Procedures for Data and Metadata harmonisation

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Introduction

This self-learning module gives an overview on the procedures used to transform heterogeneous source datasets and metadata according to the relevant INSPIRE target schemas.

It outlines the principles of data and metadata harmonisation related to INSPIRE and describes the steps needed in a harmonisation process.
The module explains how to analyse the data models (source and target) and how to utilize mapping tables in order to perform the matching between source data and INSPIRE target schema elements.

It gives an overview of some transformation tools in order to help the selection of the most suitable one.

The module introduces the principles of validation, as a necessary step to check/claim the compliance of the harmonised data and/or metadata to the relevant specification.

Practical examples of data transformation and validation are provided in the modules “Examples of Data Transformation” and “Metadata and Data Validation for INSPIRE” respectively.

Learning outcomes: After the module, the participant will be able to identify and describe the steps needed to perform a data/metadata harmonisation, identify the applicable regulations/guidelines needed in an harmonisation and/or validation process, identify the suitable transformation tool(s), evaluate the complexity of a data/metadata harmonisation process.

Intended Audience: GIS and ICT professionals, who aim to understand the principles of an INSPIRE harmonisation. Non technical staff belonging to organizations aiming to implement INSPIRE.

Pre-requisites: Basic knowledge of the INSPIRE directive.

Summary

Principles of Data harmonisation

- Definition: providing access to spatial data through network services in a representation that allows for combining it with other harmonised data in a coherent way by using a common set of data product specifications
- This includes agreements about coordinate reference systems, classification systems, application schemas, etc.
- Key to harmonisation for INSPIRE is the use of a common data model in the context of an open standard, service oriented environment.
- Typically, the stages involved in harmonisation processes are:
  - Evaluation
  - Matching
  - Transformation
  - Validation
  - Publication

Principles of Data harmonisation

- **Evaluation**: Source, target schemas and actual data should be closely examined before design begins.
- **Matching**: this step often involves extraction of data from available sources, often with some combination of queries and translation. Sometimes data assembly is required.
- **Transformation**: a process which reshapes source schema and geometry to match the required target schema.
- **Validation**: conformance assessment process i.e. process for assessing the conformance of an implementation to standards.
- **Publication**: transformed datasets have to be made available through network services.

Which legislations have to be considered in an INSPIRE Data harmonisation process?

Principles of Data harmonisation

Legislation	Short name	Involved stage
Commission Regulation (EU) No 1089/2010 of 23 November 2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial data sets and services and its sub-sequent amendments (Commission Regulation (EU) No 102/2011 of 4 February 2011 and Commission Regulation (EU) No 1253/2013 of 21 October 2013)	Implementing Rules for Interoperability of Spatial Datasets and Services (ISDSS Regulation)	Evaluation, Matching, Transformation and Validation
Commission Regulation (EC) No 976/2009 of 19 October 2009 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards the Network Services	INSPIRE Regulation on Discovery and View Services	Publication
Commission Regulation (EU) No 1088/2010 of 23 November 2010 amending Regulation (EC) No 976/2009 as regards download services and transformation services	INSPIRE Regulation on Download and Transformation Services	Publication

Principles of Data harmonisation

How to fulfill the data requirements?

Guidelines	Support
INSPIRE Data Specifications (DS) Technical Guidelines for the Annex I, II and III Spatial Data Themes.	• Provide guidelines for the implementation of the provisions laid down in the Implementing Rule for spatial data sets and services of the INSPIRE Directive (ISDSS Regulation). • Include additional requirements and recommendations that, although not included in the Implementing Rule, are relevant to guarantee or to increase data interoperability. • Help the conformance testing process providing an Abstract Test Suite (ATS) which include a set of tests to be applied on a data set to evaluate whether it fulfils the requirements included in the relevant DS and the corresponding parts of ISDSS Regulation.

Principles of Metadata harmonisation

- Article 5(1) of INSPIRE Directive states that Member States shall ensure that metadata are created for the spatial data sets and services corresponding to the themes listed in Annexes I, II and III, and that those metadata are kept up to date.
- Article 5(4) of INSPIRE Directive states that Implementing Rules shall be adopted taking account of relevant, existing international standards and user requirements.

Which legislations have to be considered in an INSPIRE Metadata harmonisation process?

Principles of Metadata Harmonisation

Legislation	Short legislation name	Name of metadata elements
COMMISSION REGULATION (EC) No 1205/2008 of 3 December 2008 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards metadata	Implementing Rules for Metadata	Discovery Metadata
COMMISSION REGULATION (EU) No 1089/2010 of 23 November 2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial data sets and services and its sub-sequent amendments (Commission Regulation (EU) No 102/2011 of 4 February 2011 and Commission Regulation (EU) No 1253/2013 of 21 October 2013)	Implementing Rules for Interoperability of Spatial Datasets and Services (ISDSS Regulation)	Metadata for interoperability (or also "Evaluation and use Metadata")

Principles of Metadata harmonisation

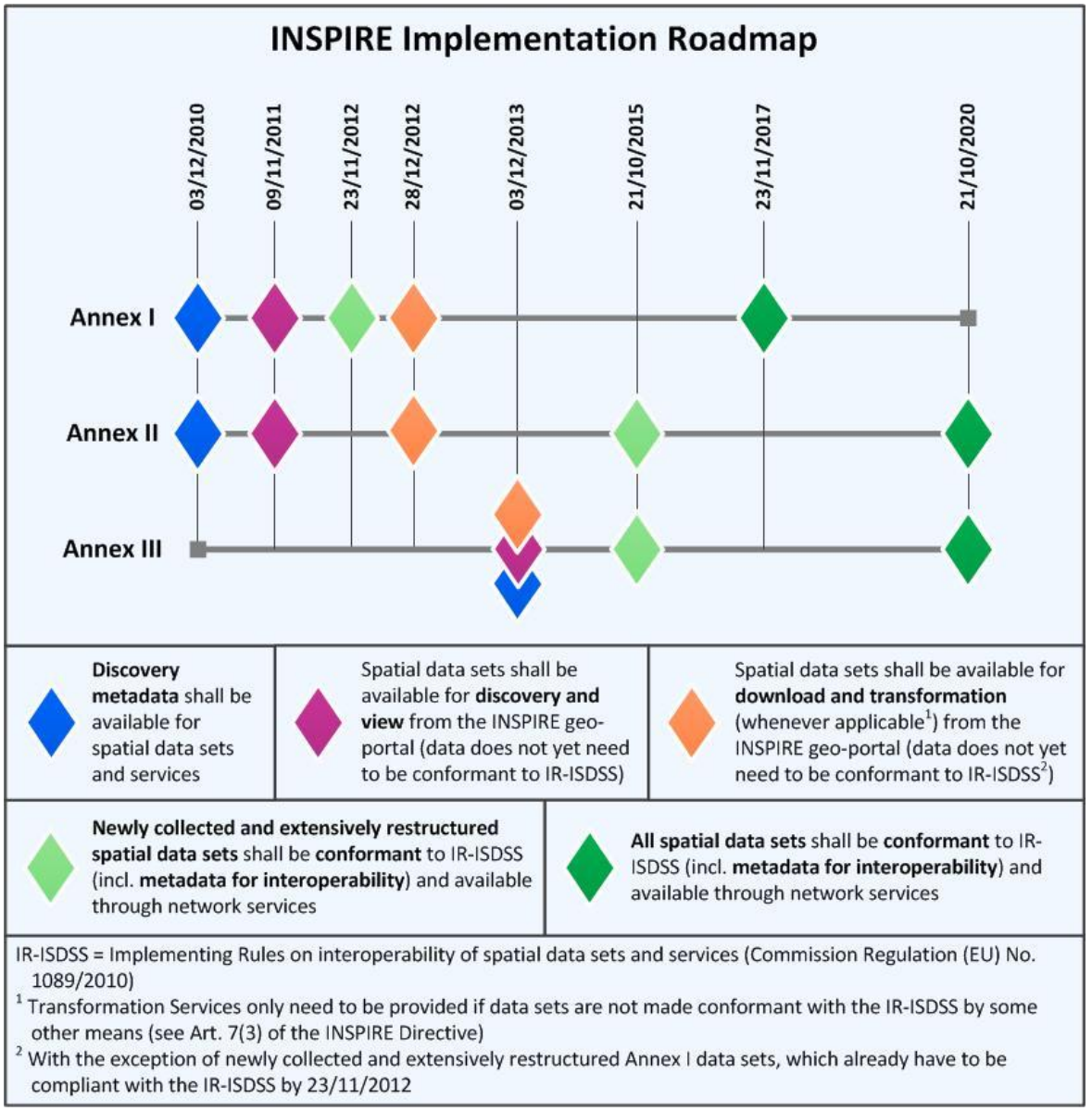
- In addition to the Metadata elements defined in the mentioned legislations there are also a set of «Recommended Metadata elements» defined in the INSPIRE Data Specifications Technical Guidelines for Annexes I, II and III Spatial Data Themes.
- No legal act binds the provision of this third set of metadata.

Principles of Metadata harmonisation

How to fulfill the metadata requirements?

Guidelines	Support
INSPIRE Metadata Implementing Rules: Technical Guidelines based on EN ISO 19115 and EN ISO 19119	It defines how the requirements of the Implementing Rules for Metadata can be implemented using EN ISO 19115 and EN ISO 19119.
INSPIRE Data Specifications Technical Guidelines for the Annex I, II and III Spatial Data Themes	They provide: 1. additional theme-specific recommendations and requirements for the implementation of the Discovery metadata 2. guidance and recommendations for the implementation of the: a) metadata for interoperability required by the ISDSS Regulation b) recommended theme-specific metadata elements.

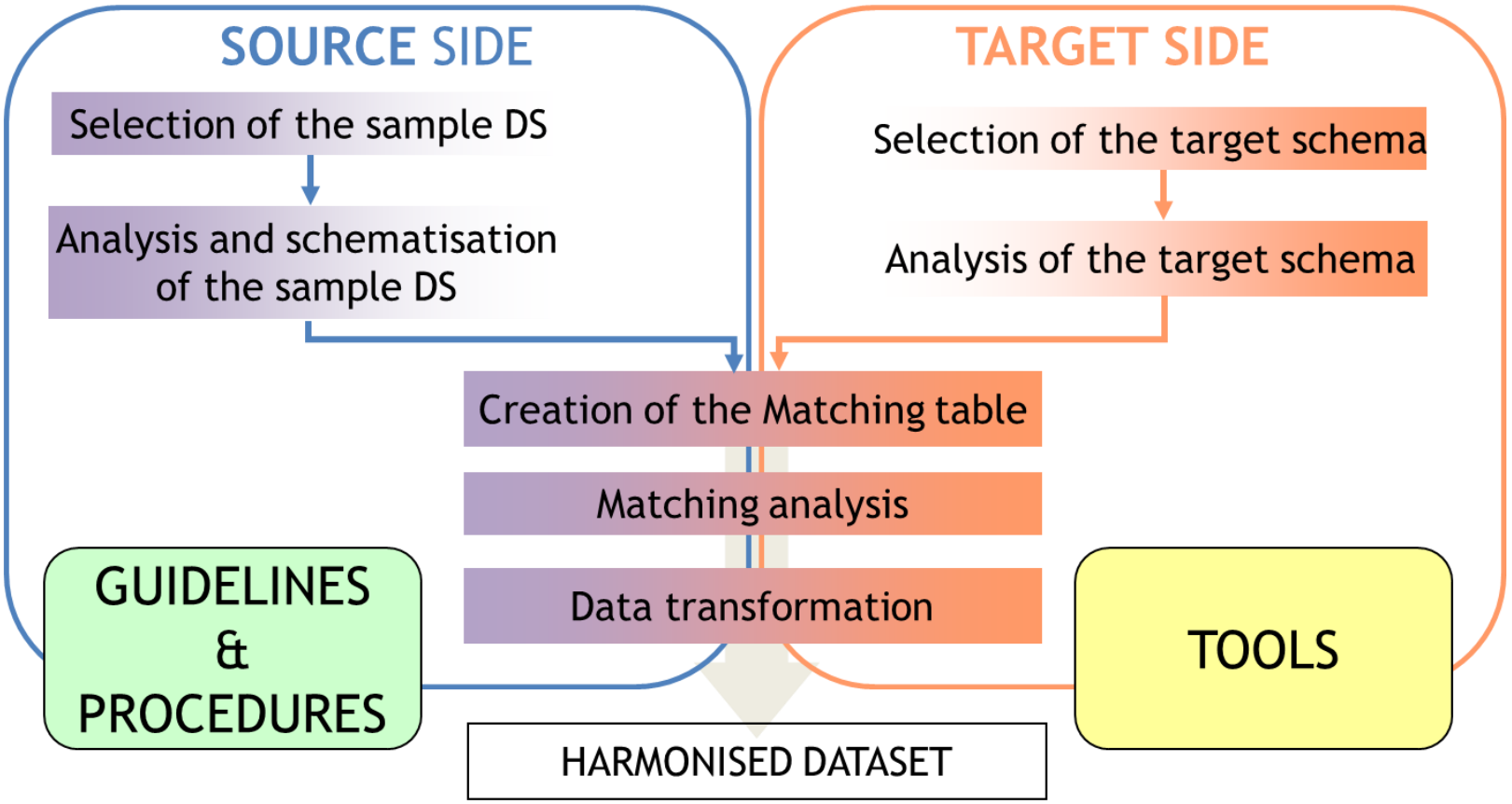
Data and Metadata harmonisation



Evaluation, Matching, Transformation of data

- Step 1: Analysis of the dataset and identification of the Source Data Model
- Step 2: Identification and analysis of the Target Data Model
- Step 3: Updating and filling of the Mapping Table
- Step 4: Analysis and solution of matching problems
- Step 5: Execution of the transformation with the selected tool
- Step 6: Creation of the transformed data

