

# STATED PREFERENCE STUDY FOR THE EVALUATION OF LAND USE DYNAMICS USING HYBRID MODELLING

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**ABRESO**

Abandonment & Rebound of land use: Societal views

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Geosciences pour une Terre durable

**brgm**



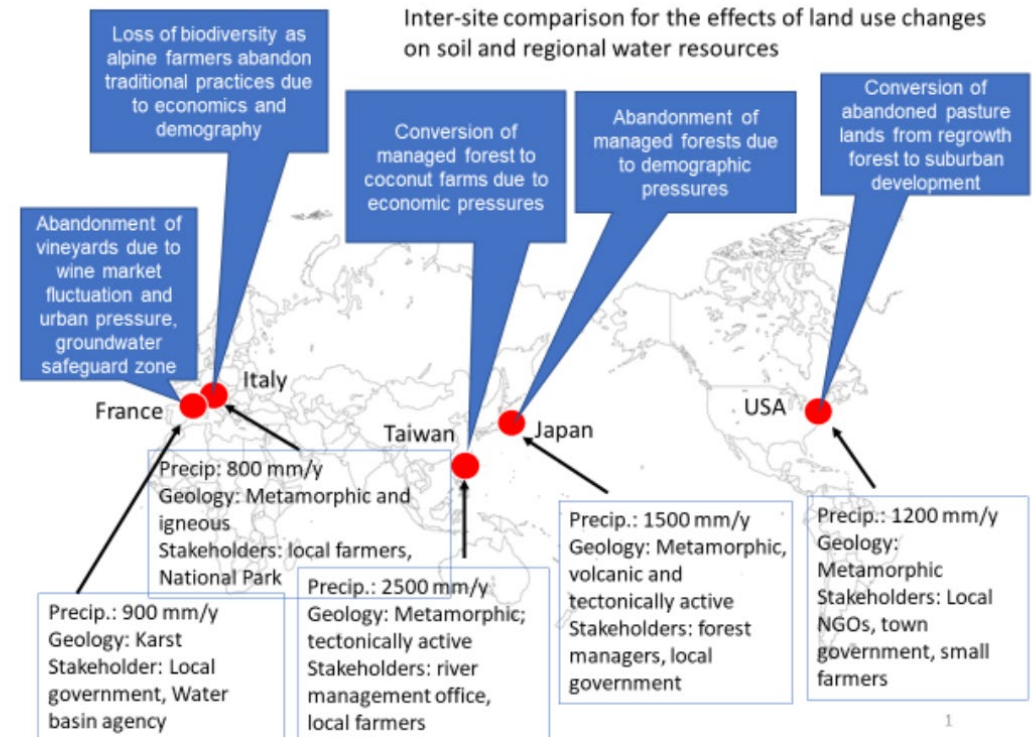
# THE ABRESO PROJECT

## Project objectives:

Develop a global transdisciplinary platform to understand the impacts of land abandonment on sustainability of soil and water resources

