

The INSPIRE Directive as an interoperability enabler within the European policy context

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**The European Commission's
science and knowledge service**
Joint Research Centre



27/10/2020



POLITECNICO
MILANO 1863



European
Commission

About me

- Environmental Engineer 'grown' at Politecnico di Milano
 - BSc (2008), MSc (2010) & PhD (2014)
 - Postdoc Research Fellow from 2014 to 2018
 - Scientific Project Officer at the European Commission – Joint Centre (JRC) since 2018
- Geospatial expert:
 - GIS/GIScience, Remote Sensing, SDIs, data ecosystems, data interoperability/sharing
- Enthusiast of 'open' (software, data, standards, etc.):
 - Charter Member of the Open Source Geospatial Foundation (OSGeo)
 - Member of GFOSS.it (OSGeo Italian chapter)
 - Member of the Editorial Board of Open Geospatial Data, Software and Standards
 - Voting Member of the Humanitarian OpenStreetMap Team (HOT)
 - OpenStreetMap contributor, Member of the OpenStreetMap Foundation (OSMF), Member of the OSMF State of the Map Working Group



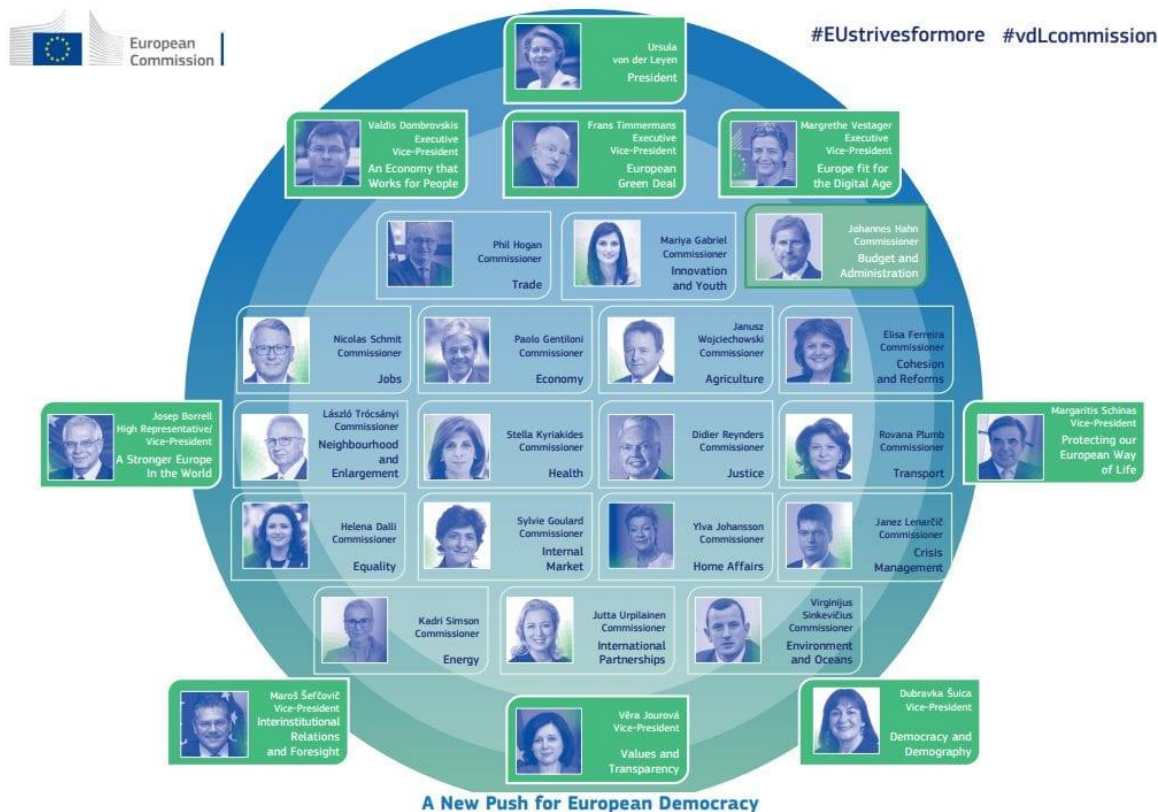
Outline

- European Commission and the Joint Research Centre
- INSPIRE Directive
- INSPIRE central components
- INSPIRE in the current & future EU policy context

European Commission & the JRC

European Commission (EC)

- The executive branch of the European Union:



- European Commission commissioners:
https://ec.europa.eu/commission/commissioners/2019-2024_en
- Political guidelines of the European Commission 2019-2024:
https://ec.europa.eu/info/strategy/priorities-2019-2024_en

EC Directorates-General (DGs)

Agriculture and Rural Development	AGRI	Human Resources and Security	HR
Budget	BUDG	Informatics	DIGIT
Climate Action	CLIMA	Internal Market, Industry, Entrepreneurship & SMEs	GROW
Communication	COMM	International Cooperation and Development	DEVCO
Communications Networks, Content and Technology	CONNECT	Interpretation	SCIC
Competition	COMP	Joint Research Centre	JRC
Defence Industry and Space	DEFIS	Justice and Consumers	JUST
Economic and Financial Affairs	ECFIN	Maritime Affairs and Fisheries	MARE
Education, Youth, Sports and Culture	EAC	Migration and Home Affairs	HOME
Employment, Social Affairs and Inclusion	EMPL	Mobility and Transport	MOVE
Energy	ENER	Regional and Urban Policy	REGIO
Environment	ENV	Research and Innovation	RTD
European Civil Protection and Humanitarian Aid Operations	ECHO	Structural Reform Support	REFORM
European Neighbourhood and Enlargement Negotiations	NEAR	Taxation and Customs Union	TAXUD
Eurostat - European statistics	EUROSTAT	Trade	TRADE
Financial Stability, Financial Services & Capital Markets Union	FISMA	Translation	DGT
Health and Food Safety	SANTE		