Evaluation, Matching, Transformation of data



Summary

- 1. Principles of Data and Metadata harmonisation
- 2. Source and Target Data models
- 3. Mapping tables
- 4. Transformation of Data and Metadata
- 5. Principles of validation of transformed data and metadata

Source Data model

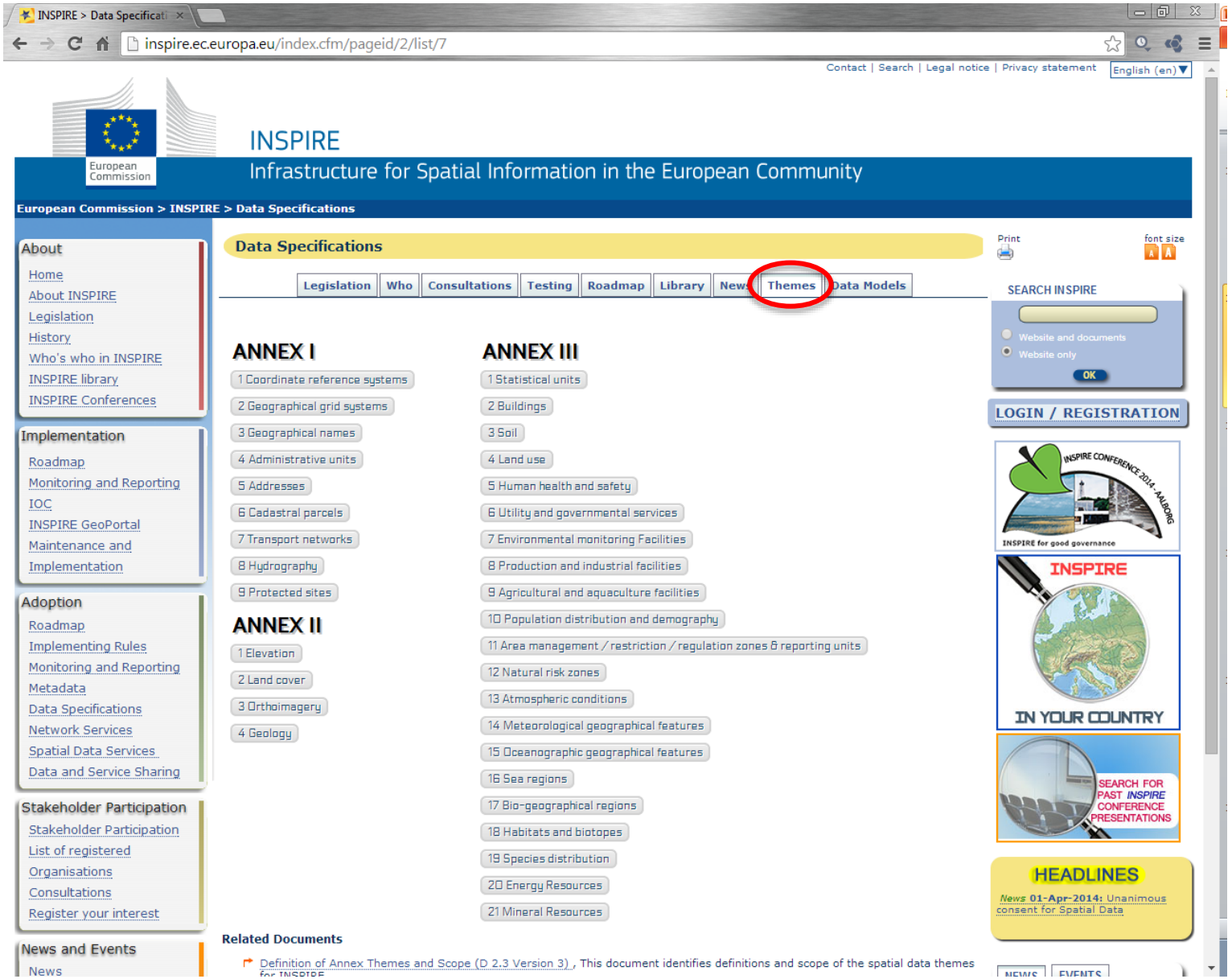
- Identify source data model (UML, doc, etc.)
  - if no documentation is present analyze the dataset to understand data content (meaning of the attributes, datatype, codelists, etc.)
- Verify data format (shape, gml, DB tables, etc.)

Target Data model

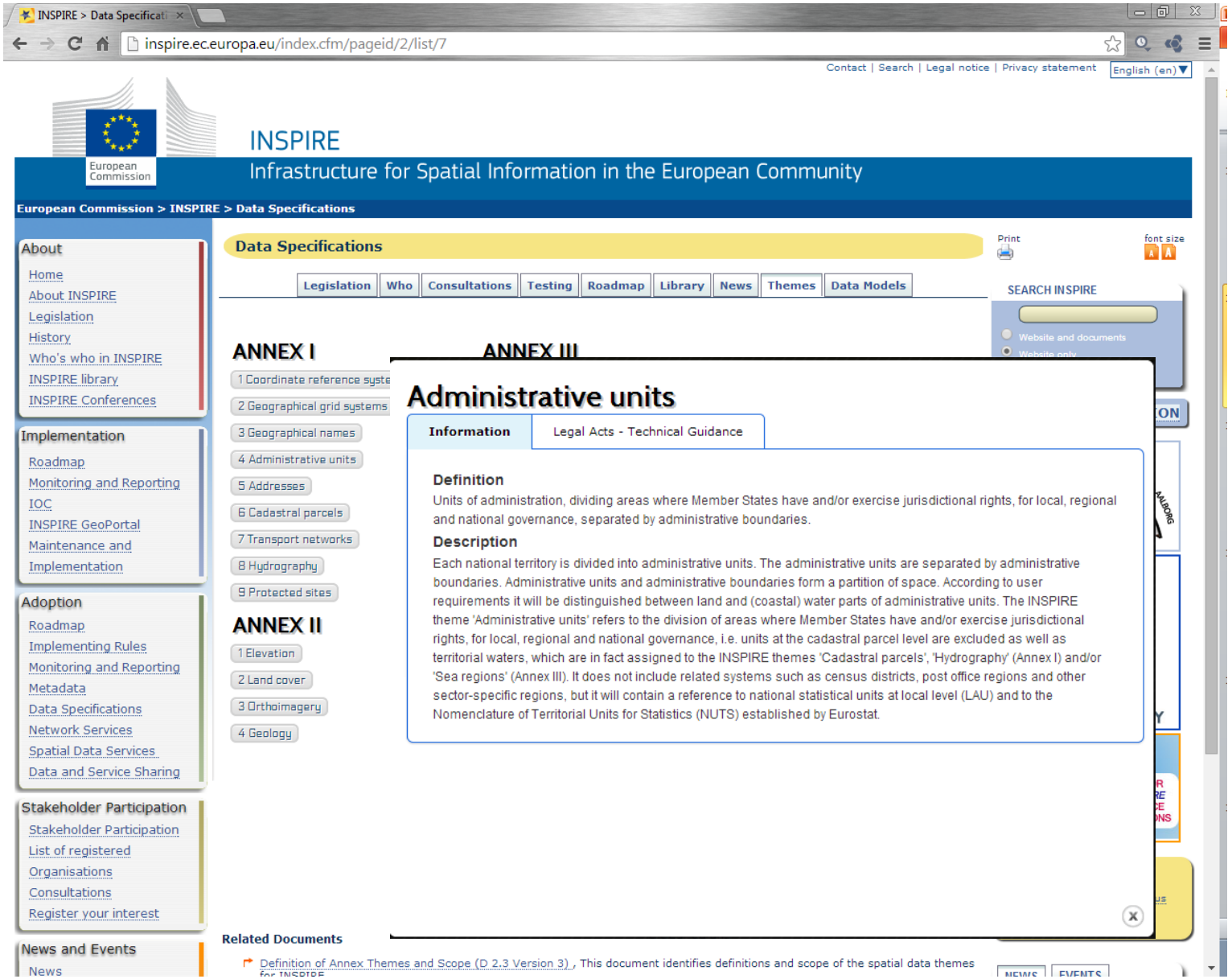
- INSPIRE website:
  - Data Themes definition
  - Legislation/Data Specification
  - Data Models
    - UML (HTML view, EA project)
    - Mapping tables
    - GML Application schemas

