



ADAPTATION TO CLIMATE CHANGE IN THE
AGRICULTURAL SYSTEM

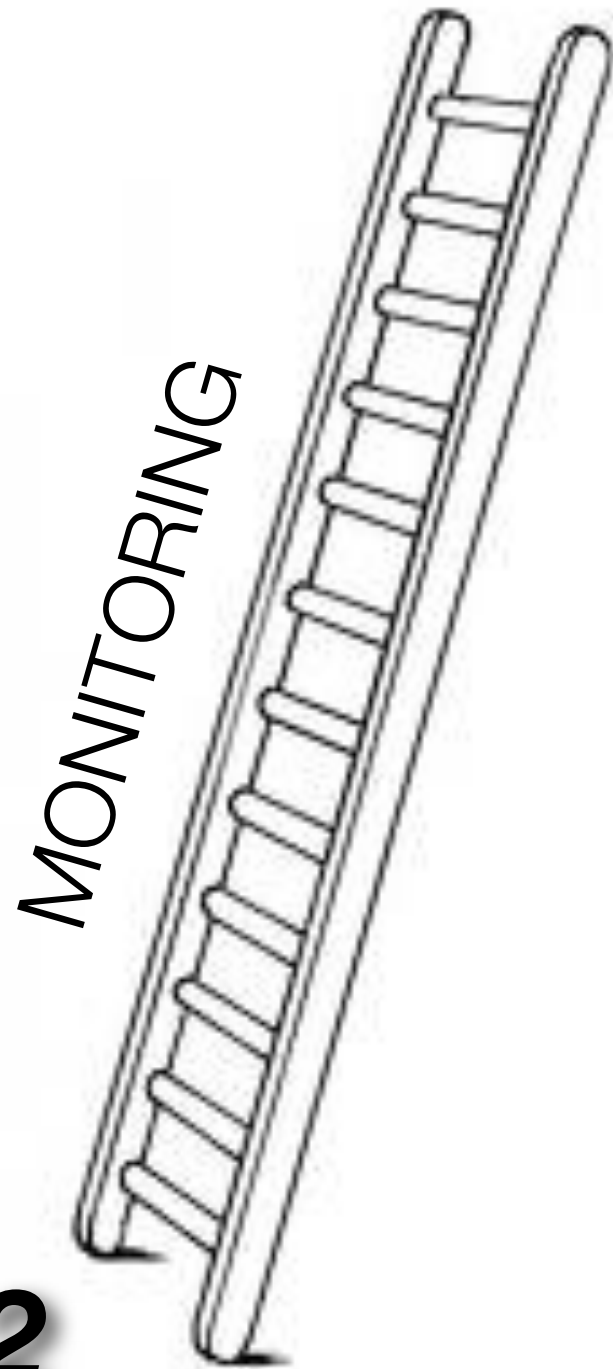
INTENSIVE PROGRAM SUMMER SCHOOL: LANDSCAPE AND CLIMATE CHANGE

OLOT, CATALUNYA (SPAIN), 9-21 JULY 2012

CARLOTA OLIVEIRA | JOANA NUNES | LAURA ROCCA | ROBERTA DE BOIS

SCENARIO

2050



2012

TEMPERATURE: +0,9°C

POPULATION: +40%

PRECIPITATION: -11,9%

WIND: +1,3%

SEA LEVEL: +80CM

MAX.

TEMPERATURE: +0,2°C

POPULATION: +14%

PRECIPITATION: -0,7%

WIND: +6,7%

SEA LEVEL: +20CM

MIN.

- Monitoring of the environmental indexes;
- Economic monitoring returning investment.



Population growth:

- increase in water, food and energy demand;
- further emergence of conflicts between the increasing housing demand and environmental protection.



Higher temperature:

- shorter biological cultivation cycle;
- increase in evapotranspiration;
- increase of fire risk.



Decrease of precipitation:

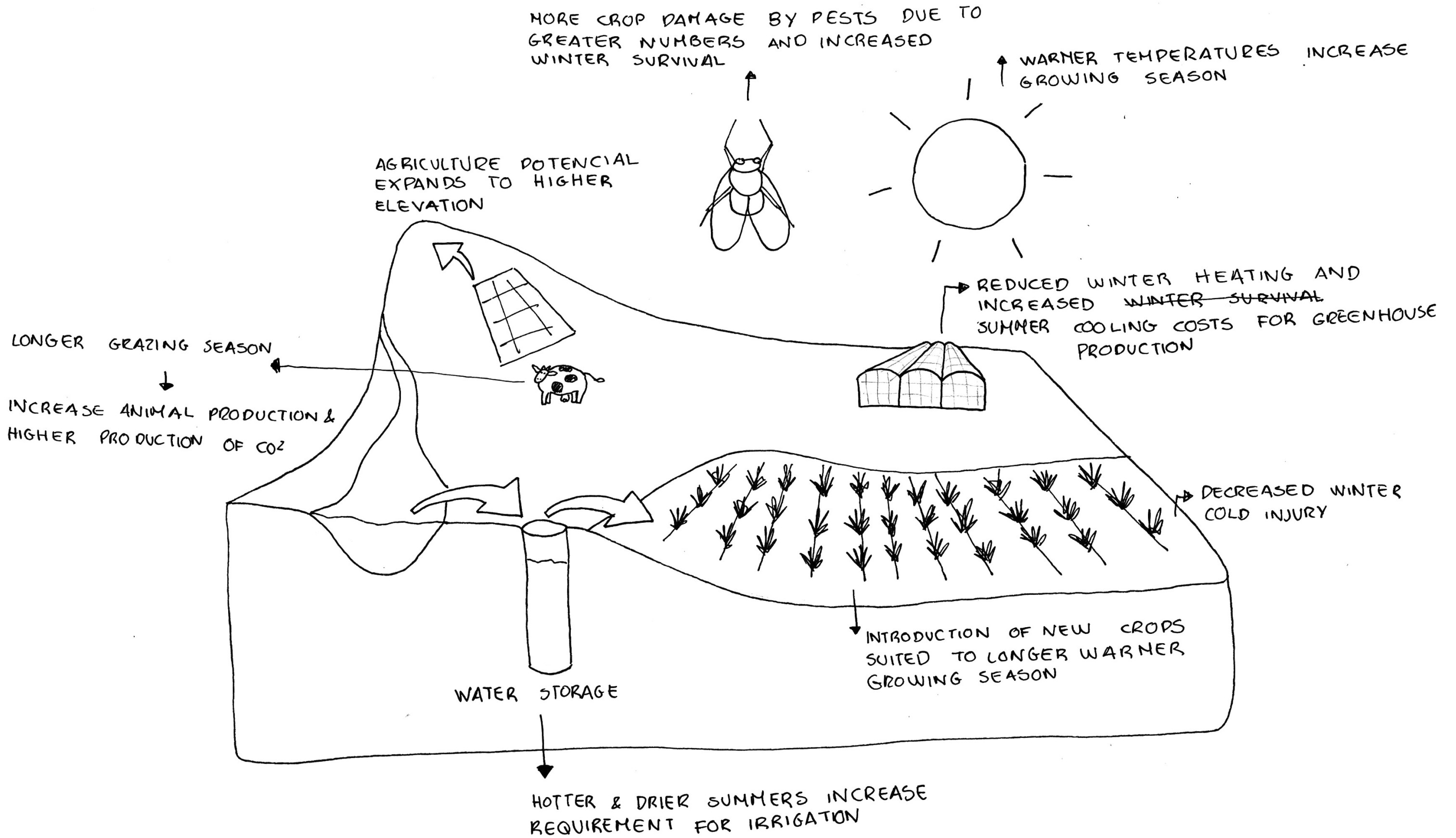
- increase of drought risk.

