Mapping Ecosystem service loss for transportation planning?

Topic of the thesis

- Integrating Ecosystem Services (ES) loss in the infrastructure projects evaluation process

- **Determine the least impacting implementation option on Natural capital**
- **Assess the ES loss as a cost in the infrastructure Cost-Benefit Analysis**

Doctoral thesis – Léa TARDIEU - financial support from EGIS Environnement

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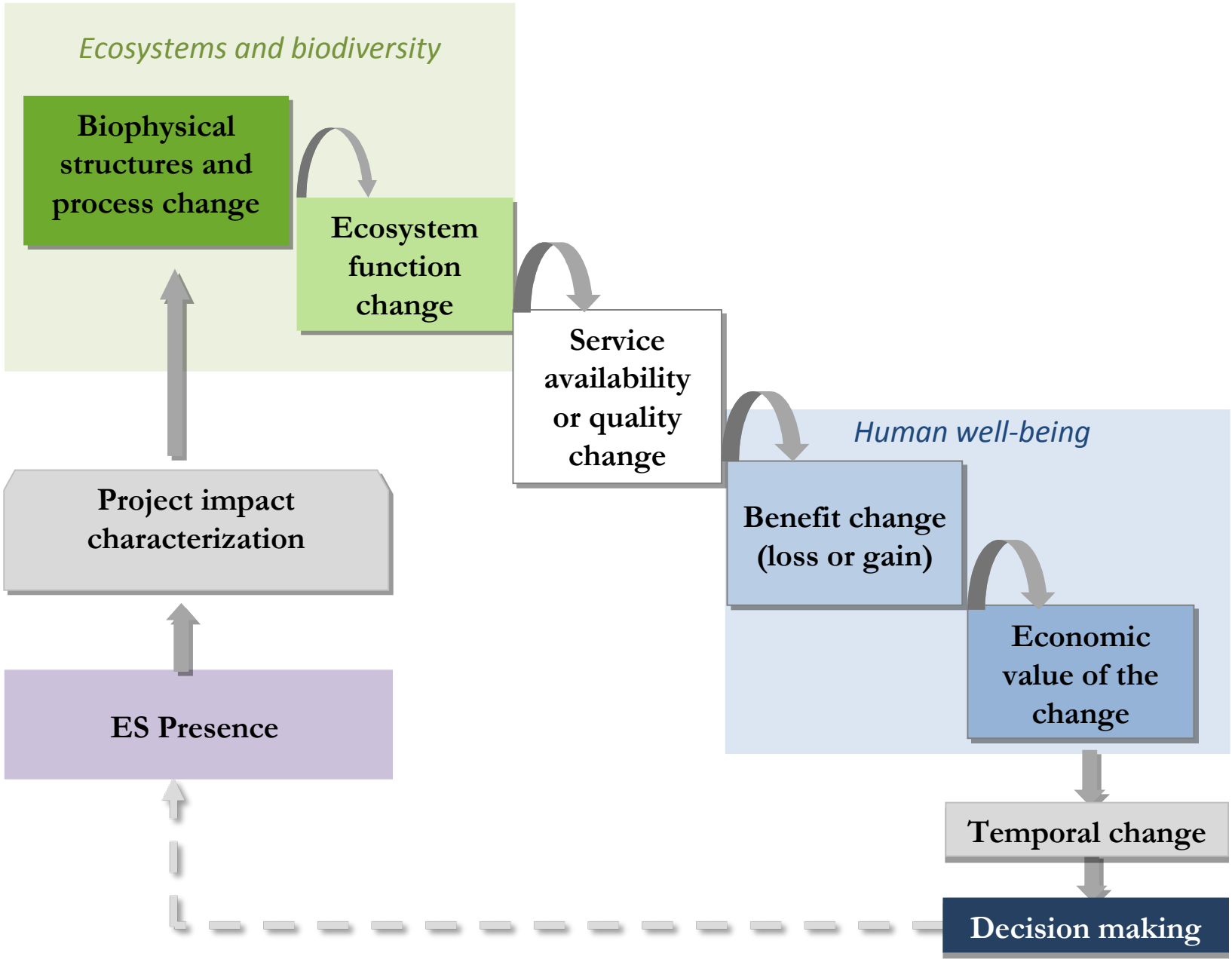
Main results

