

Session on Land Use and Land Cover Change

**RESULTS AND COMPARISON  
BETWEEN CORINE AND SIOSE IN  
THE LAND OF VALÈNCIA (SPAIN)**

Joan Carles Membrado  
Emilio Iranzo

32nd International Geographical Congress  
Cologne 26 - 30 August 2012

The land of València  
(officially *Comunitat Valenciana*)

23.000 km<sup>2</sup>

1 of 17 autonomous  
communities  
(Eastern Spain)

5 million

Oranges

Industry

Construction

Tourism

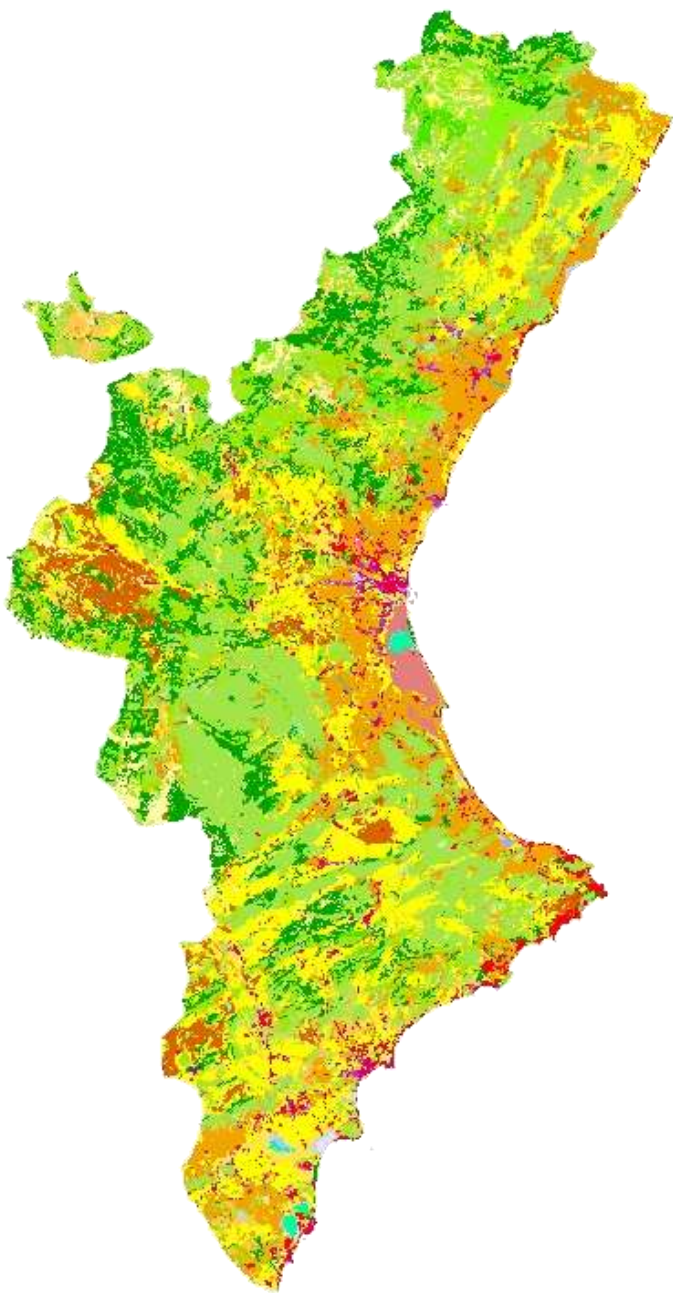


MAP 1. SPAIN'S  
AUTONOMOUS  
COMMUNITIES  
(official place names)



**RESULTS AND COMPARISON BETWEEN CORINE AND SIOSE IN VALÈNCIA (SPAIN)**

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Institut Cartogràfic Valencià  
(Cartographic Institute of València)

Joan Carles Membrado

person in charge of photointerpretation  
CORINE (2000 and 2006) land of València  
SIOSE (2005-2006) land of València

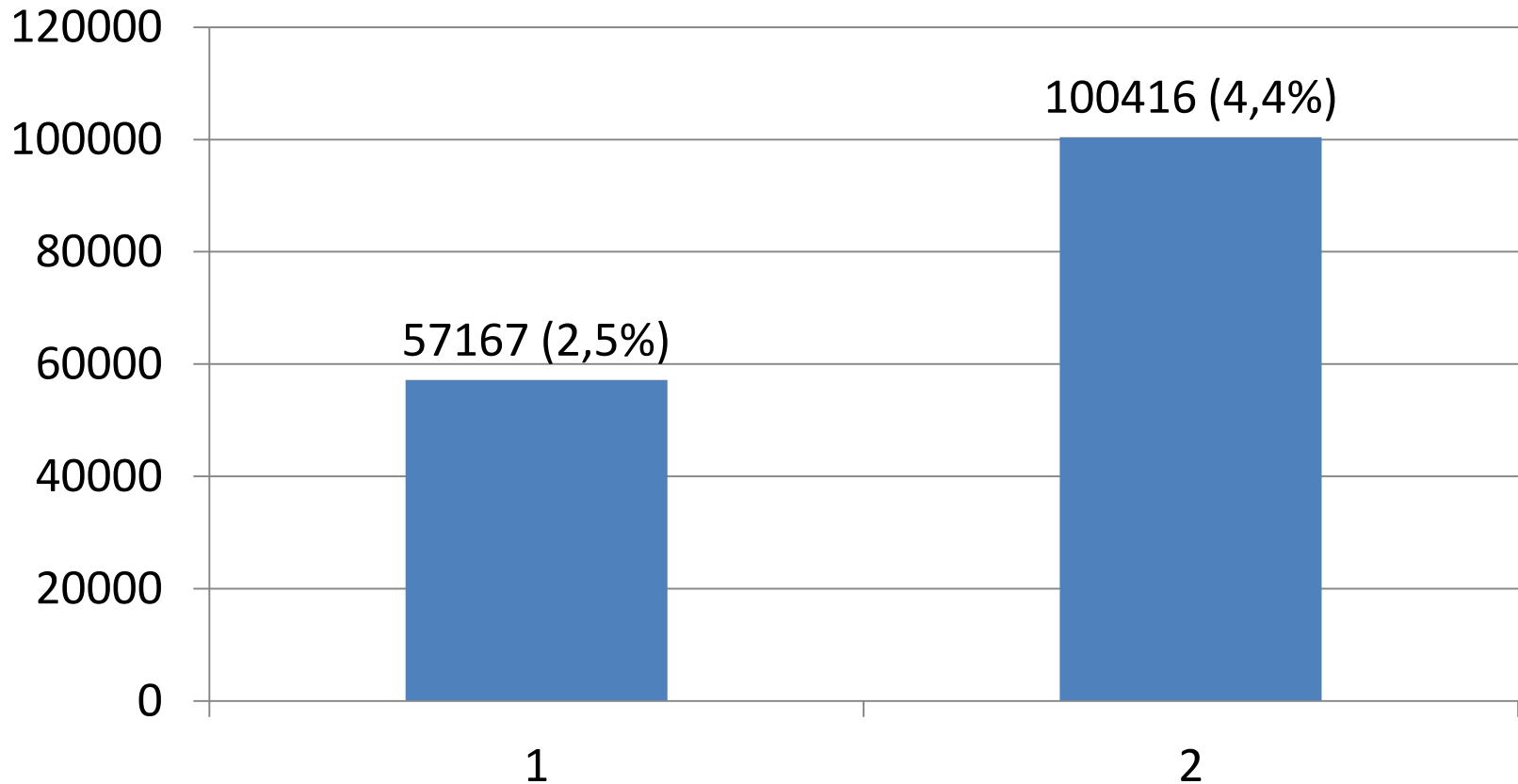
CORINE has been for many years the  
reference GIS for land use researches in  
València and Spain

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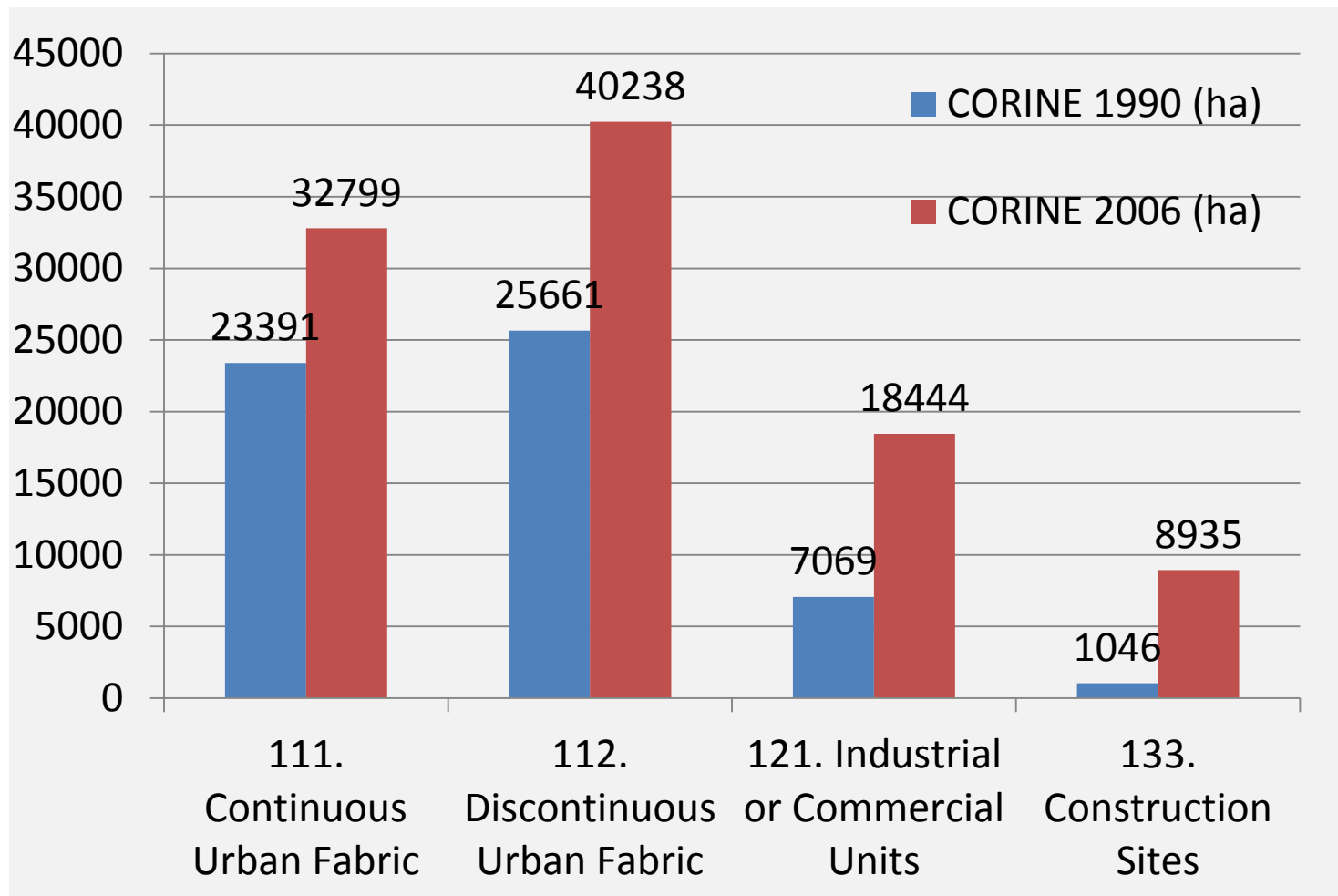
## CORINE (MAIN) ARTIFICIALS SURFACES (ha) València (1990-2006)



Between 1990 and 2006 artificial surfaces almost double

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The class that grows the most: *Discontinuous Urban Fabric*

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Land Use (CORINE)	CORINE 1990 (ha)	CORINE 2006 (ha)	90-06 %	changes (ha)
111. Continuous Urban Fabric	23391	32799	140,2205977	9408
<b>112. Discontinuous Urban Fabric</b>	25661	40238	156,8060481	<b>+14577</b>
121. Industrial or Commercial Units	7069	18444	260,9138492	11375
133. Construction Sites	1046	8935	854,206501	7889
(MAIN) ARTIFICIALS SURFACES	57167	100416	175,6537863	43249

The class that grows the most: *Discontinuous Urban Fabric*

## RESULTS AND COMPARISON BETWEEN CORINE AND SIOSE IN VALÈNCIA (SPAIN)

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# Discontinuous Urban Fabric

*300.000 from Western Europe*




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# Discontinuous Urban Fabric

