Settlements: A new producción system of GRD in the IGN_ES according to INSPIRE

Eduardo Núñez Maderal, T. Gullón, L.Camón, J. Delgado
Changes

- Geospatial frame
- User needs
- Human Resources
- GI Management

Look others

Look inside organization
Settlements for the basic cartography

GEOGRAPHIC INFORMATION
FOR THE TOPOGRAPHIC MAP PROJECT (1:25.000)

Production:
- Scale 1:25,000
- Manual capture Captura (photo-interpretation)
- Geographical name
- Built-up areas mask

Capture and maintenance for cartographic purposes
Settlements for the Geospatial Reference Information (GRI) project

GRI PROJECT

2014

Accurate (XY) and updated automatic boundaries extraction from cadastral data to define settlements

Production:
- Normalized: according to INSPIRE
- Automatic
- High resolution (cadastre)
- Maintenance cycle is in relation to user needs

Capture and maintenance for cartographic and territorial management purposes according to INSPIRE
## Settlements:

*A new GRD producción system in the IGN_ES according to INSPIRE*

<table>
<thead>
<tr>
<th>Directive INSPIRE</th>
<th>National frame law</th>
<th>IGN-E fundamental datasets GRI Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annex 1</td>
<td>IGR</td>
<td>Geodesy and Coordinates</td>
</tr>
<tr>
<td>Annex 1</td>
<td>IGR</td>
<td>Geographical names</td>
</tr>
<tr>
<td>Anexo 1</td>
<td>IGR</td>
<td>Admin. Boundaries</td>
</tr>
<tr>
<td>Anexo 1</td>
<td>IGR</td>
<td>Transport Networks</td>
</tr>
<tr>
<td>Anexo 1</td>
<td>IGR</td>
<td>Hydrography elements</td>
</tr>
<tr>
<td>Anexo 1</td>
<td>IGR</td>
<td>Settlements</td>
</tr>
<tr>
<td>Anexo 2</td>
<td>IGR</td>
<td>Althimetric data</td>
</tr>
<tr>
<td>Anexo 2</td>
<td>IGR</td>
<td>Referenced images</td>
</tr>
<tr>
<td>Anexo 2,3</td>
<td>IGR-DTF</td>
<td>Land cover-Land use</td>
</tr>
</tbody>
</table>
Índice

IGR POBLACIONES (Asentamientos de población)

Knowledge and technical criteria

Production v1

Maintenance
1. Knowledge, technical criteria
Spanish settlements

Administrative organization
• 17 Regions (NUT2)
• 52 Provinces (NUT3)
• > 8,000 Municipalities

Settlement Database v0, IGN-ES
Base de datos de poblaciones V0, IGN_ES
(manual photointerpretation)
Spanish settlements

Spatial scenarios

Urban

Rural
Spatial escenarios

NorthWest:
Small and dispersed
High density
Spatial escenarios

Center:
Grouped
Low density
Spatial escenarios

Coast:
Group and dispersed
High density
Settlement types

- Metropoly
- Urbanization
- City
- Isolated house
- Village, place
- Abandoned
• Definition of settlement
  ❖ Scope and purpose

Geographical areas that define a clearly differentiated occupation of territory by the human population

❖ Quantity: an estimation of 180,000 settlements
**Users: Requirements and needs**

**Statistical populated entities gazetteer:** 30% identified (National Statistics Institute of Spain)

Identificación estadística (Nombre y código)

- **Urban core:**
  - Jaén: 112,000 population
  - Puente Tablas: 600 population

- **Disseminated:**
  - Jaén: 3,400 population

- **Real territory**

  - Resolution: no geometry
  - Updating: annual
National cartography: 120,000 settlements captured by manual photointerpretation

- Resolution: 5-20 meters
- Updating: 4-8 years

Geographic information production

Cartographic production
Regional cartography: Higher resolution but it is not complete and not homogeneous nationwide

- Resolution: 1 metre
- Updating: ¿?