EC DG Joint Research Centre (JRC)

***" As the science and knowledge service
of the Commission our mission is to support
EU policies with independent evidence
throughout the whole policy cycle "***



EC DG JRC – Sites

- Headquarters in Brussels & research facilities located in **5 Member States**:
 - Belgium (Brussels & Geel)
 - Germany (Karlsruhe)
 - Italy (Ispra)
 - The Netherlands (Petten)
 - Spain (Seville)



EC DG JRC – Facts & Figures

€ 386 million Budget annually,
plus **€ 62** million earned income

6 locations in 5 Member States: Italy,
Belgium, Germany, The Netherlands, Spain

Independent of private,
commercial or national interests



Policy neutral: has no policy
agenda of its own

1500 core research staff,
3000 total staff



42 large scale research facilities,
more than 110 online databases



83% of core research staff
with PhD's

125 instances of support
to the EU policy-maker
annually

More than **100** economic,
bio-physical and nuclear models

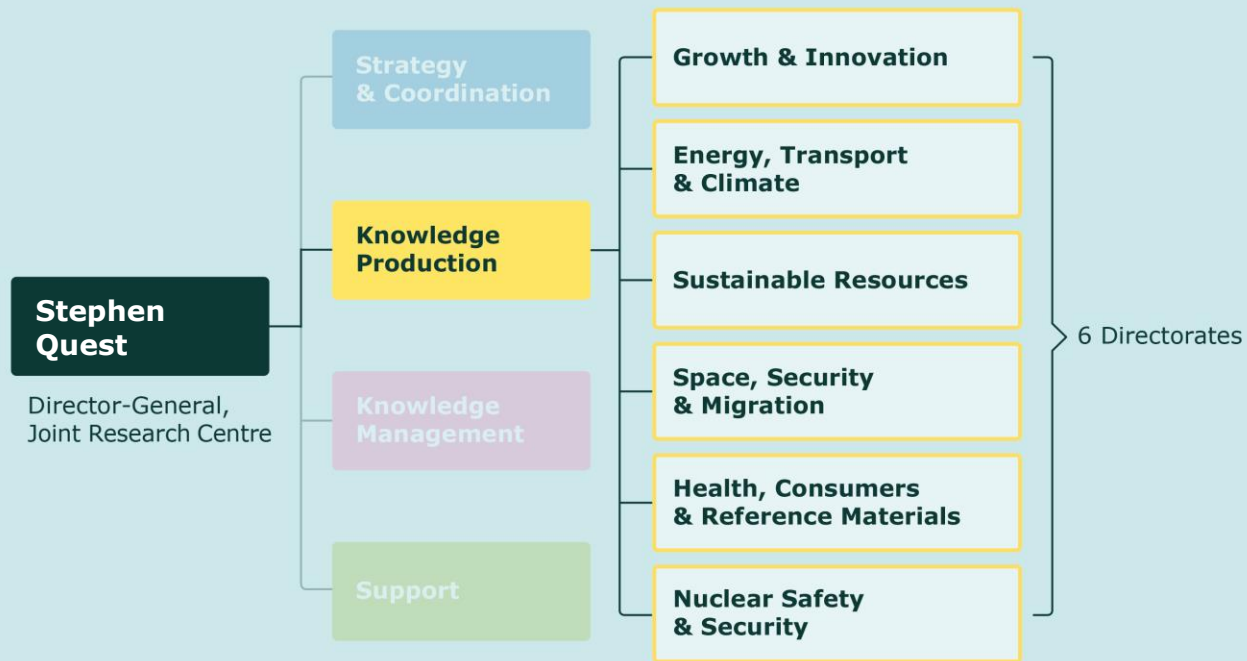


Over 1,400
scientific publications per year

<https://ec.europa.eu/jrc/en>

9 https://ec.europa.eu/info/departments/joint-research-centre_en

EC DG JRC – Structure



EC DG JRC – Unit B.6 Digital Economy

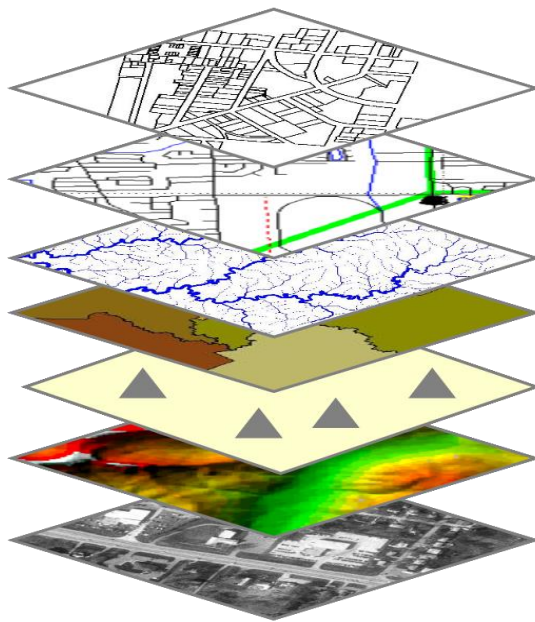
- Focused on how **digitalization** & ICT are affecting the economy:
 - innovative technology: IoT, AI, Big Data, APIs
 - benefits/opportunities vs. problems/challenges
 - EC **Digital Europe Programme** (to be launched in 2021)
- **Policy issues** in a number of areas:
 - AI, APIs, blockchain, digital government, standardization, data economy, data interoperability, data governance, data ecosystems, Citizen Science
- **Multi-disciplinary** team:
 - economists experienced on techno-economic impact of digital technologies
 - computer scientists & technologists experienced on digital technologies and digital data governance and interoperability