3 years project: 2021-2024

BELMONT Forum: Appel Soil sustainability, 2020



# OVERALL PROJECT APPROACH

Land use dynamics and their effects on hydrogeochemical cycles are poorly known

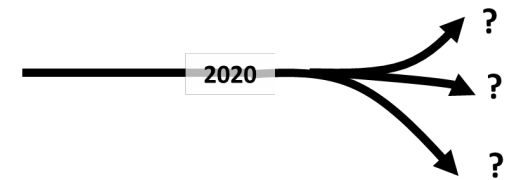
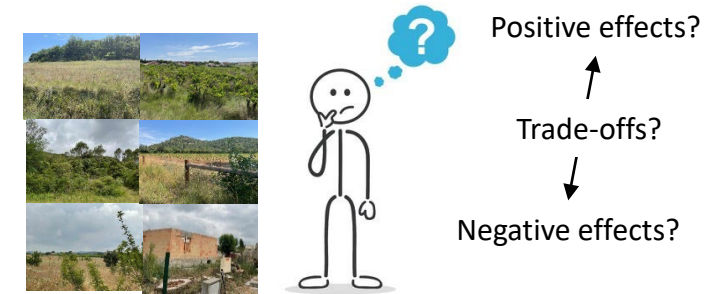
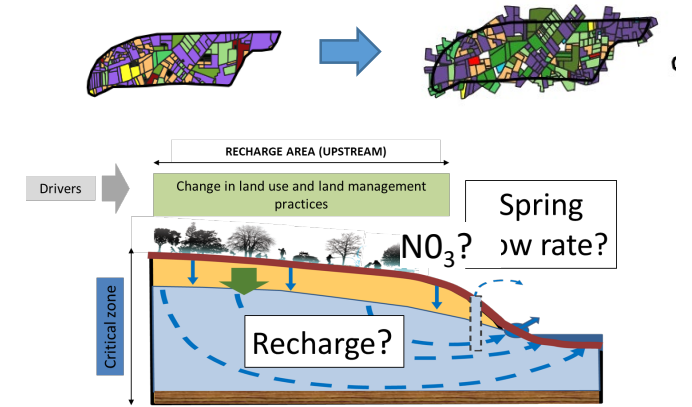
- Land use change characterization through stakeholders interviews and GIS analysis
- Hydrogeological modelling of the impact of past land use change

The structure of the perception of land-use dynamics need to be characterized: perceived land use change, positive and negative effects, preferred evolution.

- Qualitative survey of stakeholders' perceptions of land use change (2022)
- Common ABRESO survey

This work lays the foundations for constructing possible future land use scenarios, assessing their impacts on aquifers and analyzing the population's preferences (2023)

- Forthcoming hydrogeological modelling activities
- Stated preference survey on future land use scenarios (2023)

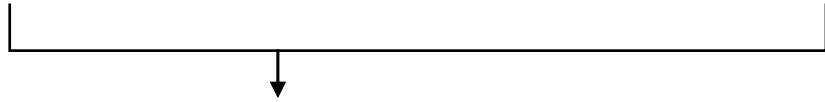


# INTRODUCTION

- Evaluating preference of watershed residents for land use change scenarios is key for the design of welfare improving land use management policies.
- Analyzing heterogeneity of preferences to better target policies and design transfer/compensation for losers/opponents
- Uncovering behavioral processes involved in the formation of individual preferences may also be useful to better design policy interventions: communication campaigns, facilitation of policy processes.

# HYBRID CHOICE MODELS (HCM)

- CE studies mostly focus on the estimation of trade-offs between attributes of the proposed project, and associated welfare compensations, while the process leading to the choice behaviour has been scarcely investigated
- Attitudinal (psychometric) models can uncover the motivations behind a certain behaviour



- HCM provide a framework to jointly model choice behaviour and the socio-psychological process leading to such behaviour
- Multiple layers with hierarchical relations and correlations among socio-psychological factors, with socioeconomic (observed) characteristics included as explanatory variables of latent factors, which in turn explain the choice behaviour

