Instituto Geográfico Nacional

CENTRO NACIONAL DE INFORMACIÓN GEOGRÁFICA

Characteristics of the publication of the Spanish transport network data set

Alicia González

agjimenez@mitma.es

Paloma Abad

paloma.abad@cnig.es

GOBIERNO DE ESPAÑA

MINISTERIO DE TRANSPORTES, MOVILIDAD Y AGENDA URBANA

INSTITUTO GEOGRÁFICO NACIONAL

Summary

- **Introduction**
  - How has IGN Spain worked to provide TN data INSPIRE compliant?
- **Creation Process of the TN DataBase (IGR-RT)**
  - Data model and documentation
  - Data stored in the TN BD
  - Data production: so far, present and future
- **Web Services of TN INSPIRE compliant**
  - Layers (WMS, WMTS) & Features (WFS)
  - Services requests figures
  - Geoportal Inspire
- **Conclusions and future actions**

Introduction: How has IGN-Spain worked to provide TN data INSPIRE compliant?

To provide a seamless INSPIRE compliant TN dataset in March 2014, IGN Spain defined a new data production strategy based on:

1. Creating a **Transport Network DB**

- **INSPIRE** compliant

- Considering the **requirements** on TN that the IGN-Spain products have (Topographic Map, Street Map, etc.)

  -> any TN data included in these products shall be obtained from the TN BD

- As much **accurate** and **updated** as possible

2. Providing the mapped data according to INSPIRE schema via **web services INSPIRE compliant**:

- Catalogue service **WCS**
- Visualizing service **WMS**
- Download services **WFS**

Additionally the whole dataset (including local attributes not INSPIRE compliant) are available in the Download Data Website (CC BY 4.0) and in the TN viewer (https://www.ign.es/web/redes_transporte/)

Creating a Transport Network DB: IGR-RT

1. Data Model definition and documentation

Analysis of datasets data models:

- **Main IGN products**
- **Main TN data providers**

Analysis INSPIRE requirements:

- **Guidelines TN**
- **INSPIRE Application Schema (.eap)**

http://inspire.ec.europa.eu/index.cfm/pageid/2/list/datamodels

➡ Results: features, attributes and local requirements

IGR-RT

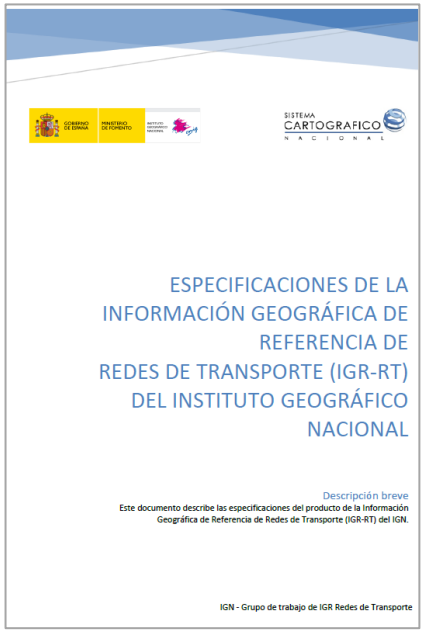
(GRI-TN, Geospatial Reference Information of Transport Network)

Creating a Transport Network DB: IGR-RT

1. Data Model definition and documentation

www.ign.es/resources/IGR/Transporte/CBG-Redes-Transporte.zip

- IGR-RT* Specifications (ISO 19131)
  - UML diagrams, Feature Catalogue
- AnnexeS
  - DB Model implemented + features, attributes mapped with INSPIRE
  - Quality Control



**IGR-RT (GRI-TN, Geospatial Reference Information of Transport Network)*

Creating a Transport Network DB: IGR-RT

1. Data Model definition and documentation:

What is IGR-RT? *(GRI-TN, Geospatial Reference Information of Transports Network)*

Seamless 3D linear transport network all over Spain

- ROAD Network
  - Urban (streets)
  - Outside urban areas (roads, ways)
- RAIL Network
- AIR Network
- WATER Network
- CABLE Network (chair lifts, cableway, ski lift)

