GOBIERNO DE ESPAÑA
MINISTERIO DE FOMENTO

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Seamless Geospatial Reference Data for Cross Border Spatial Data Infrastructures.

Sebastián Mas Mayoral

❖Summary

- Seamless Geo-Data
- Cross Border Projects
- Download and GIS integration vs Interoperability and Harmonisation
- SDI: The way for Interoperability and Harmonisation
- Common & harmonized Data crossing borders needed
- Geo-Spatial Reference Data

  - Common GRI
  - Common Specifications
  - Interoperability

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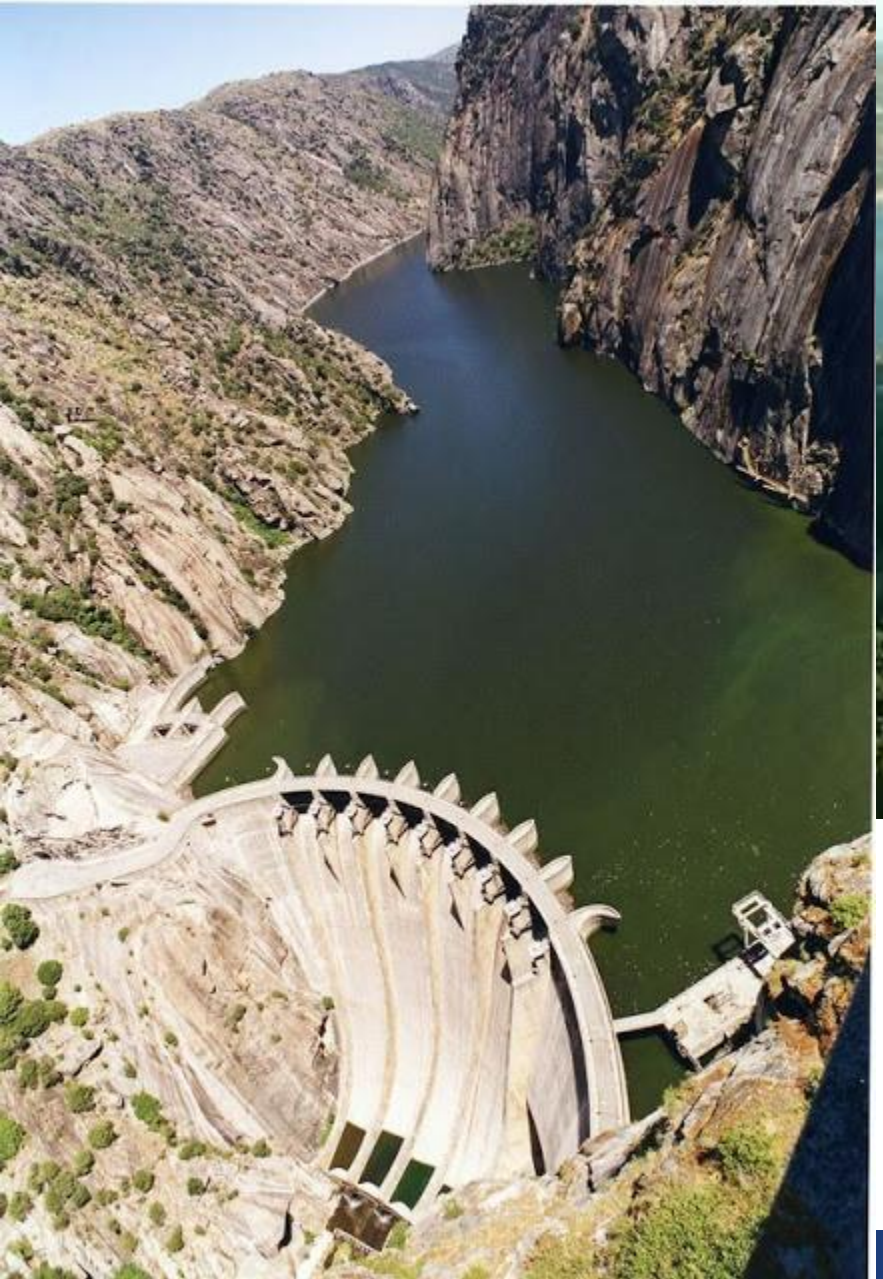
Geo-Data are seamless



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SDI of Spain crossing regional borders

Public Administration in Spain

- 1) National Level
  - Government of Spain (14 Ministries managing GI)
- 2) Regional Level
  - 17 Autonomous Regions
  - 2 Autonomous Cities
- 3) Local Level
  - 8 111 Municipalities
  - 47 Provincial Gov.
  - Consells Insulars
  - Island Councils

Every Government in Spain can produce and manage the GI they need for their own control and management

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SDI of EU crossing national+regional borders