Source: images from IECA
Postal addresses: supported with a settlementent spatial database with point geometry

- Resolution: 10 metres
- Updating: continuous
**Catastre:** cadastral parcel, addresses and buildings

At municipal level

- Resolution: < 1 metre
- Updating: 6 months
Risks and emergencies:

- Flood zones
- Earthquakes

Affected settlements
Users: Requirements and needs

European settlement map


Related Pan-European products

- Resolution: 10 metros (raster)
- updating: annually

European Settlement Map is a spatial raster dataset that is mapping human settlements in Europe based on SPOT5 and SPOT6 satellite imagery. It is published with two associated data layers. It has been produced with GHSL technology by the European Commission, Joint Research Centre, Institute for the Protection and Security of the Citizen, Global Security and Crisis Management Unit. This work has been partly financed by the Directorate General of Regional and Urban Policy, European Commission.

The European Settlement Map 2016 (also referred as ‘EUGHSL2016’) represents the percentage of built-up area coverage per spatial unit. The GHSL method uses machine learning techniques in order to understand systematic relations between morphological and textural (pantex) features, extracted from the multispectral and panchromatic (if available) bands, describing the human settlement.
Monitoring settlements: urban sprawl in Europe

- Global alarm due to a high scatter
- Monitoring settlements to manage a sustainable growth:
  - **Spatial distribution** (location and land cover)
  - **Intensity of use** (population)

Source: Application of a new GIS tool..., T. Soukup et al., 2015
Objetives to produce settlements

- Standarization: based on INSPIRE implementing rules
- User requirements:
  - What, how, when and how much
- Automatic production, homogeneous nationwide
- Full detail geospatial data (bottom-up aproach)
- Based on urban data (catastral data)
A3. Statistical units

Settlements

A1. Administration boundaries

A1. Cadastral Parcel

A3. Demography

Statistics code

A3. Land use for settlements (linked to Hilucs)

A1. Geographical names

A3. Buildings
Design for the settlements

FISICAL DESIGN (SETTLEMENTS GRD, IGN-ES)

Catalog

Settlement geometries (Parcels and polygons linked to the settlement id)

Boundaries
Design for the settlements

FISICAL DESIGN (SETTLEMENTS GRD , IGN-ES)

How to give different answers? → taking into account land use

<table>
<thead>
<tr>
<th>INSPIRE HILUCS</th>
<th>SETTLEMENT USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1: Others levels</td>
<td></td>
</tr>
<tr>
<td>1. Primary Production</td>
<td>Industrial</td>
</tr>
<tr>
<td>2. Secondary Production</td>
<td></td>
</tr>
<tr>
<td>3. Tertiary Production</td>
<td>Industrial, Services and Infrastructures</td>
</tr>
<tr>
<td></td>
<td>Green area</td>
</tr>
<tr>
<td>4. Transport Network</td>
<td>Industrial</td>
</tr>
<tr>
<td></td>
<td>Services and Infrastructures</td>
</tr>
<tr>
<td>5. Residential Use</td>
<td>Residential</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Other Uses</td>
<td>Urbanized area</td>
</tr>
<tr>
<td></td>
<td>Not built area</td>
</tr>
<tr>
<td></td>
<td>Abandoned</td>
</tr>
</tbody>
</table>
2. PRODUCTION
Roadmap

**GRDv0**

- Topographic Compilation
- Carto DB: …2015

**GRDv1**

- Automatic extraction
- IGR DB: 2015,16

**Production sys.**

- IGR DB: 2016…
Settlements GRD v0

- Existing cartography from topographic maps
- Manual capture (photointerpretation for topo-maps)
- Resolution: 5-20 metres

GRDv0 -> 2015
Settlements GRD V1

- **Automatic production**: ≈ 70-80% automation
- **Vectorial capture**: cadastral data
- **Vectorial extraction**: automatic
- **Names**: based on official sources
- **Objective and homogeneous**: common technical criteria nationwide
- **Execution time**: 2016

Zone 1: product.
Zone 2: analysis
Production methodology developed
Unique identifier assigned to each one of the urban parcels

Geometry: detail part of the settlement
Unique identifier assigned to each one of the urban parcels

