



**INDE**

Infraestrutura Nacional  
de Dados Espaciais

**IV SIMPÓSIO BRASILEIRO DE INFRAESTRUTURA  
DE DADOS ESPACIAIS - SBIDE**

IDEs Inteligentes para governança e  
políticas públicas

**15 a 18 de outubro de 2024 | Rio de Janeiro**

# Modernisation of INSPIRE: from SDIs to data spaces

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*European Commission, Joint Research Centre (JRC)*

16 October 2024



# Joint Research Centre (JRC)

- Science and knowledge service of the European Commission
- Mission to support policies with independent evidence throughout the whole policy cycle



# INSPIRE Directive

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

of 14 March 2007

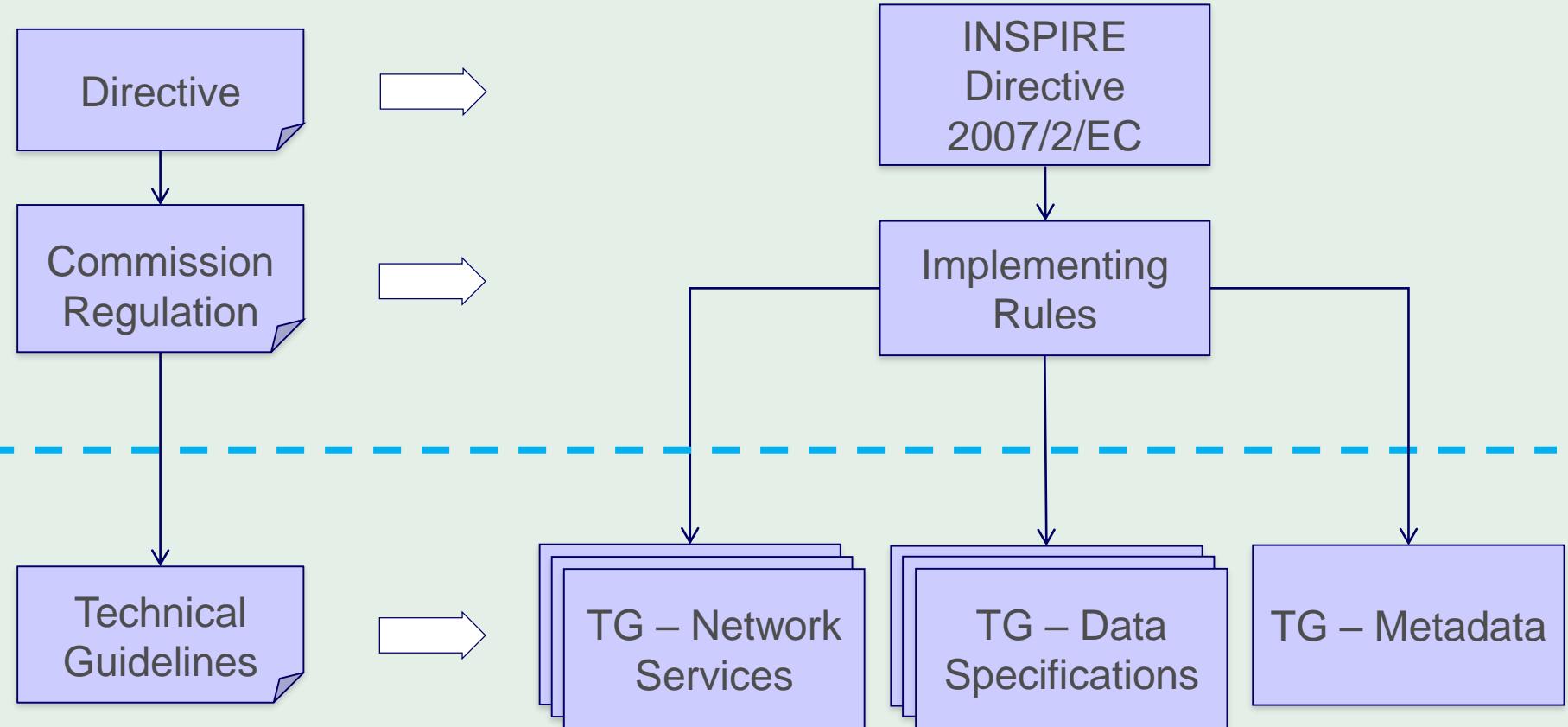
establishing an Infrastructure for Spatial Information in the European Community (INSPIRE)

- Aims to create a **European SDI** to support EU environmental policies.
- Provides a comprehensive framework for **interoperability of spatial data**:
  - **data sharing**
  - **data & service discovery (metadata)**
  - **network services**
- based on the SDIs established and operated by the EU Member States.

# Implementing Rules & Technical Guidelines

“What Member States must implement”  
(abstract specification)  
**legally binding**

**not legally binding**  
“How Member States might implement it”  
(implementation specification)



# 34 data themes for environmental use cases

## ANNEX: 1

-  Addresses
-  Cadastral parcels
-  Geographical grid systems
-  Hydrography
-  Transport networks

