

VULCAN Project

Vulnerability Assessment of Shrublands in Europe
under Climatic Changes

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Vulnerability of shrublands

- 6 EU countries
- Climate and pollution gradient
 - **Risk analysis (this talk)**
 - **Experimental approach to assess impact of climate change (Bridget's talk)**



The background of the slide is a photograph of a heathland landscape. It shows a wide expanse of low-lying vegetation, including heather and grasses, in various shades of green, yellow, and brown. Several wooden walkways or bridges are visible, crossing the terrain. The sky is bright and slightly hazy.

VULCAN risk assessment aims:

To understand the relative risks to shrublands in the UK, Spain and Hungary, arising from climate change **and other impacts**

Other major potential impacts:

- Pollution, especially nitrogen deposition
- **Land use change**

Components of the risk assessment:

1. Scale-up the VULCAN results to macro-level (temporal & spatial scales using ecological, soil and environmental data)
2. **Assess potential future land use change and socio-economic drivers of such changes.**
3. Synthesise results of the scaling-up exercise with the land use change scenarios and estimate likelihood of different pathways.

Land use change scenarios for UK, Spain and Hungary

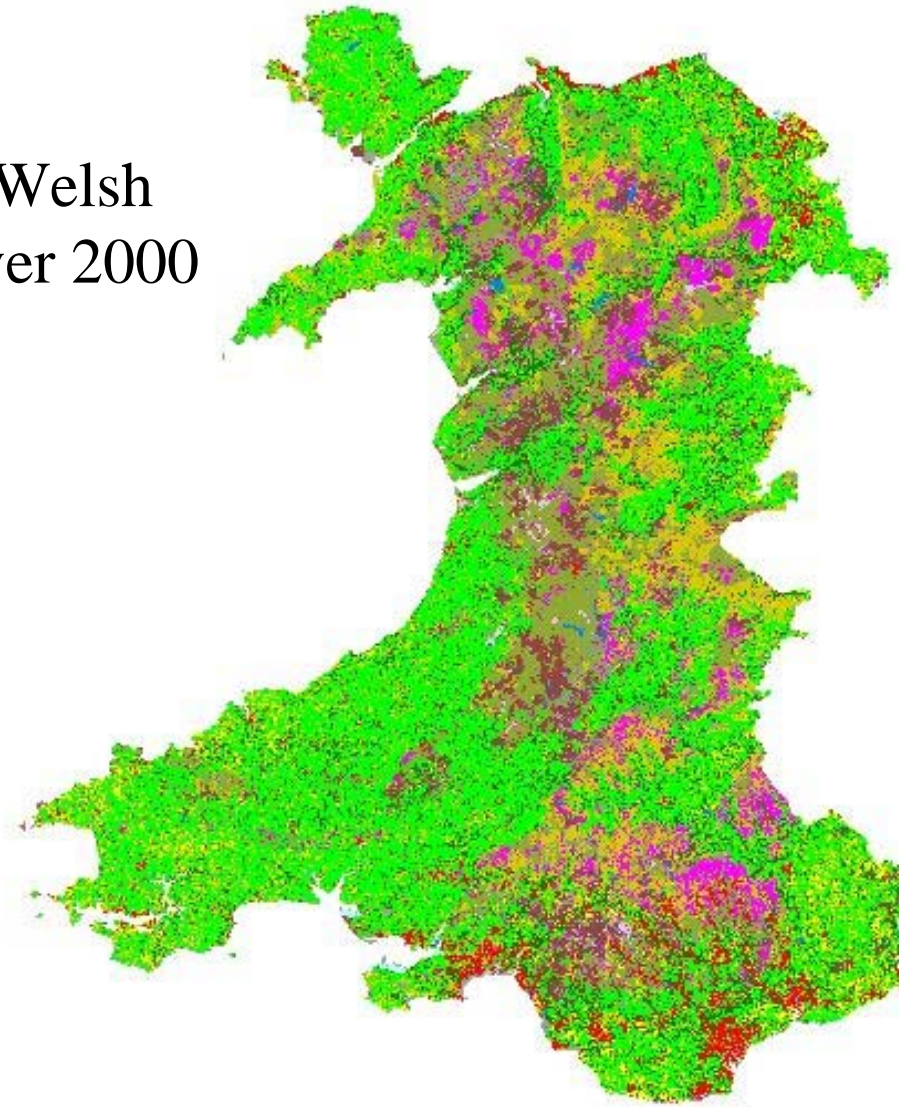
Limited to the following regions:








Atlantic → UK → Wales

Mediterranean → Spain → Catalunya

Continental → Hungary → the Dune-Titse interfluve

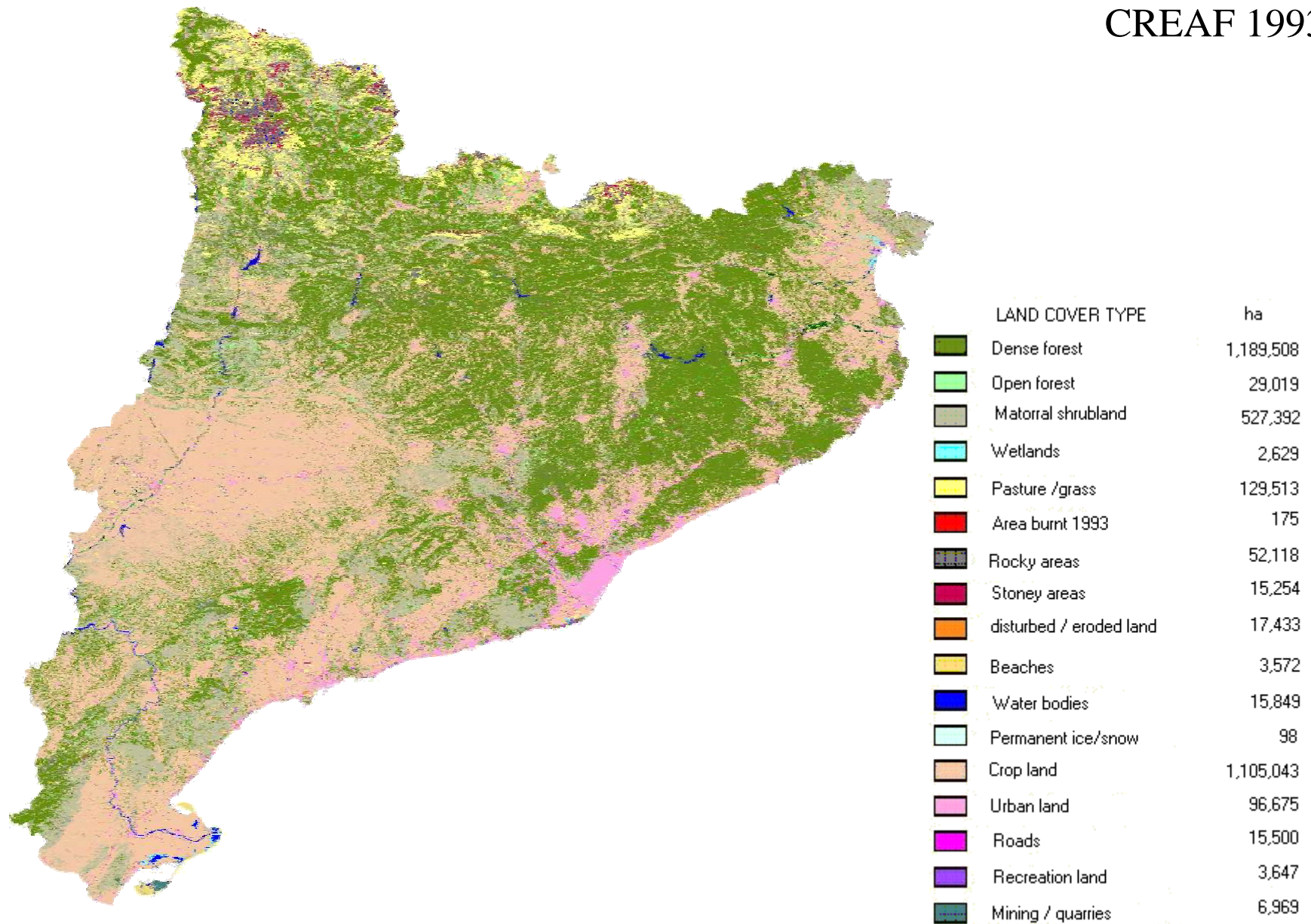
Map of Welsh land cover 2000



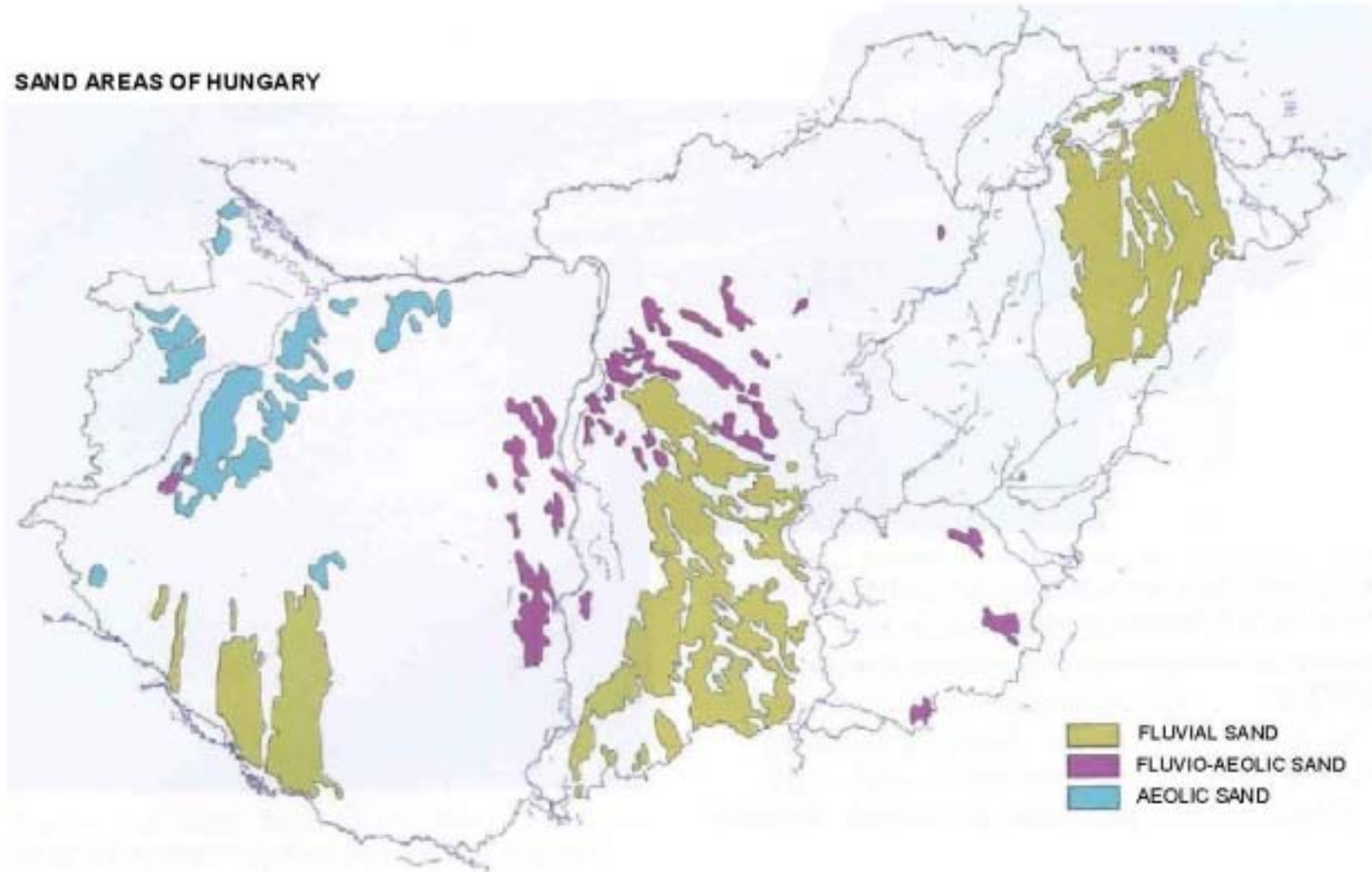
-  Arable / horticultural
-  Improved grassland
-  Urban and sub-urban
-  Heath and moorland
-  Acid grassland
-  Conifer woodland
-  Broad-leaved woodland
-  Water bodies