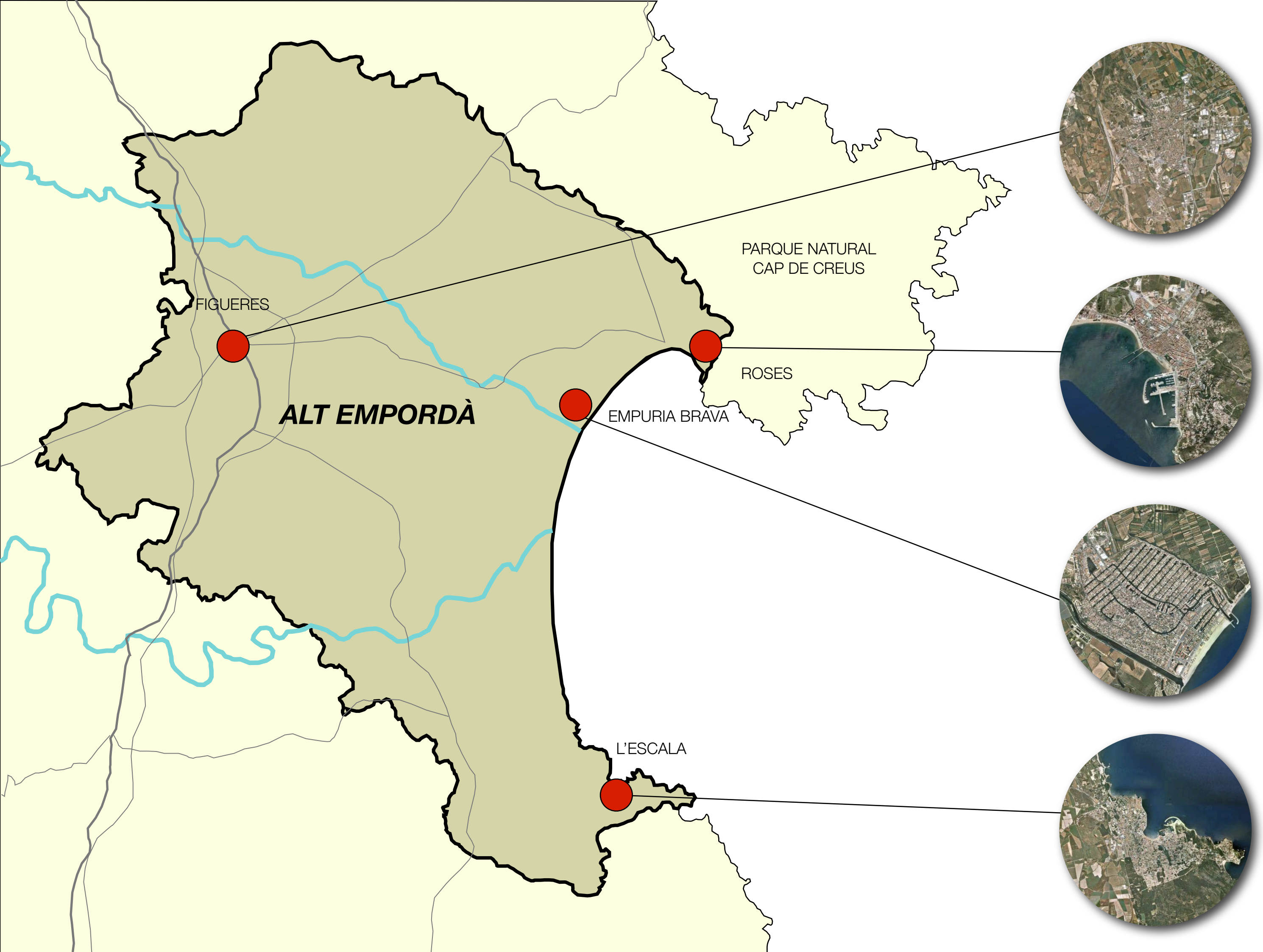


Increase in Energy demand:

- increase in the exploration of natural resources;
- increase in environmental stresses and conflicts

IMPACTS ON AGRICULTURE







Peculiarity of the area:

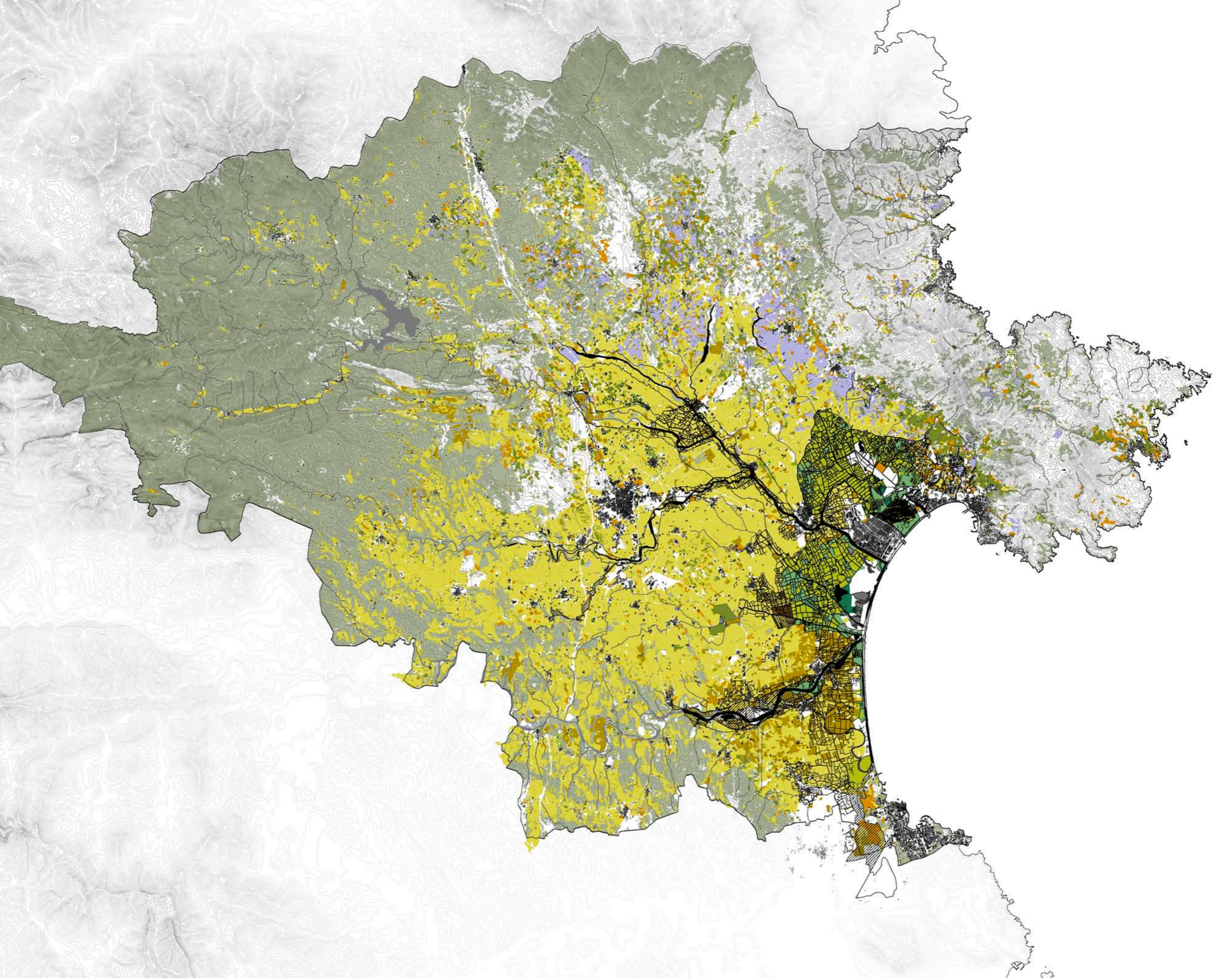
Two rivers: Muga and Fluvià

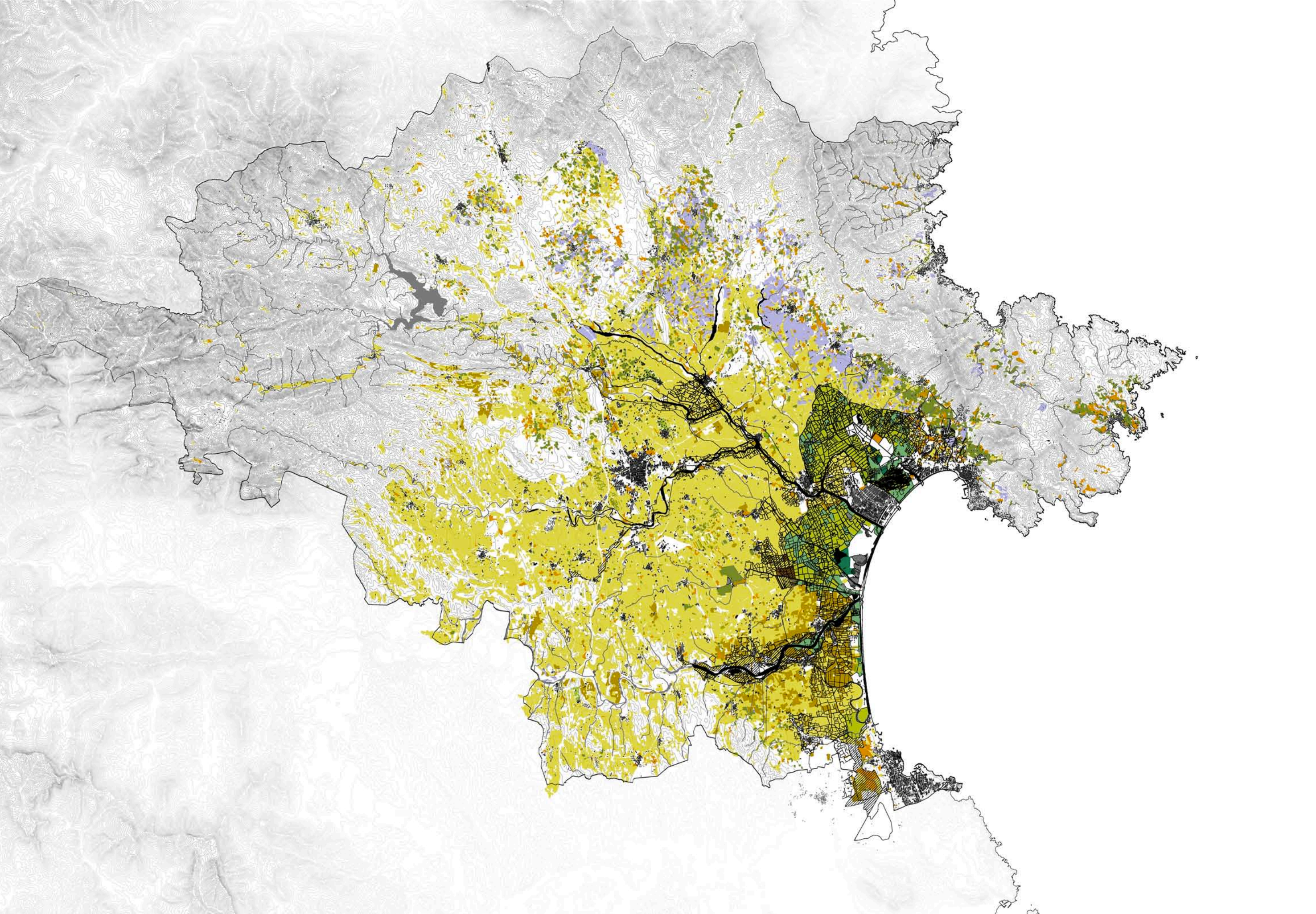
Three important centres: Figueres, Roses, l'Escala