INSPIRE Directive

Spatial Data Infrastructure (SDI)

- National Spatial Data Infrastructure (NSDI) means the **technology**, **policies**, **standards**, and **human resources** necessary to acquire, process, store, distribute, and improve utilization of **geospatial data** (*Executive Order 12906, 1994*)
- A spatial data infrastructure (SDI) is a data infrastructure implementing a framework of **geographic data**, **metadata**, **users** and **tools** that are interactively connected in order to use spatial data in an efficient and flexible way (*The White House, Office of Management and Budget, Circular No. A-16 Revised, 2002*)

SDIs – Legal vs. others



A European Spatial Data Infrastructure: why?

- Public [consultation](#) in the early 2000s identified a number of [obstacles](#) preventing the widespread use of geospatial data needed for environmental policy at the EU level:



INSPIRE Directive



DIRECTIVE 2007/2/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 14 March 2007

establishing an Infrastructure for Spatial Information in the European Community (INSPIRE)

- Aims to create a **European SDI** for the purposes of EU **environmental policies**:
 - environmental spatial data **sharing**, facilitation of **public access** to spatial data, and assisting in cross-boundary **policy-making**
 - based on the SDIs established and operated by the EU Member States
 - came into force on **May 15, 2007**, and will be implemented in various stages, with full implementation required by **2021**.

<https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32007L0002>


<https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32007L0002>

16 <https://www.youtube.com/watch?v=xew6qI-6wNk>

INSPIRE Directive – INSPIRE Knowledge Base

Home Learn ▼ Implement ▼ Participate ▼ Use ▼

INSPIRE Video



The INSPIRE Directive: a brief description

Latest News

17/10/2019
INSPIRE Conference 2020: Call for abstracts open

13/08/2019
Call for expression of interest to tender: Data ecosystems for geospatial data

02/08/2019
Call for expression of interest to tender: Facilitating access to INSPIRE data through standard-based APIs

[All News](#)

Toolkit

Focus On



Events

12/05/2020
INSPIRE Conference 2020

22/10/2019
Inspire Helsinki 2019

07/05/2019
Webinar: INSPIRE good practices – Alternative Encodings

[All Events](#)

Quick Links



INSPIRE LIBRARY



INSPIRE ROADMAP



INSPIRE GEOPORTAL



INSPIRE IN YOUR COUNTRY



INSPIRE COMMUNITY FORUM



FIND YOUR SCOPE



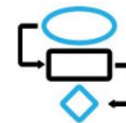
INSPIRE REGISTRY



INSPIRE LEGISLATION



INSPIRE THEMES



INSPIRE IN PRACTICE



INSPIRE VALIDATOR












INSPIRE TRAINING

INSPIRE Directive – Spatial scope

- INSPIRE addresses 34 spatial data themes for environmental applications:

ANNEX: 1

 Addresses	 Administrative units
 Cadastral parcels	 Coordinate reference systems
 Geographical grid systems	 Geographical names
 Hydrography	 Protected sites
 Transport networks	

