GOBIERNO DE ESPAÑA

MINISTERIO DE TRANSPORTES, MOVILIDAD Y AGENDA URBANA

http://www.ign.es

SIOSE

Instituto Geográfico Nacional

SIOSE

National LC/LU information system of Spain and VGI

Julián Delgado Hernández

❖Index

- European context
- National context (SIOSE)
- VGI integration

❖European context

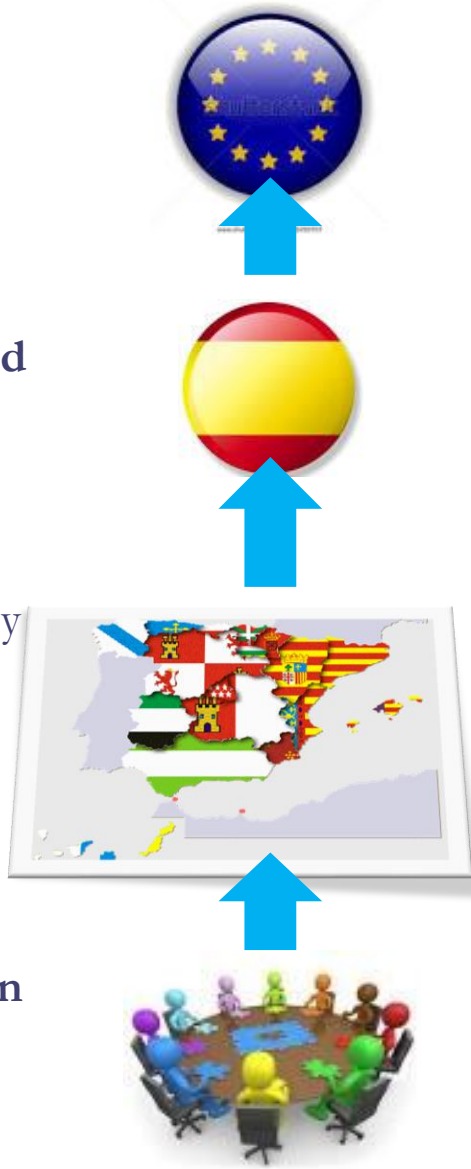
- **1990 EIONET**
  - Institutions throughout Europe providing **official data and specialized knowledge** required by the **Member States and the European Commission** to adopt the necessary measures to protect the environment. National Focal Points, National Reference Centers and European Topic Centers collaborate with **European Environmental Agency (EEA)**.
  - Main goal of NRC Land Cover (and Land Use)→ **CORINE Land Cover**
- **2014 Copernicus**
  - **Copernicus Land Monitoring Service** leaded by EEA and Joint Research Centre, creating LCLU datasets motivated by EU policy
  - Free access dataset without licence restrictions
  - Most of CLMS centred **produced by EEA** through private service providers
    - **Not much official national** data used in the production
    - **Not open knowledge about production** steps (private companies 'know-how')
    - **No coincidence with official** national data and reporting, national verification not published

    … even with this gaps, CLMS is the bigger initiative ever for sharing LCLU data!
  - **Datasets**
    - Produced by countries via EIONET NRC Land Cover
      - CORINE Land Cover (vector, 25ha, 6 years, 1990-2000-2006-2012-2018)
    - Produced by EEA and validated by countries via EIONET NRC Land Cover
      - Urban Atlas, Riparian Zones, Natura 2K (vector, 0.5 ha, 6 years, 2006-2012-2018) and new Coastal Zones
      - High Resolution Layers IMD, FO, GRA, W&W (raster, 20-10m, 3 years, 2012-2015-2018) and new S&I, Phenology
      - **New CORINE Land Cover (vector 0.5ha & raster 10m, 3-6 years, 2018)**

