SIOSE
Sistema de Información de Ocupación del Suelo en España

Instituto Geográfico Nacional

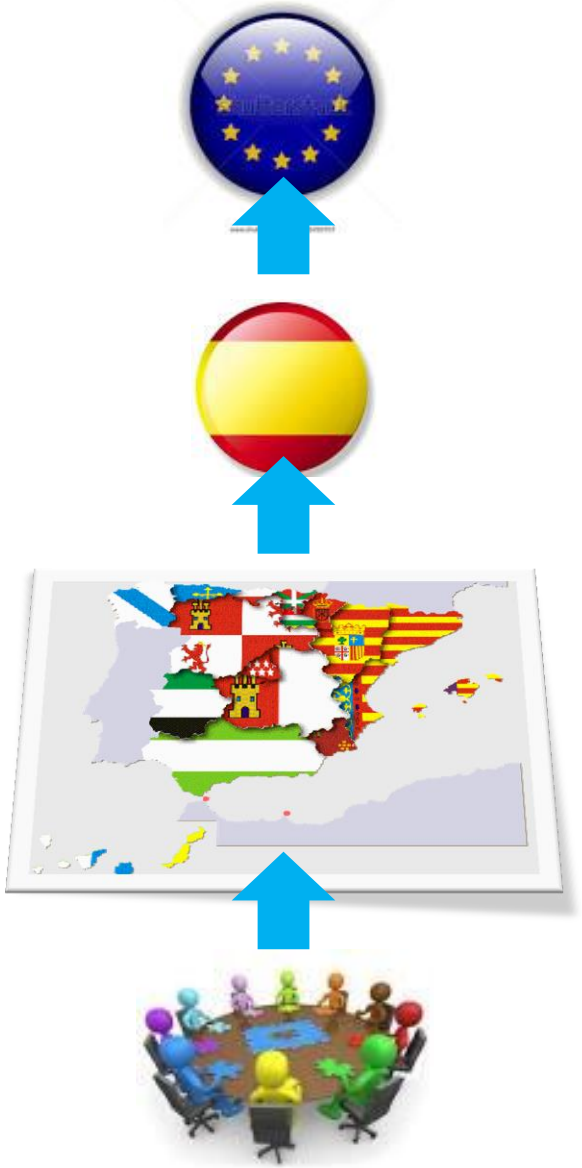
Parametric Object Oriented LC data model

SIOSE Spain

Julián Delgado Hernández

- IGN Spain is the **NRC** on Land Cover, Land Use and Spatial Planning in Spain for the **EIONET** Network, participate in terms on LC/LU in **Copernicus Land, EAGLE, UN-GGIM, INSPIRE**
- **National Information System on Land Cover and Land Use** (**SIOSE –** Sistema de Información de Ocupación del Suelo en España)
- Objectives
  - National coordination project on LC/LU (national and regional datasets)
  - **Integration** of national and regional datasets (agriculture, forest, cartography, etc.)
  - **Satisfy Spanish users' needs** (CORINE was not sufficient)
  - **INSPIRE** compliant on philosophy and techniques (webservices, data models, metadata, etc.)
  - **Copernicus**: SIOSE like origin data for production and validation
  - **UN-GGIM**: SIOSE plays the role of core data for LC/LU

- SIOSE is part of the **National Plan of Land Observation (PNOT),** coordinated by the IGN, and involves the consolidated projects on remote sensing, orthoimagery, elevations and land cover and land use
- PNOT is a production system that involves public authoritative stakeholders in a model: **decentralized** (local, regional and national), **collaborative** and **co-funded**
- Based on the use of **common shared data sources, costs and efforts,** building up a solid **bottom-up approach** national model of producing and managing geospatial information



Premio de las Naciones Unidas - 2013
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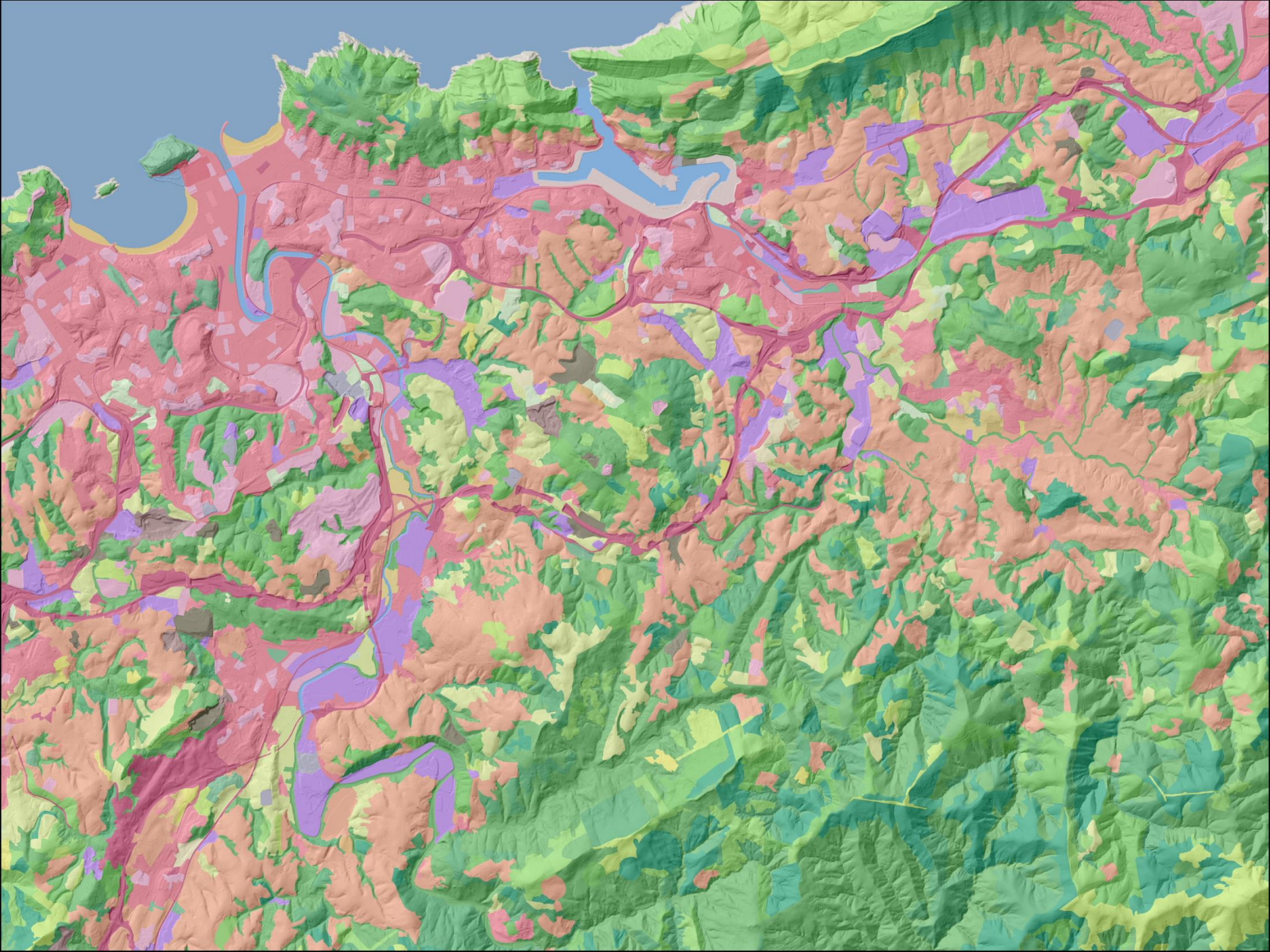
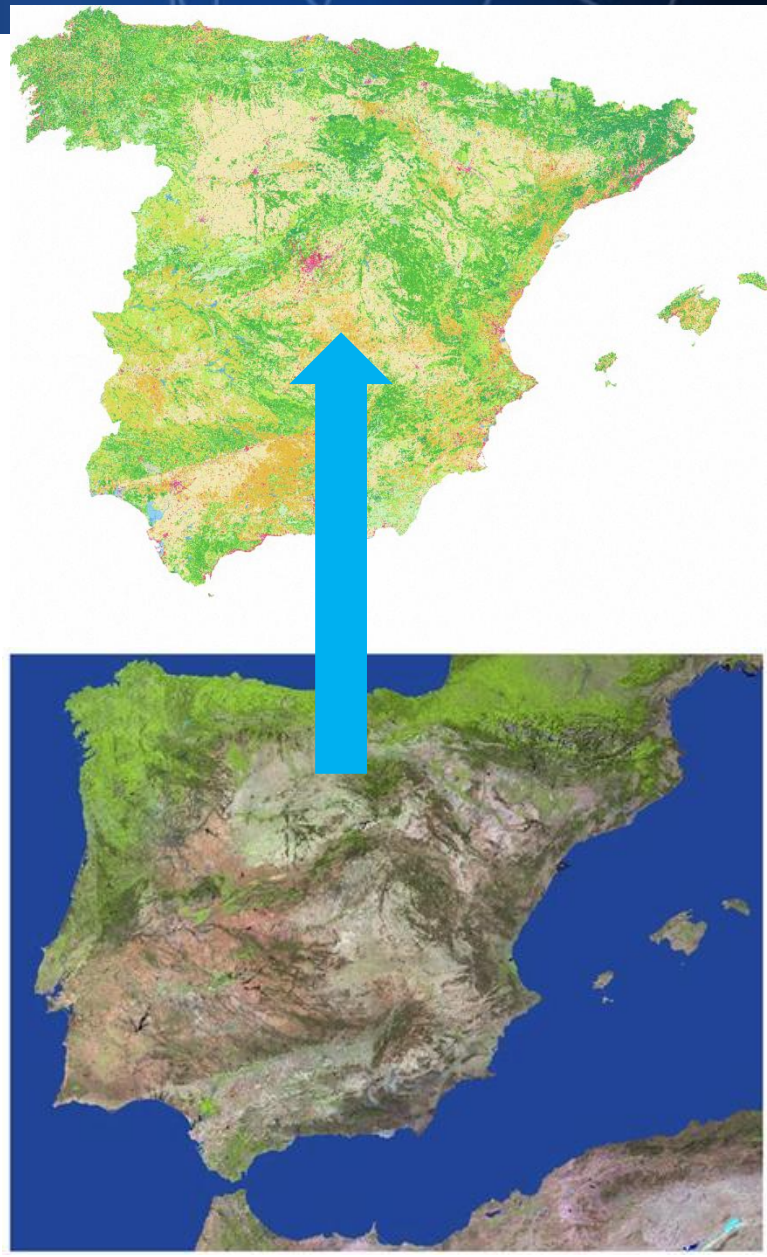