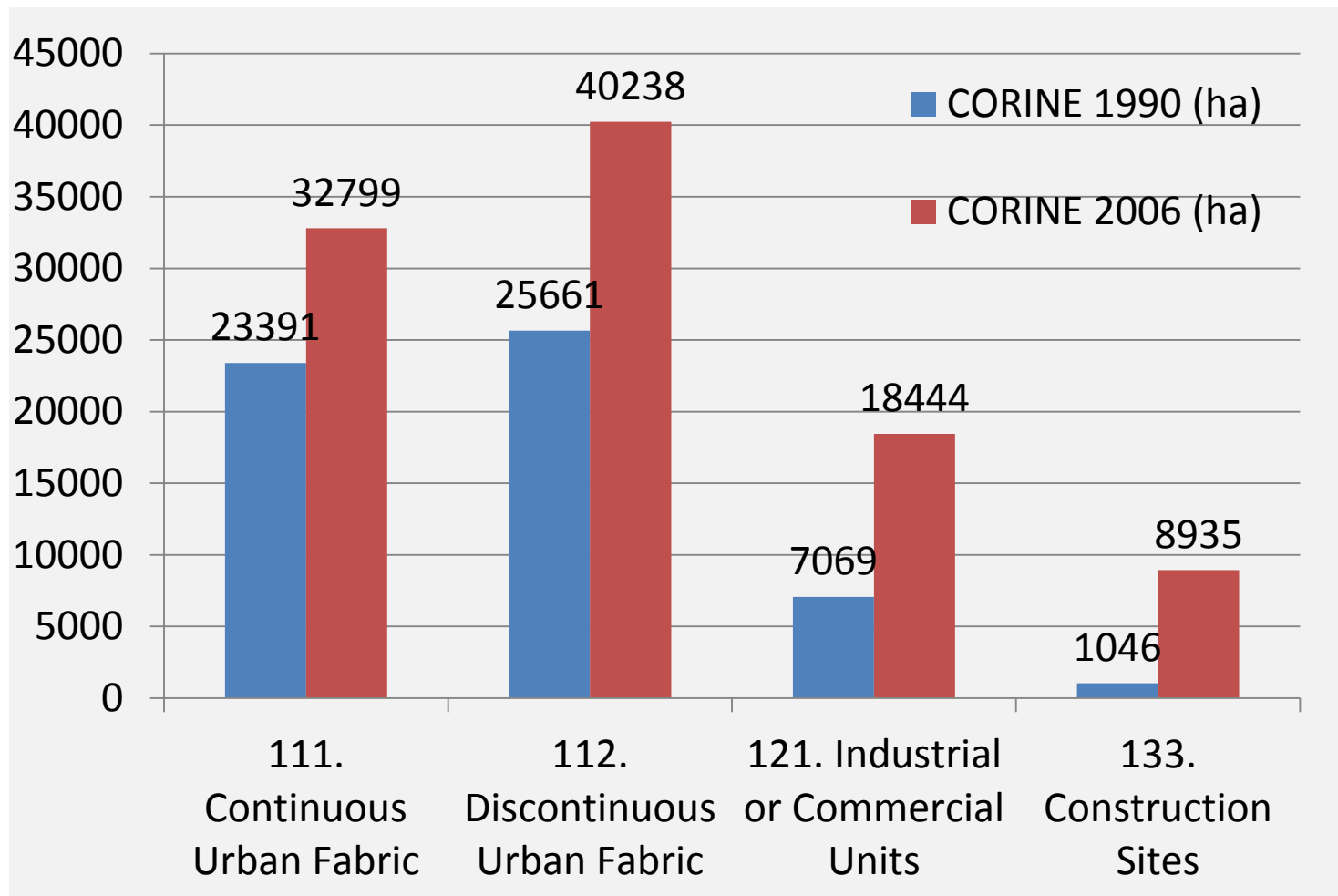
*almost 150.000 from UK*



*43.000 from Germany  
31.000 from Benelux  
22.000 from Scandinavia  
8.000 Switzerland/Austria*

**RESULTS AND COMPARISON BETWEEN CORINE AND SIOSE IN VALÈNCIA (SPAIN)**

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The class that follows in growth: *Industrial or Commercial Units*

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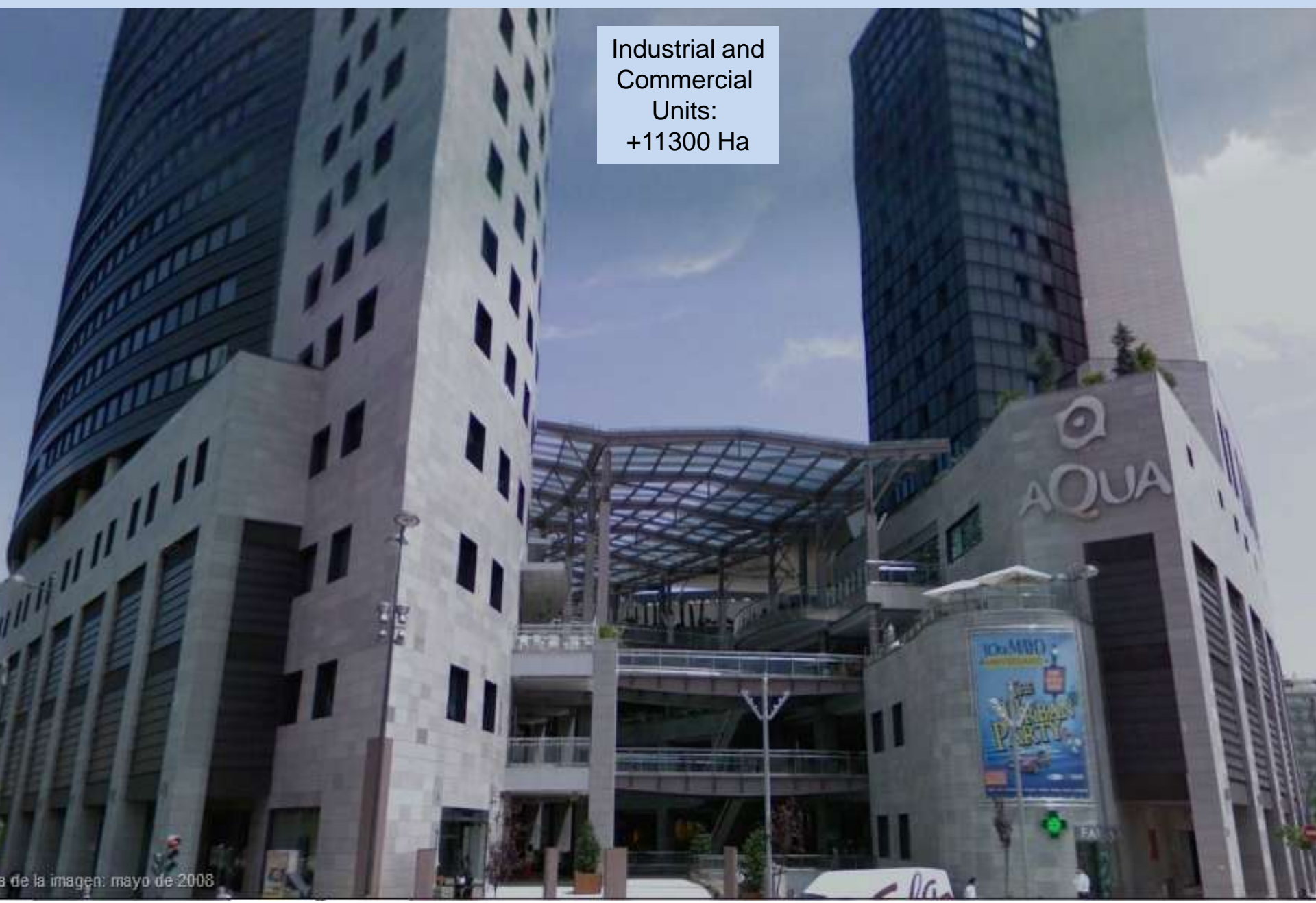
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## RESULTS AND COMPARISON BETWEEN CORINE AND SIOSE IN VALÈNCIA (SPAIN)



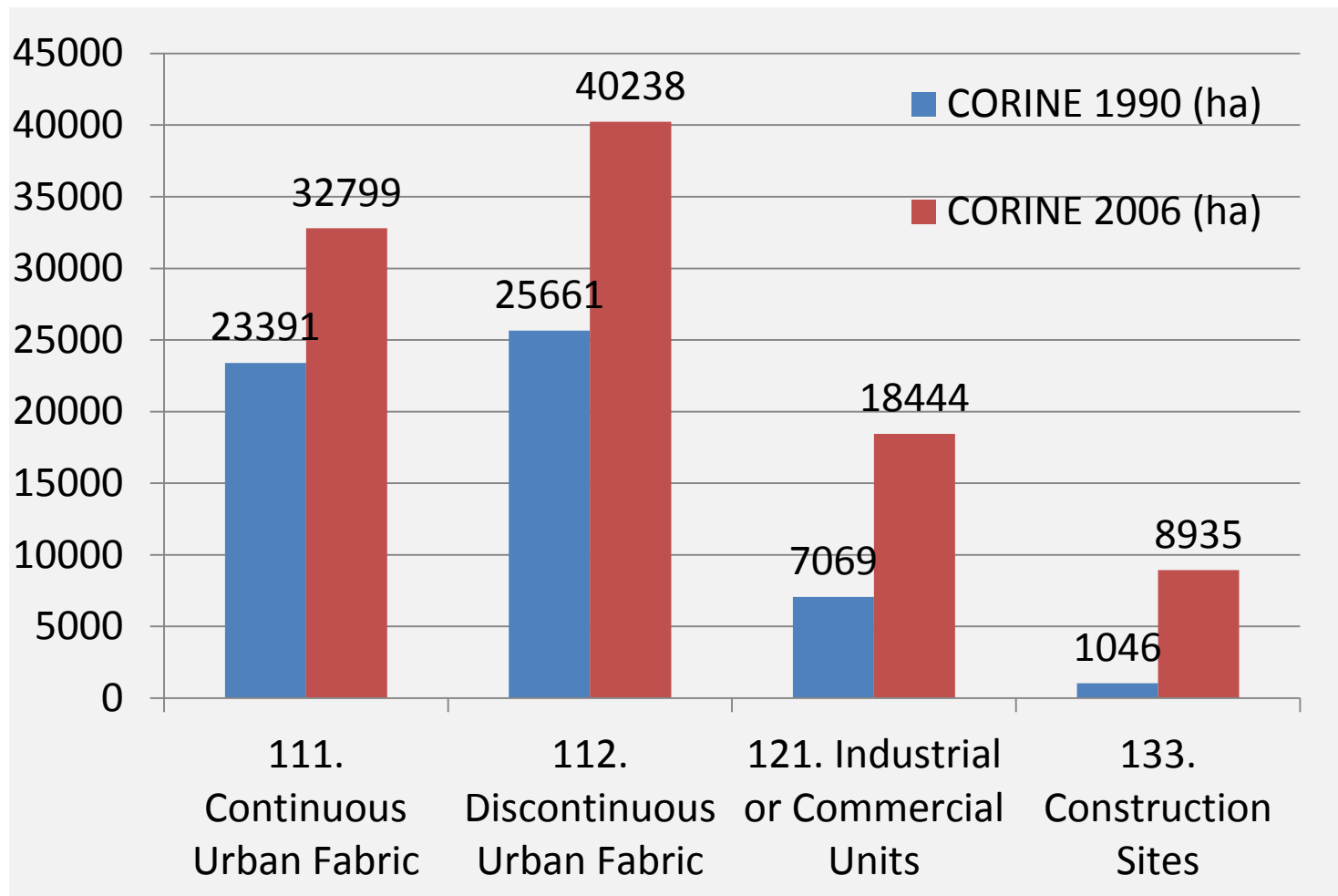
STRONG RISE OF COMMERCIAL AREAS (from 1 shopping centre in 1990 up to 68 in 2008)

Car-friendly malls developed in the Western world (from 1950s). Linked to suburbs (112)



Industrial and  
Commercial  
Units:  
+11300 Ha





Next class in growth: *Continuous Urban Fabric*

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# Benidorm resort: High Urban Density



**1950**



**2010**

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# Continuous Urban Fabric



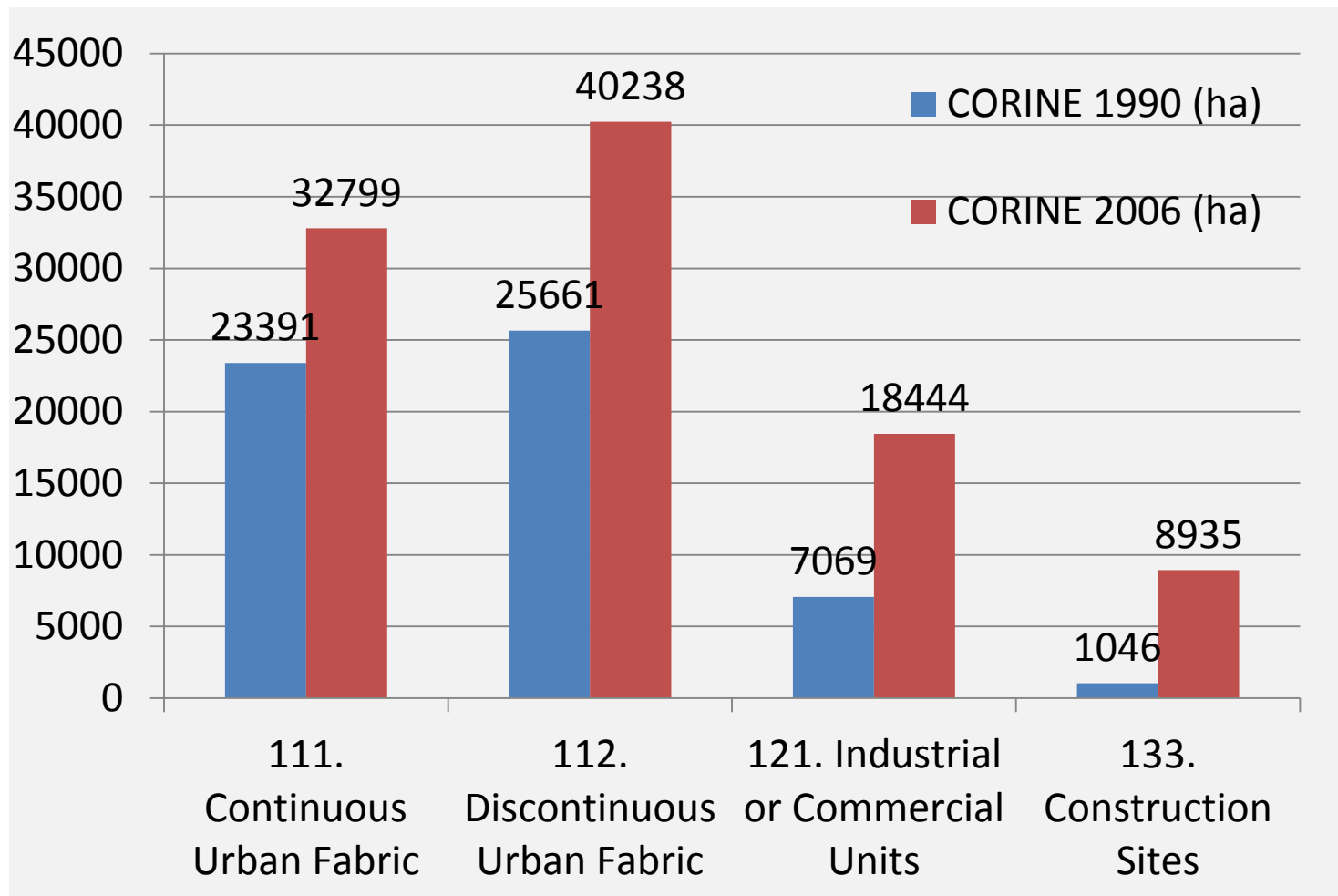
TALLEST RESIDENCIAL BUILDING IN EUROPE  
TALLEST HOTEL BUILDING IN EUROPE





***Housing boom/bubble:  
City of Arts and Sciences***





Next class in growth: *Construction Sites*

**8935 corine & 12692 siose**

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# Construction of the High Speed tracks between València and Madrid (1 hour and 35')



