Session 1 – Pillars of INSPIRE data interoperability

Data Specifications

Andrej Abramić

ECOAQUA

www.ecoaqua.eu

EMODnet-INSPIRE technical workshop

7-8 December 2015, Brussels

Research and Technology to enhance excellence in maritime development under an Ecosystem approach

UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA

CAMPUS ATLÁNTICO TRICONTINENTAL CANARIAS 2010/2015

Parque Científico Tecnológico

Grupo de Investigación en Acuicultura

Bioges

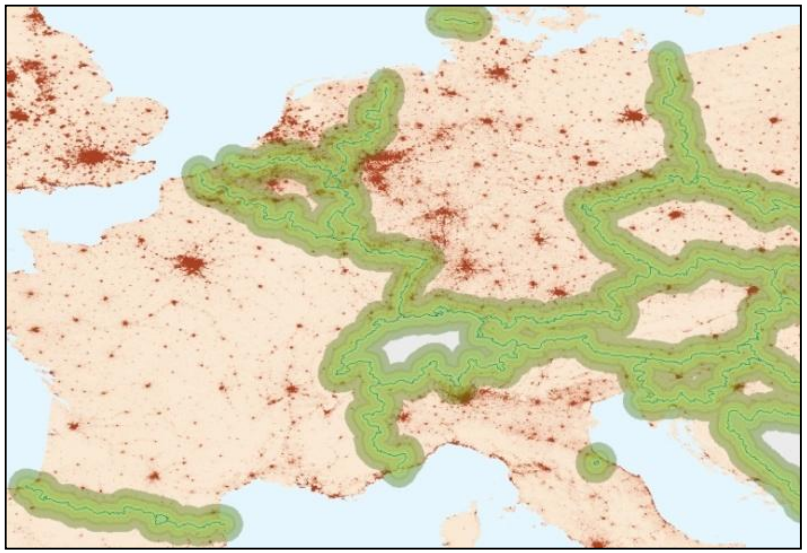
Interoperability???

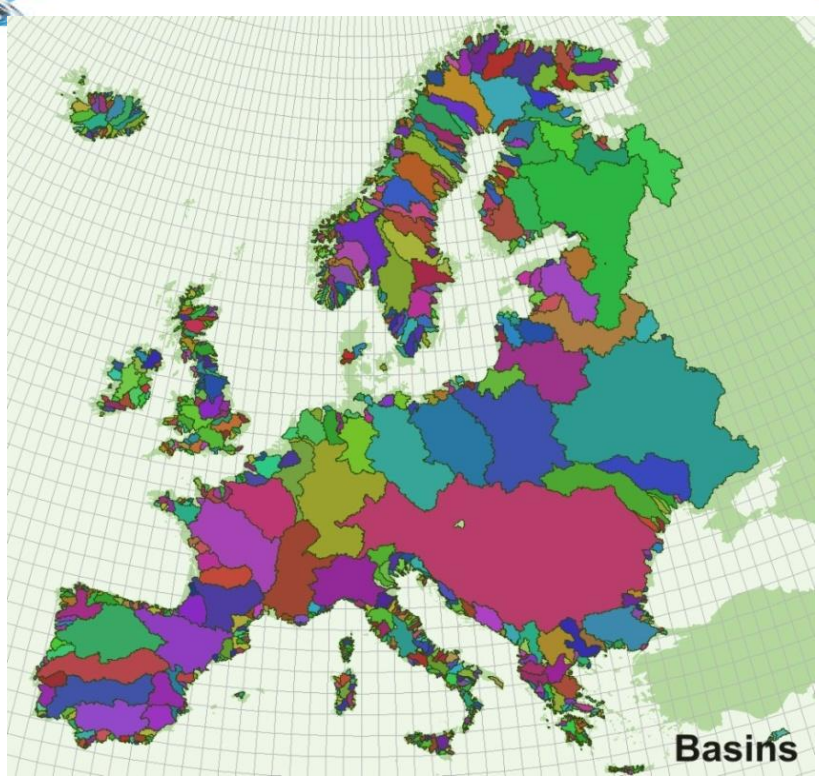
Interoperability deals with:

- 24 official languages
- 3 official alphabets
- Different institutional setups
- Diverse data governance
- Celebrated diversity

Motivation for the interoperability and development of European SDI

- Natural Disasters and as well as other environmental phenomena do not stop at national borders!
- 20% of the EU citizens (115 million) live within 50 Km from a border