## ANNEX: 2

-  Elevation
-  Land cover
-  Geology
-  Orthoimagery

## ANNEX: 3

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

# What are the present & future of INSPIRE?

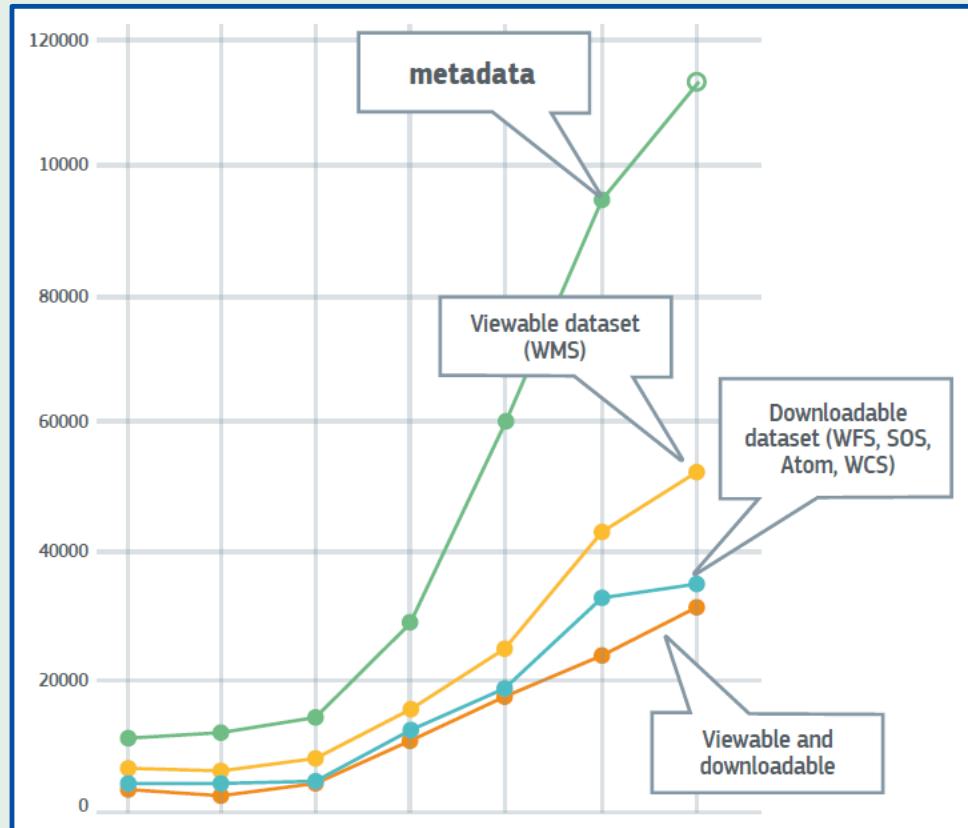
- There have been multiple reasons for analysing the present & future of INSPIRE:
  - end of the legally defined roadmap
  - new EU political context around Green Deal
  - disruptive technological trends around (geo)data sharing
- As the technical coordinator of INSPIRE, we (JRC) have offered our view on how to modernise INSPIRE from the organisational and technological perspectives, by:
  - reflecting on state of play & lessons learnt from 15+ years of implementation
  - assessing the political and technological context
  - developing a vision for the future and actions to achieve it

# *State of play & Lessons learnt*

# Data availability, accessibility & conformity



- INSPIRE implementation still heterogeneous across Member States
  - no single country has yet reached full implementation!
- The amount of datasets made available through INSPIRE is gradually growing

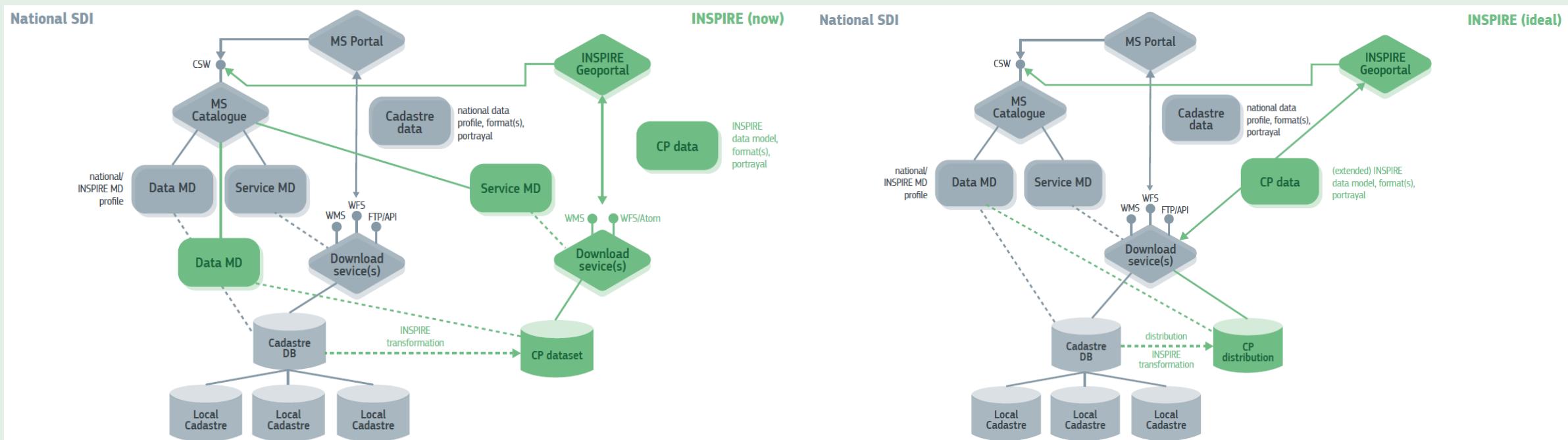


Improved data availability and in the INSPIRE infrastructure between 2007 and 2018

# Parallel implementations



- Many Member States share only a limited number of datasets within INSPIRE:
  - INSPIRE only marginally linked – instead of being built on top of national SDIs
  - **reasons:** INSPIRE requirements are different than national ones
  - **result:** available data (themes, spatial object types, scale, quality) is heterogeneous across Europe, usability is limited



# Flexible governance approaches

-  • Inclusive and open governance approach since the beginning:
  - broad spectrum of users & implementers
-  • INSPIRE MIG for organisational, legal and technical matters – but:
  - exclusively represented by data providers
  - not always flexible and fast in accommodating novelties