Airport/(without planes)

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PARTIALLY CONSTRUCTED BUILDINGS, WHOSE CONSTRUCTION HAS BEEN INTERRUPTED BECAUSE OF THE CRISIS



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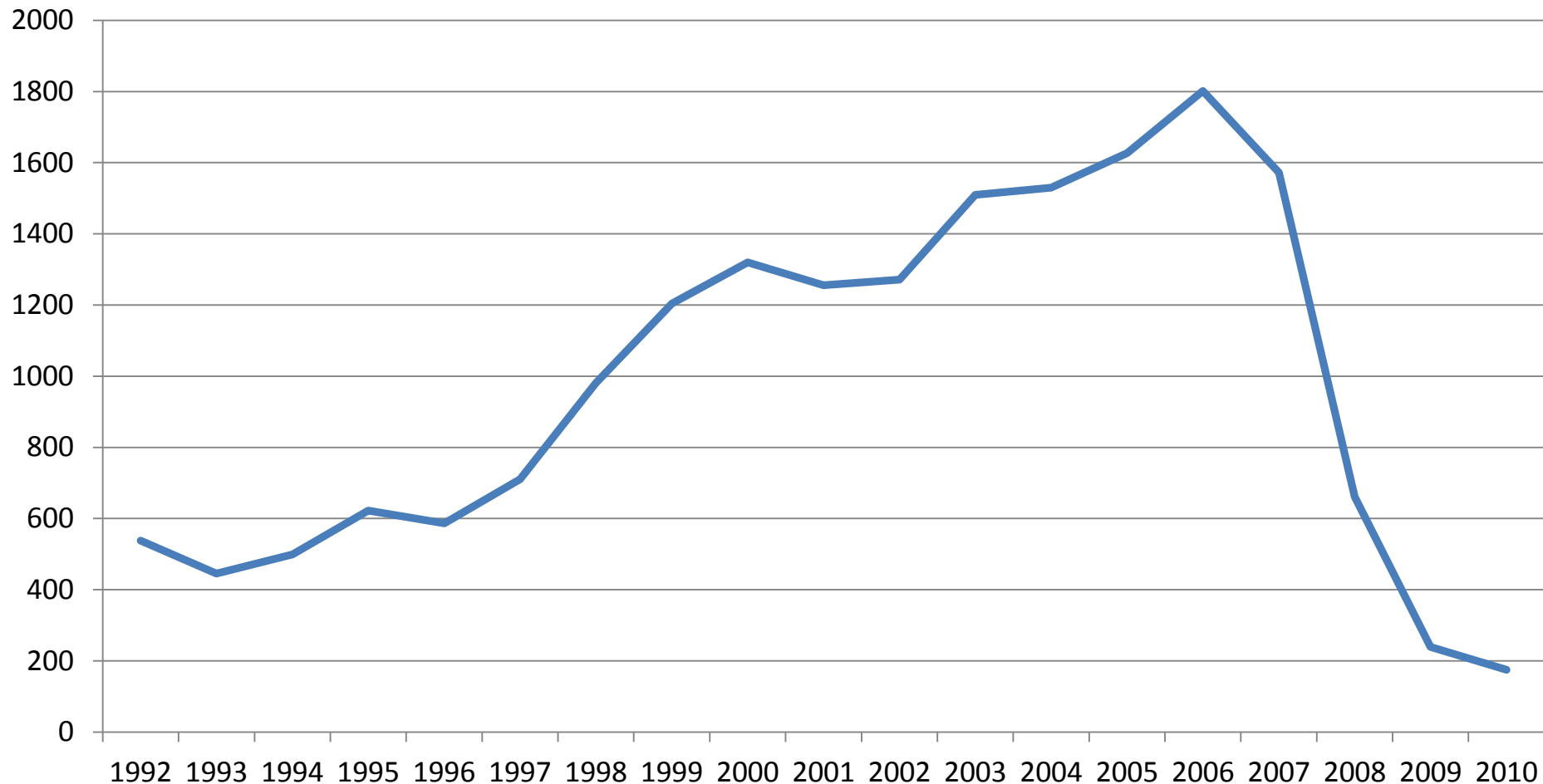
URBANISED STREETS WITH NO BUILDINGS, WHOSE  
CONSTRUCTION HAS NEVER BEGUN BECAUSE OF THE CRISIS



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## Evolución de la construcción en Valencia

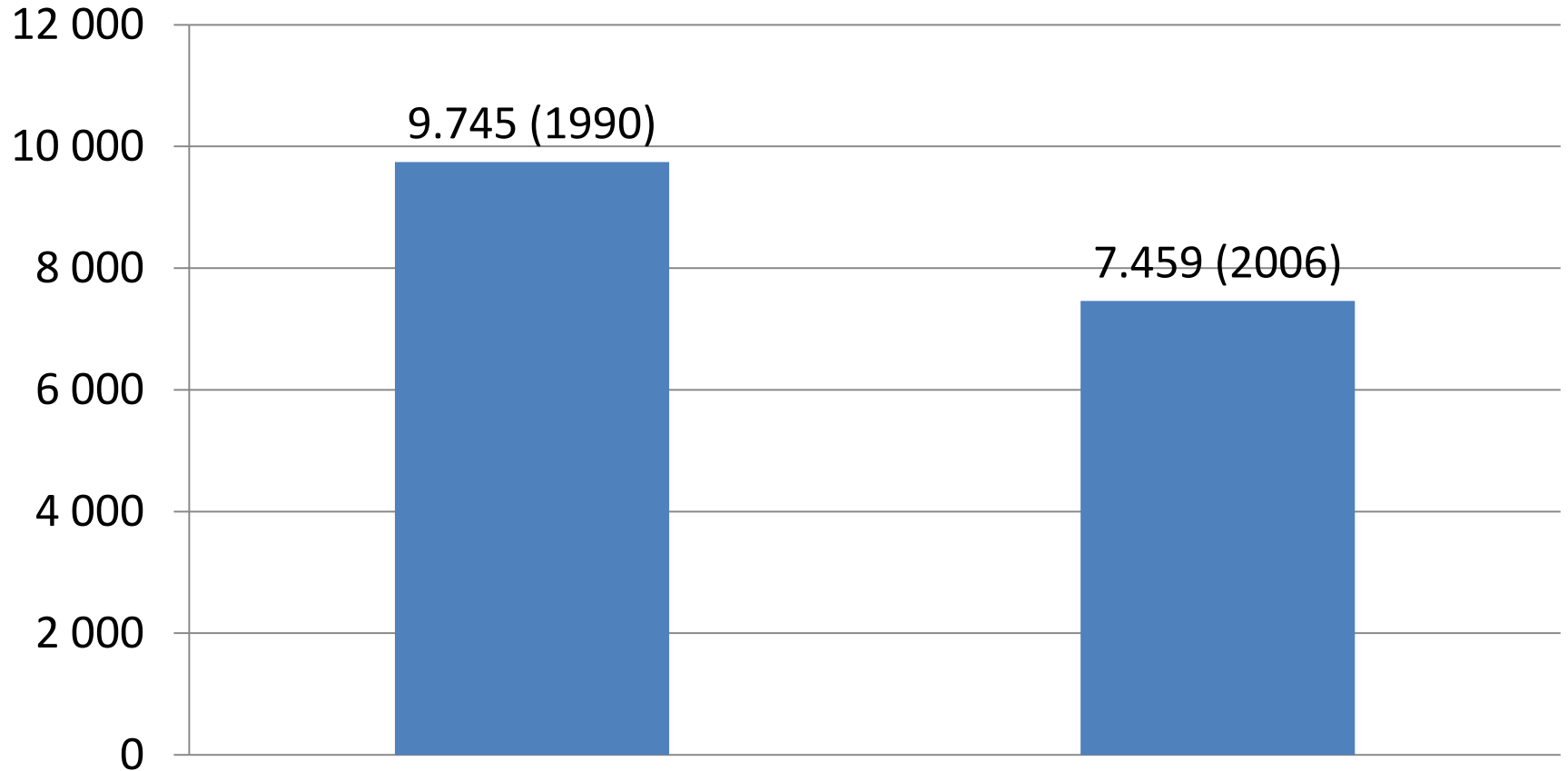


The collapse of the Spanish housing bubble put an end to this huge growth of artificial surfaces

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## Permanently Irrigated Land (Horta de València)



Decline in Permanently Irrigated Land

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<b>212. Permanently Irrigated Land (Horta de València)</b>	9.745	7.459	-23,49	<b>-2286</b>

Decline in Permanently Irrigated Land

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City growth threatens  
the centuries-old  
vegetable gardens





City growth threatens  
the multiseccular  
vegetable gardens



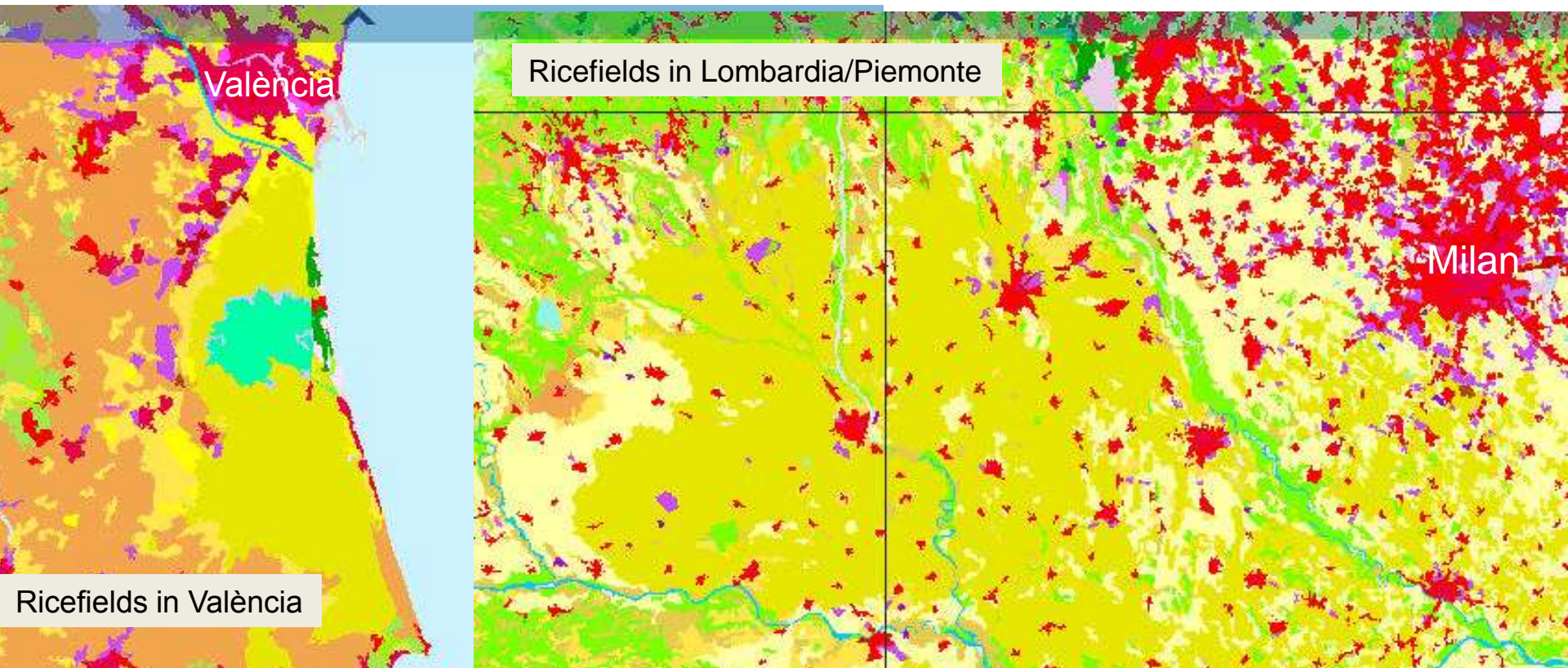
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Before **SIOSE**, the reference land cover GIS in Spain was **CORINE** which shows geographical information for almost the whole of Europe

