



# Session 2. INSPIRE metadata and Network Services

Alexander Kotsev

European Commission  
Joint Research Centre  
Institute for Environment  
and Sustainability  
Digital Earth and Reference  
Data Unit  
[www.jrc.ec.europa.eu](http://www.jrc.ec.europa.eu)

*Serving society  
Stimulating innovation  
Supporting legislation*

# Context

						
North America Grounded NEMA 5-15	Japan Non-grounded JIS C 8309	Europe German style CEE7/4 Schuko	Europe French style Schuko	Europe/Russia Non-grounded CEE7/16 Europlug	Great Britain Grounded BS-1363	Great Britain "Shaver socket" BS-4573
						
Australia/China Grounded AS-3112	Italy Grounded CEI 23-16	Switzerland Grounded SEV-1011	Denmark Grounded SRAF 1962/DB	Israel Grounded SI 32 (IS 16A-R)	India Grounded BS-546 "Small"	South Africa Grounded BS-546 "Large"

# Context

## SDI challenges in Europe

- 24 official languages
- 3 official alphabets
- Different institutional setups
- Diverse data governance
- Celebrated diversity
- Web services make a difference



# Objectives

- **Raise awareness about the types of services** defined within the INSPIRE Directive.
- **Understand different architectural approaches** for serving data in INSPIRE
- Understand the **relationship between INSPIRE services and OGC standards**
- **Learning outcomes:**
  - how to understand the INSPIRE TG
  - how to establish INSPIRE services
  - Open source technology which might be used
  - how to create INSPIRE-compliant web services with different approaches.
  - ...

# Content

## Presentations and demos (approx. 1h)

- **Architectures for INSPIRE implementation**
  - Open source tools
- **Network services in a nutshell**
- **INSPIRE Metadata and discovery services**
- **INSPIRE Geoportal**
  - Metadata editor
  - Metadata validator
- **View services**
  - WMS
  - SLD
- **Download services**
  - ATOM, WFS, WCS, SOS

## Discussion (approx. 1h)





# Architectures for INSPIRE implementation. Available technology

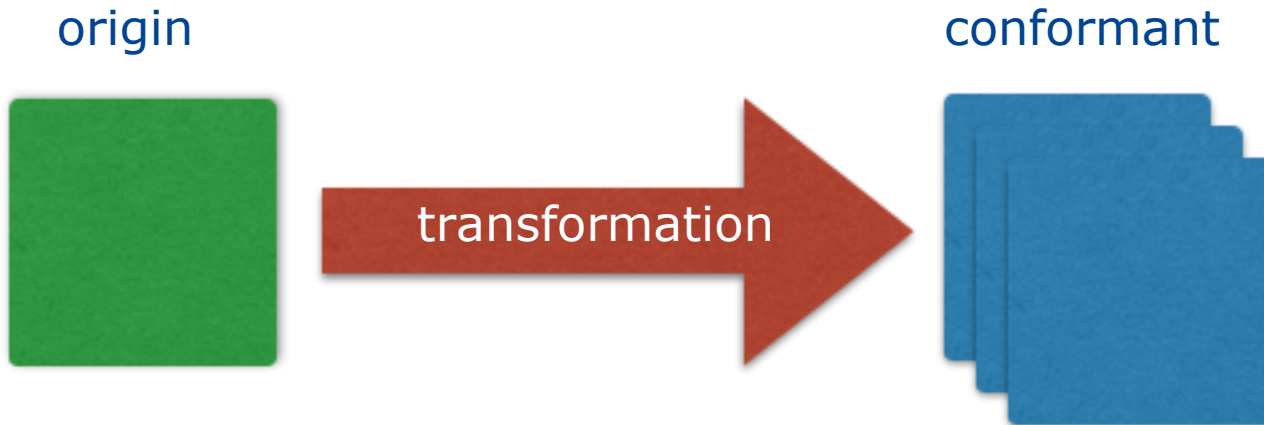


European Commission  
Joint Research Centre  
Institute for Environment  
and Sustainability  
Digital Earth and Reference  
Data Unit  
[www.jrc.ec.europa.eu](http://www.jrc.ec.europa.eu)

*Serving society  
Stimulating innovation  
Supporting legislation*

# Transformation

relationships can be complex



simple transformation - renaming, assign new properties  
complex transformation - reclassification, geometry calculation

# Transformation

relationships can be complex

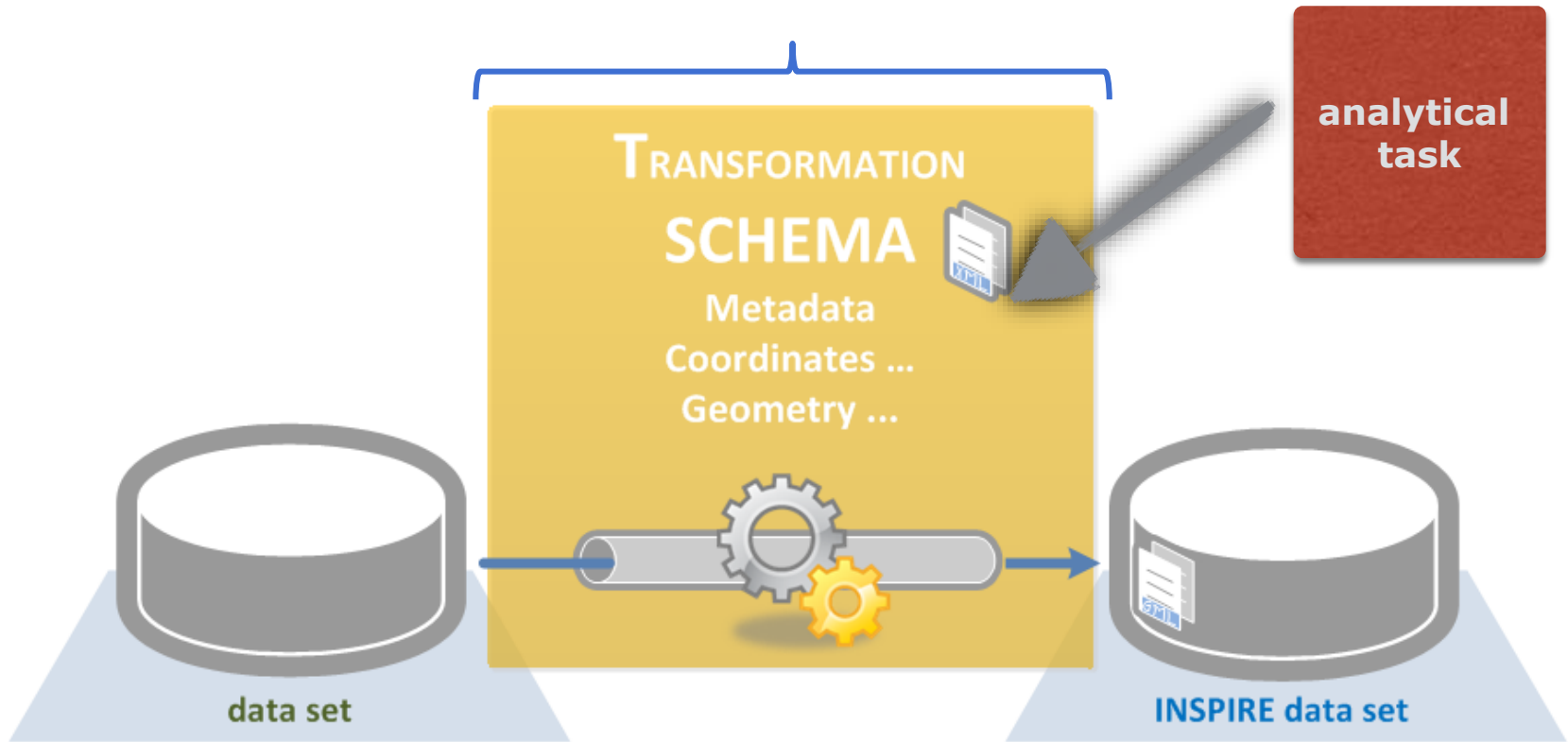


simple transformation - renaming, assign new properties  
complex transformation - reclassification, geometry calculation