❖National context

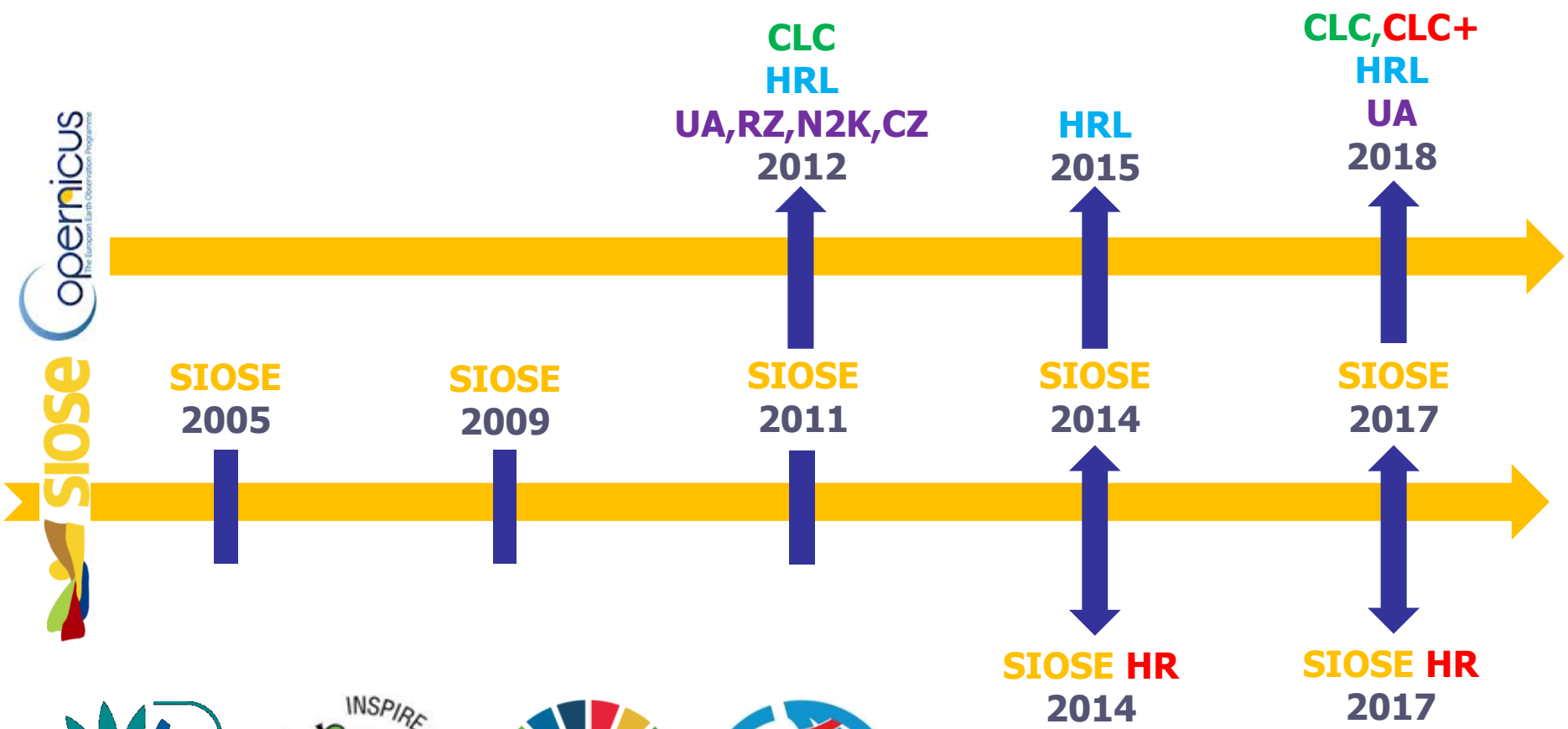
SIOSE
Sistema de Información de Ocupación del Suelo en España

- Need for a **complete official description** of the territory in **all the thematic domains** (e.g. artificial, agricultural, natural, etc.) **periodically maintained over time**
  - **Integration of national and regional datasets, avoiding duplication and cost reduction**
  - **Decentralized production scheme, collaborative and co-funded (bottom-up approach) among national & regional public administrations**
- **Biding framework**
  - EU Regulation for **EIONET** and European Environmental Agency (EC 1210/90 and 41/2009). IGN Spain is the EIONET NRC of Land Cover, Land Use and Spatial Planning.
  - **INSPIRE Directive 2007/2/EC** and National Law LISIGE 14/2010 for the Infrastructure for Spatial Information in the EC
  - Spanish Royal Decree about **structure and competencies** of Ministry of Transports, Mobility and Urban Agenda and **IGN Spain** (RD 645/2020 art.15.1)



❖National context

SIOSE
Sistema de Información de Ocupación del Suelo en España



❖SIOSE

- Vector LCLU database (MMU 0,5-2 ha) versions 2005-2009-2011-2014
- Object oriented data model
- **Free access license CC-BY**