Data source:
LCM2000

Map of Catalonian land cover CREAF 1993



Map of Hungarian Dune-Titse interfluve



Major land uses in all European countries, by extent:

Urban use (including all built land and transport infrastructure)
UK: 8-10%; rest of Europe: 5-9%

Agriculture (including intensive and extensive arable and grazing land) UK: 70%; rest of Europe: 39%

Forestry (including all forests managed for commercial production) UK: 5%; rest of Europe: 32%

Future land use change in Wales:

Scenario-based methodology: **GATE-UPI scenarios**

Land use parameters

Urban growth

Production levels in agriculture/commercial forestry

Intensity levels in agriculture/commercial forestry

Driving parameters

Green/ environmental concern

Agricultural demand

Technological progress

Economic growth

Combinations of different levels (1-10) of the GATE parameters produce different levels (1-10) of the UPI parameters

<p>Hi Ec Growth LoTech Non-green Hi Agri dmd</p>	<p>Hi Ec Growth LoTech Med-Green Hi Agri dmd</p>	<p>Hi Ec Growth LoTech Green Hi Agri dmd</p>	<p>Hi Ec Growth MedTech Non-green Hi Agri dmd</p>	<p>Hi Ec Growth MedTech Med-Green Hi Agri dmd</p>	<p>Hi Ec Growth MedTech Green Hi Agri dmd</p>	<p>Hi Ec Growth HiTech Non-green Hi Agri dmd</p>	<p>Hi Ec Growth HiTech Med-Green Hi Agri dmd</p>	<p>Hi Ec Growth HiTech Green Hi Agri dmd</p>
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Example: very high urbanisation scenario

Land use
drivers:

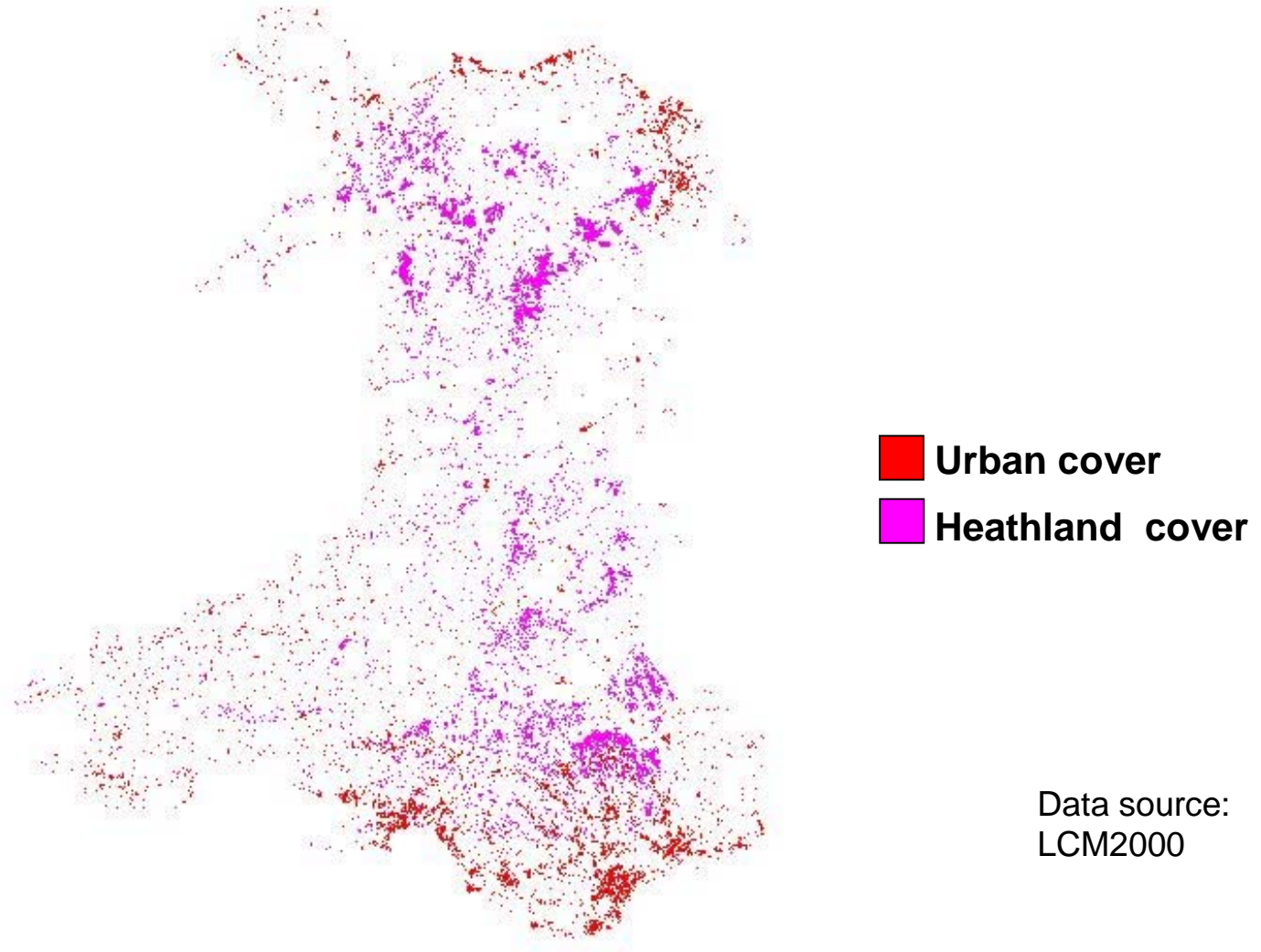
very high economic growth
very high rates of technological progress
very low agricultural demand
very low environmental concern