# Flexible governance approaches



- More agile governance approaches would help:
  - community-driven
  - based on online collaborative platforms 
- INSPIRE Good Practices
  - a mechanism to introduce new approaches (standards, technologies, etc.) in INSPIRE

## Good Practice documents

### Endorsed

[GeoJSON encoding of INSPIRE datasets](#) ↗

[GeoDCAT-AP](#)

[SDMX for Human Health and Population Distribution](#)

[GeoPackage encoding of INSPIRE datasets](#) ↗

[Data-Service Linking Simplification](#) ↗

[OGC compliant INSPIRE coverage data and service implementation](#) ↗

[Guidance for the integration of dispersed WMS sources](#) ↗

[Guidelines for making spatial data downloadable via WMS services](#) ↗

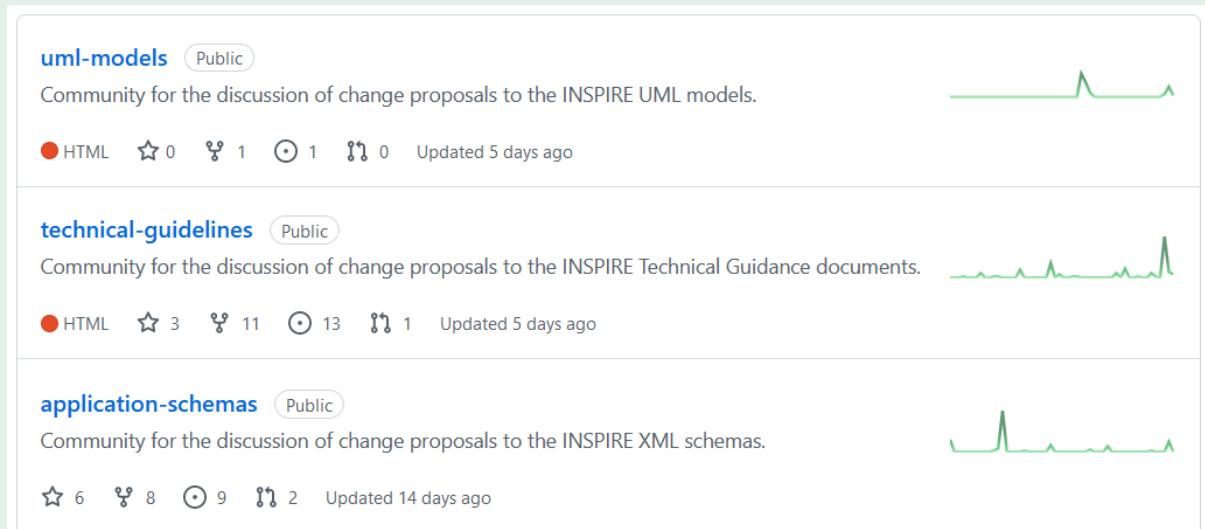
[Setting up an INSPIRE Download service based on the OGC API-Features standard](#) ↗

[INSPIRE download services based on OGC SensorThings API](#) ↗

# Flexible governance approaches



- More agile governance approaches would help:
  - community-driven
  - based on online collaborative platforms 
- INSPIRE Good Practices
  - a mechanism to introduce new approaches (standards, technologies, etc.) in INSPIRE
- Governance of INSPIRE artefacts
  - a governance process to manage changes/updates to INSPIRE TGs, schemas and UML models



uml-models Public  
Community for the discussion of change proposals to the INSPIRE UML models.  
HTML ⭐ 0 🏷 1 ○ 1 🔍 0 Updated 5 days ago

technical-guidelines Public  
Community for the discussion of change proposals to the INSPIRE Technical Guidance documents.  
HTML ⭐ 3 🏷 11 ○ 13 🔍 1 Updated 5 days ago

application-schemas Public  
Community for the discussion of change proposals to the INSPIRE XML schemas.  
⭐ 6 🏷 8 ○ 9 🔍 2 Updated 14 days ago

example (schemas): <https://github.com/INSPIRE-MIF/application-schemas/blob/main/governance-release-process/process.md>

# Technological stack



- INSPIRE (legal framework) as a catalyst for technological innovation:
  - central components based on reusable, open source software solutions

The screenshot shows the INSPIRE Geoportal homepage. At the top, there's a navigation bar with the European Commission logo, a search bar, and language selection (English). Below it, a banner says "ENHANCING ACCESS TO EUROPEAN SPATIAL DATA". The main content area is titled "INSPIRE GEOPORTAL" and features a "INSPIRE Datasets - EU & EFTA Country overview" map. To the right of the map, there's a summary box with the following statistics:

- 91533 Metadata records
- 44778 Downloadable Datasets
- 46446 Viewable Datasets

A section titled "Select a COUNTRY" lists datasets for various countries with their respective counts. At the bottom, there are buttons for "Select the whole EUROPE" and "Download stats".

INSPIRE Geoportal, based on  
GeoNetwork opensource

The screenshot shows the "INSPIRE Validator - Test selection" page. It has a header with the European Commission logo, search bar, and language selection (English). The main content area is titled "Configure your test". It includes sections for selecting the INSPIRE resource to test (radio buttons for Metadata, View Service, Download Service, Discovery Service, or Data set), selecting the Technical Guidelines version (radio buttons for Version 1.3 - DEPRECATED or Version 2.0), and selecting the type of metadata record(s) to be tested (radio buttons for Data sets and data set series, Network Service, or Spatial Data Service). There's also an "Advanced options" dropdown. Below these, there's a "Provide the resource to test" section with a "File upload" input field, a "Choose files" button, and a note about file size and accepted formats. At the bottom, there's a "Start test >" button.