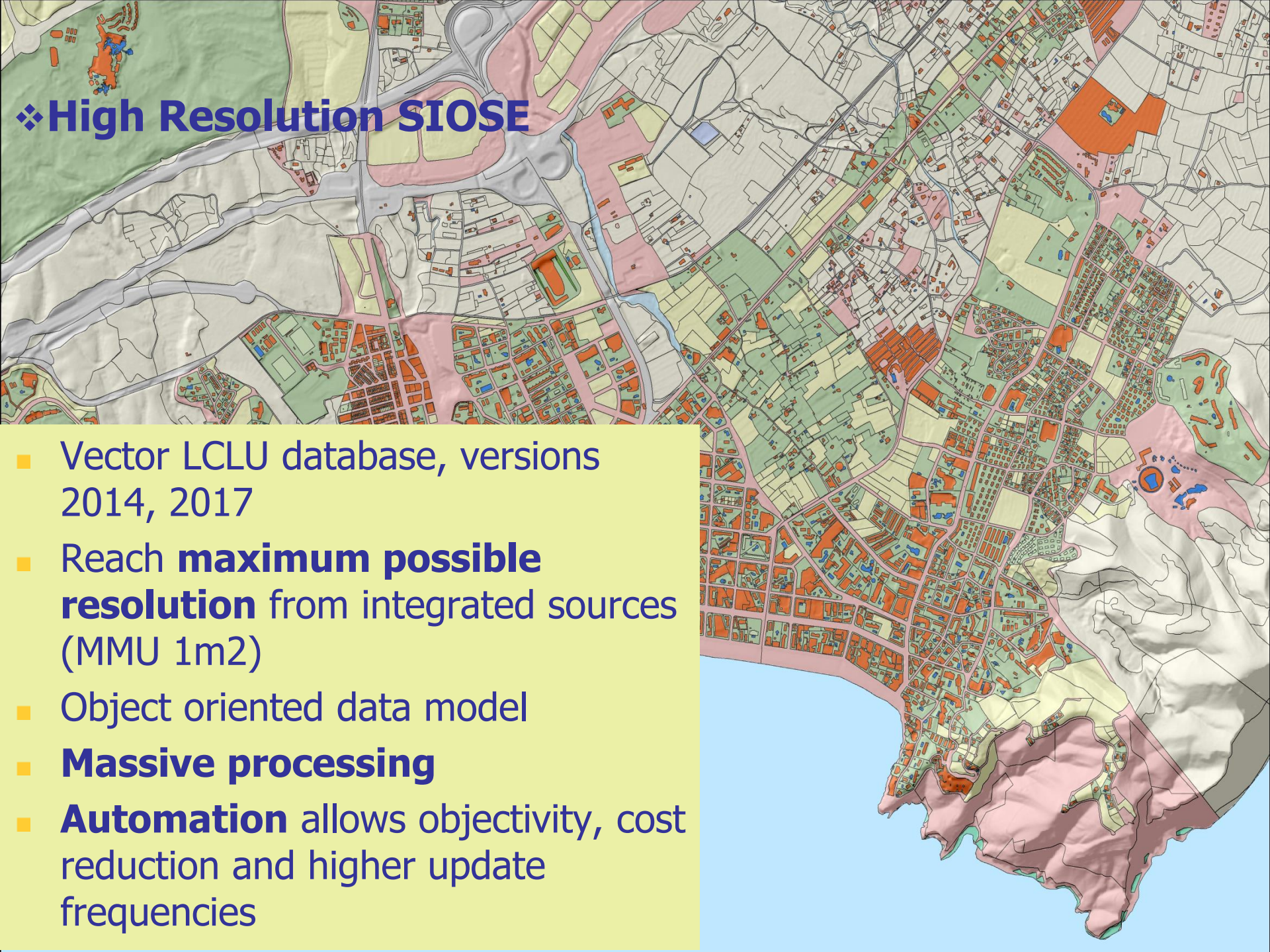
http://centrodedescargas.cnig.es/CentroDescargas/locale?request_locale=en