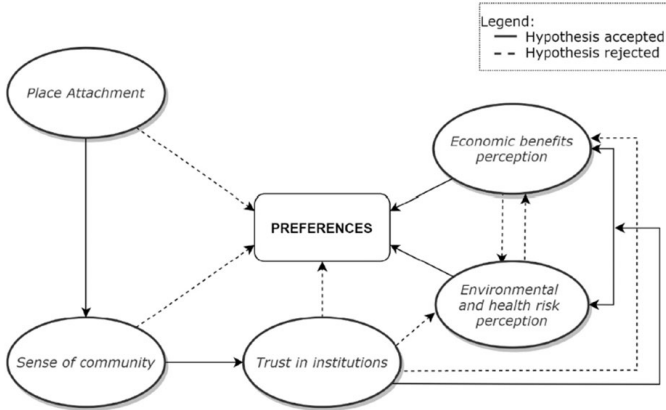
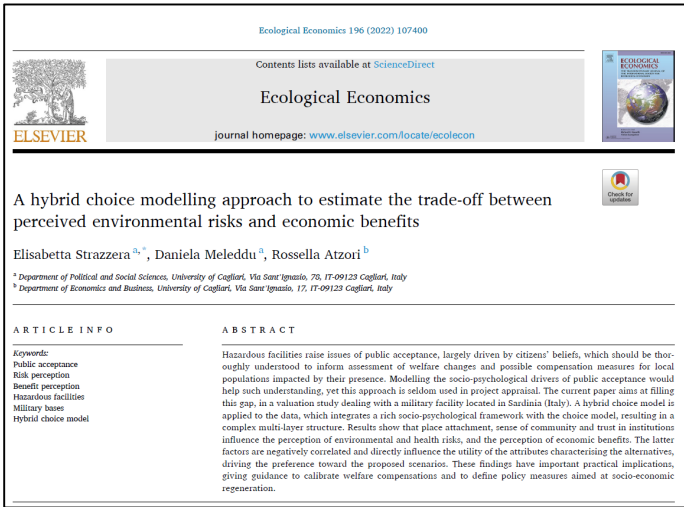
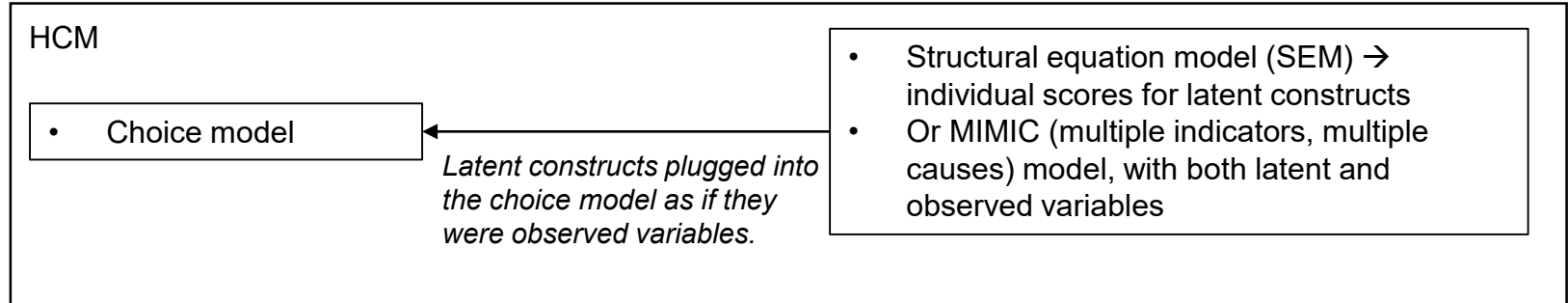