1. **Geometry + cadastral reference**

   ![Map of a settlement with a cadastral reference]

   **[Cadastral ref.] = 6004901UL9560S**
   **Id settlement = 123456789**

2. **Settlement (name, id and code):**
   Adresses, Population gazetteer, streets, Cartography

   **Id = 123456789**
   **Geo. Name: Urbanización las Mimosas-La Chismosa**
   **Gazetteer code = 03099000817**

   **Id = 123456788**
   **Geo. Name: Las Piscinas-Sector J-1**
   **Gazetteer code = 03099000828**
Unique identifier assigned to each one of the urban parcels

Results:
13 M loaded parcels
- 3 % without id
- 25% conflicts
→ > 70% automation
8-10 months of manual edition

Error in geographic name

<table>
<thead>
<tr>
<th>nomgeo</th>
<th>cod_pob</th>
<th>cpro</th>
<th>nomgeo_prop</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Casa del Guarda)</td>
<td>02008000000</td>
<td>02</td>
<td>Casa del Guarda</td>
</tr>
<tr>
<td>El Mencal</td>
<td>02058000000</td>
<td>02</td>
<td>El Mencal (ruinas)</td>
</tr>
<tr>
<td>Casas Portelano</td>
<td>02059000000</td>
<td>02</td>
<td>Casas Portelano (ruinas)</td>
</tr>
<tr>
<td>Casa del Royo</td>
<td>02021000000</td>
<td>02</td>
<td>Casa del Royo (ruinas)</td>
</tr>
<tr>
<td>Casa de la Viña</td>
<td>02037000000</td>
<td>02</td>
<td>Casa de la Viña (ruinas)</td>
</tr>
</tbody>
</table>

Parcels without link

Parcels in wrong settlement

Parcels that are not settlement
settlements production

Automatic result without editing

1. Data extraction

2. Dispersion

3. Auxiliar info. allocation

4. Boundaries

Automatic process
Current production state

Legend:
- Pending
- Proposal with region
- Manual EDITION
- QUALITY control
- Loaded DB

80% Produced
Finish in December 2016
Loaded in early 2017
Technologies

- Design
- Development
- Edition and quality
- Load and management
- Platform
3. Maintenance. Production system
## SETTLEMENTS PRODUCTION SYSTEM

### “Production system”

<table>
<thead>
<tr>
<th><strong>Content</strong></th>
<th>Fundamental (core): urban areas Complete urban, rural and others areas for live and work</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>updating</strong></td>
<td>1 year for the core: automatic 3 years complete (new version): automatic + manual review</td>
</tr>
<tr>
<td><strong>Resolution</strong></td>
<td>&lt;= 1 metre</td>
</tr>
<tr>
<td><strong>Metodology</strong></td>
<td>Automation of production &gt; 70%, automatic change detection, manual review</td>
</tr>
<tr>
<td><strong>Production</strong></td>
<td>Coordinate updating at national and regional levels Bottom-up approach</td>
</tr>
</tbody>
</table>
• **Lines of work:**
  
  • **Complete** the rest of the **territory** through agreements with the regional agencies
  
  • Stablish **harmonized work flows between** national and regional **organizations** to automate the production (statistical units, geographical names, parcels and buildings)
  
  • **Bottom-up approach.** Coordinate a joint and single production of settlements with all regional agencies: technical specifications and production cycles
  
  • **Maintenance:**
    
    o Develop automatic processes to link cadastral data
    
    o Develop automatic change detectors based on Lidar, images, to reduce cost and time of production
✓ IGN_ES is promoting and coordinating the production of this fundamental data set at national and regional level

✓ Achieve automation > 70%

✓ Homogeneous and objective nationwide

✓ Methodology based on cadastral data provides the concept of real state and official boundaries of the territory

✓ We delay in the availability of data this year to early 2017 mainly due to the current economic and politic situation and its impact significantly on the ability to involve resources in the project
Thank you for your attention

Eduardo Núñez Maderal
National Geographic Institute of Spain

enmaderal@fomento.es