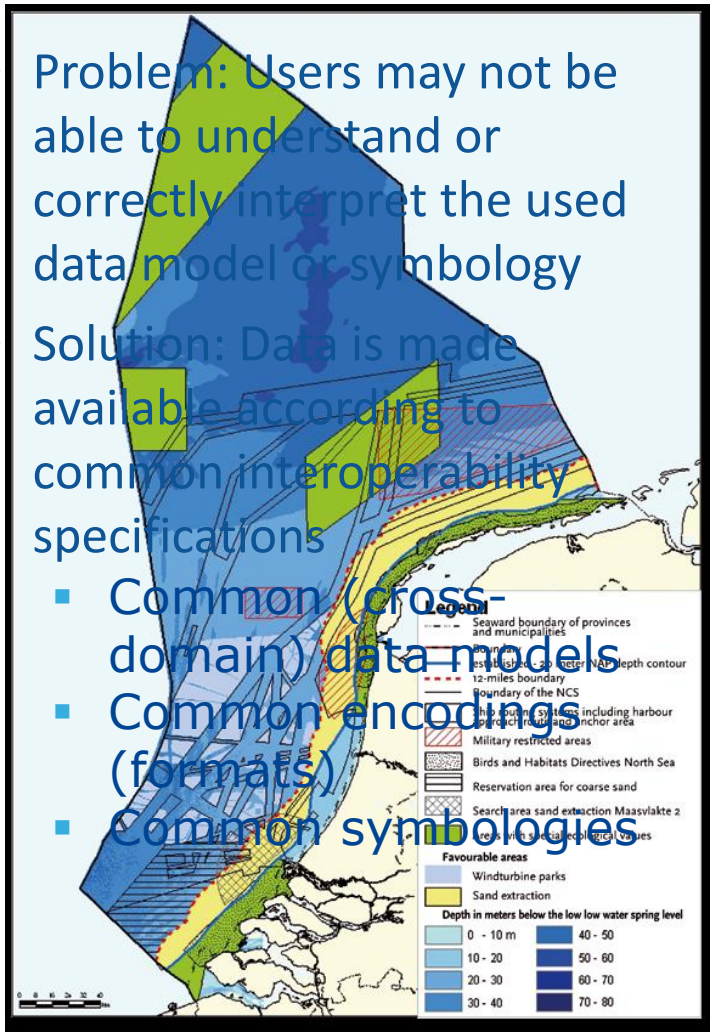


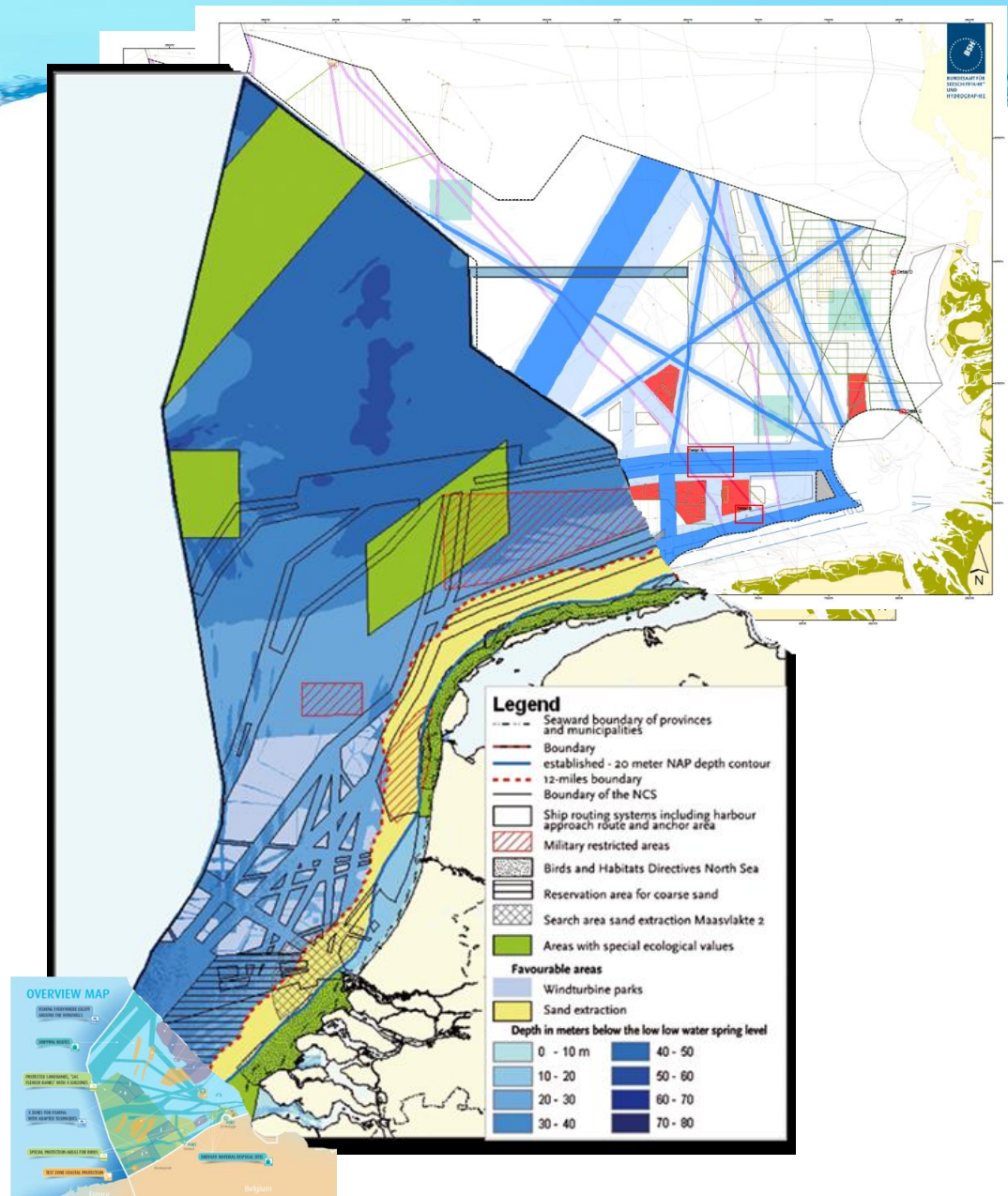


- 70% of all fresh water bodies in Europe are part of a trans-boundary river basin
- The EU Water Framework Directive 2000/60/EC - *integrated river basin management* for Europe

Marine Spatial Planning - advanced EU examples

- Problem: Users may not be able to understand or correctly interpret the used data model or symbology
- Solution: Data is made available according to common interoperability specifications
  - Common (cross-domain) data models
  - Common encodings (formats)
  - Common symbologies





INSPIRE thematic scope

Annex I

1. Coordinate reference systems
2. Geographical grid systems
3. Geographical names
4. Administrative units
5. Addresses
6. Cadastral parcels
7. Transport networks
8. Hydrography
9. Protected sites

Annex II

1. Elevation
2. Land cover
3. Ortho-imagery
4. Geology

Annex III

1. Statistical units
2. Buildings
3. Soil
4. Land use
5. Human health and safety
6. Utility and governmental services
7. Environmental monitoring facilities
8. Production and industrial facilities
9. Agricultural and aquaculture facilities
10. Population distribution – demography
11. Area management/ restriction/regulation zones & reporting units
12. Natural risk zones
13. Atmospheric conditions
14. Meteorological geographical features
15. Oceanographic geographical features
16. Sea regions
17. Bio-geographical regions
18. Habitats and biotopes
19. Species distribution
20. Energy Resources
21. Mineral resources

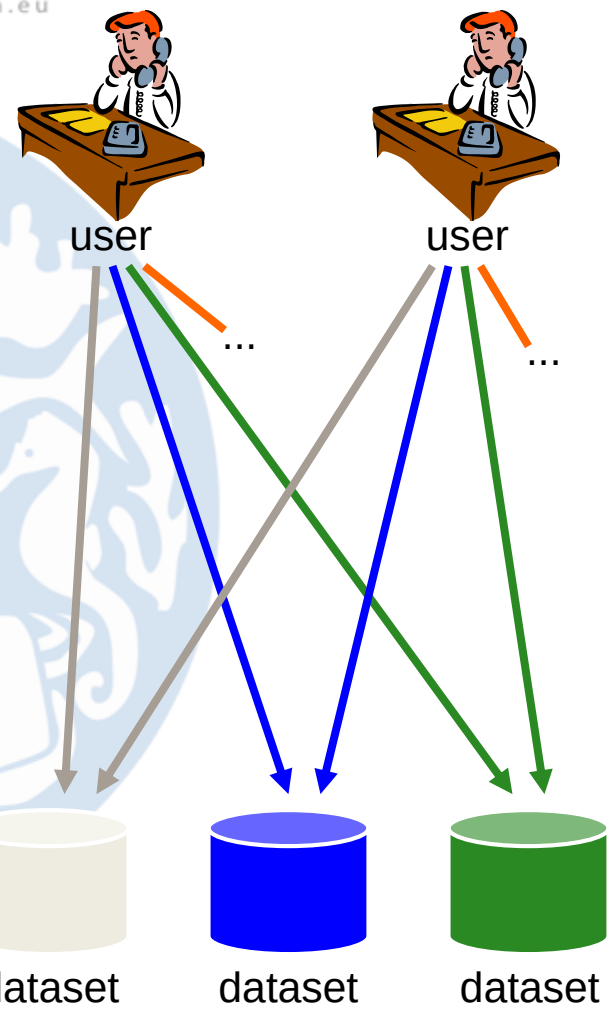
Cross-sector data interoperability

Data from other sectors

- Urban Planning
- Environmental Impact Assessment
- Risk Management
- Waste Management Plans
- ...

Data interoperability

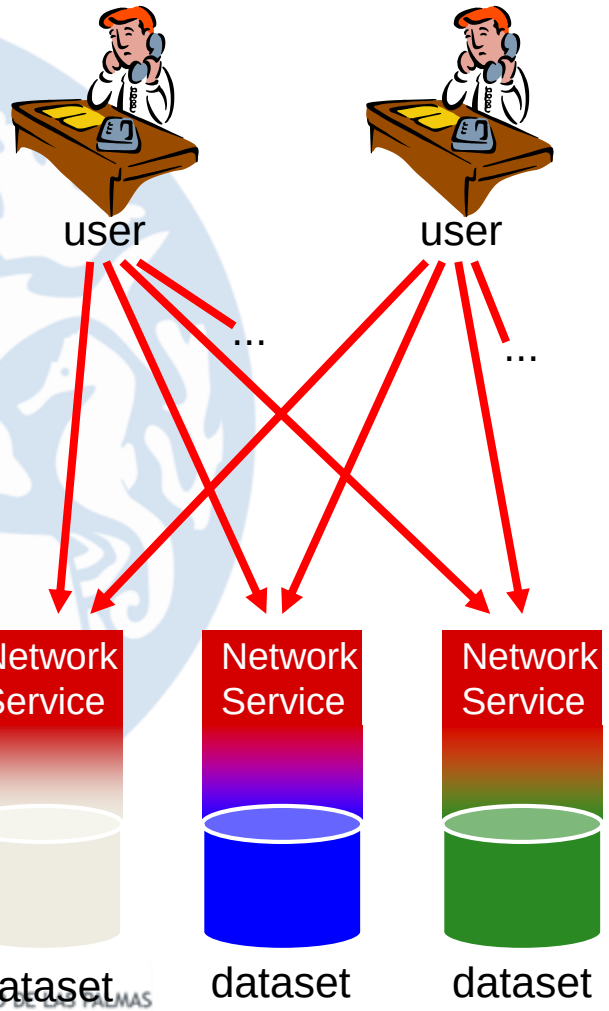
(pre**INSPIRE** situation)



The starting point ...

- Access to spatial data in various ways
- User has to deal with interpreting heterogeneous data in different formats, identify, extract and post-process the data he needs → lack of interoperability

Data interoperability



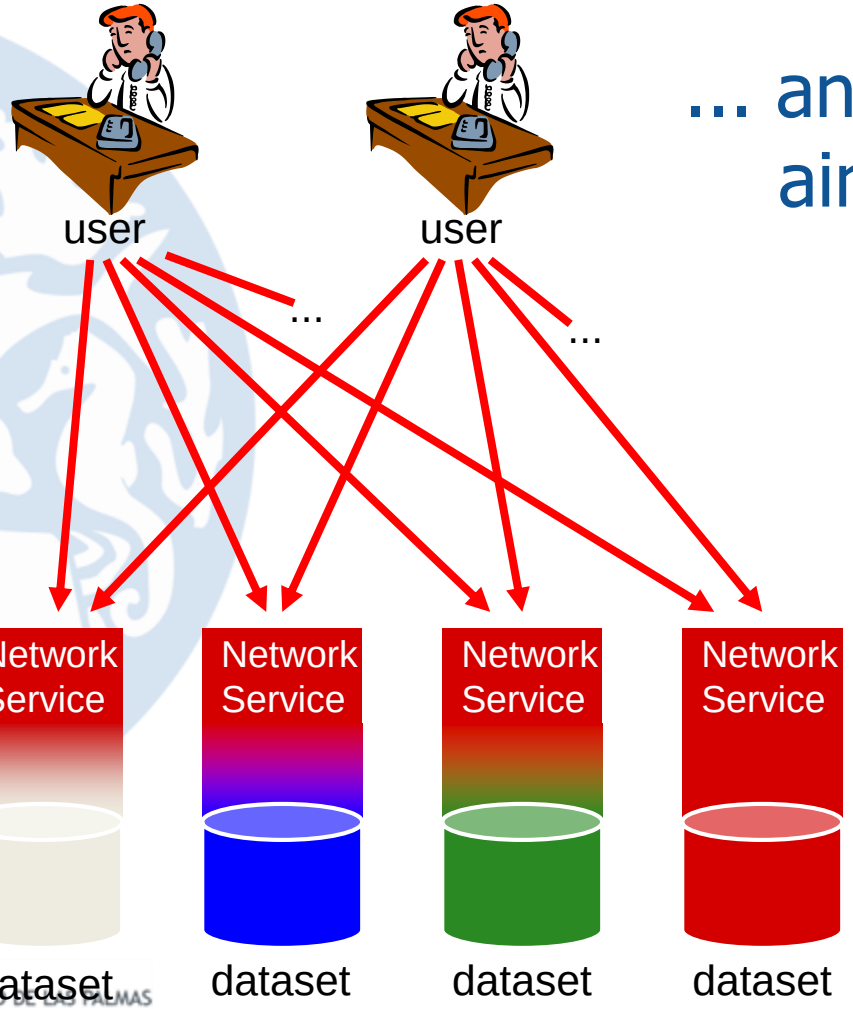
... and what INSPIRE is aiming at

- Provide access to spatial data via network services and according to a harmonised data specification to achieve interoperability of data