INSPIRE Reference Validator, based  
on the ETF testing framework

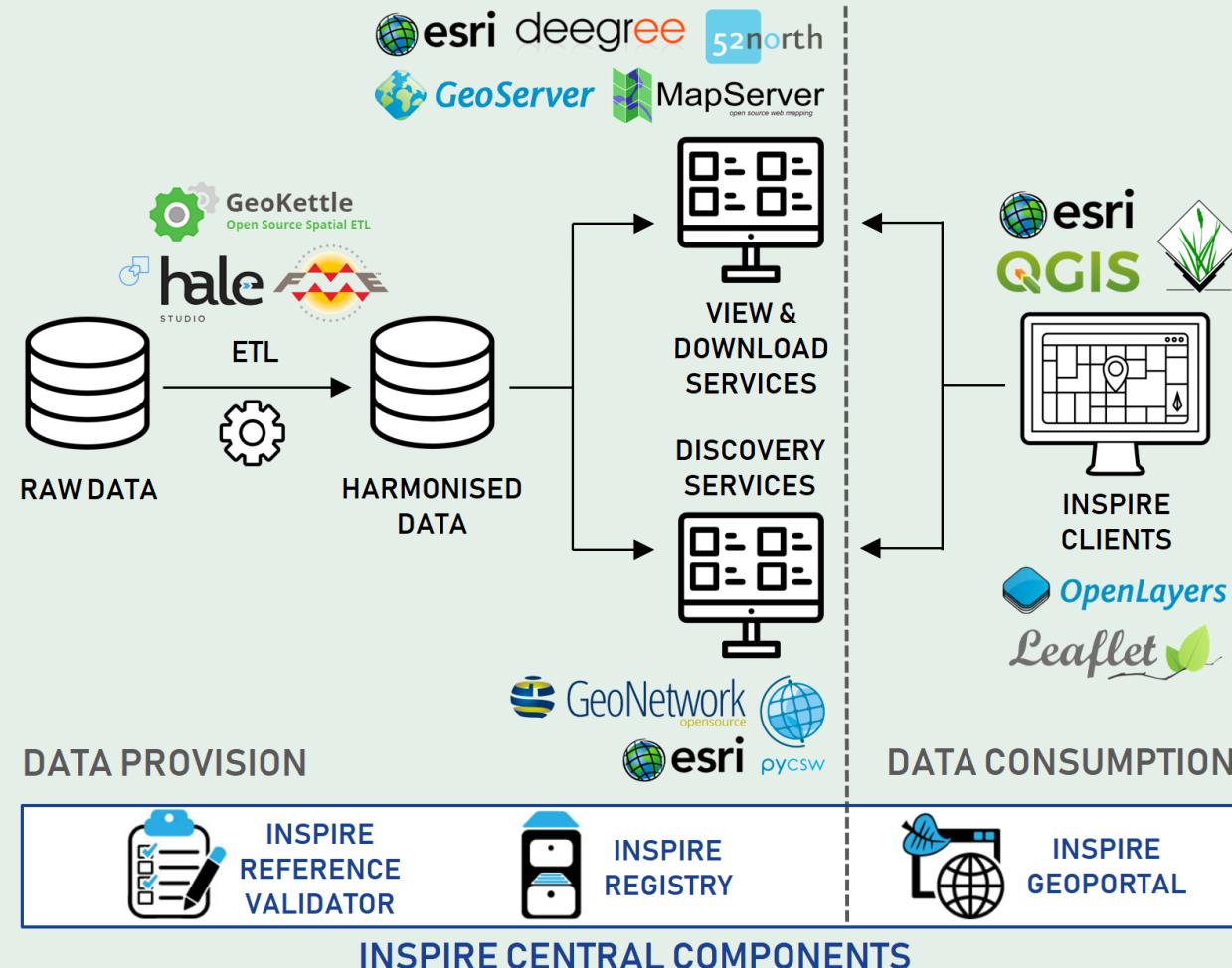
The screenshot shows the "INSPIRE Registry" page. It has a header with the European Commission logo, search bar, and language selection (English). The main content area is titled "INSPIRE registry". It includes sections for "ID" (http://inspire.ec.europa.eu/registry), "Label" (INSPIRE registry), "Content Summary", "Registry manager" (European Commission, Joint Research Centre), and "Other formats" (XML, Registry ID: 190 19122). Below these, there's a "Registers" section listing various INSPIRE registers such as INSPIRE application schema register, INSPIRE code list register, etc. At the bottom, there are pagination controls for items per page (50) and a link to "Showing 1 to 10 of 10 entries".

INSPIRE Registry, based on the Re3gistry

# Technological stack



- INSPIRE-related software for data provision and consumption



# Impact of standardisation



Open  
Geospatial  
Consortium.