# Transformation

... is an ETL repeatable process

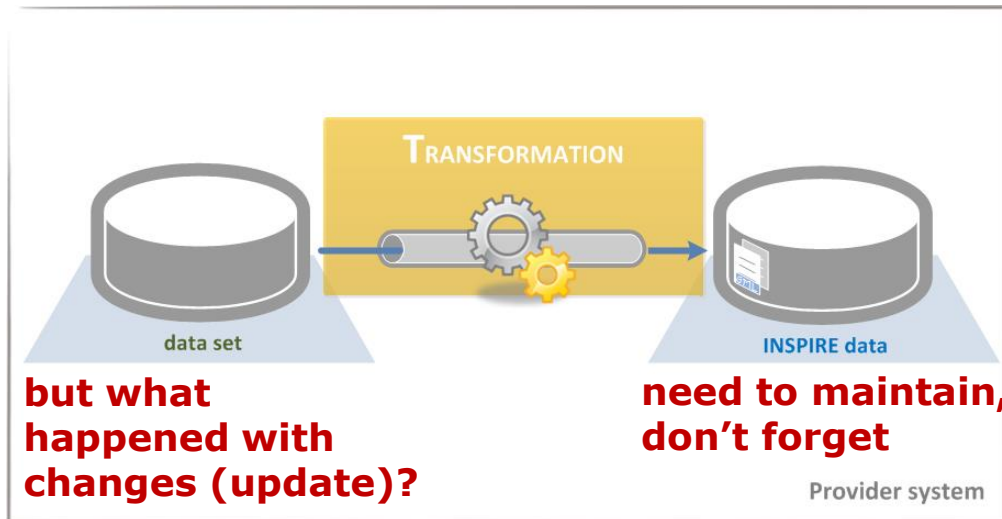


# architectural approaches, an Overview

**One-off** transformation + external web based services | Atom/WFS/...

**One-the-fly** transformation | Atom/WFS/...

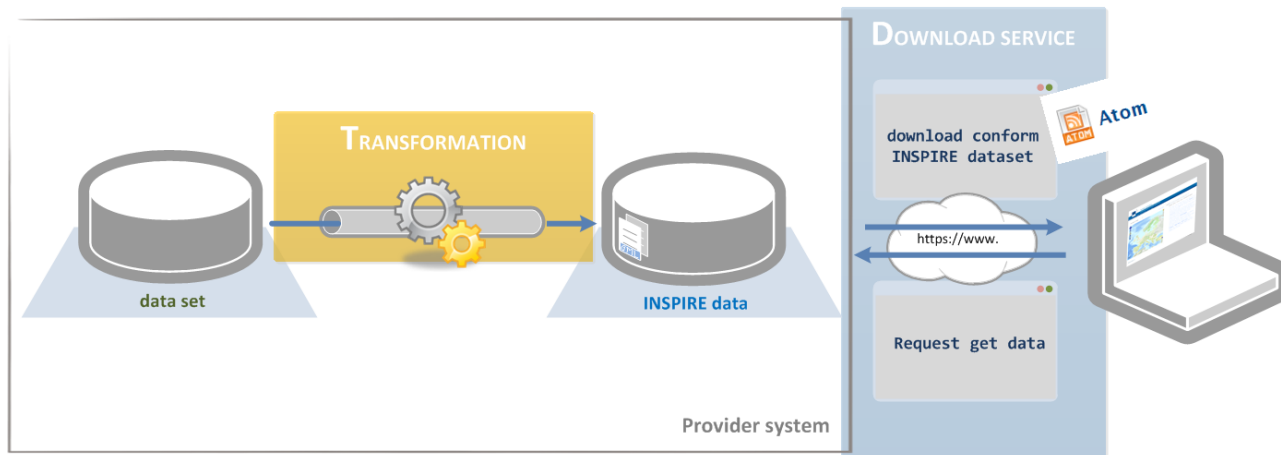
**Hybrid** transformation + integrated web based services | Atom/WFS/...



Consider for choosing an approach (operational process) will the data set in future

- +/- static, *e.g. geology*
- under frequently change, *e.g. land use*
- under permanent change *e.g. air quality reporting*

# One-off transformation + external web based services



positive aspects are:

## transformed once for all users

- better performance when delivering the data
- no transformation during delivery
- Wide choice of software components

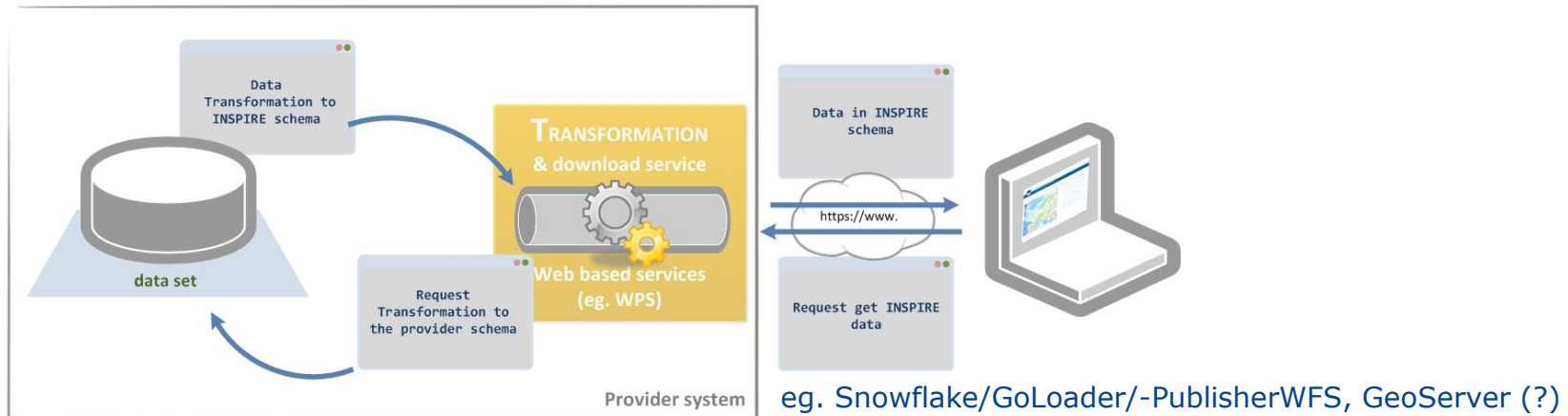
negative aspects are:

## Requires storage and management of transformed data

- in addition to original data
- high processing effort
- the entire database is transformed
- to be maintained also transformed data

**This approach is useful if data are stable**

# On the fly transformation+ integrated web services



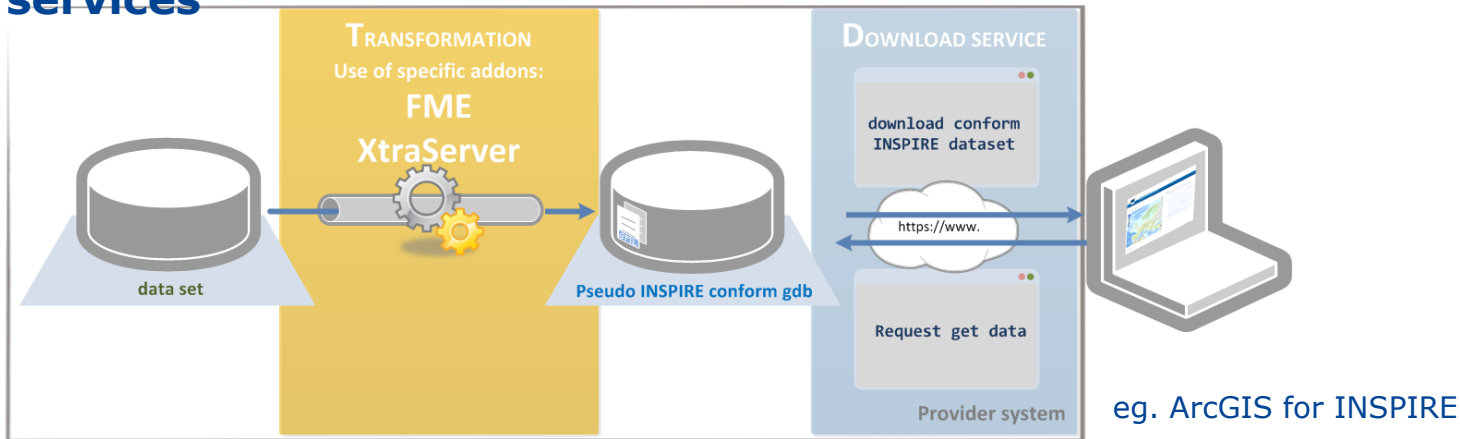
positive aspects are:  
**only the original data has to be maintained**  
**only the requested data has to be transformed**

negative aspects are:  
**Performance issues**

- high processing required before delivery especially for large volumes of data and complex transformations
- the same data is potentially transformed multiple times
- Caching or pre-processing mechanisms has to be used

**This approach is useful if data is continuously or frequently updated**

# One-off transformation + DB + integrated web based services



positive aspects are:

**Data transformed offline can be managed in same system as original data** e.g. in the same database management

system, not as GML files

- 'On-the-fly' get more performance because of predefined data structure

negative aspects are:

**Data provider still has to store transformed data**

Limited FOSS-GIS solutions (current)