! **Datasets used in Member States may stay as they are**

! Data or service providers have to provide a transformation between their internal data model and the harmonised data specification

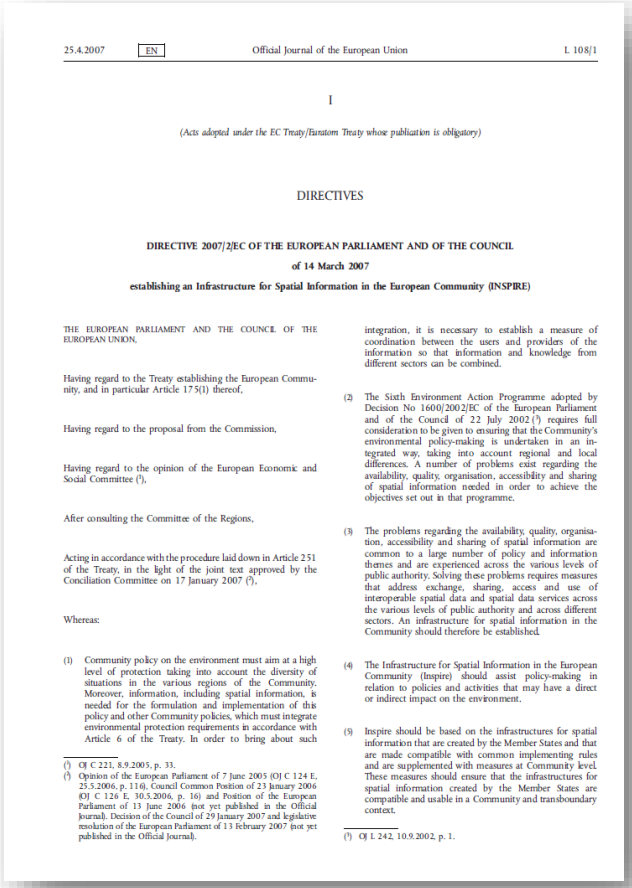
Data interoperability



... and what INSPIRE is aiming at

- Data providers may also choose to align their internal data model with the harmonised data specifications and extend these based on their requirements

INSPIRE Directive



25.4.2007 EN Official Journal of the European Union L 108/1

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(Acts adopted under the EC Treaty/Euratom Treaty whose publication is obligatory)

DIRECTIVES

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)

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community, and in particular Article 175(1) thereof,

Having regard to the proposal from the Commission,

Having regard to the opinion of the European Economic and Social Committee (1),

After consulting the Committee of the Regions,

Acting in accordance with the procedure laid down in Article 251 of the Treaty, in the light of the joint text approved by the Conciliation Committee on 17 January 2007 (2),

Whereas:

(1) Community policy on the environment must aim at a high level of protection taking into account the diversity of situations in the various regions of the Community. Moreover, information, including spatial information, is needed for the formulation and implementation of this policy and other Community policies, which must integrate environmental protection requirements in accordance with Article 6 of the Treaty. In order to bring about such integration, it is necessary to establish a measure of coordination between the users and providers of the information so that information and knowledge from different sectors can be combined.

(2) The Sixth Environment Action Programme adopted by Decision No 1600/2002/EC of the European Parliament and of the Council of 22 July 2002 (3) requires full consideration to be given to ensuring that the Community's environmental policy-making is undertaken in an integrated way, taking into account regional and local differences. A number of problems exist regarding the availability, quality, organisation, accessibility and sharing of spatial information needed in order to achieve the objectives set out in that programme.

(3) The problems regarding the availability, quality, organisation, accessibility and sharing of spatial information are common to a large number of policy and information themes and are experienced across the various levels of public authority. Solving these problems requires measures that address exchange, sharing, access and use of interoperable spatial data and spatial data services across the various levels of public authority and across different sectors. An infrastructure for spatial information in the Community should therefore be established.

(4) The Infrastructure for Spatial Information in the European Community (Inspire) should assist policy-making in relation to policies and activities that may have a direct or indirect impact on the environment.

(5) Inspire should be based on the infrastructures for spatial information that are created by the Member States and that are made compatible with common implementing rules and are supplemented with measures at Community level. These measures should ensure that the infrastructures for spatial information created by the Member States are compatible and usable in a Community and transboundary context.

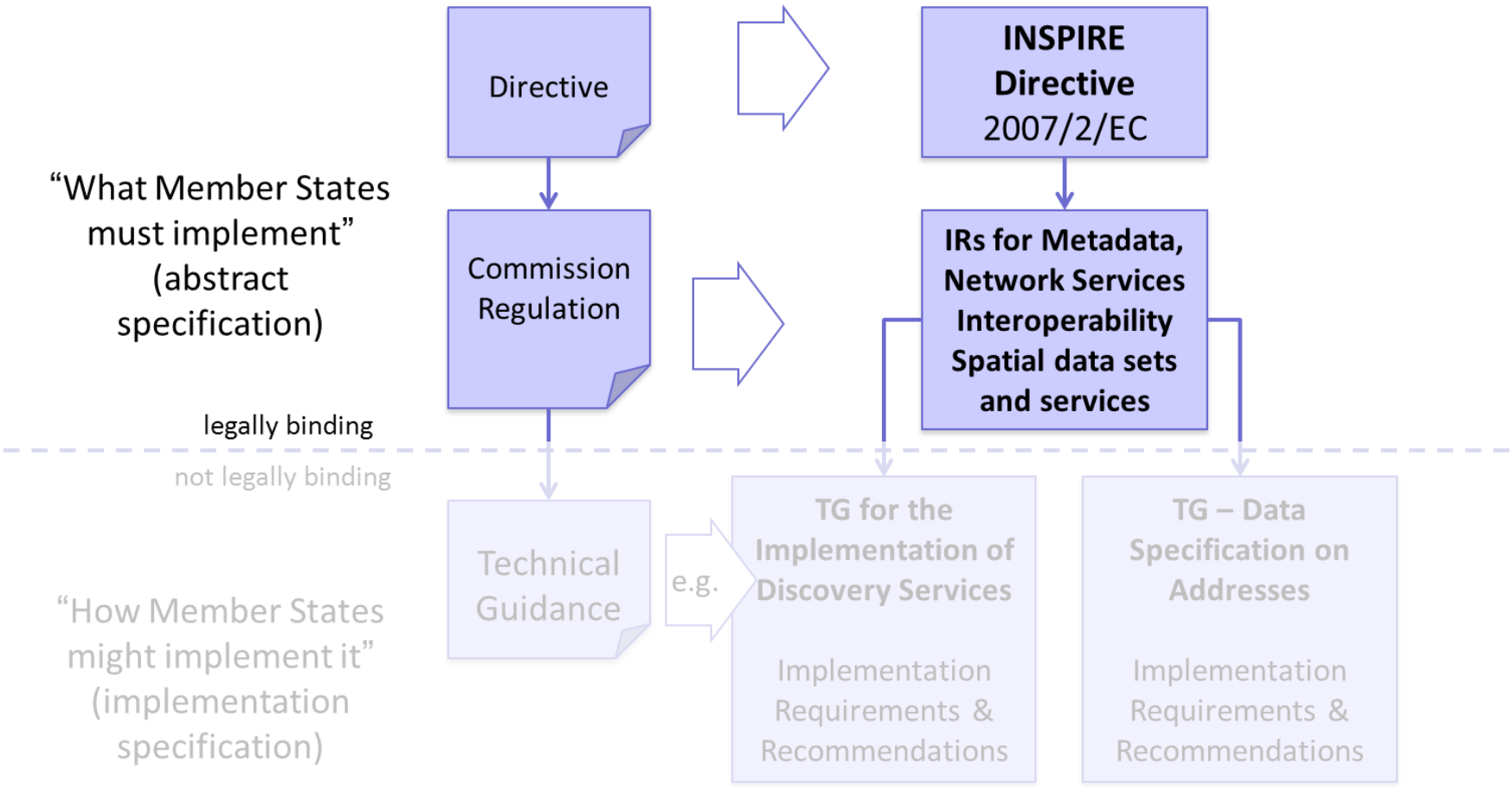
(1) OJ C 221, 8.9.2005, p. 33.
(2) Opinion of the European Parliament of 7 June 2005 (OJ C 124 E, 25.5.2006, p. 116), Council Common Position of 23 January 2006 (OJ C 126 E, 30.5.2006, p. 16) and Position of the European Parliament of 13 June 2006 (not yet published in the Official Journal). Decision of the Council of 29 January 2007 and legislative resolution of the European Parliament of 13 February 2007 (not yet published in the Official Journal).