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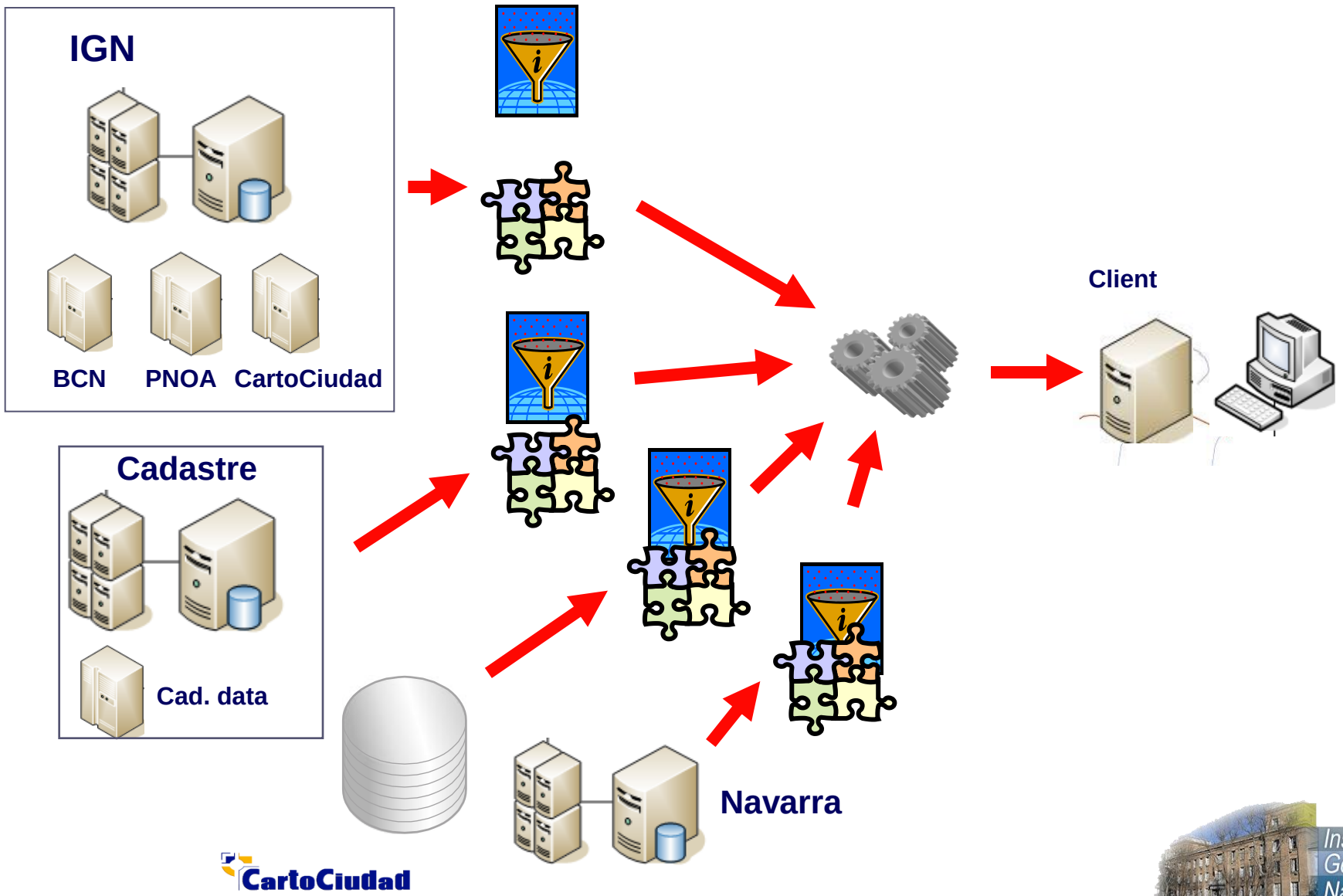
Download and GIS integration



The need for harmonisation

- **Geographic Information from several data providers**

  Processes to transform and load it into the user GIS system.

- **A simpler and less expensive way is to use interoperable web services provided by other organisation: SDI**

  - **Interoperability, based on standards and common specifications**
  - **Harmonisation, to cooperate in order to harmonise geographic information produced by different authorities or to produce jointly a new one shared and co-owned by several authorities.**

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❖ INSPIRE

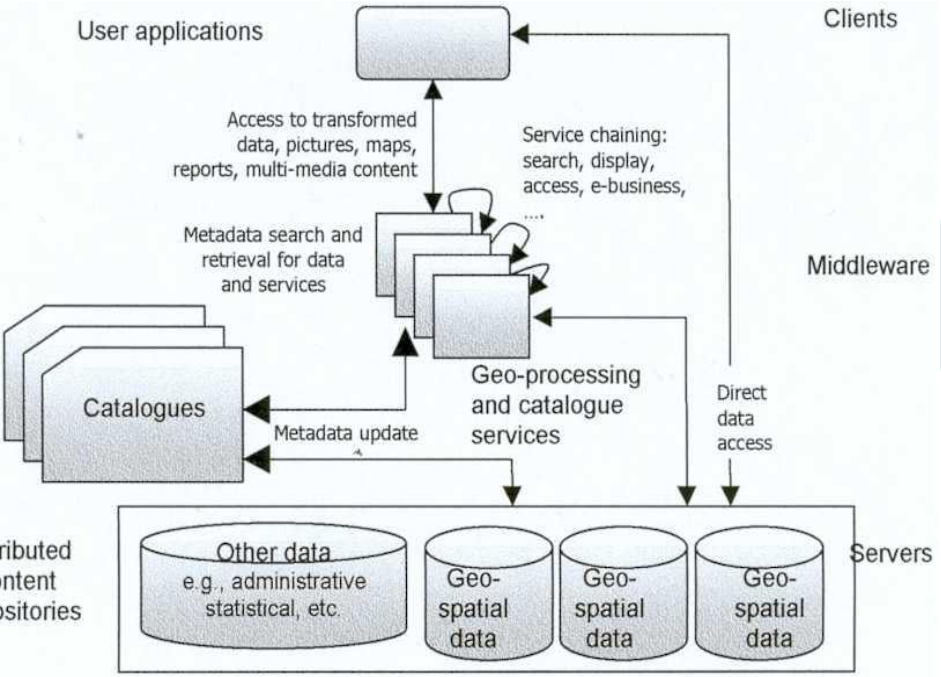
- **Object:**
  - Purpose of the INSPIRE Directive is to lay down general rules aimed at the establishment of the SDI in the E C, for the purposes of Community environmental policies and policies or activities which may have an impact on the environment.
  - INSPIRE shall build upon infrastructures for spatial information established and operated by the Member States.

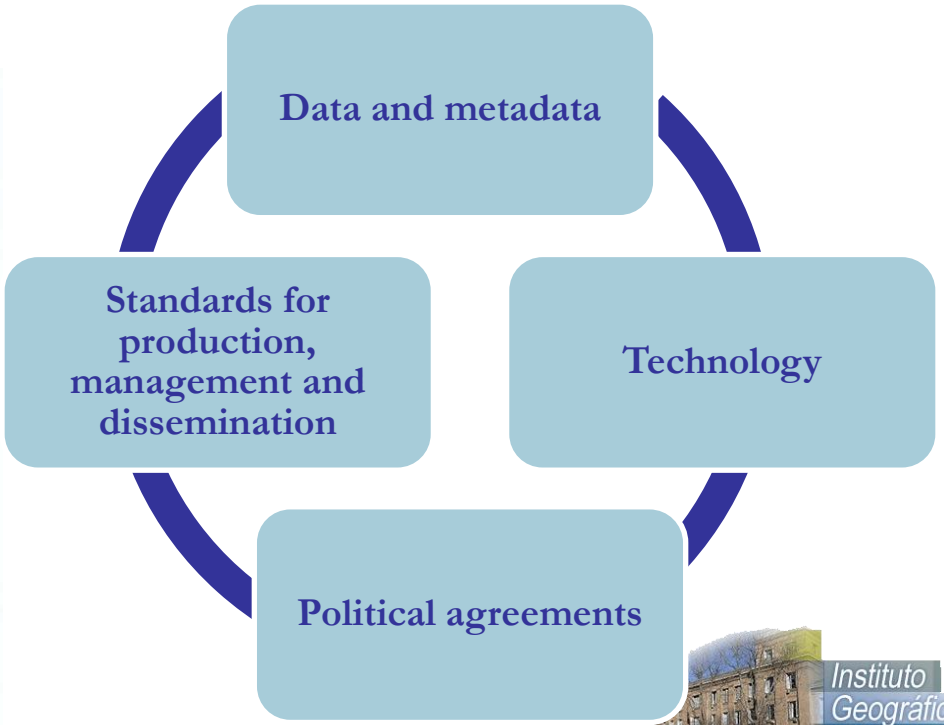
- INSPIRE Directive approval process
  - May 15th 2007 INSPIRE Directive approved