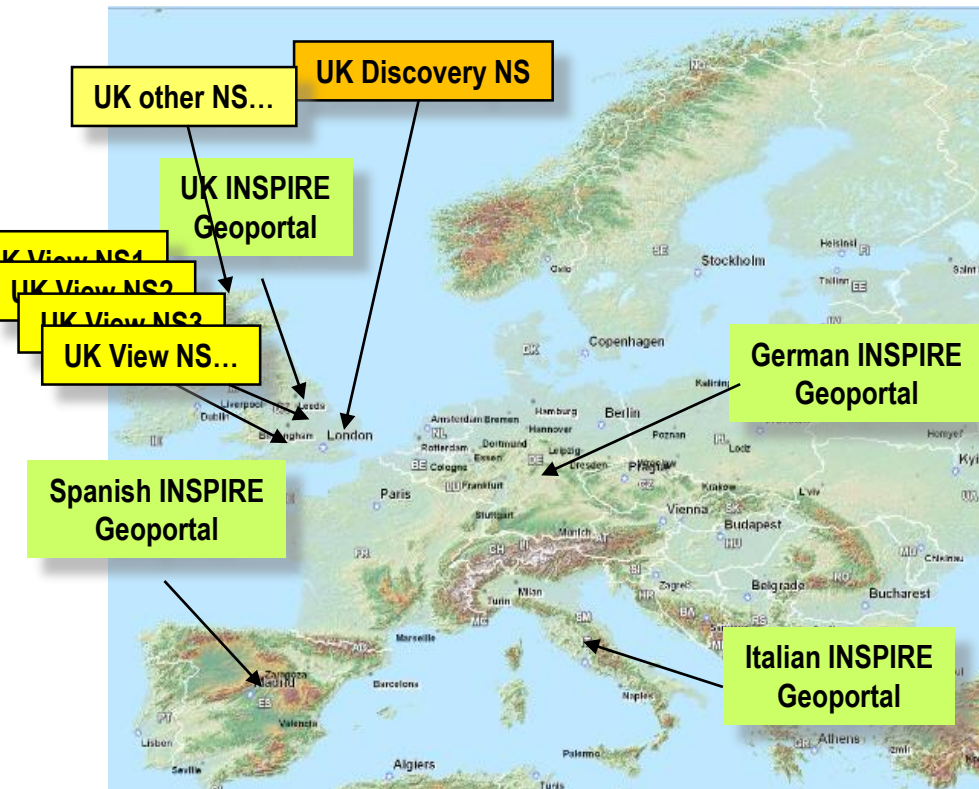
**This approach is useful if data is continuously or frequently updated**