Target Data model

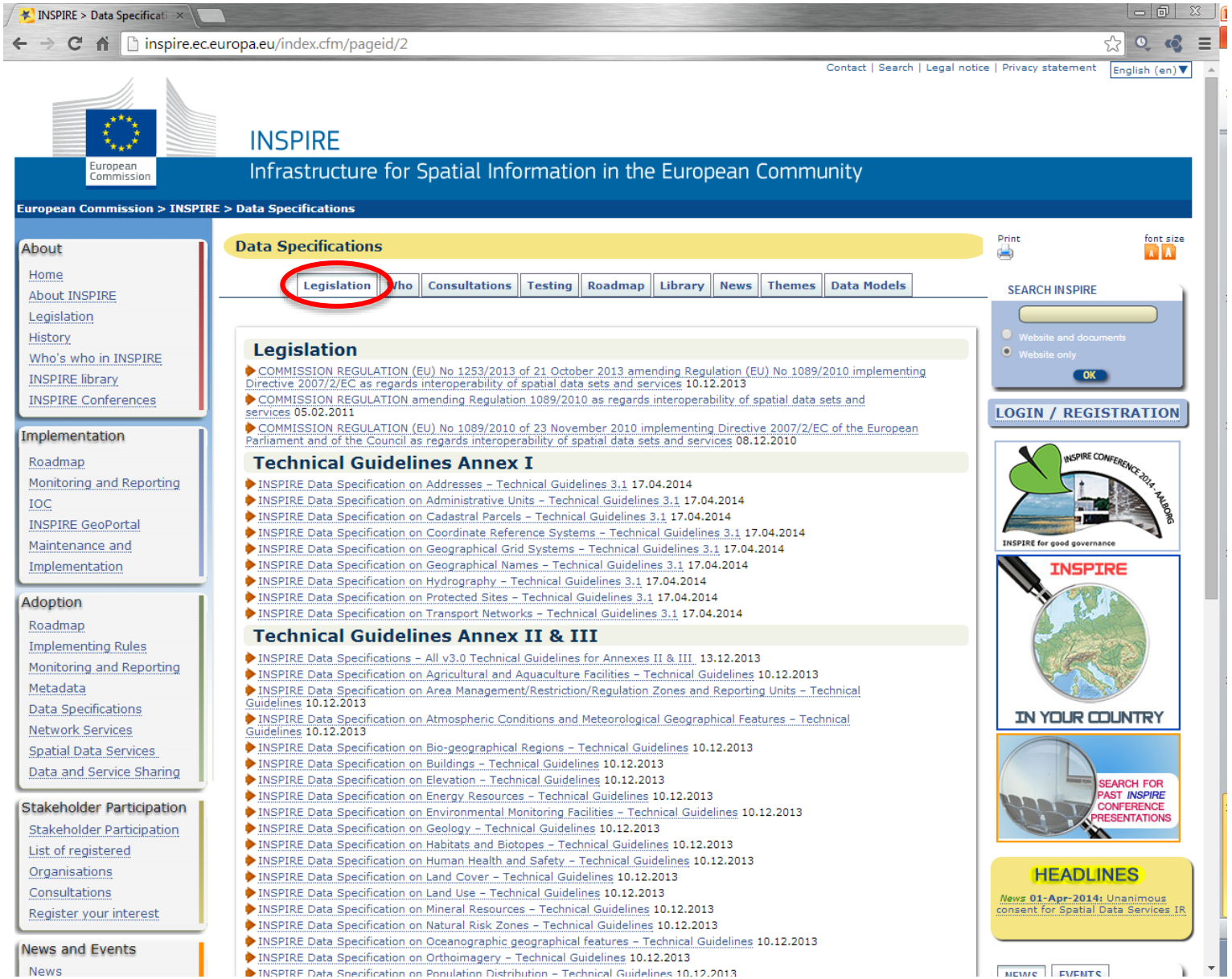
Target Data model



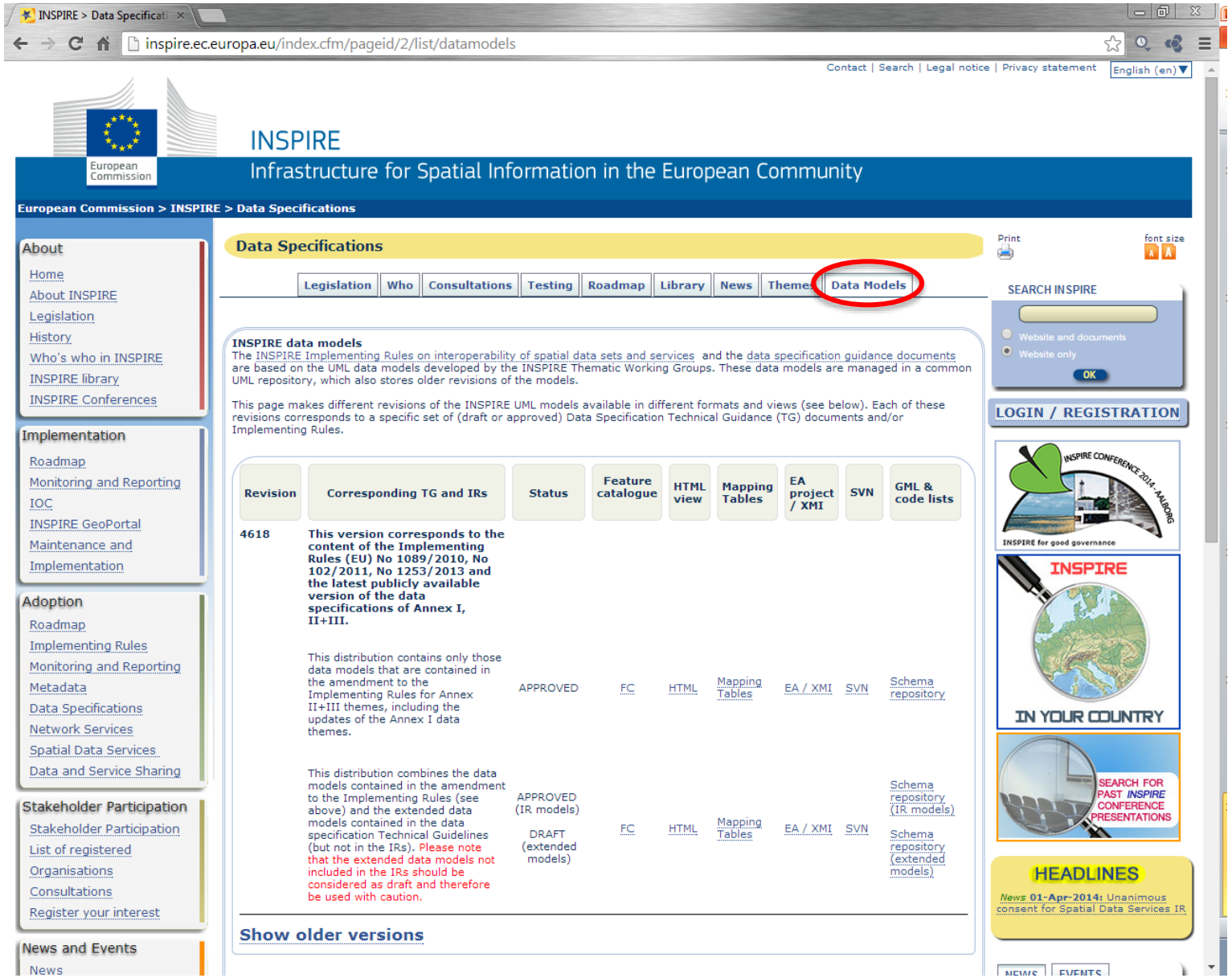
Target Data model



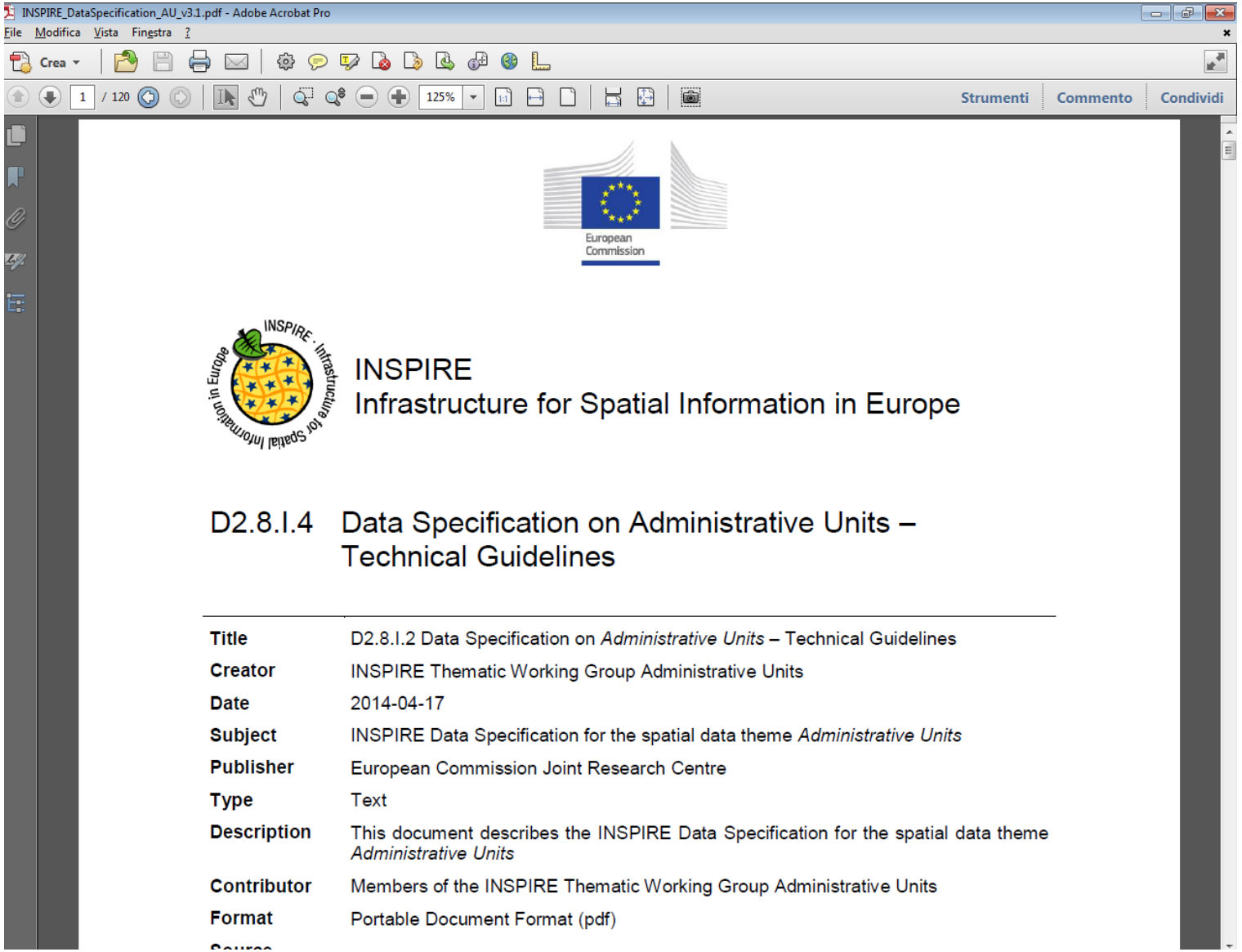
Target Data model



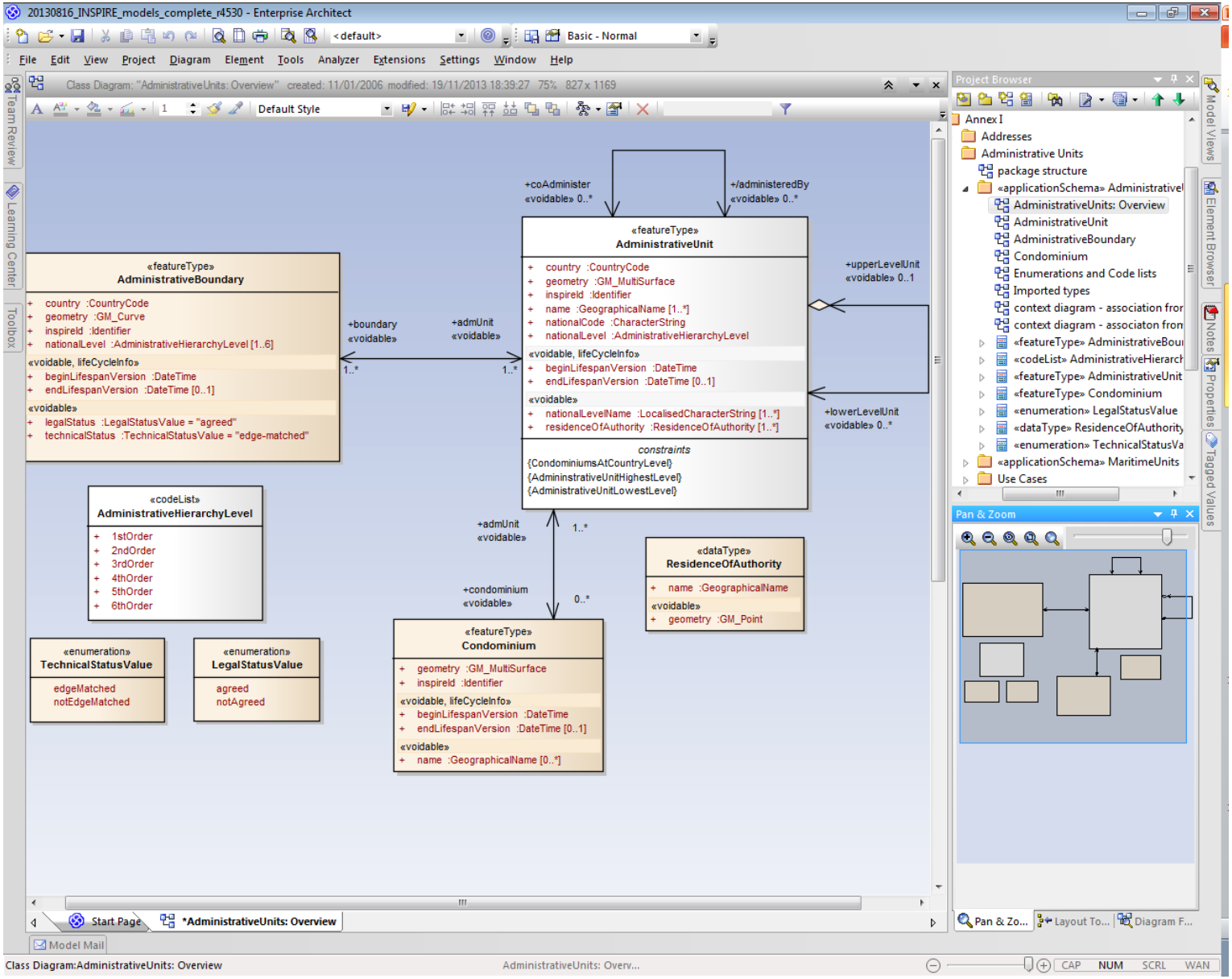
Target Data model



Target Data model



Target Data model



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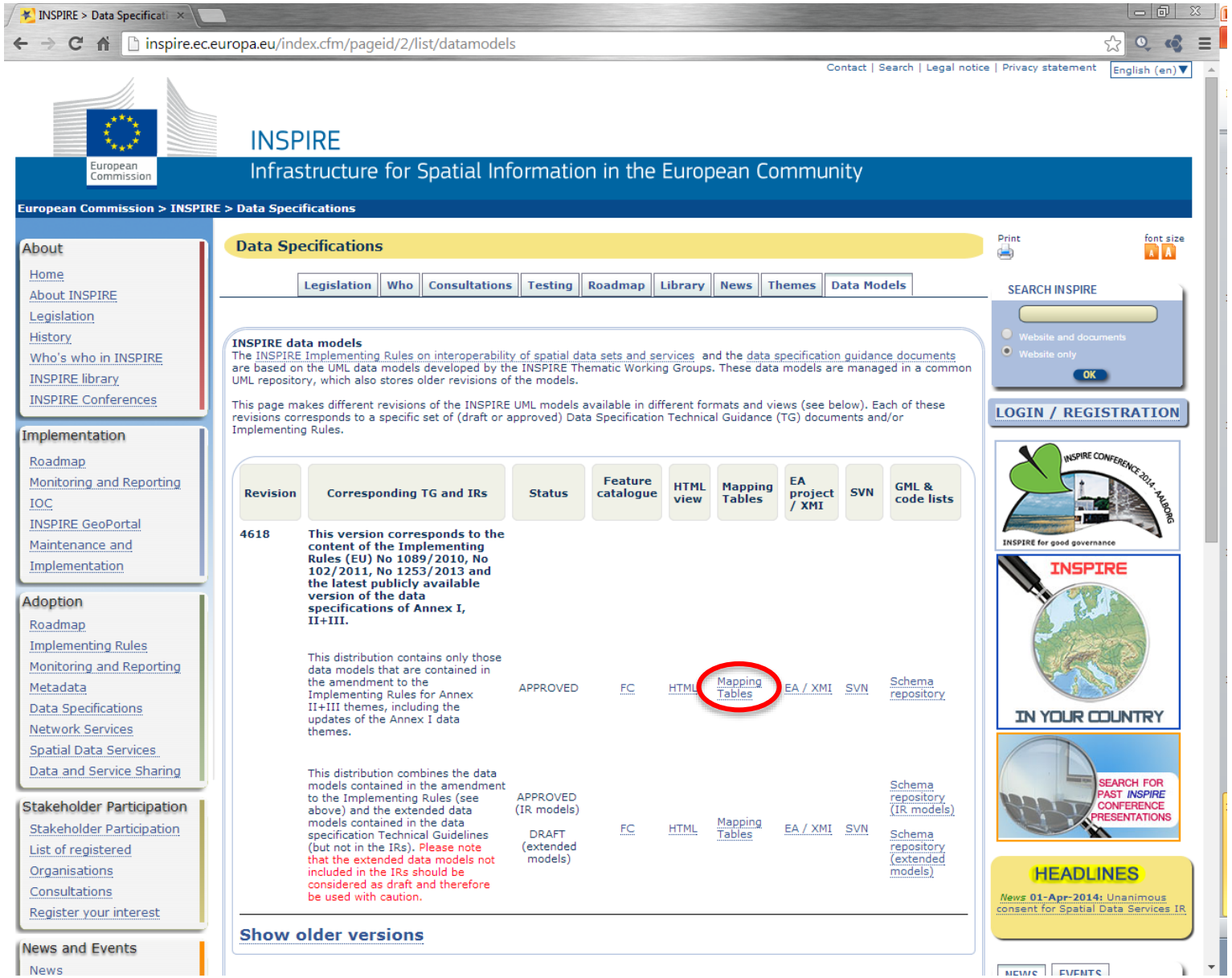
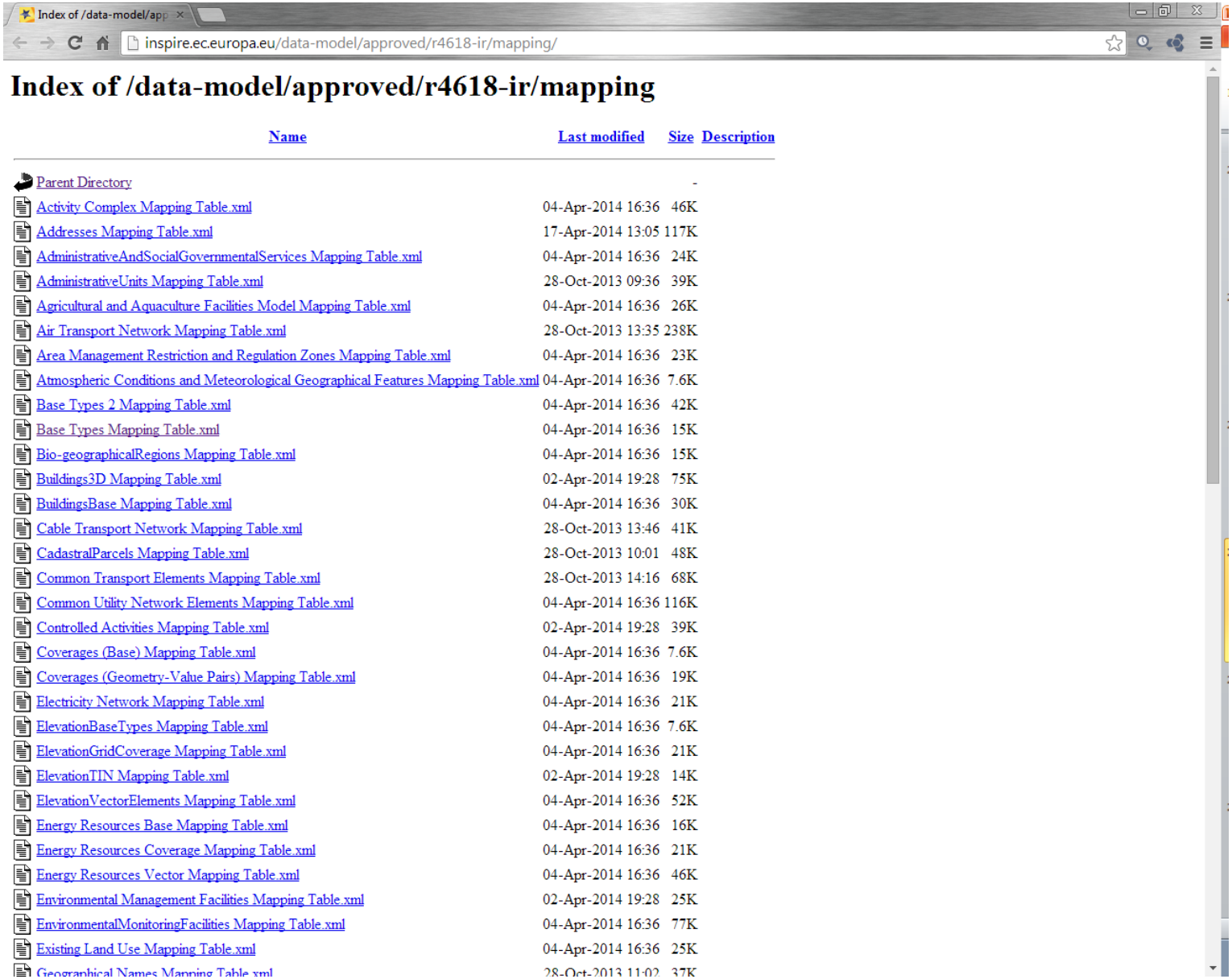
Target Data model