ISO W3C®



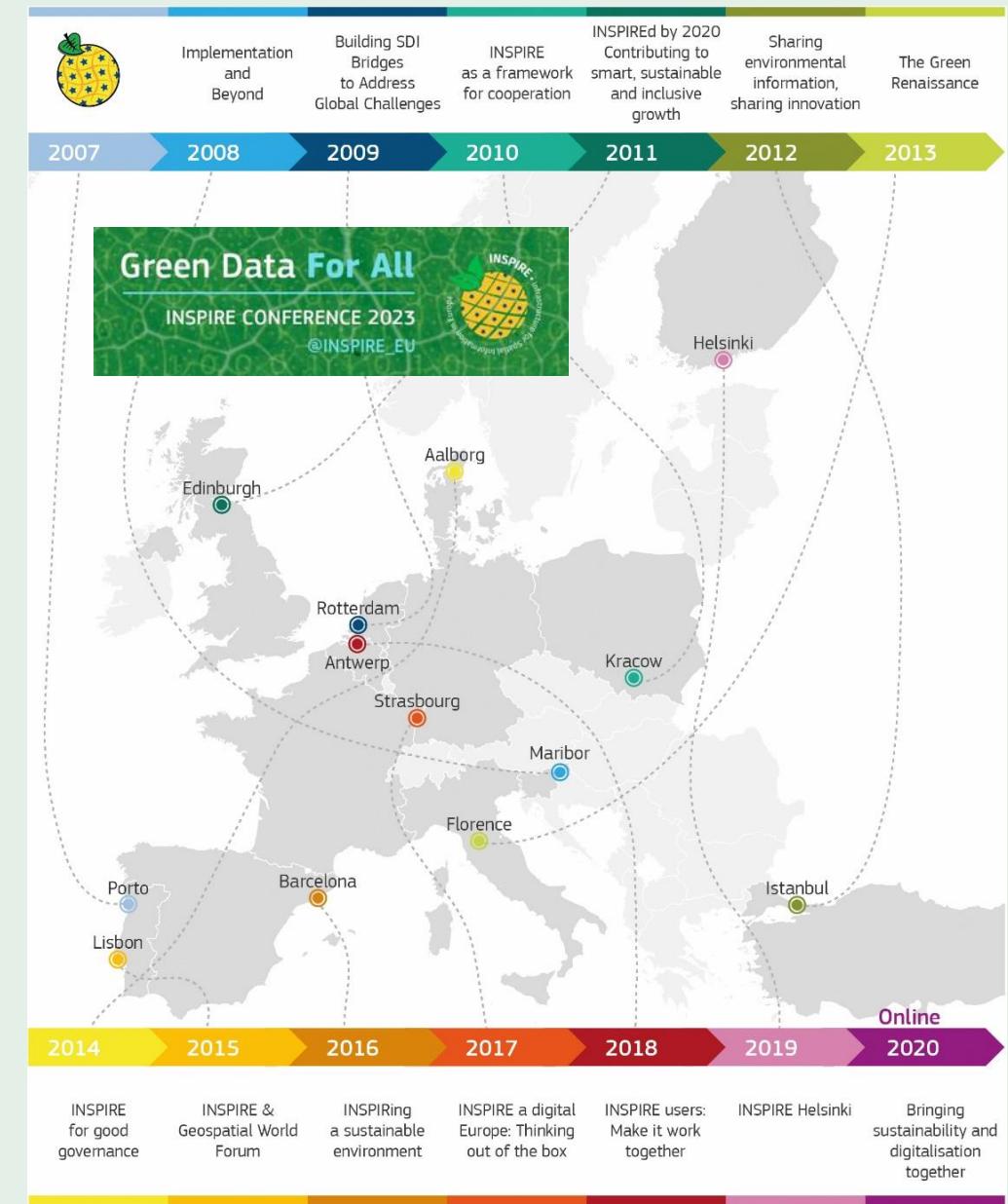
- INSPIRE is by nature based on **open standards** – probably the largest uptake of OGC standards worldwide!
  - **benefits** for all players: data providers, users & standardisation bodies
  - **problems** of slowing down the implementation process
- Only mature and **well-supported standards** should be **considered** for INSPIRE technical provisions:
  - selected standards should not only satisfy the legal requirements, but also simplify the lives of providers/users!



# Community



*“A technical infrastructure is only as good as the social infrastructure underpinning it”*



# Custom extensions are problematic!



- Wrong assumption that INSPIRE requirements would automatically lead to the evolution of software tools, such as:
  - support for **GML encoding** of INSPIRE data in mainstream GIS software
  - support for **extended capabilities** of INSPIRE network services
- Complex requirements only covering specific ‘niches’ created an **implementation overhead** with little value added.

# Heterogeneity in licensing



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  - open vs. closed data, data with licensing information not available
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- Heterogeneous licensing approaches are a **barrier to data usage**:
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  - use of custom licenses (often in country-specific languages)
- Need for a **common European approach** for the licensing of the data:
  - Open Data Directive (2019) & Implementing Act on high-value datasets (2022)
  - reuse of existing licensing frameworks, e.g. Creative Commons