European Environment Agency

Spatial Data Infrastructure

- Infrastructure = A support for social and economic activities
  - Framework supporting knowledge economical and social development
- Structure composed of georeferenced data distributed in different GIS
  - Accessible via Internet with a minimum of protocols and standard specifications





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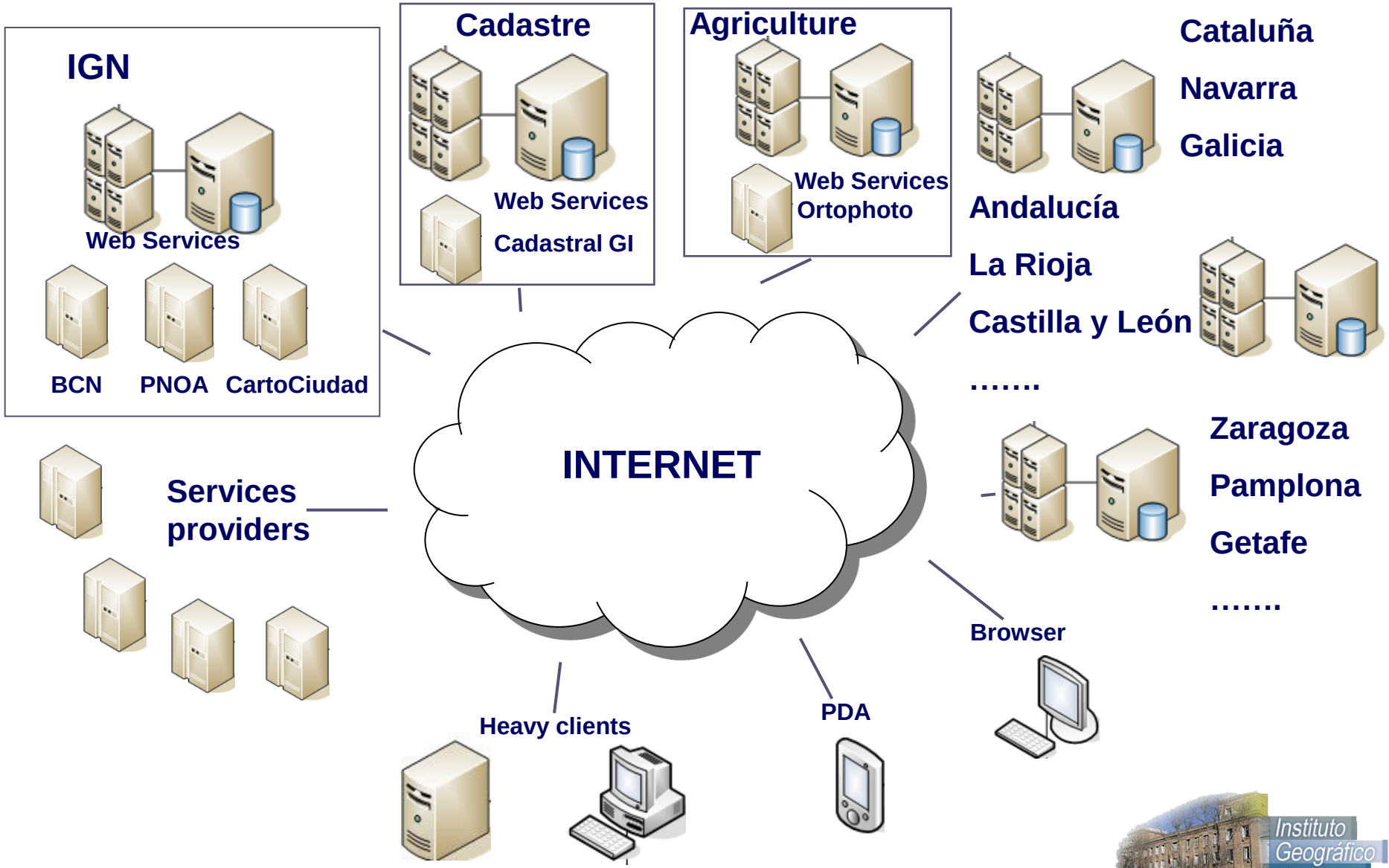
IDEE Architecture