Many important protected areas

Heterogeneous landscape, with different type of culture fields with different shapes, orientations and dimensions: radial and smaller near centers and longer and narrower in the internal section;

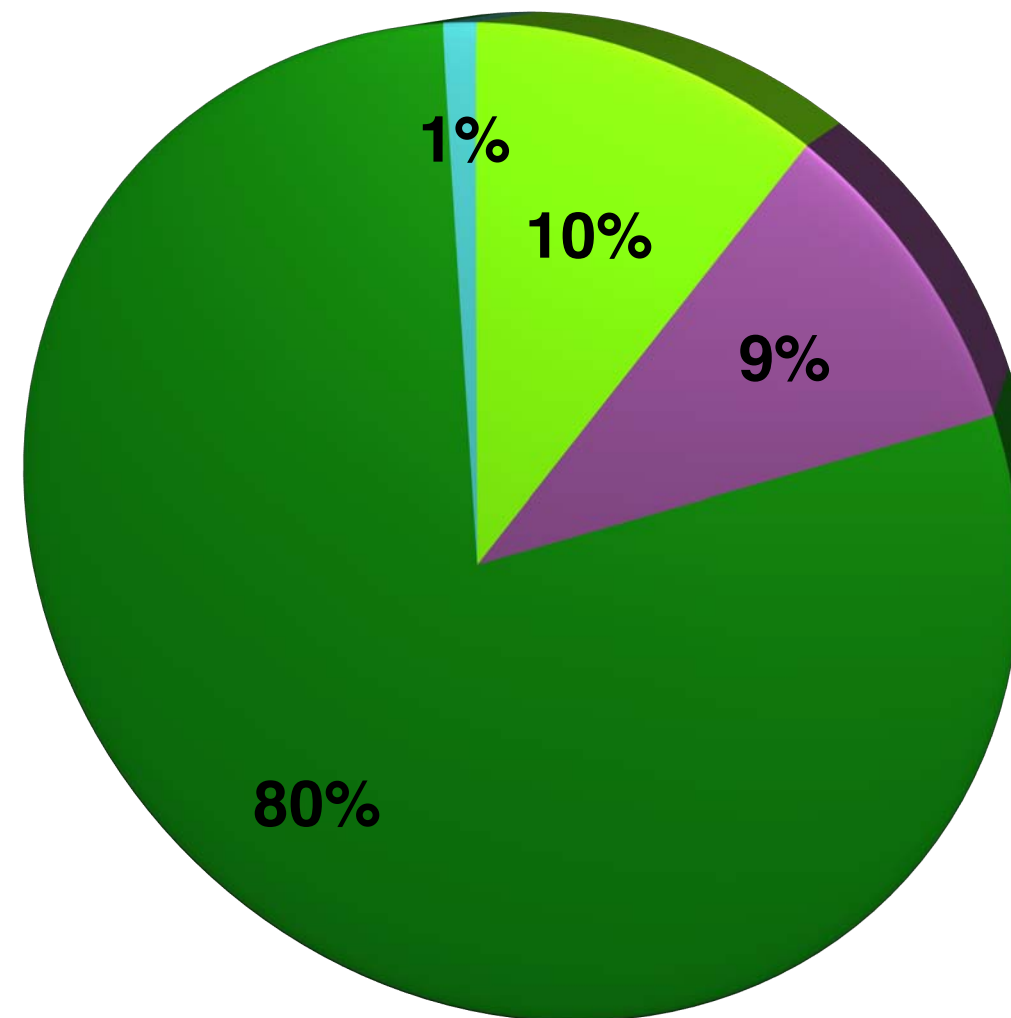
The most important agriculture of the area are: olives and vineyards, in the north section, corns, and fruit trees in the south section.







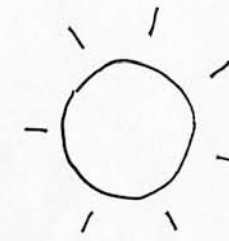
Use of the soil: Plana de l'Empordà



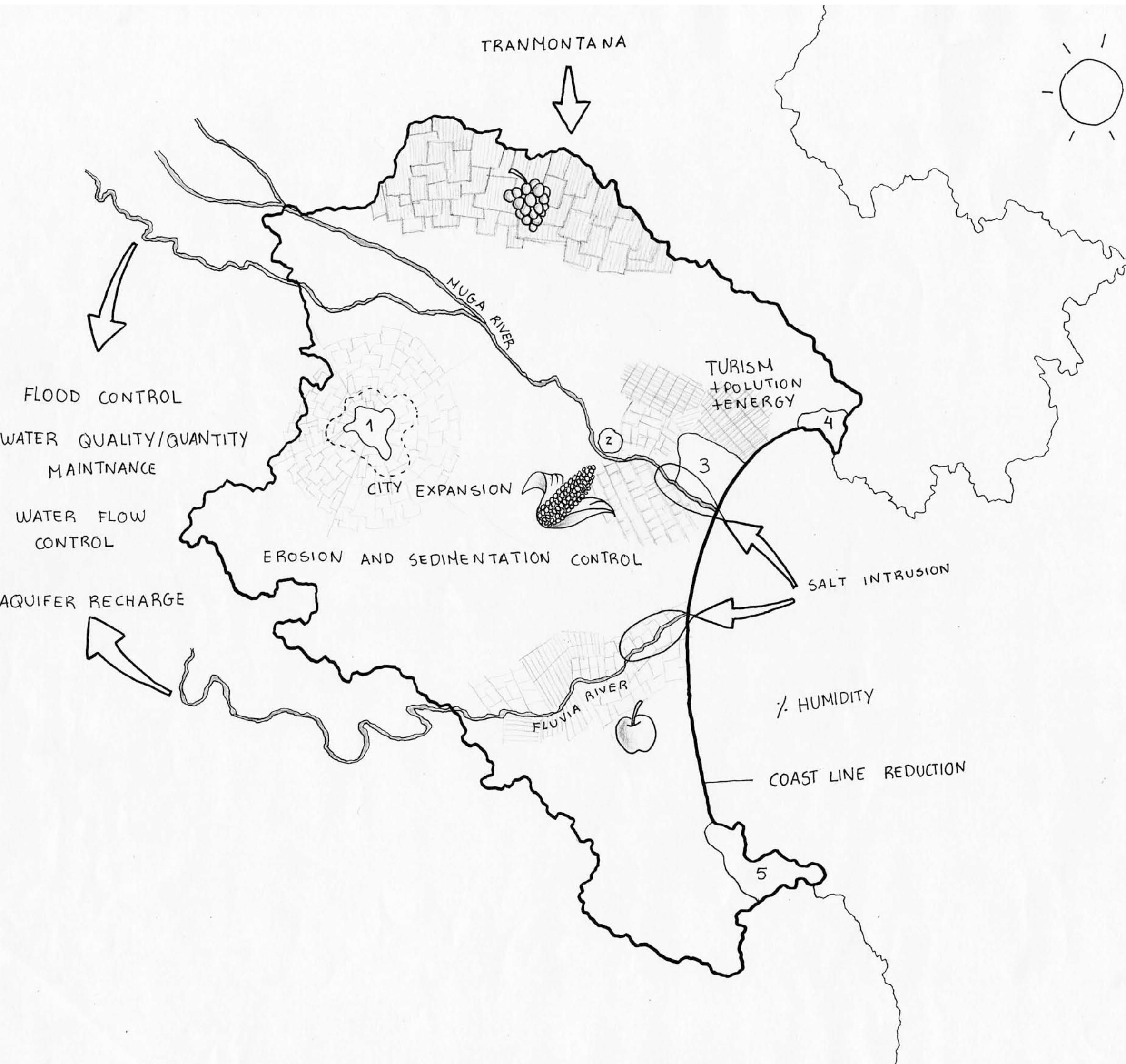
- Vegetació Espontània
- Espai agrícola
- Espai construït
- Morfologia litoral i l'àmies d'aigua

Font: Elaboració pròpia a partir de la cartografia d'usos i cobertes del sòl (ICC)