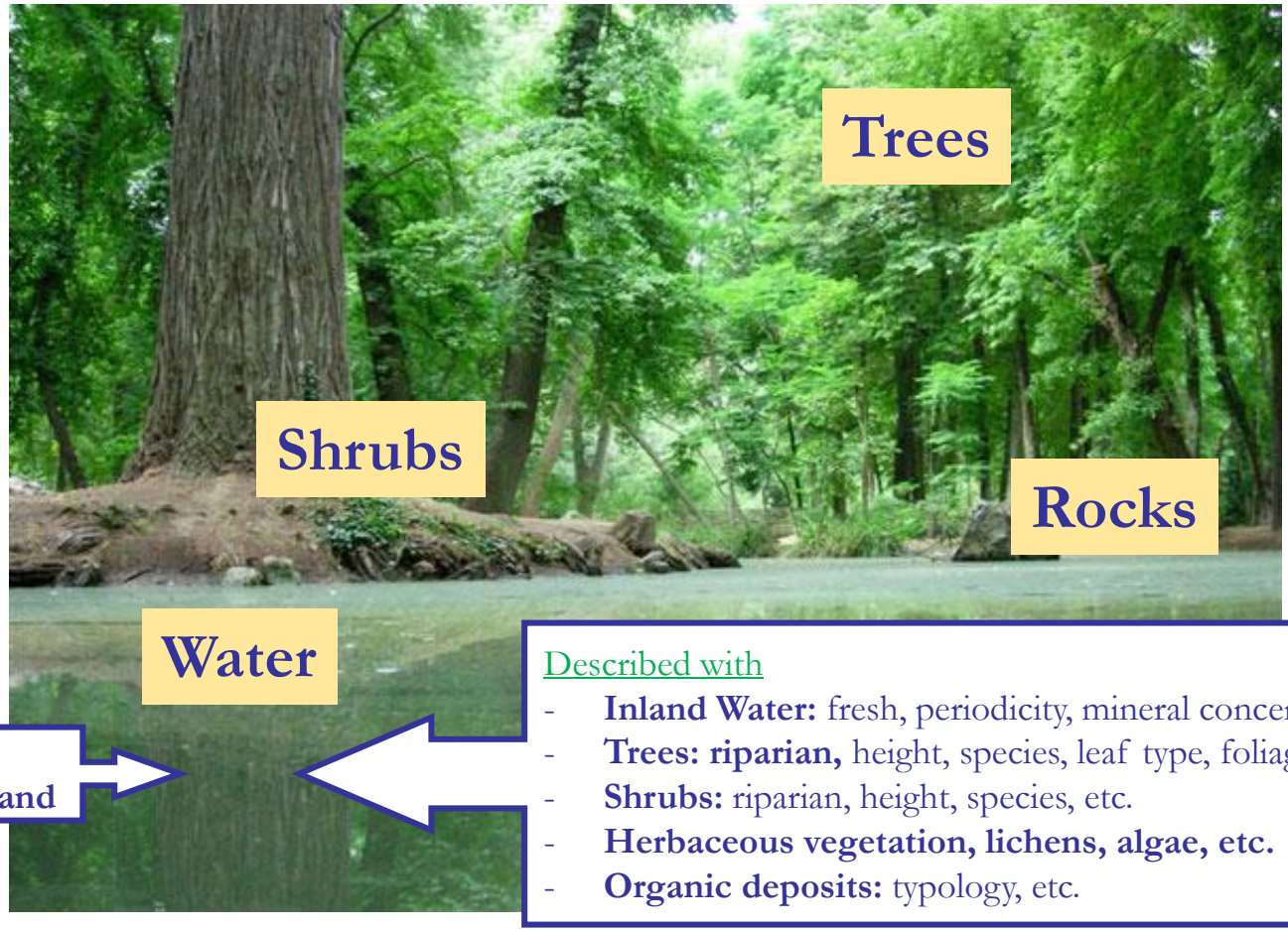
❖Technical Characteristics

- **Vector dataset** (geospatial database) generated by photointerpretation and data integration for entire country
- Reference image → SPOT and supported orthophotography (PNOA)
- **Frequency for update 3 years**, accomplished with Copernicus Land services/products. Versions of 2005, 2009, 2011, 2014
- Geometric scale 1:25.000, minimum mapping unit **2 ha - 0,5 ha,** (0,4 ha changes) minimum narrow length 15m
- ISO and INSPIRE data and metadata compliant
- **Semantic description of land by an object oriented data model** → flexible identification of LC/LU classes per geometries



❖Object Oriented data model

- Objects are **single feature classes of surface elements** able to describe the land by their compositions and characteristics (e.g. *EAGLE LC Component*). Different combination of LC components generate different LC classes



Classified like
Continental Wetland

Described with
- **Inland Water:** fresh, periodicity, mineral concentration, etc.
- **Trees: riparian,** height, species, leaf type, foliage seasonality, etc.
- **Shrubs:** riparian, height, species, etc.
- **Herbaceous vegetation, lichens, algae, etc.**
- **Organic deposits:** typology, etc.

❖Object Oriented data model

Human reasoning:

Most of the land is covered by structures and transport network. Buildings, roads and artificially surfaced areas cover more than 80 % of the total surface. Non-linear areas of vegetation and bare soil are exceptional.

- **SIOSE is not a classification**. In Classifications, each polygon has only one specific value, and can be mapped giving a different color to every type of class

CORINE Land Cover would classify as

1.1.1 CONTINOUS URBAN FABRIC

Implies **generalization of information and loss**

- **SIOSE describes** polygons and all information with % land cover and **attributes** is stored in the database.

SIOSE describe as

URBAN FABRIC with:

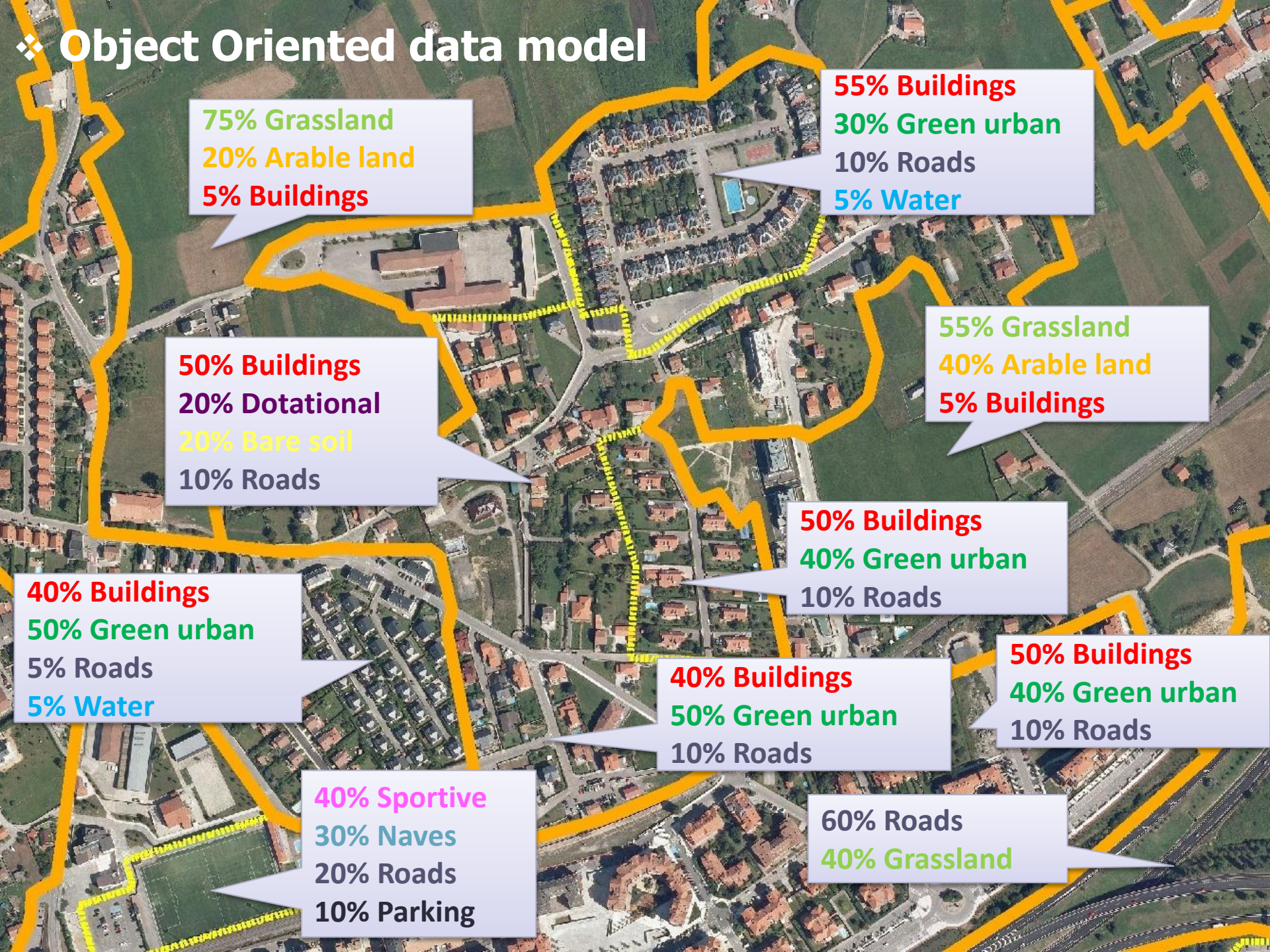
Trees: 5%

Buildings: 85%.