# Architecture : European View

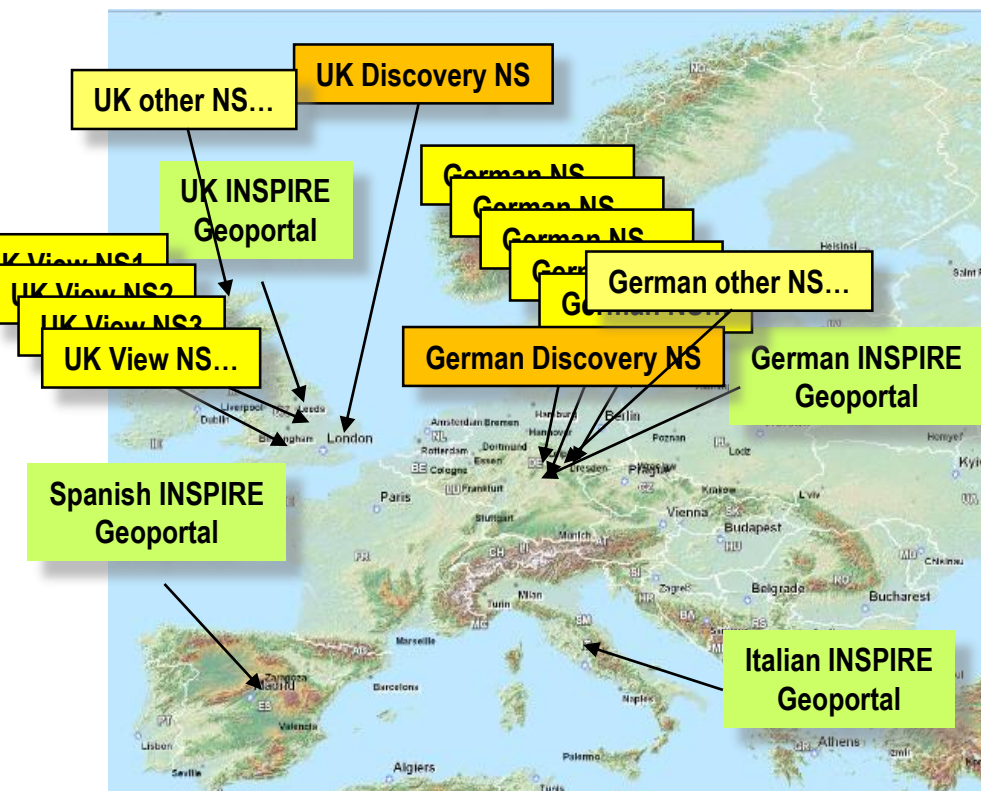




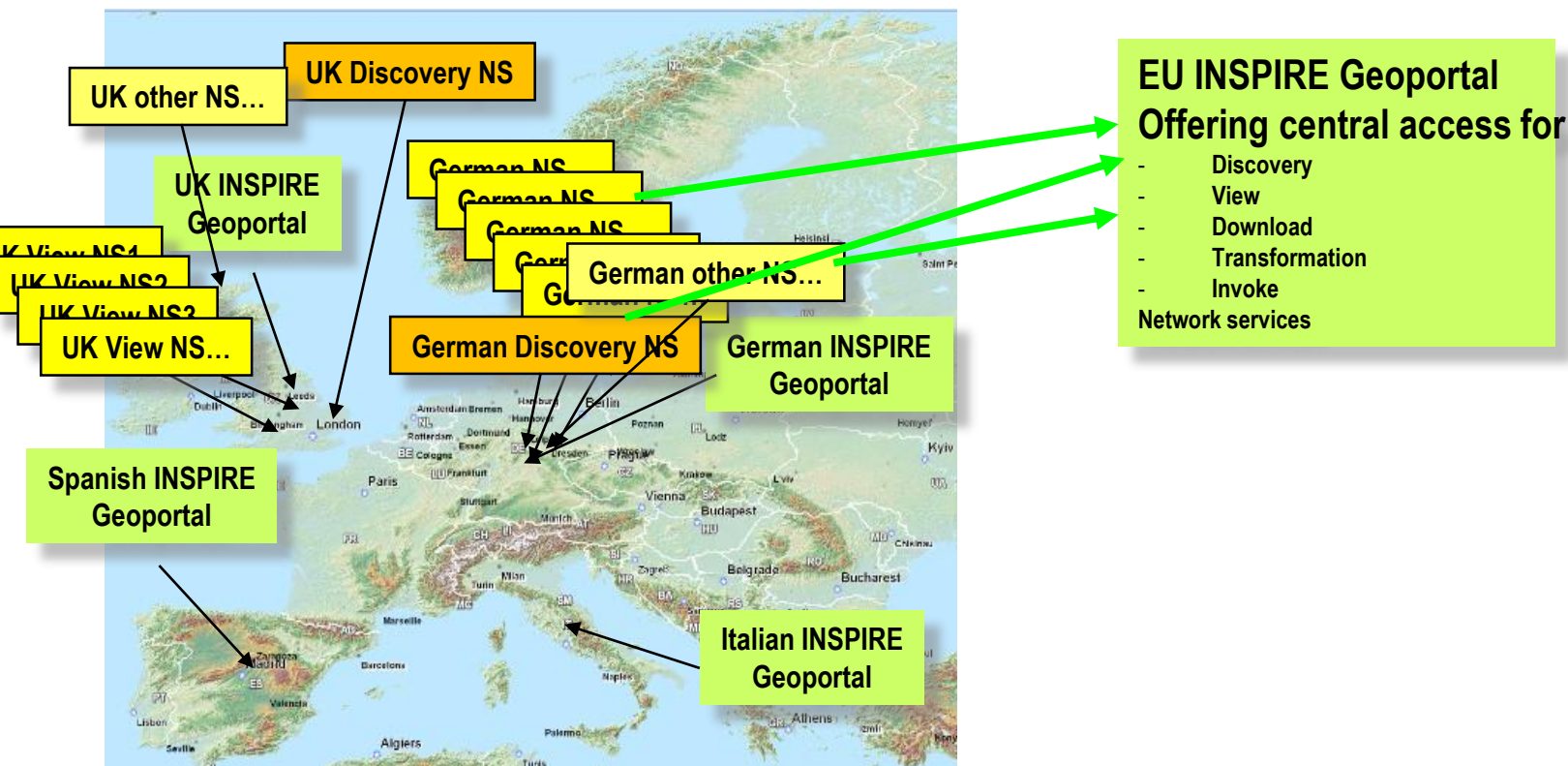
# Architecture : European View



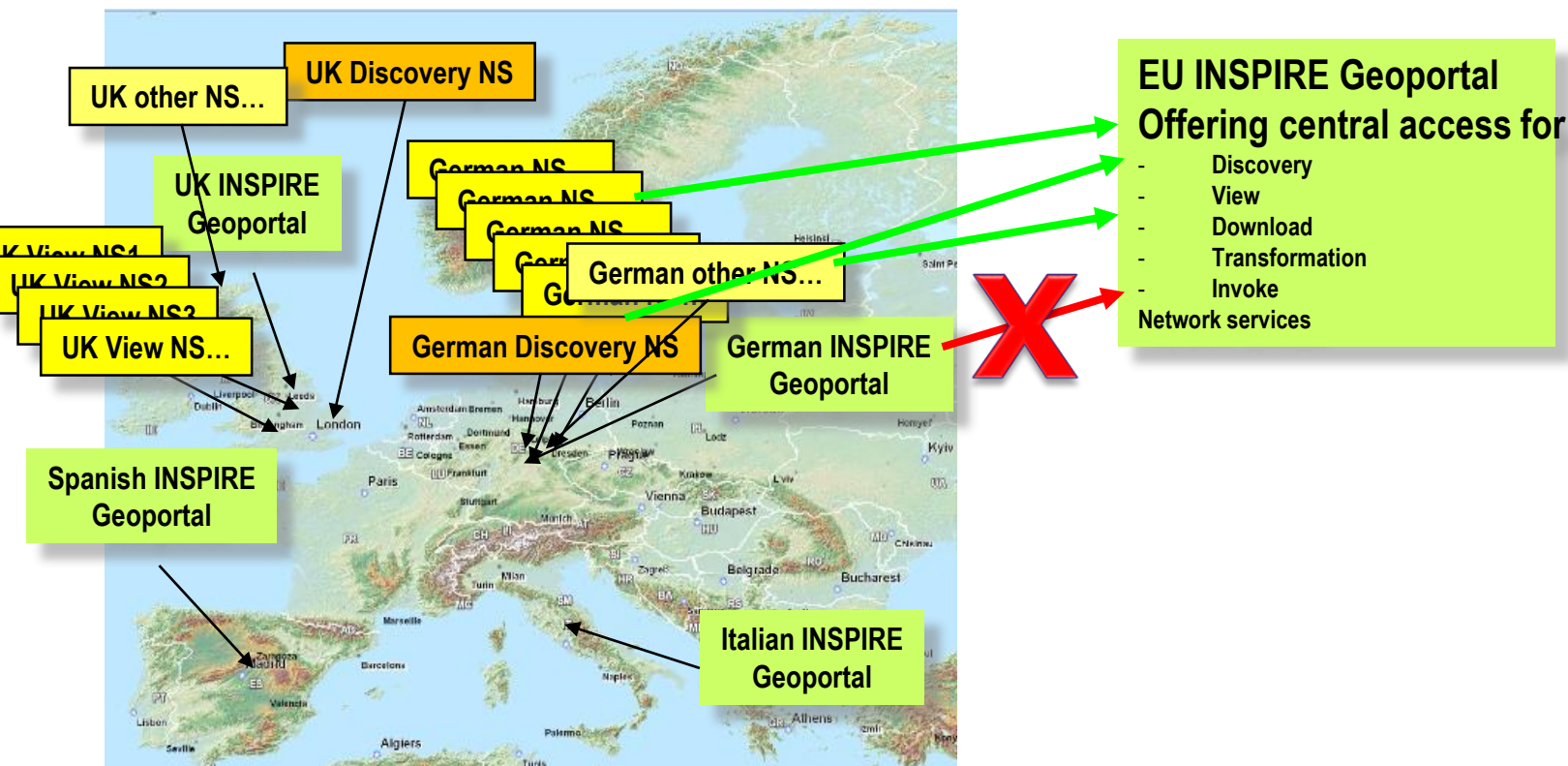
# Architecture : European View



# Architecture : European View

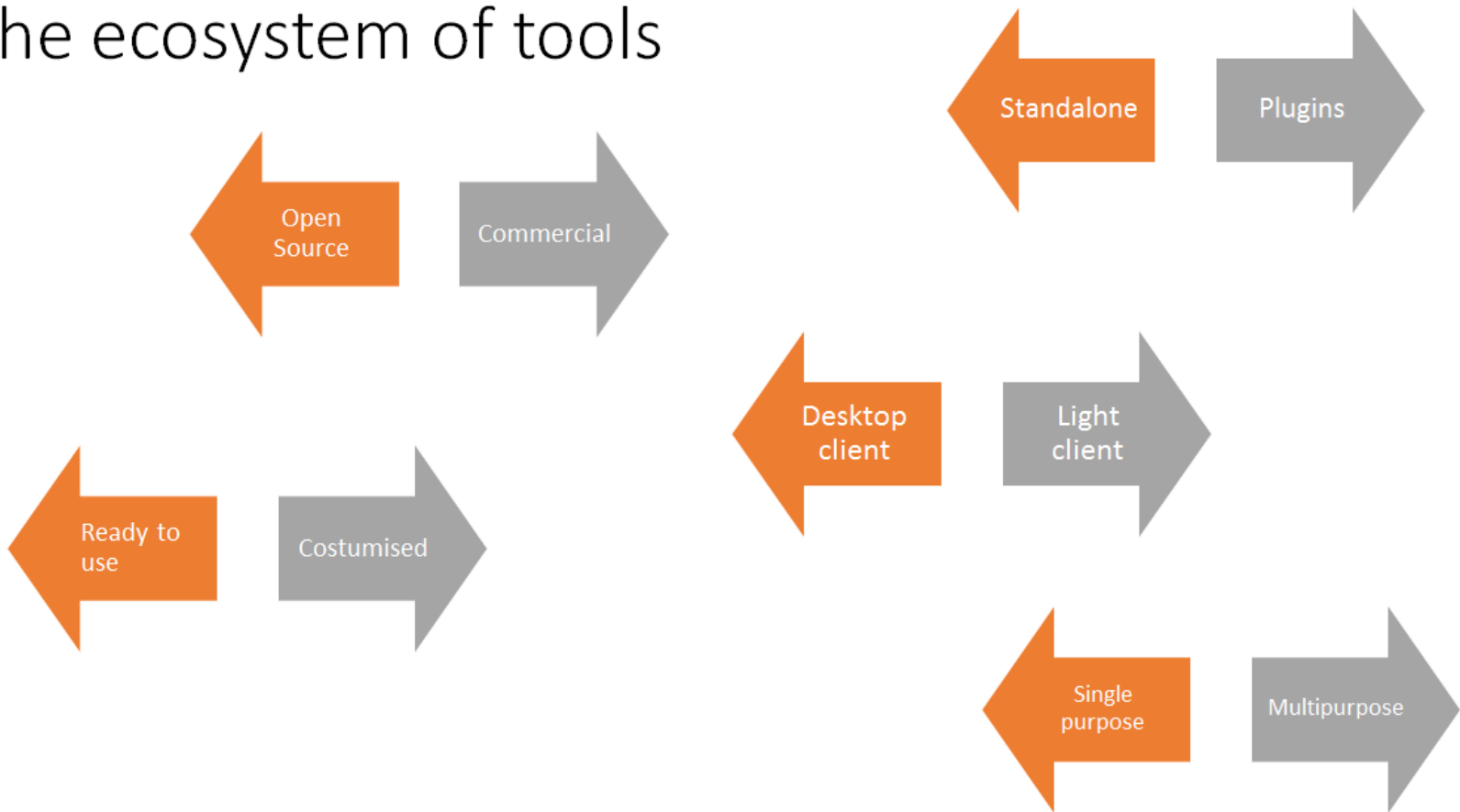


# Architecture : European View



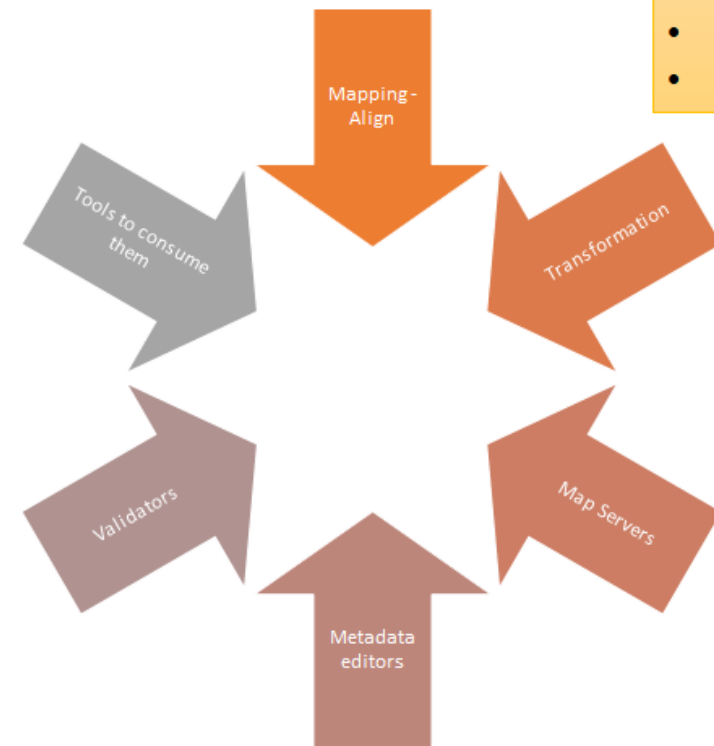
# Technology for implementation

# The ecosystem of tools





# Single purpose versus Multipurpose tools



- ETL
- Extract
  - Transform
  - Load

# Some popular solutions

Tool	Data Transformation	Metadata management	Network Services Publishing	Notes
HALE	*		*	Exports to GML
FME	*	*	*	Commercial
Geokettle	*	*		Some functionality not mature enough
Geoserver	* app-schema extension		*	INSPIRE compliant Services → Extension → Complex feature types (limited)
Mapserver			*	INSPIRE compliant Services (view, discovery, partial download)
Deegree	*	*	*	INSPIRE compliant Services
Geonetwork		*	*(CSW)	INSPIRE compliant Services & metadata
Geoportal Server		*	*	INSPIRE compliant Services & metadata
Geoconverter	*			
ArcGIS for INSPIRE	*	*	*	Commercial
Snowflake	*		*	Commercial