*Geospatial*



*Earth  
observation and  
environment*

*Meteorological*

*Statistics*

*Companies and  
company  
ownership*



*Mobility*

# Context



# Policy context

## Overview of data actions

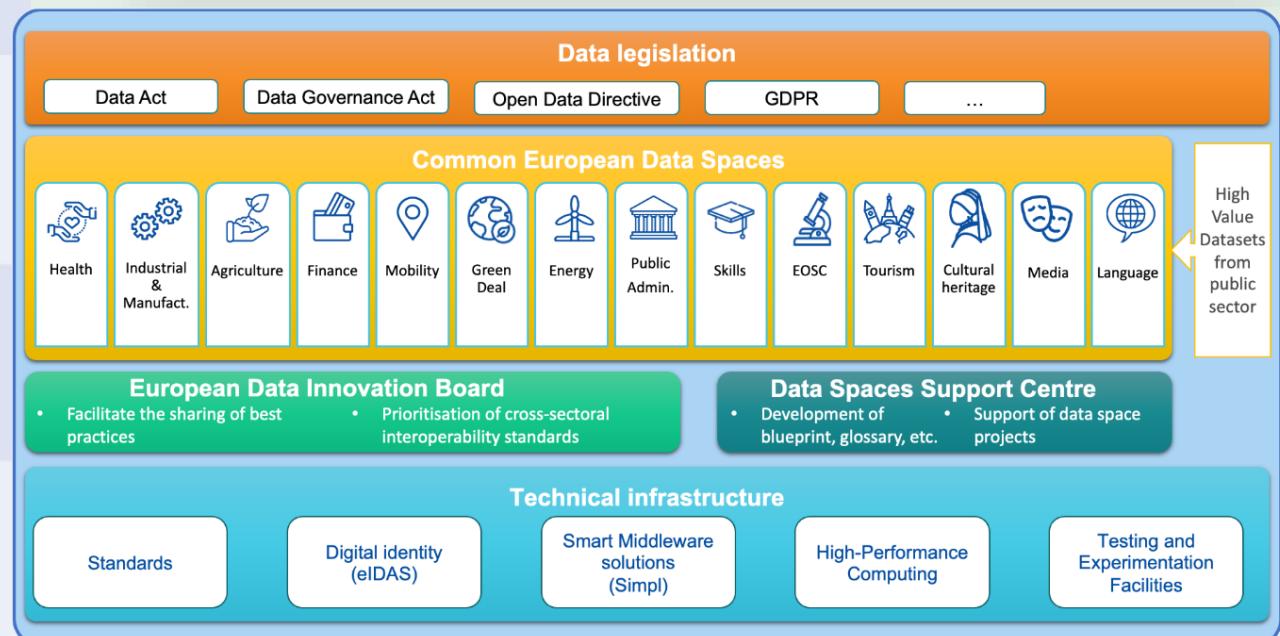
	[D] What data are we talking about?	[H] Who holds such data?	[A] What policy intervention?
<b>Good governance of data cannot wait</b>			
Data Governance Act	[D] Data voluntarily made available by data holders	[H] Public sector, business, individuals, researchers	[A] Make such data easier to share in a controlled manner (technical, legal and with organisational support); Build trust in data sharing; Ensure data interoperability access sectors
<b>Data: a key element of Big Tech's market power</b>			
Digital Markets Act	[D] Data held by online platforms originating from the users (both businesses and individuals)	[H] Online platforms	[A] Among other policy options; identify appropriate data access and data portability remedies
<b>High quality government data for SMEs &amp; innovation</b>			
Implementing Act under Open Data Directive	[D] "High-value" open government data	[H] Public sector	[A] Make such data available for re-use free of charge
<b>Better access to and control over data for a fair data economy</b>			
Data Act	[D] Co-generated, IoT data from industry and individuals, Big Data sources held by business	[H] Business	[A] Ensure flexible use of Big Data sources by government for the common good. Establish fairness in use of co-generated, IoT data. Make sure that Europeans stay in control over their data vis-à-vis third country jurisdictions. Examine IPR legislation for possible obstacles.

Source: adapted from European Commission, SWD(2020) 295 final

[https://knowledge-base.inspire.ec.europa.eu/policy-context\\_en](https://knowledge-base.inspire.ec.europa.eu/policy-context_en)

## COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

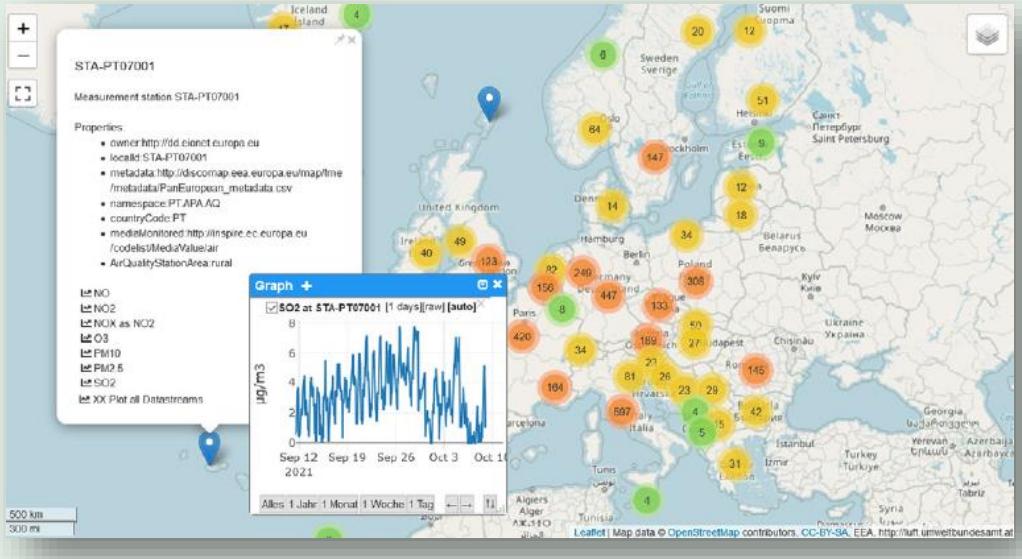
### A European strategy for data



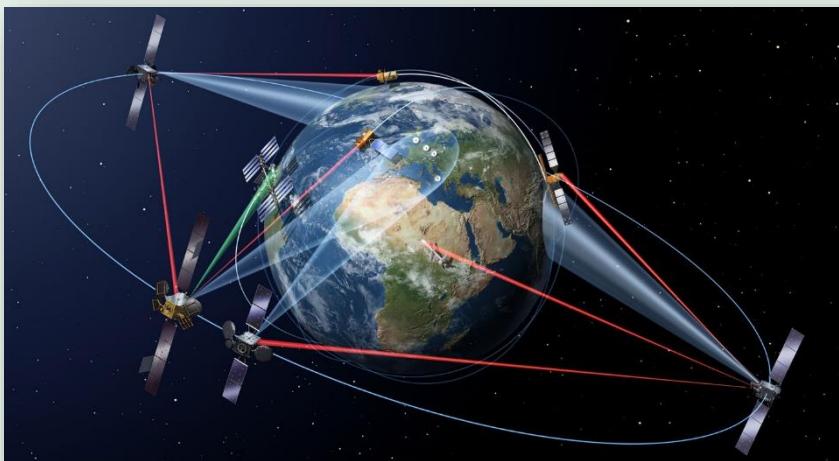
Content courtesy of DG CONNECT, Unit G.1