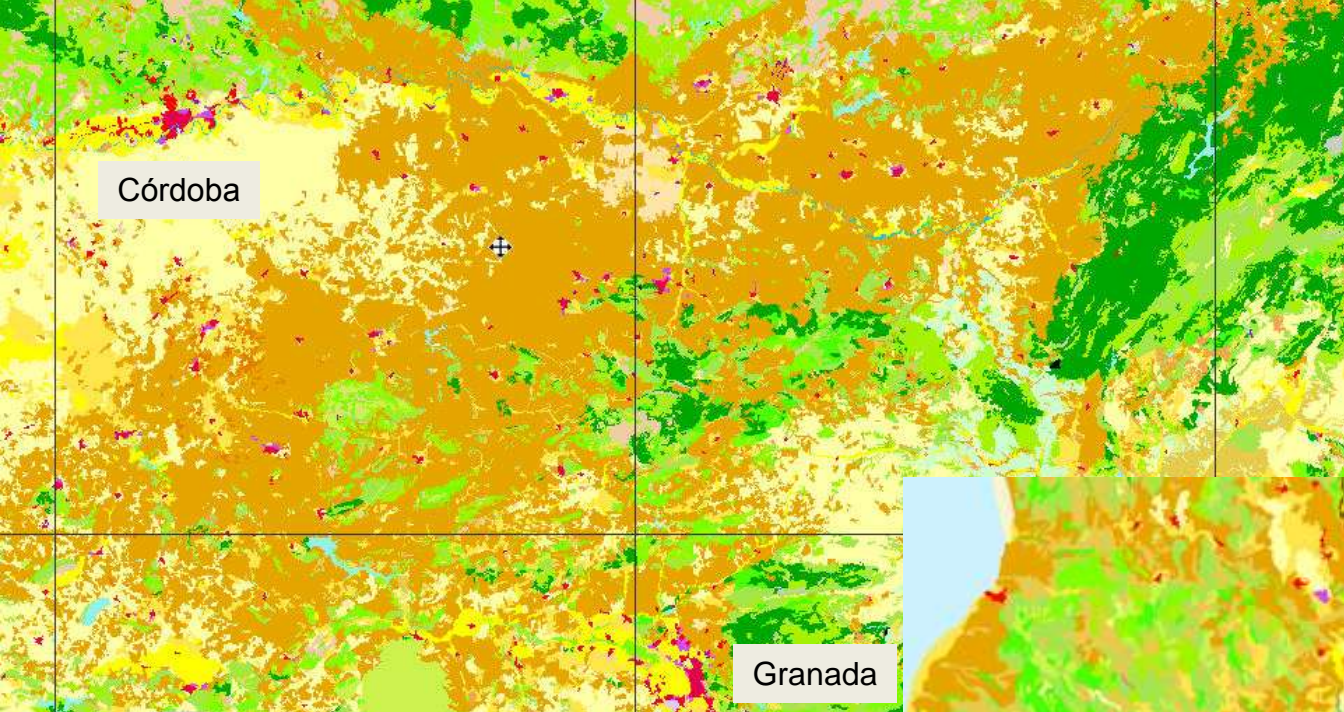
On a **regional or a national level**, it is still better to use **CORINE** land cover than SIOSE, because of the *excessive* detail of SIOSE



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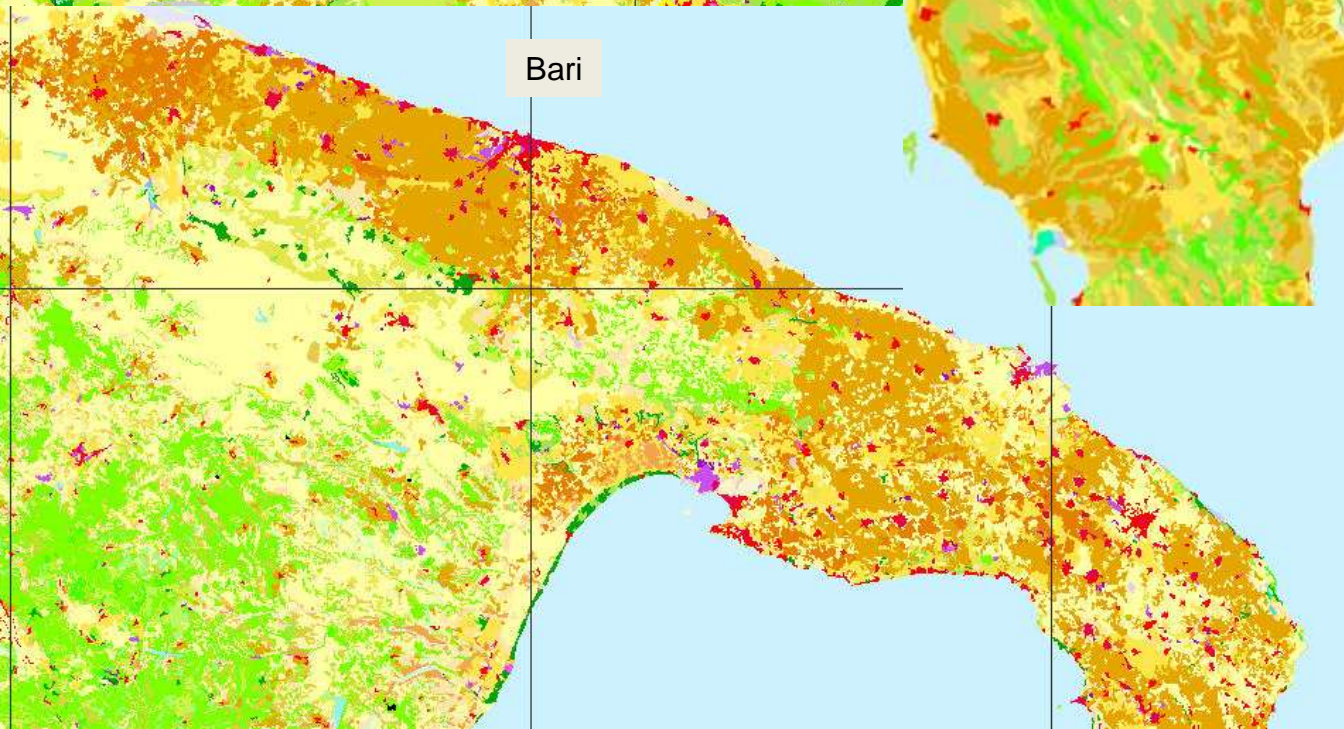


Córdoba

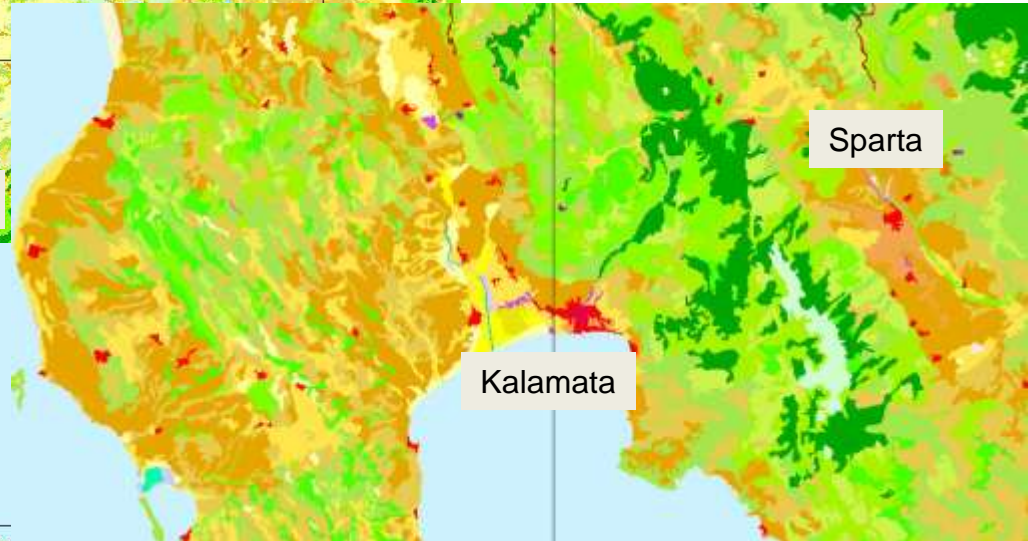
Granada

Olive groves in Andalucía (largest producer)

Olive groves in Peloponneso



Bari

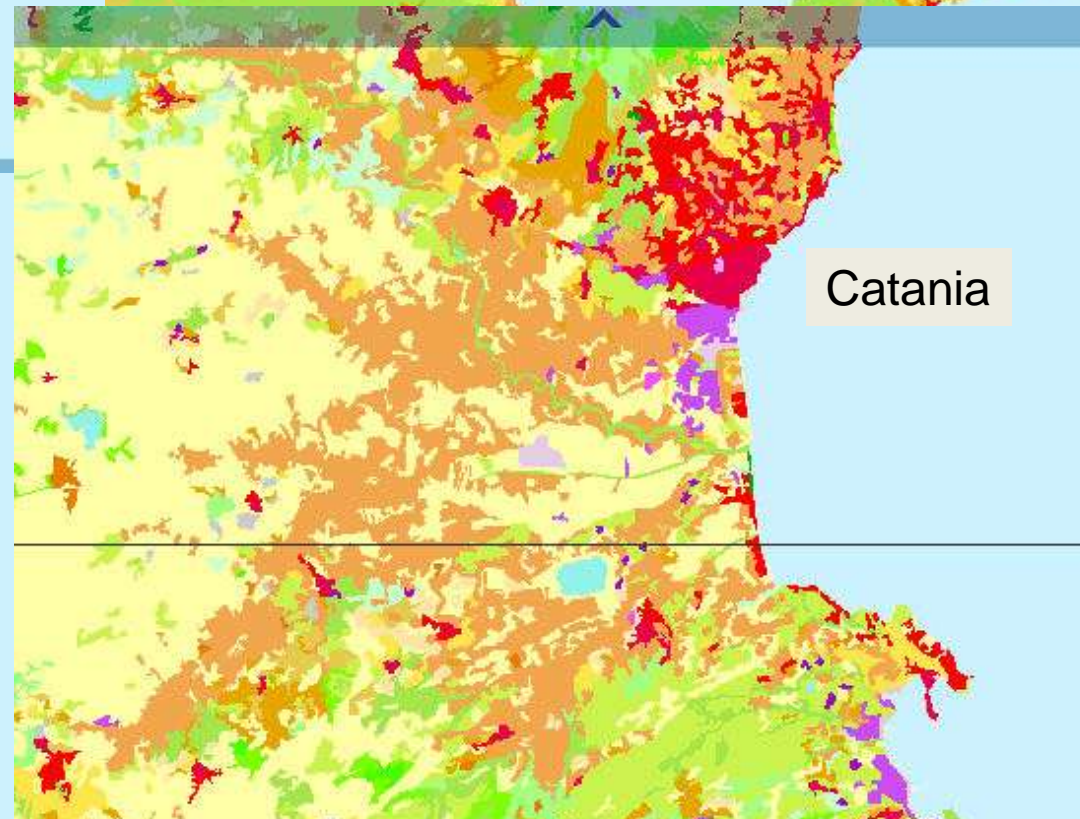
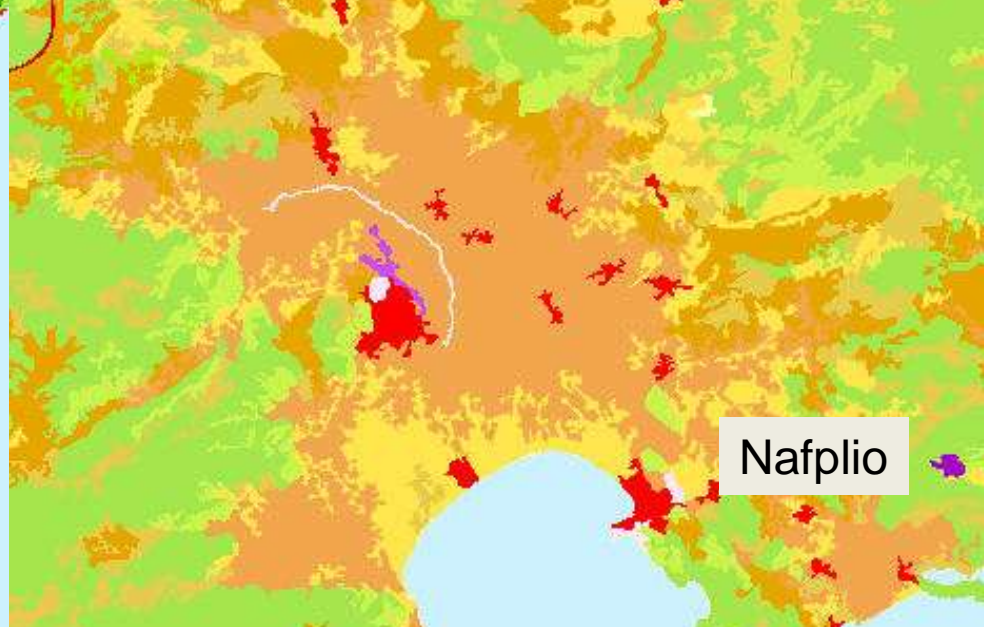
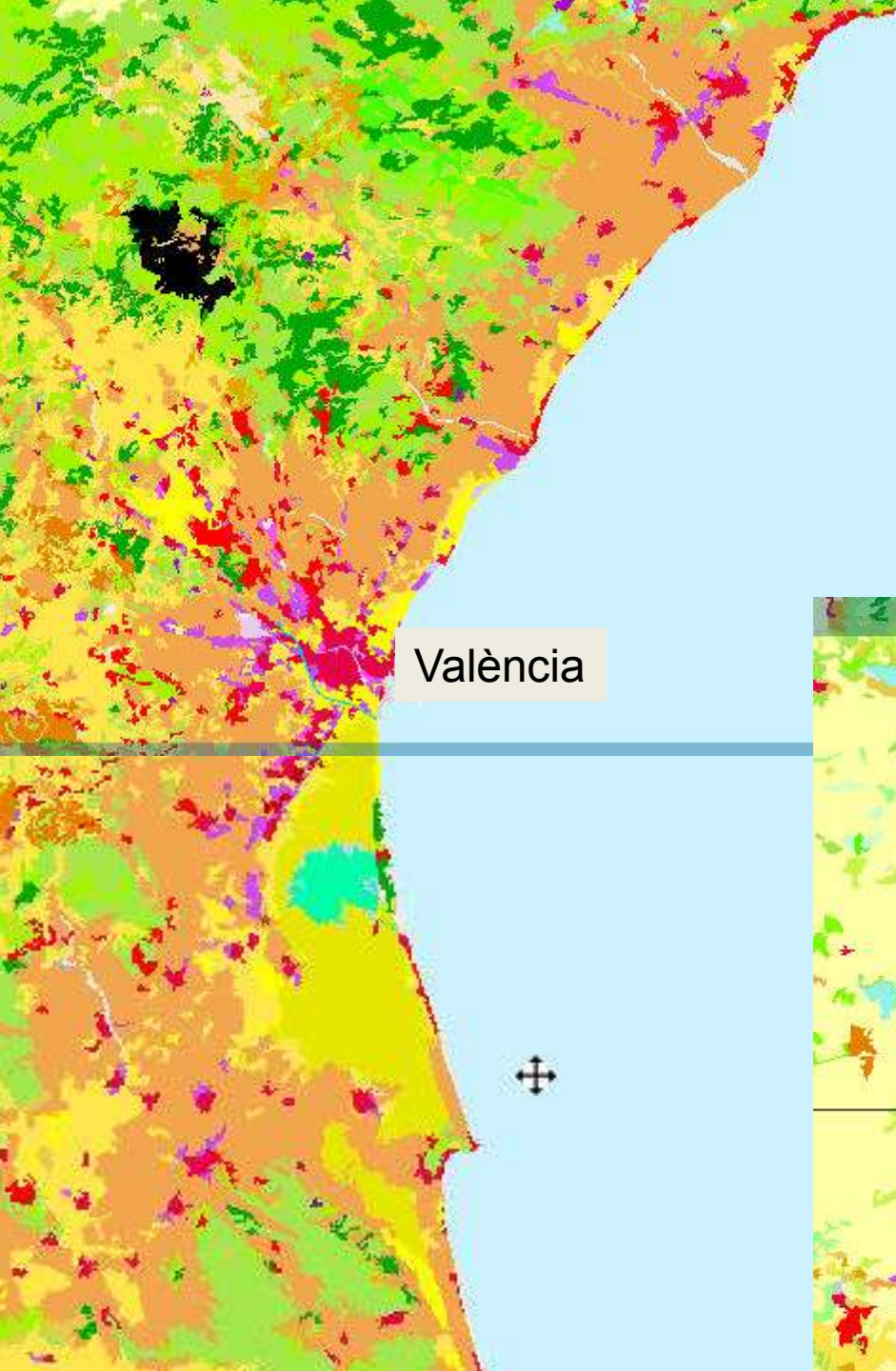