- Intermodal connections

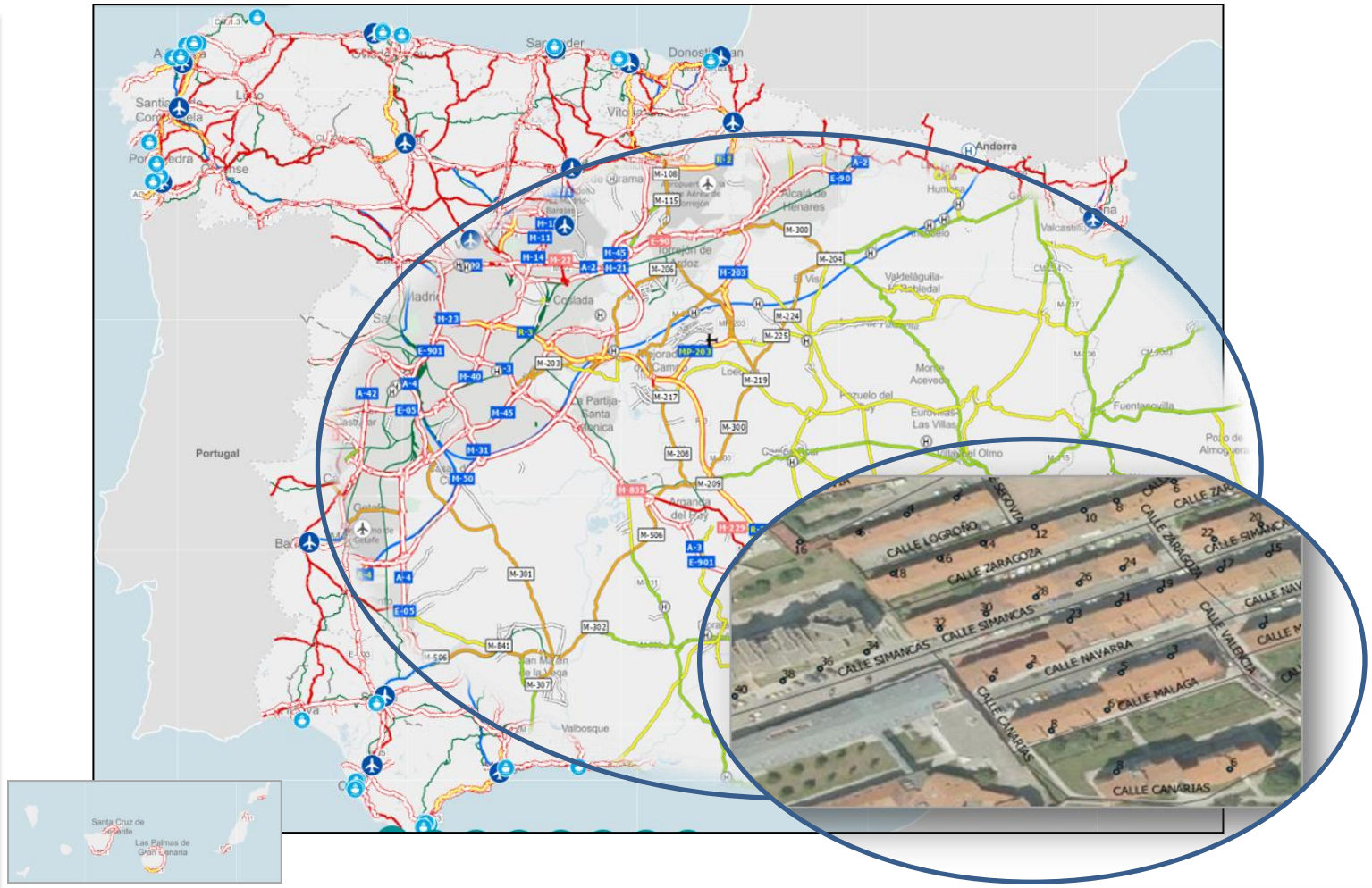
INSPIRE compliant

Official Data Providers

National Cartographic System

IGR-RT: Transport Network Data

Road Network : streets + road (outside cities) + ways network

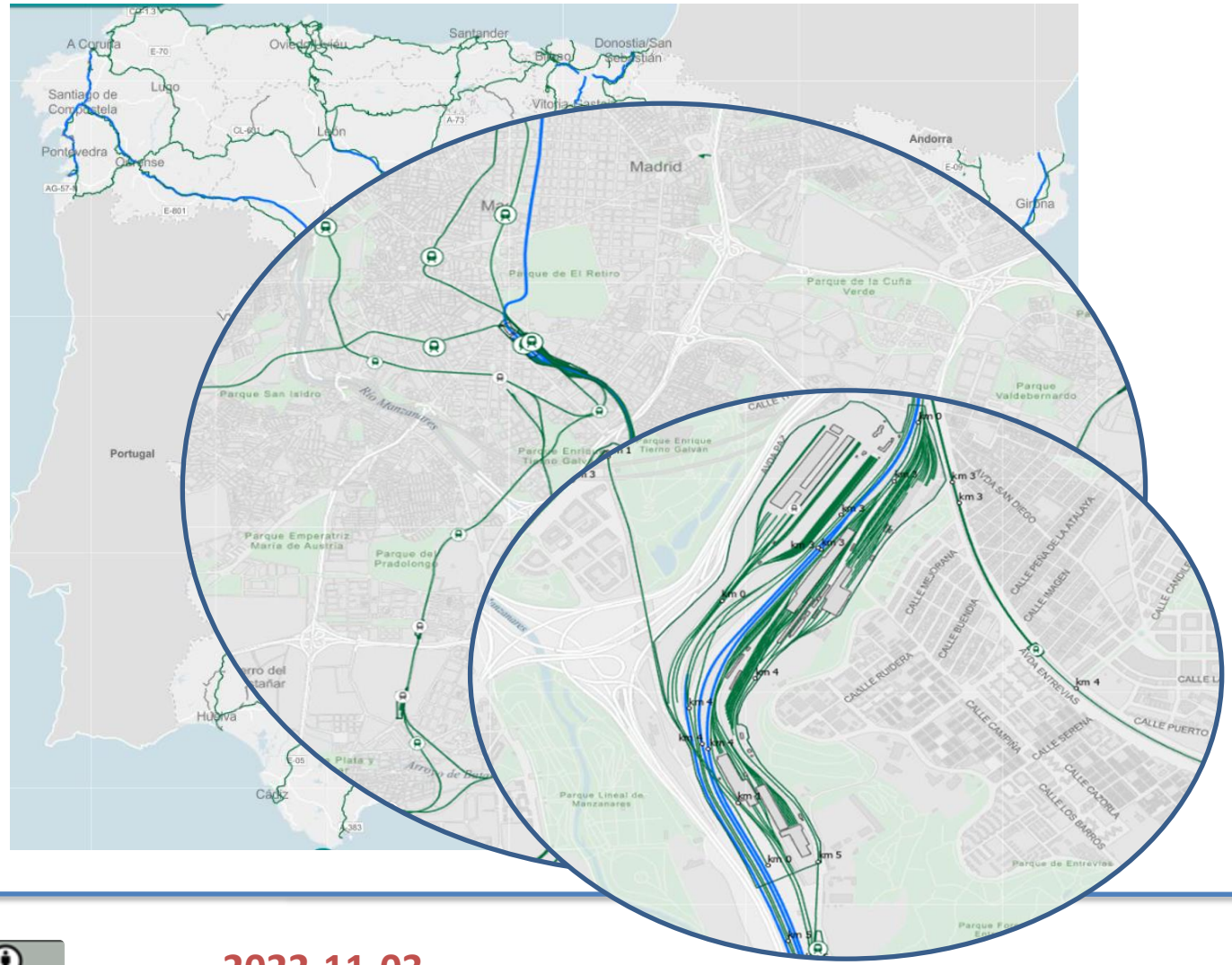


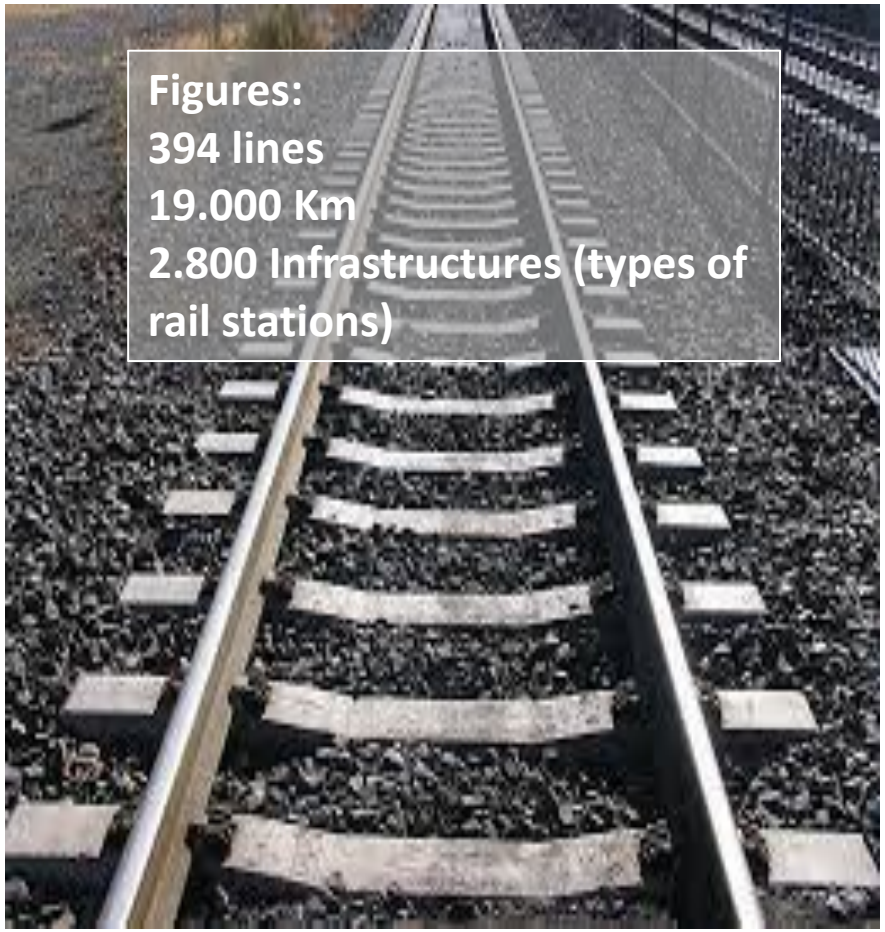
Figures:
259.000 Km of roads
1.500.000 Km of ways
206.700 Km of streets
191.500 KKPP
12.000.000 Building numbers
10.000 Road Infrastructure (Service Area, toll area, etc)

2022-11-03

IGR-RT: Transport Network Data

Railway Network: railway (metro and tram not yet)





2022-11-03

IGR-RT: Transport Network Data

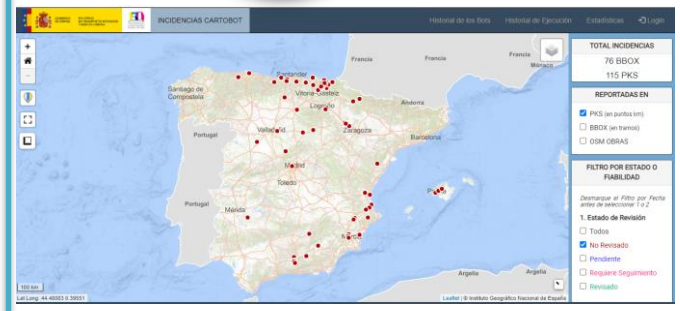
Air and Water Network: airports, heliports, ports

2022-11-03

IGR-RT: Data Production

- ✓ 1st Version: 2017, by re-using official data existing in IGN-Spain products and official providers data
- ✓ Update:
  - ✓ Firstly: complete update of data either by geographical unit (province) or by transport mode
  - ✓ Current trend: selective updating by detection of changes in data sources and aerial images