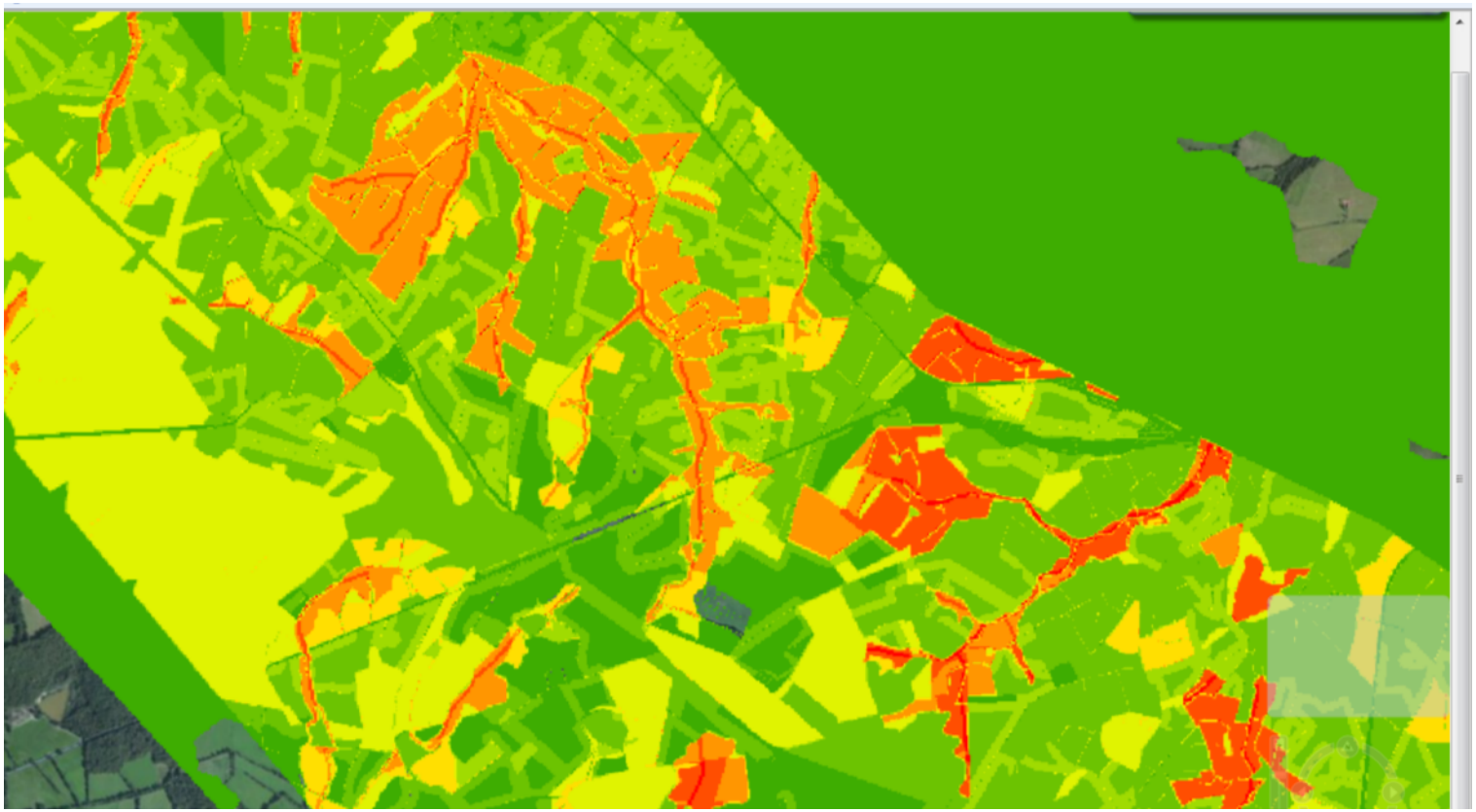
- **Determination of presence / importance Indicators for the baseline conditions**
- **Implementation option: Assessment and map of ES supply and values potentially loss because of each option**
- **Attempt of integration of the loss as a cost in the infrastructure Cost-Benefit Analysis (CBA)**
- **Assessment of the cost/efficiency ratio of a mitigating measure (wildlife passageway)**


Ecosystems and biodiversity
Biophysical structures and process change
Ecosystem function change
Service availability or quality change
Human well-being
Benefit change (loss or gain)
Economic value of the change
Temporal change
Decision making
Project impact characterization
ES Presence

Ecosystem services assessed

Provision	Regulation	Recreation
Food	Erosion prevention	Hunting recreation
Raw materials	Pollination	Fishing recreation
	Biological control	Recreation
	Global Climate regulation	
	Air quality regulation	
	Local climate regulation	
	Regulation of water flows	
	Disturbance prevention (flood protection)	
	Water (groundwater recharge)	
	Waste treatment	

Mapping of the service



ES loss impact characterization

Linear infrastructure construction impacts can **directly or indirectly** affect ES supply.