Kalamata

Sparta

Olive groves in Puglia







## SIOSE

Spanish acronym standing for 'Sistema de Información de Ocupación del Suelo en España' (Spain's Land Cover Information System)

a GIS promoted and coordinated by the Spanish Instituto Geográfico Nacional

a GIS with the highest level of territorial disaggregation ever carried out in Spain

An optimal tool for:

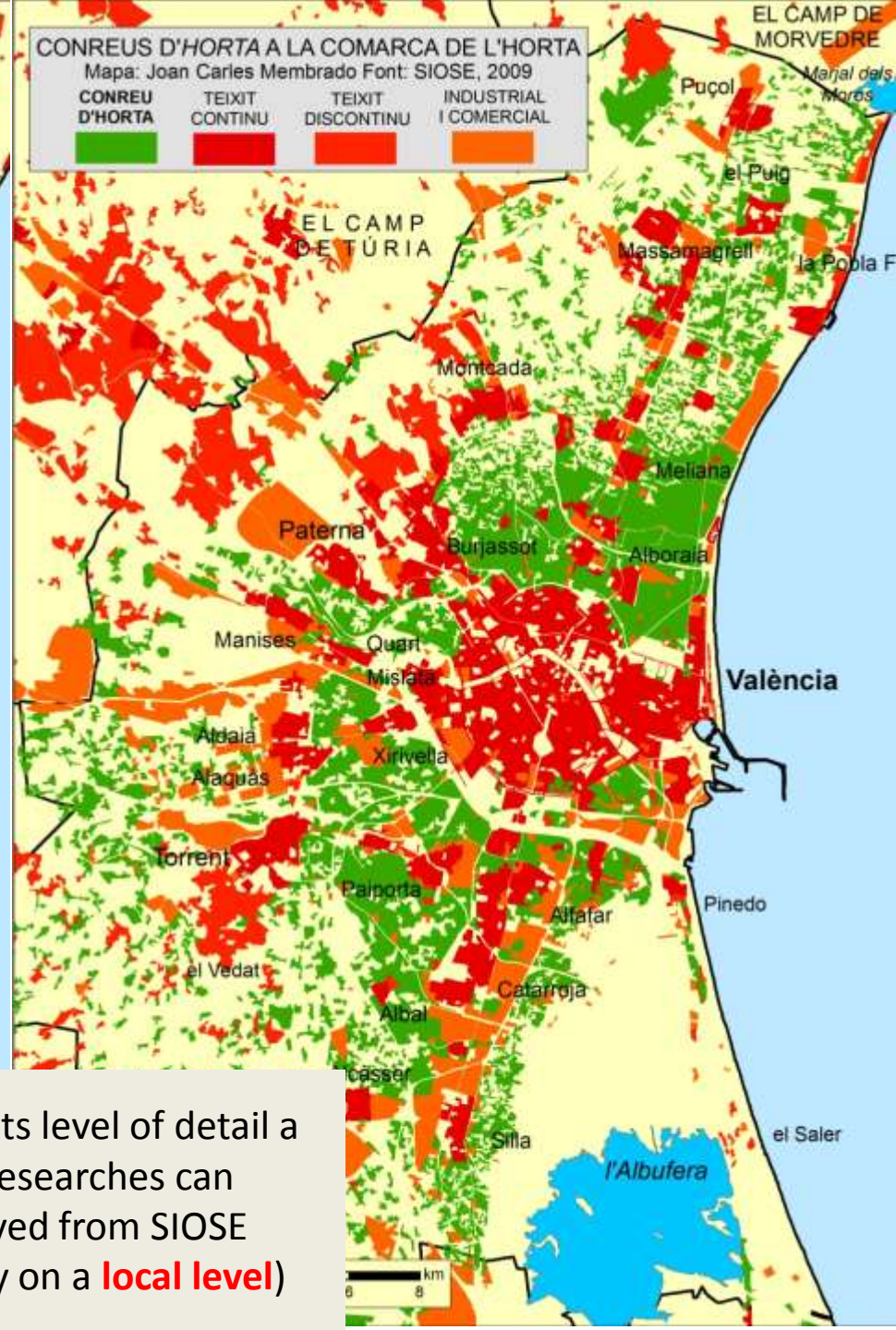
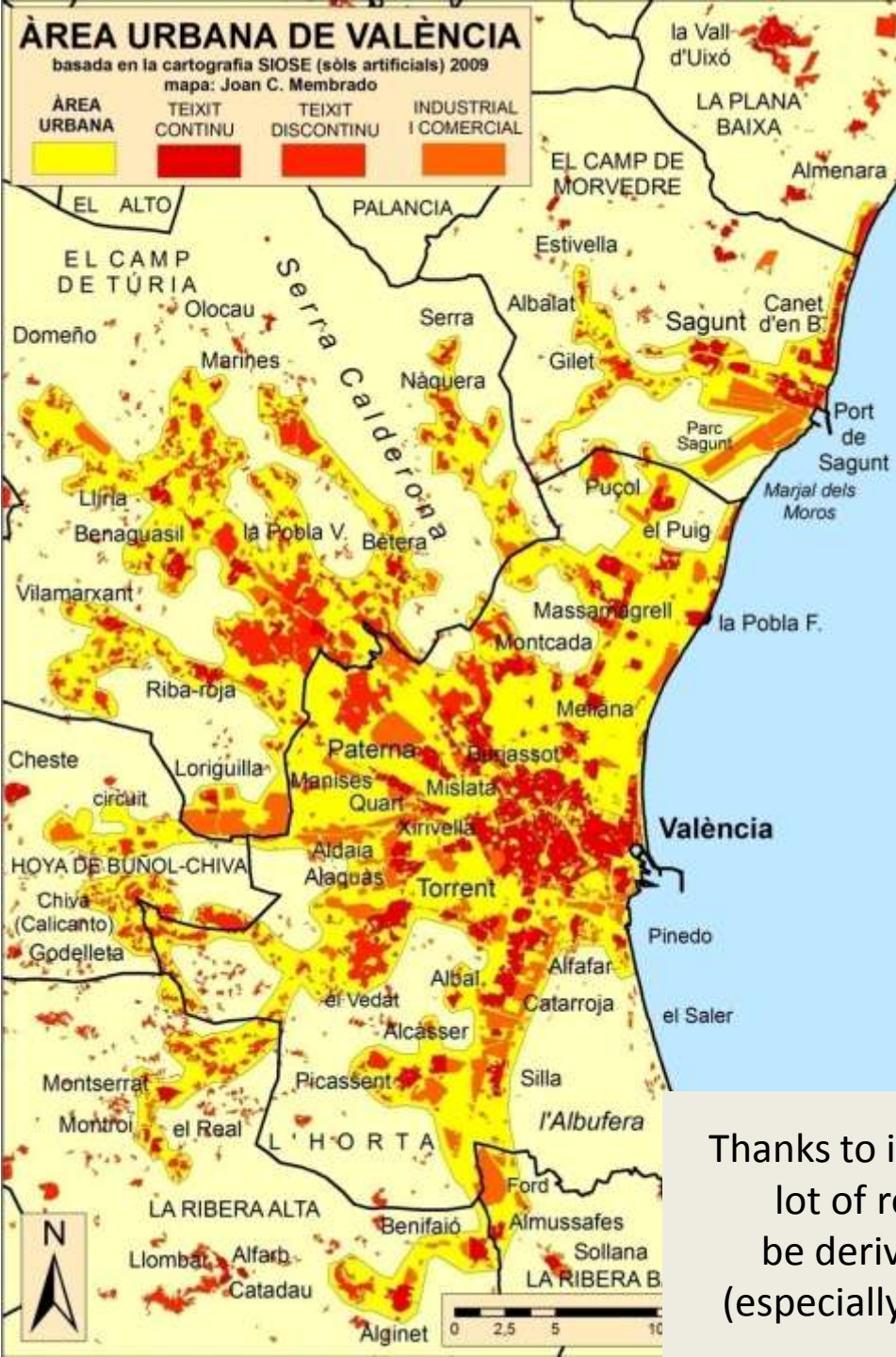
Strategies of sustainable regional development

Planning and management of environmental resources

Dynamic studies on land cover

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Thanks to its level of detail a lot of researches can be derived from SIOSE (especially on a **local level**)



## MINIMUM MAPPING UNIT

Territory is divided into many polygons, each associated with its land use, and with the only restriction of representing a minimum size, which for SIOSE is:

- 2 hectares for natural (forest, shrub, etc.) and agricultural areas;
  - 1 hectare for artificial areas (urban fabric, road network, etc.);
  - 0,5 hectare for water bodies, wetlands, beaches, greenhouses and riverside vegetation
- 
- minimum width 15 m for linear elements (no minimum width for water bodies, wetlands, beaches, greenhouses and riverside vegetation)

And for CORINE is:

- minimum mapping unit 25 hectares
- minimum width 100 m for linear elements

### RESULTS AND COMPARISON BETWEEN CORINE AND SIOSE IN VALÈNCIA (SPAIN)



# IMAGERY RESOLUTION

## SIOSE

Its reference imagery is **SPOT5**

Resolution: 2.5 m

Reference scale: 1:25.000

Other support reference imagery is Spanish **PNOA**

Resolution: 0.5 m

Reference scale: 1:5.000

## CORINE

Its reference imagery is **Landsat**

Resolution: 30 m

Reference scale: 1:100.000

.

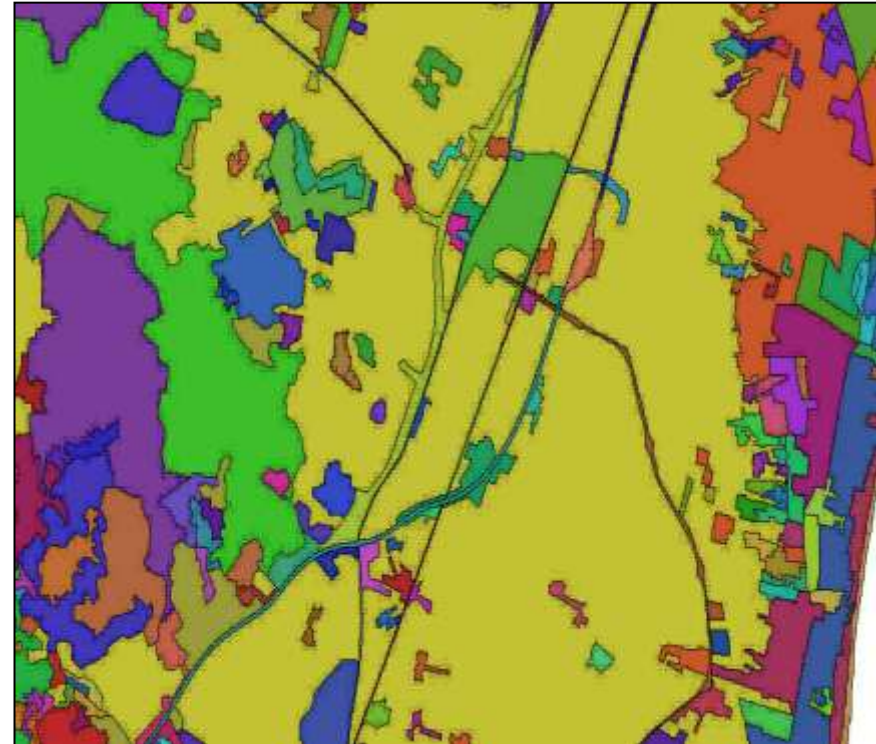
SIOSE: the most detailed GIS ever created in Spain on land use

In **València**: CORINE 8.541 different polygons and SIOSE > than 157.000

The reason for such a wide gap: the minimum mapping unit (CORINE = 25 ha and SIOSE = 2, 1 or 0,5 ha)

Two images from the same territory.

CORINE = more generalized // SIOSE = bigger level of detail



## RESULTS AND COMPARISON BETWEEN CORINE AND SIOSE IN VALÈNCIA (SPAIN)

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## **NOMENCLATURE**

- SIOSE 40 simple covers

A lot of complex covers, consisting of

regular (layout) mosaic

irregular (layout) mosaic

associations (anarchic layout)

42 artificial predefined associations

- CORINE            44 simple covers (3rd level of CORINE)

- Conceived for different purposes

- SIOSE (big scale)            CORINE (small scale)

But their nomenclature have some similarities:

Both GIS's aim to create a land cover classification

National Spanish Geographical Institute intends to automatically create CORINE 2012 from SIOSE 2012 data, whose photo interpretation is currently finishing.