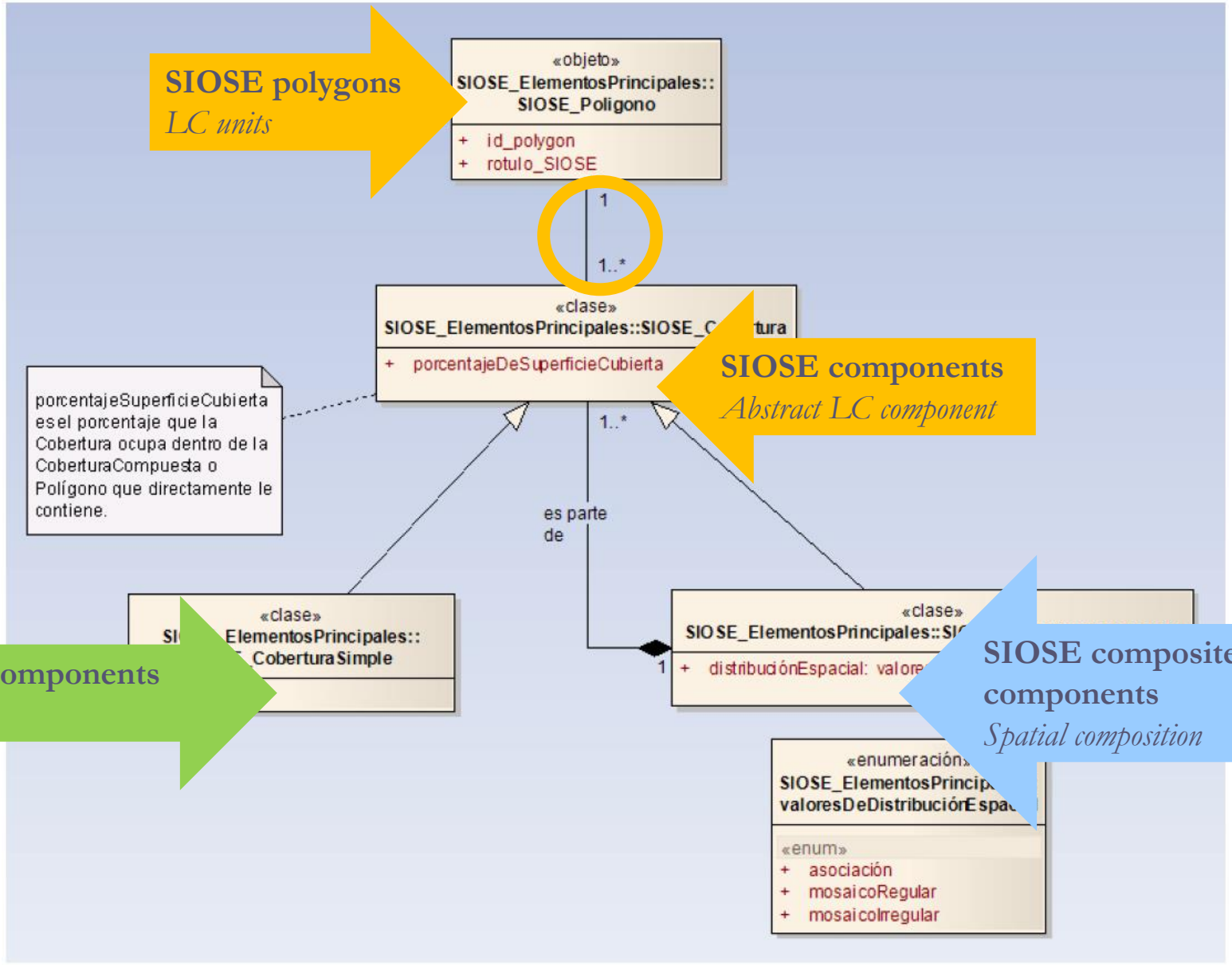
Attribute: residential

Roads: 10%

❖ Object Oriented data model



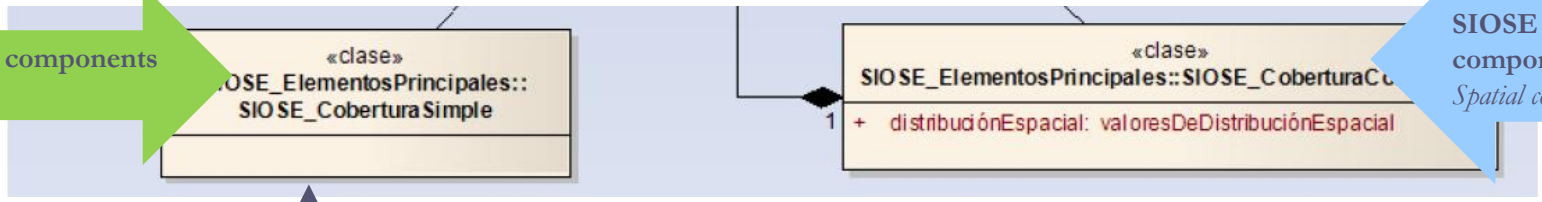
❖Object Oriented data model



❖Object Oriented data model

SIOSE simple components
LC component

SIOSE composite components
Spatial composition



Crops

Waters

Natural Vegetation

Wetlands

Natural Materials

Artificial

❖SIOSE users

Central Administrations

SIA Sistema Integrado de Información del Agua

SIU Sistema de Información Urbana

adif

Sistema Nacional de Cartografía de Zonas Inundables — Gobierno de España — Ministerio de Medio Ambiente y Medio Rural y Marino