(3) OJ L 242, 10.9.2002, p. 1.

- INSPIRE is a **Framework Directive**
- **General rules** to establish an **Infrastructure for Spatial Information in Europe** for
  - Community **environmental policies**
  - Policies or activities which impact on the environment
- INSPIRE is built on the **SDIs established and operated by the Member States**
- Spatial data held by/on behalf of **public authorities**
- Does **not** require **collection of new data**

- **JRC** is/was the **technical coordinator**

Legally binding documents



INSPIRE Implementing Rules (IRs)

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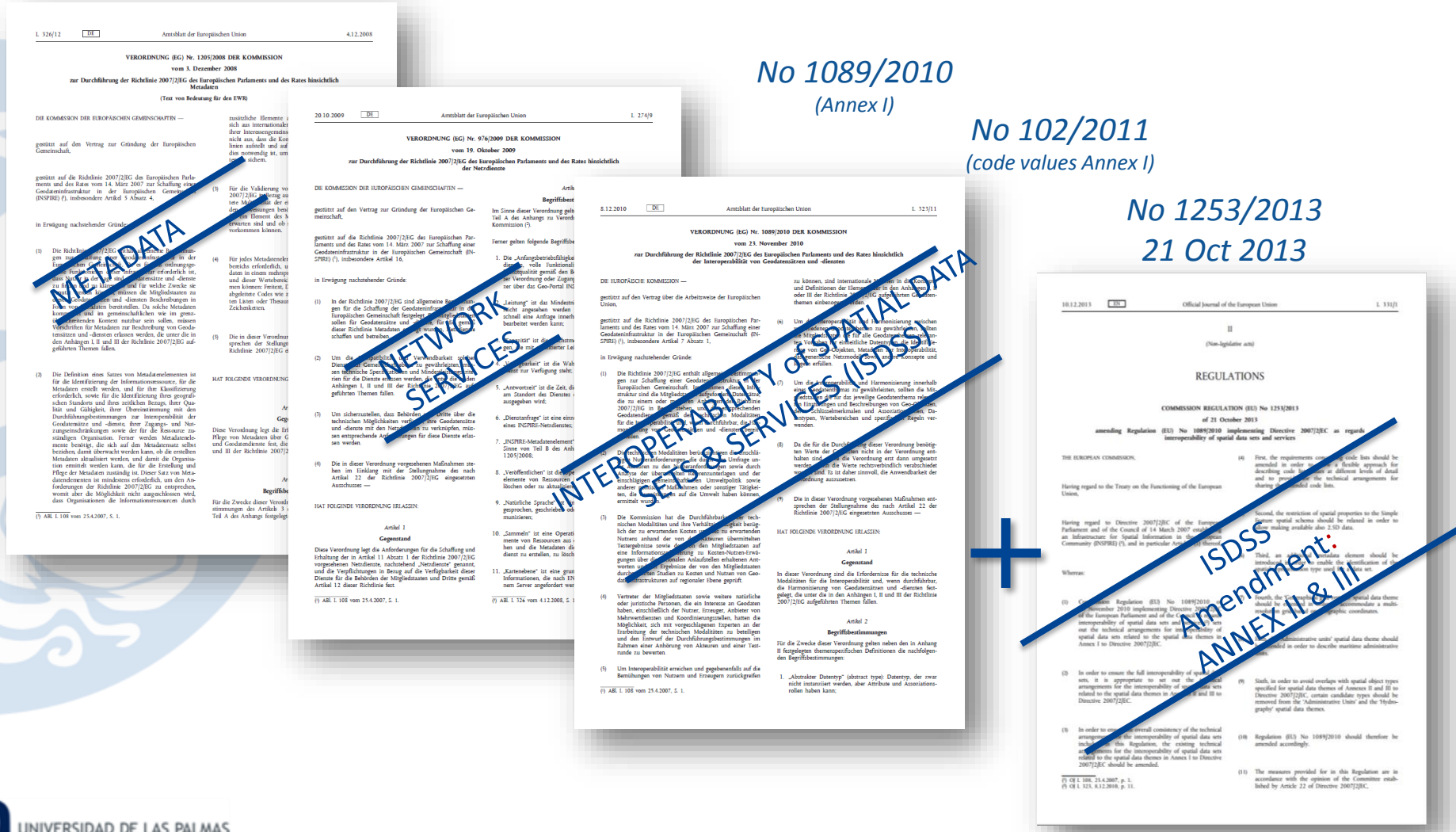

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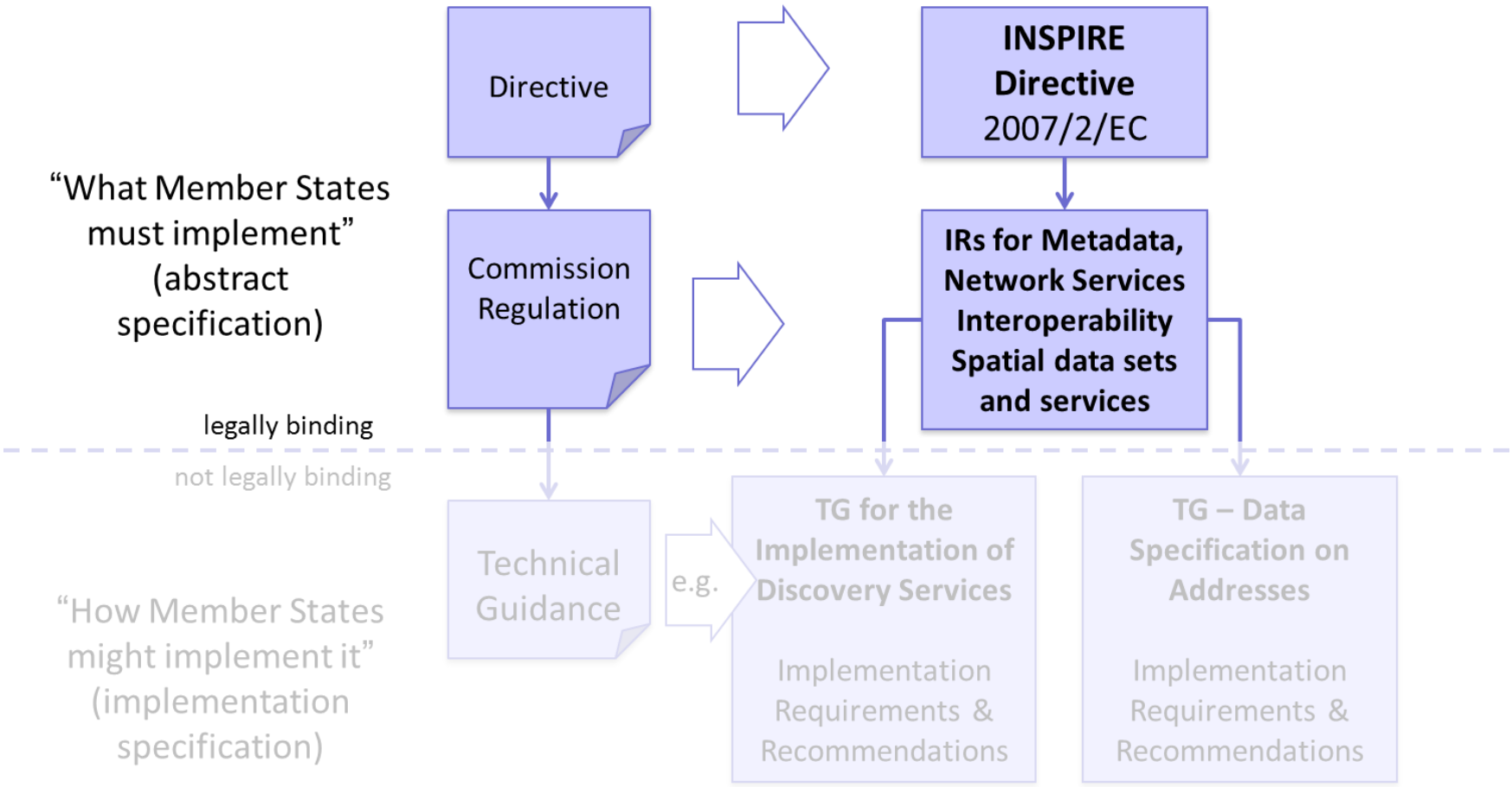
Implementing Rules vs. Technical Guidelines



Key pillars of INSPIRE data interoperability

Conceptual data models

- spatial objects and their properties and relationships for 34 data themes
- cross-domain harmonization
- based on a common modelling framework
- managed in a common UML repository

Encoding

- GML application schemas as standard encoding
- conceptual models independent of concrete encodings
- also possible to derive other encodings (e.g. based on RDF)

Harmonised vocabularies

- to overcome interoperability issues caused by free-text and/or multi-lingual content
- allow more specific terms from local vocabularies in addition to the harmonized terms

Registers

- provide unique and persistent identifiers for resources
- allow their consistent management and versioning
- items can be made unique and referred to unambiguously