Bots



Artificial Intelligence

Image - Image

Image - Vector

IGR- RT ways

IGR- RT ways vs ways detected by AI

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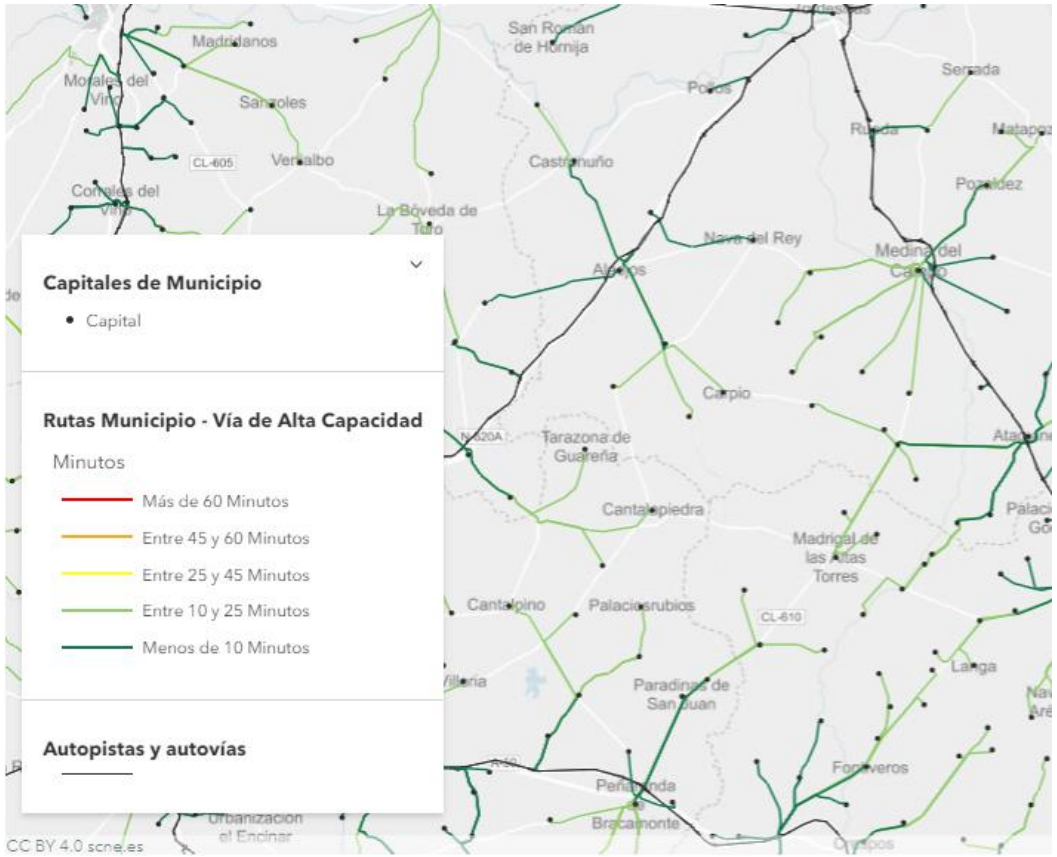
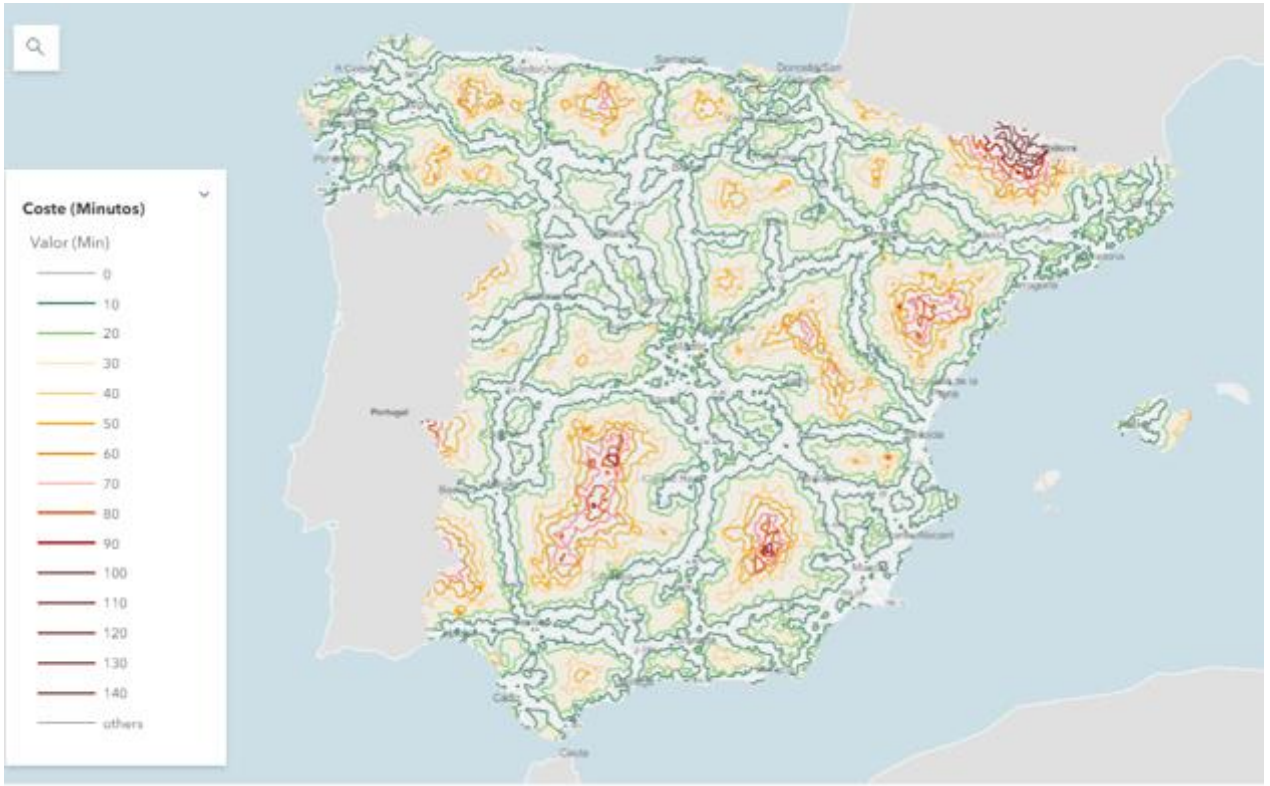
IGR-RT: Present & Future

- ✓ As TN data become more complete, accurate, and up-to-date -> they enable more complex queries to be resolved: i.e. Routing from every town hall to the closest Main Road



Routing results



Isochrones map

(For more information visit the storymap)

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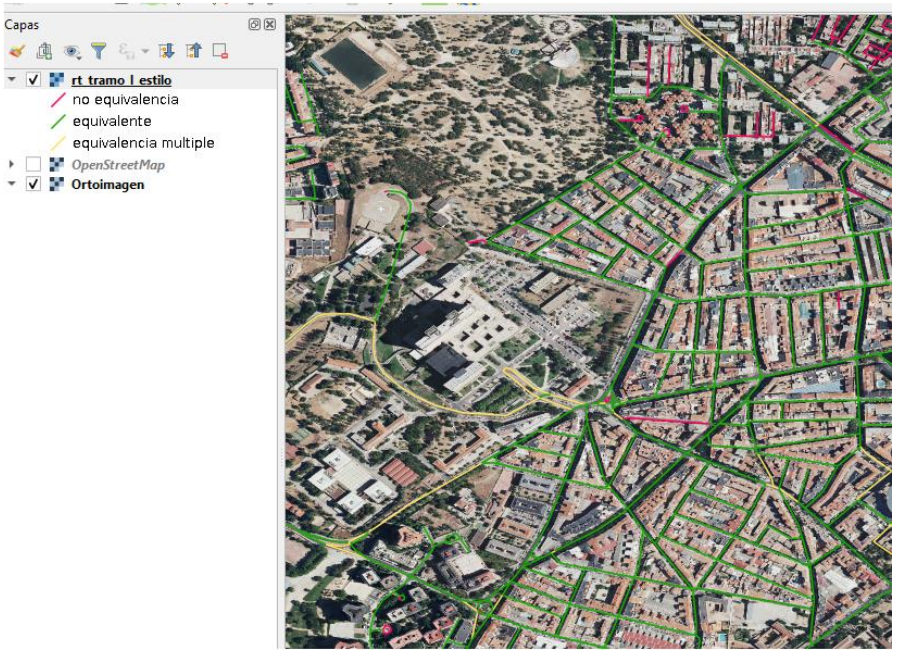
IGR-RT: Present & Future