CEDEX Centro de Estudios y Experimentación de Obras Públicas

Ciemat Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas

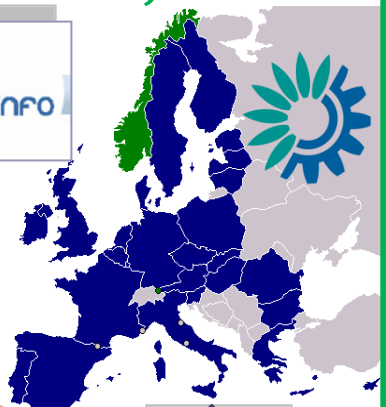
CHEbro

Instituto Geológico y Minero de España

EC, JRC, EEA, COPERNICUS, etc

GMES.info Because we need to know

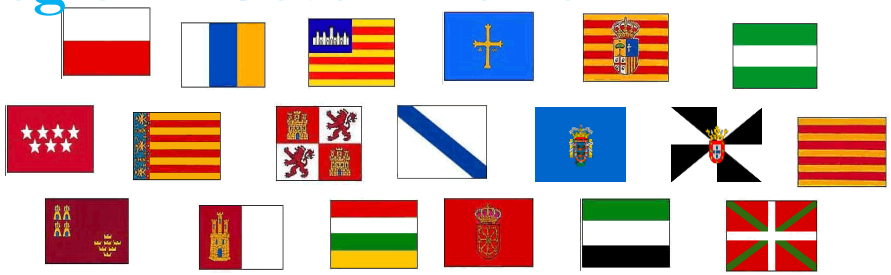
JRC European Commission



UNFCCC

KYOTO PROTOCOL 16 FEBRUARY 2005

Regional Governments



Research Institutions, Universities, Public and private corporations

OSE

Universidad Politécnica de Madrid

UCLM Universidad de Castilla-La Mancha

Universidad de Alcalá

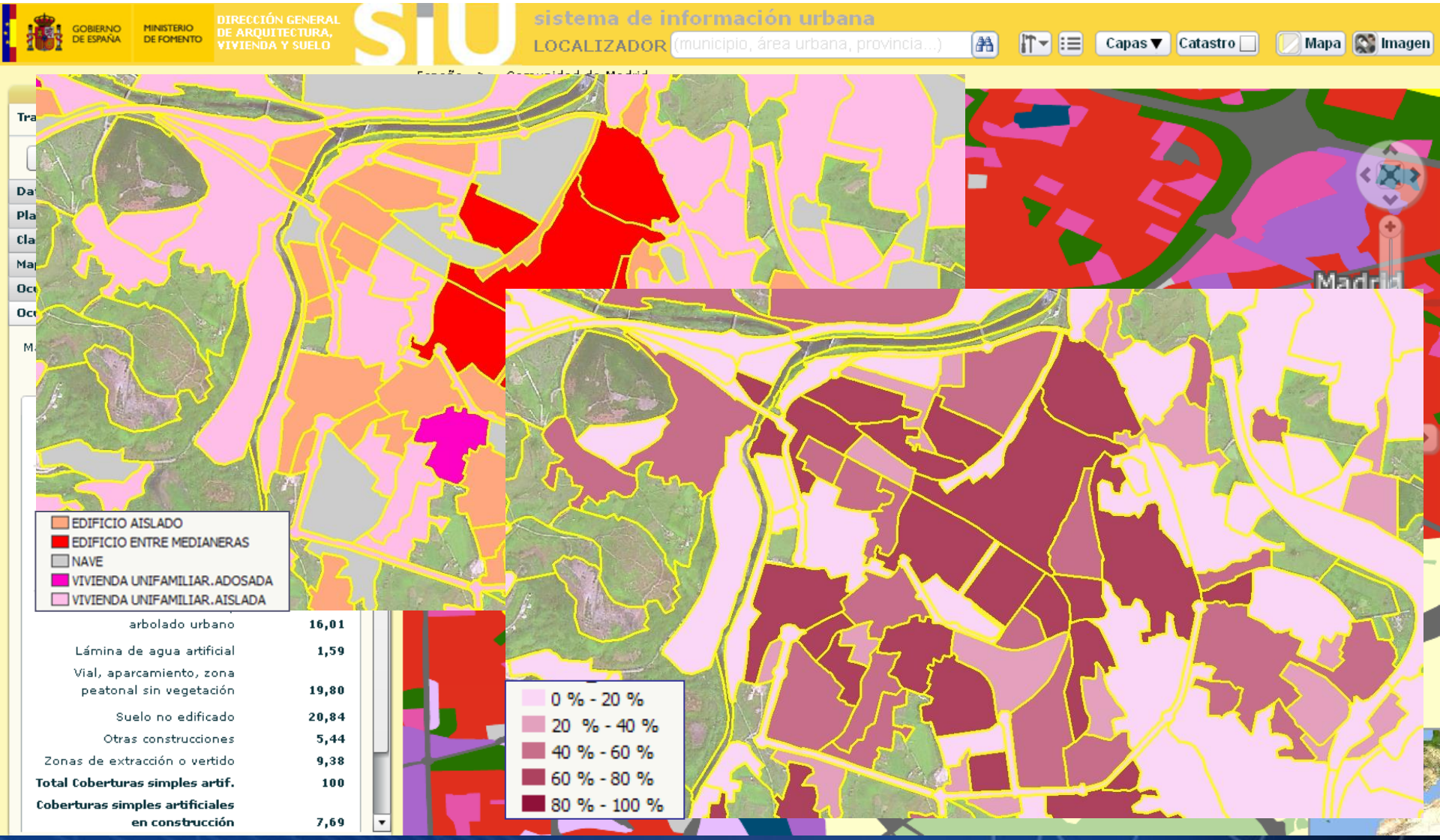
Canal de Isabel II

enresa soluciones ambientales

tracasa

❖SIOSE users, success cases

- Urban applications

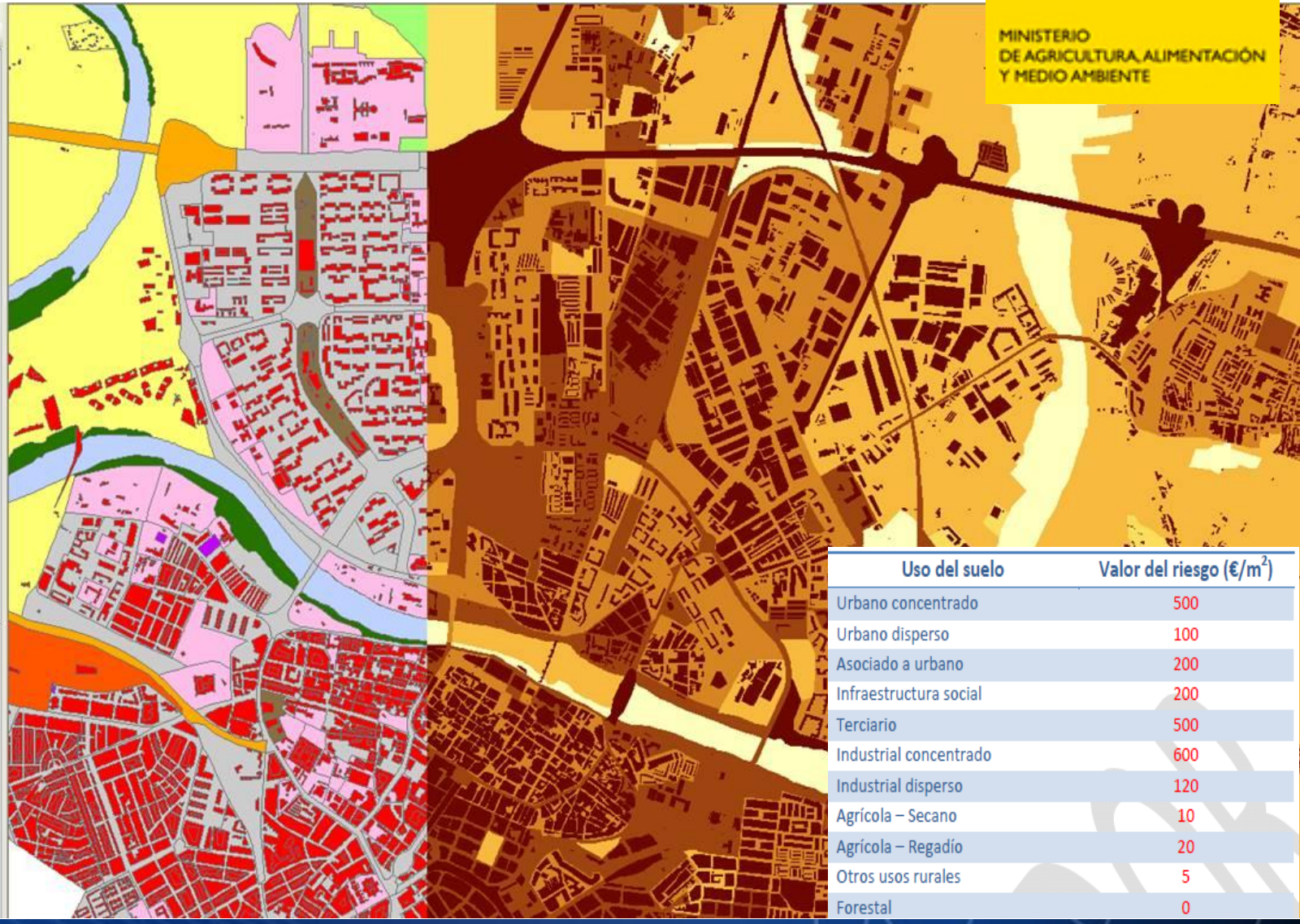


❖SIOSE users, success cases

- Flooding risks zones

SISTEMA NACIONAL DE CARTOGRAFÍA DE ZONAS INUNDABLES

MINISTERIO DE AGRICULTURA, ALIMENTACIÓN Y MEDIO AMBIENTE



Uso del suelo	Valor del riesgo (€/m^2)
Urbano concentrado	500
Urbano disperso	100
Asociado a urbano	200
Infraestructura social	200
Terciario	500
Industrial concentrado	600
Industrial disperso	120
Agrícola – Secano	10
Agrícola – Regadío	20
Otros usos rurales	5
Forestal	0

❖SIOSE users, success cases

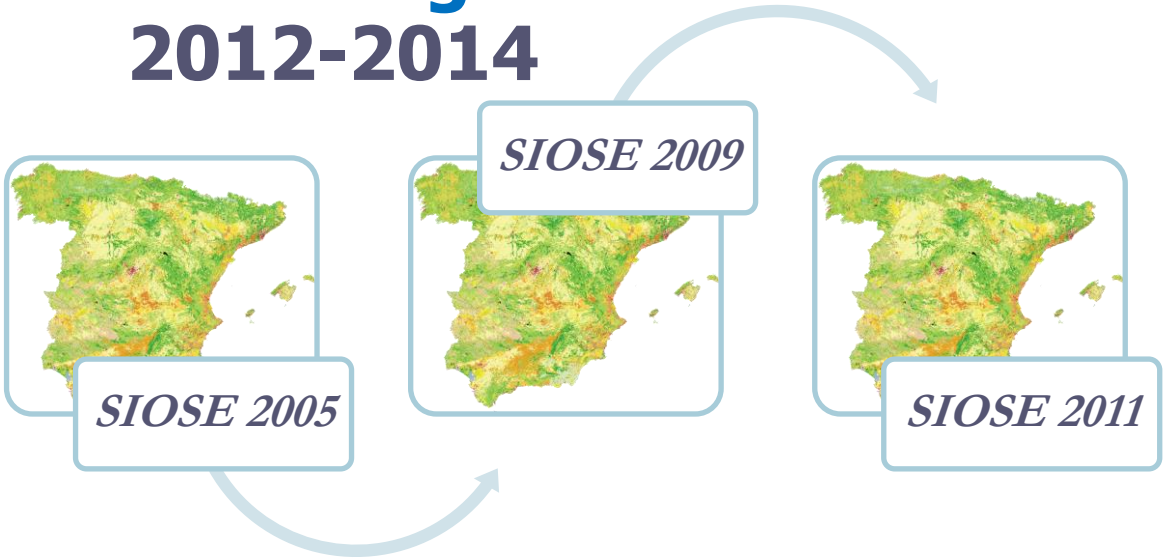
Land Services (PNOT)

Continental

GIO Land

Continental Service (CLC-HRL)

→Grant Agreement EEA-IGN 2012-2014



Land Services (PNOT)

Continental& Local

Copernicus Land Framework Agreement

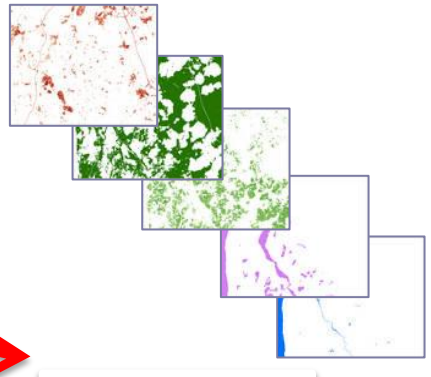
(CLC-HRL-Local components-CLC+) → 2017-2021