Session 1 – Available tools and guidance's

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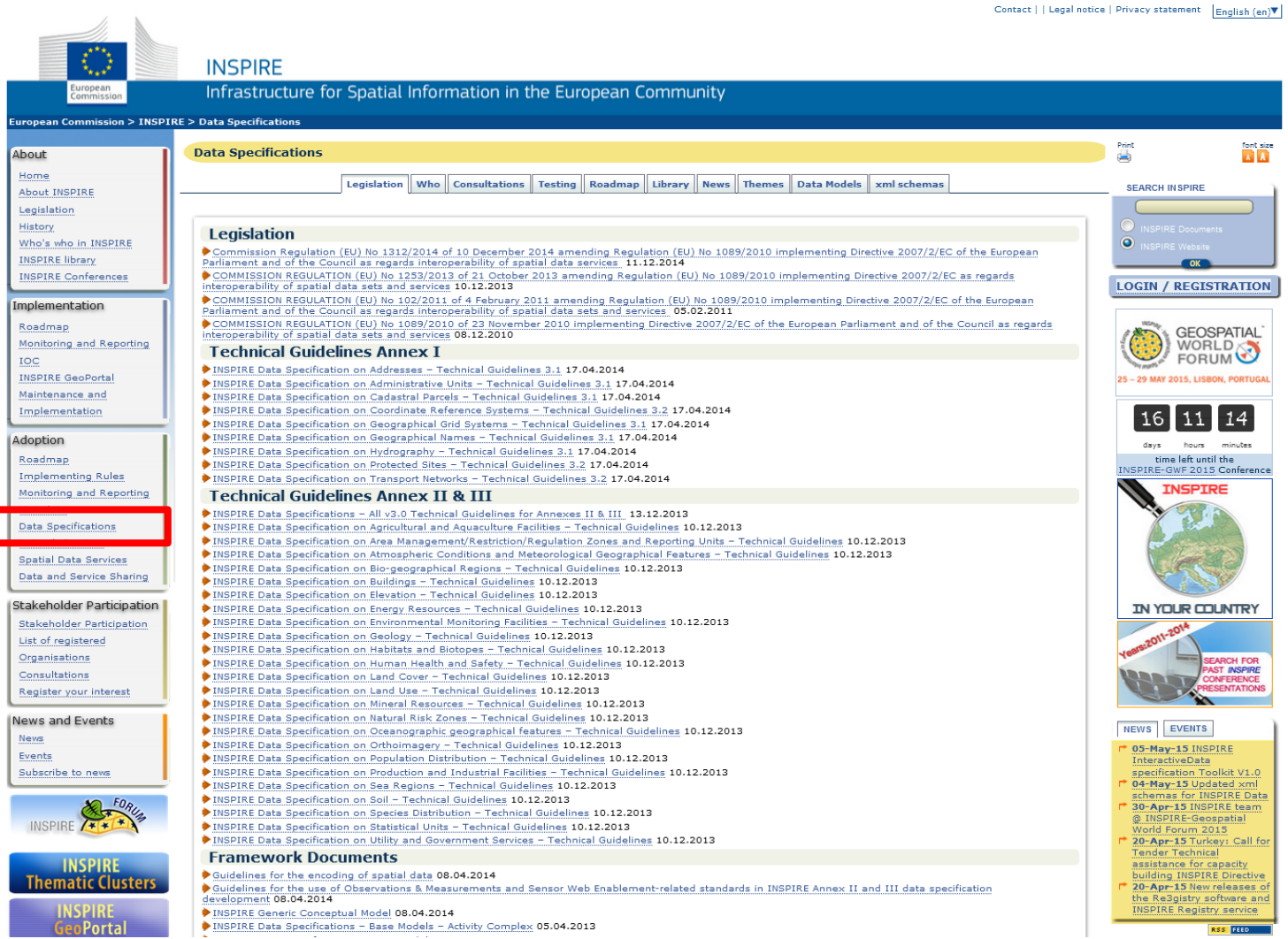
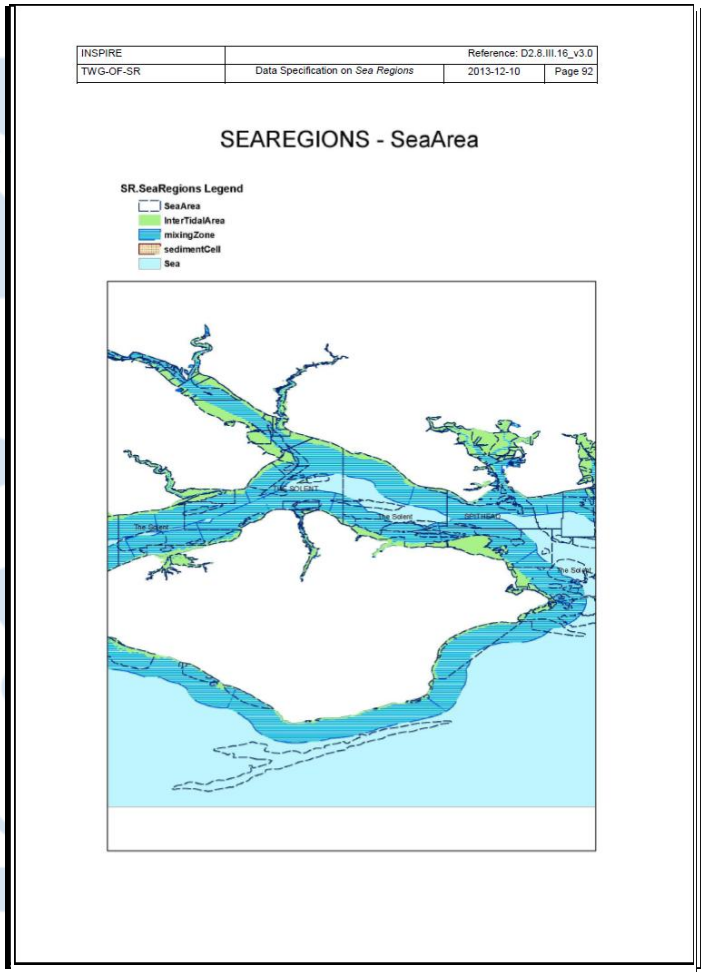
Data specification corner on INSPIRE web

http://inspire.ec.europa.eu



Technical Guidelines

(TG-Data Specification)



INSPIRE		Reference: D2.8.III.16_v3.0	
TWG-OF-SR	Data Specification on *Sea Regions*	2013-12-10	Page 92