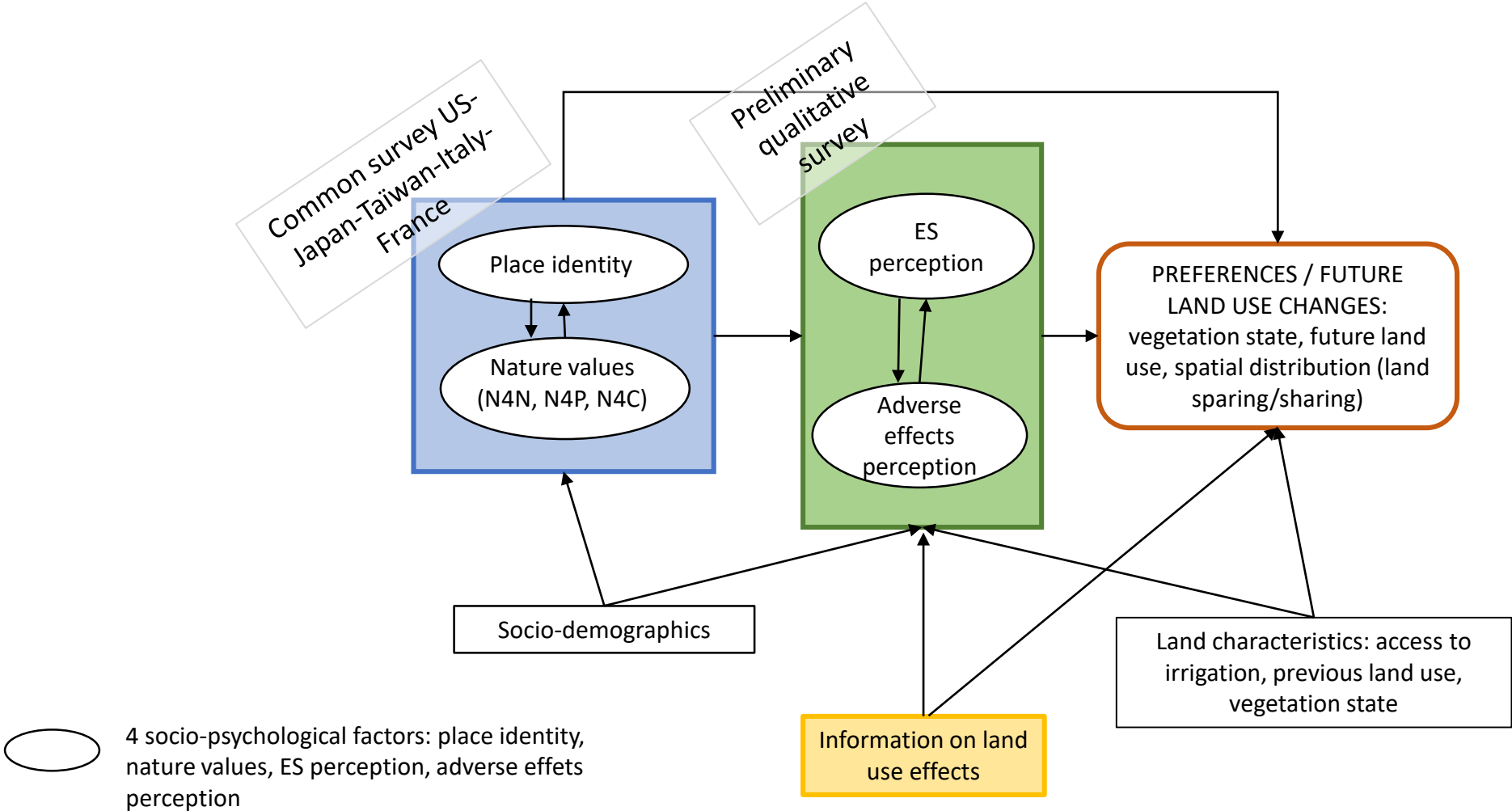
Fig. 2. Hypotheses tested in the structural equation model.



→ The socio-psychological part of the model exposes how attitudes and beliefs guide the respondent's decision making in the choice between alternative strategies

(Strazzera et al., 2022)

# CONCEPTUAL FRAMEWORK



# CONCEPTUAL FRAMEWORK

- **Nature values:**

Several distinct value bases for nature (Lambiza, Swim and Aviste,2022). Specifically, three underlying reasons for valuing nature stand out (Pascual et al., 2017)

- (1) Valuing nature for anthropocentric or instrumental reasons: Nature for People (N4P)
  - (2) Valuing nature for biocentric or intrinsic reasons: Nature for Nature (N4N)
  - (3) valuing nature for relational or collective-oriented reasons: Nature for Community (N4C)
- Evaluated in the international survey implemented

# CONCEPTUAL FRAMEWORK

## ▪ Nature values:

Veillez indiquer votre niveau d'accord ou de désaccord sur les affirmations suivantes.