opernicus
The European Earth Observation Programme

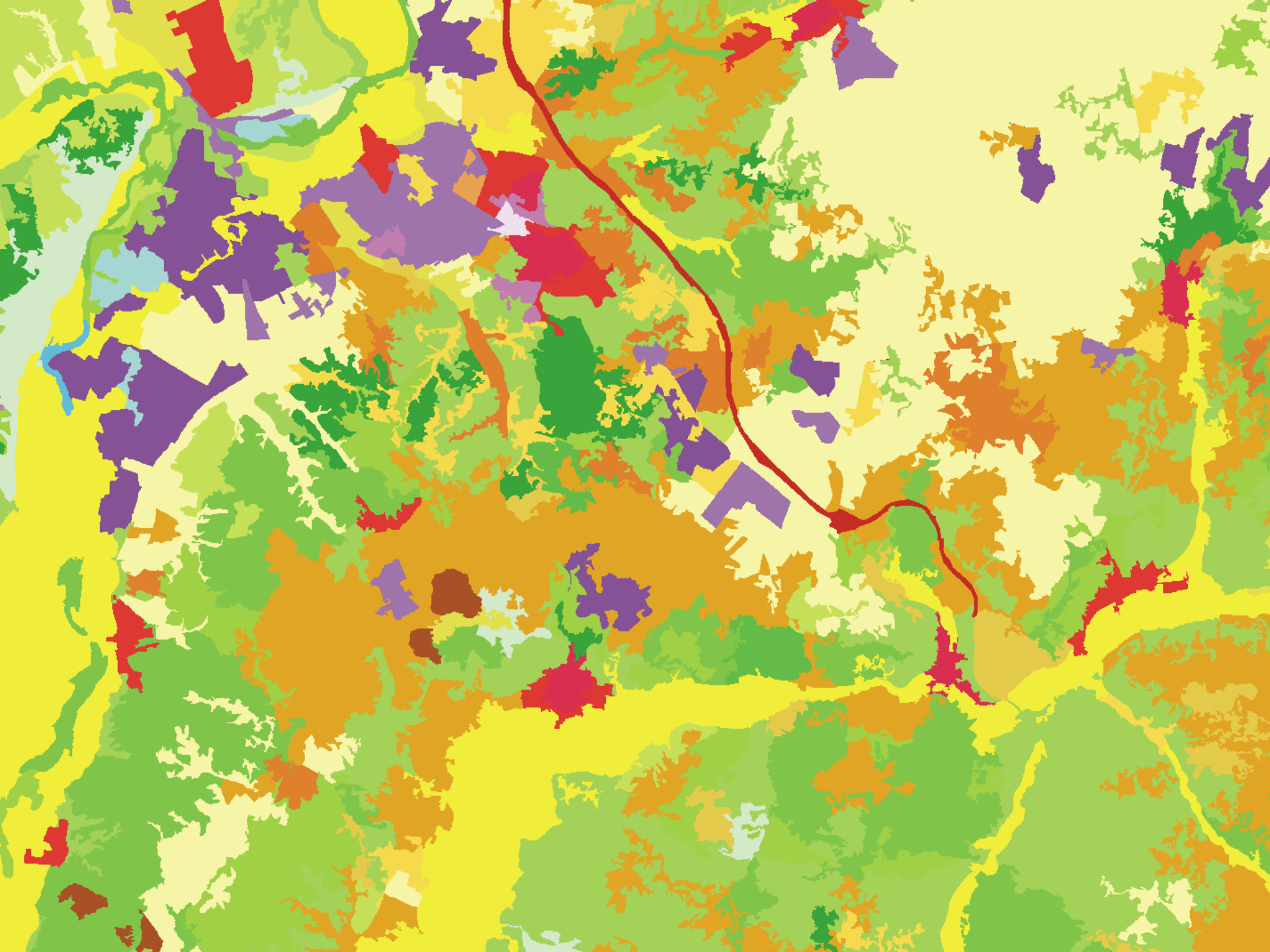
CLC 2018

opernicus
The European Earth Observation Programme

HRL 15-18

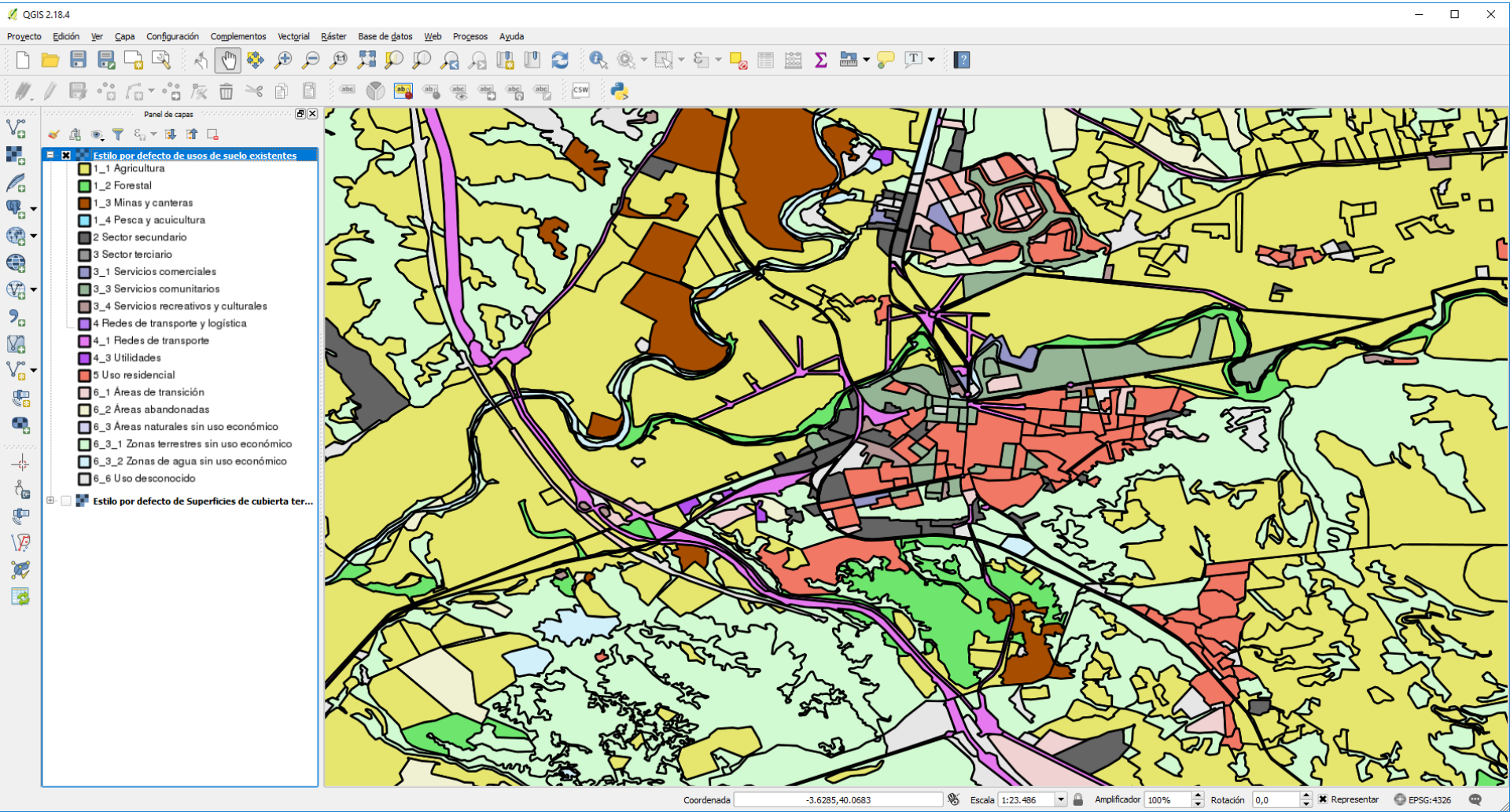


LOCAL Comp



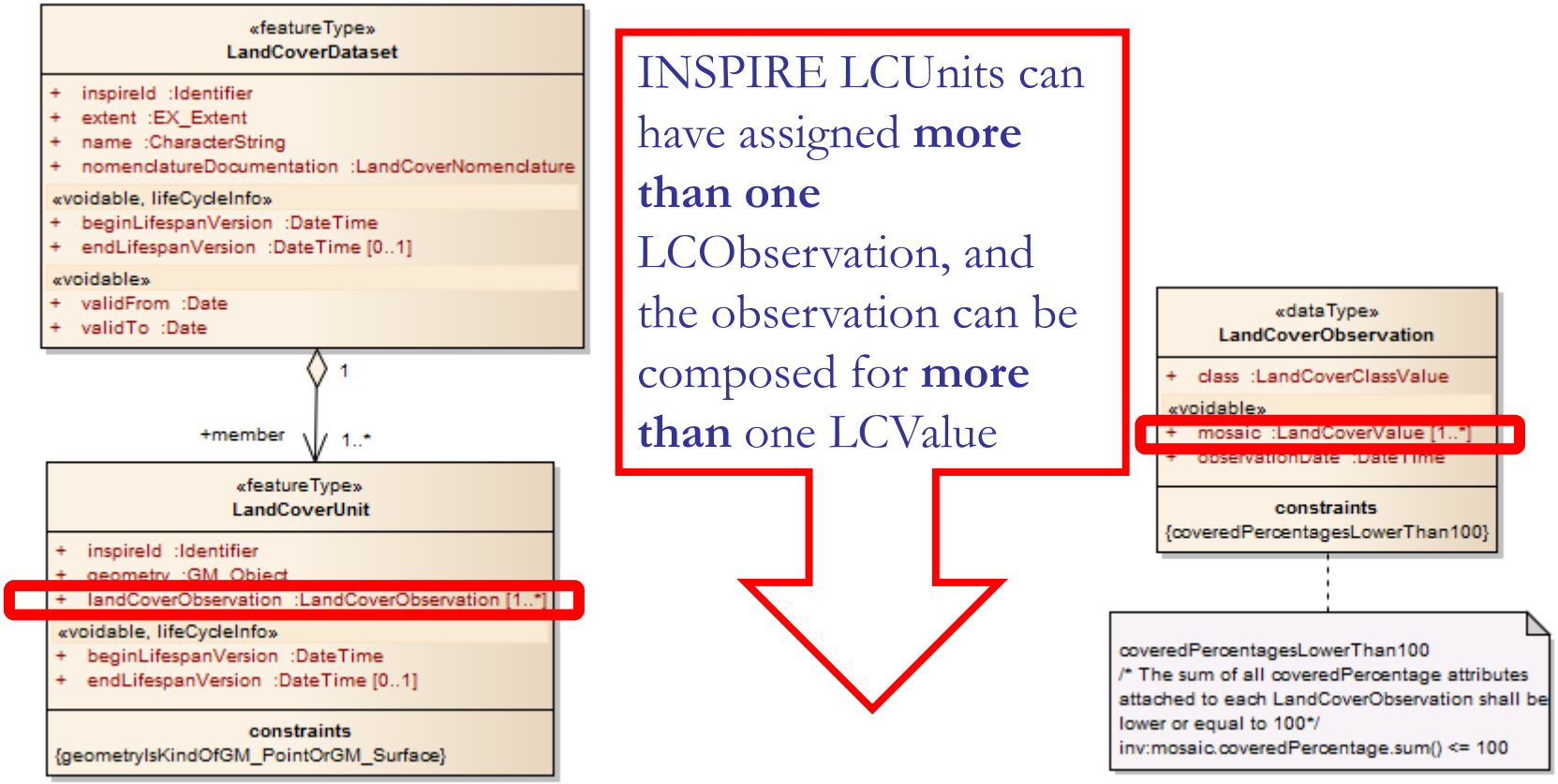
❖SIOSE users, success cases

- INSPIRE reference compliant data for Land Cover and Existing Land Use
  - WMS: http://servicios.idee.es/wms-inspire/ocupacion-suelo
  - WFS: http://servicios.idee.es/wfs-inspire/ocupacion-suelo



❖SIOSE EU contributions

- IGN participated in INSPIRE TWG on LC & LU and transmitted the data modelling experience to the Directive
- **Land Cover**