→ **Direct** ES loss is related to the areas' conversion

→ Three main types of **indirect** (additional) loss of ES flows :

- due to a threshold behavior of ecosystem function and ES supply
- related to an impact on landscapes' connectivity (impacting a network)
- disturbance of a particular point of interest (e.g. recreational areas)

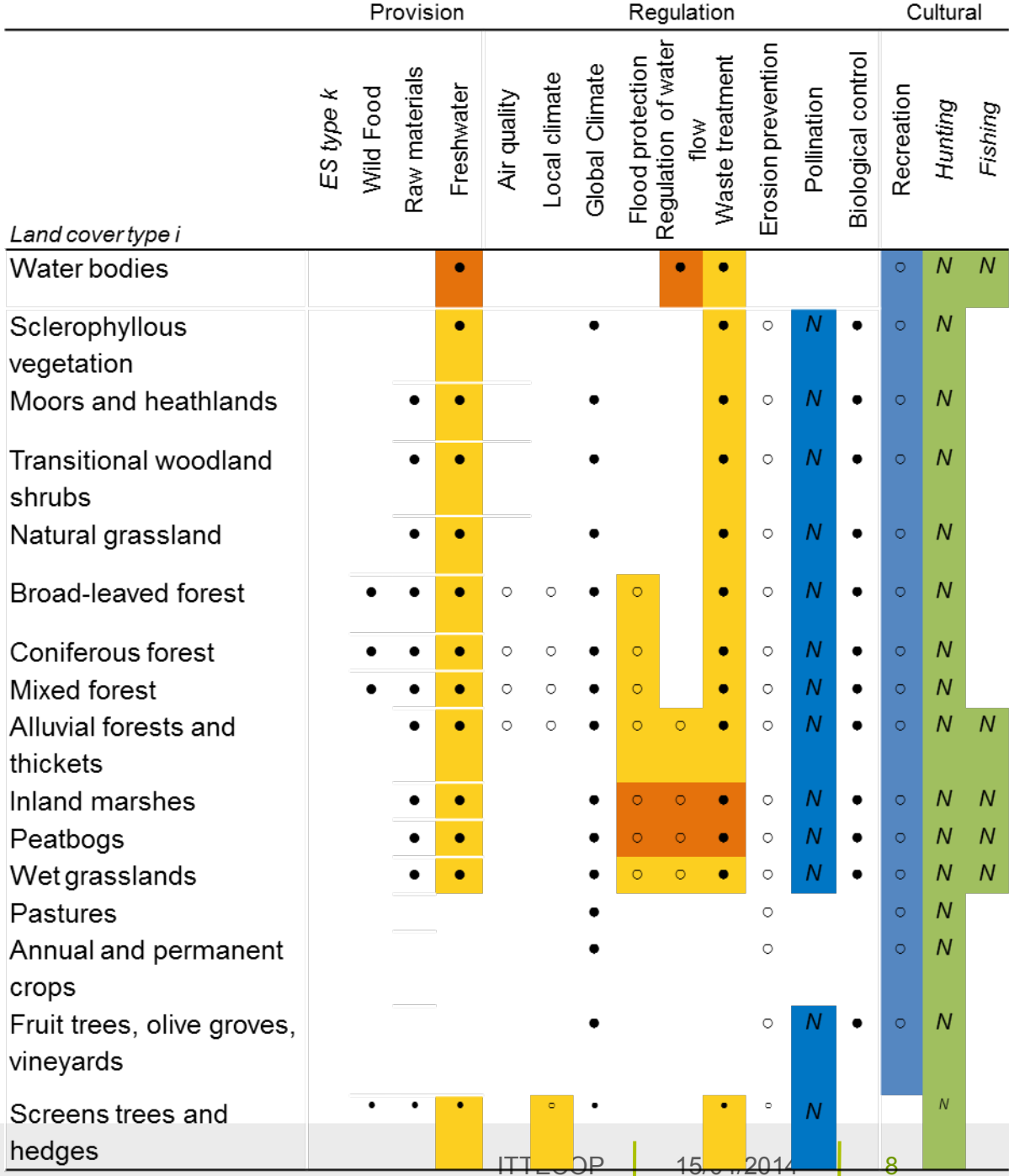
direct loss = infrastructure land take

ES supply Related to landscapes' connectivity

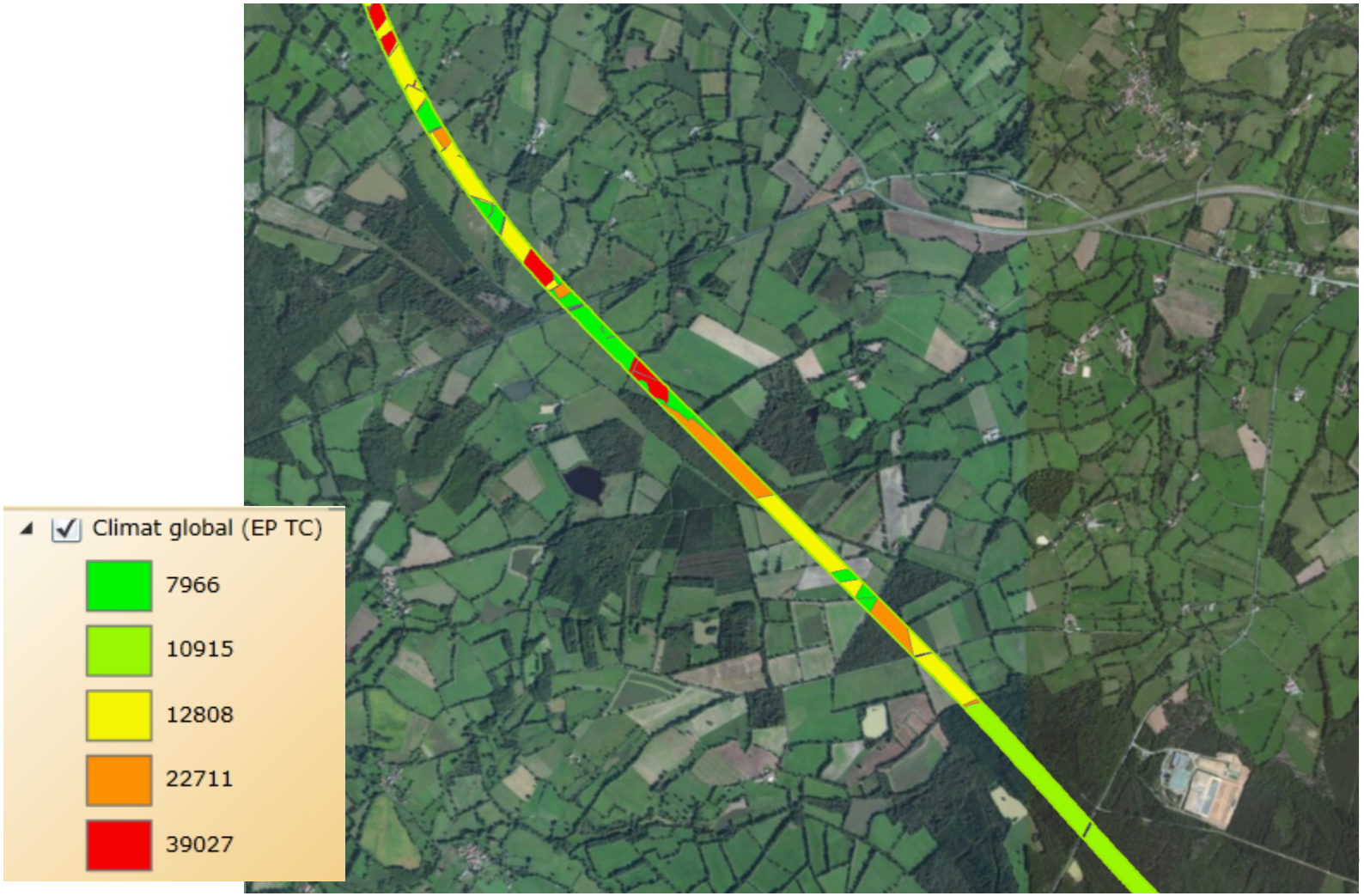
ES supply very likely to have a threshold response