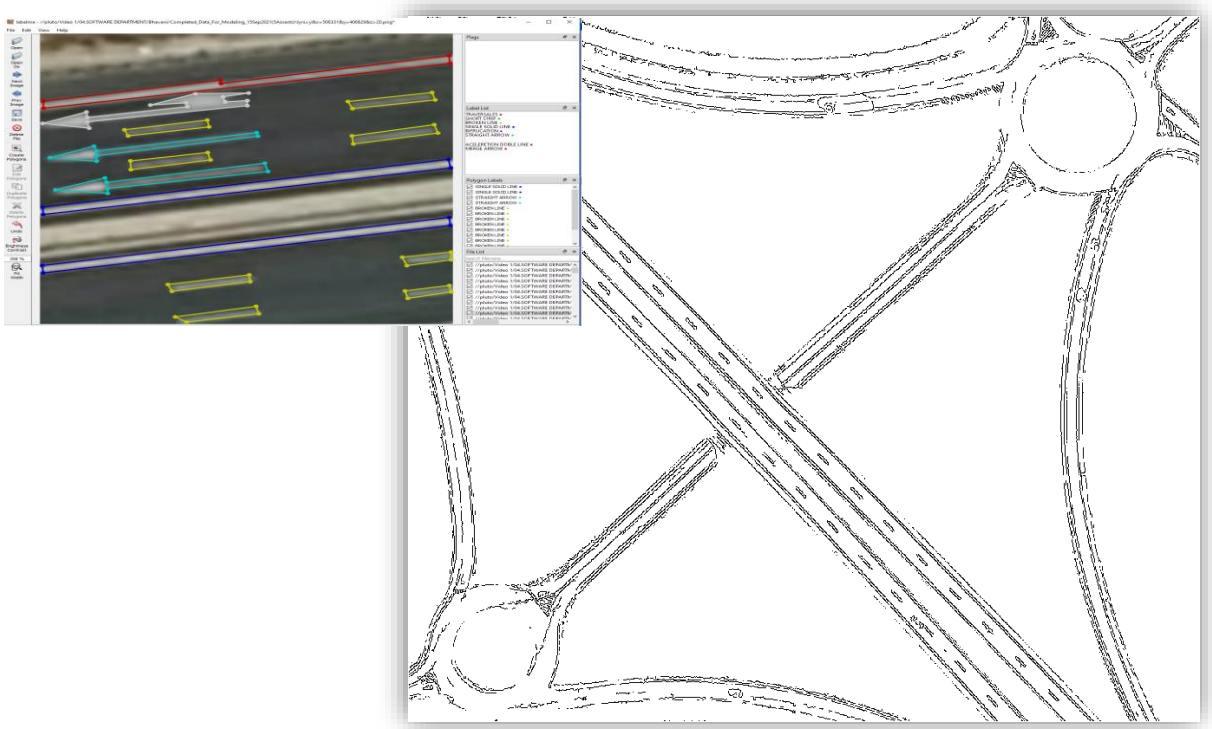
✓ On going work lines and futures: improving data

- Providing traffic direction data from OSM

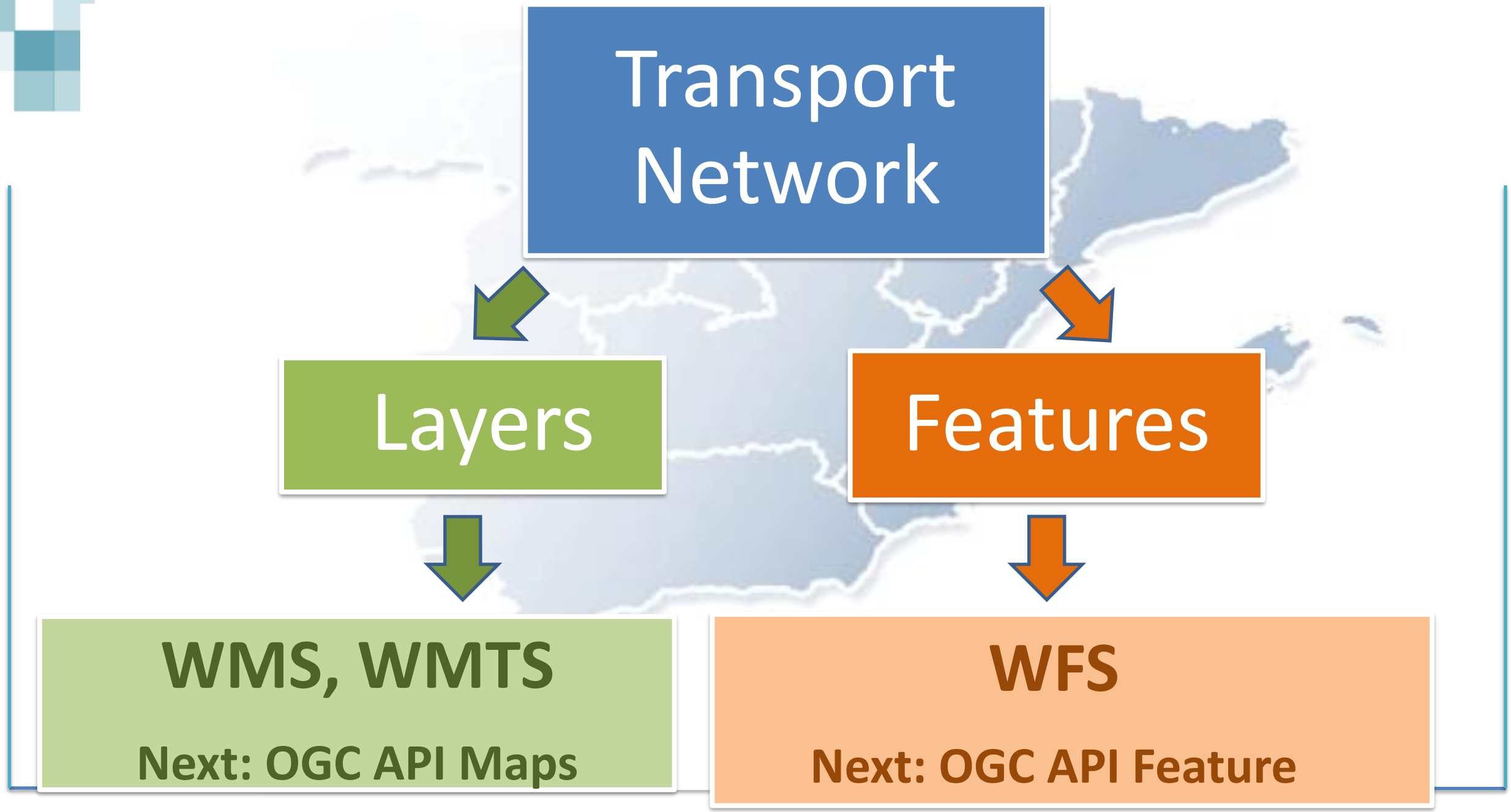


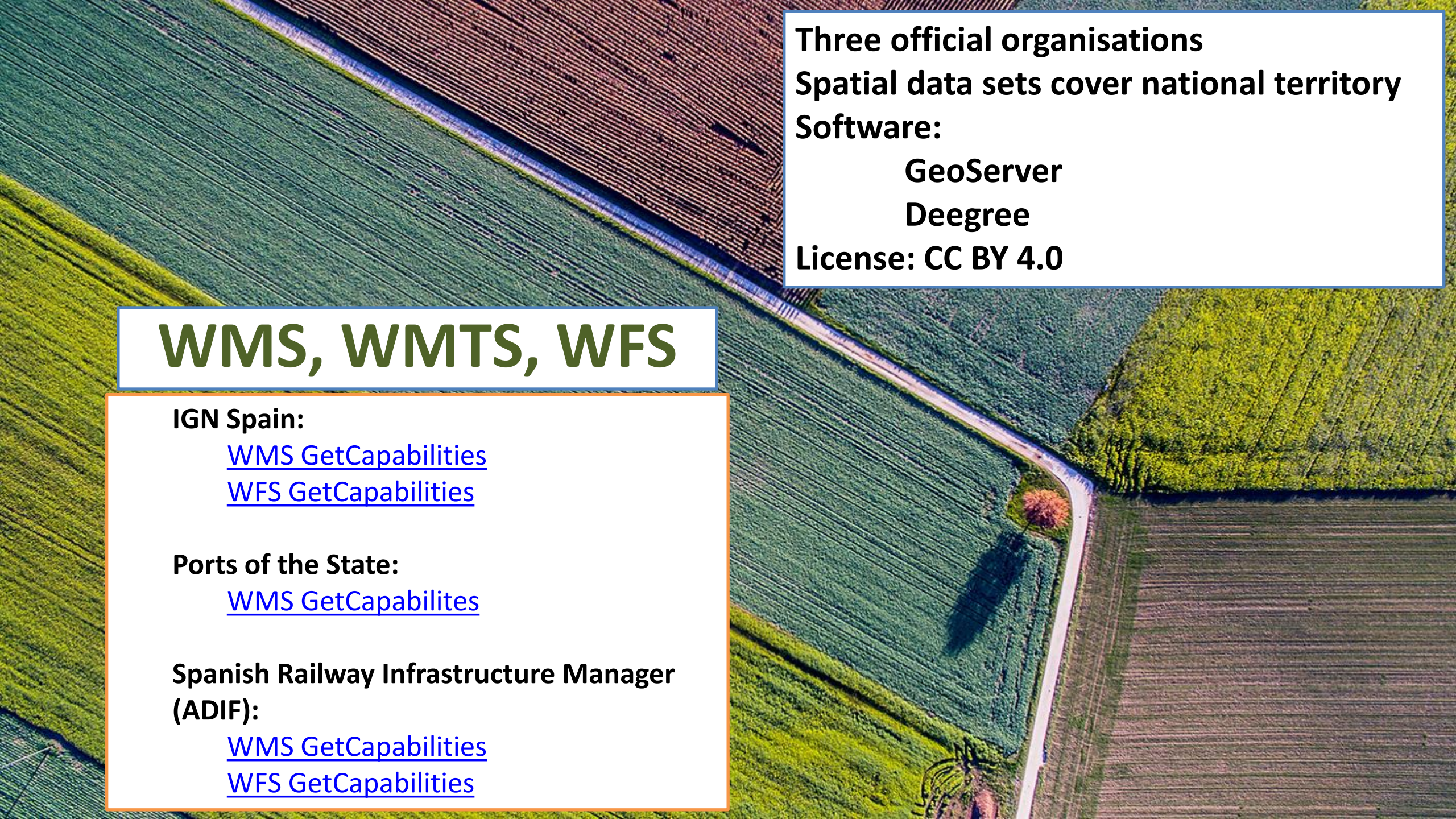
Traffic direction data mapping between RT-OSM