- 13.000 users and 113.000 downloaded files
- www.siose.es & siose@mitma.es

❖High Resolution SIOSE

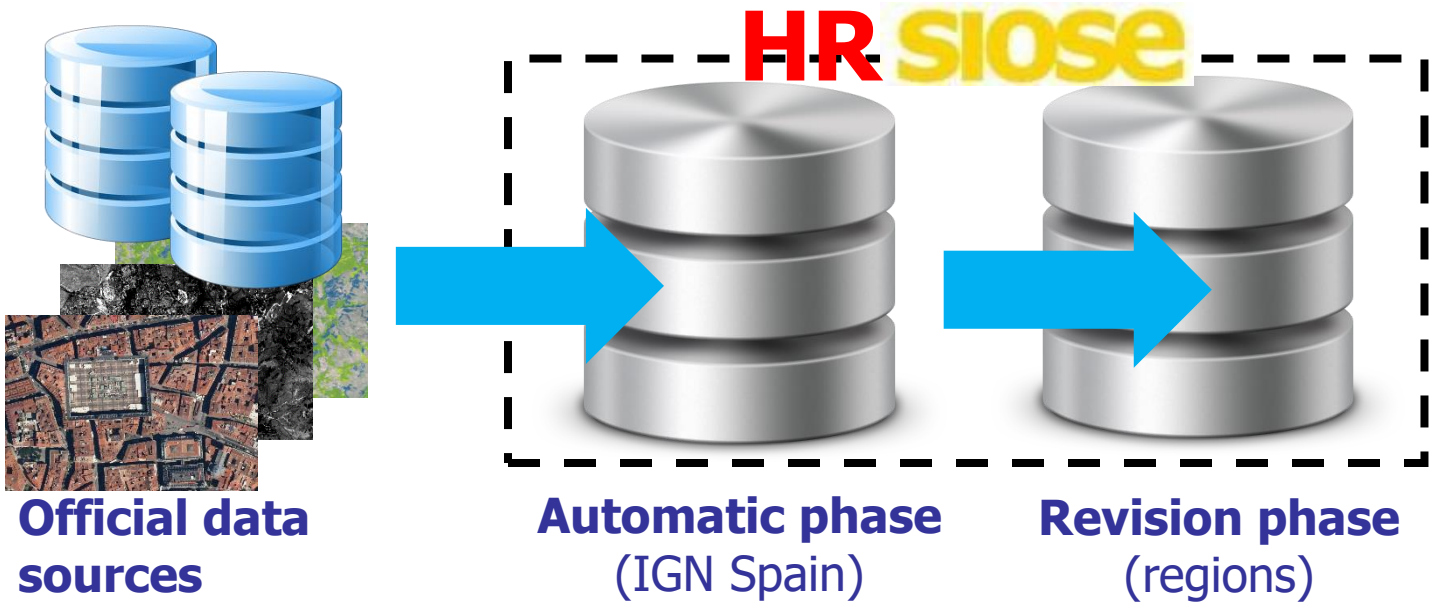
- **Increase of users' needs** in geometric detail, thematic and temporal frequency
  - **New data sources**: Earth observation (e.g. Sentinel and LiDAR), reference vector available (e.g. Cadaster, LPIS, VGI, Reference Information on Transports and Hydrography)
  - Request from project partners (regional governments)
  - **Requirements changes in fundamental user: Copernicus**
    - New CORINE Land Cover will be used for monitoring EU policies in LULUCF, Energy, Greening CAP, Urban Agenda, Biodiversity Strategy
    - **Need for a contrasted and official tool to be used in the verification and contribution in the new CORINE Land Cover products → High Resolution SIOSE**