ES supply presumably likely to have a threshold response

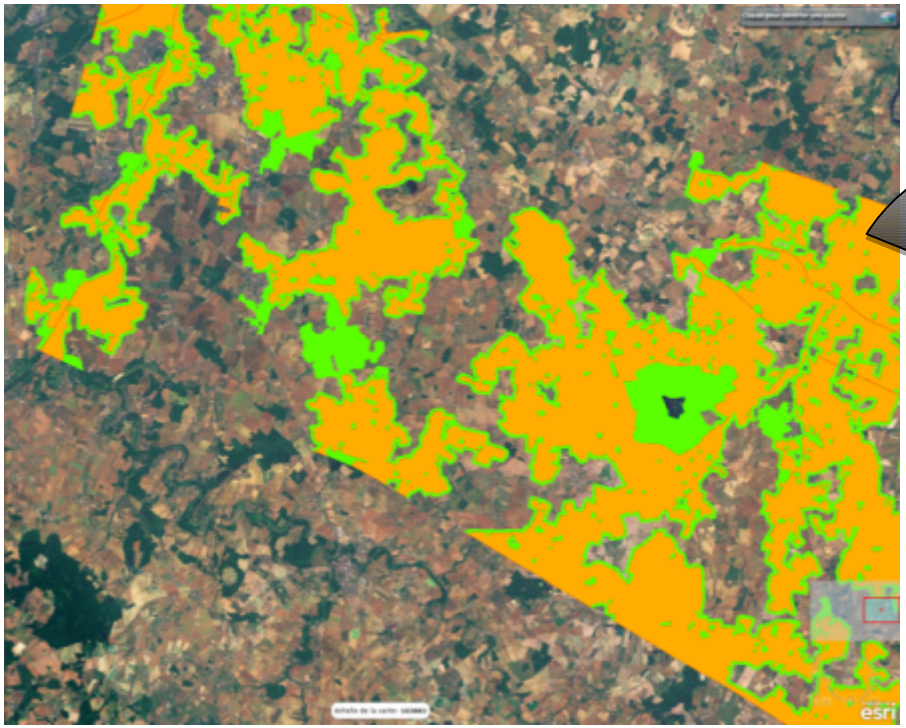
Disturbance of a point supplying the service

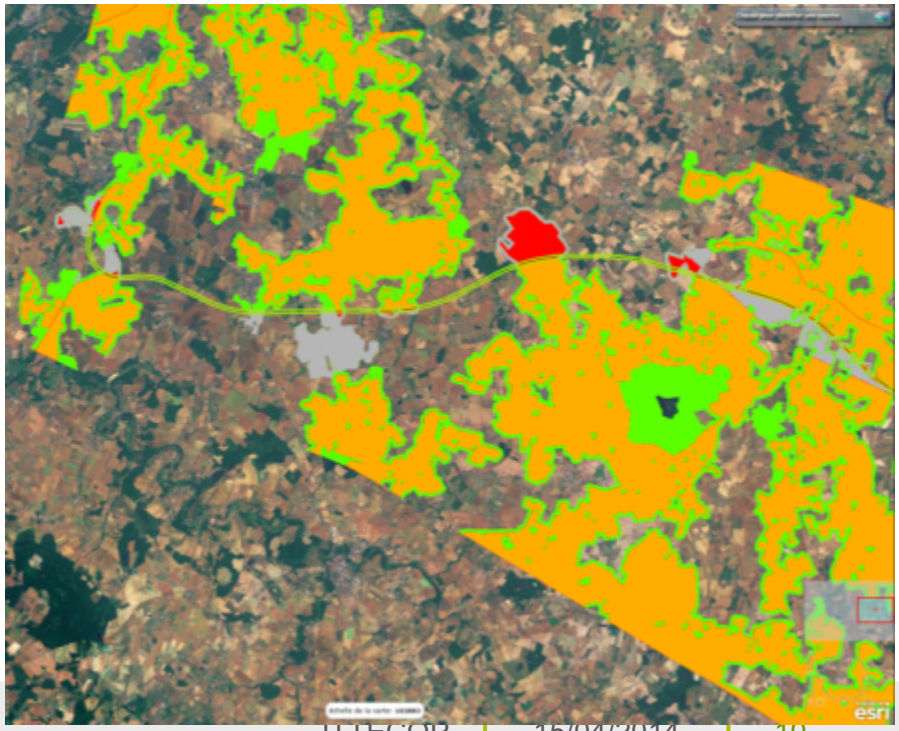


Exemple of a direct loss (global climate regulation)