- Increase the delineation of roads from the detection of road markings using AI on image



Example of road markings detection (UPM image source


Transport Network
Layers
Features
WMS, WMTS
Next: OGC API Maps
WFS
Next: OGC API Feature



Three official organisations
Spatial data sets cover national territory
Software:
GeoServer
Deegree
License: CC BY 4.0

WMS, WMTS, WFS

IGN Spain:

WMS GetCapabilities
WFS GetCapabilities

Ports of the State:

WMS GetCapabilites

Spanish Railway Infrastructure Manager (ADIF):

WMS GetCapabilities
WFS GetCapabilities

Air

Layers

Runway Area

Taxiway Area

Apron Area

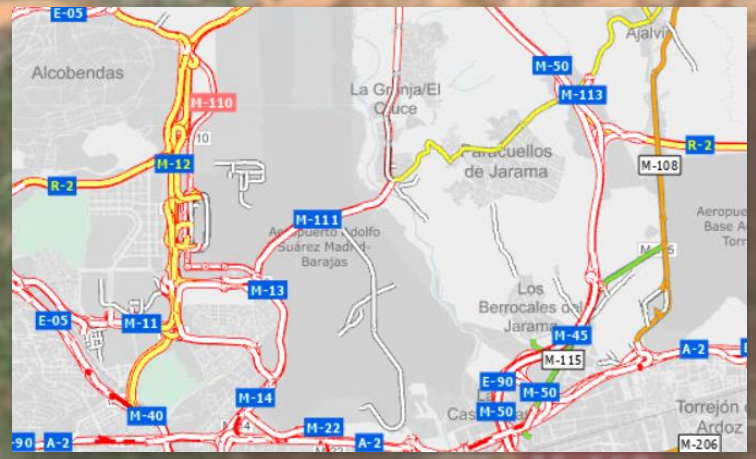
Aerodrome Area

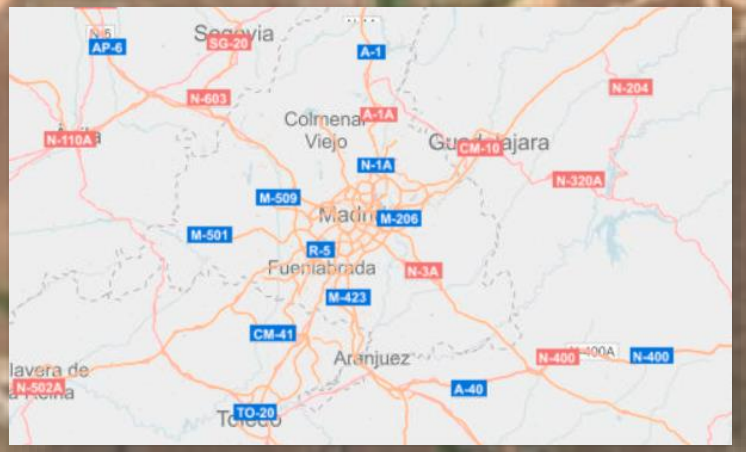
Road

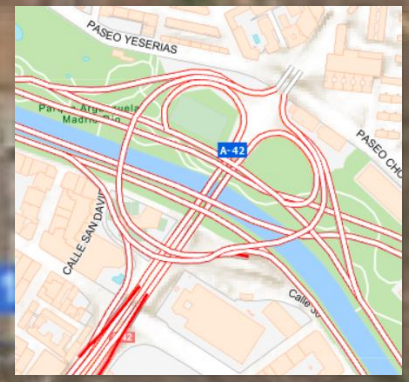
Layers

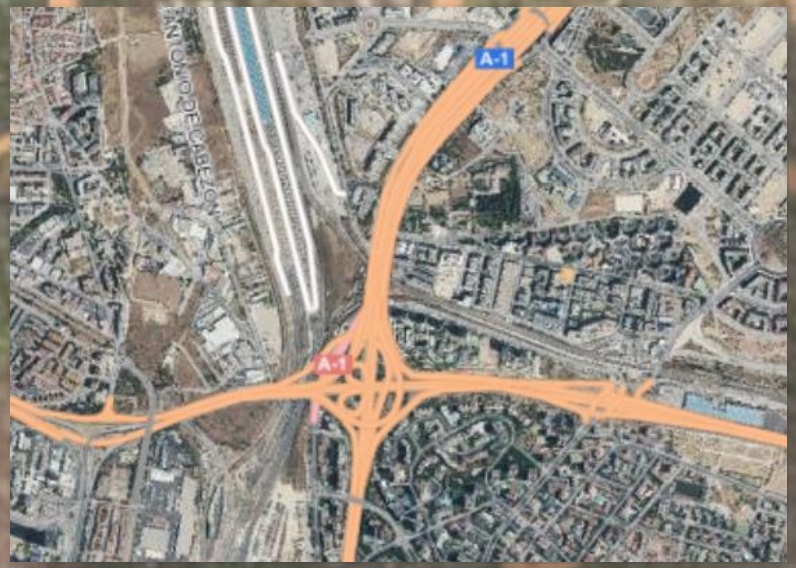
Road Link

Road Service Area









▼ Información de **Enlace de carretera**

Enlace de carretera

Nombre	Tipo	Clase	Orden	Titular	Tipo de tramo	Calzada	Acceso	Firme	Carriles	Sentido	Situación	Estado físico	Tipo
A-1	Carretera	Carretera convencional	Principal	Administración General del Estado	Troncal	Única	Libre	Pavimentado	Desconocido	Doble	En superficie	En servicio	Peatón+
M-11	Carretera	Autopista libre / autovía	Principal	Ayuntamiento	Troncal	Duplicada o superior	Libre	Pavimentado	2	Único	Elevado	En servicio	Solo veh

Rail

Layers

Railway Link

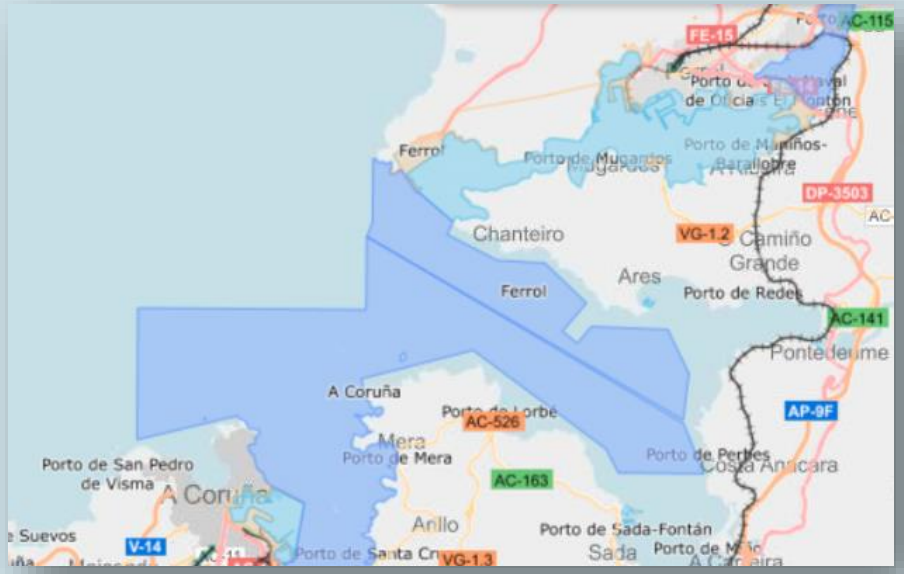
Railway Station Area

Water

Layers

Port Area

Fairway Area



WFS

https://servicios.idee.es/wfs-inspire/transportes?SERVICE=WFS&VERSION=2.0.0&REQUEST=GetCapabilities&language=eng

Out of 107 space features but 51 features are published

National coverage

Updated every 6 months

The WFS service is closely related and linked to postal addresses.