❖High Resolution SIOSE

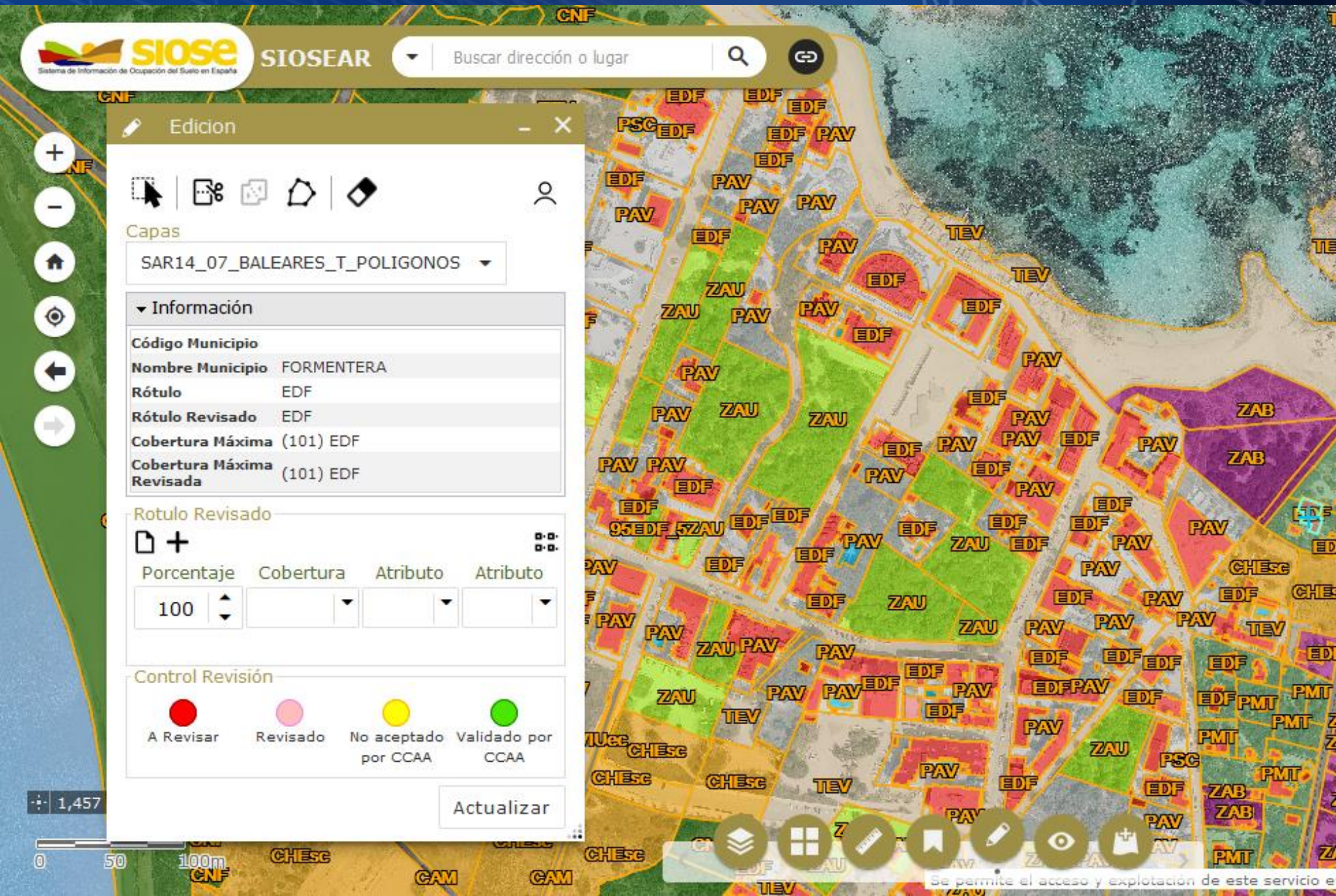


- Vector LCLU database, versions 2014, 2017
- Reach **maximum possible resolution** from integrated sources (MMU 1m2)
- Object oriented data model
- **Massive processing**
- **Automation** allows objectivity, cost reduction and higher update frequencies

❖High Resolution SIOSE



❖High Resolution SIOSE: online revision tool



❖Reference sources

Earth Observation
LiDAR (m^2 buildings, vegetation)

EO

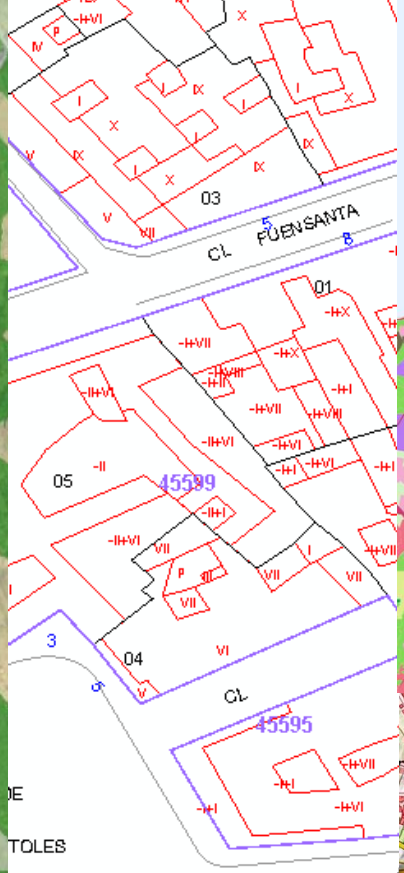
LPIS
Vector

CAP farmers declaration
Thematic content of crops and agricultural information

LPIS

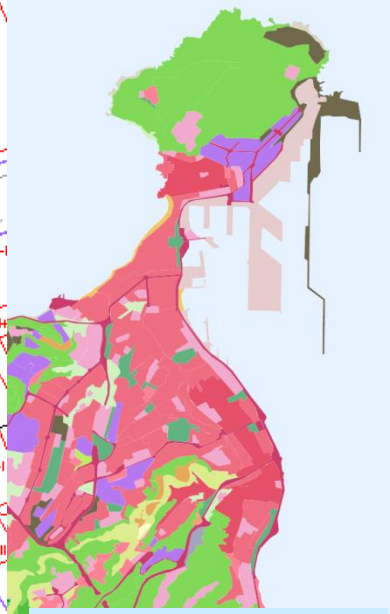
National Forest Map
Vector and thematic content of species and forestry