### **RESULTS AND COMPARISON BETWEEN CORINE AND SIOSE IN VALÈNCIA (SPAIN)**



SIOSE **covers** can be *simple* or *complex*.

**Simple Covers** cannot be divided into simpler ones:

100% of the polygon is homogeneous and bigger than the minimum size required.

There are eight big types of simple land covers:

- *Crops*
- *Grassland*
- *Scrub*
- *Trees*
- *Bare soils*
- *Wetlands*
- *Water bodies*
- *Artificial areas*


Simple land covers of crops (orange groves)



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Simple cover of trees (conifers)

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**Complex Covers** consist of the sum of simple covers that do not satisfy the minimum size required, and they need to be aggregated into larger and *complex* covers.

A complex cover can be distributed as a:

a **Regular Mosaic** if it has a more or less regular layout (as in crops)

A **regular mosaic**, consisting of  
60% of orange groves  
30% of arable crops  
10% of grassland (from abandoned crops).



**Complex covers** can also be distributed as a: an **Irregular Mosaic** if its layout is not uniformly distributed (as in forest areas)  
An **irregular mosaic**, consisting of: conifer trees (80%) grassland (20%)





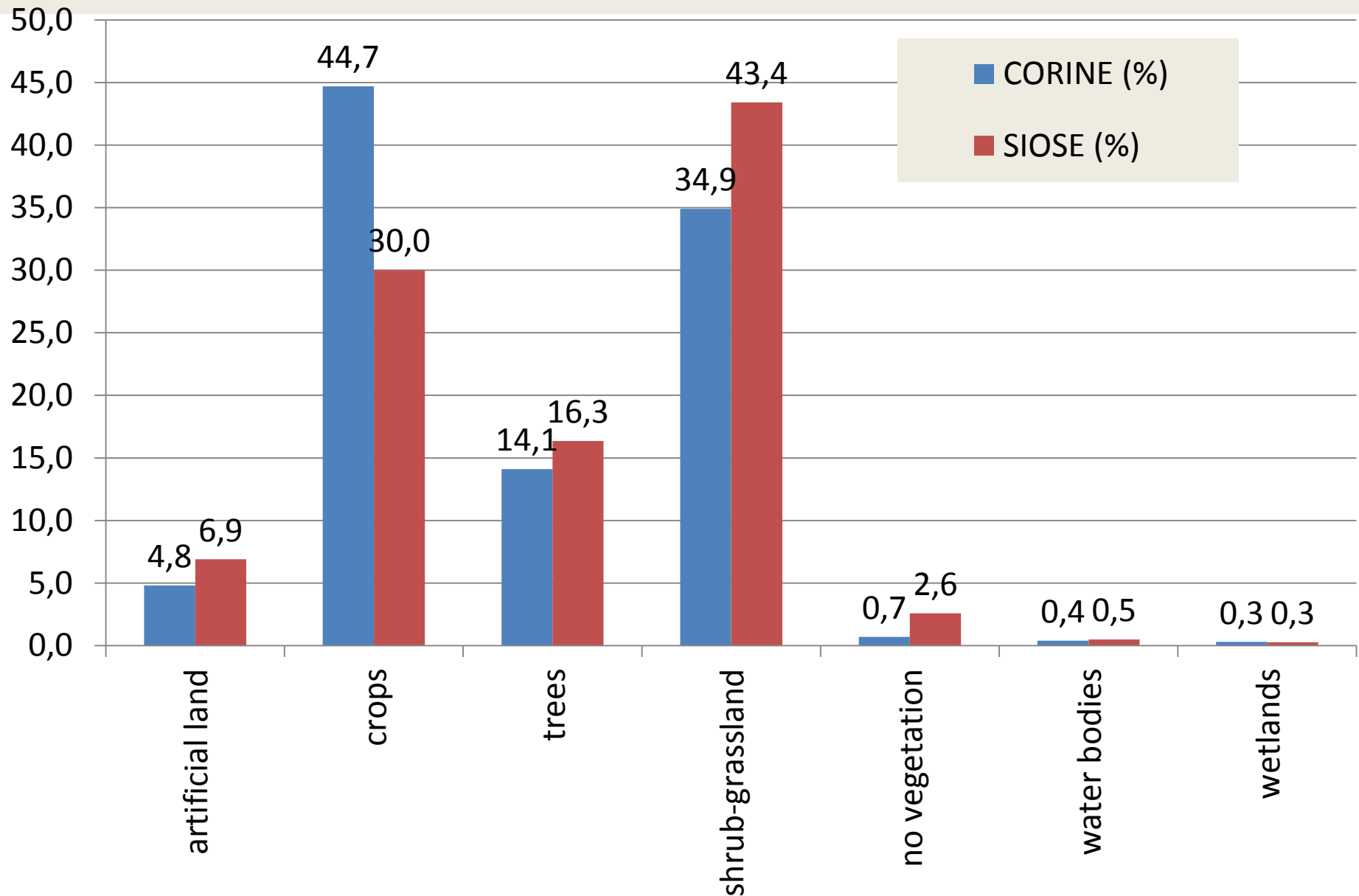
**Complex covers** can also be distributed as an **Association** if its layout is anarchicly mixed



There are 42 predefined artificial **associations**. This one is a *discontinuous mixed urban* association consisting of: 50% of buildings, 35% of streets, parking lots and pedestrian area without green areas ; 10% of green areas; 3% of unbuilt land; 2% of artificial water surface



# Different imagery, minimum mapping and nomenclature means different results



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## ABANDONED CROPS IN VALÈNCIA

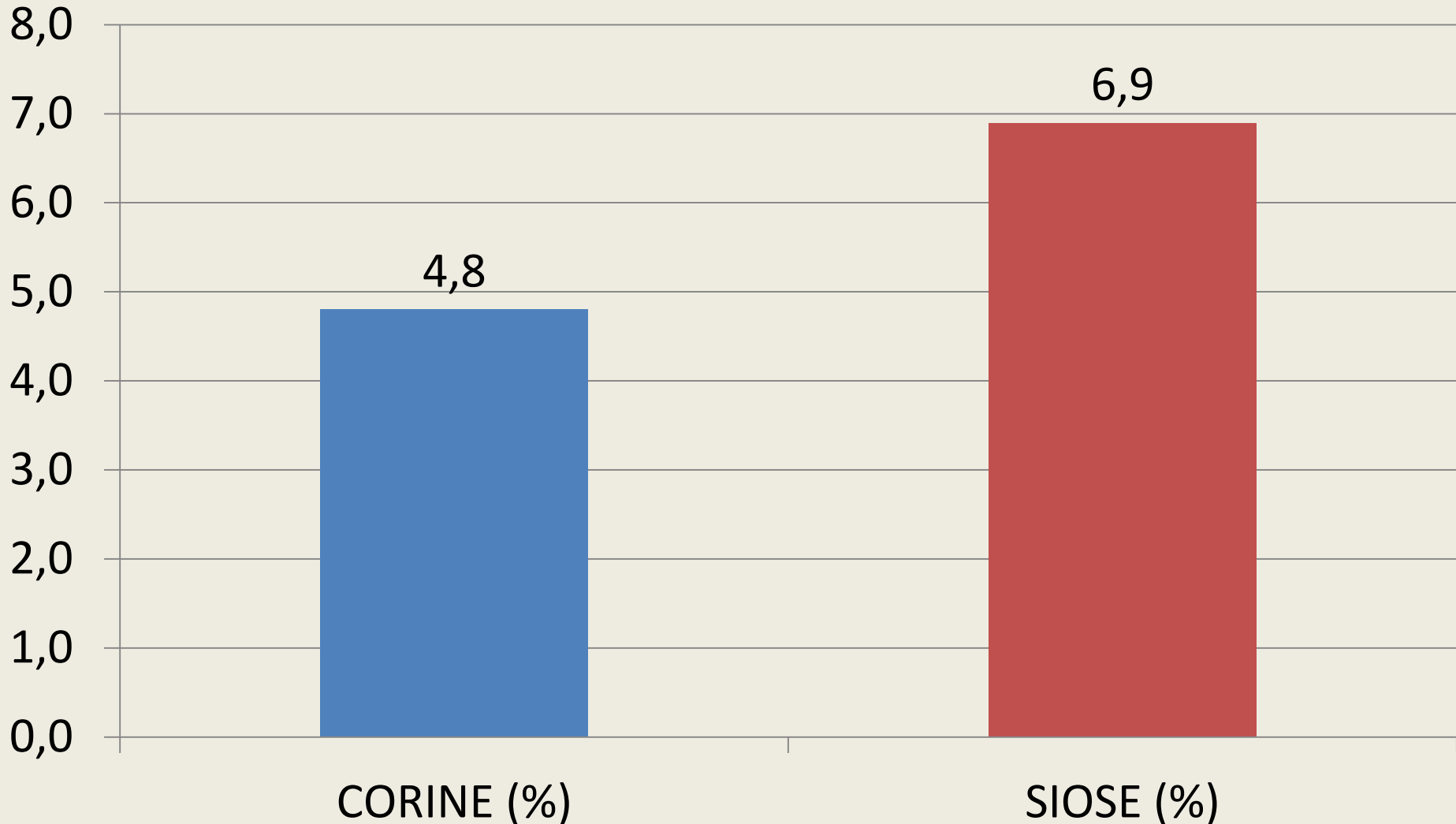


According to SIOSE: almost 194.000 ha are abandoned crops.  
For SIOSE they are grassland, but for CORINE, most of them are still crops (because of generalization)

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*32nd IGC (Cologne)*

From an economic and ecological point of view: main difference is the artificial land.  
Generalization of covers (CORINE) distorts –reduces– the statistics of artificial lands

## artificial land

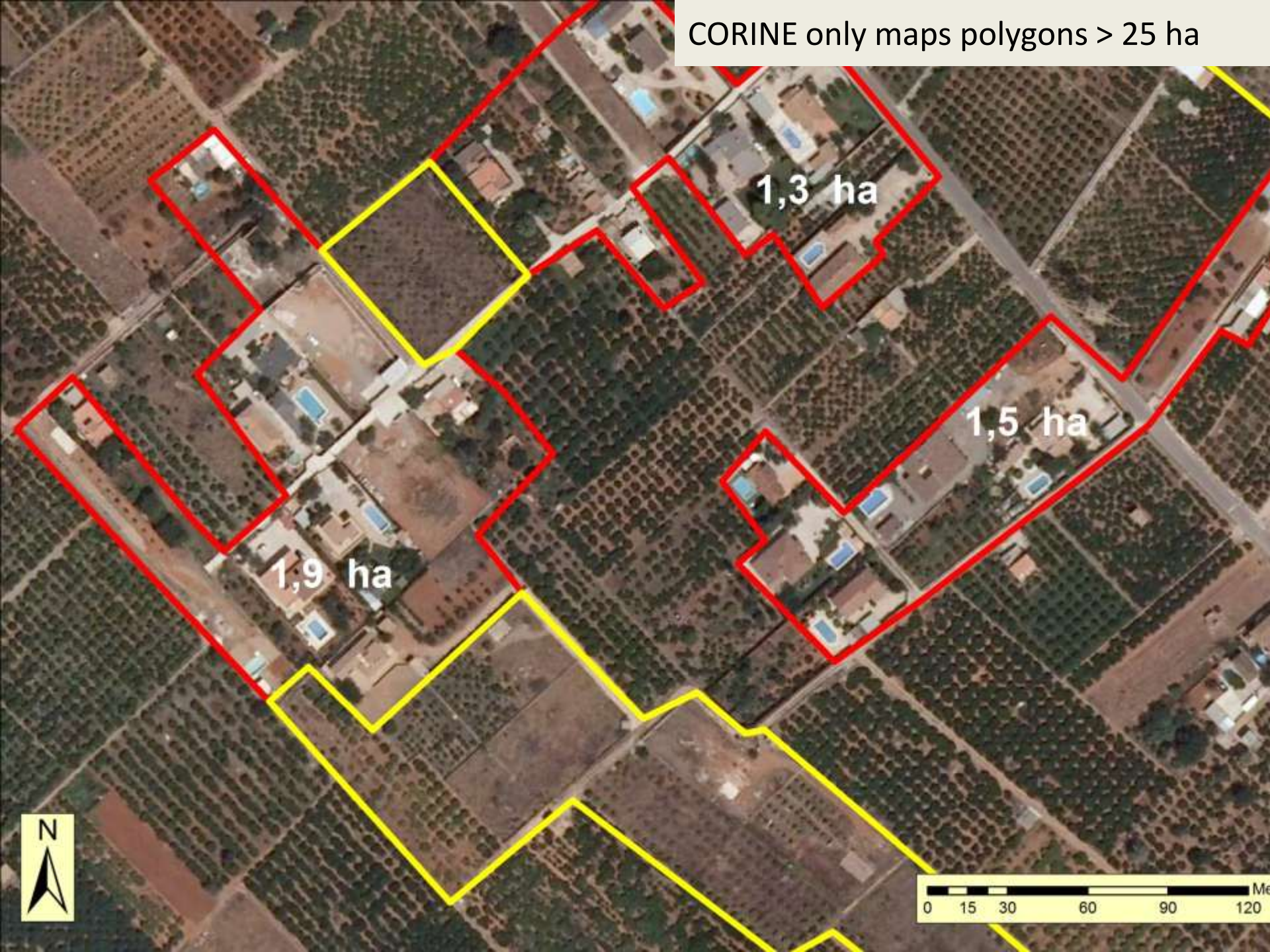


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CORINE only maps polygons > 25 ha



## DIFFERENCES in ARTIFICIAL LANDS between

**CORINE:** 11 artificial classes

- 111. continuous urban fabric    112. discontinuous urban fabric
- 121. industrial or commercial units    122. road and rail networks
- 123. port areas    124. airports
- 131. mineral extraction sites    132. dump sites    133. construction sites
- 141. green urban areas    142. sport and leisure facilities

**and SIOSE:** 42 predefined artificial associations

- ❖ *mixed urban* which can present three layouts:
  - old area* (old city)    *expansion area* (new city)    *discontinuous area* (suburbs)
- ❖ *primary sector* (farms, forestry facilities, mineral extraction sites, fish farms)
- ❖ *industrial buildings* (planned or unplanned industrial areas, isolated factory)
- ❖ *tertiary buildings* (business & commercial area, recreational park, hotel complex, camping)
- ❖ *different facilities* (government, health, education & justice facilities, cemeteries, churches, prisons, monuments, cultural sites, sport facilities, golf courses, green areas)
- Infrastructures* (road networks, rail networks, port areas, airports)
- ❖ *power plants* (nuclear, hydroelectric, thermal, wind & solar farms)
- ❖ *water* (sewage treatment plant, desalination plant, irrigation canal)
- ❖ *Telecommunication repeater*
- ❖ *waste* (dump sites, waste treatment plant)

## RESULTS AND COMPARISON BETWEEN CORINE AND SIOSE IN VALÈNCIA (SPAIN)

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CORINE distinguishes 3 classes & polygons (111, 122 & 141)

SIOSE distinguishes up to 100 polygons, all of them consisting of

*predefined artificial associations* (old city, new city, green areas, sports facilities, etc.)