TRANMONTANA



TEMPERATURE AND INSULATION



- 1-FIGUERAS
- 2-CASTELLO D'EMPURIAS
- 3-EMPURIA BRAVA
- 4-ROSES
- 5-L'ESCALA

PERCEPTION / VISION

LEGIBILITY

COMPLEXITY

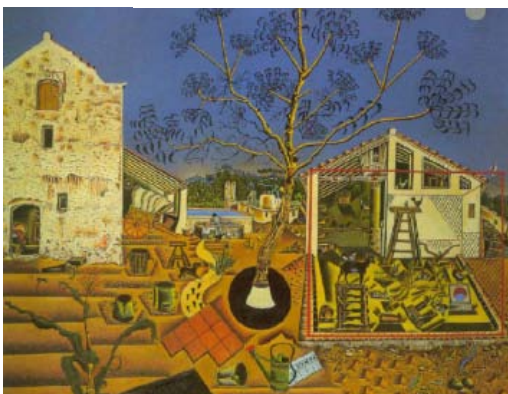
COHERENCE

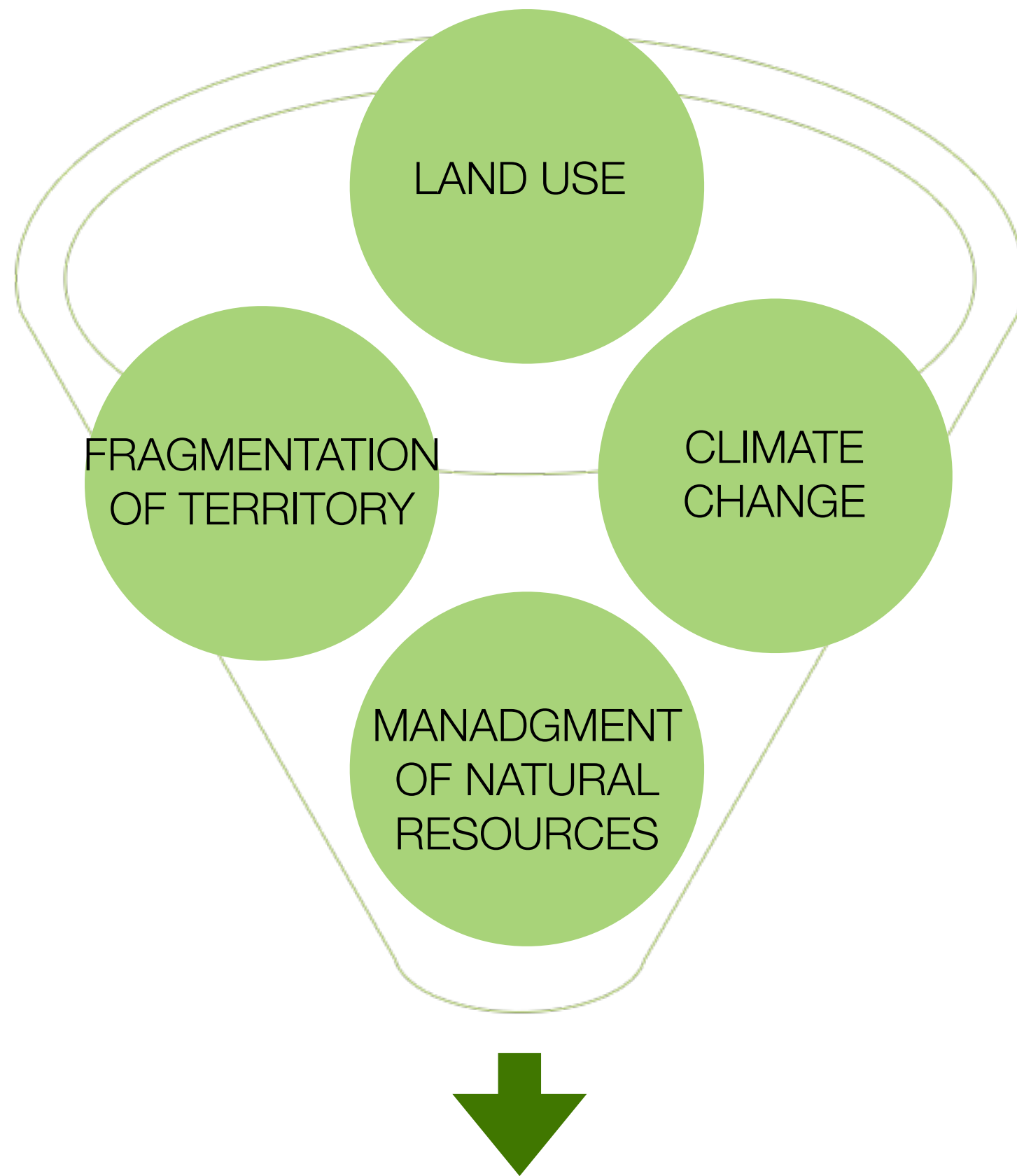
Landscape not as individual components but as a set of relationships

The landscape is constantly changing

The landscape has always been a historical dimension, then can take historical and cultural value of property

Ecological *Spiritual* *Historical* *Historical* *Ecological*
Historical *Social use* *Aesthetic* *Spiritual* *Social use*
Symbolic and identity *Ecological* *Symbolic and identity*





HOW CAN THE PERCEPTION CHANGE ?



STRENGTHS

WEAKNESSES



OPPORTUNITIES

THREATS

BIODIVERSITY

<i>STRENGTHS</i>	<i>WEAKNESSES</i>
<p>Diversification of cultivation typologies in relation to the characteristics of different areas as sea, river, etc.</p>	<p>Potentials due to diverse cultivation patterns related to specific territorial characteristics are not fully achieved.</p>
<i>OPPORTUNITIES</i>	<i>THREATS</i>
<p>Improvement, through landscape heterogeneity, of perceptual/visual landscape values.</p> <p>Increase in biodiversity: increase the adaptation capability of the landscape in relation to climate change.</p> <p>Introduction of cultivations which are localization of the cultures thinking about local characteristics.</p> <p>Promotion of km0 agricultural production and local landscape valorization</p>	<p>Impossibility to find incentives (monetary or not) capable of promoting a diversified production supply.</p> <p>Change in seasonality and biological agricultural cycles.</p> <p>Increase in transport costs due to fossil fuel scarcity.</p>

TOURISM

<i>STRENGTHS</i>	<i>WEAKNESSES</i>
<i>OPPORTUNITIES</i>	<i>THREATS</i>
<p>Landscape heterogeneity allows a diversified touristic supply.</p>	<p>Negative impacts of tourism on the landscape due to lack landscape value awareness.</p>
<p>Further diversification of touristic supply schemes, in order to increase territorial and ecological awareness.</p> <p>Possible increase of touristic demand due to development of specific strategies.</p> <p>More uniform distribution of tourism within the territory.</p>	<p>Increase in pollution of natural resources due to high exploitation.</p> <p>Conflict between urban sprawl and natural and agricultural protection objectives.</p>

WATER MANAGMENT

<i>STRENGHTS</i>	<i>WEAKNESSES</i>
<i>OPPORTUNITIES</i>	<i>THREATS</i>
<p>Possibility of storing water in order to use it gradually during time. (in case of high precipitation)</p>	<p>Decrease in water availability for agricultural and domestic uses.</p>
<p>Possibility to find less water demanding agricultural schemes.</p>	<p>Increased probability of extreme events connected with intense rainfall periods: flood risk, soil saturation, damaging of crops.</p> <p>Increase in irrigation costs.</p> <p>Increase in cultivations prices due to scarcity.</p>

WATER PROTECTION

<i>STRENGTHS</i>	<i>WEAKNESSES</i>
<p>Fundamental role of the river for water supply and for the transportation of nutrients in the soils</p>	<p>Unsustainable use of the hydric resource</p>
<i>OPPORTUNITIES</i>	<i>THREATS</i>
<p>Possibility of improve water quality through sustainable river management.</p> <p>Possibility to preserve water quantity to face increasing demand.</p>	<p>Increase in the risk of water contamination due to the use of chemical fertilizers in agricultural production.</p> <p>impossibility of using water for agricultural use due to highly salty water in the coastal area.</p>

ECOSYSTEM

<i>STRENGTHS</i>	<i>WEAKNESSES</i>
Presence of important ecosystems and protected areas	Too intensive exploitation of natural resources due to the lack of a proper management system and to insufficient awareness about the value of local territory.
<i>OPPORTUNITIES</i>	<i>THREATS</i>
Introduction of economic and agricultural schemes which do not damage ecosystems and which improve the productive and ecological value of the territory .	Irreversible degradation process caused by inefficient management choices.

ENERGY

<i>STRENGTHS</i>	<i>WEAKNESSES</i>
Use of heliolic resource.	Wrong localization of cultivations with respect to wind direction.
<i>OPPORTUNITIES</i>	<i>THREATS</i>
Amount of energy saved	Irreversible degradation process caused by inefficient management choices. Negative visual impact in the landscape.

How can we use or improve each **Strength** ?

What can we do to reduce or remove each **Weakness** ?

How can we make use of each **Opportunity** ?

What can we do to reduce or remove each **Threat** ?



OBJECTIVES

Contribute to sustainable agriculture and rural development in areas with high disaster risks and improved livelihoods for the rural population;

Development of adaptation measures and policies related to the reduction of impacts of climate change in the field of agriculture, forestry and water management;

Promote a different kind of tourism to reduce the touristic demand in the coast;

Increase the use of renewable resources in the agriculture system;

Redefine the relationship in the local system between town and country;

Promote km 0 agriculture;

Reorganization of the agriculture system keeping on the diversity of the current landscape.

STRATEGIES

Water

Improve the use of irrigation, with water saving techniques
Choice of cultivation typologies less-water demanding
Reorganization of agriculture patterns with a more reasoned system.

Tourism

Insert some services to attract other typology of tourism, that it could be more sustainable.

Biodiversity and Landscape

Keep on the traditional structure of the historical agriculture areas though the cultures will have to be adapt at the climate change
Connect the areas with an important landscape value, to create a network

Energy

Improve the use of renewable energy in the agriculture activities

Social

Propose awareness activities and environmental education of the farmers on procedures and techniques for optimal use of resources
Redefine the relation in local system between city and country through with connection system.