	Pas d'accord du tout	Pas d'accord	Plutôt pas d'accord	Plutôt d'accord	D'accord	Tout à fait d'accord
Les écosystèmes sont précieux parce qu'ils favorisent une vie saine pour les plantes et les animaux.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Donner des droits légaux à la nature est extrême.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
La Nature mérite d'être en bonne santé.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Les écosystèmes ont le droit d'exister.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Les plantes et les animaux sont importants car ils font partie d'un écosystème florissant.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Les forêts sont importantes car elles fournissent des habitats pour les plantes et les animaux.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
La Nature est précieuse pour elle-même.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
L'environnement a le droit de s'épanouir.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



# CONCEPTUAL FRAMEWORK

- **ES and adverse effects perception**

Previous studies have shown that risk perception play an important role in explaining acceptability

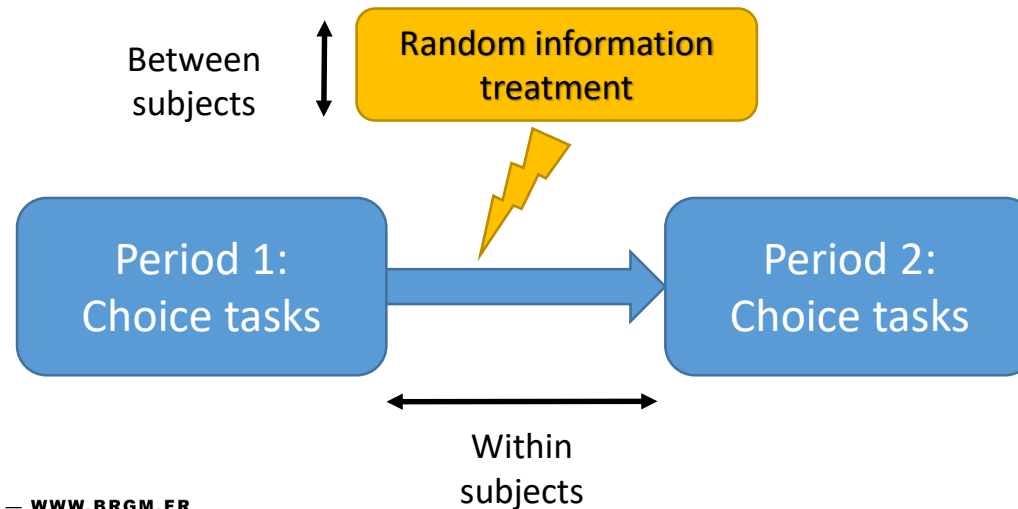
Benefit perception is also seen as positively associated with acceptance

Based on a qualitative survey of stakeholders' perceptions of land use change (2022)

## Conceptual framework

### ▪ Effect of information:

- Preference may be affected by information on the effects of land use change on different type of ES.
  - Water quality
  - Biodiversity
  - Fire risk
  - ...
- Effectiveness of information campaign may be tested in an experimental design with informational treatments : within-between subjects design (Lang et al., 2022)

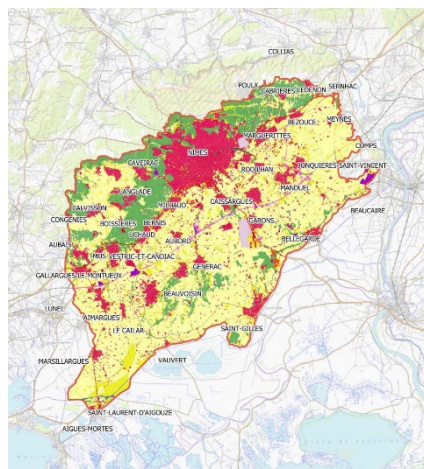


# Context

## Vistrenque and Costières

- Decline of vineyards and orchards due to market dynamics leading to abandoned land
- Large biodiversity offset program (LGV Nimes Montpellier) leading to the development of extensive grazing
- Biodiversity hotspot and water quality issues.
- Conflicting projects for abandoned land:

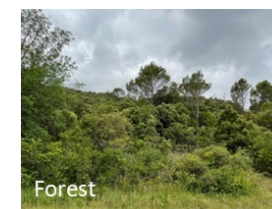
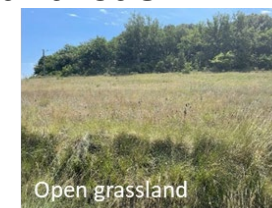
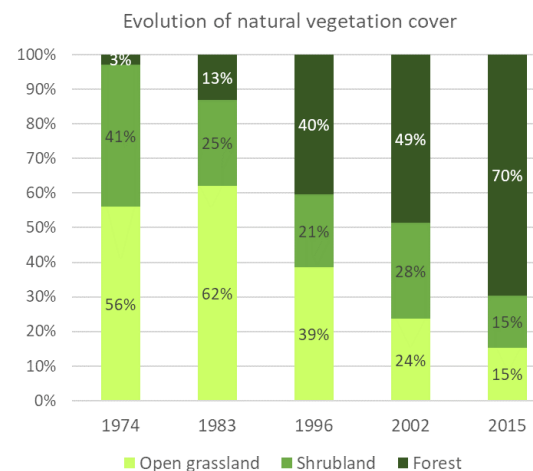
- Agriculture development for markets
- Food security (PAT)
- Biodiversity protection
- Water quality protection



## Lez impluvium : 3 major Land use changes from the 1970s

- From open grasslands to forests (> 50% of the study area): Progressive abandonment of livestock farming (sheep farming for wool) + of wood charcoal burning practices
- Urban sprawl (5% of the study area): Strongly influenced by the development of Montpellier
- Abandonment AND rebound of vineyards (17% of the study area): development of agroecologic practices

## → Future evolution of natural/ semi-natural vegetation in agricultural areas?






# CHOICE EXPERIMENT: LEZ

## On the Lez impluvium:

- Focus on the evolution of natural/semi-natural vegetation in agricultural areas (pastures → forests in the Western part; agro-ecological practices and infrastructures in vineyards in the Eastern part)
- Natural/ semi-natural vegetation = a key component of public policies to address different societal challenges (biodiversity, water, climate, food production)


→ A survey to analyze people's preferences for different agricultural land use change scenarios, leaving more or less space for natural/ semi-natural vegetation

### Spatial distribution nature vs agriculture



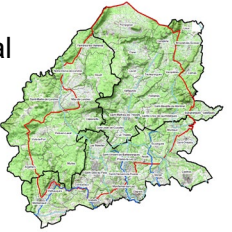
Land sparing      Land sharing

### Type of natural/ semi-natural vegetation



Herbaceous      Diverse      Trees

### Differing by landscape entity



Semi-natural areas (Western part)      Vineyards (Eastern part)

Agricultural land use change scenarios



Preferences

### Potential factors influencing preferences

- Perceived ES and adverse effects
- Place identity
- Nature values
- Living environment (urban/rural)
- Socio-demographics