# INSPIRE Network Services



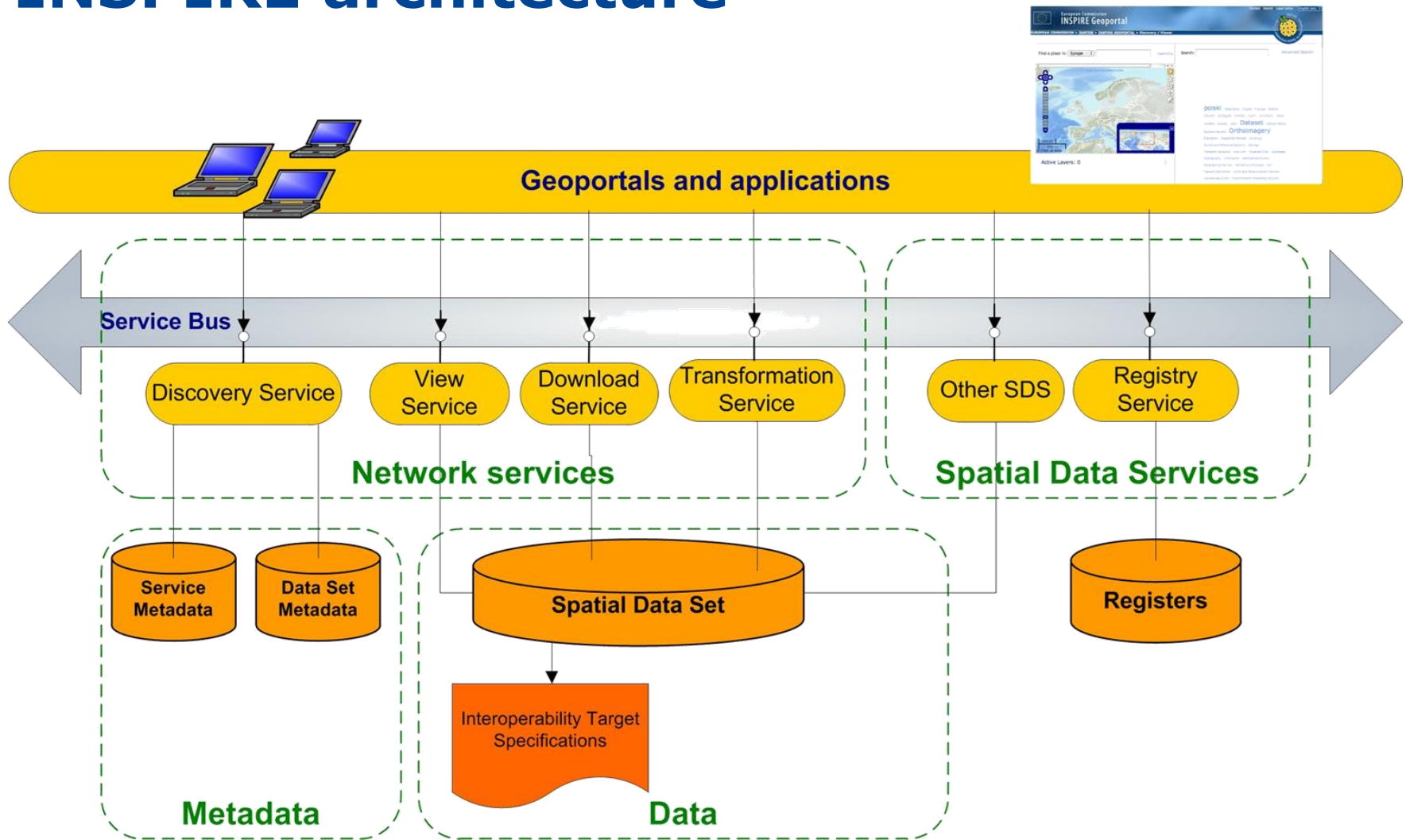
European Commission  
Joint Research Centre  
Institute for Environment  
and Sustainability  
Digital Earth and Reference  
Data Unit  
[www.jrc.ec.europa.eu](http://www.jrc.ec.europa.eu)

*Serving society  
Stimulating innovation  
Supporting legislation*

# INSPIRE principles

- ✓ Data should be collected once
- ✓ Distributed **Service Oriented Architecture** (SOA)
- ✓ Possible to combine data from different sources
- ✓ Focus on information relevant for governance
- ✓ Focus on reusability
- ✓ GI should be easily discoverable, together with its metadata

# INSPIRE architecture



# INSPIRE Roadmap for Implementation



2020 All Annex II+III data

2018 All Annex I data

2015 New Annex II and III data interoperable



2013 New Annex I data interoperable  
Harmonized conditions for access to data  
Metadata Annex III



2012 Download and transformation services

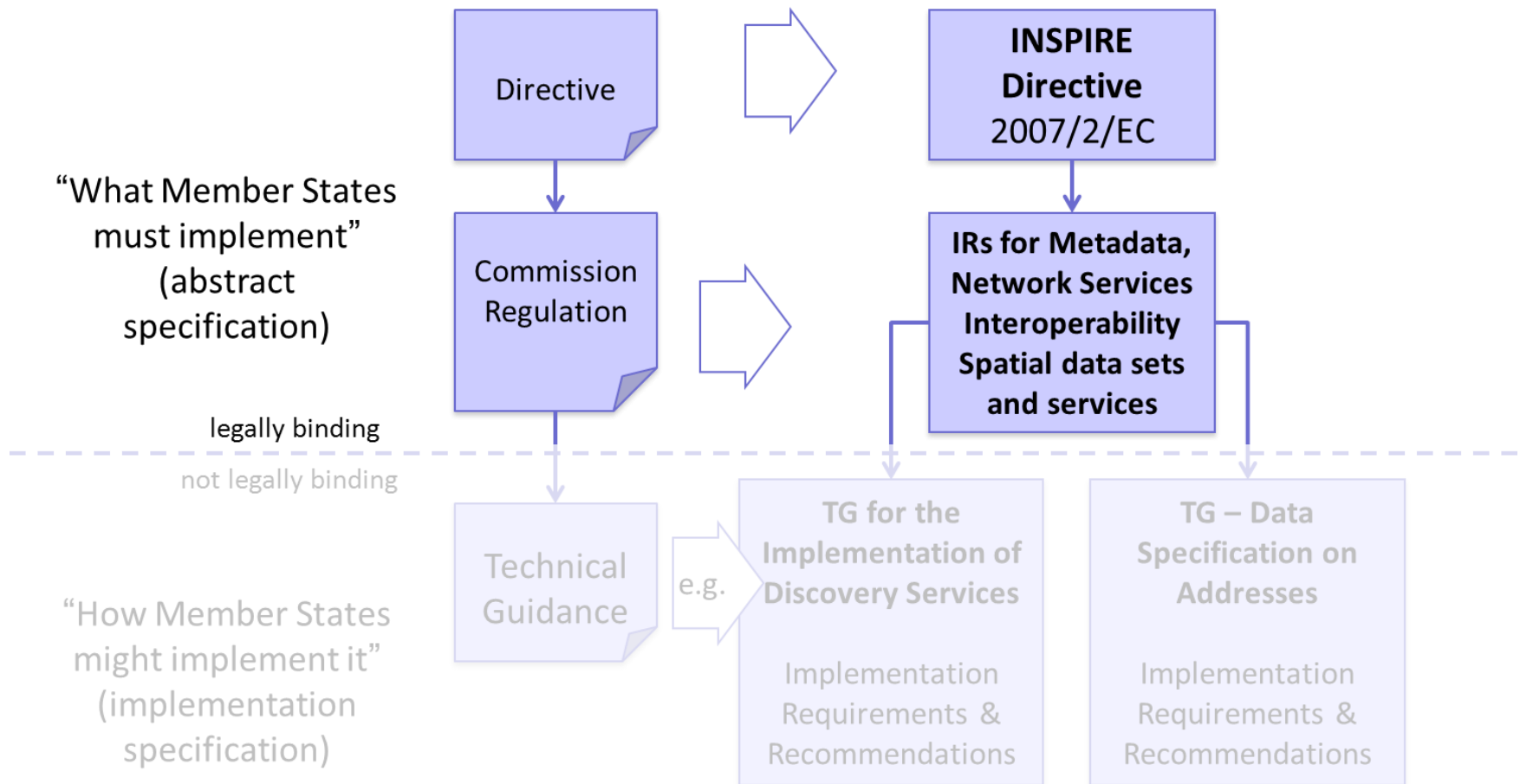
2011 Discovery and view services

2010 Metadata Annex I and II





# Implementing Rules vs. Technical Guidelines



# How to read the guidance documents

## **IR Requirement**

### *Article 3*

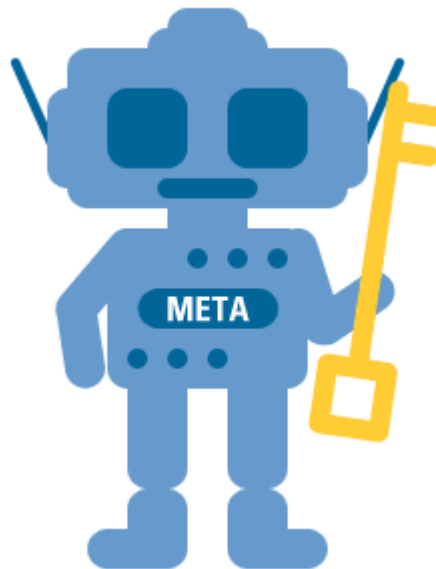
## **Common Types**

Types that are common to several of the themes listed in Annexes I, II and III to Directive 2007/2/EC shall conform to the definitions and constraints and include the attributes and association roles set out in Annex I.