ACTIONS

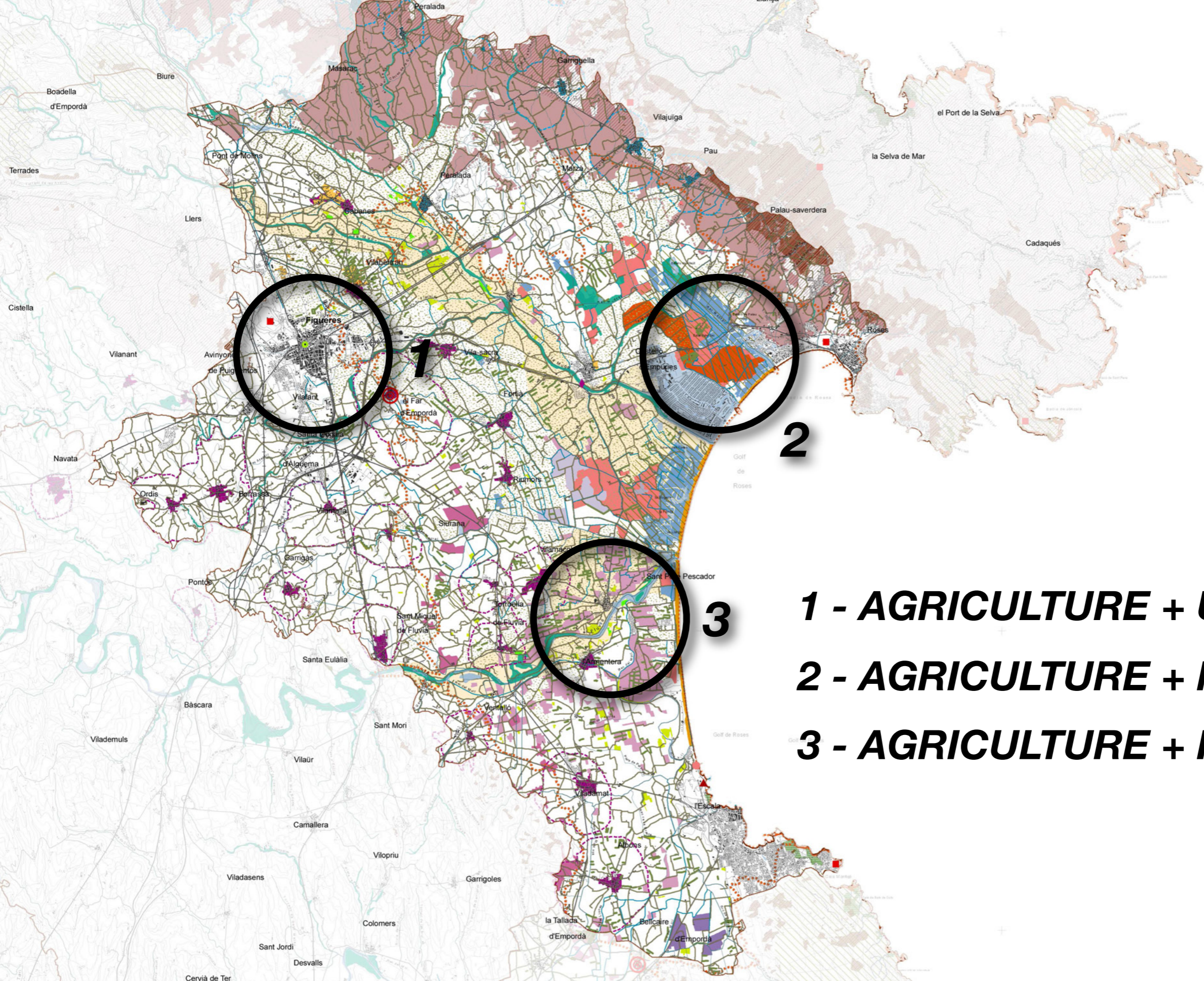
The actions to be developed should lead to a business and economical diversification. They have to be implemented in all the economic sectors, in order to guarantee a concrete integration among different activities within the territory.

Those actions aim to enhance the endogenous rural resources. This action can be achieved by protecting and safeguarding the environmental and landscape values, with particular regard to future challenges that will be introduced by climate changes.

GOOD PRACTICES

Good landscape practices are aimed not only at the implementation of monitoring systems focused on climate changes in Mediterranean landscapes considered. They would also improve the awareness about the **cultural identity of the territory**.

- **Propose the enhancement** of a complex area starting. It is necessary to recognise and reinterpret from the specificity of the socio-cultural landscape, also considering its environmental conditions and the new socio-economic and functional dynamics.
- It provides a new meaning for the existing elements and it offers new spaces in order to **improve the social perception of local landscape values**.
- Promoting a new and more aware “landscape culture” through awareness and the promotion of **active participation** of local communities.
- Designing activities capable of **involving the public** through massive communication strategies.