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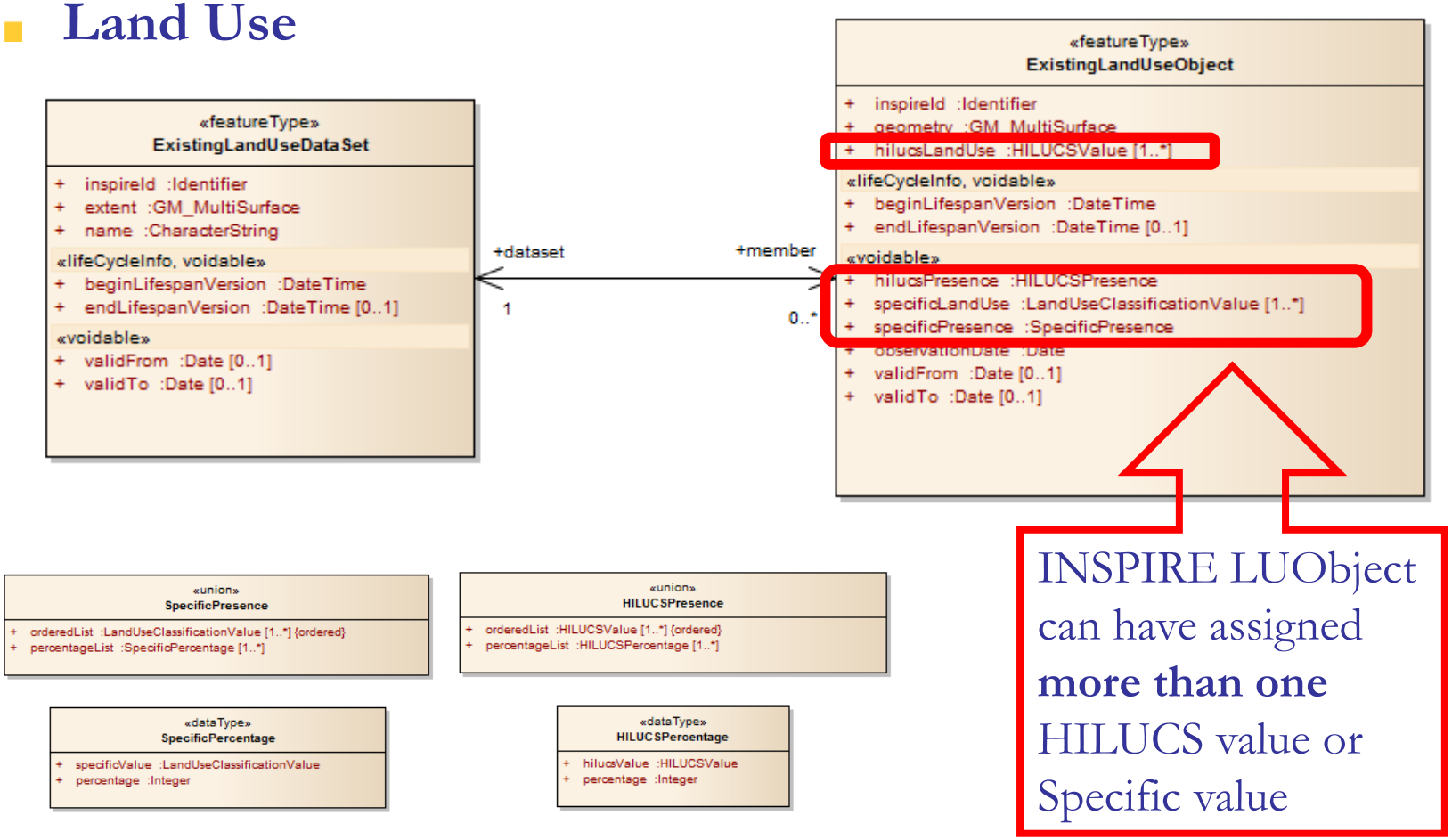
- **Land Use**



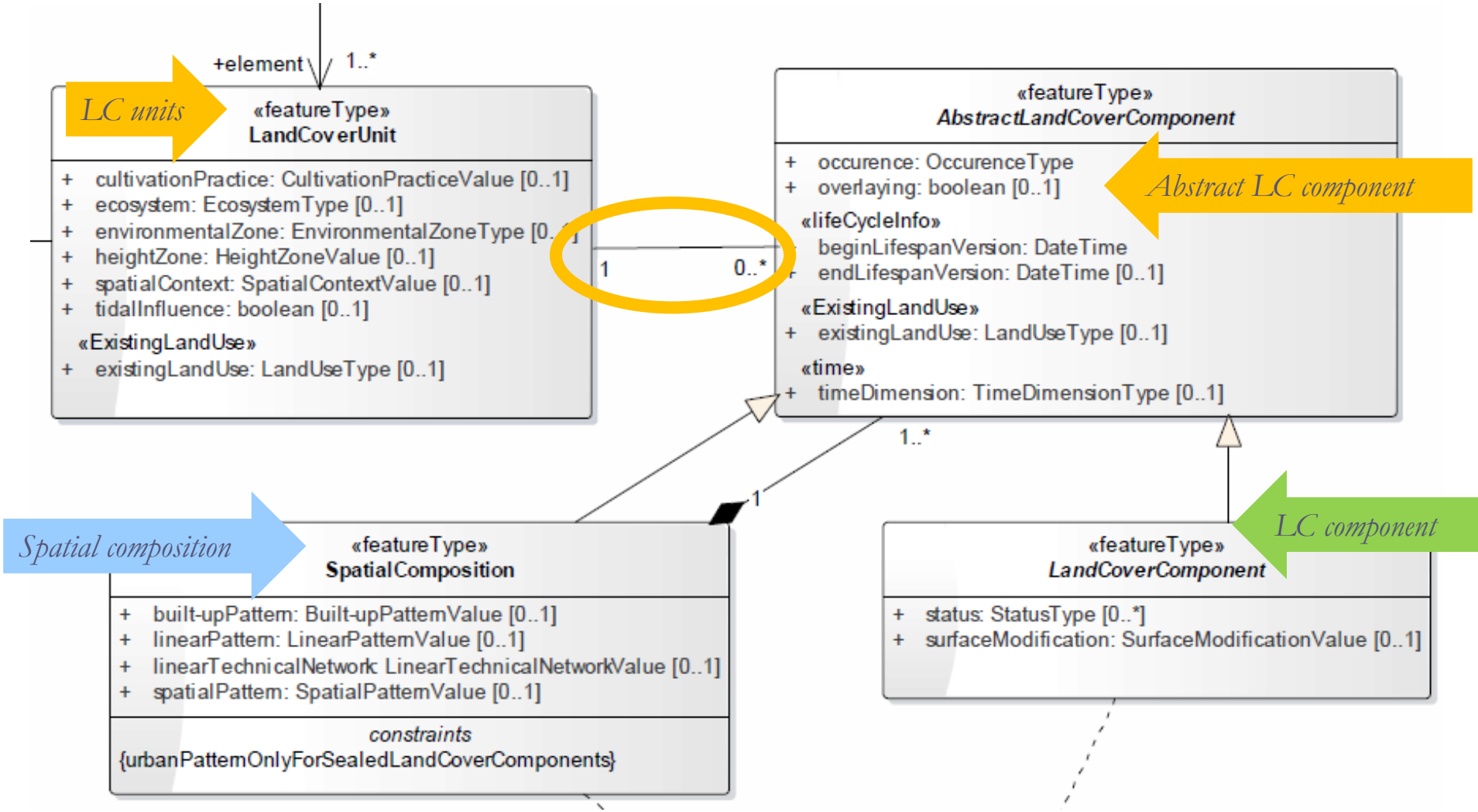
❖SIOSE EU contributions

EAGLE

Land Monitoring experts and EIONET NRC for Land Cover (Austria, Bulgaria, Czech R, Finland, Germany, Hungary, The Netherlands, Norway, Portugal, Spain, Switzerland, United Kingdom) participating on INSPIRE TWG LC, TWG LU, CLC Technical Team, FP7 HELM, Geoland2, GMES Initial Operations, etc: Antonin Orlik, Antonio Arozarena Villar, Andreas Littkopf, Alejandro Simon Colina, Gebhard Banko, Barbara Kosztra, Cesar Martinez Izquierdo, Christoph Perger, Charlotte Steinmeier, Elise Järvenpää, Emanuele Mancosu, Gerard Hazeu, Geir-Harald Strand, Gergely Maucha, Geoff Smith, Henrik Forsberg Mathiesen, Julian Delgado Hernandez, Kathrin Renner, Markus Törmä, Marc Zebisch, Mario Caetano,Michael Bock, Mirko Gregor, Nuria Valcarcel Sanz, Pavel Milenov, Radko Radkov, Roger Milego, Ruth Sonnenschein, Stefan Kleeschulte, Stephan Arnold, Suvi Hatunen, Tomas Soukup