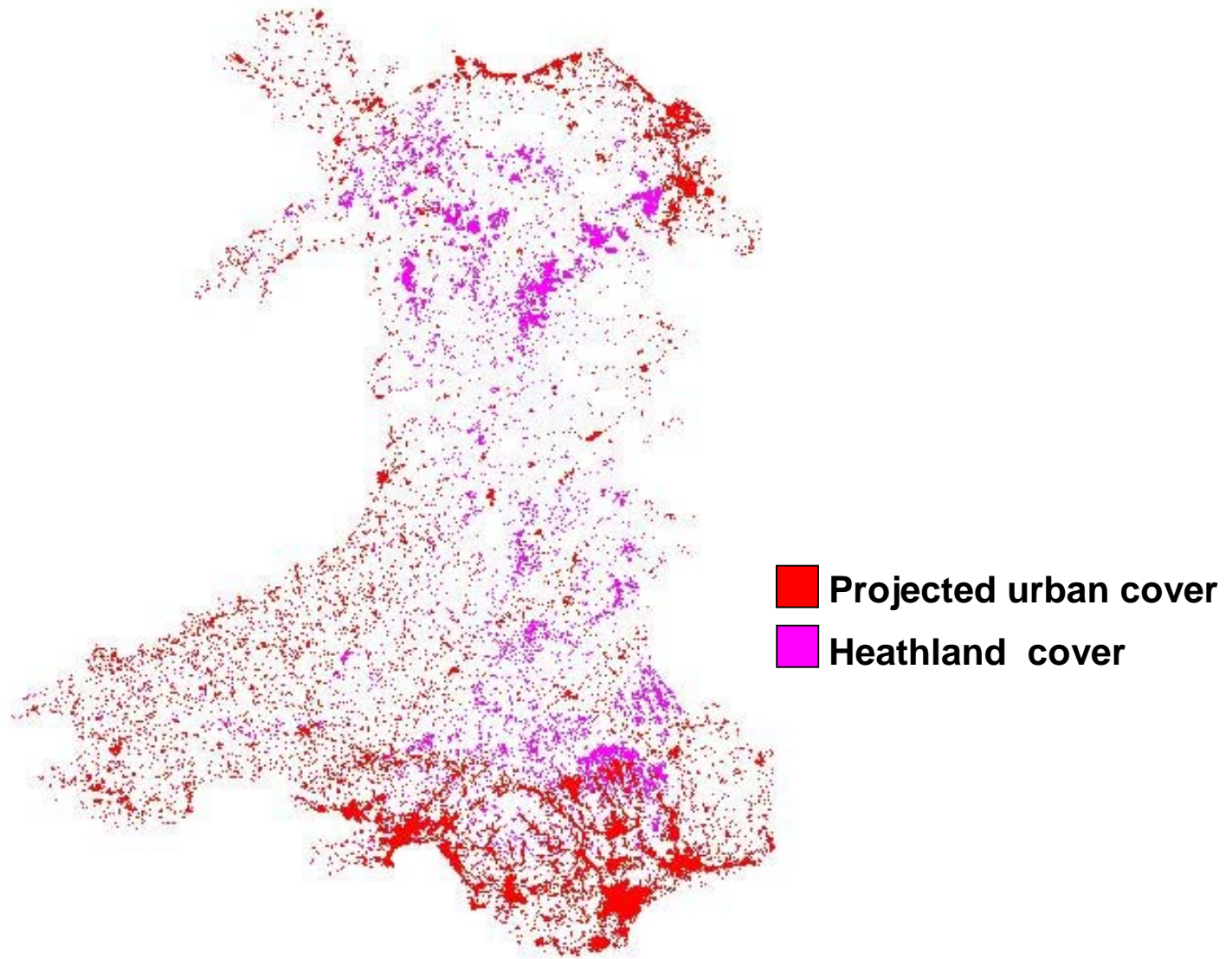
Land use
variables:

→ very low, very intense agricultural production,
thus little demand for land from agriculture.