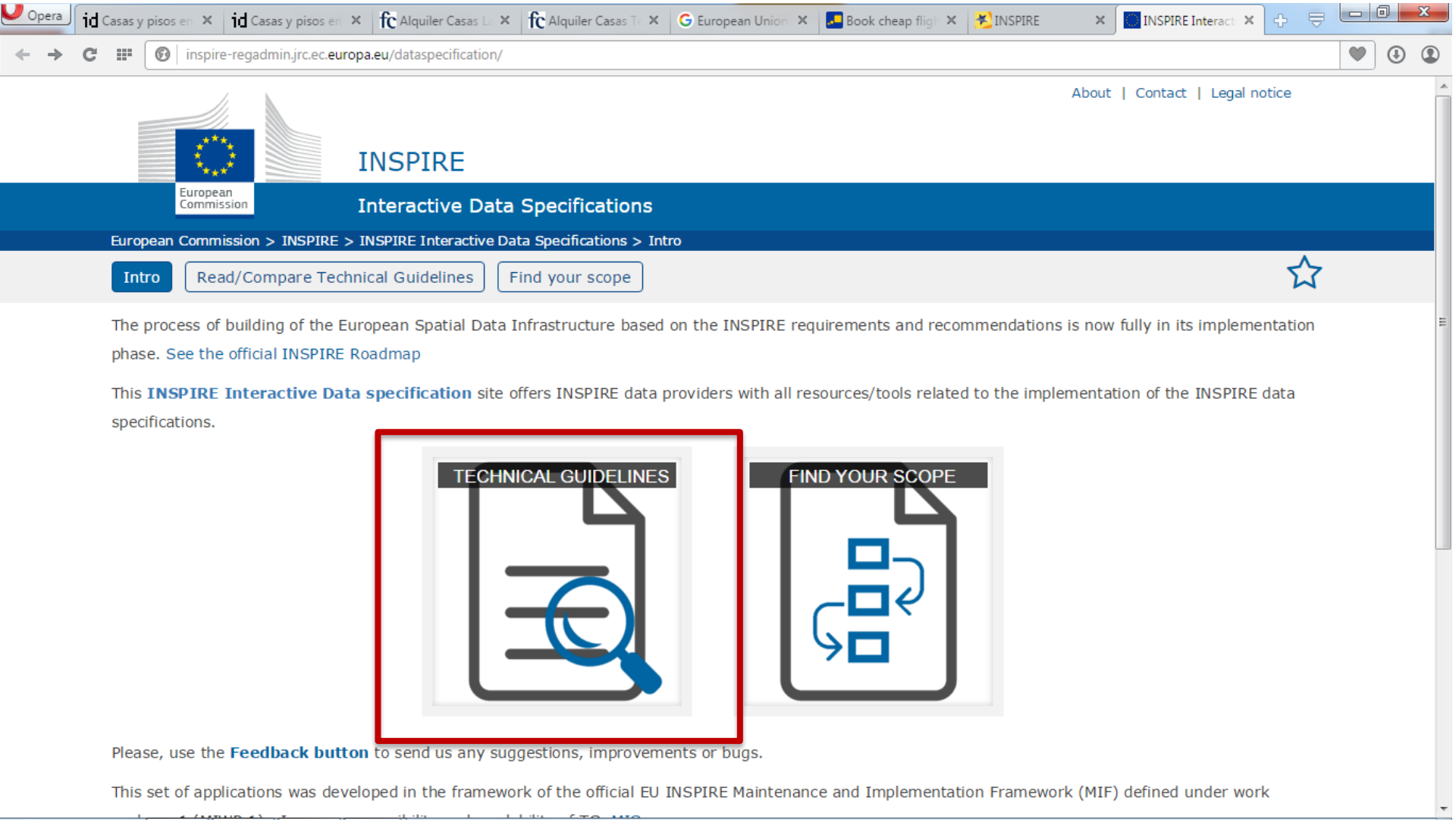
SEAREGIONS - SeaArea

SR.SeaRegions Legend

- SeaArea
- InterTidalArea
- mixingZone
- sedimentCell
- Sea

1 Scope
2 Overview and Description
3 Specification scopes
4 Identification information
5 Data content and structure
Application schemas, Feature catalogue,
Notations, Voidable characteristics,
Enumerations, Code lists
Identifier management
Geometry representation,
Temporality representation
6 Reference systems, units of measure and grids
Theme-specific requirements & recommendations
7 Data quality
8 Dataset-level metadata
9 Delivery incl. Encoding
10 Data Capture
11 Portrayal
12 Bibliography
Annex A (normative) Abstract Test Suite
Annex B (informative) Use cases
Annex C (normative) Code list values
Annex D (informative) Examples

INSPIRE Interactive Data Specifications – read Technical Guidelines



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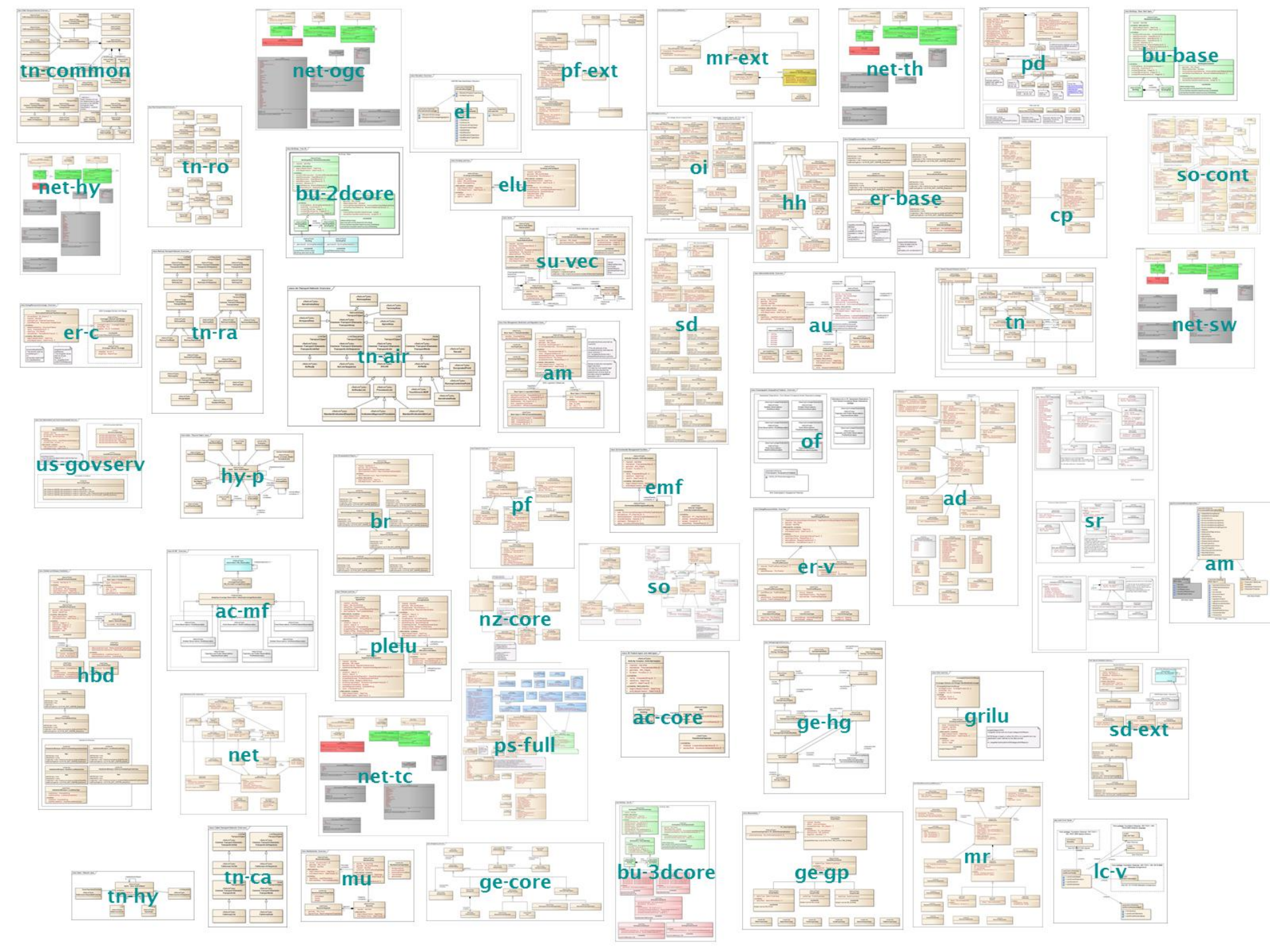
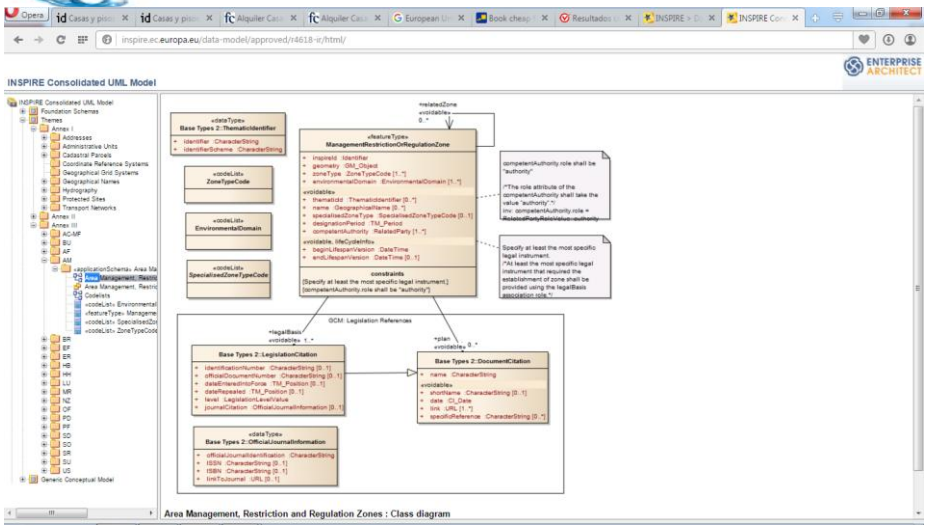
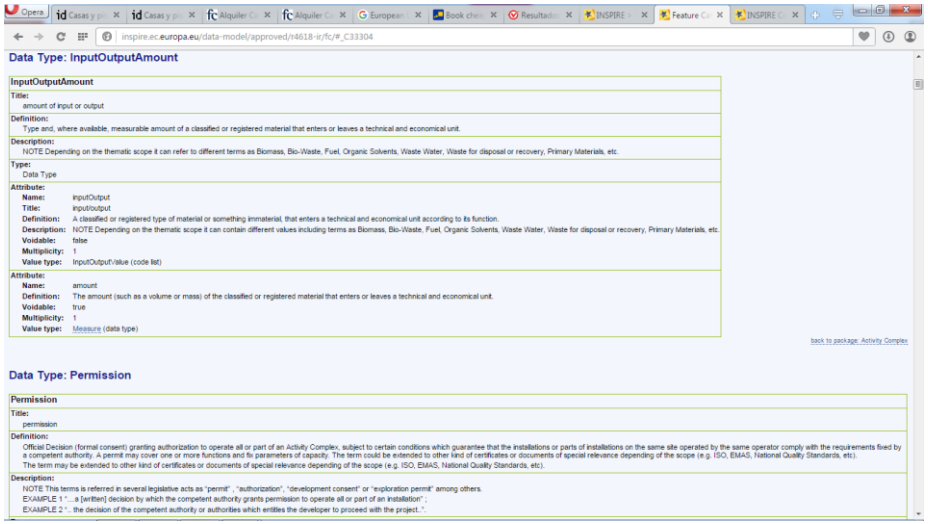

tn-common
net-ogc
pf-ext
mr-ext
net-th
pd
bu-base
el
tn-ro
net-hy
bu-2dcore
elu
oi
hh
er-base
cp
so-cont
su-vec
sd
au
tn
net-sw
er-c
tn-ra
tn-air
am
of
us-govserv
hy-p
br
pf
emf
ad
sr
am
er-v
so
ac-mf
nz-core
plelu
hbd
ac-core
ge-hg
grilu
sd-ext
net
net-tc
ps-full
tn-hy
tn-ca
mu
ge-core
bu-3dcore
ge-gp
mr
lc-v