Calculation between two points or minimum Manhattan distance

(distance between two points measured along axes at right angles)

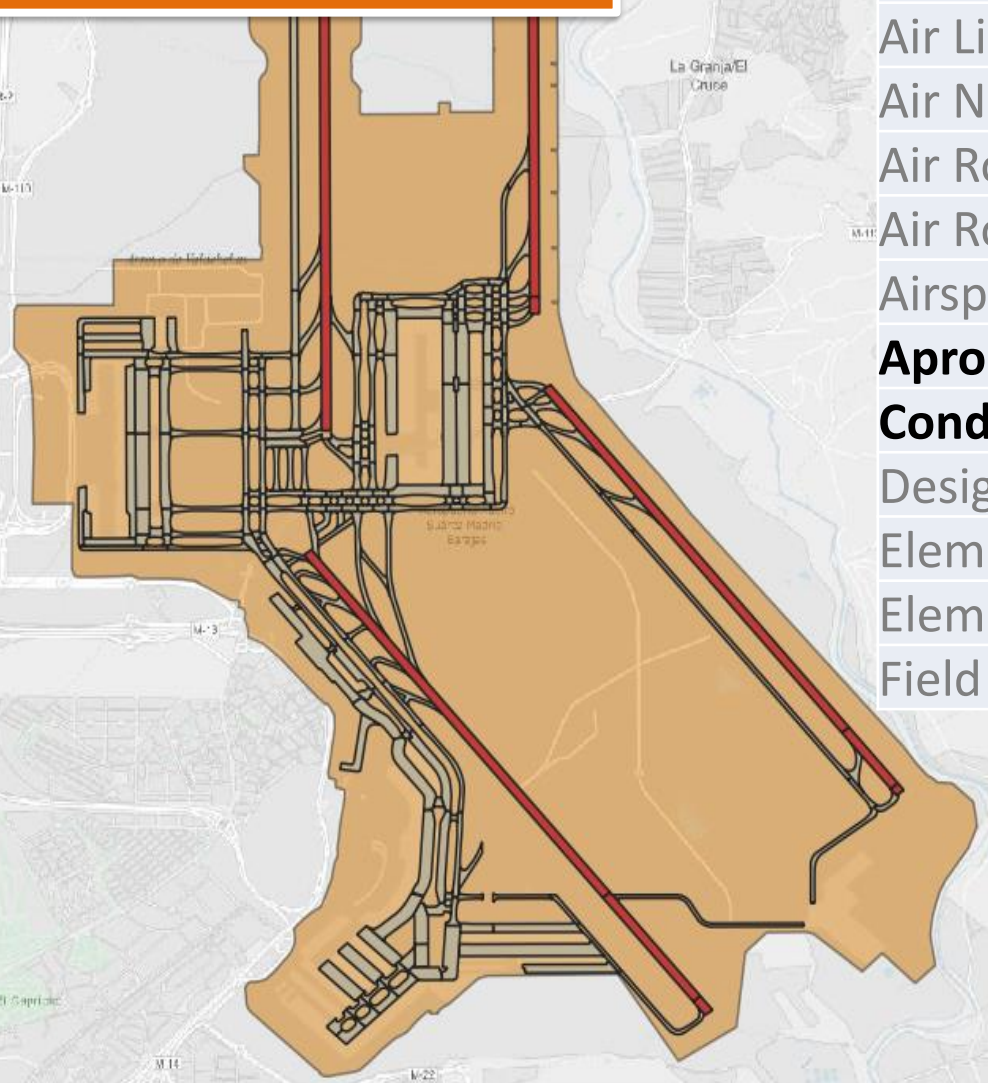
Features

Generic Transport Node

AccessRestriction	Yes
Network Connection	Yes
ConditionOfFacility	Yes
MaintenanceAuthority	Yes
MarkerPost	Yes
OwnerAuthority	Yes
RestrictionForVehicles	No
TrafficFlowDirection	No
TransportArea	Abstract class
TransportLink	Abstract class

TransportLinkSequence	Abstract class
TransportLinkSet	Abstract class
TransportNetwork	
TransportNode	Abstract class
TransportObject	Abstract class
TransportPoint	Abstract class
TransportProperty	Abstract class
VerticalPosition	Yes

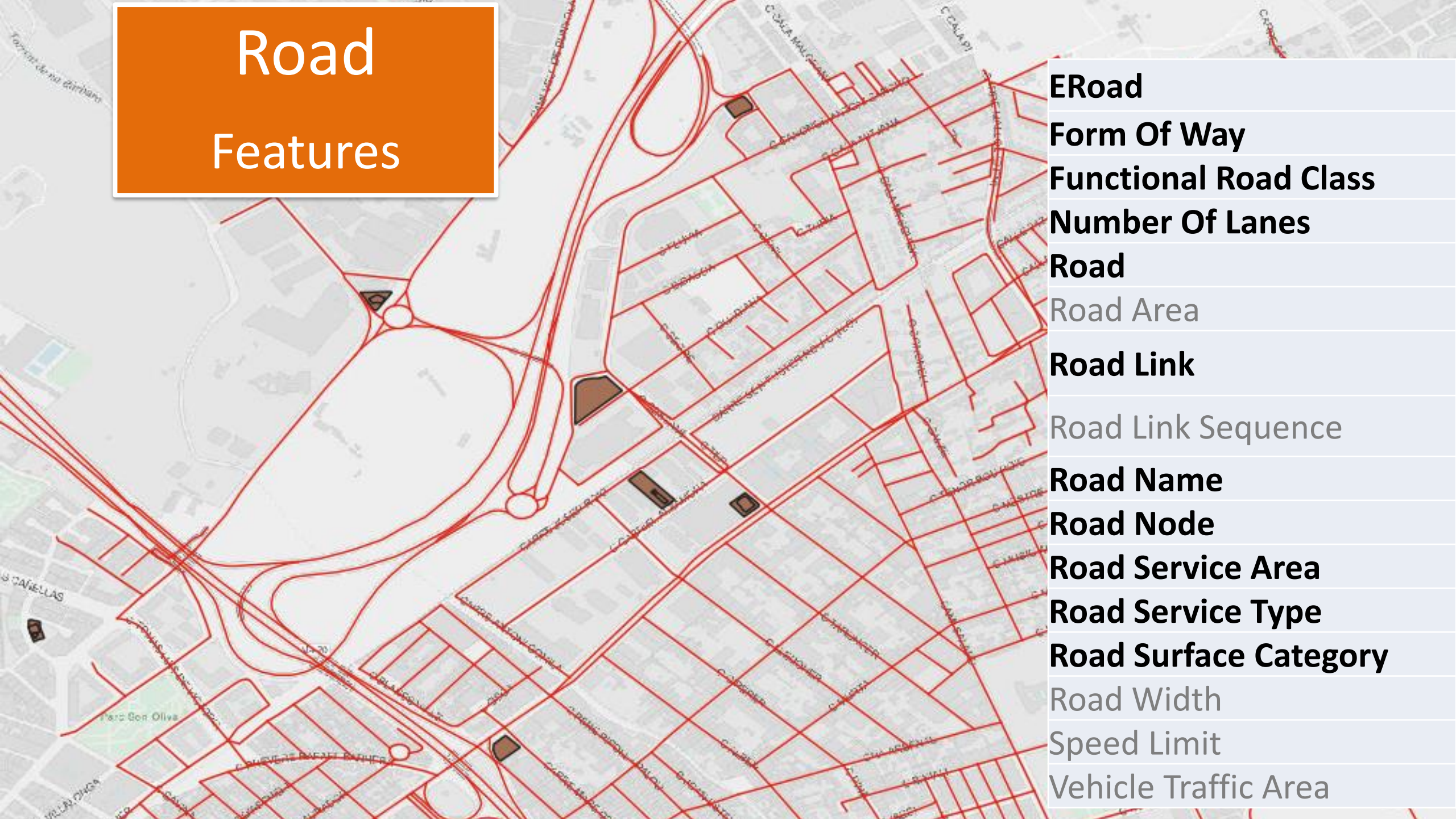
Air Features



- **Aerodrome Area**
- **Aerodrome Category**
- **Aerodrome Node**
- **Aerodrome Type**
- Air Link
- Air Link Sequence
- Air Node
- Air Route
- Air Route Link
- Airspace Area
- **Apron Area**
- **Condition Of Air Facility**
- Designated Point
- Element Length
- Element Width
- Field Elevation
- Instrument Approach Procedure
- Lower Altitude Limit
- Navaid
- Procedure Link
- **Runway Area**
- Runway Centre line Point
- Standard Instrument Arrival
- Standard Instrument Departure
- Surface Composition
- **Taxiway Area**
- Touch Down Lift Off
- Upper Altitude Limit
- Use Restriction