# CHOICE EXPERIMENT : LEZ



## Potential land use changes in vineyard areas



**Land sparing - vineyards**

Conventional viticulture  
No semi-natural vegetation



**Land sharing - herbaceous**

Organic viticulture  
Inter-row grassing



**Land sharing - diverse**

Organic viticulture  
Inter-row grassing +  
Hedges + woodlands

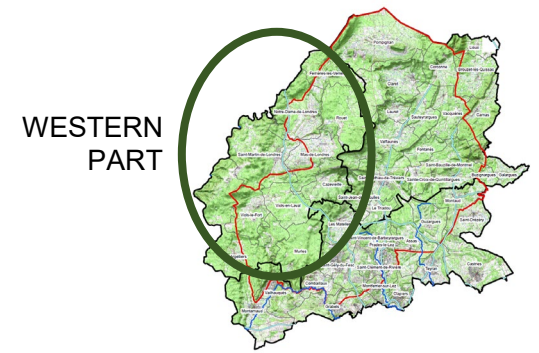


**Land sharing - trees**

Organic viticulture  
Vineyard agroforestry



# CHOICE EXPERIMENT: LEZ



## Potential land use changes in natural/ semi-natural areas



**Land sparing - forests**

Forests  
No pastoral activity



**Land sharing – trees**

Forests  
With pastoral activity



**Land sharing - diverse**

Semi-open forests  
With pastoral activity











**Land sharing - herbaceous**

Semi-natural grassland  
With pastoral activity



# CHOICE EXPERIMENT: LEZ

Municipalities of the Lez impluvium are thinking about how to mobilize nature in land use planning in order to respond to different societal challenges (biodiversity, water, climate, food production). You will be confronted with several choice situations. In each choice situation you will need to choose among different scenarios of future land use in vineyards (attribute 1), in natural and semi-natural areas (attribute 2) and different levels of local tax associated (attribute 3).

<p><b>ATTRIBUTE 1</b> Vineyards areas</p>	<p><b>LAND SPARING VINEYARDS</b></p>  <p>Conventional viticulture No semi-natural vegetation</p>	<p><b>OR</b></p> <p><b>LAND SHARING HERBACEOUS</b></p>  <p>Organic viticulture Inter-row grassing</p>	<p><b>OR</b></p> <p><b>LAND SHARING DIVERSE</b></p>  <p>Organic viticulture Inter-row grassing + hedges + woodlands</p>	<p><b>OR</b></p> <p><b>LAND SHARING TREES</b></p>  <p>Organic viticulture Vineyard agroforestry</p>
<p><b>ATTRIBUTE 2</b> Natural and semi-natural areas</p>	<p><b>LAND SPARING FORESTS</b></p>  <p>Forests No pastoral activity</p>	<p><b>OR</b></p> <p><b>LAND SHARING TREES</b></p>  <p>Forests With pastoral activity</p>	<p><b>OR</b></p> <p><b>LAND SHARING DIVERSE</b></p>  <p>Semi-open forests With pastoral activity</p>	<p><b>OR</b></p> <p><b>LAND SHARING HERBACEOUS</b></p>  <p>Semi-natural grassland With pastoral activity</p>
<p><b>ATTRIBUTE 3</b> Contribution to local tax</p>	<p><b>20, 40, 60, 80, 100 or 120 €/household/year</b></p>			

## CHOICE EXPERIMENT VISTRENQUE

- Evaluate preference for policies aiming at redeveloping abandoned land.
- Preferences are determined by :
  - Characteristics of abandoned land:
    - Type of vegetation : herbaceous, tree cover
    - Past land use: vineyard, food crops
    - Agronomic potential: access to irrigation or not.
    - Geographic area: peri-urban, agriculture, biodiversity rich/natural
  - Type of land development:
    - Economic development/tradition: vineyard
    - Food autonomy: food crops
    - Biodiversity: extensive pasture.


## CHOICE EXPERIMENT VISTRENQUE

- Several types of abandoned land exist in the vistrenque territory. Municipalities envisage to invest in the management of abandoned land. You will be confronted with several choice situation. In each choice situation you will need to choose among different scenarios of use of abandoned land: characterized by the type of land use and different level of local tax associated.

	<u>Vineyard</u>	<u>Cereal</u>	<u>Extensive grazing</u>	No action
				
Abandoned land with tree cover/ <u>shrubland</u>				
Contribution to local tax <u>tax</u>	20€/yr	10€/yr	5€/yr	0€/yr <u>yr</u>
<u>Choice</u>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



# CHOICE EXPERIMENT VISTRENQUE

	<u>Vineyard</u>	<u>Cereal</u>	<u>Extensive grazing</u>	No action
				
Abandoned vineyard				
Contribution to local tax <u>tax</u>	10€/yr	5€/yr	10€/yr	0€/yr <u>yr</u>
<u>Choice</u>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>