Target Data model



Index of /data-model/app

inspire.ec.europa.eu/data-model/approved/r4618-ir/mapping/

Index of /data-model/approved/r4618-ir/mapping

Name	Last modified	Size	Description
Parent Directory		-	
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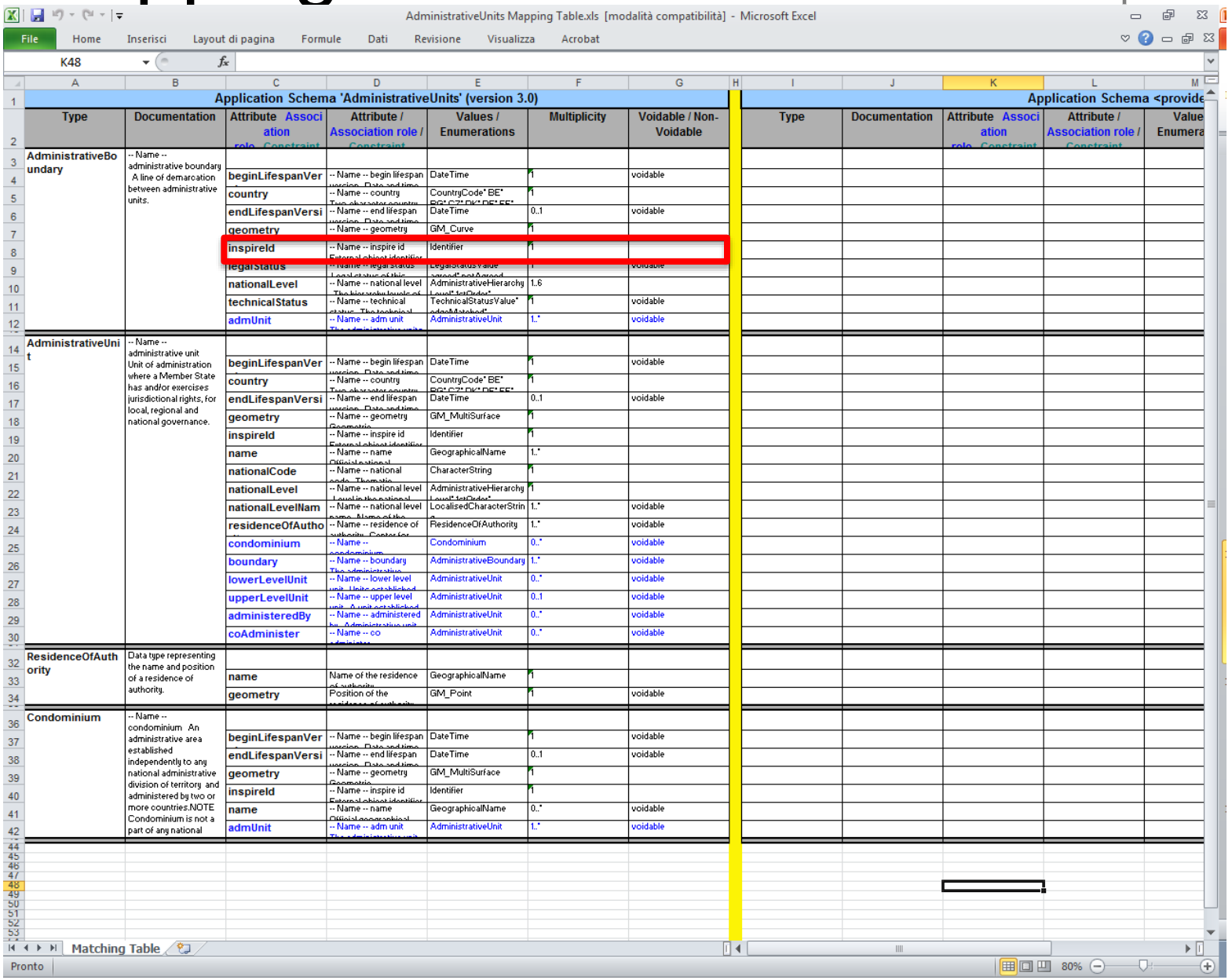
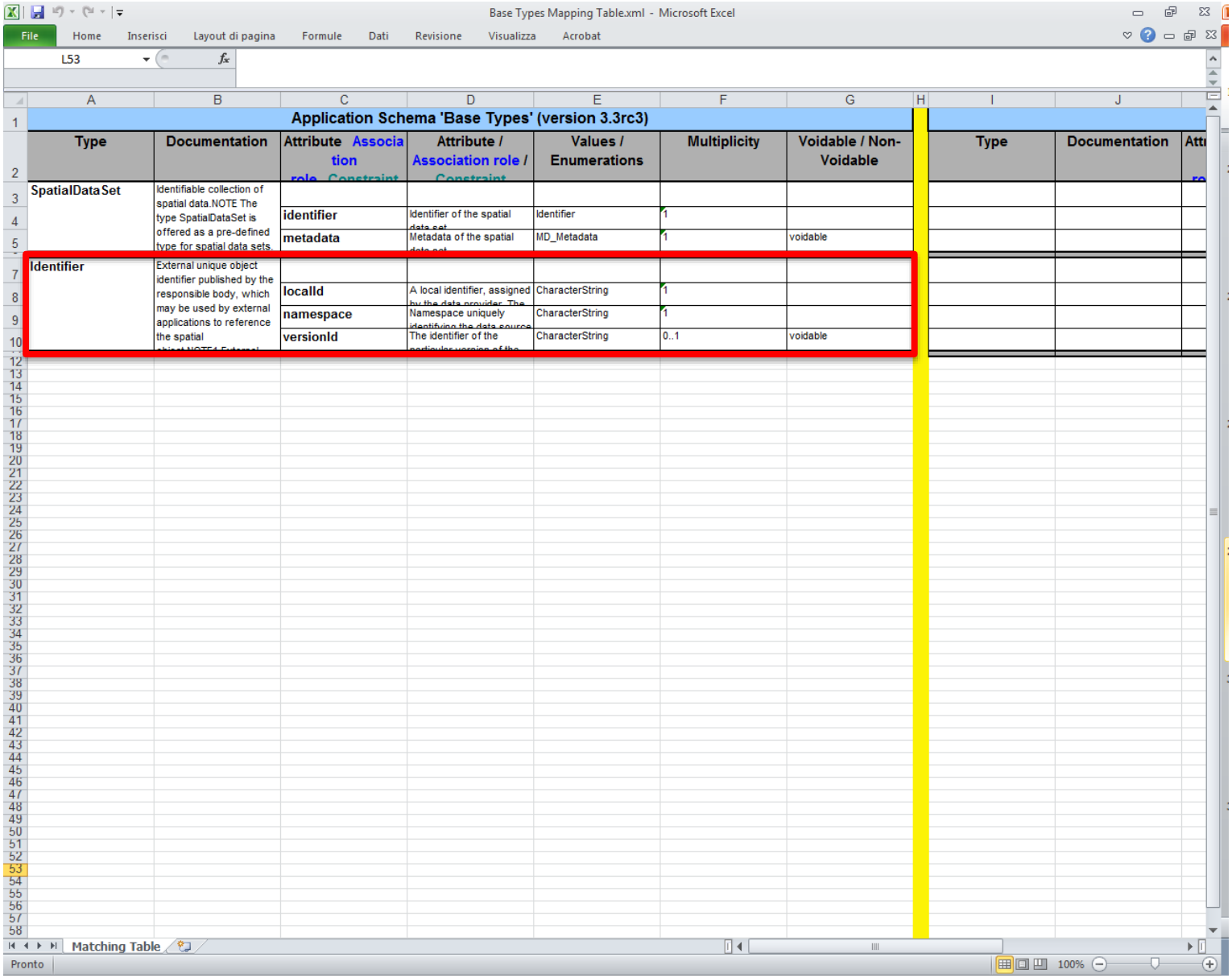
Addresses Mapping Table.xml	17-Apr-2014 13:05	117K	
AdministrativeAndSocialGovernmentalServices Mapping Table.xml	04-Apr-2014 16:36	24K	
AdministrativeUnits Mapping Table.xml	28-Oct-2013 09:36	39K	
Agricultural and Aquaculture Facilities Model Mapping Table.xml	04-Apr-2014 16:36	26K	
Air Transport Network Mapping Table.xml	28-Oct-2013 13:35	238K	
Area Management Restriction and Regulation Zones Mapping Table.xml	04-Apr-2014 16:36	23K	
Atmospheric Conditions and Meteorological Geographical Features Mapping Table.xml	04-Apr-2014 16:36	7.6K	
Base Types 2 Mapping Table.xml	04-Apr-2014 16:36	42K	
Base Types Mapping Table.xml	04-Apr-2014 16:36	15K	
Bio-geographicalRegions Mapping Table.xml	04-Apr-2014 16:36	15K	
Buildings3D Mapping Table.xml	02-Apr-2014 19:28	75K	
BuildingsBase Mapping Table.xml	04-Apr-2014 16:36	30K	
Cable Transport Network Mapping Table.xml	28-Oct-2013 13:46	41K	
CadastralParcels Mapping Table.xml	28-Oct-2013 10:01	48K	
Common Transport Elements Mapping Table.xml	28-Oct-2013 14:16	68K	
Common Utility Network Elements Mapping Table.xml	04-Apr-2014 16:36	116K	
Controlled Activities Mapping Table.xml	02-Apr-2014 19:28	39K	
Coverages (Base) Mapping Table.xml	04-Apr-2014 16:36	7.6K	
Coverages (Geometry-Value Pairs) Mapping Table.xml	04-Apr-2014 16:36	19K	
Electricity Network Mapping Table.xml	04-Apr-2014 16:36	21K	
ElevationBaseTypes Mapping Table.xml	04-Apr-2014 16:36	7.6K	
ElevationGridCoverage Mapping Table.xml	04-Apr-2014 16:36	21K	
ElevationTIN Mapping Table.xml	02-Apr-2014 19:28	14K	
ElevationVectorElements Mapping Table.xml	04-Apr-2014 16:36	52K	
Energy Resources Base Mapping Table.xml	04-Apr-2014 16:36	16K	
Energy Resources Coverage Mapping Table.xml	04-Apr-2014 16:36	21K	
Energy Resources Vector Mapping Table.xml	04-Apr-2014 16:36	46K	
Environmental Management Facilities Mapping Table.xml	02-Apr-2014 19:28	25K	
EnvironmentalMonitoringFacilities Mapping Table.xml	04-Apr-2014 16:36	77K	
Existing Land Use Mapping Table.xml	04-Apr-2014 16:36	25K	
Geographical Names Mapping Table.xml	28-Oct-2013 11:02	37K	