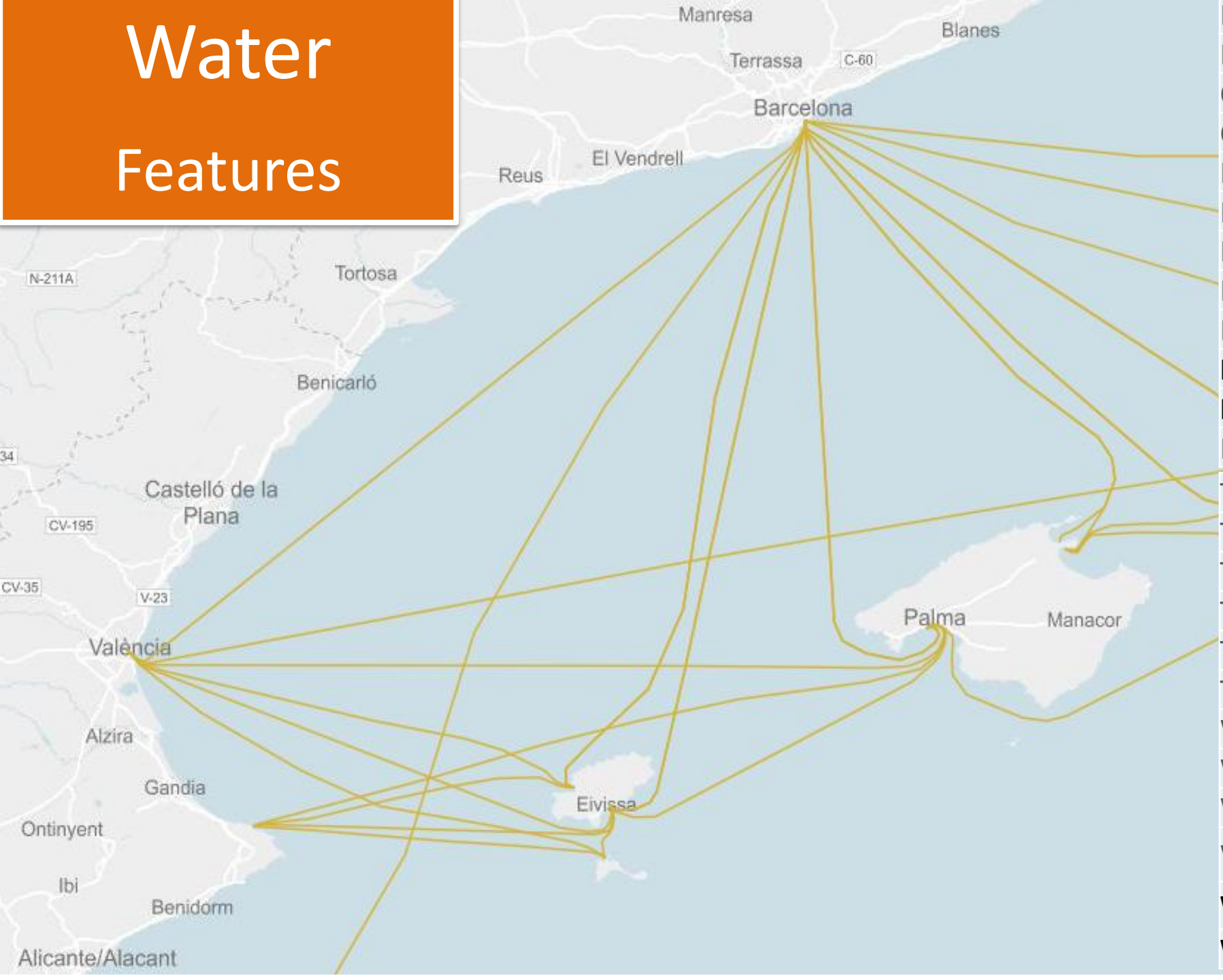
Road

Features



- **ERoad**
- **Form Of Way**
- **Functional Road Class**
- **Number Of Lanes**
- **Road**
- Road Area
- **Road Link**
- Road Link Sequence
- **Road Name**
- **Road Node**
- **Road Service Area**
- **Road Service Type**
- **Road Surface Category**
- Road Width
- Speed Limit
- Vehicle Traffic Area