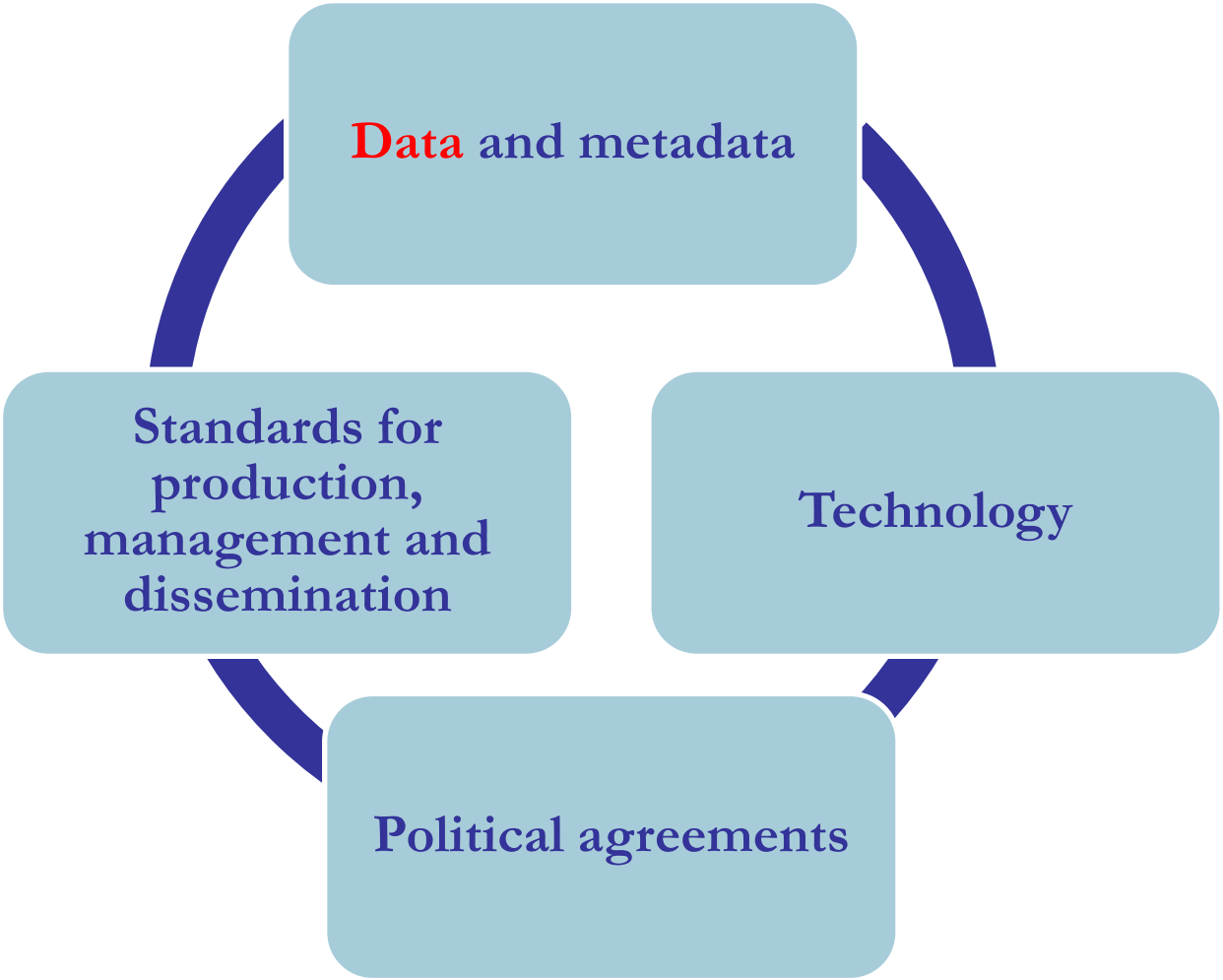


❖Interoperability

- How to get interoperability amongs GI services
  - Coordination
  - Standards:

- ISO (ISO/TC 211) (Normas 19100)
- CEN (CEN/TC 287) (Normas ENV)
- AENOR (AEN/CTN 148) (Normas UNE)
- Open Geospatial Consortium (OGC)
- Implementing Rules from INSPIRE (EU)

Common & harmonized Data crossing borders needed



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Geo-Spatial Reference Data

(Harmonized & Shared)

Anex I (INSPIRE)
Coordinate Reference Systems
Geographical grid systems
Geographic Names
Administrative Units
Addresses
Cadastral Parcels
Transport Network
Hydrography
Protected Sites

Anex II (INSPIRE)
Digital Elevation Models
Land Cover
Orthoimages
Geology

INSPIRE

ANEXO III
(Thematic Data)

Statistical units
Buildings
Soil
Land Use
Human health and safety
Utility and governmental services
Environmental monitoring facilities
Production and industrial facilities
Agricultural and aquaculture facilities
Population distribution — demography
Area management/restriction/regulation zones and reporting units
Natural risk zones
Atmospheric conditions
Meteorological geographical features
Oceanographic geographical features
Sea regions
Bio-geographical regions
Habitats and biotopes
Species distribution
Energy resources
Mineral resources

- **COMMISSION REGULATION (EU) No 1089/2010 of 23 November 2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial data sets and services**
  - **Guidelines :**
    - **CRS (Sistemas de referencia por coordenadas);**
    - **Sistemas de Cuadrículas Geográficas;**
    - **Geographic Names;**
    - **Administrative Units;**
    - **Addresses;**
    - **Cadastral Parcels;**
    - **Transport Network;**
    - **Hidrography;**
    - **Protected Sites**

Geo-spatial Reference Data Project Basement

characteristics

- It provides an unambiguous data location for thematic databases
- It support data from different sources
- It provides the geospatial data framework to spatially understand the spatial information managed
- It must be produced with maximum accuracy and resolution in order to be useful for every application
- It must be continuously updated
- It must be produced and distributed by an authorized agency with legal mandate to produce and update the GRD.