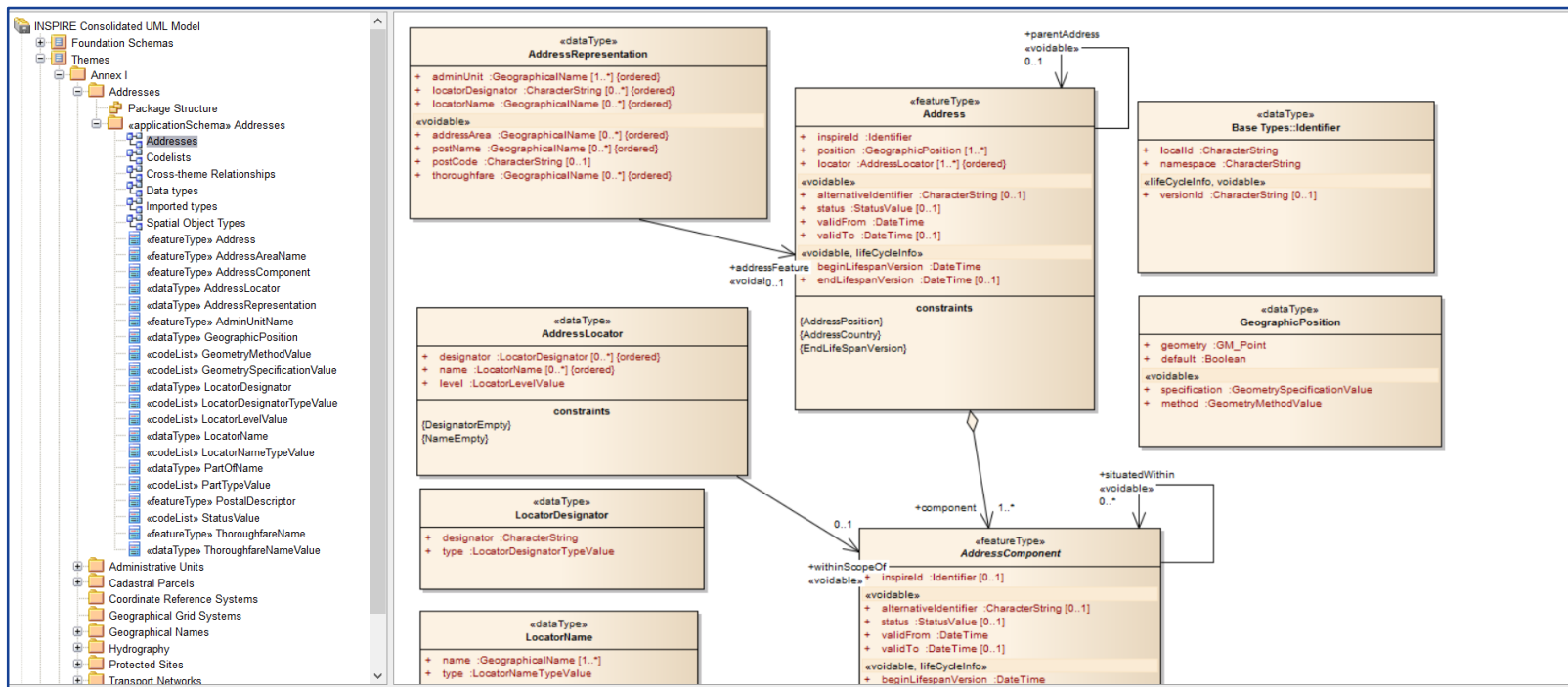
ANNEX: 2

 Elevation	 Geology
 Land cover	 Orthoimagery

ANNEX: 3

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

- default encoding is the Geography Markup Language ([GML](#))



Implementing Rules (IR), Technical Guidelines (TG) and tools

“What Member States must implement”
(abstract specification)

legally binding

Directive

Commission Regulation

not legally binding

Technical Guidelines

“How Member States might implement it”
(implementation specification)

Tools implementing INSPIRE requirements

INSPIRE Directive 2007/2/EC

Implementing Rules

TG – Network Services

TG – Data Specifications

TG – Metadata

INSPIRE Geoportal

INSPIRE Registry

INSPIRE Validator

INSPIRE Directive – Governance

- INSPIRE Coordination Team (CT):
 - Directorate General Environment (DG ENV), Joint Research Centre (JRC) & European Environment Agency (EEA)
- INSPIRE Committee (IC):
 - Member States representatives
- Member States National Contact Points (NCPs)
- INSPIRE Maintenance and Implementation Group (MIG):
 - representatives of the NCPs
 - MIG-P (Political) & MIG-T (Technical)
 - Maintenance and Implementation Work Programme (MIWP)
- INSPIRE stakeholders

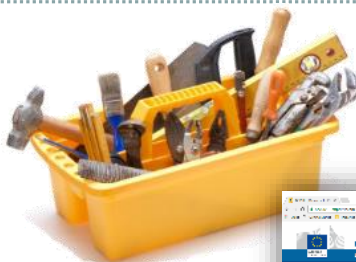
INSPIRE Directive – Where are we in 2020?