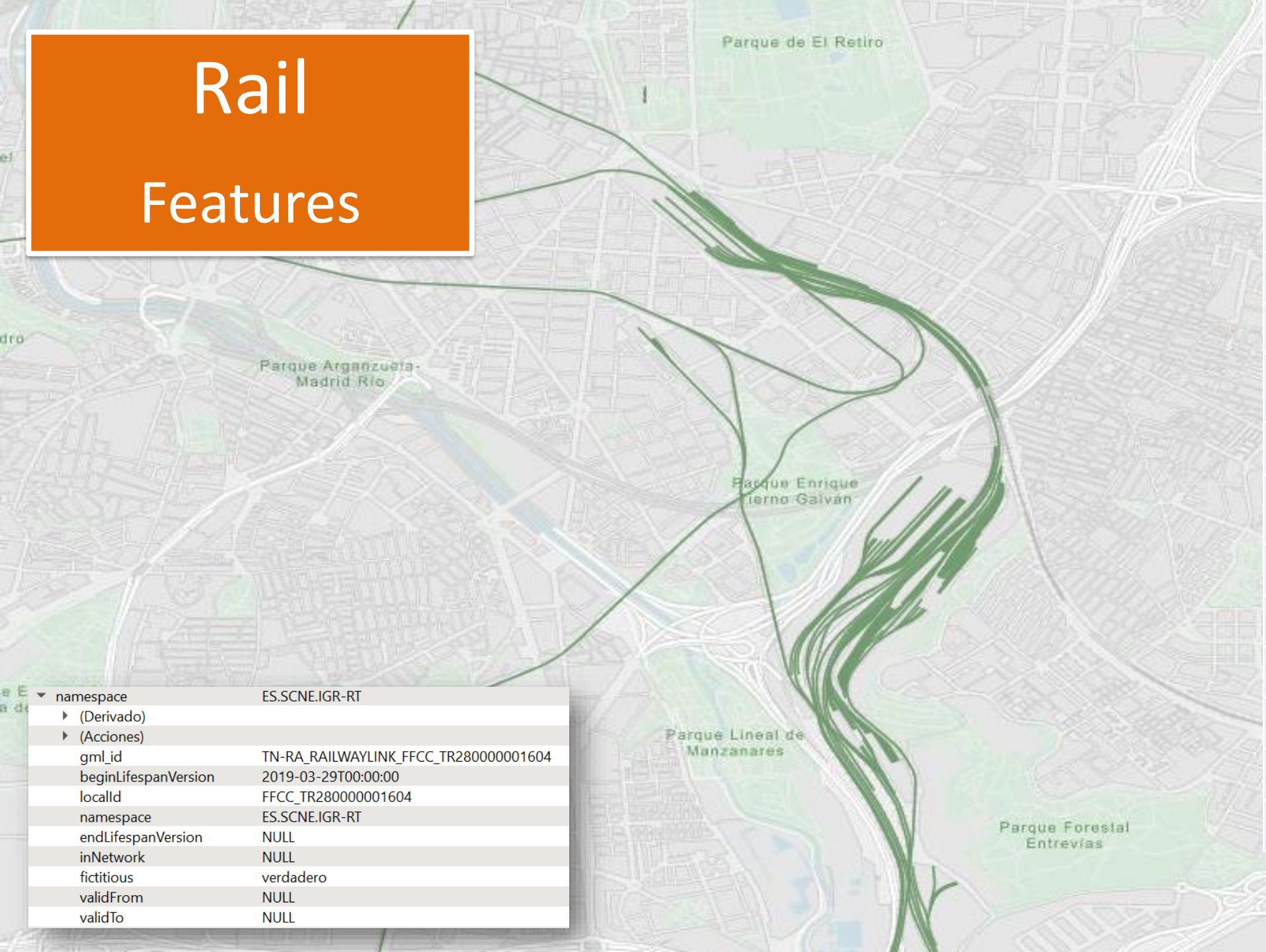
Water Features



- Beacon
- Buoy
- CEMT Class
- Condition Of Water Facility
- Fairway Area
- Ferry Crossing
- Ferry Use
- Inland Water way
- Marine Water way
- **Port Area**
- **Port Node**
- Restriction For Water Vehicles
- Traffic Separation Scheme
- Traffic Separation Scheme Area
- Traffic Separation Scheme Crossing
- Traffic Separation Scheme Lane
- Traffic Separation Scheme Roundabout
- Traffic Separation Scheme Separator
- Water Link Sequence
- Water Node
- Water Traffic Flow Direction
- Water way
- **Water way Link**
- **Water way Node**

Rail

Features



namespace	ES.SCNE.IGR-RT
(Derivado)	
(Acciones)	
gml_id	TN-RA_RAILWAYLINK_FFCC_TR280000001604
beginLifespanVersion	2019-03-29T00:00:00
localId	FFCC_TR280000001604
namespace	ES.SCNE.IGR-RT
endLifespanVersion	NULL
inNetwork	NULL
fictitious	verdadero
validFrom	NULL
validTo	NULL

Design Speed

Nominal Track Gauge

Number Of Tracks

Railway Area

Railway Electrification

Railway Line

Railway Link

Railway LinkSequence

Railway Node

Railway Station Area

Railway Station Code

Railway Station Node

Railway Type

Railway Use

Railway Yard Area

Railway Yard Node

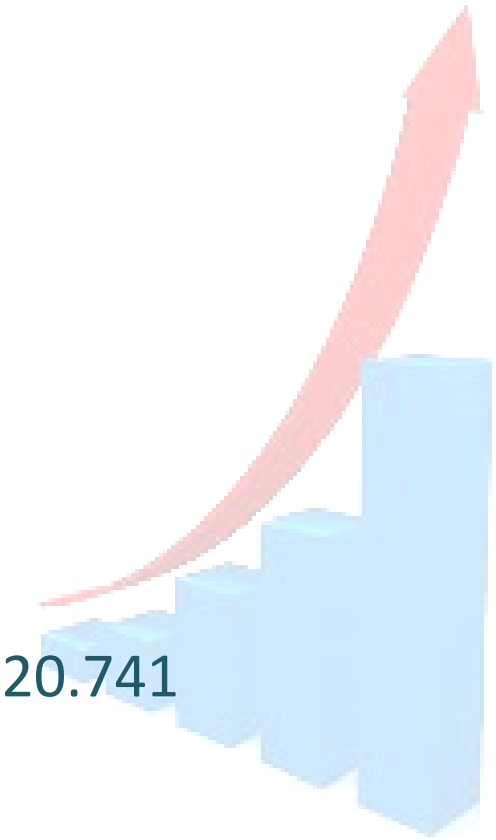
Number of the request Transport Network

2019 (12 months)

- **WMTS:** 4.596.328.242
- **WMS**: 103.754.109

2020 (12 months)

- **WMTS:** 6.149.213.927
- **WMS**: 84.380.152



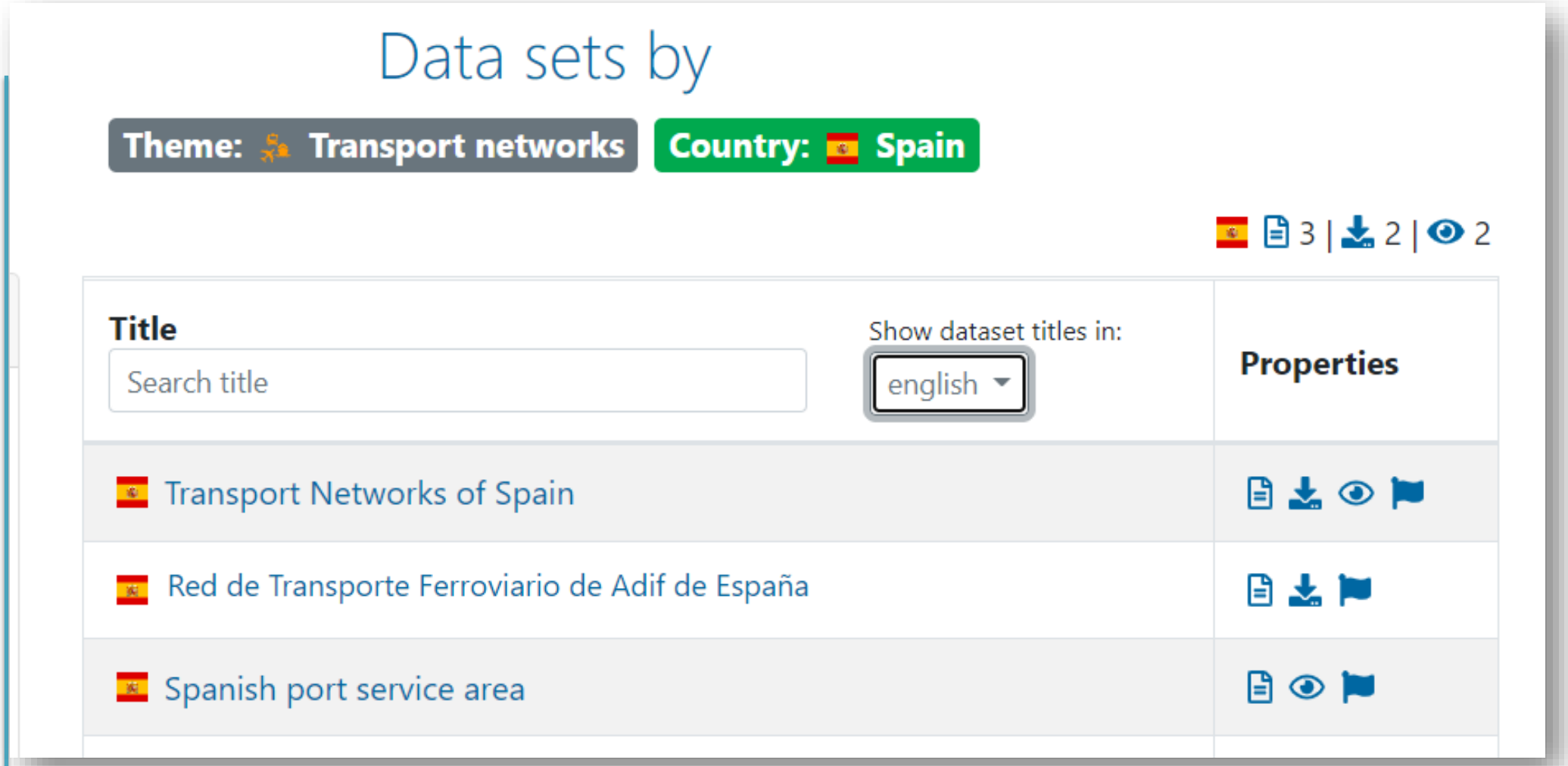
2021 (12 months)

- **WMTS:** 5.898.834.762
- **TMS (7 months):** 1.227.220.741
- **WMS**: 98.354.255

2022 (only 9 months)

- **WMTS:** 840.988.202
- **TMS:** 5.622.604.966
- **WMS:** 102.193.192

Geoportal INSPIRE



Georeferencing

- **Transport network is closely linked to postal addresses**
  - Today, more than 15 million addresses can be located through web services (WFS and Rest)
  - There is an open plugin that can be implemented in the APIs (viewers).

Conclusions and future actions

- For IGN-Spain, to be INSPIRE compliant was “the trigger we needed” to tackle the creation of a specific TN DB
- Being INSPIRE compliant is not an obstacle for the database to go beyond those requirements and become the support for more complex use cases
- Publication of transport networks through the OGC API Feature and OGC API Maps (2023)
- Publish more features through WFS or ATOM
- Improve INSPIRE validation of the WFS
- Include direction of traffic (direction of roads) on data base of transport network

Thank you