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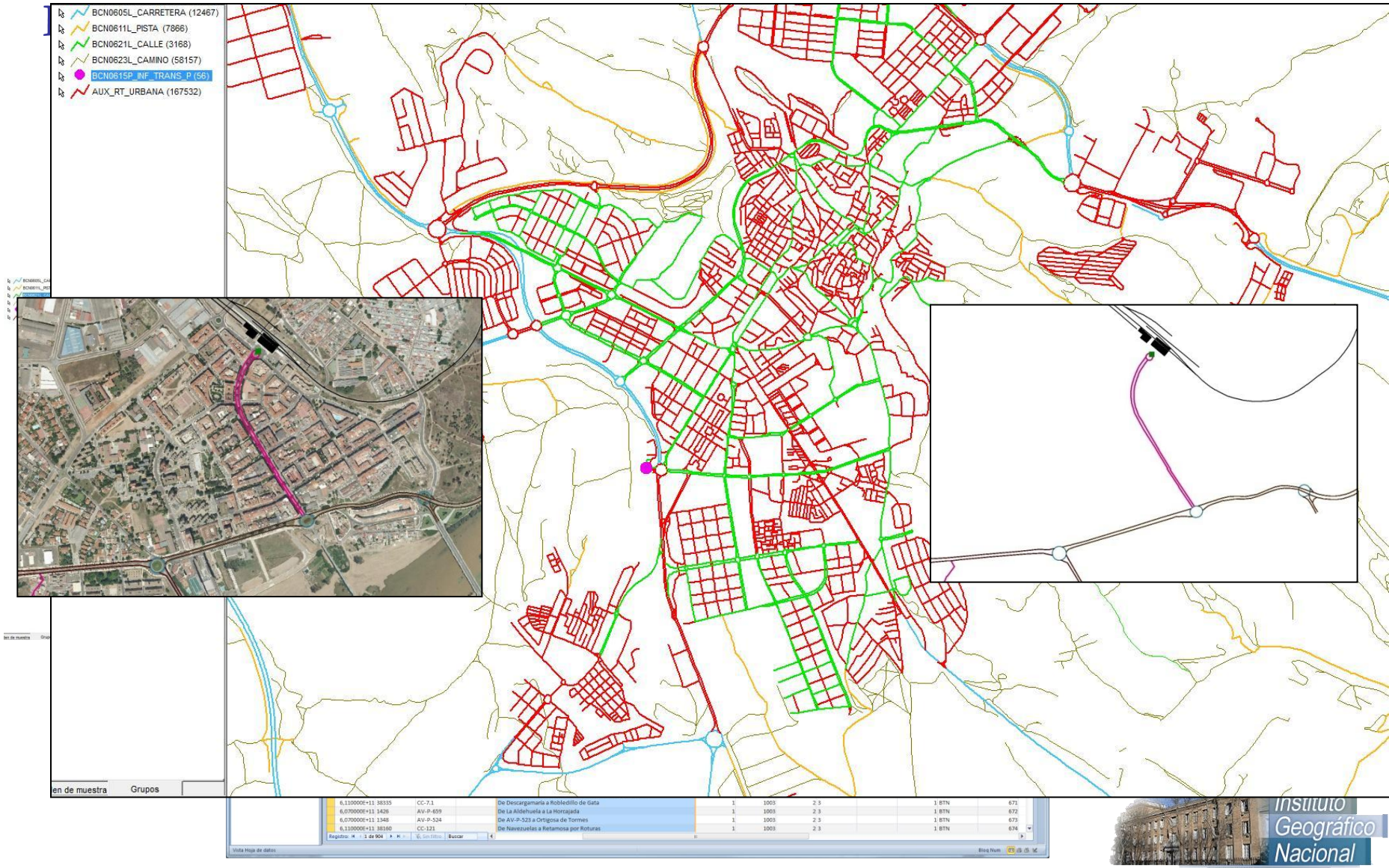
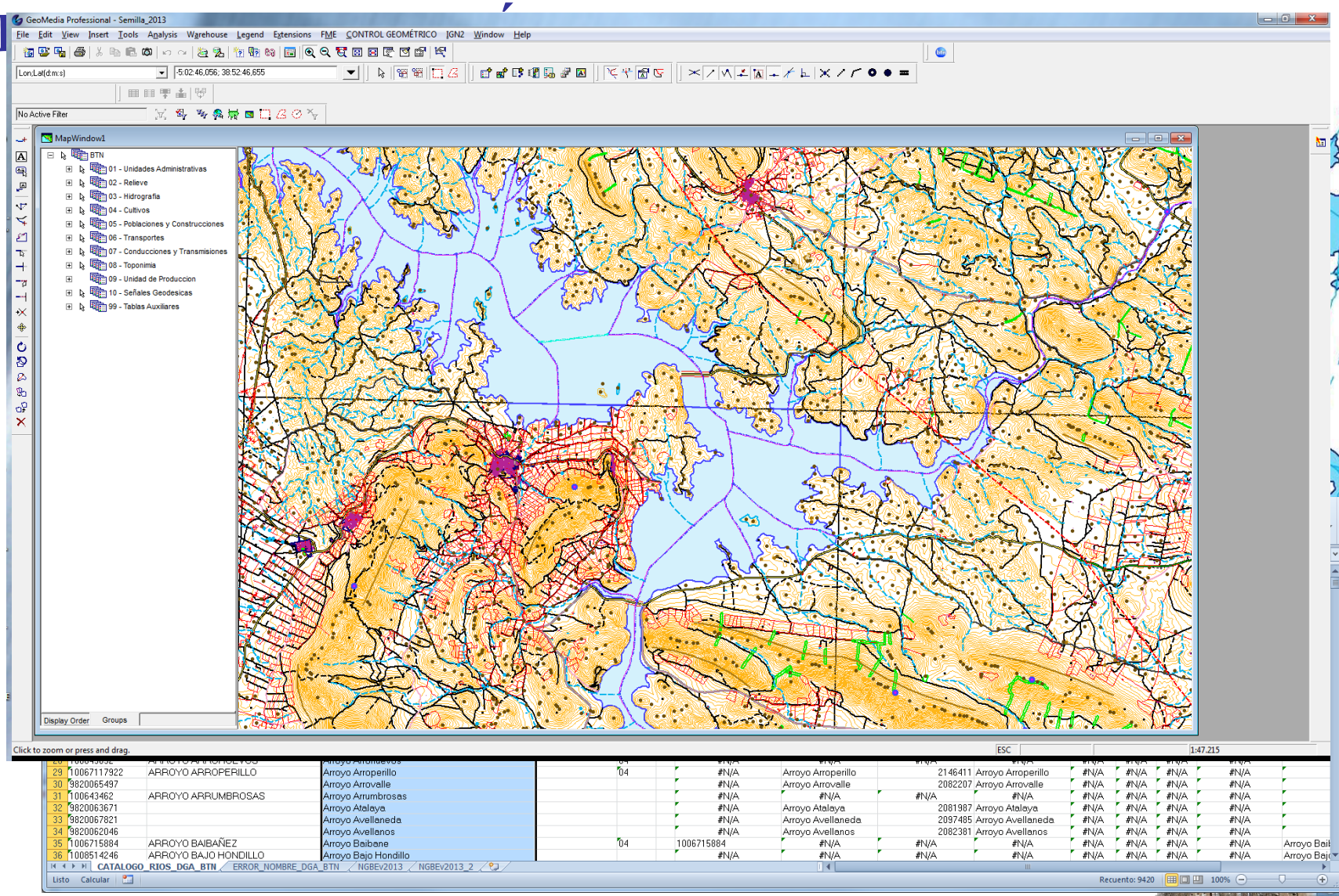
Geo-Spatial Reference Data in the Spanish NCS Framework

- National GI co-operative production plans for Territory observation and National Mapping System.
  - PNOT
    - PNT
    - PNOA
    - LIDAR
    - SIOSE
- Geo-Spatial harmonization programs
  - Transport Network production
  - Hydrographic elements production
  - Population settlements definition
  - CartoCiudad: harmonized database
  - Regional Harmonized Topographic Databases and National Topographic Base