Mapping table



Mapping table



Base Types Mapping Table.xml - Microsoft Excel

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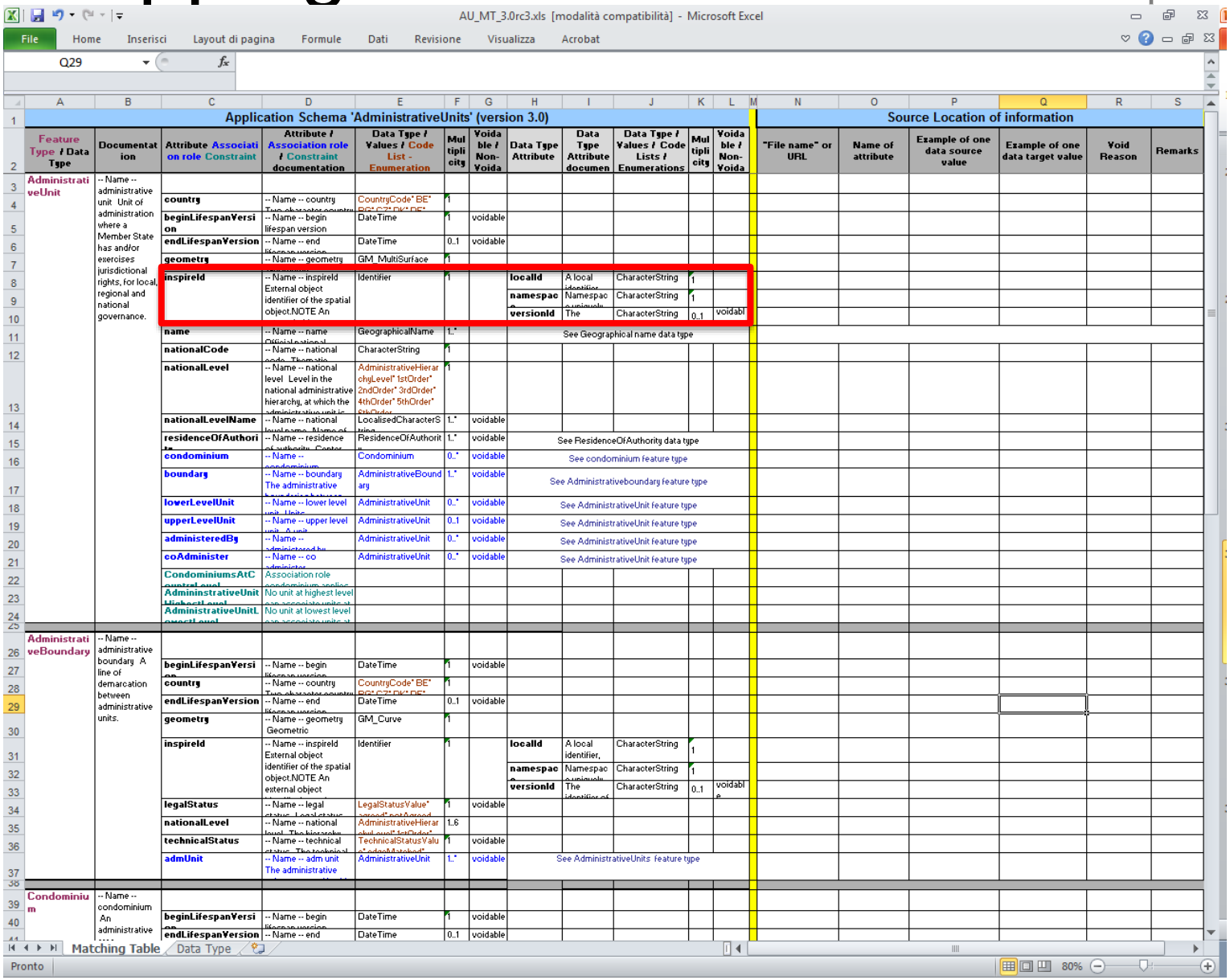
	A	B	C	D	E	F	G	H	I	J
1	Application Schema 'Base Types' (version 3.3rc3)									
2	Type	Documentation	Attribute Association role Constraint	Attribute / Association role / Constraint	Values / Enumerations	Multiplicity	Voidable / Non-Voidable		Type	Documentation
3	SpatialDataSet	Identifiable collection of spatial data.NOTE The type SpatialDataSet is offered as a pre-defined type for spatial data sets.								
4			identifier	Identifier of the spatial data set	Identifier	1				
5			metadata	Metadata of the spatial data set	MD_Metadata	1	voidable			
7	Identifier	External unique object identifier published by the responsible body, which may be used by external applications to reference the spatial								
8			localId	A local identifier, assigned by the data provider. The	CharacterString	1				
9			namespace	Namespace uniquely identifying the data source	CharacterString	1				
10			versionId	The identifier of the particular version of the	CharacterString	0..1	voidable			

Matching Table

Pronto

100%

Mapping tables



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	Application Schema 'AdministrativeUnits' (version 3.0)												Source Location of information					
	Feature Type / Data Type	Documentation	Attribute / Association role / Constraint	Attribute / Association role / Constraint documentation	Data Type / Values / Code List - Enumeration	Multiplicity	Voidable / Non-Voida	Data Type Attribute	Data Type Attribute documen	Data Type / Values / Code Lists / Enumerations	Multiplicity	Voidable / Non-Voida	"File name" or URL	Name of attribute	Example of one data source value	Example of one data target value	Void Reason	Remarks
3	AdministrativeUnit	-- Name -- administrative unit Unit of administration where a Member State has and/or exercises jurisdictional rights, for local, regional and national governance.																
4			country	-- Name -- country	CountryCode* BE*	1												
5			beginLifespanVersion	-- Name -- begin lifespan version	DateTime	1	voidable											
6			endLifespanVersion	-- Name -- end	DateTime	0..1	voidable											
7			geometry	-- Name -- geometry	GM_MultiSurface	1												
8			inspireId	-- Name -- inspireId External object identifier of the spatial object.NOTE An	Identifier	1		localId	A local	CharacterString	1							
9								namespac	Namespac	CharacterString	1							
10								versionId	The	CharacterString	0..1	voidabl						
11			name	-- Name -- name	GeographicalName	1..*		See Geographical name data type										
12			nationalCode	-- Name -- national	CharacterString	1												
13			nationalLevel	-- Name -- national level Level in the national administrative hierarchy, at which the	AdministrativeHierarchyLevel* 1stOrder* 2ndOrder* 3rdOrder* 4thOrder* 5thOrder*	1												
14			nationalLevelName	-- Name -- national	LocalisedCharacterString	1..*	voidable											
15			residenceOfAuthority	-- Name -- residence	ResidenceOfAuthority	1..*	voidable	See ResidenceOfAuthority data type										
16			condominium	-- Name --	Condominium	0..*	voidable	See condominium feature type										
17			boundary	-- Name -- boundary The administrative	AdministrativeBoundary	1..*	voidable	See Administrativeboundary feature type										
18			lowerLevelUnit	-- Name -- lower level	AdministrativeUnit	0..*	voidable	See AdministrativeUnit feature type										
19			upperLevelUnit	-- Name -- upper level	AdministrativeUnit	0..1	voidable	See AdministrativeUnit feature type										
20			administeredBy	-- Name --	AdministrativeUnit	0..*	voidable	See AdministrativeUnit feature type										
21			coAdminister	-- Name -- co	AdministrativeUnit	0..*	voidable	See AdministrativeUnit feature type										
22			CondominiumsAtCountryLevel	Association role														
23			AdminInstrativeUnitHighestLevel	No unit at highest level														
24			AdministrativeUnitLowestLevel	No unit at lowest level														
25																		
26	AdministrativeBoundary	-- Name -- administrative boundary A line of demarcation between administrative units.																
27			beginLifespanVersion	-- Name -- begin	DateTime	1	voidable											
28			country	-- Name -- country	CountryCode* BE*	1												
29			endLifespanVersion	-- Name -- end	DateTime	0..1	voidable											
30			geometry	-- Name -- geometry Geometric	GM_Curve	1												
31			inspireId	-- Name -- inspireId External object identifier of the spatial object.NOTE An external object	Identifier	1		localId	A local identifier,	CharacterString	1							
32								namespac	Namespac	CharacterString	1							
33								versionId	The	CharacterString	0..1	voidabl						
34			legalStatus	-- Name -- legal	LegalStatusValue*	1	voidable											
35			nationalLevel	-- Name -- national	AdministrativeHierarchyLevel* 1stOrder*	1..6												
36			technicalStatus	-- Name -- technical	TechnicalStatusValue* operational*	1	voidable											
37			admUnit	-- Name -- adm unit The administrative	AdministrativeUnit	1..*	voidable	See AdministrativeUnits feature type										
38																		
39	Condominium	-- Name -- condominium An administrative																
40			beginLifespanVersion	-- Name -- begin	DateTime	1	voidable											
41			endLifespanVersion	-- Name -- end	DateTime	0..1	voidable											

Matching Table | Data Type

Pronto

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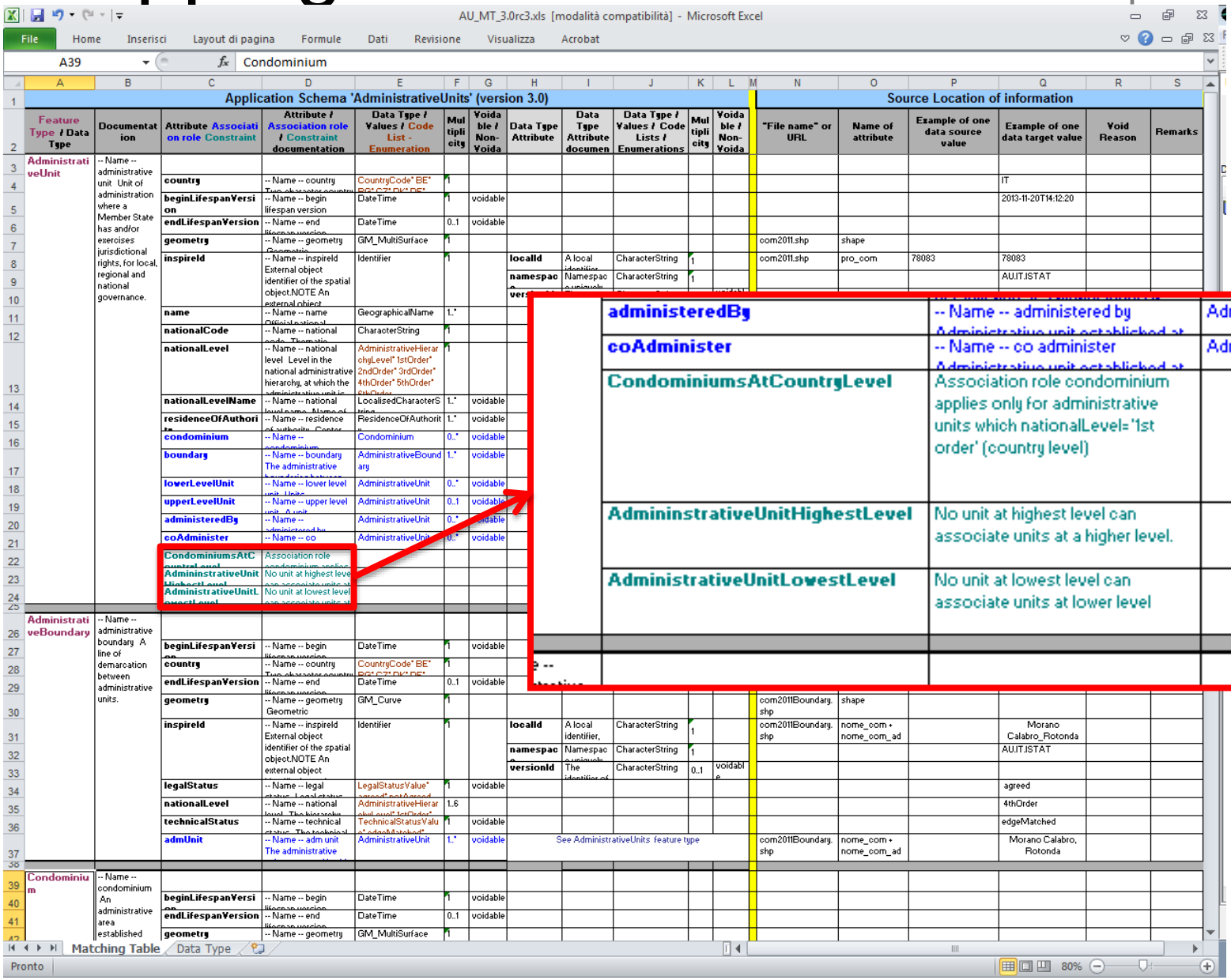
Mapping tables



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A39 | Condominium

Application Schema 'AdministrativeUnits' (version 3.0)