→ → very high rates of urbanisation in Wales

Current urban cover and current heathland cover





Very high urbanisation rate scenario: resulting urban cover by 2050

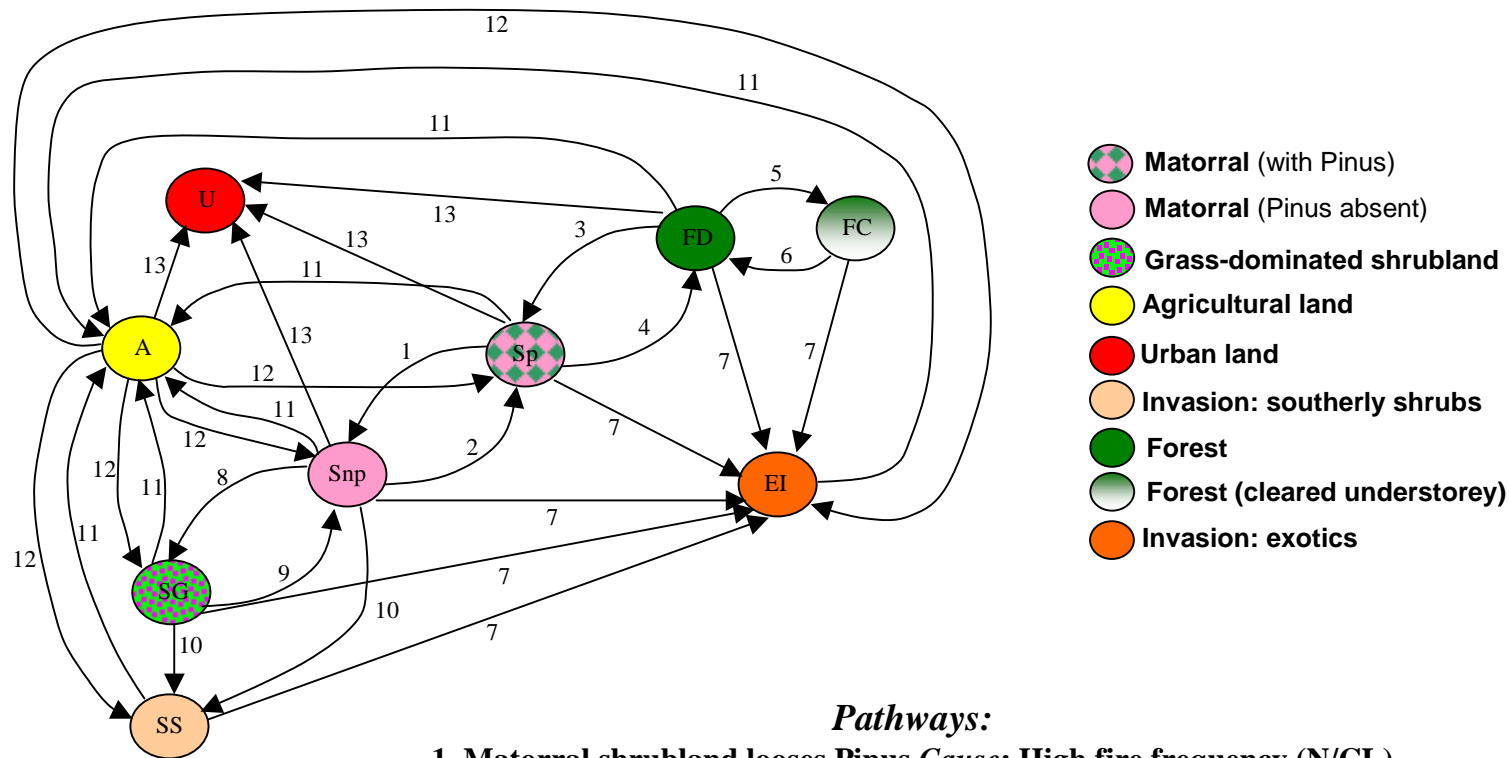
Losses from land cover types under high urbanisation scenario

	Current Cover (ha)	ha lost	% lost
Heathland:	112,908	3049	2.7
Improved grasslands:	772,017	72,675	9.41
Acid grasslands:	319,292	10,468	3.28
Broadleaf forests	161,006	17,986	11.2
Conifer forests	143,614	5341	3.71
Marsh	5847	454	7.76

The background of the slide is a collage of various natural scenes. It includes close-ups of purple and yellow flowers, a butterfly, a bird, and a landscape with a body of water and trees. The text is overlaid on this collage.

Land use change in Catalonia and potential feedbacks under climate change

Feedbacks between climate change and land use change are much more likely in Catalunya due to the potential increase in fire frequency and spread.