Pre  
defi  
ned

*old area (old city)*



Artifi  
cial

*expansion area (new city)*



Asso  
cia  
tions

some  
exam  
ples

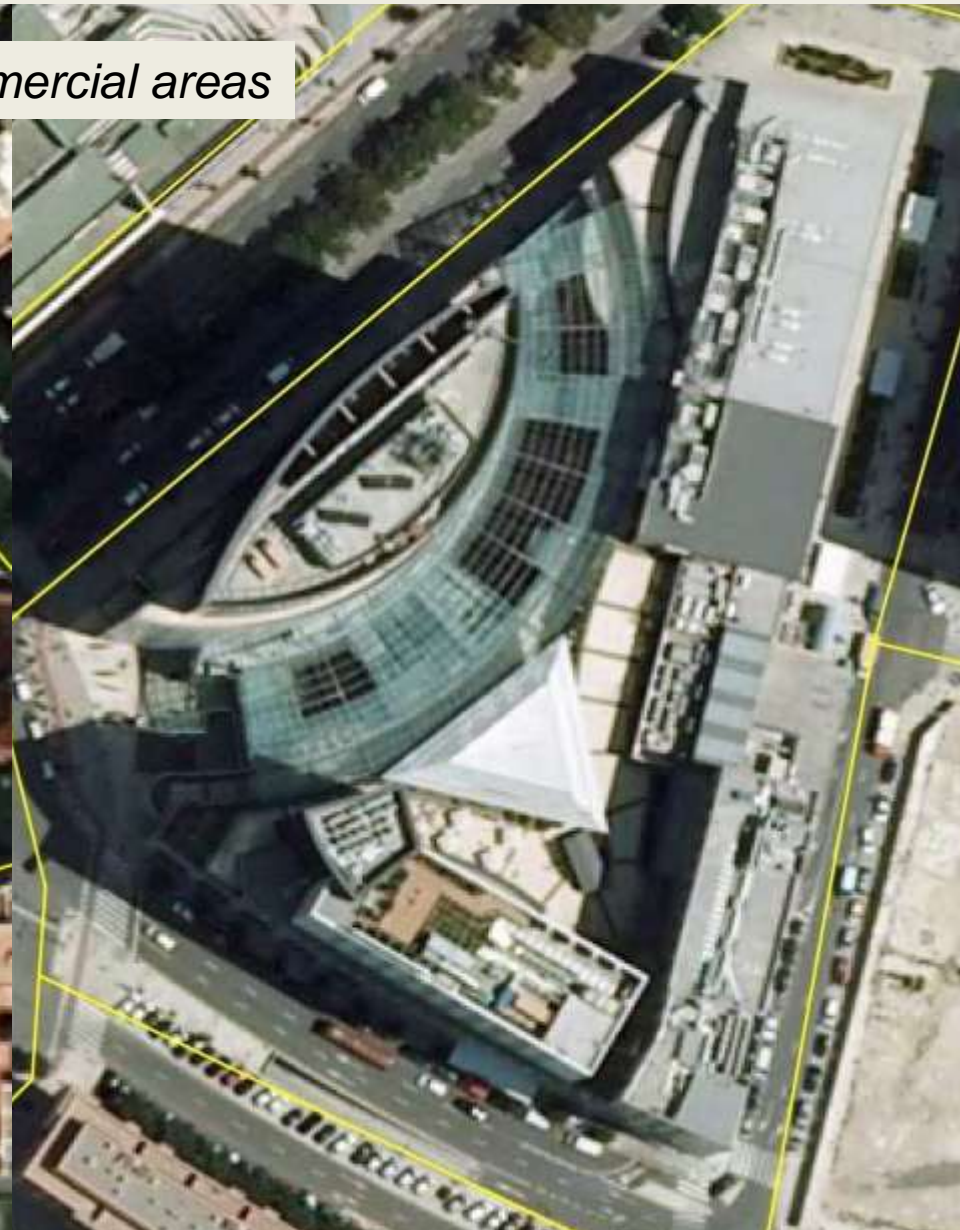
*discontinuous area (suburbs)*





*Predefined Artificial Associations some examples*

*Business & commercial areas*



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*Predefined Artificial Associations some examples*



*Educational areas*



*Health areas*



*Predefined Artificial Associations some examples*

*Port areas*

*Nuclear power plant*



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## Select by attributes: Citrus (code 222)

The screenshot displays the ArcGIS interface with the following components:

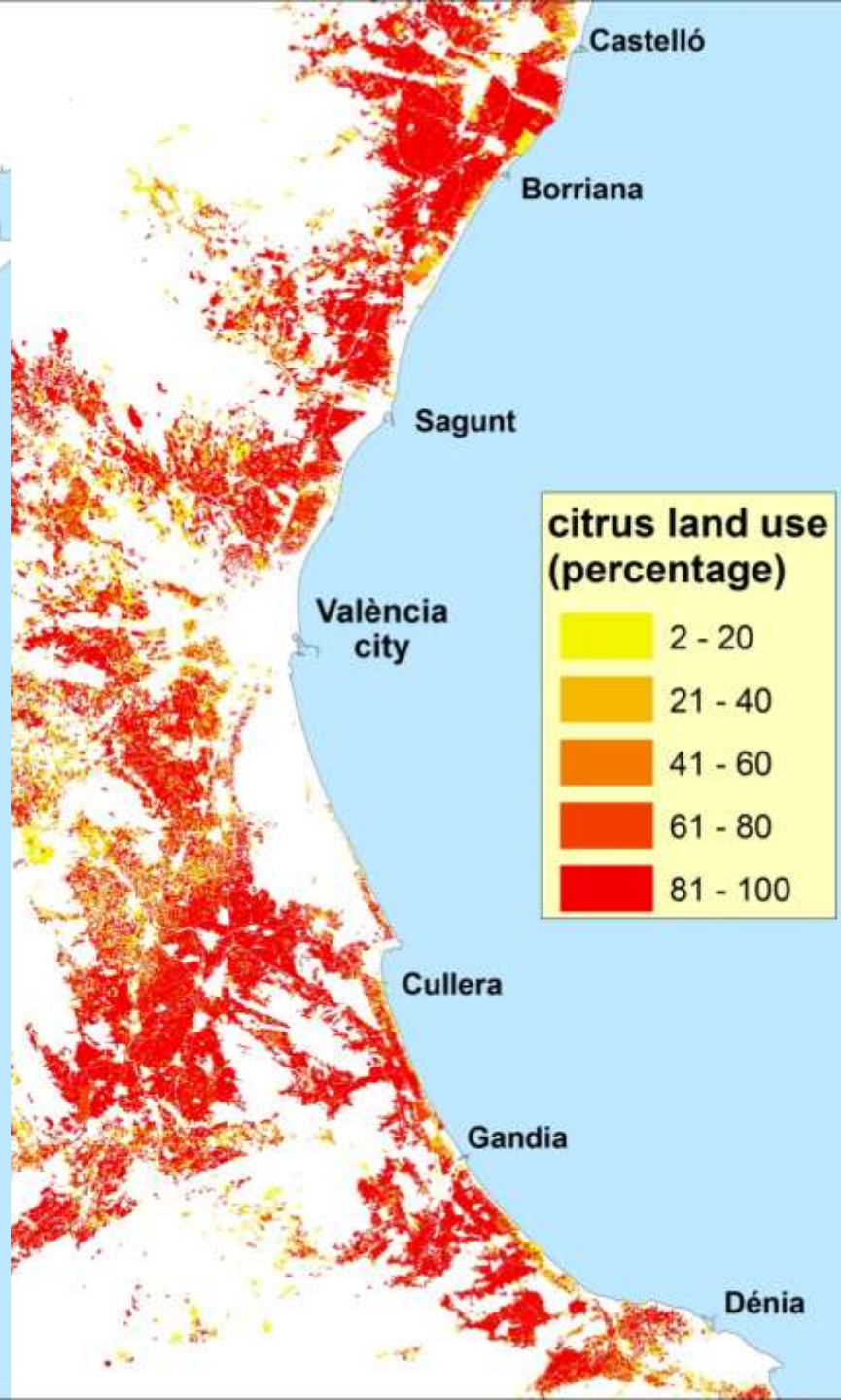
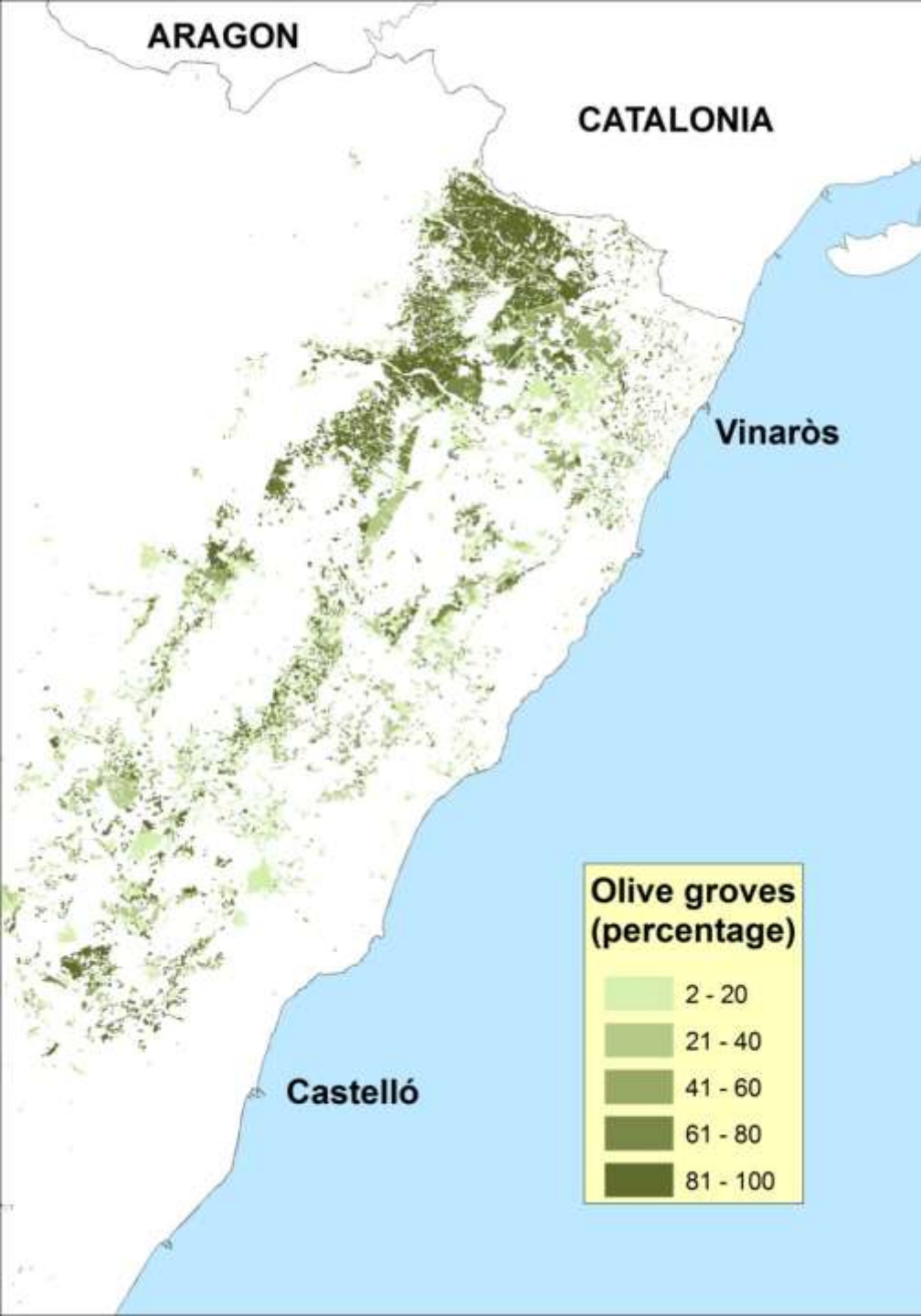
- Georeferencing toolbar:** Includes tools for layer selection, zoom, and pan.
- Editor toolbar:** Shows the current task as 'Create New Feature' and the target layer.
- Layers panel:** Lists the following layers:
  - C:\Geografia\Siose200
    - T\_valores\_join
  - C:\Geografia\Siose200
    - T\_POLIGONOS
    - T\_POLIGONOS
    - T\_VALORES
    - TC\_SIOSE\_COBERT
- Main map area:** Shows a map of Valencia, Spain, with citrus orchards highlighted in cyan.
- Select By Attributes dialog box:**
  - Layer: T\_valores\_join
  - Method: Create a new selection
  - Fields: "FID", "OBJECTID\_2", "ID\_2009\_OR", "ID\_2009", "CODE\_2009", "XML\_2009"
  - Operators: =, <>, Like, >, >=, And, <, <=, Or, %, (), Not
  - Buttons: Is, Get Unique Values, Go To: [ ]
  - Query: SELECT \* FROM T\_valores\_join WHERE: "ID\_COBERTU" =222
  - Buttons: Clear, Verify, Help, Load..., Save..., OK, Apply, Close