❖Transport Network Data Base



❖Hydrographic Elements Data Base



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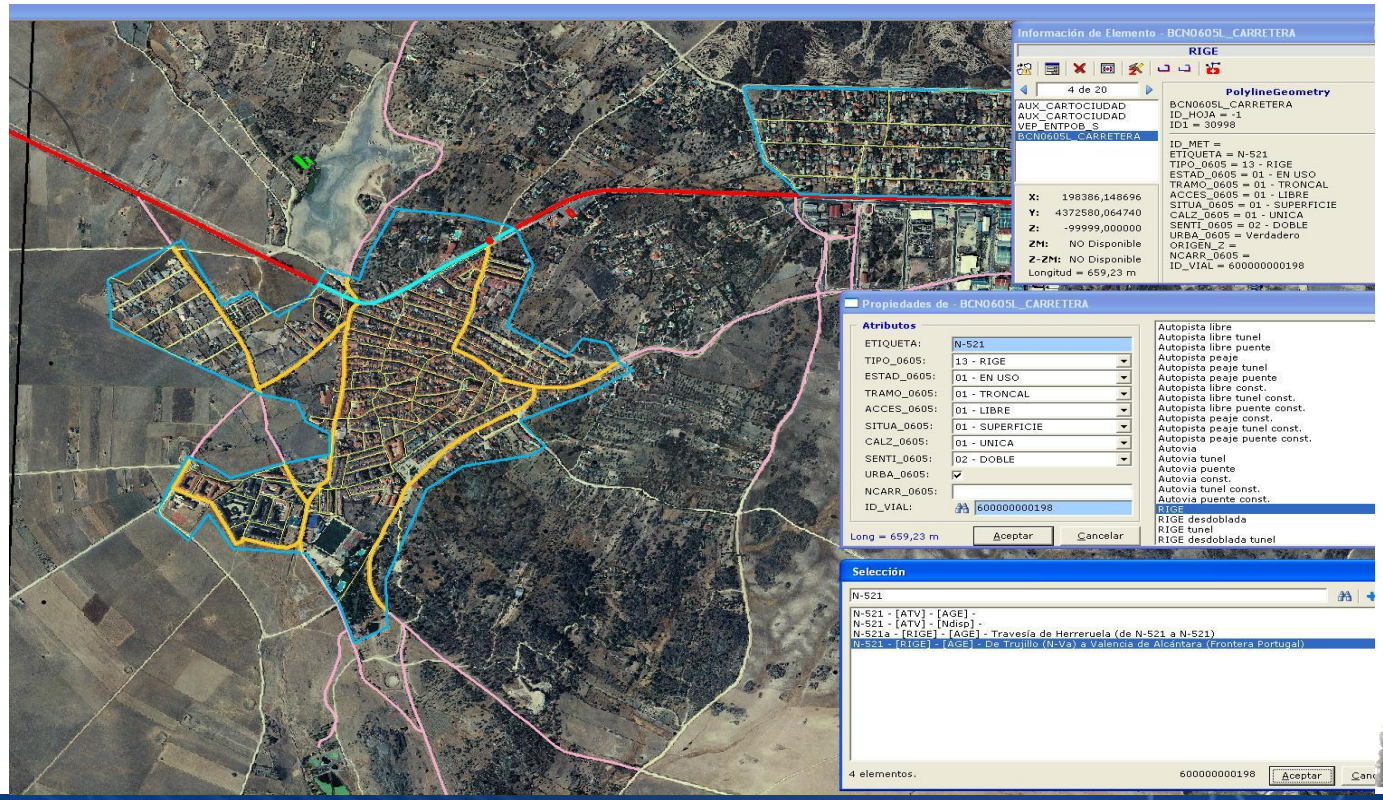
❖Population Settlements Data Base

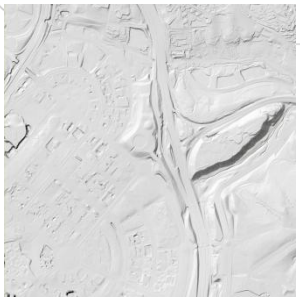
- Population settlement catalogue ➔ Common for different applications (Statistical, cadaster, urbanism, …..)
  - Population settlement location
  - Population settlement border line
  - Population settlement shape



❖PNOA (Aerial Orthophotography National Plan)

PNOA (Plan Nacional de Ortofotografía Aérea)

- One common **photogrammetric fly** for every official application
- One national **orthophotogrammetric coverage (25/50 cm)** all over the whole country every 3 years.
- High resolution **orthophotogrammetric coverage (10 cm)** coverage on specific zones according common needs (towns and urban coastal zones).
- One common **LiDAR fly** for every official application.
- One common **Digital Elevation Model** updated all over the whole country every **3 years (correlation)** and **6 years (LiDAR)**.



MDT

MDS

Products: resolution and accuracy

	GSD Vuelo (cm)	GSD Ortofoto (cm)	Precisión planimétrica de la ortofoto	Precisión altimétrica del Modelo Digital del Terreno	Paso de malla
PNOA 50 cm	45	50	$RMSE_{X,Y} \leq 1{,}00$ m	$RMSE_{z} \leq 2{,}00$ m	5mx5m
PNOA 25 cm	22	25	$RMSE_{X,Y} \leq 0{,}50$ m	$RMSE_{X,Y} \leq 1{,}00$ m	5mx5m
PNOA 10 cm	9	10	$RMSE_{X,Y} \leq 0{,}20$ m	$RMSE_{X,Y} \leq 0{,}20$ m (con LiDAR)	1mx1m

	Densidad Nominal (p/m2)	Distancia nominal entre puntos (m)	Precisión altimétrica de la nube de puntos	Precisión altimétrica del Modelo Digital del Terreno	Paso de malla
LiDAR	0,5	1,4	RMSE z ≤ 0,20 m	RMSE z ≤ 0,50 m	5mx5m