Conceptual data models available :

- **As UML models & As Feature Catalogue**
- Available in HTML at the “Data specification corner”
- Available in Technical Guidance's documents
- **Explanation of the conceptual (UML) models** are given in the technical guidance documents



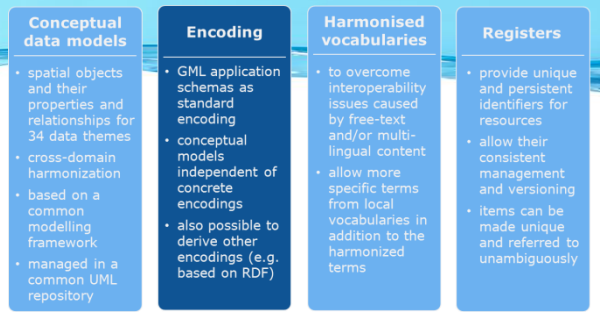


Matching tables

- Conceptual model is also provided as “Matching table”
- Excel file – with features and related attributes of the INSPIRE application schema
- To be used for the design of the INSPIRE data transformation
- To document mapping form source data model to INSPIRE data model

Application Schema <provide name of source schema>						
Type	Documentation	Attribute Association role Constraint	Attribute / Association role / Constraint	Values / Enumerations	Multiplicity	Voidable / Non-Voidable

Encodings



- Commission Regulation on interoperability:

- Every encoding rule used to **encode spatial data shall conform to EN ISO 19118. In particular, it shall specify schema conversion rules** for all spatial object types and all attributes and association roles and the output data structure used.

- Specifically, **ISO 19118:2011** includes:

- requirements for creating encoding rules based on UML schemas,
- requirements for creating encoding services, and
- requirements for XML-based encoding rules for neutral interchange of data.

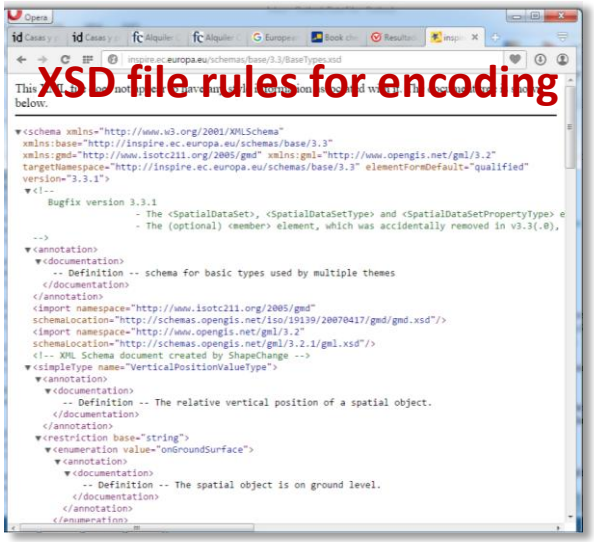
- Every **encoding rule used to encode spatial data shall be made available**.

Standard GML

- Geography Markup Language (**GML**) application schemas as standard
- GML 3.2v **proposed** encoding

- The xml schema document is available on the *INSPIRE website* http://inspire.ec.europa.eu in the INSPIRE schema repository
  - **GML application schema** - XML schema - **kind of templates** that is used to express a set of conformance rules for an GML file (*.xsd files)
  - also possible to derive other encodings, but not provided this type of solution in the technical guidelines

- **Encoding guidelines (D2.7)**



Software for INSPIRE encodings

Humboldt Alignment Editor (HALE)

Maintained, frequently updated, current version 2.9.4 (GeoServer app)

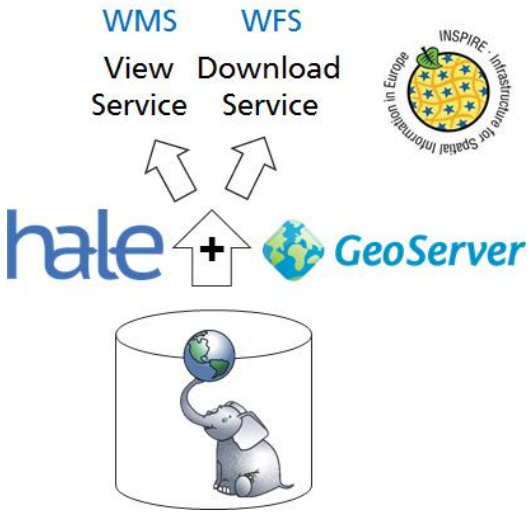
Tool useful to:

- Create mappings (alignments)
- Validate
- Transform data to INSPIRE GML version 3.2

HALE Graphical User Interface

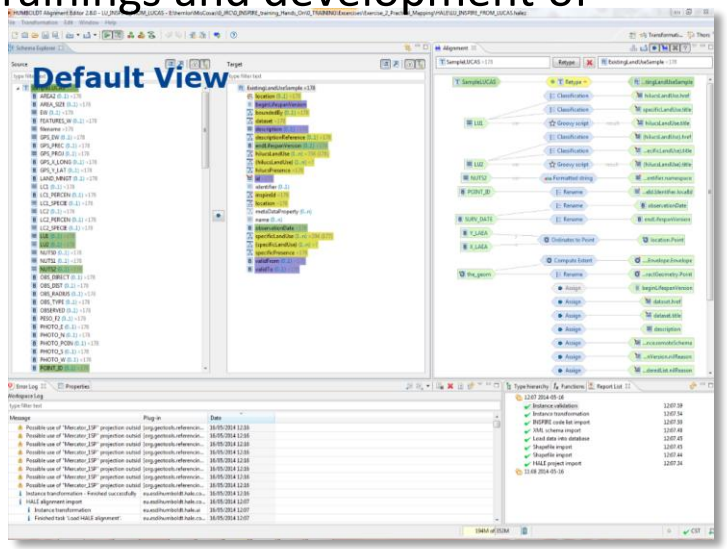
- **Usable and Flexible (**GUI completely customizable)

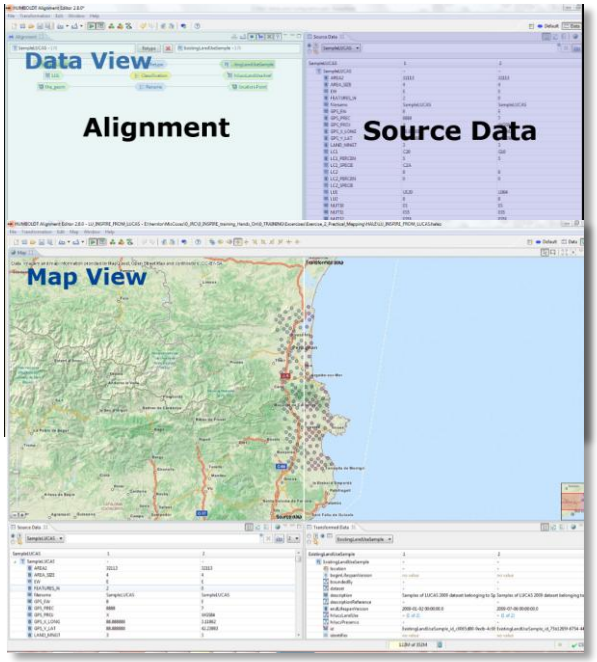
Already developed functions for transformation (but can be developed/modified by user)



Humboldt Alignment Editor (HALE)

- It is free of charge
- Have been used for trainings and development of the JRC Marine Pilot