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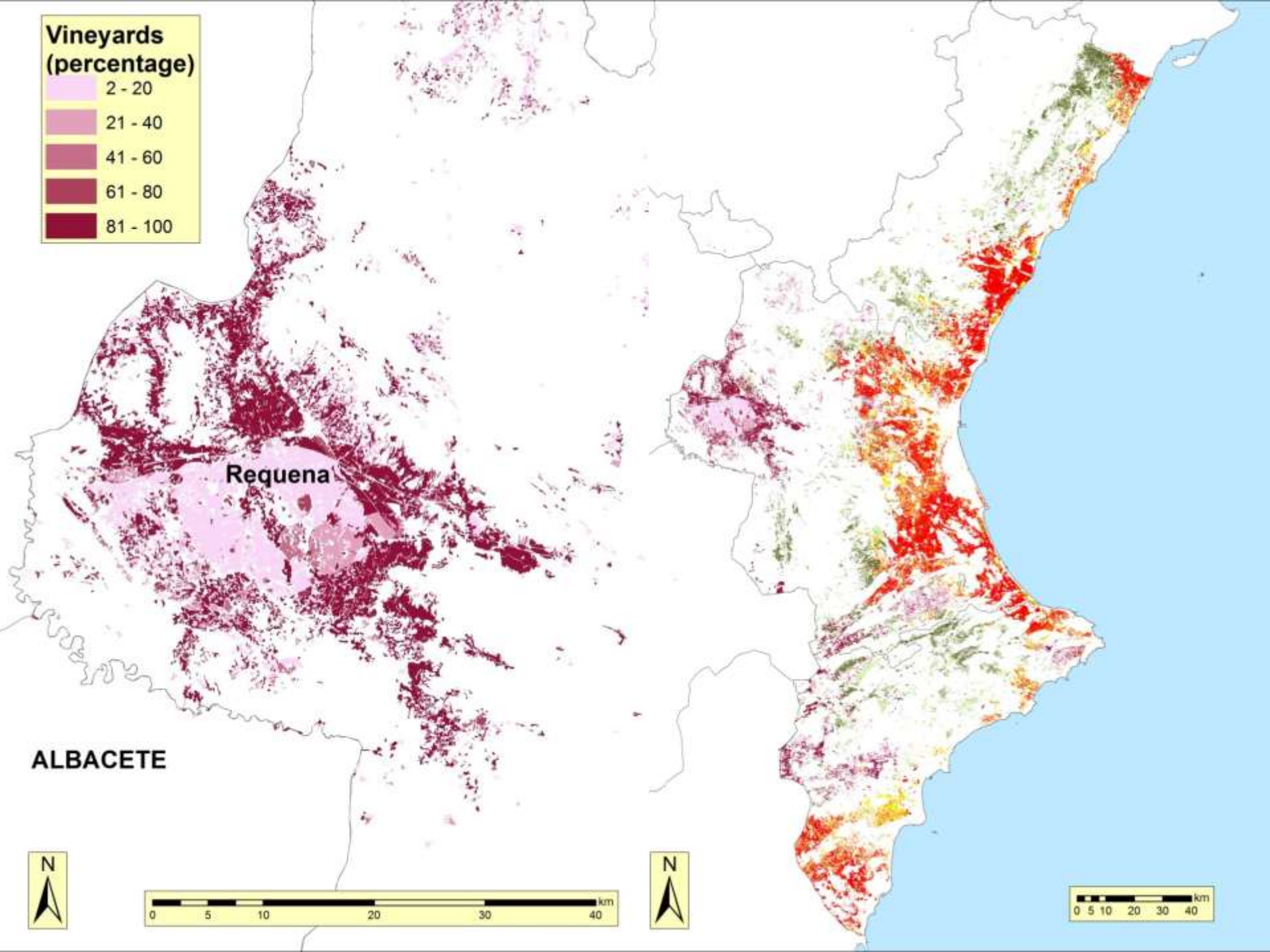
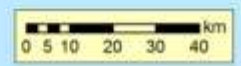
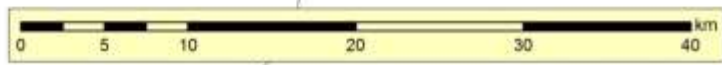


**Vineyards  
(percentage)**



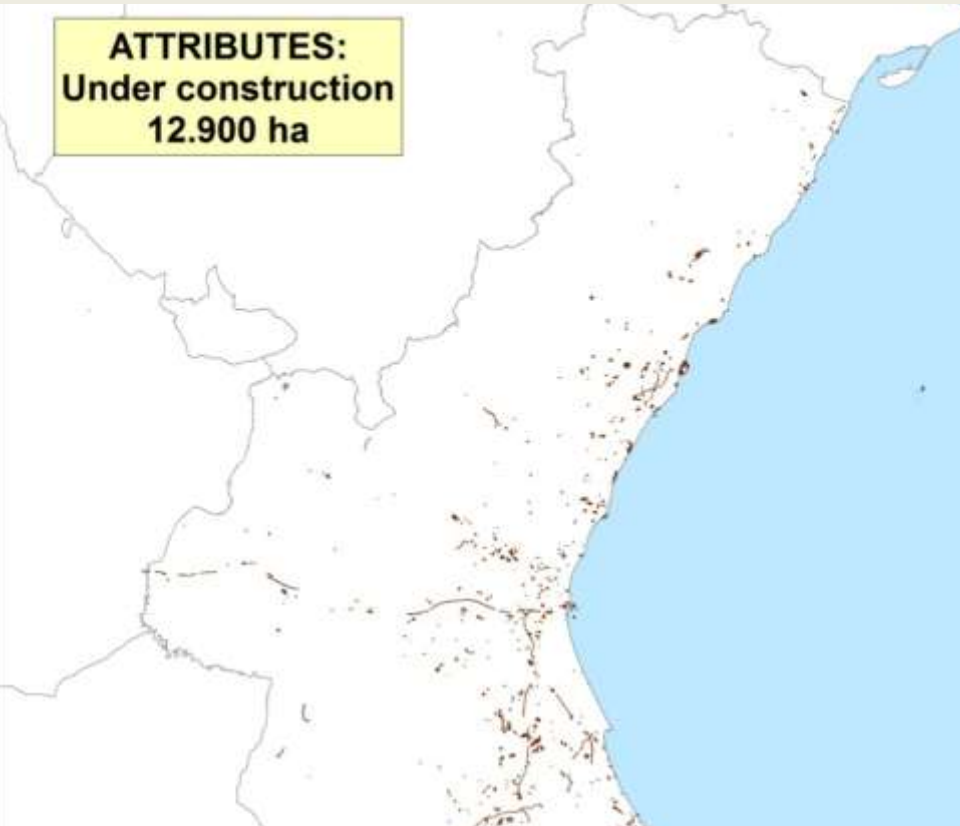
**Requena**

**ALBACETE**

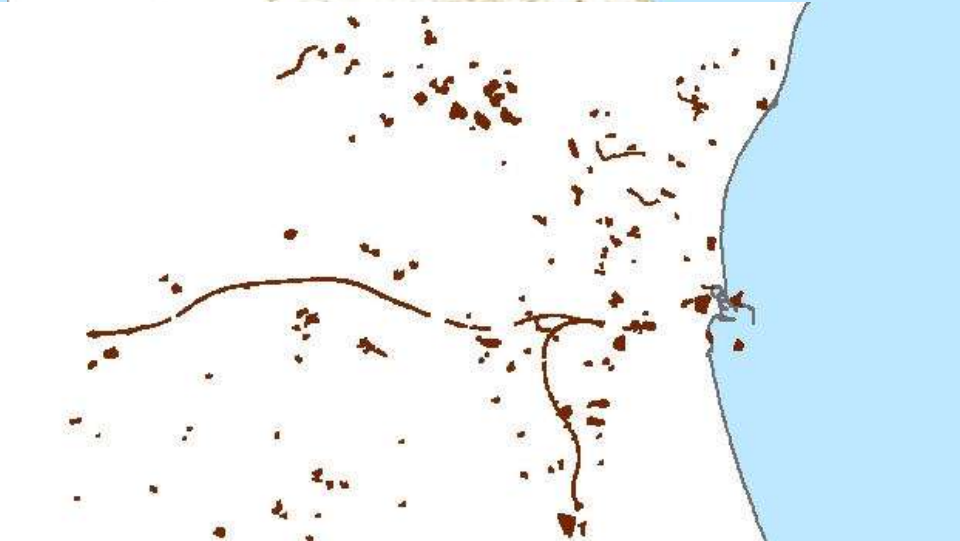
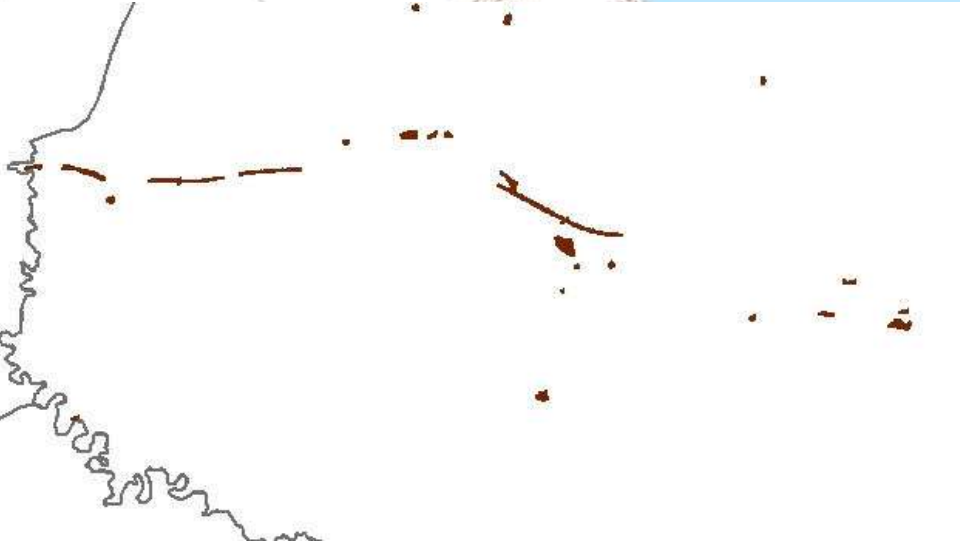
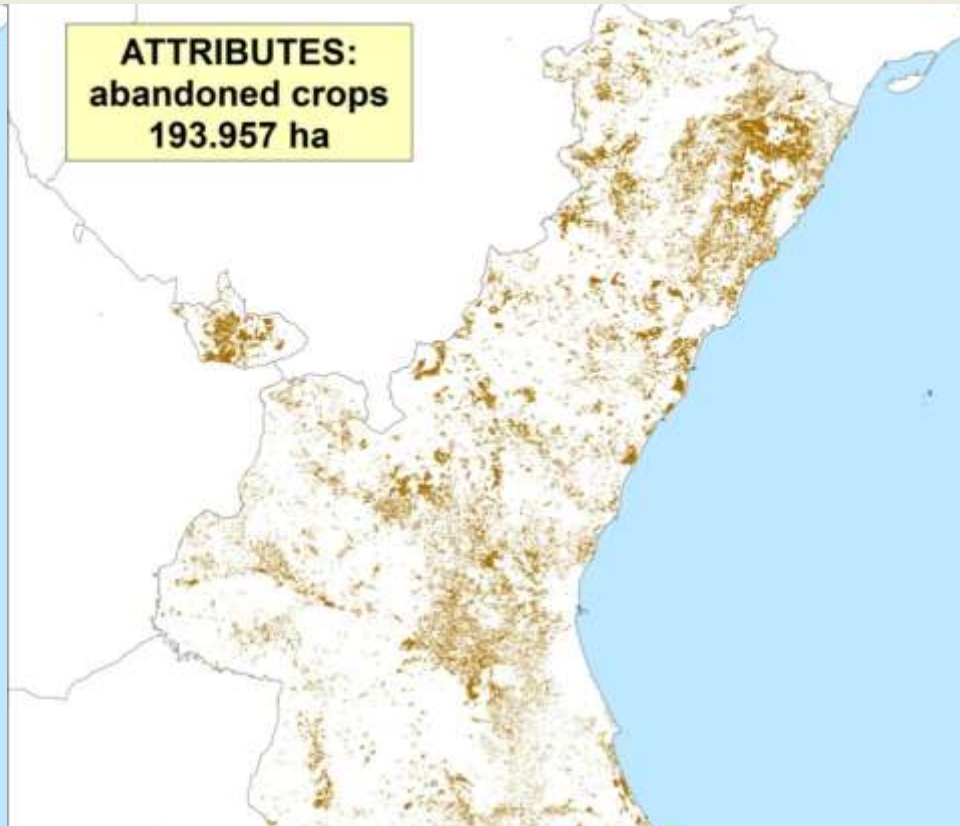


# Some simple covers can or cannot have an **attribute**

**ATTRIBUTES:**  
Under construction  
12.900 ha



**ATTRIBUTES:**  
abandoned crops  
193.957 ha





# CONCLUSIONS

- **CORINE: Dynamic studies on land cover**

- Growth of artificial surfaces
- Discontinuous urban fabric & commercial units
- Model of extensive urbanization
- Best land cover GIS to compare (small scales)

- **SIOSE: highest level of detail GIS in Spain**

- Best land cover GIS to compare (big scales)
- Different imagery (more resolution in SIOSE)
- Different nomenclature (more complex in SIOSE)
- Different minimum mapping size (more restrictive in CORINE)
- Different results between SIOSE & CORINE
  - SIOSE more accurate (more artificial surface, more grassland from crops, less crops)

Session on Land Use and Land Cover Change

**THANK YOU**

**RESULTS AND COMPARISON BETWEEN CORINE AND  
SIOSE IN THE LAND OF VALÈNCIA (SPAIN)**

Joan Carles Membrado  
Emilio Iranzo

32nd International Geographical Congress  
Cologne 26 - 30 August 2012