Feature Type / Data Type	Documentation	Attribute / Association role / Constraint	Attribute / Association role / Constraint documentation	Data Type / Values / Code List - Enumeration	Multiplicity	Voidable / Non-Voida	Data Type Attribute	Data Type Attribute documen	Data Type / Values / Code Lists / Enumerations	Multiplicity	Voidable / Non-Voida
AdministrativeUnit	-- Name -- administrative unit Unit of administration where a Member State has and/or exercises jurisdictional rights, for local, regional and national governance.										
		country	-- Name -- country	CountryCode* BE*	1						
		beginLifespanVersion	-- Name -- begin lifespan version	DateTime	1	voidable					
		endLifespanVersion	-- Name -- end	DateTime	0..1	voidable					
		geometry	-- Name -- geometry	GM_MultiSurface	1						
		inspireId	-- Name -- inspireId External object identifier of the spatial object.NOTE An external object	Identifier	1		localId	A local	CharacterString	1	
							namespac	Namespac	CharacterString	1	
		name	-- Name -- name	GeographicalName	1..*						
		nationalCode	-- Name -- national	CharacterString	1						
		nationalLevel	-- Name -- national level Level in the national administrative hierarchy, at which the	AdministrativeHierarchyLevel* 1stOrder* 2ndOrder* 3rdOrder* 4thOrder* 5thOrder*	1						
		nationalLevelName	-- Name -- national	LocalisedCharacterString	1..*	voidable					
		residenceOfAuthori	-- Name -- residence	ResidenceOfAuthorit	1..*	voidable					
		condominium	-- Name --	Condominium	0..*	voidable					
		boundary	-- Name -- boundary The administrative	AdministrativeBoundary	1..*	voidable					
		lowerLevelUnit	-- Name -- lower level	AdministrativeUnit	0..*	voidable					
		upperLevelUnit	-- Name -- upper level	AdministrativeUnit	0..1	voidable					
		administeredBy	-- Name --	AdministrativeUnit	0..*	voidable					
		coAdminister	-- Name -- co	AdministrativeUnit	0..*	voidable					
		CondominiumsAtC	Association role								
		AdmininstrativeUnit	No unit at highest leve								
		AdministrativeUnitL	No unit at lowest level								
AdministrativeBoundary	-- Name -- administrative boundary A line of demarcation between administrative units.										
		beginLifespanVersion	-- Name -- begin	DateTime	1	voidable					
		country	-- Name -- country	CountryCode* BE*	1						
		endLifespanVersion	-- Name -- end	DateTime	0..1	voidable					
		geometry	-- Name -- geometry Geometric	GM_Curve	1						
		inspireId	-- Name -- inspireId External object identifier of the spatial object.NOTE An external object	Identifier	1		localId	A local identifier,	CharacterString	1	
							namespac	Namespac	CharacterString	1	
							versionId	The	CharacterString	0..1	voidabl
		legalStatus	-- Name -- legal	LegalStatusValue* agreed* notAgreed	1	voidable					
		nationalLevel	-- Name -- national	AdministrativeHierarchyLevel* 1stOrder*	1..6						
		technicalStatus	-- Name -- technical	TechnicalStatusValue* edgeMatched*	1	voidable					
		admUnit	-- Name -- adm unit The administrative	AdministrativeUnit	1..*	voidable	See AdministrativeUnits feature type				
Condominium	-- Name -- condominium An administrative area established										
		beginLifespanVersion	-- Name -- begin	DateTime	1	voidable					
		endLifespanVersion	-- Name -- end	DateTime	0..1	voidable					
		geometry	-- Name -- geometry	GM_MultiSurface	1						

Source Location of information

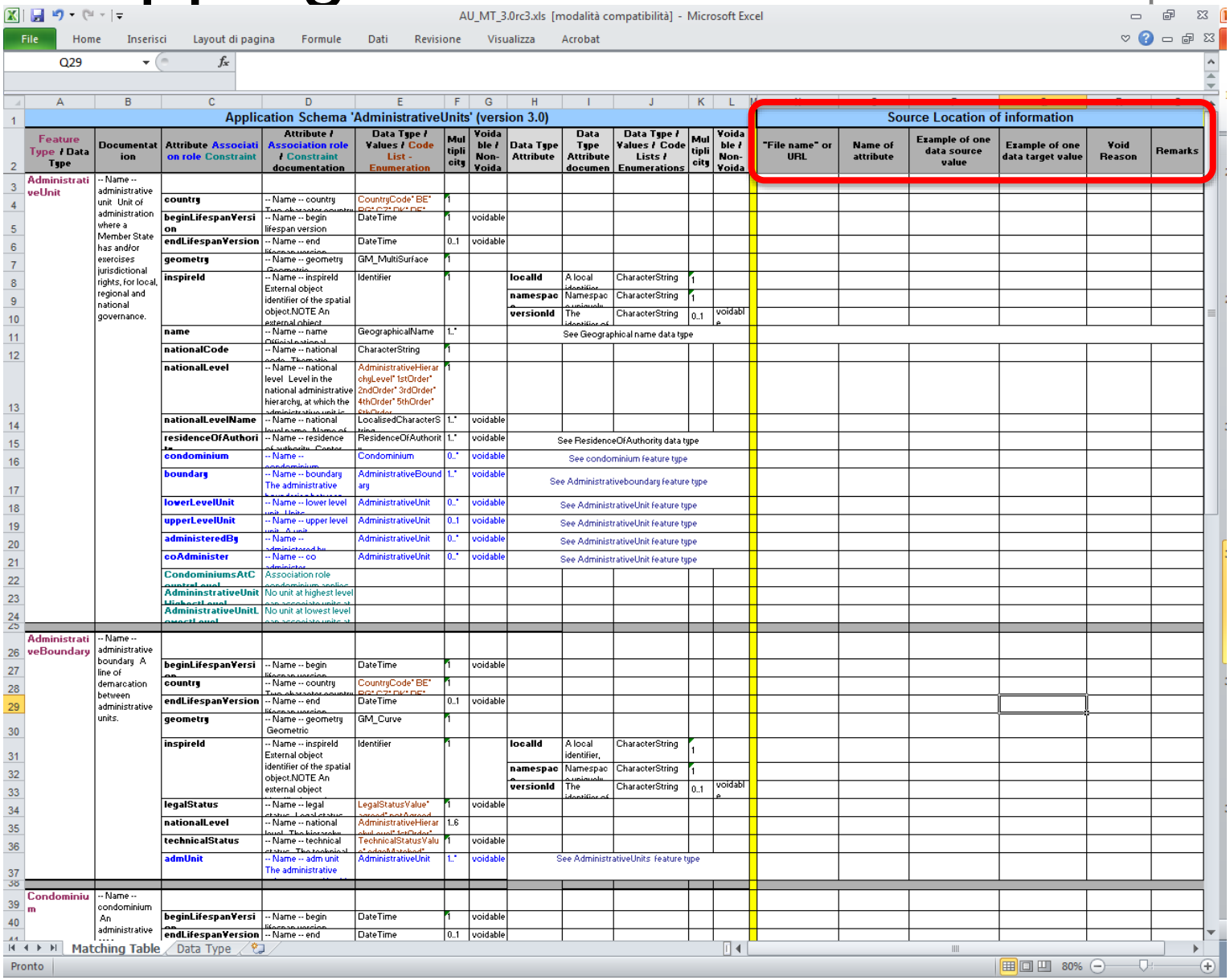
"File name" or URL	Name of attribute	Example of one data source value	Example of one data target value	Void Reason	Remarks
			IT		
			2013-11-20T14:12:20		
com2011.shp	shape				
com2011.shp	pro_com	78083	78083		
			AU.IT.ISTAT		
com2011Boundary.shp	shape				
com2011Boundary.shp	nome_com + nome_com_ad		Morano Calabro_Rotonda		
			AU.IT.ISTAT		
			agreed		
			4thOrder		
			edgeMatched		
com2011Boundary.shp	nome_com + nome_com_ad		Morano Calabro, Rotonda		

administeredBy	-- Name -- administered by	Adminis
coAdminister	-- Name -- co administer	Adminis
CondominiumsAtCountryLevel	Association role condominium applies only for administrative units which nationalLevel='1st order' (country level)	
AdmininstrativeUnitHighestLevel	No unit at highest level can associate units at a higher level.	
AdministrativeUnitLowestLevel	No unit at lowest level can associate units at lower level	

Matching Table | Data Type

Pronto | 80%

Mapping tables



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Application Schema 'AdministrativeUnits' (version 3.0)

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		beginLifespanVersion	-- Name -- begin lifespan version	DateTime	1	voidable											
		endLifespanVersion	-- Name -- end	DateTime	0..1	voidable											
		geometry	-- Name -- geometry	GM_MultiSurface	1												
		inspireId	-- Name -- inspireId External object identifier of the spatial object.NOTE An external object	Identifier	1		localId	A local identifier	CharacterString	1							
							namespac	Namespac	CharacterString	1							
							versionId	The	CharacterString	0..1	voidabl e						
		name	-- Name -- name	GeographicalName	1..*		See Geographical name data type										
		nationalCode	-- Name -- national	CharacterString	1												
		nationalLevel	-- Name -- national level Level in the national administrative hierarchy, at which the	AdministrativeHierarchyLevel* 1stOrder* 2ndOrder* 3rdOrder* 4thOrder* 5thOrder*	1												
		nationalLevelName	-- Name -- national	LocalisedCharacterString	1..*	voidable											
		residenceOfAuthority	-- Name -- residence	ResidenceOfAuthority	1..*	voidable	See ResidenceOfAuthority data type										
		condominium	-- Name --	Condominium	0..*	voidable	See condominium feature type										
		boundary	-- Name -- boundary The administrative	AdministrativeBoundary	1..*	voidable	See Administrativeboundary feature type										
		lowerLevelUnit	-- Name -- lower level	AdministrativeUnit	0..*	voidable	See AdministrativeUnit feature type										
		upperLevelUnit	-- Name -- upper level	AdministrativeUnit	0..1	voidable	See AdministrativeUnit feature type										
		administeredBy	-- Name --	AdministrativeUnit	0..*	voidable	See AdministrativeUnit feature type										
		coAdminister	-- Name -- co	AdministrativeUnit	0..*	voidable	See AdministrativeUnit feature type										
		CondominiumsAtCountryLevel	Association role														
		AdminInstrativeUnitHighestLevel	No unit at highest level														
		AdministrativeUnitLowestLevel	No unit at lowest level														
AdministrativeBoundary	-- Name -- administrative boundary A line of demarcation between administrative units.																
		beginLifespanVersion	-- Name -- begin	DateTime	1	voidable											
		country	-- Name -- country	CountryCode* BE*	1												
		endLifespanVersion	-- Name -- end	DateTime	0..1	voidable											
		geometry	-- Name -- geometry Geometric	GM_Curve	1												
		inspireId	-- Name -- inspireId External object identifier of the spatial object.NOTE An external object	Identifier	1		localId	A local identifier,	CharacterString	1							
							namespac	Namespac	CharacterString	1							
							versionId	The	CharacterString	0..1	voidabl e						
		legalStatus	-- Name -- legal	LegalStatusValue*	1	voidable											
		nationalLevel	-- Name -- national	AdministrativeHierarchyLevel* 1stOrder*	1,6												
		technicalStatus	-- Name -- technical	TechnicalStatusValue*	1	voidable											
		admUnit	-- Name -- adm unit The administrative	AdministrativeUnit	1..*	voidable	See AdministrativeUnits feature type										
Condominium	-- Name -- condominium An administrative																
		beginLifespanVersion	-- Name -- begin	DateTime	1	voidable											
		endLifespanVersion	-- Name -- end	DateTime	0..1	voidable											

Matching Table | Data Type

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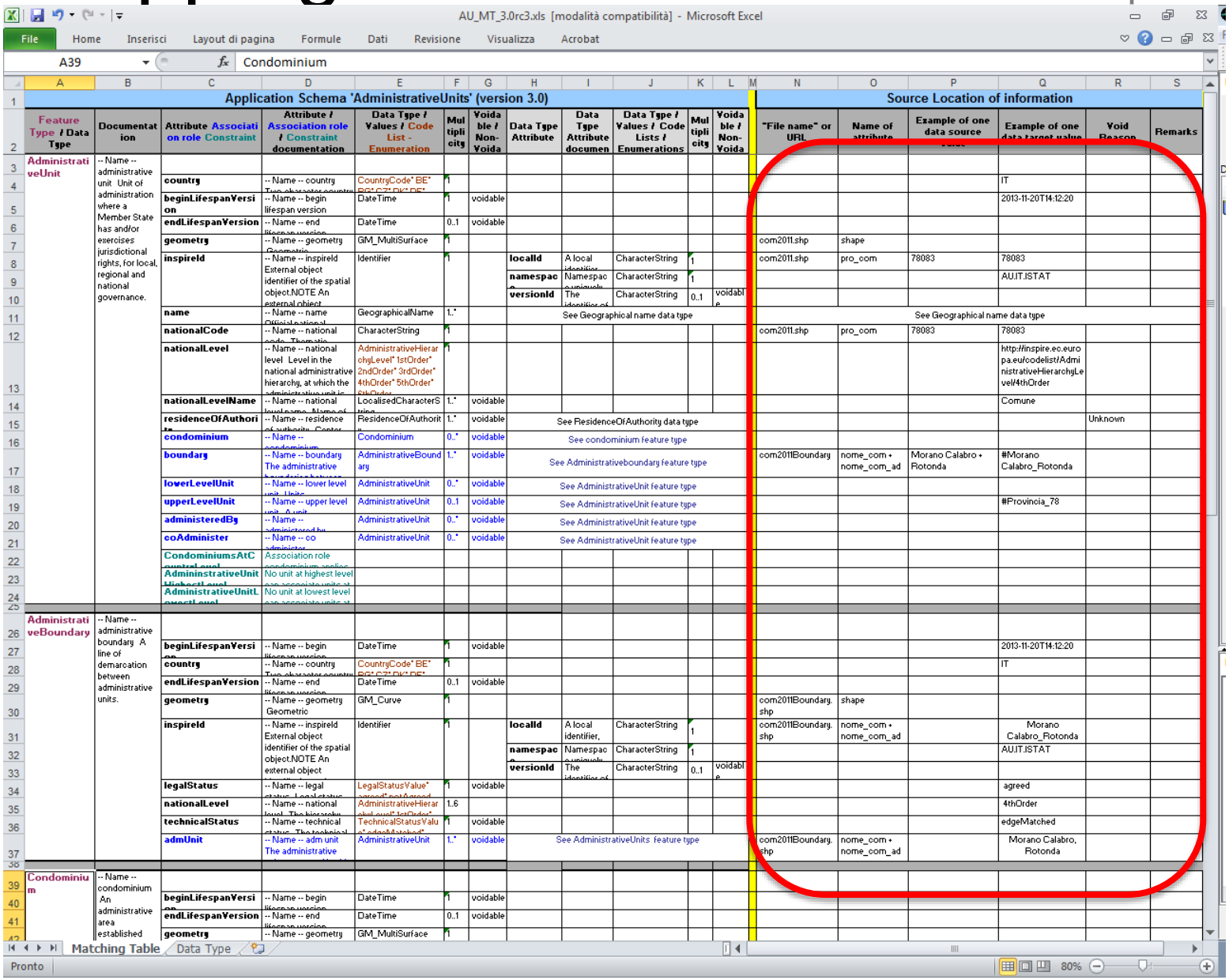
Mapping tables