# Technology trends – new data sources

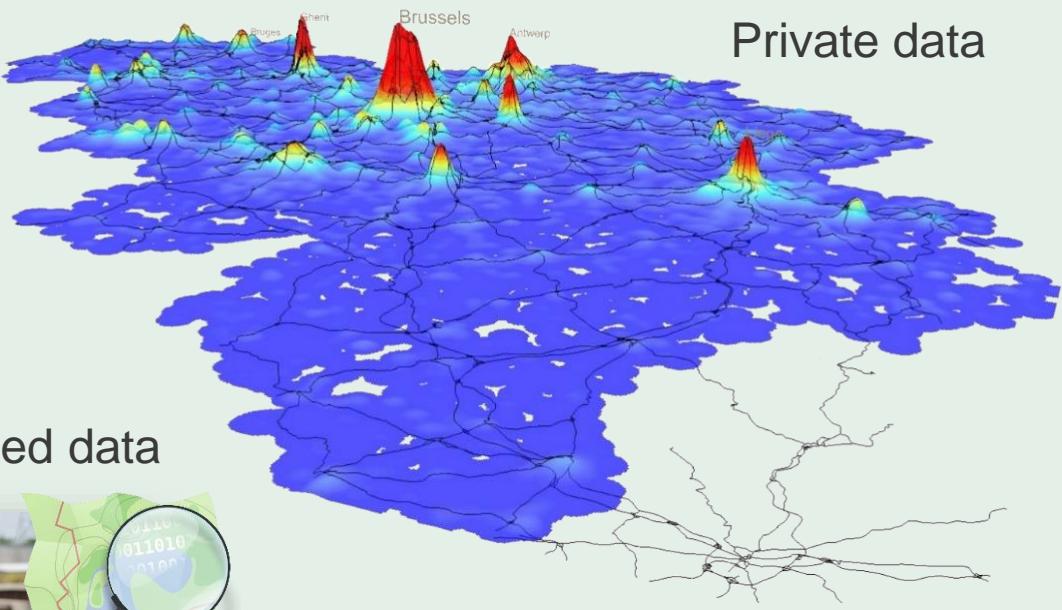
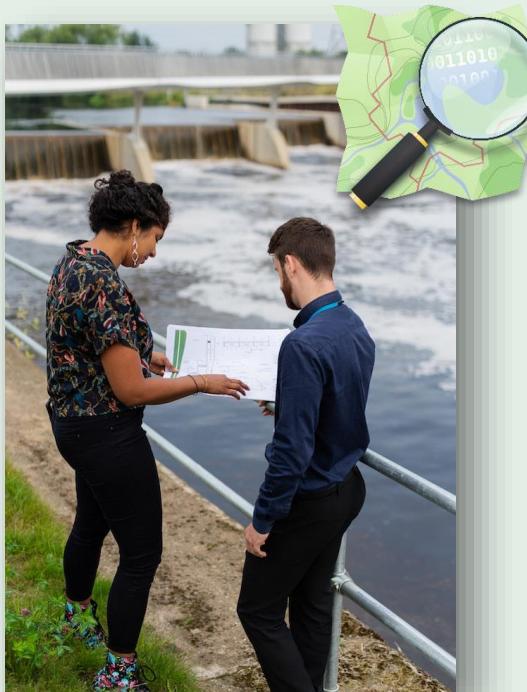
## Internet of Things