**DS Requirement 6** INSPIRE view services providing data according to the Reporting Units application schema shall support the styles to that are required to be supported for the spatial object type that makes up the reporting units.

**Recommendation 4** If additional thematic identifiers have been assigned to a zone they should be provided to ensure continued linkages to other information (e.g. reporting information).

# Metadata in INSPIRE



# INSPIRE Metadata

## Distinguish between

- Spatial object metadata
- Dataset-level metadata

## Tools available at JRC site

- INSPIRE Metadata editor
- INSPIRE metadata validator

### INSPIRE compliant metadata:

- Based on ISO 19115 and ISO 19119 standards
- Follows INSPIRE Implementing Rule on metadata
- Follows INSPIRE Technical Guidance on metadata



# Discovery services

„discovery services making it possible to search for spatial data sets and services on the basis of the content of the corresponding metadata and to display the content of the metadata“

<http://inspire-geoportal.ec.europa.eu/discovery/>

## INSPIRE compliant discovery service:

- This is where you upload your metadata
- Based on OGC CSW (catalogue service for the web) specification
- Follows INSPIRE Implementing Rule on INSPIRE discovery services
- Follows INSPIRE Technical Guidance on INSPIRE discovery services



# Describing INSPIRE data and services through metadata

Every INSPIRE data holder or service provider:

- Describes every data set/series or service,
- By providing the information required by the INSPIRE metadata Implementing Rule, a.o.:
  - Title, abstract, location on the web, geographical and temporal coverage, quality, ..., of the dataset or service
  - Use conditions, access limitations, responsible party, ...



# Describing INSPIRE data and services through metadata

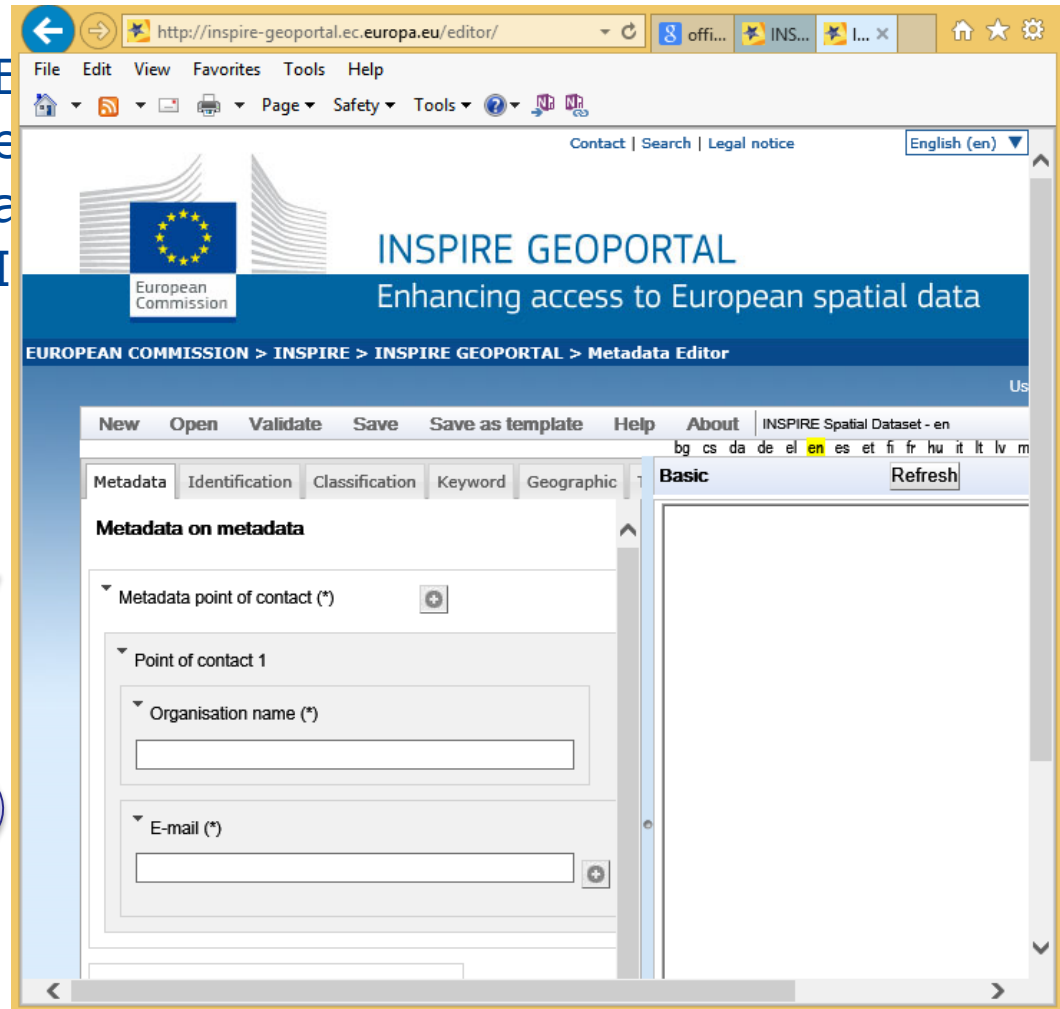


**INSPIRE  
metadata  
editor**

<http://inspire.ec.europa.eu/>

**INSPIRE  
GeoPortal**

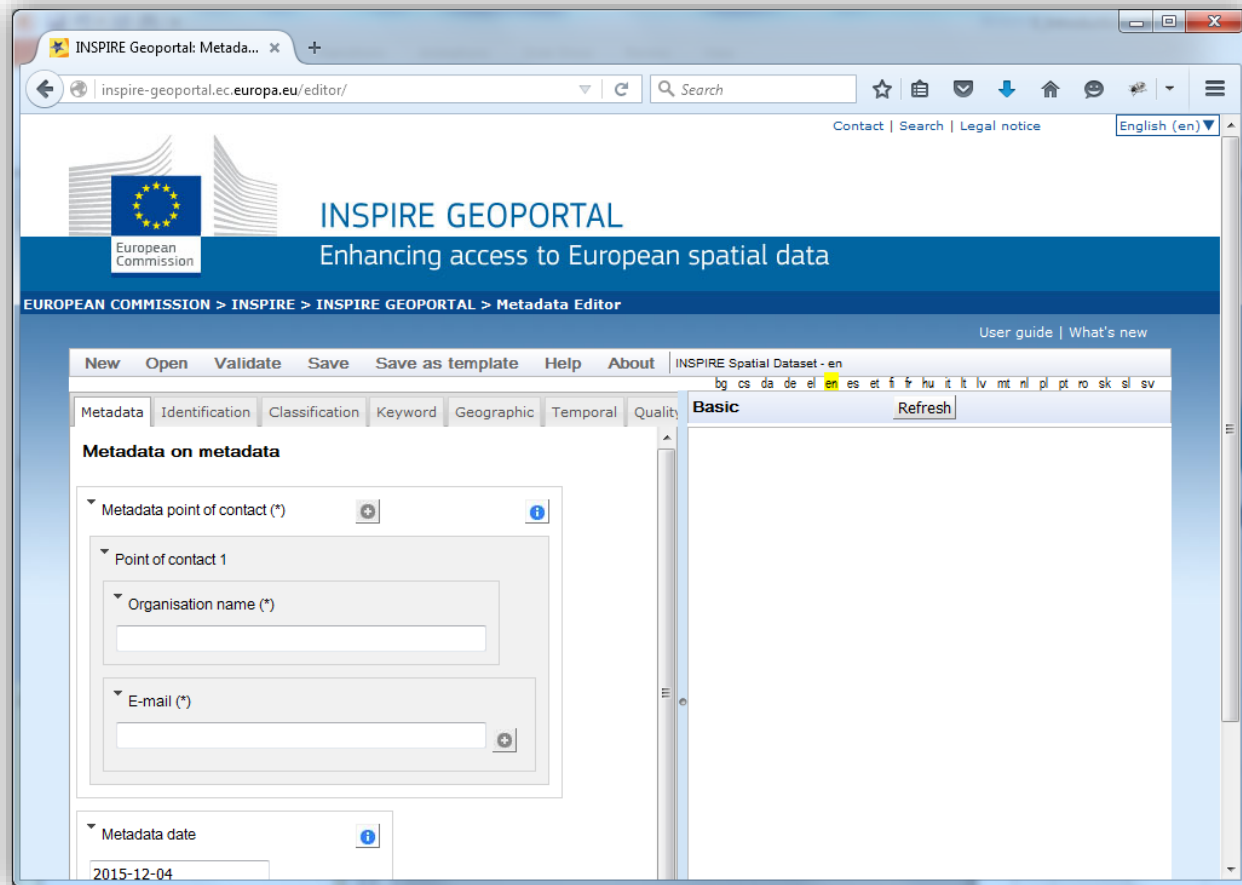
- E  
e  
a  
I





# Metadata Editor Demo

<http://inspire-geoportal.ec.europa.eu/editor/>



## INSPIRE Geoportal Validator 2 - Features

- Validates metadata and functionality of INSPIRE resources with respect to the INSPIRE Technical Guidance documents
- Accepts ISO 19139 documents, endpoints of INSPIRE Network Services, zipped files, etc.
- Available as a web page and as a RESTful web service
-

# Metadata Compliance Meter

Validation reports now feature a metadata compliance meter.