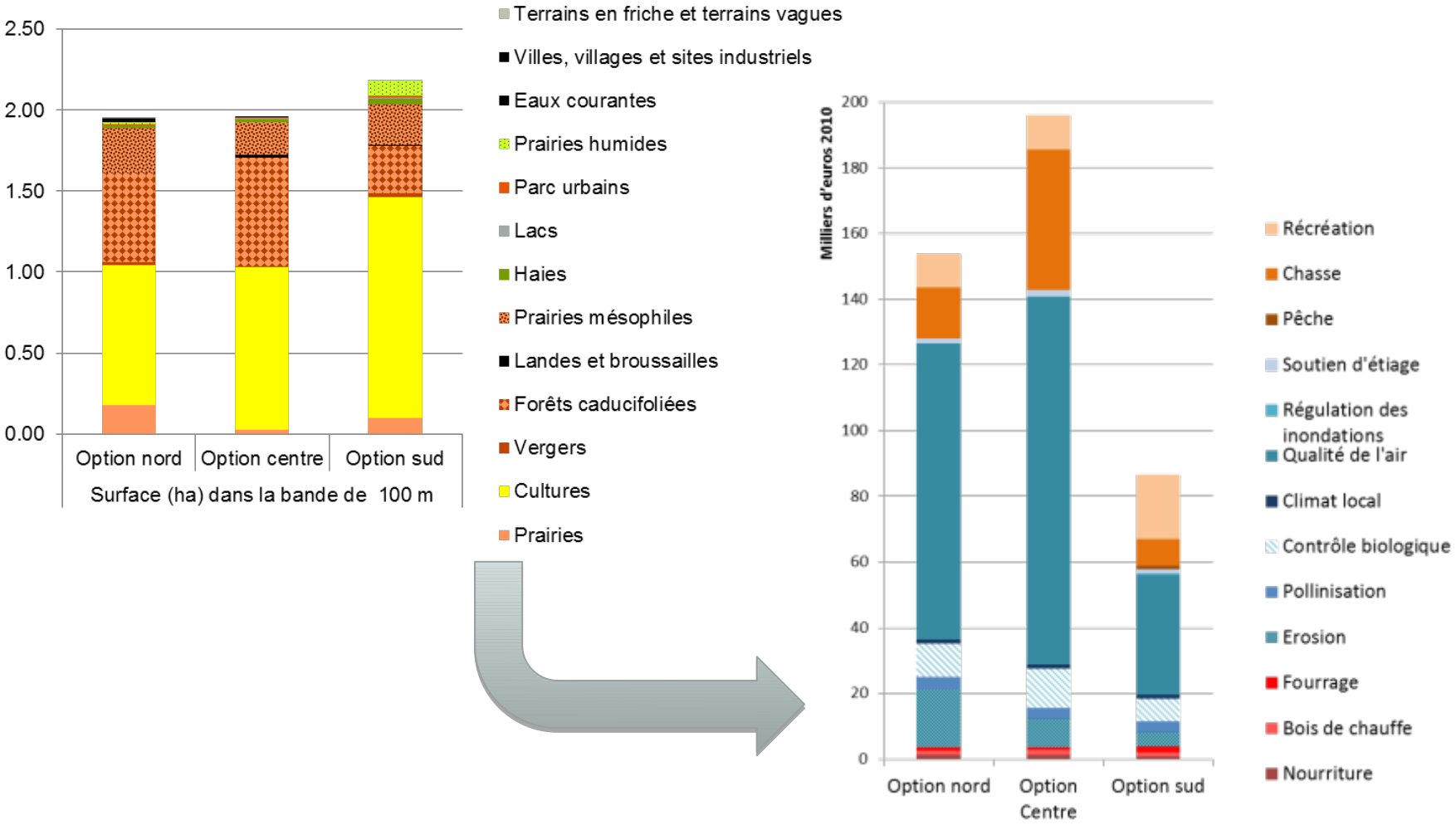
Indirect loss – landscapes' connectivity





Indirect ES loss

ES in the environmental impact assessment



ES in the Cost-Benefit Analysis

- linear infrastructure (120 km)

- Assessment made over 55 years of lifespan : 5 years of construction and 50 years of usage

- Estimated cost of the project : 2240 M d'€
- External costs incurred by third parties ~ 107 M d'€

→ ES loss ~ 44 M d'€ 2010
19 % of the NPV (without investment costs)
41 % of costs incurred by third parties

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