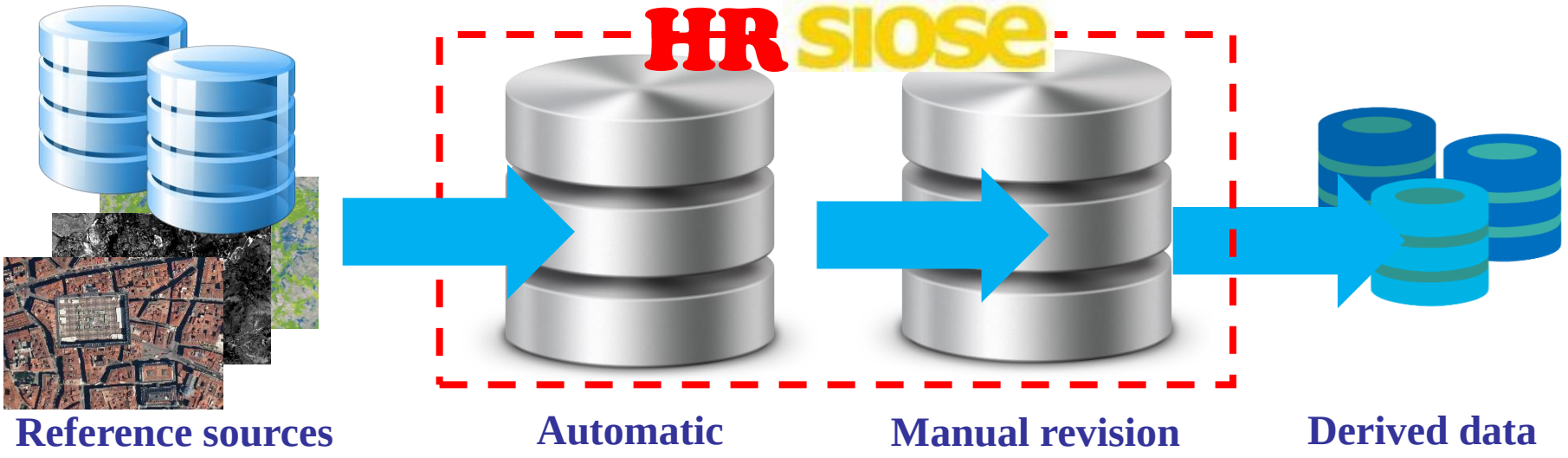
❖SIOSE EU contributions

- EAGLE data model

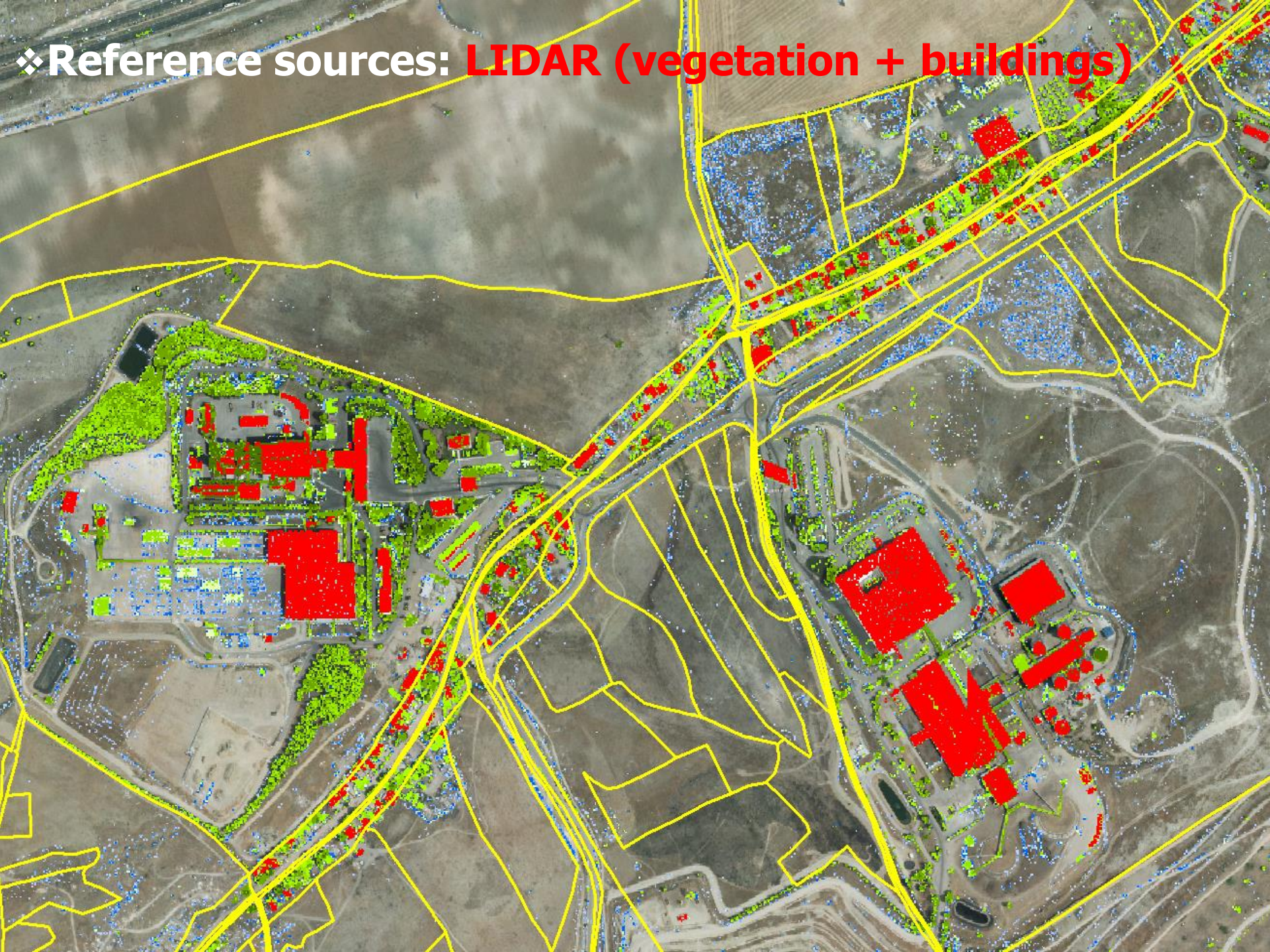


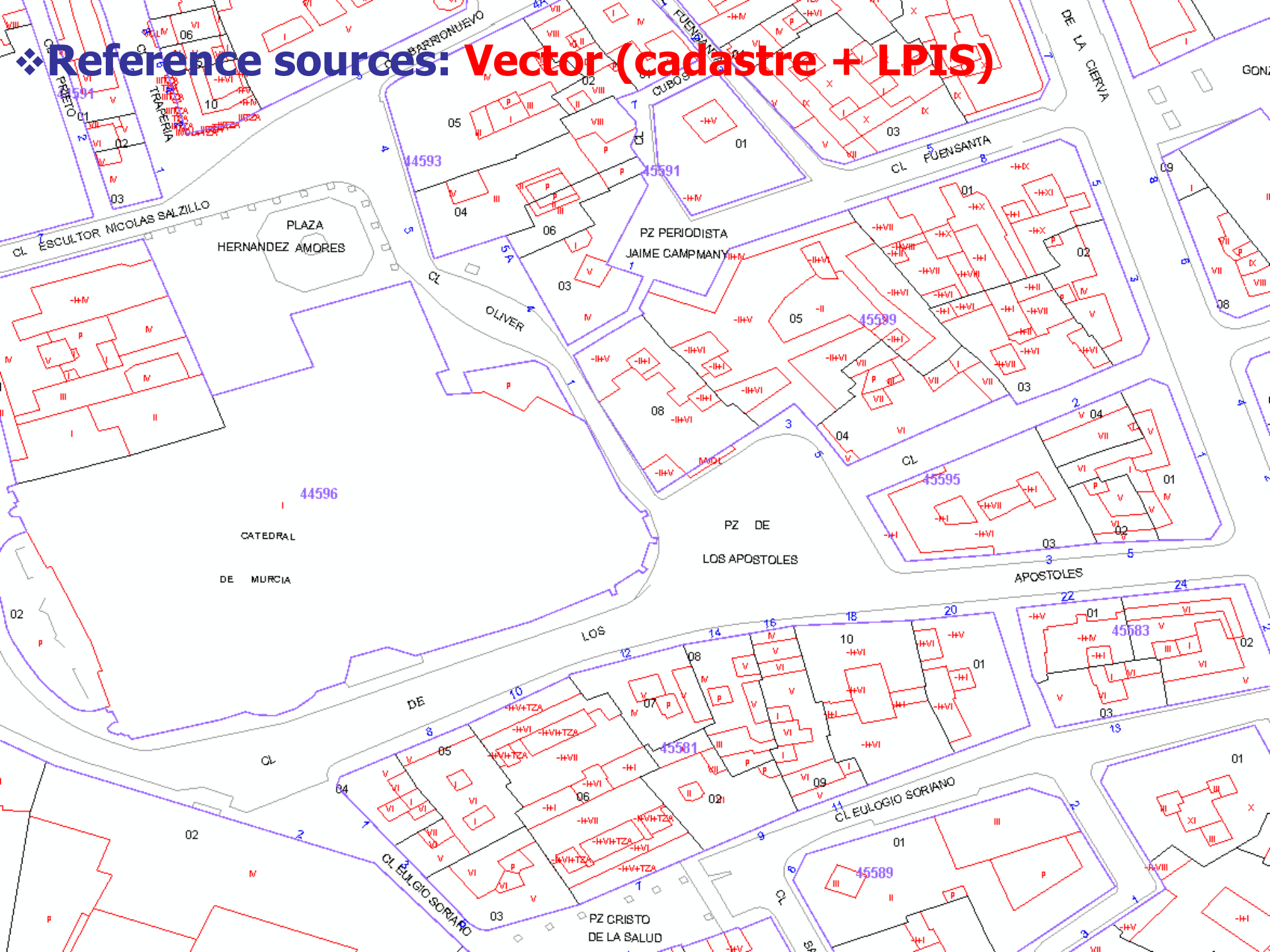
❖High Resolution SIOSE

- Future SIOSE according new data requirements about **geometric, semantic details and frequency for update**
- Key points
  - Continuation of object oriented philosophy → SIOSE and EAGLE
  - Formed by **integration of reference information** → **Cadaster**
  - **Improvement** of semantic and geometric resolution (**1:5.000-1:1.000**)
  - **Automatic** processing of big data → **objectivity, cost reduction, faster update frequencies**



❖Reference sources: Images


❖Reference sources: LIDAR (vegetation + buildings)