❖ Orthophoto Coverage

Planing 2014-2016

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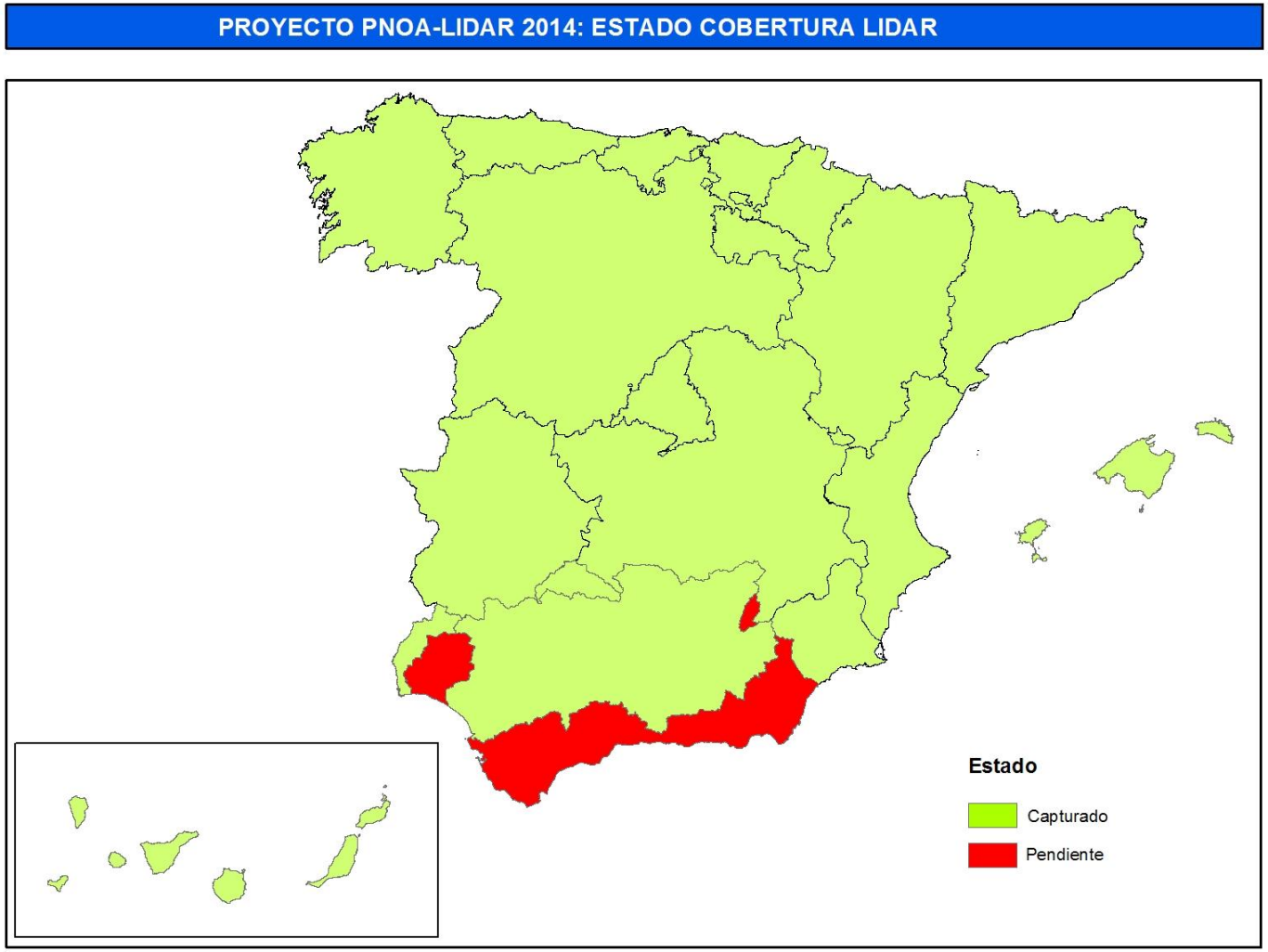
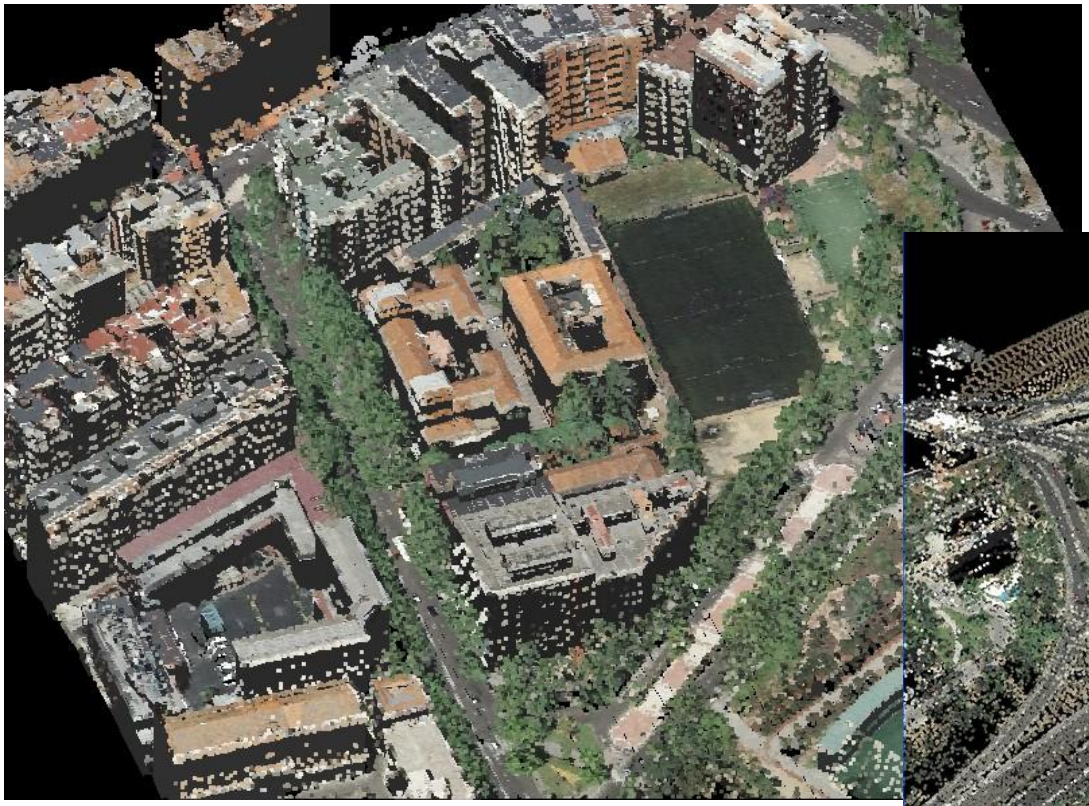
❖ LiDAR coverage