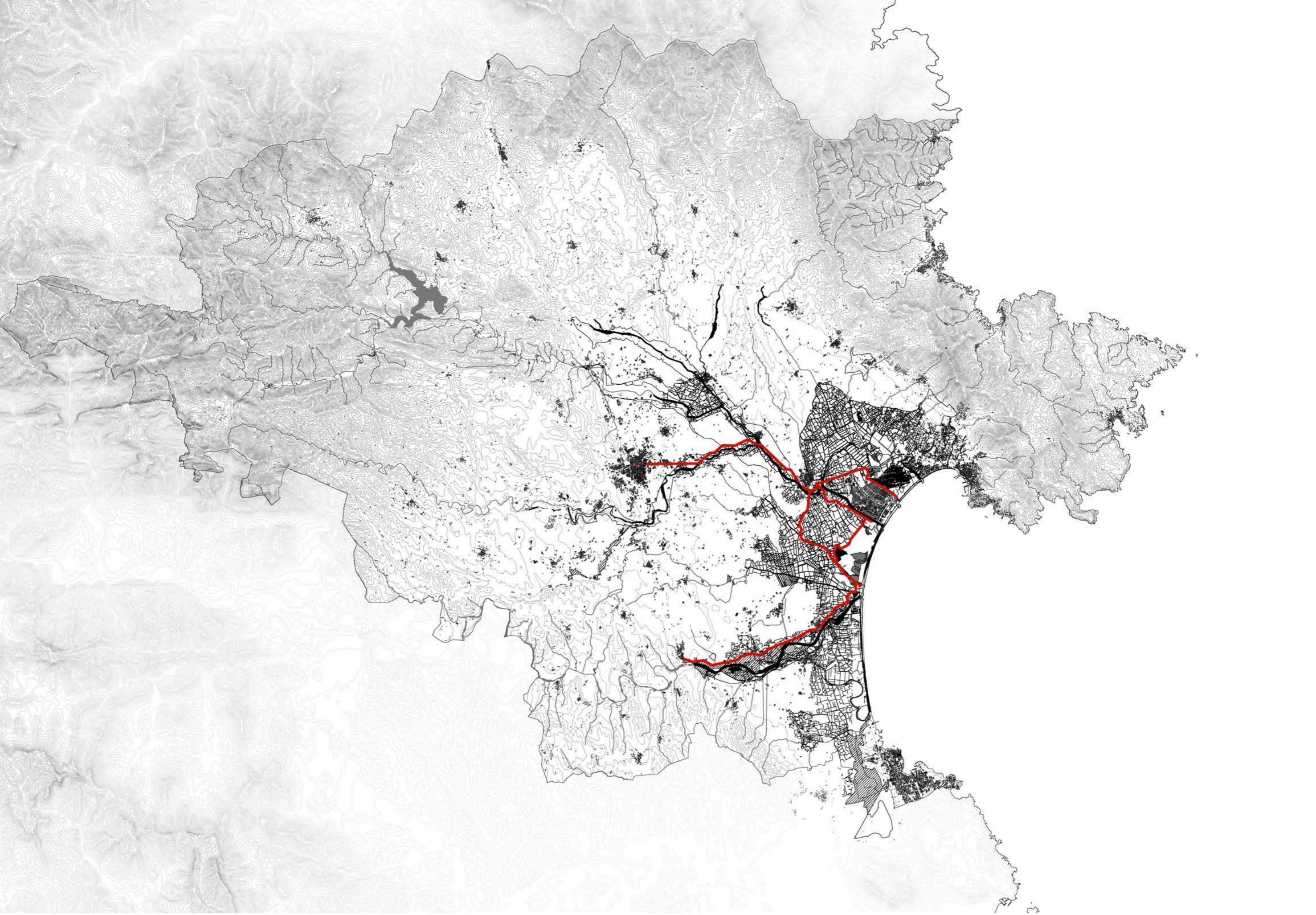


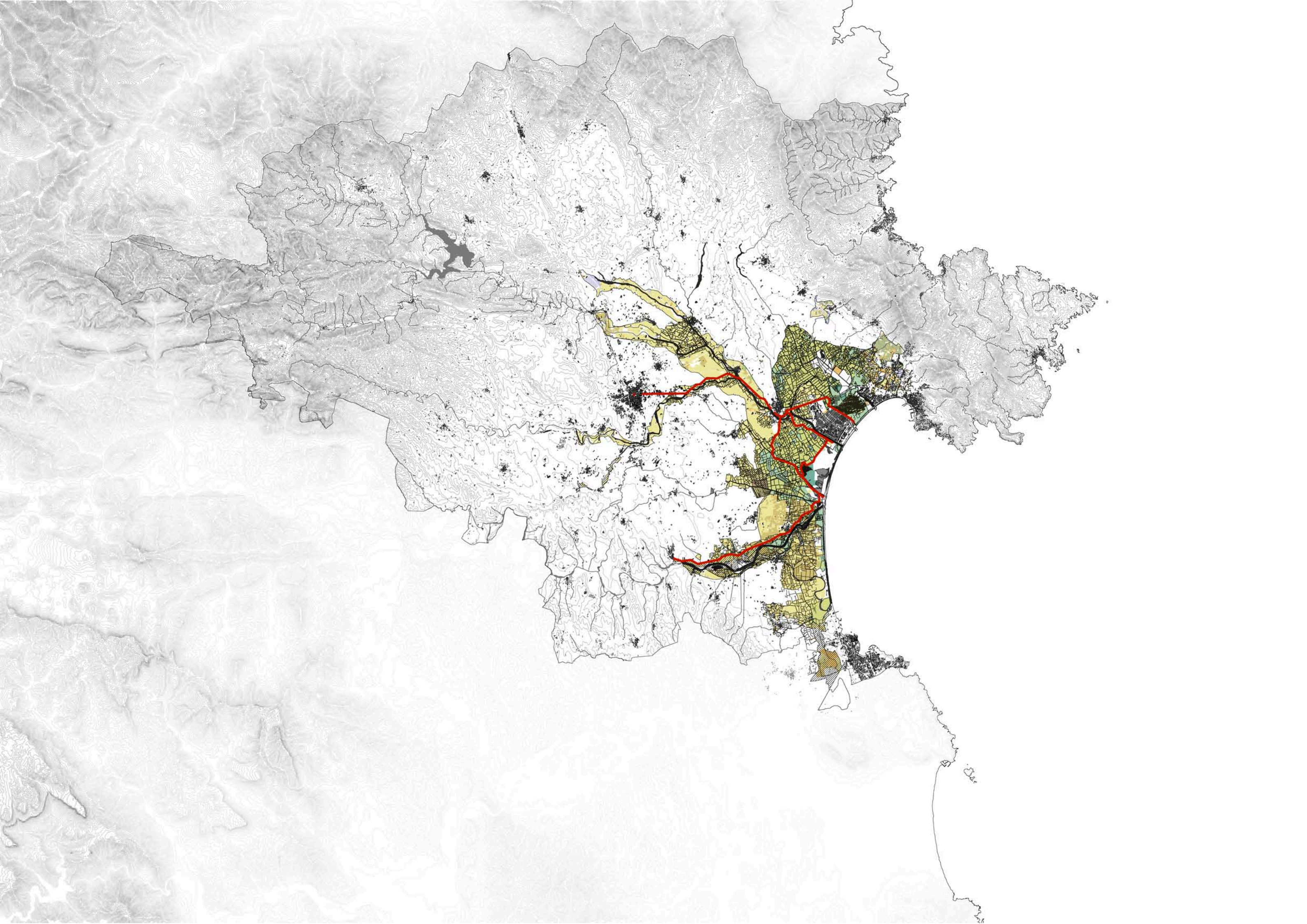
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2

3

- 1 - AGRICULTURE + URBAN AREA**
- 2 - AGRICULTURE + NATURAL PARK**
- 3 - AGRICULTURE + RIVER + COAST**





1_AGRICULTURE + URBAN AREA

An important centre:
Figueres;

The urban gardens
fragmentations;

High quantity of citrus
trees.



URBAN HORT



CROPS



CYTRUS TREE



2

2

2

2

3

4

4

3

3

5

5

2

1

1

2

1

1

1

1

1

2050 *AGRICULTURE + URBAN AREA*

Questions

Fragmentation of the territory caused by rivers, streets and different types of cultures;
Reorganization of irrigation system because of the loss of water;
Lack of connections between the two most important centres: Figueres and Castellò d'Empuries;
The inefficient promotion of natural resources ;
The localization of an industry area.

Strategies to solve these questions

- 1_ Mitigate the border between industrial areas or urban areas and the natural landscape;
- 2_ Protect areas near the river to valorize them;
- 3_ Maintain the traditional structure and quality of air and the fields;
- 4_ Encourage the rural tourism by new attractive services;
- 5_ Connect Figueres to other smaller towns.

2_AGRICULTURE + RIVER + COAST

Small portions of enclosure areas;
Some abandoned fields;

High quantity of citrus trees;
Arable coltures;

Two rivers;
Coast.



CROP



ENCLOSURES



CYTRUS TREES



6

7

2

5

4

2

3

5

4

1

2050 *AGRICULTURE + RIVER + COAST*

Questions:

Sea level elevation;

Salt intrusions;

Vulnerability of citrus trees at climate change

Strategies to solve these questions:

- 1_Link the urban system to the coast by a connection system, localized near the river, that could be floodable;
- 2_Link the enclosures system with other typologies of cultures;
- 3_Exploit the abandoned fields inserting plant species vary that could tolerate salt-affected soils;
- 4_Organize the canals system to improve management of water resouces;
- 5_Encourage the rural tourism by new attractive services;
- 6_Link areas characterized by hight biodiversity where there are oliveyards and vineyards;
- 7_Improve the irrigations system to satisfy the request of water.

3_AGRICULTURE + NATURAL PARK

Enclosure areas;
Oliveyards and Vineyards;
Tourism;

Arable coltures;
Wetlands

Two rivers:Muga and Fluvia;
Coast.



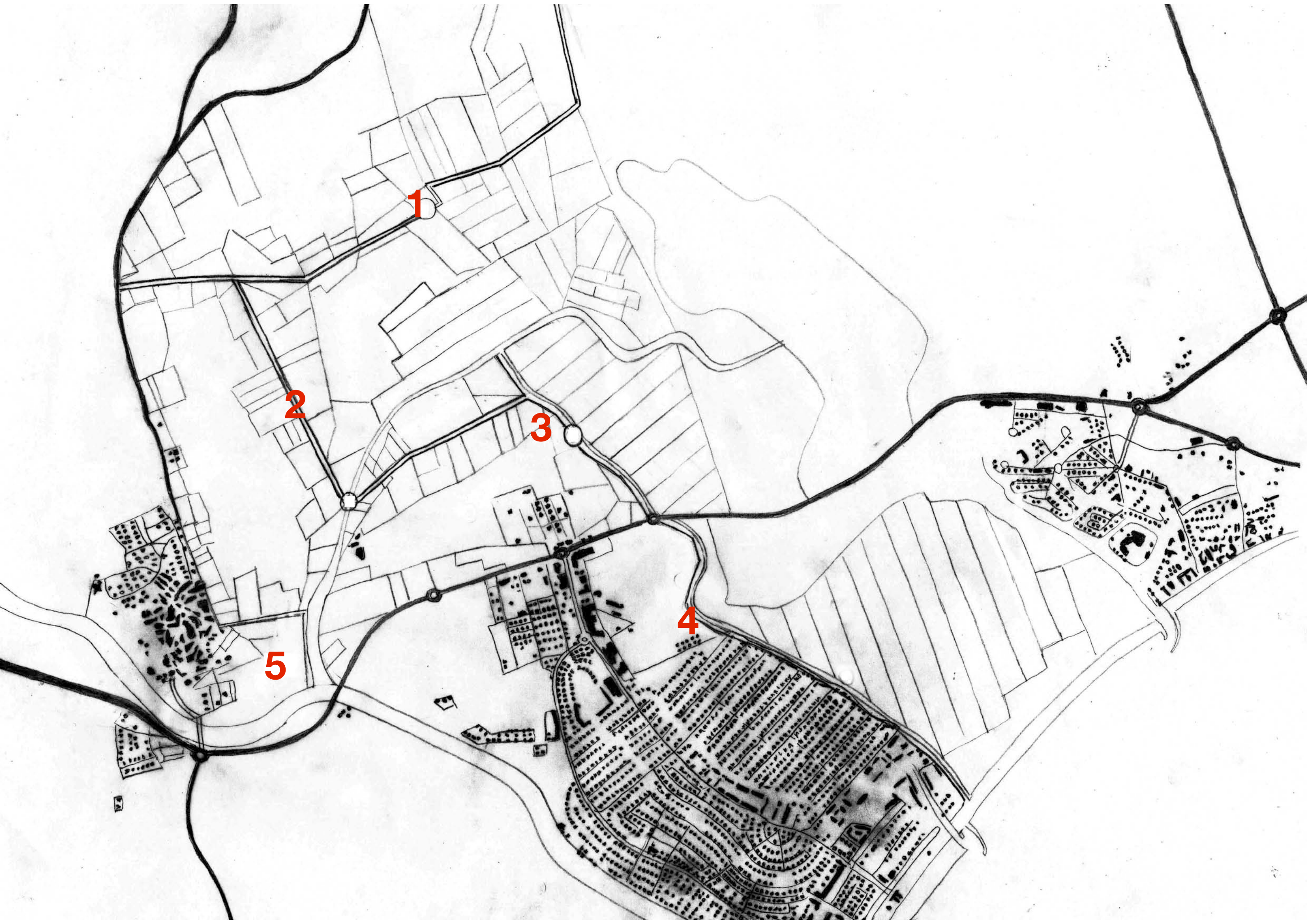
WHINEYARD



OLIVEYARD



ENCLOSURES



1

2

3

4

5

2050 *AGRICULTURE + NATURAL PARK*

Questions:

Sea level elevation;

Salt intrusions;

Concentration of tourism in the coastal areas -> Pollution and Energy;

Strategies to solve these questions:

- 1_Expansion of the tourism circuit (beach and countryside) promoting rural tourism associated to agriculture activities;
- 2_Link the cities to the rural areas with better accessibility and sinalization;
- 3_Stimulate the presence of people in the rural areas;
- 4_Organize the canals system to improve management of water resouces;
- 5_Improve the irrigations system to satisfy the request of water.