1



draft

2



implement

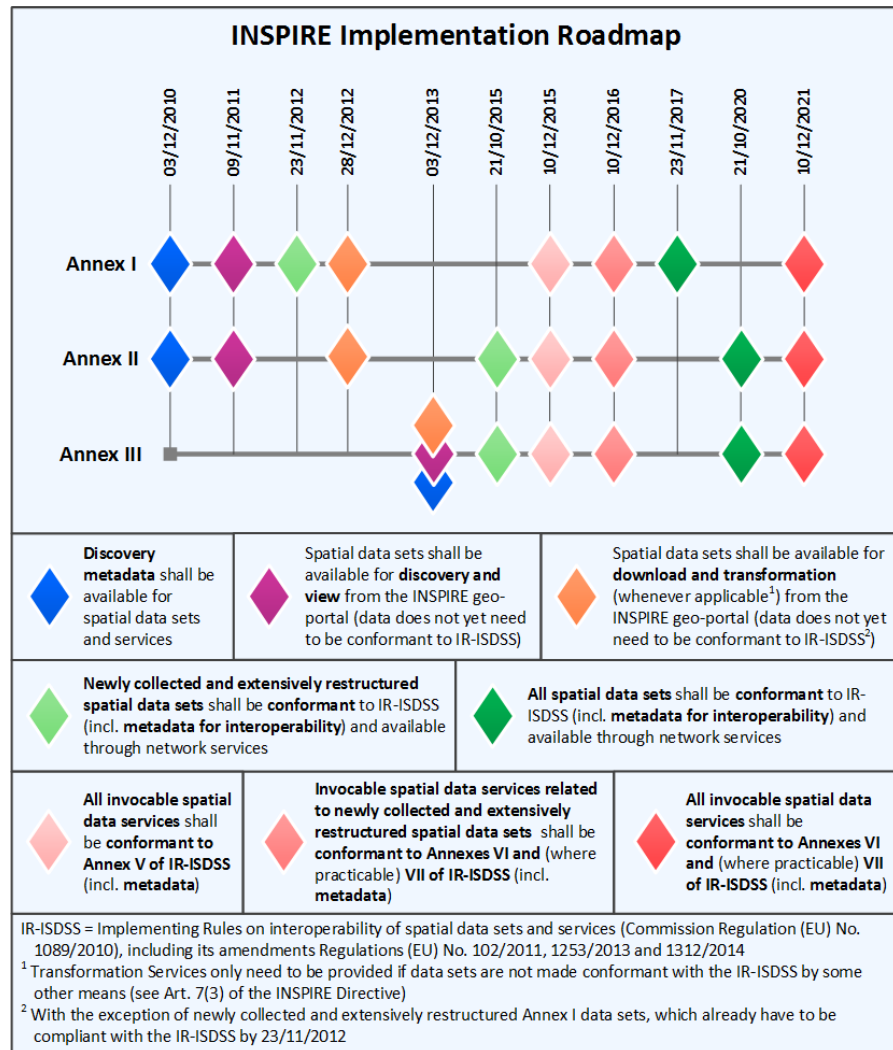
3



use

INSPIRE Directive – Roadmap

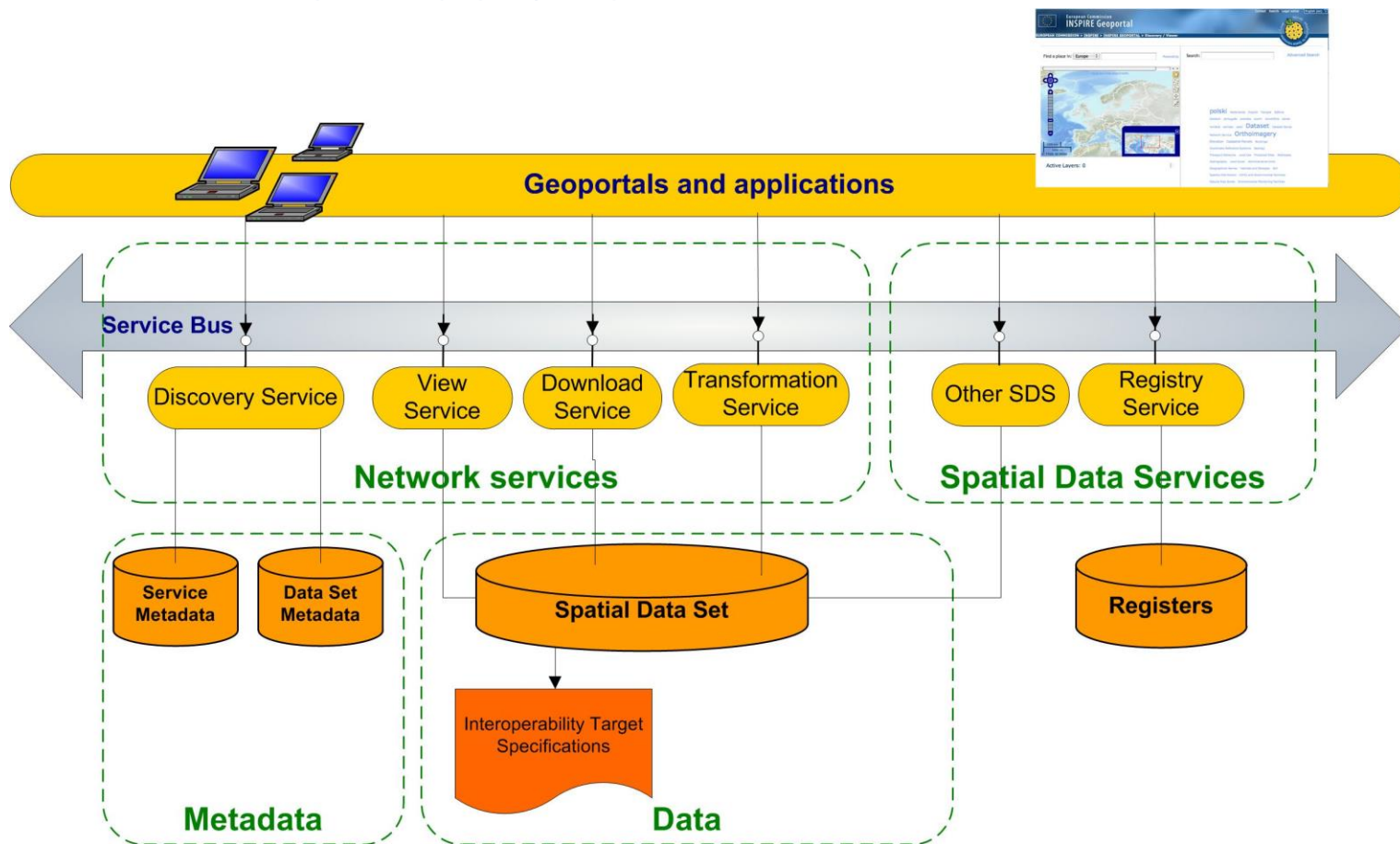
- Implementation in subsequent stages:
 - depending on the **Annex**
 - depending on the **resource type**
 - metadata
 - services (Discovery / View / Download)
 - data sets (as-is / compliant)



INSPIRE

central components

INSPIRE Architecture



INSPIRE – Tools for implementers

- A very rich INSPIRE-compliant ecosystem:
 - data **serving** (WMS/WMTS, WFS, WCS, SOS)



- data/metadata **catalogs** (CSW)



- data **consumption**




- ETL (Extract-Transform-Load) tools



INSPIRE central components – Geoportal

- Allows to **search, view & download** data sets using **2 viewers**:
 - Priority Data Sets Viewer
 - INSPIRE Thematic Viewer

Priority Data Sets Viewer




Credits: Map data: Google | Map style: snazzy | Icons: Nick Roach

The application displays the availability and provides access to the selected priority data sets **1** used for environmental reporting. It allows filtering by environmental domain, environmental legislation and country.

[Browse Priority Data Sets](#)

INSPIRE Thematic Viewer



Credits: Map data: Google | Map style: snazzy | Icons: INSPIRE

The application displays the availability and provides access to all EU MS data sets falling under the scope of INSPIRE Directive filtered by data themes and countries (i.e. Annex I, II and III).

