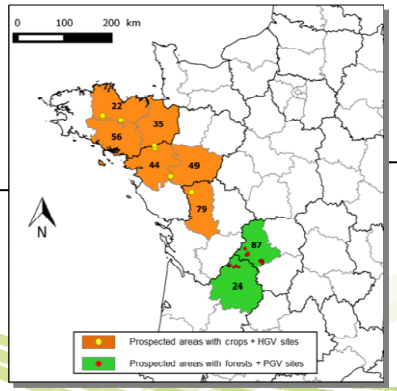
PolLinéaire: Assessing the potential of linear infrastructure verges for conservation and dispersal of wild pollinators in landscapes

Denis.francois@ifsttar.fr

Infrastructure verges as habitat and ressource for wild bees and butterflies

Highway green verges



Power line green verges

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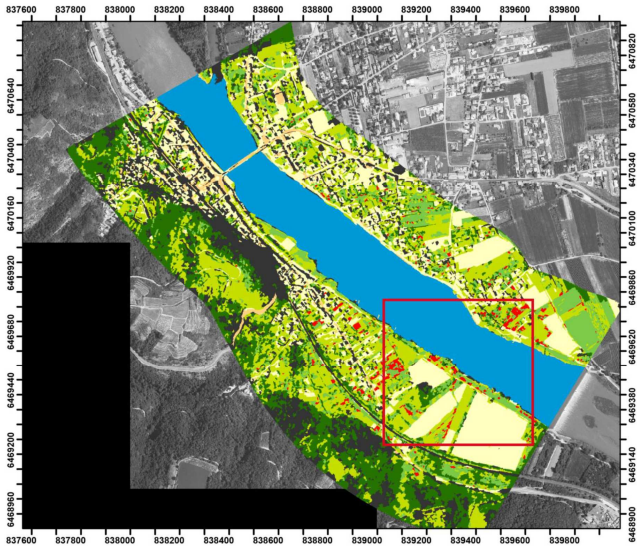
Infrastructures de transports terrestres, écosystèmes et paysages

DYNARP - Invasion by Asian knotweed (*Fallopia spp.*) along linear landscape features: spatial dynamics and perspectives



Andre.evette@irstea.fr

Objectives:

1- Diachronical analysis and cartography of Asian knotweed dynamics

2- Verges and rights-of-ways management solutions adopted in relationship with surrounding green networks

3 - Perceptions by actors