***The project proposes different solutions,
which are necessary, given the
complexity and the variety of landscape,
harmonious with the environment that
aimed to return usability to the
landscape.***

MODIFY THE CROPS



CC	P	I
+	+	+

**ANTECIPATE / DELAY THE
PLANTING SEASON**

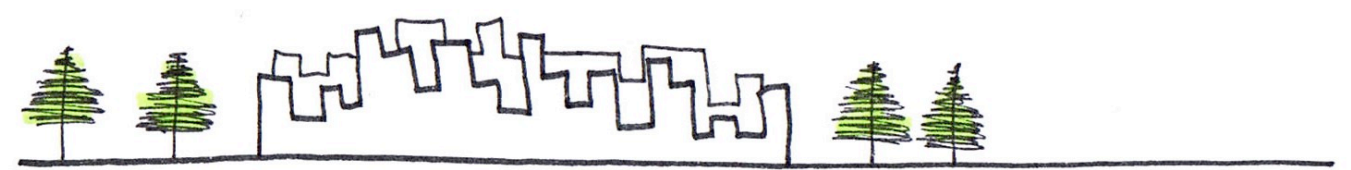
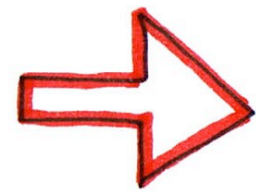
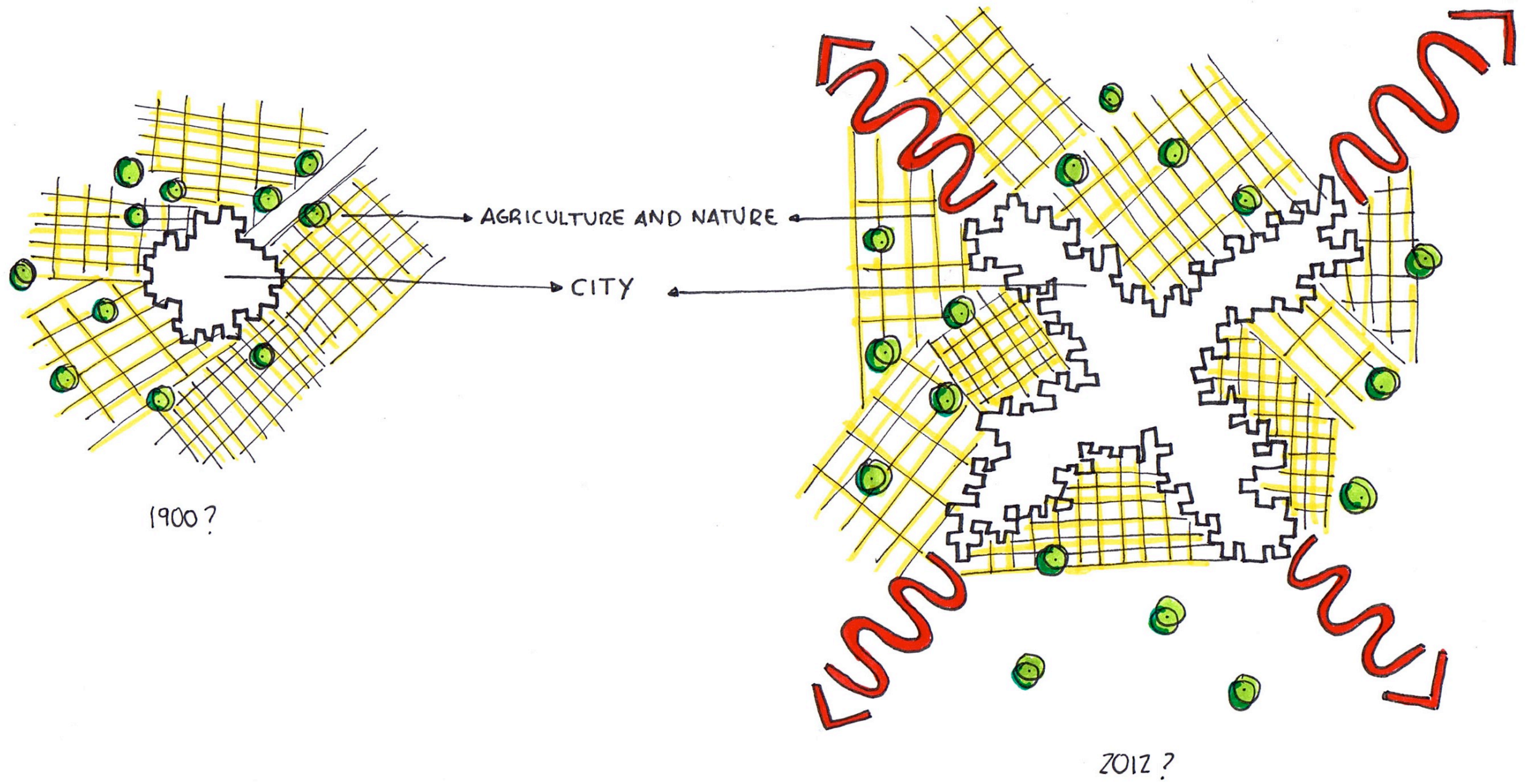


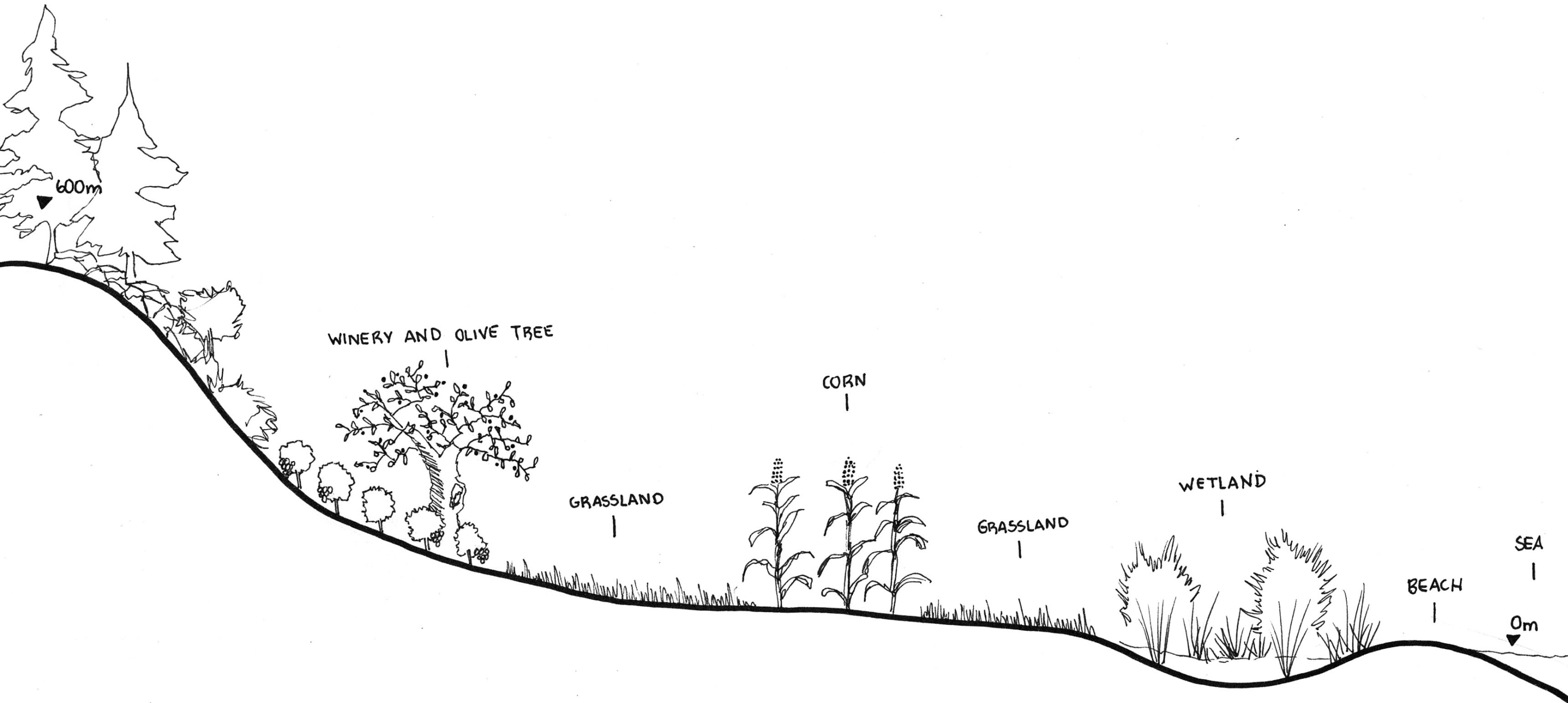
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**TECHNOLOGICAL
INNOVATION**