This indicator shows how complete a metadata document, or group of documents, is with respect to the INSPIRE Metadata Implementing Rules, the Network Service Regulation and the Technical Guidance documents.

The indicators also include colour clues:

Average degree of conformity of INSPIRE Metadata: 60.67%



What's this?

# Some validation examples

- Metadata record (xml)

EMODNET-Physics

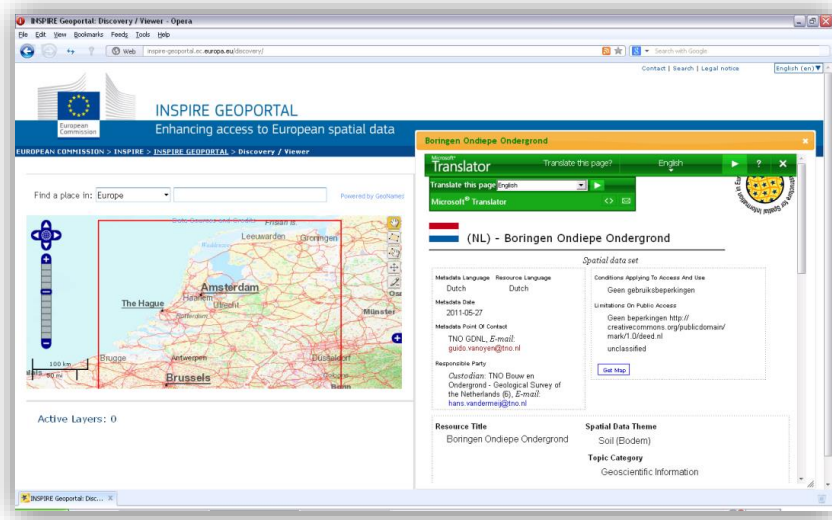
<http://www.emodnet-physics.eu/Portal>

EMODNET-Geology

<http://www.emodnet-geology.eu/emodnet/srv/eng/csw?request=GetCapabilities&service=CSW>

# View services

„view services making it possible, as a minimum, to display, navigate, zoom in/out, pan, or overlay viewable spatial data sets and to display legend information and any relevant content of metadata“



## INSPIRE compliant view service:

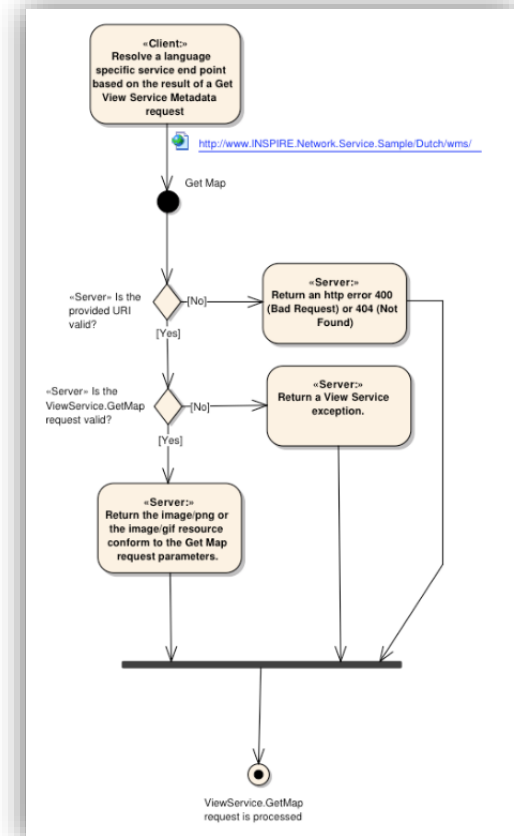
- Based on OGC WMS (web map server) specification
- Follows INSPIRE Implementing Rule on INSPIRE view services
- Follows INSPIRE Technical Guidance on INSPIRE view services

# View services

## Objectives: Learn how to establish INSPIRE View Services -

[http://inspire.ec.europa.eu/documents/Network\\_Services/TechnicalGuidance\\_ViewServices\\_v3.11.pdf](http://inspire.ec.europa.eu/documents/Network_Services/TechnicalGuidance_ViewServices_v3.11.pdf)

- Deegree
- GeoServer
- Mapserver
- Etc.



# View services

View services are based/inspired by OGC WMS

- Portrayal based on OGC SLD (Styled Layer Descriptor)
- Naming conventions for layers:
- E.g. `<wms:Name>TN.RoadTransportNetwork.RoadArea</wms:Name>`

**Implementation Requirement 39** Name shall be mapped with the `<wms:Name>` element. The harmonised name of a layer shall comply with the Layer requirements of the [INS DS, Article 14]

Table 5: Annexes I harmonised name examples

Theme	Examples of layer names
Geographical names	GN.GeographicalNames
Administrative units	AU.AdministrativeUnit
Addresses	AD.Address
Cadastral parcels	CP.CadastralParcel
Transport networks	TN.RoadTransportNetwork.RoadArea
Hydrography	HY.Network
Protected sites	PS.ProtectedSite



# View and discovery services at INSPIRE Geoportal

The screenshot displays the INSPIRE Geoportal interface. On the left, a map of Ireland is shown with a red bounding box around the country. The map includes labels for major cities like Londonerry, Lisburn, Belfast, and Dublin, and regions like IRELAND and BRITISH ISLES. A search bar at the top left contains 'Europe'. Below the map, it says 'Active Layers: 0'. On the right, a metadata panel for 'Smoky Coal Ban Specified Areas (INSPIRE Download Service)' is visible. The panel includes a language translator (set to Spanish), the title '(IE) - Smoky Coal Ban Specified Areas (INSPIREDownload Service)', and a 'Spatial data service' type. The metadata section lists:
 

- Metadata Language: English
- Metadata Date: 2013-05-09T12:30:19
- Metadata Point Of Contact: Department of Environment, Community and Local Government, E-mail: [inspire@environ.ie](mailto:inspire@environ.ie)
- Responsible Party: Point Of Contact: Department of the Environment, Community and Local Government, E-mail: [airquality@environ.ie](mailto:airquality@environ.ie)
- Resource Abstract: (with effect from 01 May 2013) because they have populations over 15,000 people - Greystones, Letterkenny, Mullingar, Navan, Newbridge and Portlaoise; Wicklow Town is also to be included following requests from members of the public, Wicklow County Council and local representatives; A prohibition on the burning of bituminous or smoky coal is also being introduced to complement the existing ban on the marketing, sale and distribution. Regulations: These improvements have now been given effect through new consolidating regulations - the Air Pollution Act (Marketing, Sale, Distribution and Burning of Specified Fuels) Regulations 2012 (S.I. No. 326 of 2012) (pdf, 206kb). These Regulations also incorporate the existing provisions of earlier regulations.
- Resource Locator: <http://176.34.130.8/InspireDemo/AtomDownloadService/DemoSmokyCoalBanInspireDownloadService.atom.en.xml>
- Coupled Resource: Code: 617d7200-16e1-11e2-892e-0800200c9a66, Namespace:
- Spatial Data Service Type: Download Service
- Keyword: Feature access service (infoFeatureAccessService)

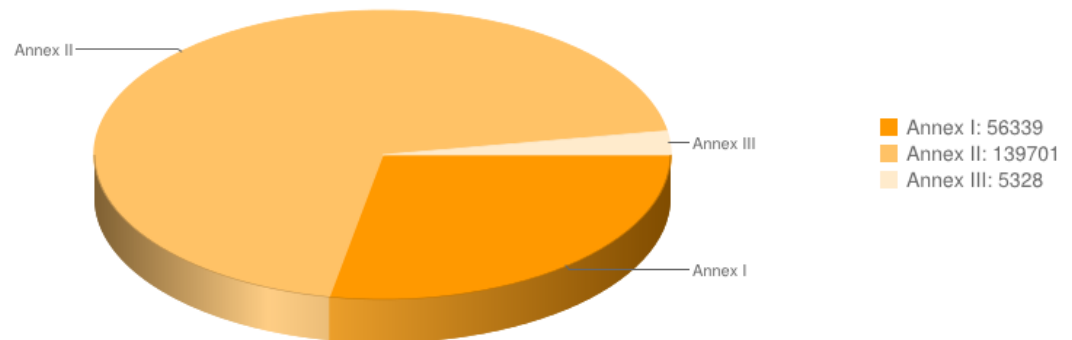
# INSPIRE geo-portal resources available

Resources categorised per type  
 Resources not categorised: 317  
 Spatial data set and spatial data set series categorised per annexes  
 Resources without INSPIRE spatial data theme