[Browse INSPIRE Thematic Data Sets](#)

INSPIRE Geoportal – Technical architecture

- Backend



- Frontend



INSPIRE Geoportal – INSPIRE Thematic Viewer

- Allows to access [all INSPIRE data sets](#), classified according to:
 - country & data theme

INSPIRE Thematic Viewer

Explores INSPIRE data sets provided by EU Member States and EFTA countries. You can filter by [spatial data theme](#) (from Annex I, II and III) and country.

The Thematic Viewer provides statistical overviews of data set availability as well as simplified access to view or download selected data sets.

Browse INSPIRE Data Sets:

Country overview



Availability of INSPIRE data sets grouped by individual EU & EFTA countries

INSPIRE Data Themes



Availability of INSPIRE data sets grouped by INSPIRE data themes

INSPIRE Geoportal – Priority Data Sets Viewer

- Allows to access [priority data sets](#), classified according to:
 - country, environmental domain & environmental legislation

Priority Data Sets Viewer

Explores the data sets identified by EU Member States and EFTA countries as [priority data sets for environmental reporting](#). You can filter by environmental domain, environmental legislation and country.

The list of priority data sets has been defined and is being further developed in the framework of [INSPIRE Maintenance and Implementation Work Plan 2016-2020 \(MIWP\)](#).

The Priority Data Sets Viewer provides statistical overviews of the availability of priority data set as well as simplified access to view or download selected data sets.

Browse Priority Data Sets:

Country overview



Priority Data Sets grouped by individual EU & EFTA countries

Environmental Domains



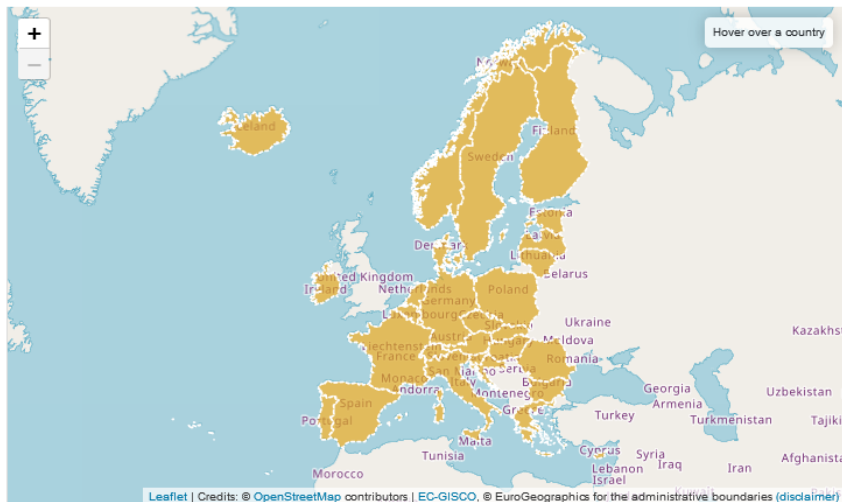
Priority Data Sets grouped by 6 environmental domains

Environmental Legislation



Priority Data Sets grouped by relevant environmental reporting legislation

INSPIRE Geoportal – Implementation overview



INSPIRE Geoportal Data Set Statistics

172809

Metadata records

28410

Downloadable Data Sets

32368

Viewable Data Sets

Spatial scope coverage:

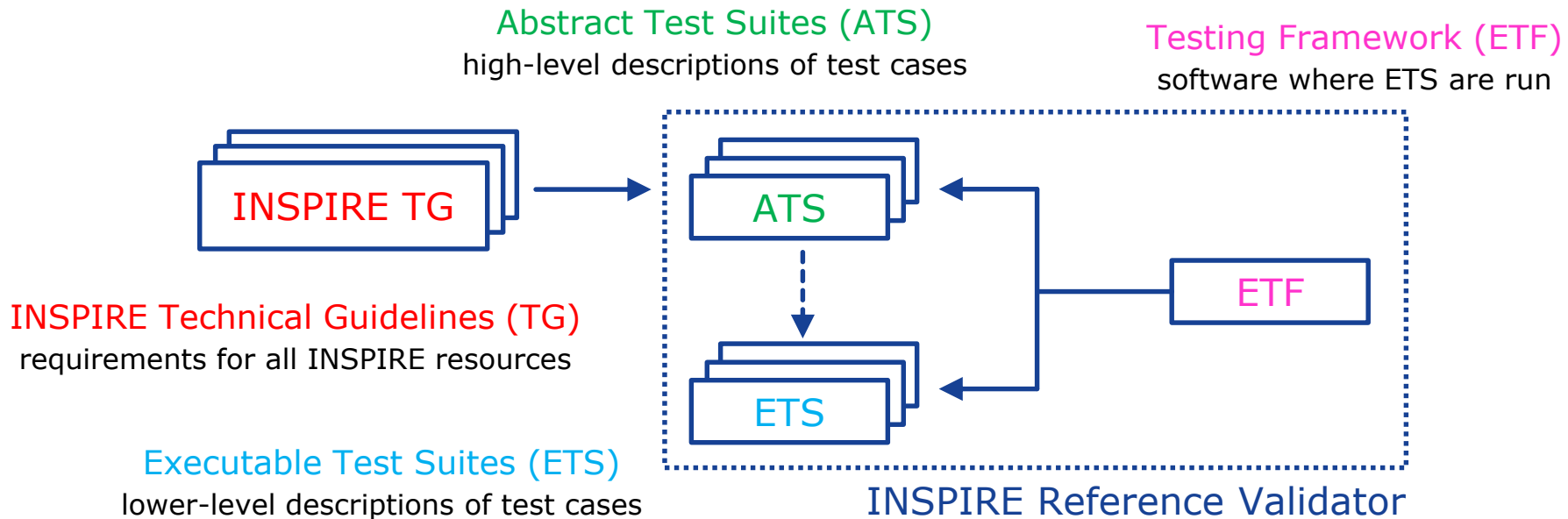
- ☐ National
☐ Regional

Select a COUNTRY


Austria	503 345 392	Finland	618 121 226	Latvia	142 35 43	Portugal	631 277 285
Belgium	534 397 429	France	43371 2399 3039	Liechtenstein	49 9 11	Romania	116 28 32
Bulgaria	134 23 23	Germany	44692 22029 23627	Lithuania	129 102 36	Slovakia	270 38 45
Croatia	114 10 22	Greece	58 58 58	Luxembourg	304 214 256	Slovenia	93 12 12
Cyprus	42 32 34	Hungary	121 23 20	Malta	157 136 152	Spain	219 153 47
Czech Republic	146 54 75	Iceland	147 7 0	Netherlands	196 120 132	Sweden	245 168 206
Denmark	186 76 72	Ireland	76 3 7	Norway	162 62 26	Switzerland	204 2 4
Estonia	82 26 39	Italy	22106 606 508	Poland	35592 792 2261		

INSPIRE central components – Validator

- Allows data providers to **validate** metadata, data sets & services:
 - it translates the TG requirements into Abstract & Executable Test Suites



INSPIRE central components – Validator

 European Commission

English

Search

European Commission > INSPIRE > Validator > Test selection

INSPIRE Validator - Test selection

Test your INSPIRE data, services and metadata

[Home](#) [Start Test](#) [Test Reports](#) [Get support](#) [More on the INSPIRE Validator](#)

Configure your test

Select the INSPIRE resource you would like to test *

- ☒ Metadata
- ☐ View Service
- ☐ Download Service
- ☐ Discovery Service
- ☐ Data set

Select the Technical Guidelines version *

- ☐ Version 1.3
- ☒ Version 2.0

Select the type of metadata record(s) to be tested *

- ☐ Data sets and data set series
- ☒ Network Service
- ☐ Spatial Data Service

Advanced options

Provide the resource to test

Select the input type and upload or link the resource *

The system can process multiple files at once. You can upload a compressed ZIP file or enter a service operation with requests to one or more records/features.

File upload

Upload file*

Maximum size is 5 MB.
Encrypted documents and those containing macros are not accepted.


Choose files

Provide a label for your test report (optional)

Your test report will appear with the label below, edit the text if you wish to change it.

Test run on 10:39 - 12.10.2020 with test suite Conformance Class 4: INSPIRE Network Services metadata

Start test

 European Commission

English

Search

European Commission > INSPIRE > Validator > Test reports

INSPIRE Validator - Test reports

Review the results of the tests performed

[Home](#) [Start Test](#) [Test Reports](#) [Get support](#) [More on the INSPIRE Validator](#)

Search options

Resource type

Any resource

Status

Any status

Refine results

Clear all

Search results (1500)

Sort by date







Showing results 1 to 30

+	Test run on 10:41 - 12.10.2020 with test suite Conformance class: Application schema, Administrative Units
+	Test run on 11:41 - 12.10.2020 with test suite Conformance Class 4: INSPIRE Network Services metadata.
+ ✗	Test run on 10:38 - 12.10.2020 with test suite Conformance Class 4: INSPIRE Network Services metadata, and one more test suite
+ ✗	TEST c7980264-97af-41ec-8853-35c7de2f55e6 - 1602491889376
+	Test run on 11:35 - 12.10.2020 with test suite Conformance Class 4: INSPIRE Network Services metadata.
+	Test run on 11:31 - 12.10.2020 with test suite Conformance Class 2: INSPIRE data sets and data set series interoperability metadata, and one more test suite
+ ✗	Test run on 11:29 - 12.10.2020 with test suite Conformance class: Application schema, Air Transport Networks
+	Monitor Status
+ ✗	TEST 489ef74f-a1e2-4510-bdbc-5f8ce34dbaa8 - 1602491117860
+ ✗	Test run on 09:59 - 12.10.2020 with test suite Conformance Class: Download Service - Direct WFS
+ ✗	Test run on 10:55 - 12.10.2020 with test suite Conformance Class: View Service - WMS
+ ✗	Test run on 09:48 - 12.10.2020 with test suite Common Requirements for ISO/TC 19139:2007 based INSPIRE metadata records, and 2 more test suites
+	Monitor Status
+ ✗	Test run on 09:46 - 12.10.2020 with test suite Common Requirements for ISO/TC 19139:2007 based INSPIRE metadata records, and 2 more test suites

INSPIRE central components – Registry

- Based on the open source Re3gistry software, a tool to manage and share reference codes (i.e. unique identifiers)

Registry manager: **European Commission, Joint Research Centre**

Other formats:  XML Re3gistry  XML ISO 19135  RDF/XML  JSON  Atom  CSV

Registers

Filter Label
Label
INSPIRE application schema register
INSPIRE code list register
INSPIRE enumeration register
INSPIRE feature concept dictionary
INSPIRE glossary
INSPIRE layer register
INSPIRE media-types register
INSPIRE metadata code list register
INSPIRE reference document register
INSPIRE theme register

Items per page: Showing 1 to 10 of 10 entries

First Previous 1 Next Last

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

34 <https://joinup.ec.europa.eu/solution/re3gistry>

INSPIRE in the current & future EU policy context

INSPIRE & the new EU policy context

- (The evolution of) INSPIRE will play a **key role** in the context of 2 political priorities of the European Commission:

A European Green Deal

Europe aims to be the first climate-neutral continent by becoming a modern, resource-efficient economy.



A Europe fit for the digital age

The EU's digital strategy will empower people with a new generation of technologies.