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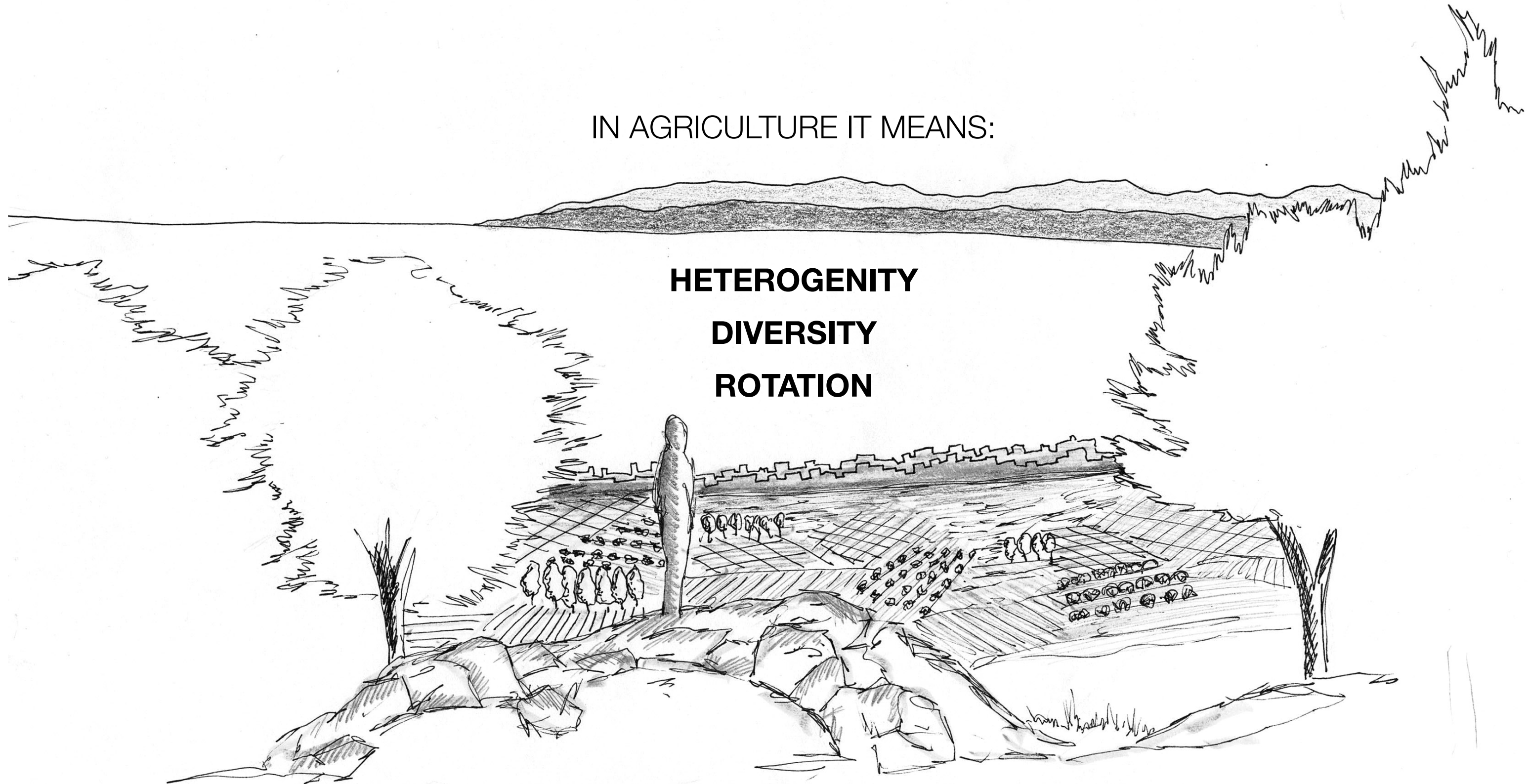




THE URBAN AND TERRITORIAL PLANNING HAVE TO BE FLEXIBLE TO RECEIVE ANY KIND OF CLIMATE CHANGE AND ABOVE ALL, TO INCREASE THE VALUE OF RESOURCES WITH LANDSCAPE INTEREST.

IN AGRICULTURE IT MEANS:

HETEROGENITY
DIVERSITY
ROTATION

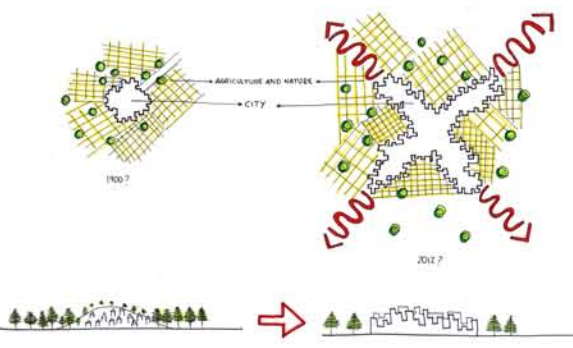
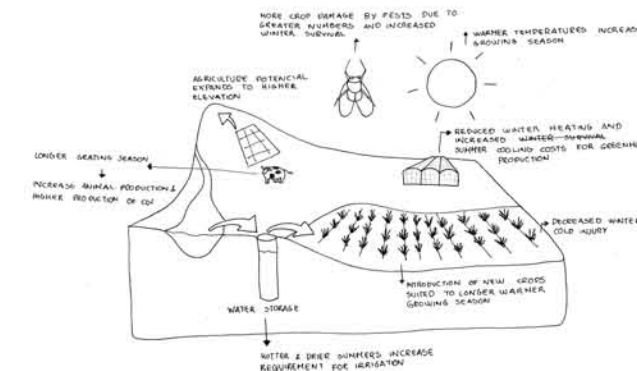
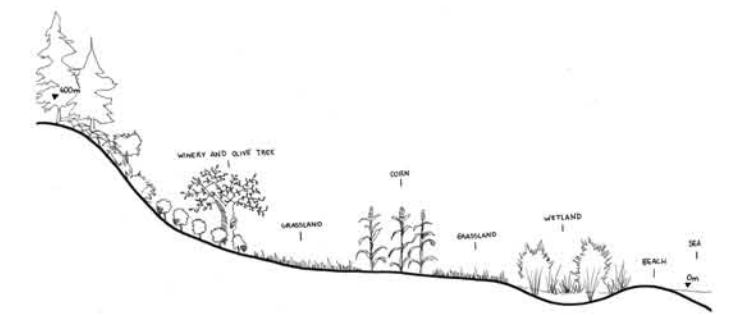
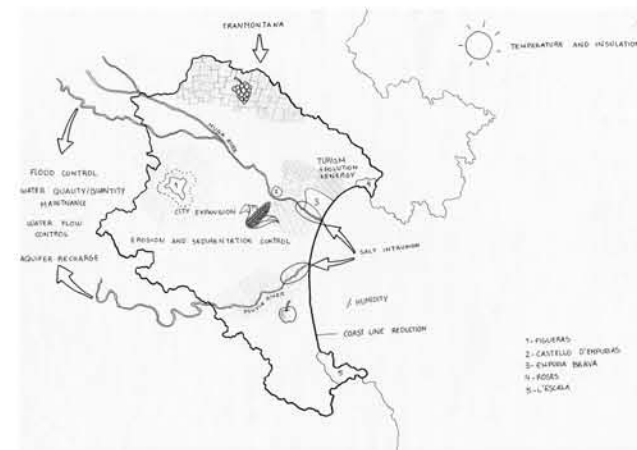
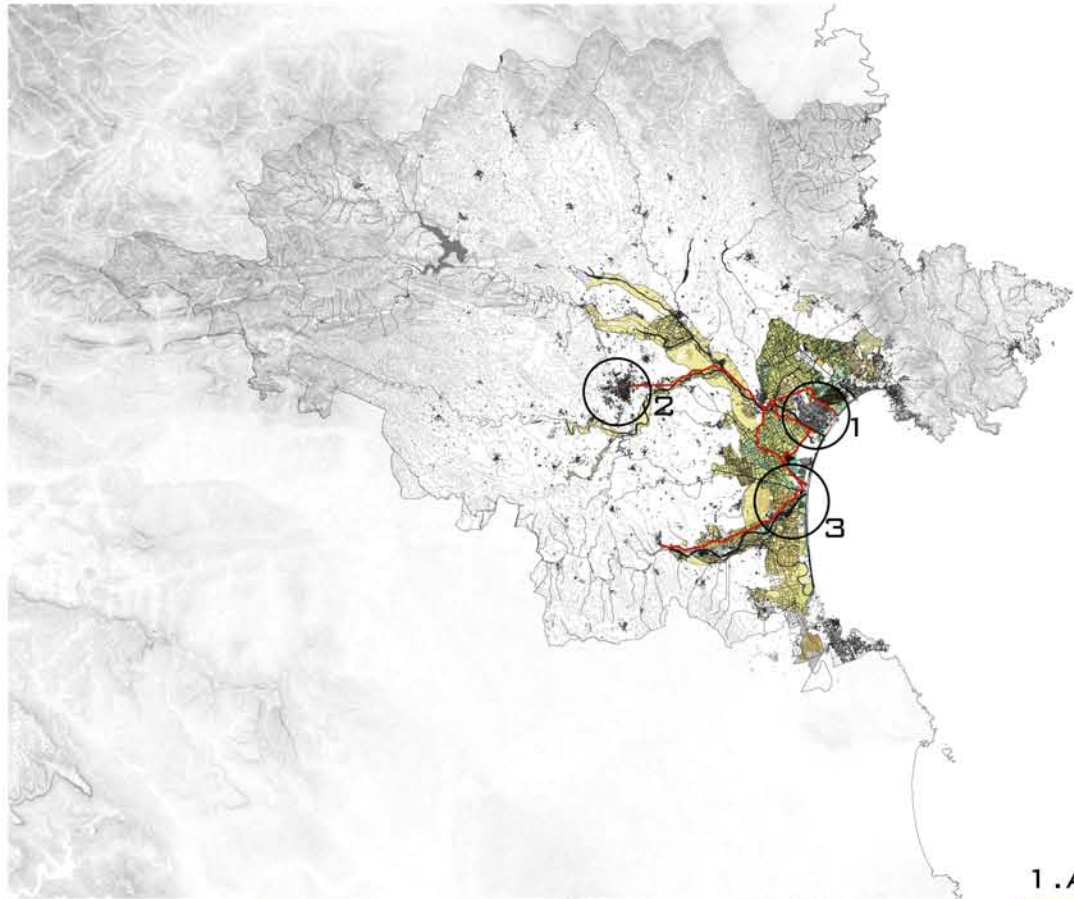




THANK YOU FOR YOUR ATTENTION !

AGRICULTURAL SYSTEM

INTENSIVE SUMMER SCHOOL : LANDSCAPE AND CLIMATE CHANGE, OLOT CATALUNYA (SPAIN), 9-21 JULY 2012



1. AGRICULTURE + NATURAL

2. AGRICULTURE + URBAN

3. AGRICULTURE + RIVER + COAST