Pathways:

1. Matorral shrubland loses Pinus *Cause: High fire frequency (N/CL)*
2. Shrubland gains Pinus *Cause: re-seeding or eventual re-invasion along with fire suppression (N/SOC)*
3. Forest reduced to shrubland *Cause: fire event (N/CL)*
4. Matorral shrubland succeeds to forest *Cause: natural succession in absence of fire (N/SOC)*
5. Forest loses dense understorey *Cause: clearing for fire prevention (SOC)*
6. Dense understorey grows under forest *Cause: cessation of clearance activities (N)*
7. Habitats invaded by exotic species *Cause: radical climate change impact (CL)*
8. Shrubland increases in grass component *Cause: natural invasion or grazing (N/CL/SOC)*
9. Grass-shrub vegetation loses grass component *Cause: shrub invasion or grazing cessation (N)*
10. Grass-shrub or non-pinus shrubland invaded by southerly shrubs *Cause: climate change (CL)*
11. Habitats cleared for improved grazing or arable agriculture *Cause: socio-economic factors (SOC)*
12. Agricultural land invaded by indigenous or exotic communities
13. Habitats cleared for urbanisation *Cause: socio-economic factors (SOC)*

Major land use change issues in Catalunya

- Past:
- land abandonment & migration to cities
 - agricultural intensification & abandonment of poorer soils
- Present:
- people still migrating to cities but land under production stabilising (lower labour requirements for mechanised agriculture)

Current trends:



Urbanisation drivers

Demand for housing in a stable population

Economic growth

Desire for second homes

Demand for diffuse city (U.S. suburban model)

Demographic age structure

Catalunya: Spain's gateway to Europe

Transport infrastructure

Service industry facilities

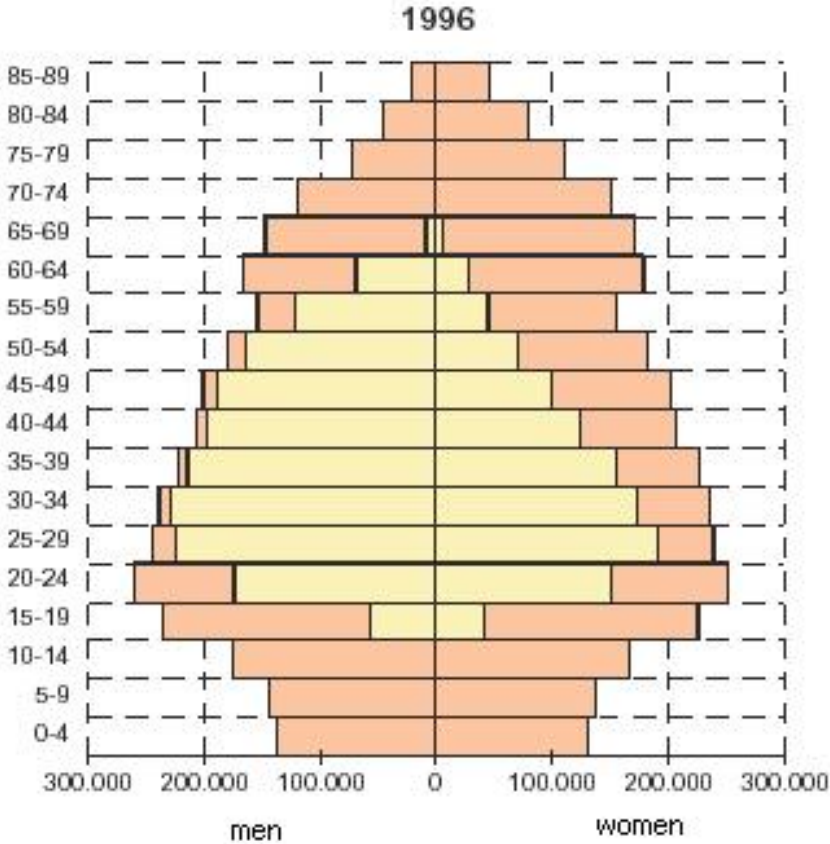
Warehousing

Tourism

Traditional sun/beach tourism

Rural tourism

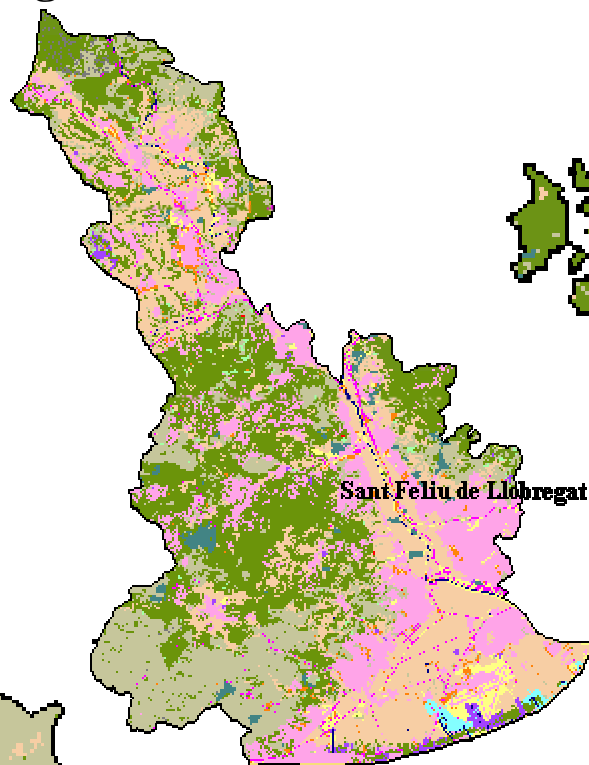
Catalunya: demographic age structure 1996