Resource Types

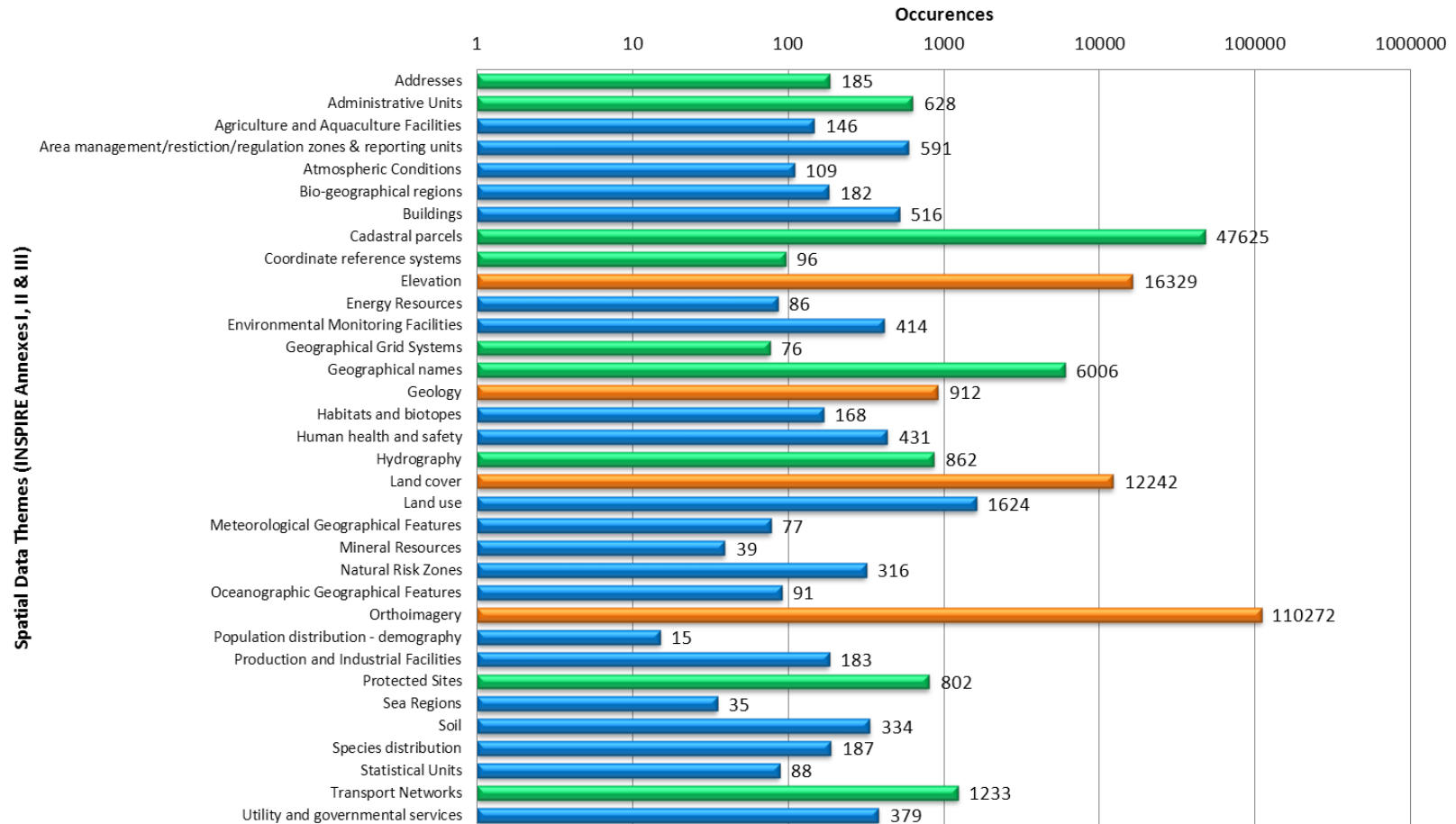


Coverage of Spatial Data Themes Annexes

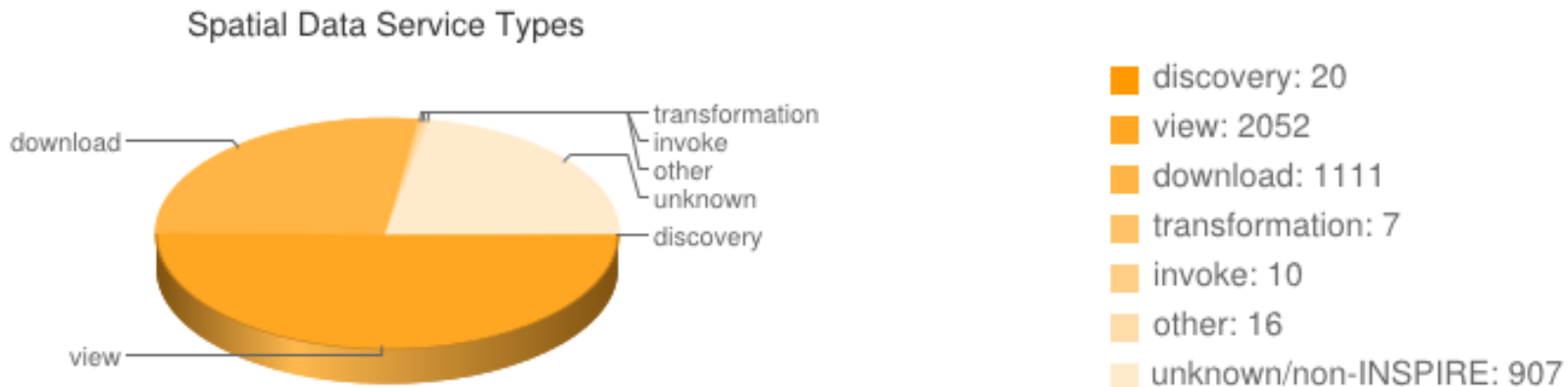


# Metadata availability (existence of MD)

Metadata resources per INSPIRE Spatial Data Theme (data sets and data set series)  
07/10/2013



# Spatial Data Services Types



- Majority of services type: view
- Interesting signal that increasing number of download services available (over 1100)
- Still more than 900 Spatial Data Services types values not according to Metadata Guidelines (discovery, view, ...)

# View services metadata

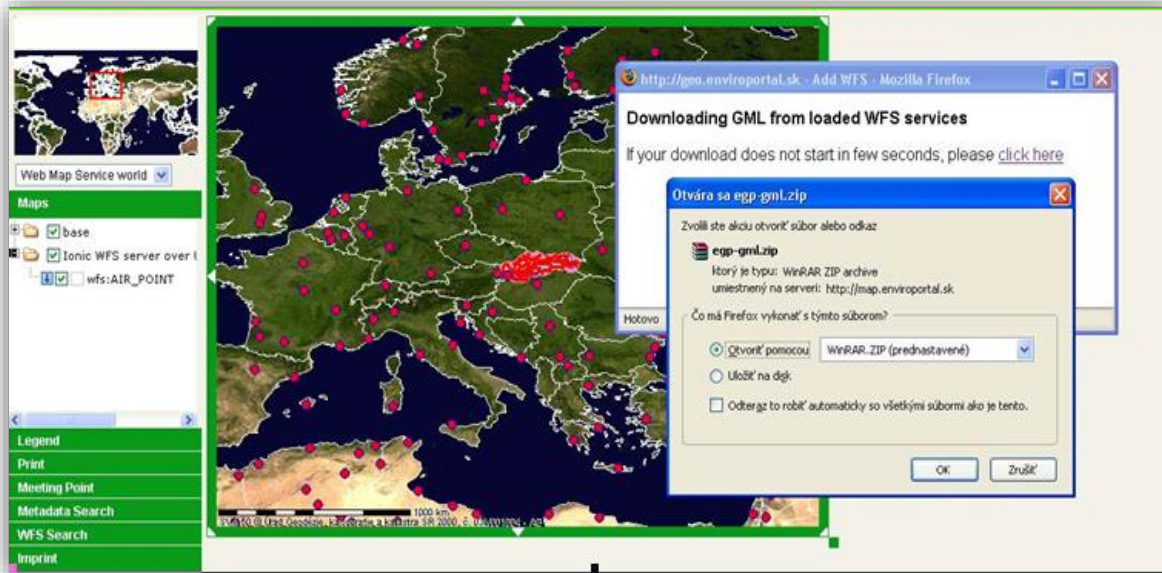
View Service Implementation Spec.



- WMS 1.1.1 still widely used across Europe
- Adherence to INSPIRE view services technical guidance increasing slowly (presence of an extended capabilities section)
- Still many are still failing → additional training, clarification of technical guidance; ISA Projects

# Download services

„download services, enabling copies of spatial data sets, or parts of such sets, to be downloaded and, where practicable, accessed directly“



# INSPIRE Download services

## Available options (now)

- Atom feeds
- WFS (Web Feature Service)

## Work ongoing for

- INSPIRE compliant download service based on OGC Sensor Observation Service (SOS)
- Web Coverage Service (WCS)



# Download services

- Predefined
- Direct access

Service implementation	Predefined dataset download service	Direct access download service
SOS	X	X
WFS	X	X
Atom	X	
WCS	x	x

# M&I Work Programme – Priority actions

MIWP-5: **Validation** and conformity testing

MIWP-6: Registries and **registers**

MIWP-7a: Extension of **Download Service** TG for observation data

MIWP-7b: Extension of **Download Service** TG for coverage data

MIWP-8: Update of **Metadata** TG

MIWP-10: Update **Annex I data specifications**

MIWP-14: **Theme-specific issues** of data specifications & exchange of implementation **experiences in thematic domains**

MIWP-16: Improve usefulness and reliability of **monitoring**

MIWP-18a: Update of **Annex I XML schemas**

MIWP-21: **Pilots** for INSPIRE-based applications (including for e-reporting)