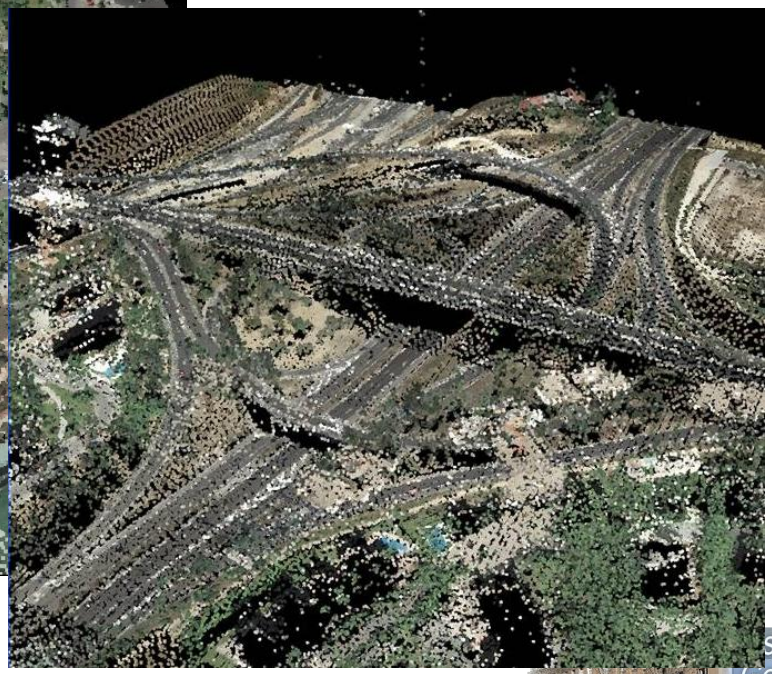


LiDAR utility

LiDAR + RGB data from aerial images

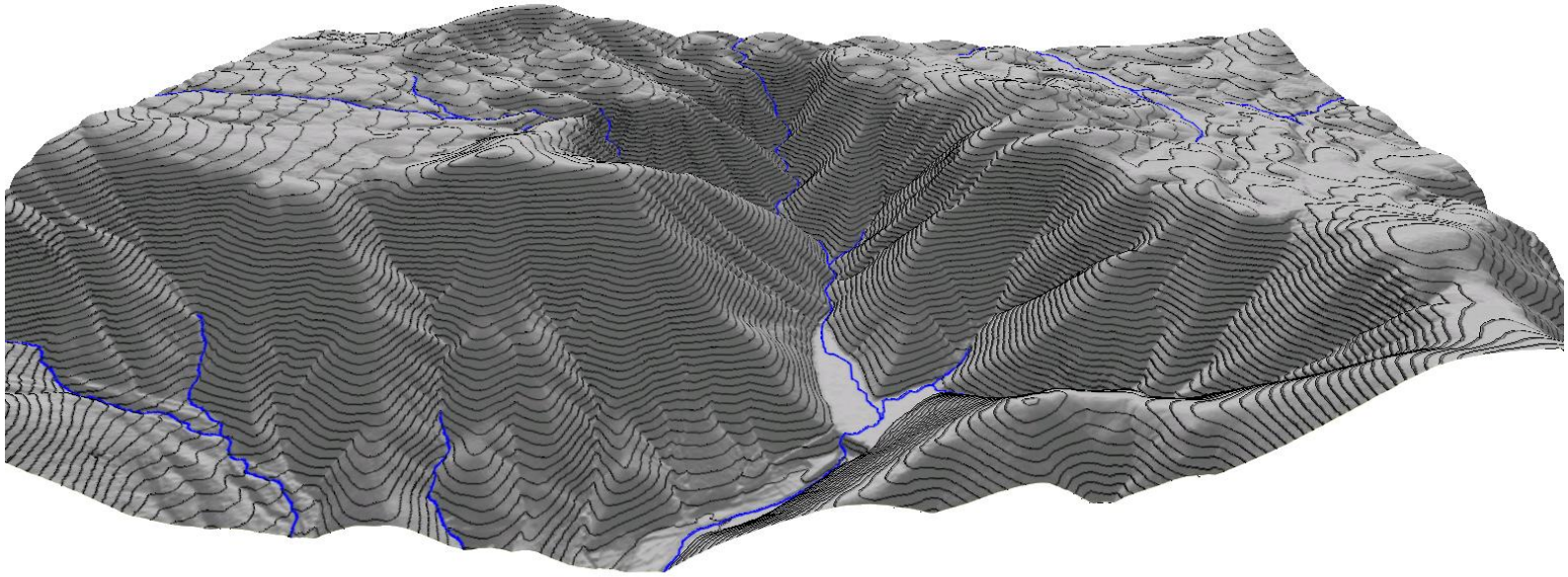


Sede Central del IGN

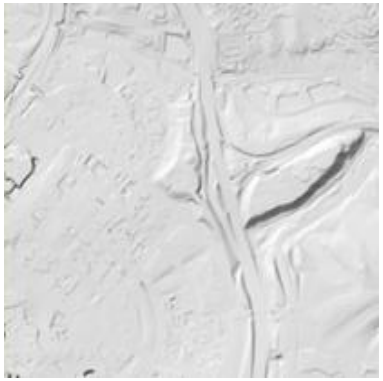


Nudo de Carreteras

❖ DTM LiDAR and Hydrography harmonization



Contour lines and Hydrographic network produced from LiDAR data



DTM 5 m

DSM 2 m

DTM + Ortho

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Land Cover + Land Use = SIOSE

Land Cover:
Physical, chemical, ecological and byological classification of land surface
→
What there are on ground

Land Use:
Human activities developed on land → Land usage

SIOSE

INSPIRE - Infrastructure for Spatial Information in Europe

Copernicus

European Environment Agency

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Land use evolution

Fotografía de Benidorm en 1956

Benidorm en 2002

Construcción del Embalse de la Loteta, Zaragoza. SPOT 2005 (der.) SPOT 2011 (izq.).

❖ CONCLUSIONS

- NMCA or authoritative national/regional agencies must provide GRD and Inspire web services on Inspire GRD in an easy and open way.
- EC and NMCA must agreed on setting up Inspire GRD seamless crossing borders in order to have the basement for projects crossing borders.
- Inspire GRD seamless crossing borders must be setting up at the highest resolution and accuracy. GRD seamless is not directly related to an specific cartographic scale. Projects and events happen in a broad zone or in a very limited one but in this case a very detailed geo-data are needed (floods, fires, hazards,….).
- We need to be ready to provide at an European level these seamless Inspire GRD.
- Some kind of EU fostering is needed in order to get the seamless Inspire GRD. But a new EU GRD built top-down is not the way.
- Seamless Inspire GRD need to be built bottom up (Region-Nation-EU) in order to be the common GRD basement for any project at regional, national or european level.

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Thank you for your attention

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