## Copernicus

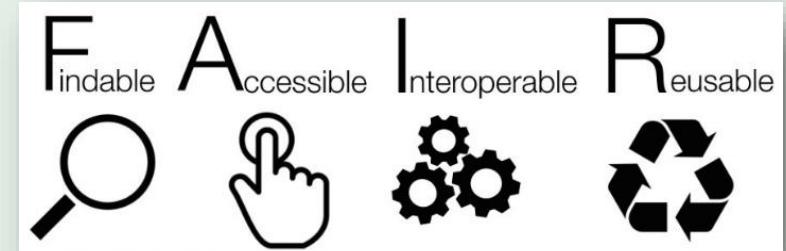


## Citizen-generated data



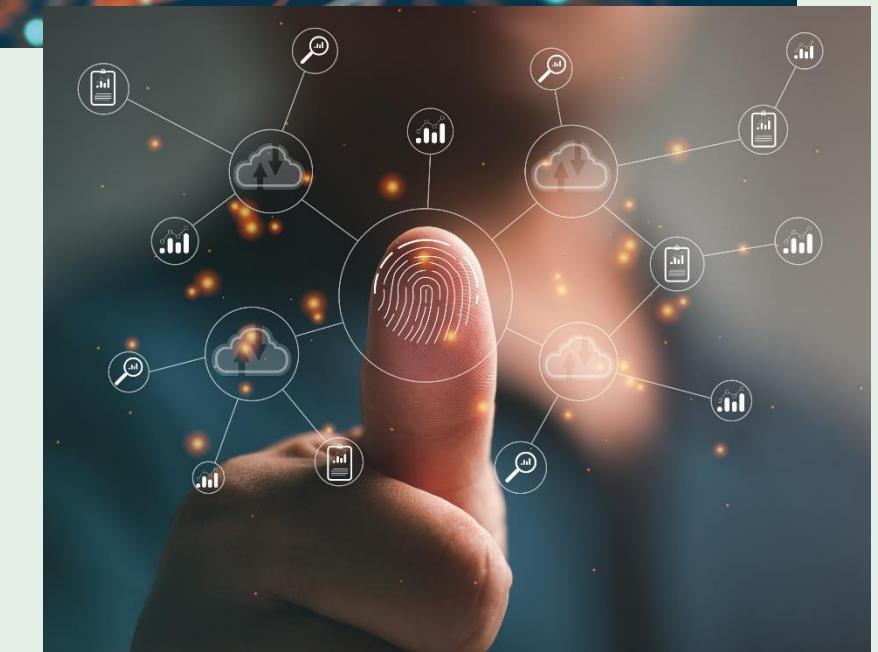
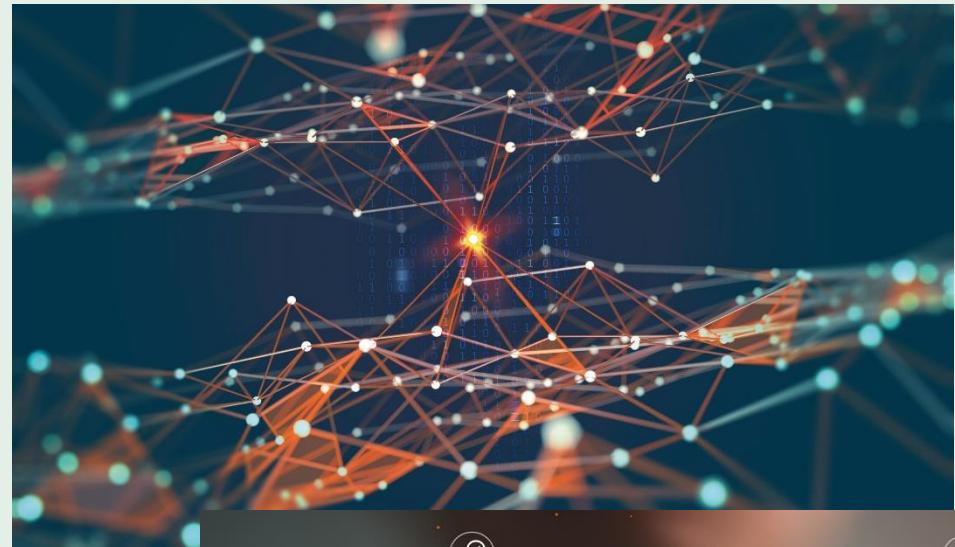
## Private data

## Open research data



# Technology trends

- From data collection to **data connection**:
  - APIs, APIs, APIs
- Agile standards
- Mature tools:
  - multiple approaches for using & serving data
  - powerful **ETL** instruments
- Novel **architectures**:
  - federated cloud
  - edge/fog
  - Solid



# *Vision*



# The possible future of INSPIRE

- Data sharing is **not a goal in itself**. To remain fit for purpose, INSPIRE should support data-driven decision-making and innovation.
- To be sustainable, INSPIRE should ‘**blend in**’ with the broader ecosystem of spatial and non-spatial data, infrastructures, technologies and policies.
- This will mean **opening up to a broader community** of implementers and users and to a wider range of applications and use cases.
- Making the INSPIRE framework more **flexible and agile** will significantly lower the entry level to the sharing and utilisation of data.
- Technical approaches need to be simplified by reusing well-adopted standards and technologies.

# Actions

- Legal:
  1. Avoid overspecification in legislation
  2. Use a simple licensing framework

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  2. Rethink the existing governance structures
  3. Adopt an ecosystem approach

# Actions

- Legal:
  1. Avoid **overspecification** in legislation
  2. Use a **simple licensing framework**
- Organisational:
  1. Embrace **co-design** by default
  2. Rethink the existing **governance structures**
  3. Adopt an **ecosystem approach**
- Technological:
  1. Continue to improve the **discoverability** and **accessibility** of data
  2. Ensure **neutrality** and embrace well-adopted standards and technologies
  3. Avoid **custom extensions**
  4. Embrace well-documented, **standard-based APIs**
  5. Optimise data for **search engines**
  6. Leverage on the developments of **federated European cloud infrastructure**

# Present and future of INSPIRE

- Evaluation of the Directive (2022)
  - recognised achievements & issues
  - demonstrated that INSPIRE is still relevant
  - identified the need for simplification & alignment with other legislation
- Revision of the Directive (2024-2026) known as GreenData4All initiative

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- Revision of the Directive (2024-2026) known as GreenData4All initiative
- JRC scientific support throughout the whole process



# Special Issue alert

Special Issue  
*Data in Brief*

CALL FOR PAPERS

Common European Data Spaces  
Enabling data-driven innovation at scale

DEADLINE FOR SUBMISSION  
20 December 2024

Guest Editors: **Marco Minghini**, PhD (European Commission, Joint Research Centre, Ispra, Italy) · **Alexander Kotsev**, PhD (European Commission, Joint Research Centre, Ispra, Italy) · **Matthijs Punter**, PhD (TNO, Amsterdam, The Netherlands) · **Paolo Mazzetti**, PhD (Italian National Research Council - Institute of Atmospheric Pollution, Florence, Italy) · **Tuomo Tuikka**, PhD (VTT Technical Research Centre of Finland, Espoo, Finland) · **Edward Curry**, PhD (University of Galway, Galway, Ireland) · **Natalie Bertels**, PhD (KU Leuven, Leuven, Belgium).

<https://www.sciencedirect.com/journal/data-in-brief/about/call-for-papers#common-european-data-spaces-enabling-data-driven-innovation-at-scale>

# Obrigado!



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