NFM



Parcels and buildings
Vector and thematic content of artificial land uses

Cadastre



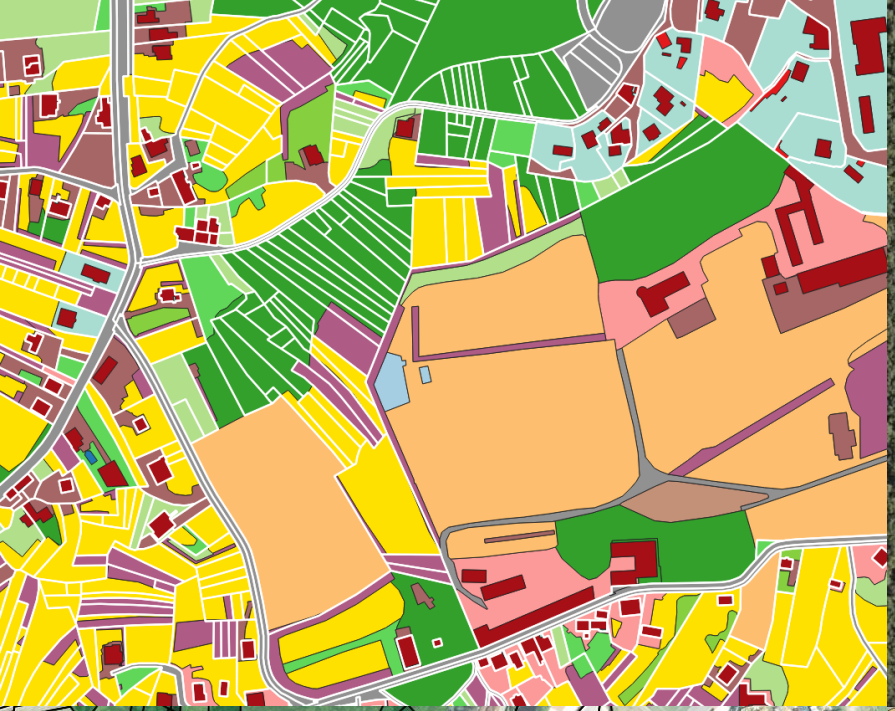
IGR
Hydrography
Transports

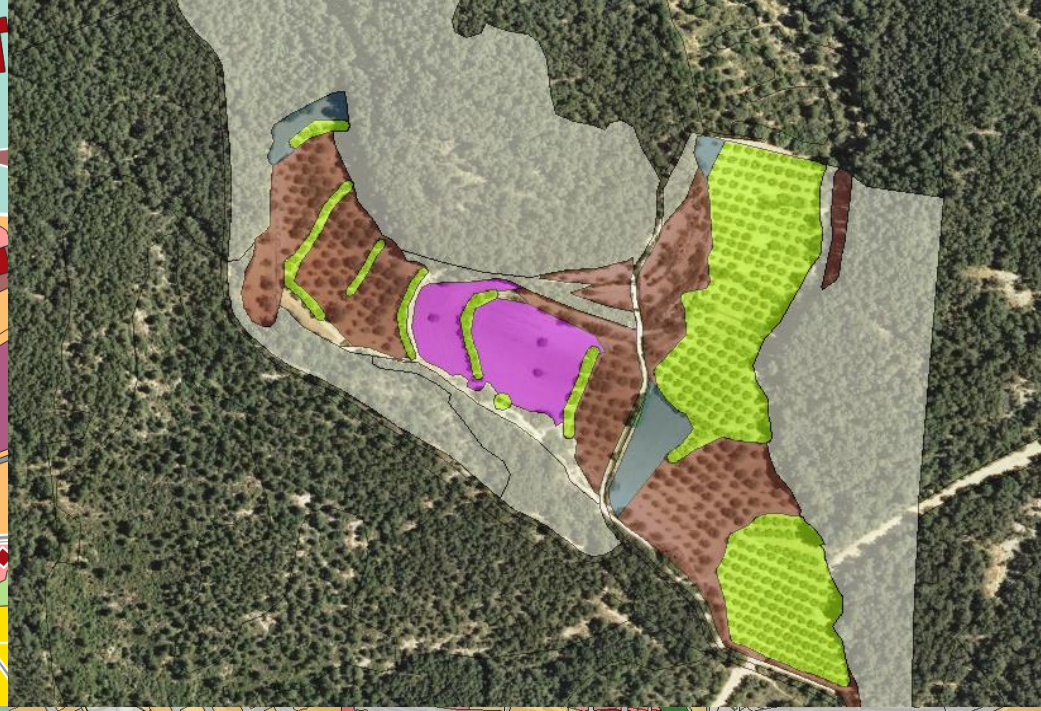
National Topographic database

Regional databases

VGI

...






www.sinac.cr

- Experience on OpenStreetMap and inclusion in the SIOSE **production chain** following…
  - **License** 'de facto' terms assumed by IGN Spain about OSM does not allow use directly OSM data
    - **IGN Spain products: license CC-BY**
      - Attribution
      - Any use of data is allowed, included to derive commercial benefits for users high interest for private sector
    - **OSM license: ODbL ≈ CC-BY-SA**
      - Attribution
      - Share-alike
      - Not allowed derive commercial benefits for users → **more restrictive for private sector**

- Experience on OpenStreetMap and inclusion in the SIOSE **production chain** following…
  - **Validation experiences**: own IGN Spain studies and collaboration in punctual interest studies motivated for CORINE Land Cover Backbone with **EuroGeographics** and Copernicus **EAGLE group**
    - Main conclusions: heterogeneous, suitable for some Transports Networks but insufficient for Hydrography, Land Cover and Land Use
    - **Main obstacles to use pure OSM data:**
      - **<u>not-official, not-responsible</u>**
      - **not-precise, not-reliable for all topics**
      - **undefined reference date**
      - **indirect cost for re-use OSM data**