❖Reference sources: Vector (cadastre + LPIS)
CL ESCULTOR NICOLAS SALZILLO
PLAZA
HERNANDEZ AMORES
CL OLIVER
PZ PERIODISTA
JAIME CAMPMANY
CL PUENSANTA
CL BARRIONUEVO
CL CUBOS
CL PRIETO
CL TRAPERIA
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CL EULOGIO SORIANO
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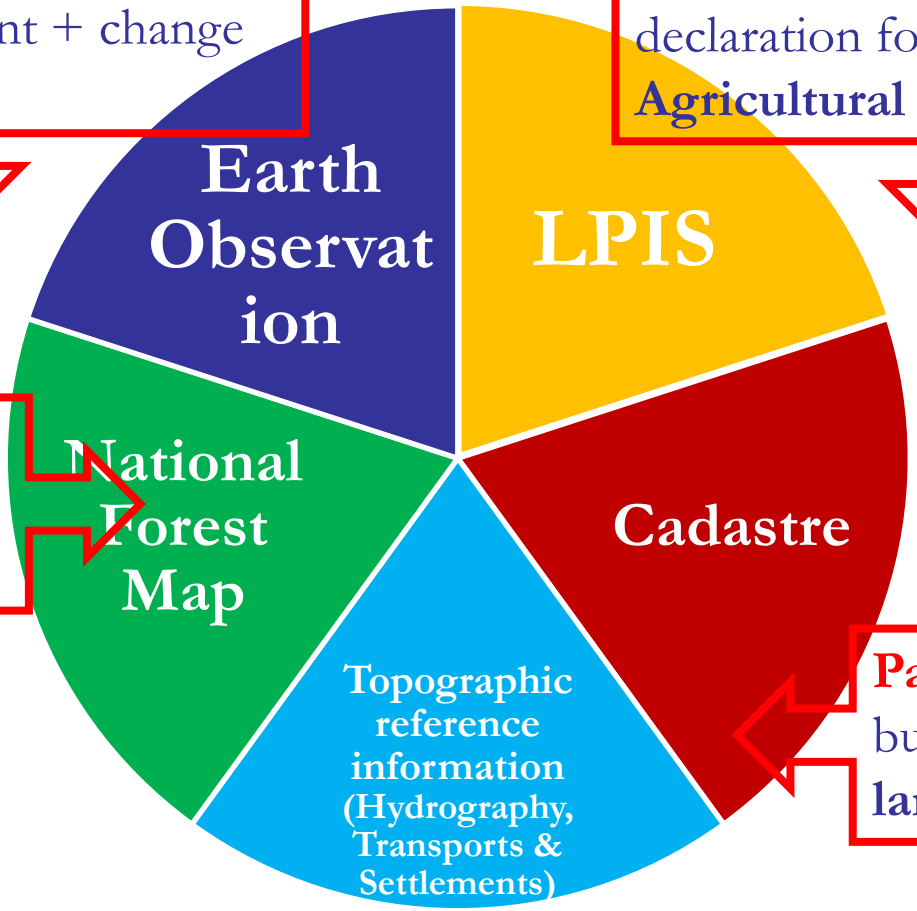
PZ CRISTO
DE LA SALUD

❖SIOSE High Resolution

Orthophoto, Lidar, Sentinel (temporal assessment + change detection)

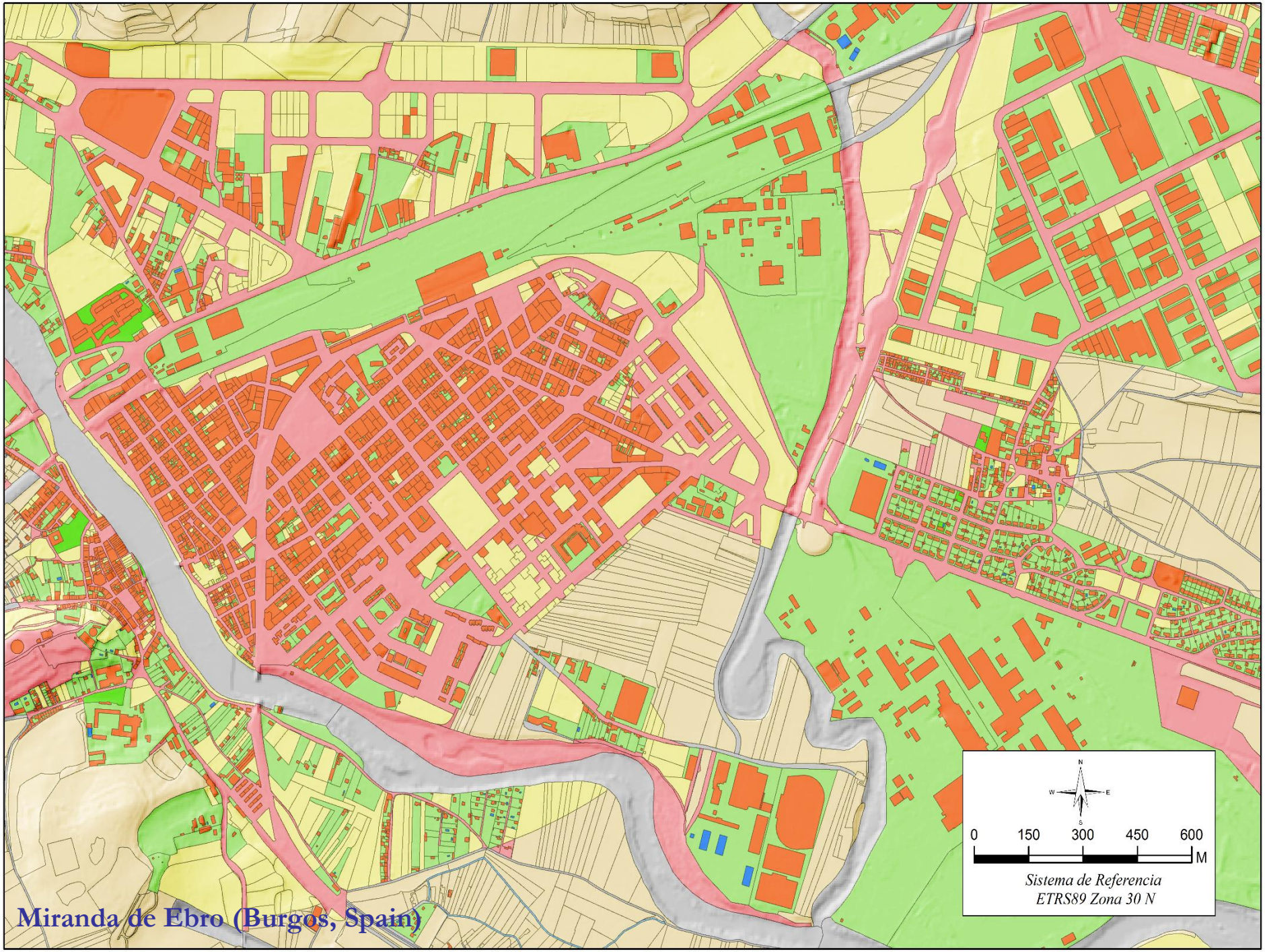
Agriculture sub-parcels delineation, farmers' crop declaration for **Common Agricultural Policy**



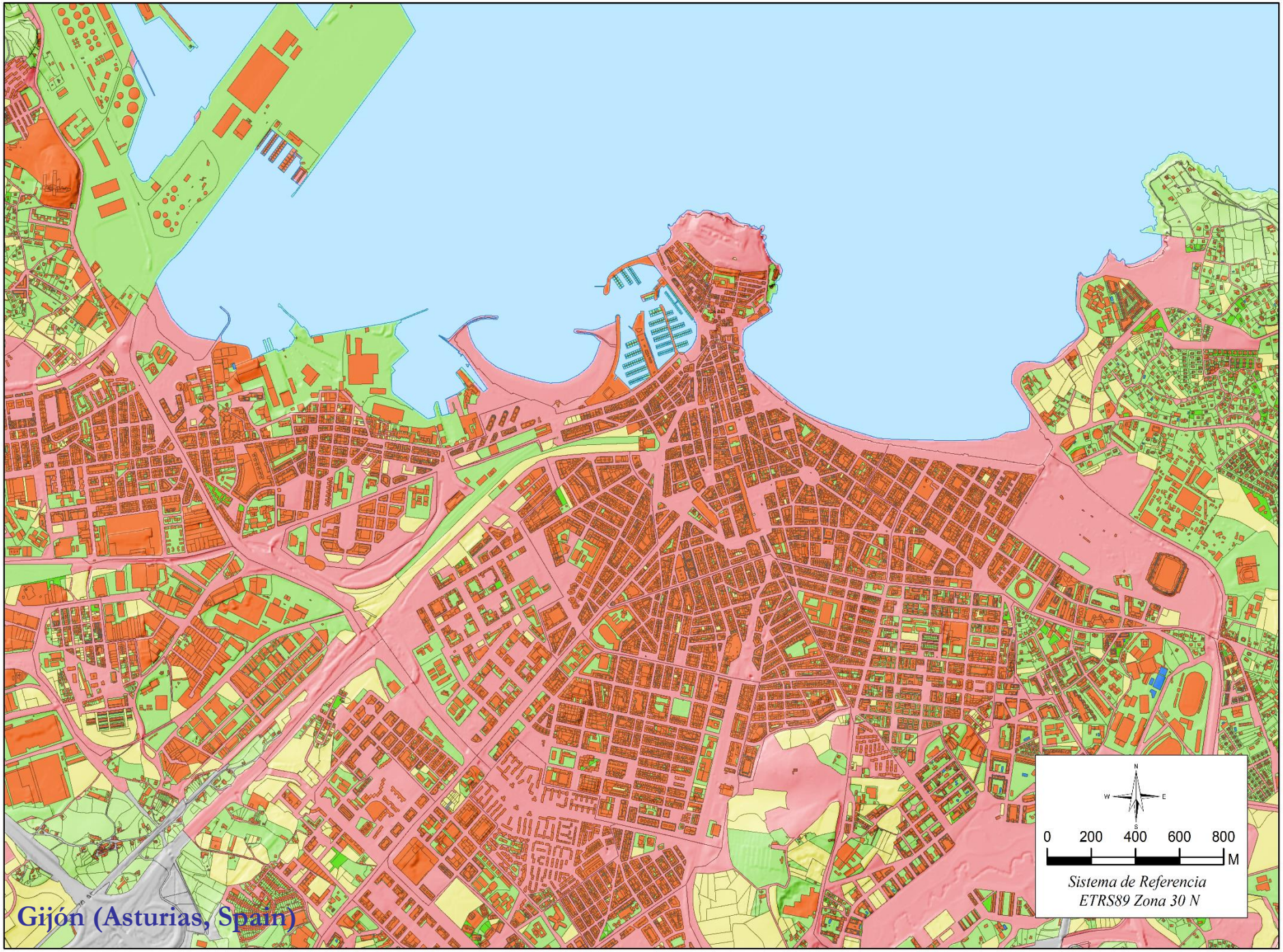
Forestry categorization, and **species** identification

Parcels delineation, buildings, 'artificial' **land use** identification

* OSM: residual utilization for semantic identification



Miranda de Ebro (Burgos, Spain)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Thanks

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