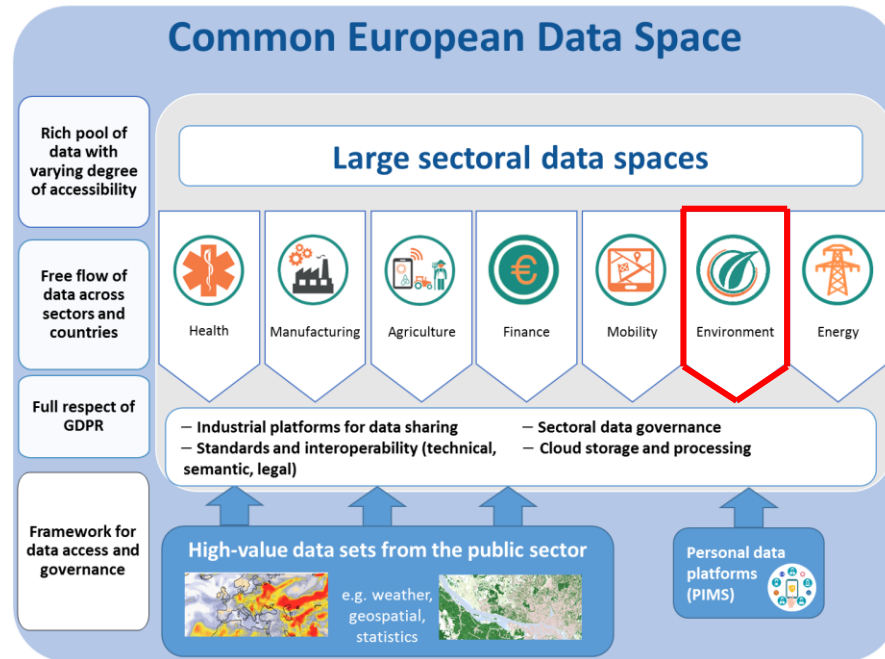
European strategy for data

- Communication from the European Commission in February 2020:
 - envisages the creation of a **European single market for data**
 - highlights problems to address:
 - data **availability** (licensing), **sharing** (G2G, G2B, B2B, B2G), **interoperability**, **quality**, **governance**, **infrastructure**, **skills & data literacy**, **cybersecurity**



European strategy for data

- Communication from the European Commission in February 2020:
 - envisages the establishment of a common EU + sectoral **data spaces**



INSPIRE as the key building block of the European Green Deal data space

Open Data Directive

- Requires that specific datasets from the public sector are made available:
 - free of charge and under open licenses
 - via APIs and bulk download

L 172/56	EN	Official Journal of the European Union	26.6.2019
DIRECTIVE (EU) 2019/1024 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL			
of 20 June 2019			
on open data and the re-use of public sector information			
(recast)			

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of 20 June 2019			
on open data and the re-use of public sector information			
(recast)			

- Such datasets are named **high-value datasets**, to be defined in thematic areas:
 - geospatial
 - Earth observation and environment
 - meteorological
 - statistics
 - company and company ownership
 - mobility
- **Implementing act** defining the full **list of high-value datasets** & their mode of provisions expected for Q1 2021.

A new JRC B.6 project: **ENABLED**

- Data ecosystems and enablers (**ENABLED**) – JRC Work Programme 2021-2022
- Built on the European Strategy for Data
- Objectives:
 - study the **actors, roles, barriers, enablers** in **data ecosystems** to understand the advantages and disadvantages of socio-economic, organisational and technical approaches related to data through the extensive **use of sandboxing** for the evaluation of different policy options
 - To develop a **data ecosystems toolbox** which encompasses economic, technical, semantic and organisational enablers for setting up interoperable European data spaces at multiple levels of governance
 - to support the establishment of the **Green Deal data space** through targeted activities in support to the implementation of the 'Destination Earth' and 'GreenData4all' initiatives

Current/future (INSPIRE) activities

- Evolution of SDIs (& INSPIRE) into data spaces:



Article

From Spatial Data Infrastructures to Data Spaces—A Technological Perspective on the Evolution of European SDIs

Alexander Kotsev ^{†,*} , Marco Minghini [†] , Robert Tomas [†] and Vlado Cetl [†] 
and Michael Lutz [†]

Current/future (INSPIRE) activities

- Modernisation of INSPIRE:
 - alternative [data encodings](#): GeoJSON, GeoPackage, binary encodings, etc.
 - data provision through [APIs](#), e.g. OGC API - Features & OGC SensorThings API
 - collection of community-driven [INSPIRE good practices](#)
- Other more general research topics on (location) data:
 - asynchronous transactions, [event-driven architectures](#) and data streaming
 - [virtualisation](#) technologies
 - [edge and fog](#) data management and use
 - combined use of public sector and [citizen-generated data](#)
 - [binary data encodings](#)
 - [personal data spaces](#)
 - [private data](#) for social benefit
 - [hyper-local AI applications](#) to deliver social value
 - understanding the [demand for data-driven innovations](#) from the public sector

An example of what can be done in 2020

- API for air quality developed within the API4INSPIRE project:
 - data harvested from multiple sources (Member States and EEA)
 - standards-based access through [SensorThings API](#)
 - data available in a public [cloud](#) through virtualization
 - [300+ million air quality observations](#) from the last 2.5 years & still counting!
- Public webinar on November 19 at 2:00 pm!



<https://datacoveeu.github.io/API4INSPIRE>



Thank you!

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@MarcoMinghini

Stay in touch



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YouTube: ***[EU Science Hub](https://www.youtube.com/EU_Science_Hub)***