https://wiki.openstreetmap.org/wiki/Disclaimer

Disclaimer

Disclaimer - Otros idiomas Purgar · Ayuda

Deutsch · **English** · español · português · svenska ·

Otros idiomas · Traducir

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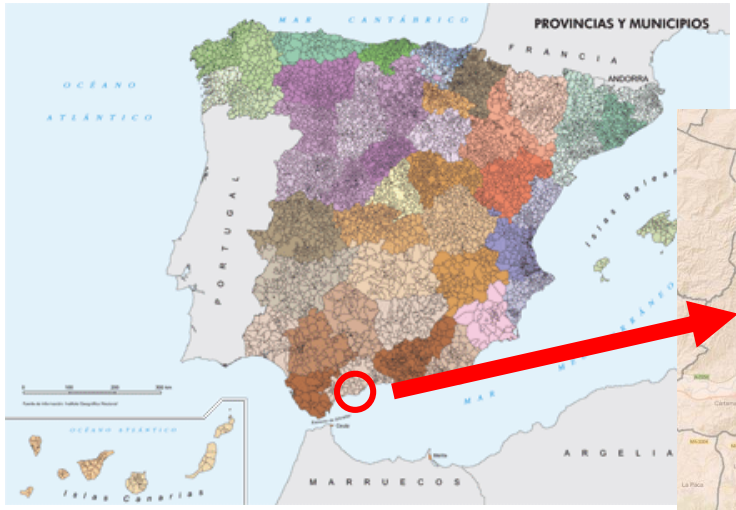
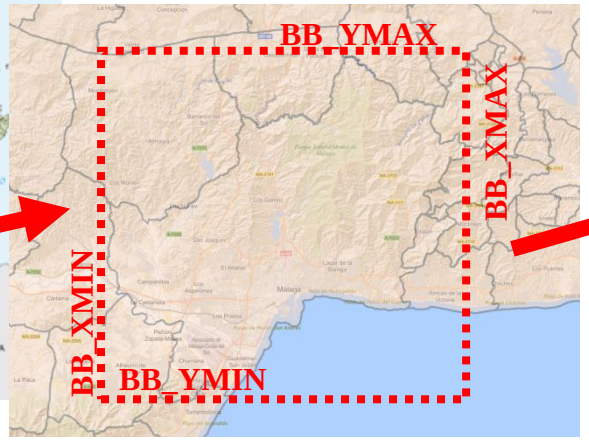
Categoría: Legal

❖VGI

- Experience on OpenStreetMap and inclusion in the SIOSE **production chain** following…
  - **OSM helps in the detection** of elements and thematic content for SIOSE, information not identified by previous used official data sources
  - **Automatic download** with Overpass API for each production unit (+8000 municipality areas, covering complete national territory 500.000 km2)
  - **Difficulties**
    - Heterogeneity among elements of same feature types, and among municipalities
    - Hard work in the information interpretation (matching OSM feature types and SIOSE types)
    - Sometimes OSM service did not respond, input lost to SIOSE
    - OSM info mistakes and unknown reference date
  - **Benefits**
    - Identification of information not collected from another source
    - **Recommendable!**