Active population
Total population

Source: Idescat

Baix Llobregat

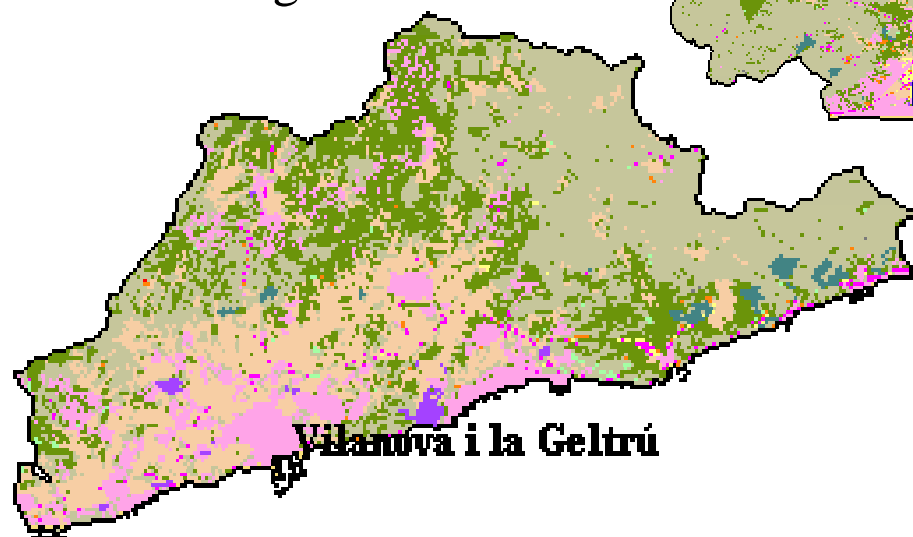


Sant Feliu de Llobregat

Barcelona

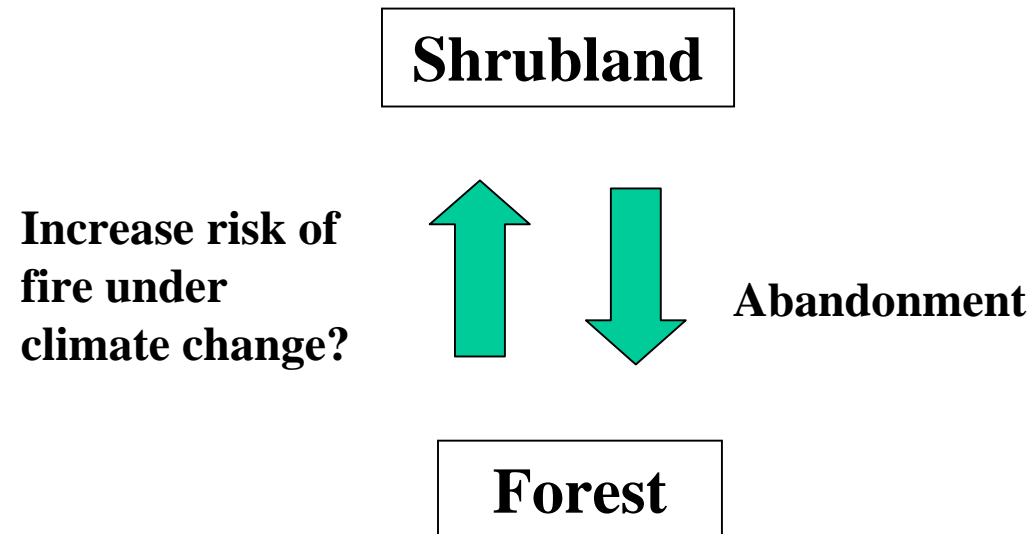


Garraf region

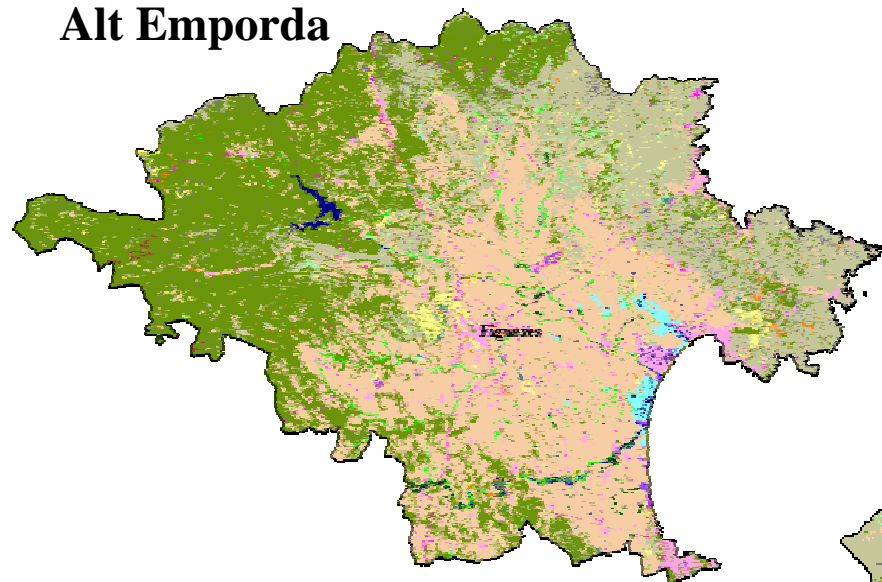


Vilanova i la Geltrú

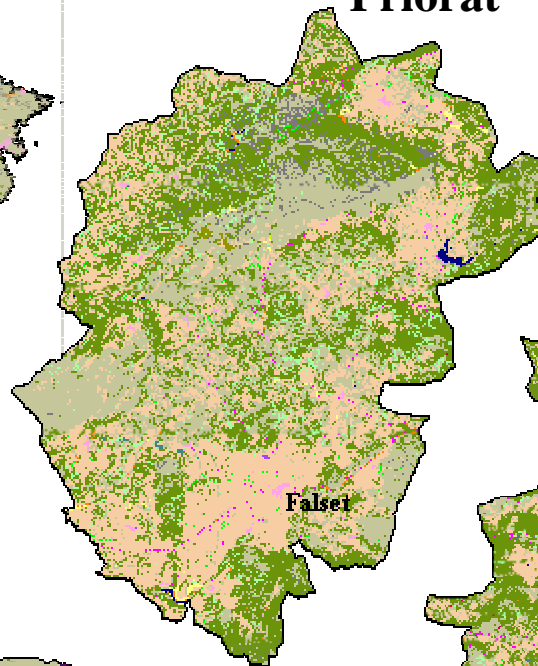
Threats to shrublands that are not highly susceptible to urbanisation: afforestation



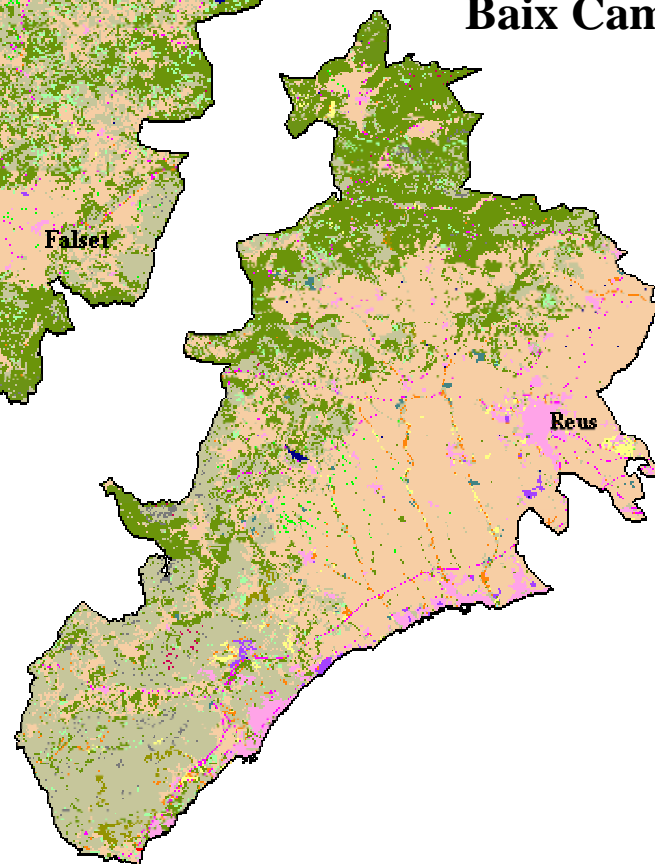
Alt Emporda