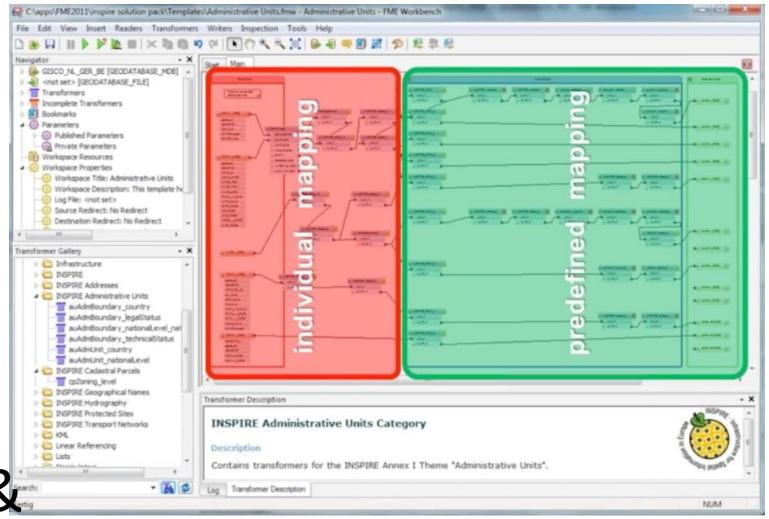


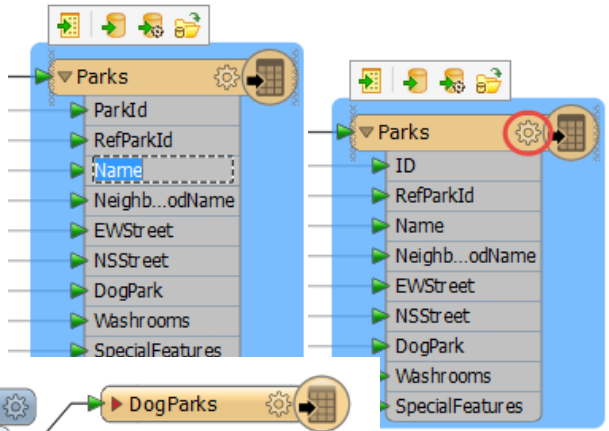


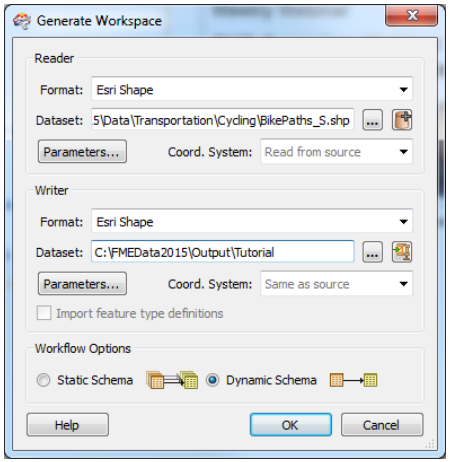
HALE website	http://www.dhpanel.eu/humboldt-framework/hale.html
HALE Wiki	http://www.esdi-community.eu/projects/hale/wiki
HALE Tutorial	http://www.dhpanel.eu/humboldt-framework/hale-tutorial.html
HALE download	http://www.esdi-community.eu/projects/hale/files
HALE User Guide	http://hale.igd.fraunhofer.de/2.8.0/help/index.jsp

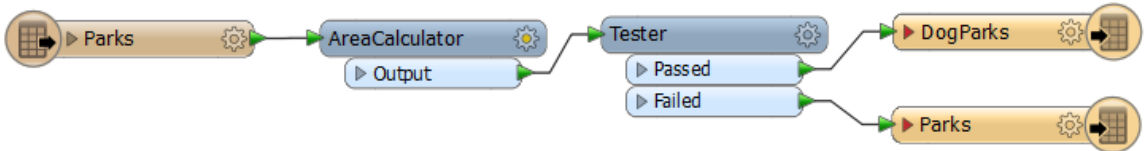
Feature Manipulation Engine (FME)

- Includes format translation - FME Workbench
- Content Transformation
  - Coordinate REProjection
- Data Restructuring
- XML validator
- Direct support for INSPIRE – reads & write INSPIRE GML

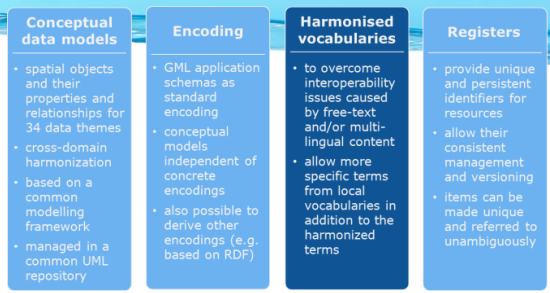








Harmonised vocabularies



- to overcome interoperability issues caused by free-text and/or multi-lingual content
- INSPIRE introduce **code lists** into data model

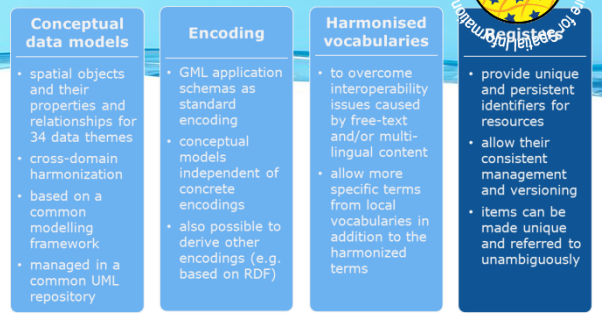
4 types of INSPIRE code lists according **to extensibility**

a) **not extensible** – only values included in IRs are allowed
b) **freely extensible** – values included in IRs and any other values are allowed
c) **narrower extensible** – values included in IRs and any narrower values are allowed
d) **empty** – any values are allowed

Any extension - values have to be included in the code list register

- INSPIRE code list register,
- national SDI code list register,
- thematic register as BODC P01, P03 or ICES parameter use registers

Registers & registry



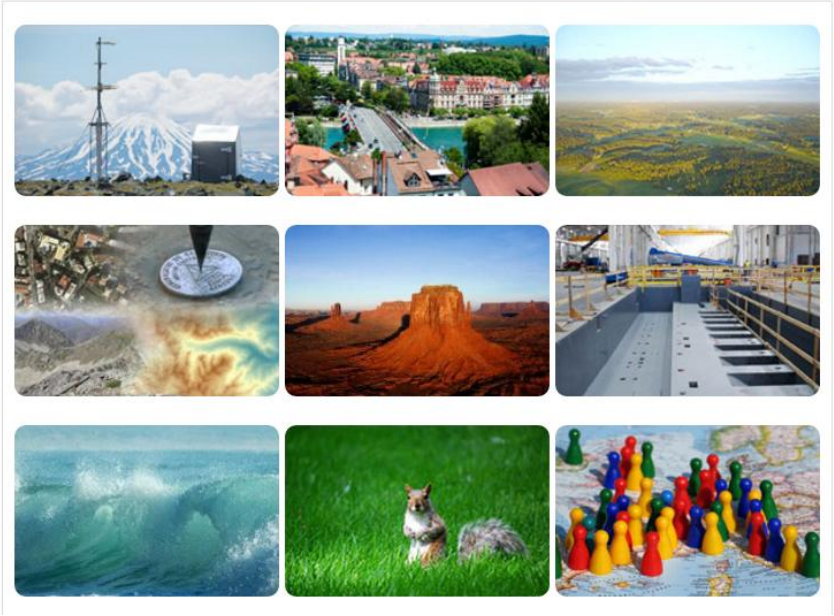
- EC provides central registry/ies for INSPIRE resources
- INSPIRE registry provides a central access
- INSPIRE involves a number of items, which require clear descriptions and the possibility to be referenced through unique identifiers (URLs)
- published on

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

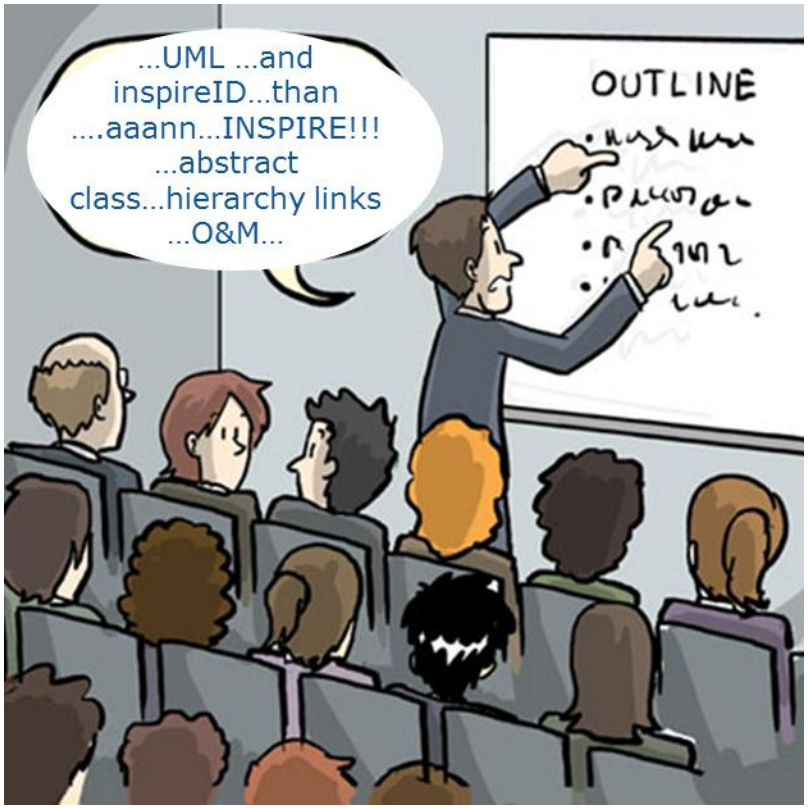
  – registers: code lists, themes, application schemas, feature concept dictionary
  – browsing and accessing register content
  – Formats: HTML, XML, Atom, JSON and RDF/SKOS
  – Multilingual content (based on IR content)
- Open to external contributions

INSPIRE Thematic clusters

- **INSPIRE Thematic Clusters Platform** is a European Commission initiative, linked to the INSPIRE Maintenance and Implementation Framework, with the objective of supporting INSPIRE implementation
- platform that builds upon the relevant INSPIRE Forum content and software, **is a single entry point** for INSPIRE implementers and users to share experiences, best practices, raise questions and resolve issues **in their thematic domains**.



Thank you for your attention



....and patience

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