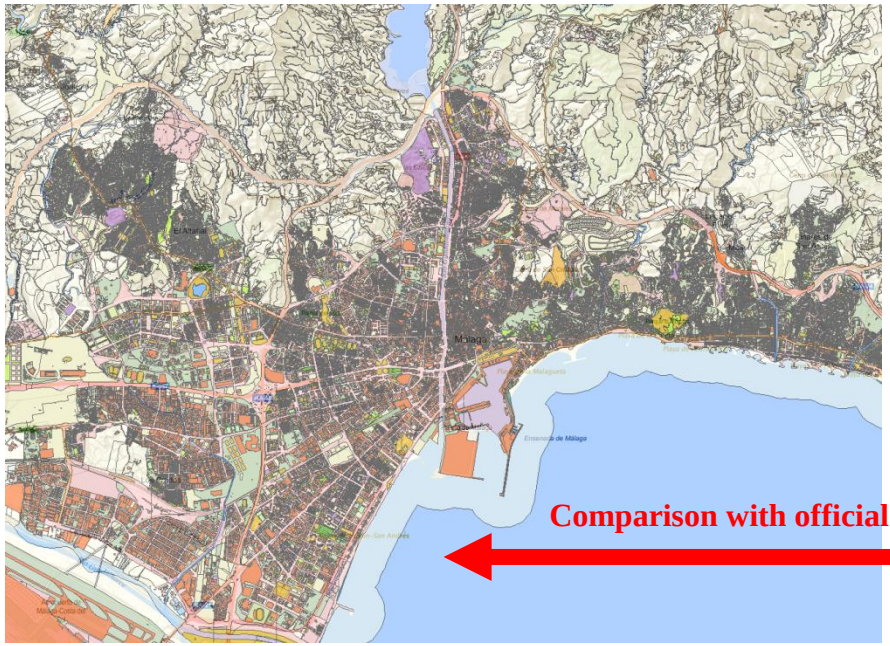
❖How OSM is used in SIOSE



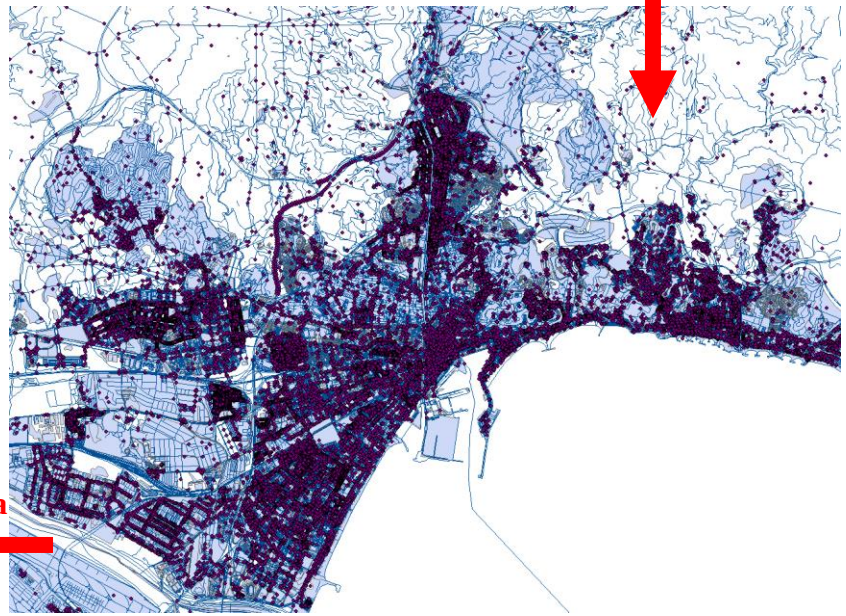


http://www.overpass-api.de/api/xapi_meta?*[bbox=(BB_XMIN),(BB_YMIN),(BB_XMAX),(BB_YMAX)]

Complete download
- **Nodes**
- Ways (~~lines~~, **polygons**)
- ~~Relations~~



Comparison with official data



❖How OSM is used in SIOSE

- Geometric identification
  - OSM elements **not overpaying** with any official data source
  - OSM type=leisure AND (subtype=park OR subtype=garden)
  - 37454 elements → 0,04 % of total SIOSE elements 99260643
- Thematic content identification
  - Some OSM elements **overlapping** with official data sources are evaluated in order to get additional thematic and compatible content
  - 85558 → 0,09% of total SIOSE elements 99260643

For Land Use	For Land Cover			
building government	amenity parking	landuse industrial	leisure water_park	power plant
building university	amenity	landuse allotments	leisure park	power heliostat
building school	motorcycle_parking	landuse vineyard	leisure dog_park	power generator
building hotel	amenity bicycle_parking	landuse depot	leisure garden	power substation
building supermarket	amenity parking_space	landuse garages	leisure bullfighting	power converter
highway services	amenity taxi	landuse grass	man_made windmill	power switchgear
highway rest_area	amenity swimming_pool	landuse greenhouse_horticulture	man_made dyke	sport
landuse commercial	building stadium	landuse landfill	man_made lighthouse	tourism
landuse industrial	building parking	landuse quarry	man_made breakwater	camping
landuse cemetery	building bridge	leisure stadium	man_made bridge	tourism
leisure golf_course	building ruins	leisure pitch	man_made observatory	caravan_site
leisure bullfighting	highway pedestrian	leisure swimming_pool	man_made wastewater_plant	tourism camp_site
power heliostat	highway footway	leisure marina	man_made water_tower	tourism camp_pitch
power generator	highway services	leisure disc_golf_course	man_made communications_tower	waterway riverbank
power substation	highway rest_area	leisure golf_course	natural sand	waterway dam
power converter		leisure miniature_golf	natural beach	
power switchgear		leisure tennis	natural glacier	
tourism camping				
tourism camp_site				

- Revision
  - Manual acceptation/modification of thematic content and geometries

❖SIOSE validation

- Most of the SIOSE elements are generated automatically and need a validation
- Current approach
  - Automatic comparison with **official in situ data on land** not included in the SIOSE production (e.g. forest and crops inventories, geodetic/topographic/altimetric control points, LUCAS, etc.) → **600.000 samples**
  - Official in situ data offers: reliable LC LU information, accurate coordinates and reference date
- VGI approach
  - Not considered now

❖Conclusions

- Need for and **integrated National & European approach** → Copernicus leads today LCLU data production → countries need to be aware and be participative
- National LCLU data should integrate
  - Geometric definition by **official fundamental data themes** (parcels, transports, rivers, etc.)
  - Thematically complemented by **additional sources** (official inventories, EO derived data, VGI, etc.)
- **VGI need to be integrated and reused** somehow
  - The freshest geospatial information, multiple participation, more connected with land (lowest level of a bottom-up approach)
  - **Need to be solved** limitations on licenses, re-think production pipelines, evaluate VGI accuracy and heterogeneity… and willingness

Instituto Geográfico Nacional

Thanks

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