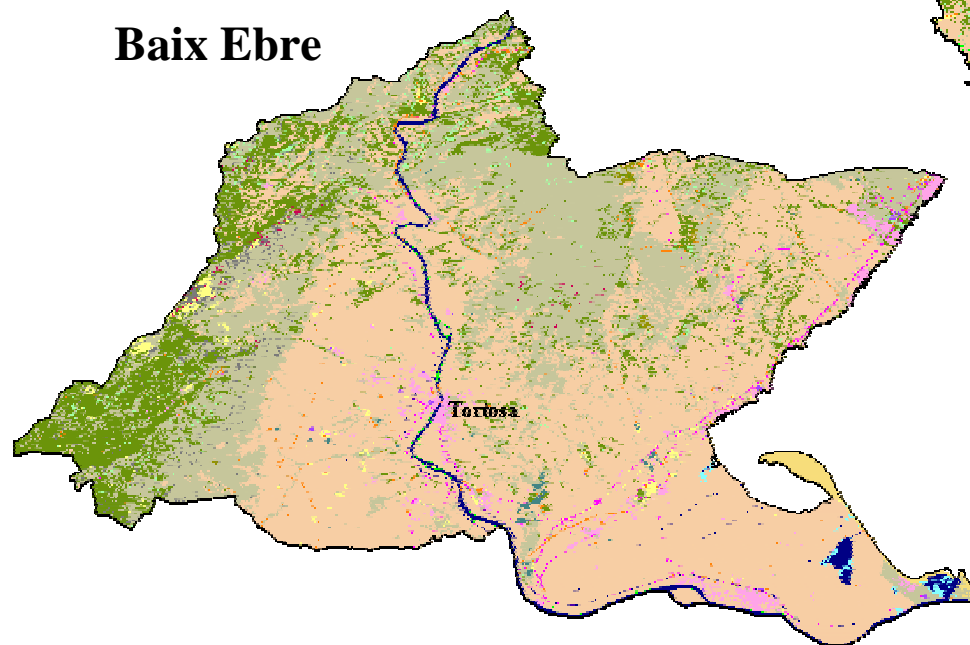
Priorat



Baix Camp



Baix Ebre



Conclusions

- Strong contrast in land use drivers affecting shrublands in Wales compared to Catalonia
 - Wales: urbanisation not a problem, shrubland persistence more based on conservation priorities
 - Catalonia: urbanisation potentially strong threat to shrublands but fire risk potential might increase their extent away from urban areas
- Cultural perceptions!