AU_MT_3.0rc3.xls [modalità compatibilità] - Microsoft Excel

File | Home | Inserisci | Layout di pagina | Formule | Dati | Revisione | Visualizza | Acrobat

A39: Condominium

Application Schema 'AdministrativeUnits' (version 3.0)

Feature Type / Data Type	Documentation	Attribute / Association role / Constraint	Attribute / Association role / Constraint documentation	Data Type / Values / Code List - Enumeration	Multiplicity	Voidable / Non-Voida	Data Type Attribute	Data Type Attribute documen	Data Type / Values / Code Lists / Enumerations	Multiplicity	Voidable / Non-Voida
AdministrativeUnit	-- Name -- administrative unit Unit of administration where a Member State has and/or exercises jurisdictional rights, for local, regional and national governance.										
		country	-- Name -- country	CountryCode* BE*	1						
		beginLifespanVersion	-- Name -- begin lifespan version	DateTime	1	voidable					
		endLifespanVersion	-- Name -- end	DateTime	0..1	voidable					
		geometry	-- Name -- geometry	GM_MultiSurface	1						
		inspireId	-- Name -- inspireId External object identifier of the spatial object.NOTE An external object	Identifier	1		**localId**	A local identifier,	CharacterString	1	
							namespac	Namespac	CharacterString	1	
							versionId	The	CharacterString	0..1	voidabl
		name	-- Name -- name	GeographicalName	1..*		See Geographical name data type				
		nationalCode	-- Name -- national	CharacterString	1						
		nationalLevel	-- Name -- national level Level in the national administrative hierarchy, at which the	AdministrativeHierarchyLevel* 1stOrder* 2ndOrder* 3rdOrder* 4thOrder* 5thOrder*	1						
		nationalLevelName	-- Name -- national	LocalisedCharacterString	1..*	voidable					
		residenceOfAuthori	-- Name -- residence	ResidenceOfAuthorit	1..*	voidable	See ResidenceOfAuthority data type				
		condominium	-- Name --	Condominium	0..*	voidable	See condominium feature type				
		boundary	-- Name -- boundary The administrative	AdministrativeBoundary	1..*	voidable	See Administrativeboundary feature type				
		lowerLevelUnit	-- Name -- lower level	AdministrativeUnit	0..*	voidable	See AdministrativeUnit feature type				
		upperLevelUnit	-- Name -- upper level	AdministrativeUnit	0..1	voidable	See AdministrativeUnit feature type				
		administeredBy	-- Name --	AdministrativeUnit	0..*	voidable	See AdministrativeUnit feature type				
		coAdminister	-- Name -- co	AdministrativeUnit	0..*	voidable	See AdministrativeUnit feature type				
		CondominiumsAtC	Association role condominium applies								
		AdmininstrativeUnit	No unit at highest level								
		AdministrativeUnitL	No unit at lowest level								
AdministrativeBoundary	-- Name -- administrative boundary A line of demarcation between administrative units.										
		beginLifespanVersion	-- Name -- begin	DateTime	1	voidable					
		country	-- Name -- country	CountryCode* BE*	1						
		endLifespanVersion	-- Name -- end	DateTime	0..1	voidable					
		geometry	-- Name -- geometry Geometric	GM_Curve	1						
		inspireId	-- Name -- inspireId External object identifier of the spatial object.NOTE An external object	Identifier	1		**localId**	A local identifier,	CharacterString	1	
							namespac	Namespac	CharacterString	1	
							versionId	The	CharacterString	0..1	voidabl
		legalStatus	-- Name -- legal	LegalStatusValue* agreed* notAgreed	1	voidable					
		nationalLevel	-- Name -- national	AdministrativeHierarchyLevel* 1stOrder*	1..6						
		technicalStatus	-- Name -- technical	TechnicalStatusValue* edgeMatched*	1	voidable					
		admUnit	-- Name -- adm unit The administrative	AdministrativeUnit	1..*	voidable	See AdministrativeUnits feature type				
Condominium	-- Name -- condominium An administrative area established										
		beginLifespanVersion	-- Name -- begin	DateTime	1	voidable					
		endLifespanVersion	-- Name -- end	DateTime	0..1	voidable					
		geometry	-- Name -- geometry	GM_MultiSurface	1						

Source Location of information

"File name" or URL	Name of attribute	Example of one data source	Example of one data target value	Void Reason	Remarks
			IT		
			2013-11-20T14:12:20		
com2011.shp	shape				
com2011.shp	pro_com	78083	78083		
			AU.IT.ISTAT		
	See Geographical name data type				
com2011.shp	pro_com	78083	78083		
			http://inspire.ec.europa.eu/codelist/AdministrativeHierarchyLevel/4thOrder		
			Comune		
				Unknown	
	See condominium feature type				
com2011Boundary	nome_com + nome_com_ad	Morano Calabro + Rotonda	#Morano Calabro_Rotonda		
	See AdministrativeUnit feature type				
	See AdministrativeUnit feature type		#Provincia_78		
	See AdministrativeUnit feature type				
	See AdministrativeUnit feature type				
			2013-11-20T14:12:20		
			IT		
com2011Boundary.shp	shape				
com2011Boundary.shp	nome_com + nome_com_ad		Morano Calabro_Rotonda		
			AU.IT.ISTAT		
			agreed		
			4thOrder		
			edgeMatched		
com2011Boundary.shp	nome_com + nome_com_ad		Morano Calabro, Rotonda		

Matching Table | Data Type

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Common matching problems

Matching problem	Possible solutions
A corresponding source value for an INSPIRE mandatory attribute is missing.	• If the missing value is common to all spatial objects, it can be added as a constant during transformation process. • Otherwise, the missing value must be added in the source dataset for each spatial object.
The source codelist (list of predefined values for an attribute) differs from the target INSPIRE codelist.	• Conversion of values can be executed during transformation process, if the transformation tool allows it. • Otherwise, conversion of values must be executed in the source dataset.

Summary

- 1. Principles of Data and Metadata harmonisation
- 2. Source and Target Data models
- 3. Mapping tables
- 4. Transformation of Data and Metadata
- 5. Principles of validation of transformed data and metadata

Data Transformation

- The easiest way to transform a dataset is to follow the Data Specifications – Technical Guidelines (DS) which allow to obtain a dataset conformant to the Implementing Rules.
- The DS propose the use of GML as the default encoding. GML application schemas (XSD files) are available for all data themes at the INSPIRE schema repository (http://inspire.ec.europa.eu/schemas/).
- Several transformation tools are available for the transformation of source datasets by means of the relevant application schema.

Data Transformation

- Among the many transformation tools available, a mention is given for two of them:
  - HUMBOLDT Alignment Editor (HALE), open source tool to define and evaluate conceptual schema mapping and to transform geodata based on these mapping. http://hale.igd.fraunhofer.de/2.8.0/help/index.jsp
  - GO Publisher, proprietary tool distributed by Snowflake Software - http://www.snowflakesoftware.com/products/gopublisher/.

Data Transformation

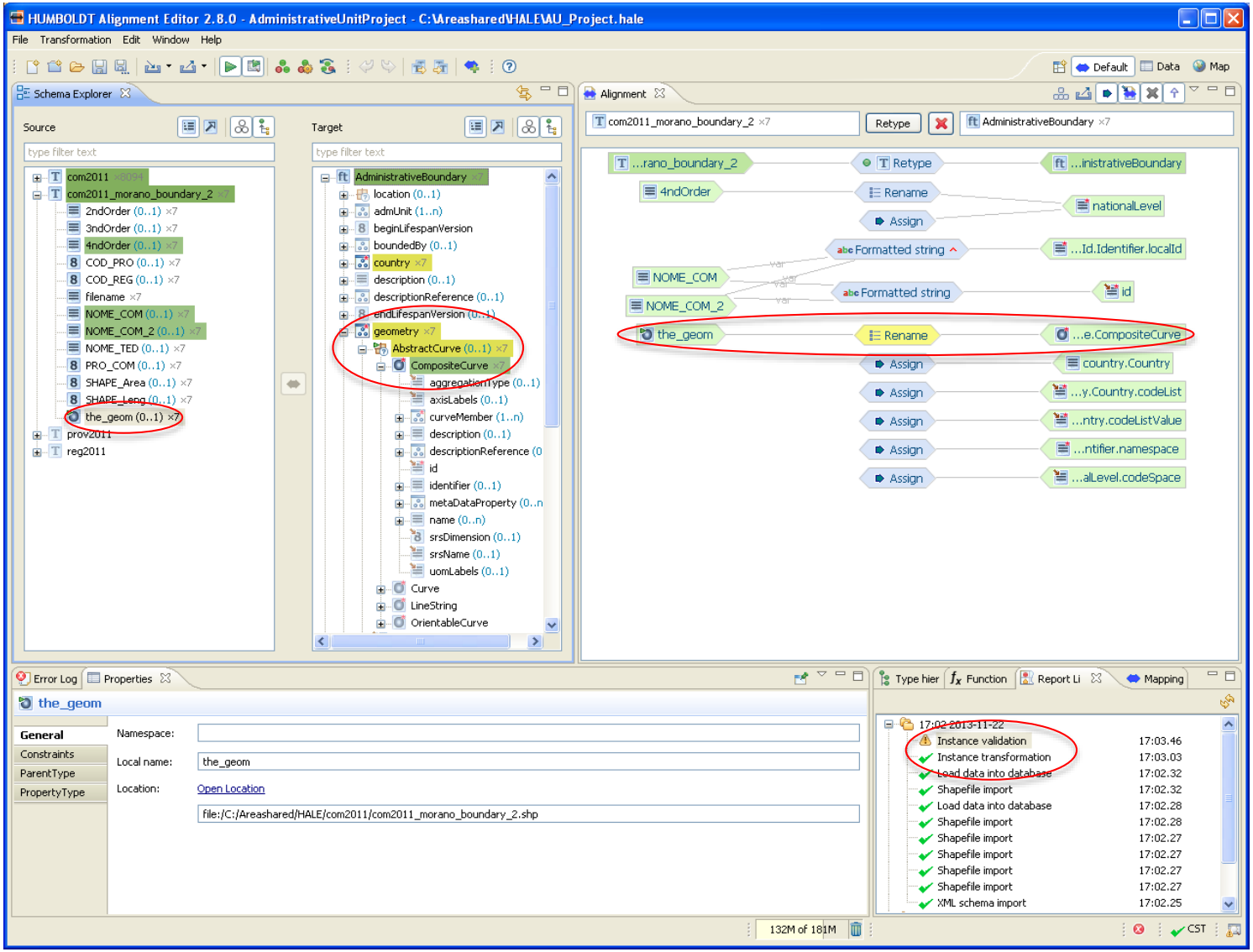
- Main functionalities common to the transformation tools are:
  - ✓ Import of target schemas from online resource
  - ✓ On-the-fly conversion of attribute values
  - ✓ Preview of the transformed dataset
  - ✓ Real-time validation of the transformed dataset against relevant XSD schema
  - ✓ Export of the transformed dataset in GML format

Data Transformation

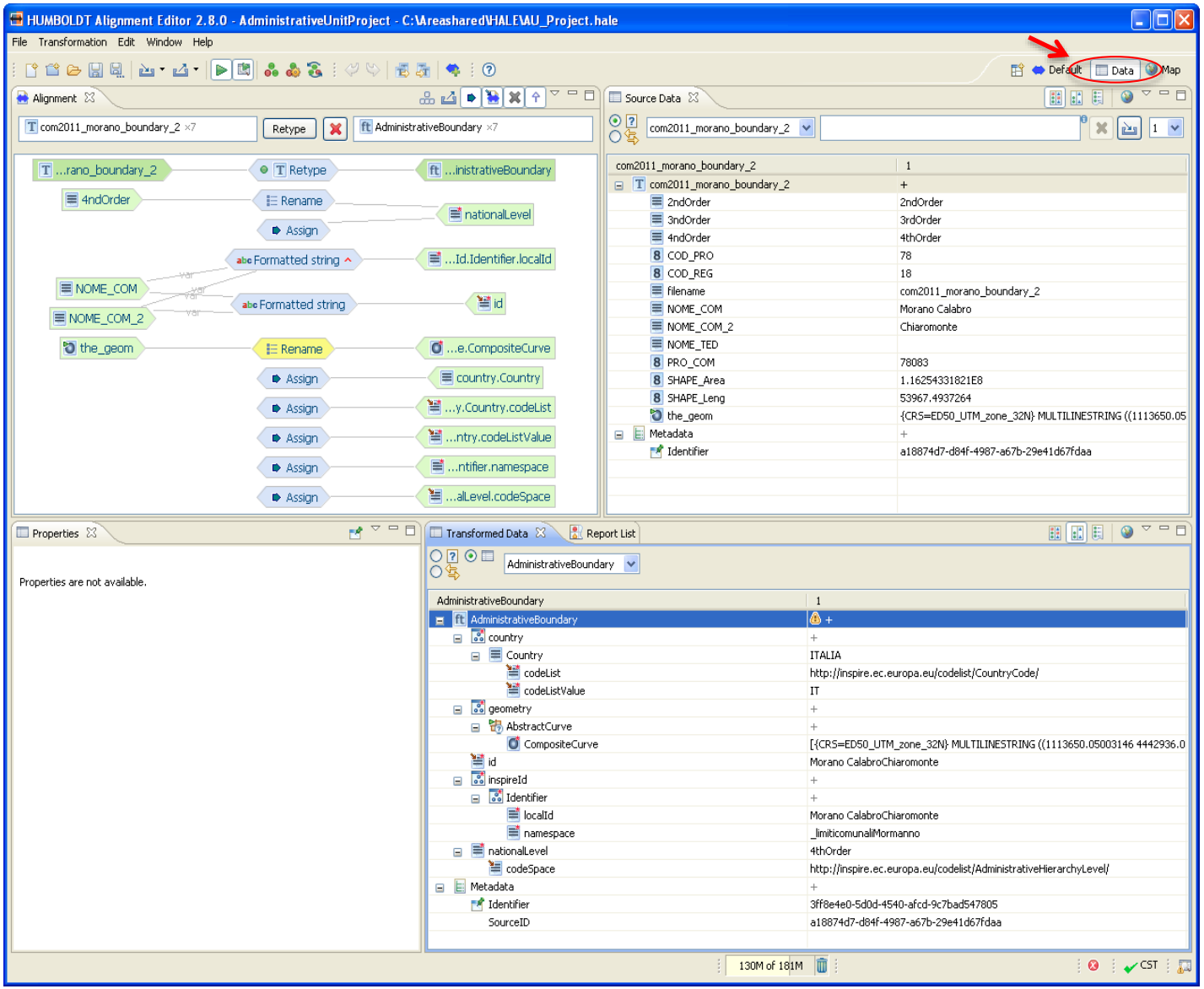
- Main differences:

Functionality	HALE	GoPublisher
Format of source dataset	• Shape file • WFS • PostGIS • CSV (for non-spatial data)	• ORACLE • PostGIS • SQL Server and MS Access or Excel file (for non-spatial data)
Conversion of values	• Predefined classification function	• SQL scripting
Mapping of INSPIRE complex data type	• Predefined function for “inspireId” and “Geographical name”	• Manual creation of the data type structure

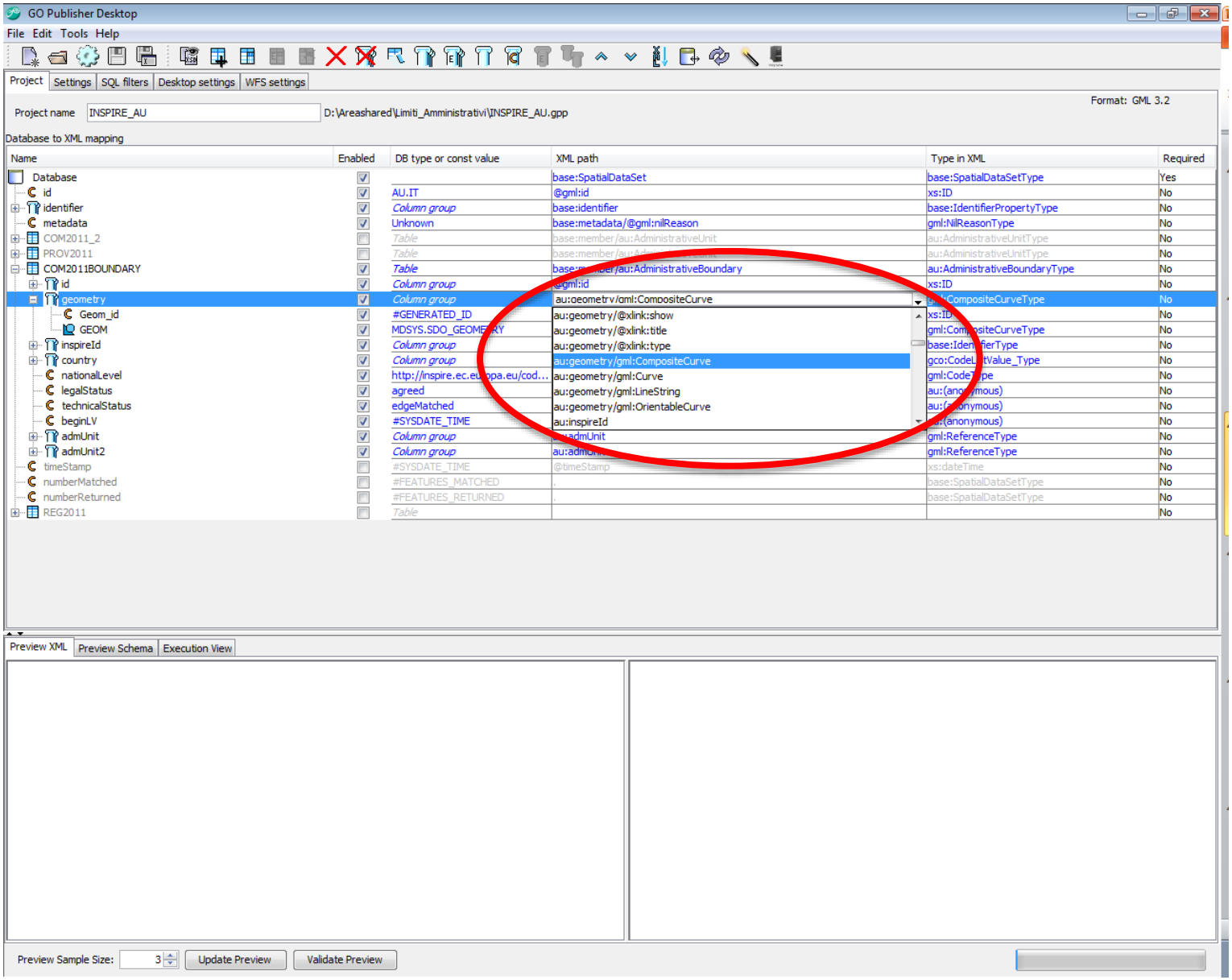
Data Transformation



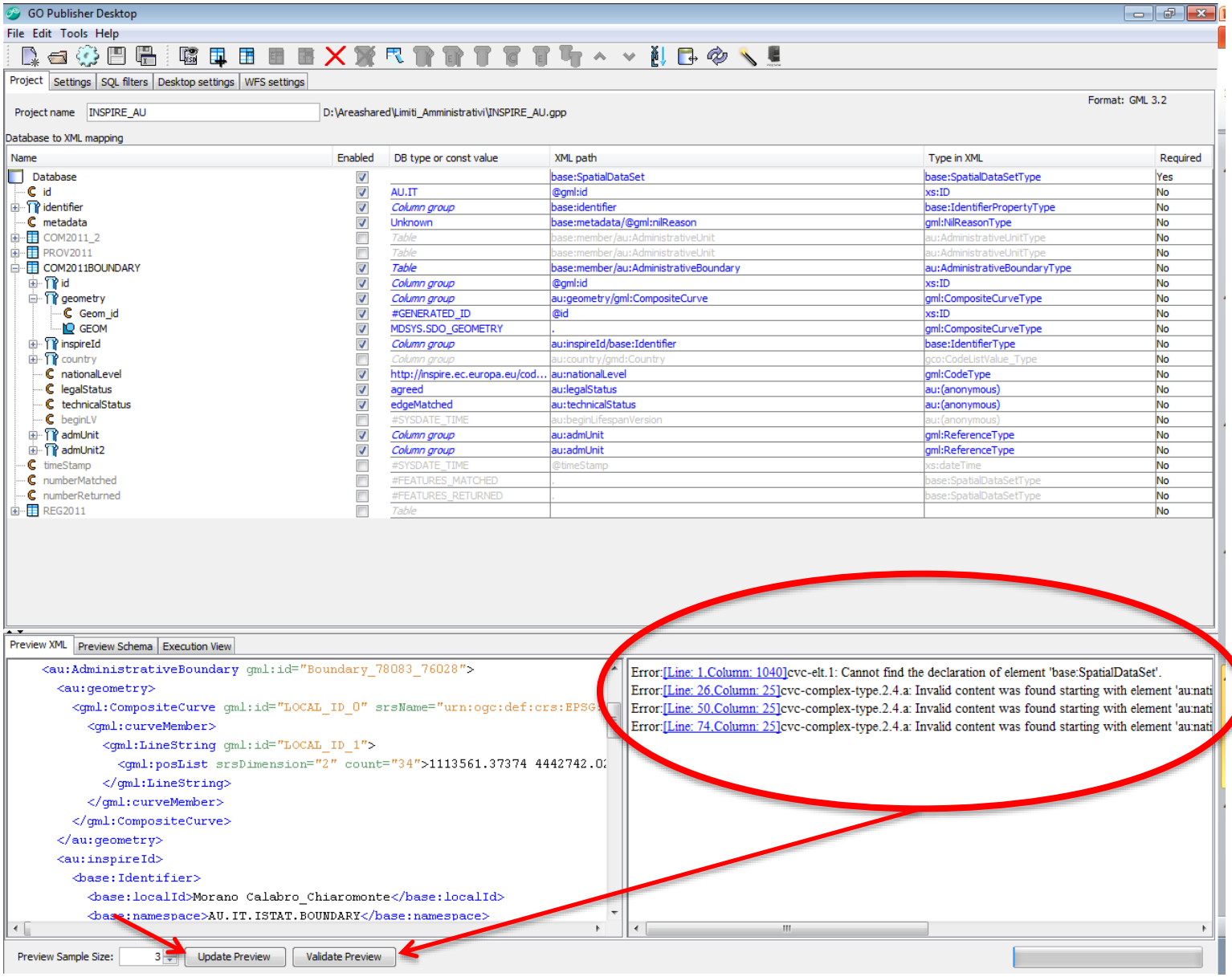
Data Transformation



Data Transformation



Data Transformation



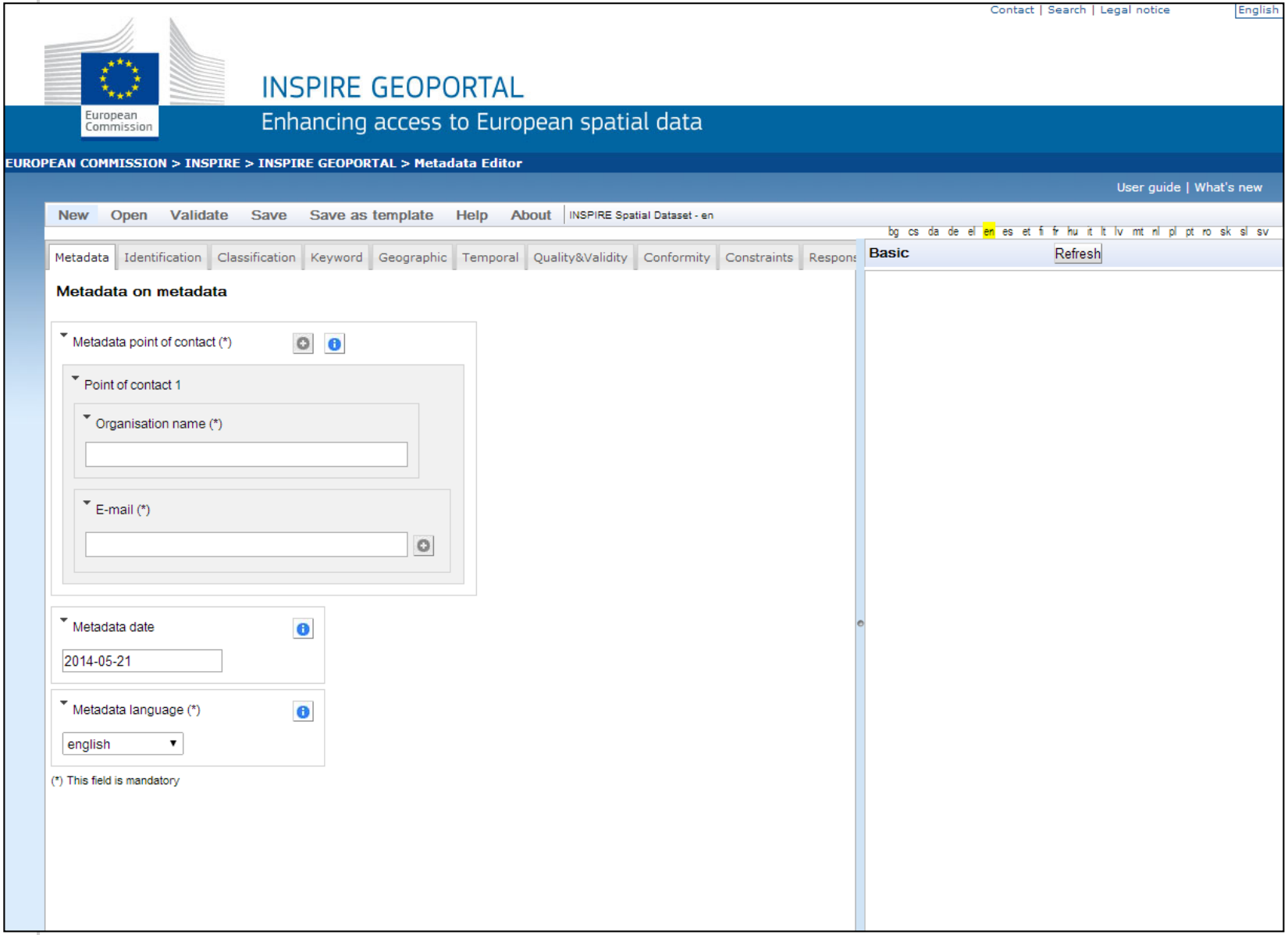
Metadata Transformation/Creation

- There are two possible options to obtain INSPIRE compliant metadata:
  - ➢ to transform existing metadata
  - ➢ to create new metadata from scratch
- In the first case the same transformation methodology described for the data still applies.
  - ✓ Because an XSD metadata target schema is still missing, the users has to load the full ISO 19115 profile and use the elements defined in the applicable Regulation for the transformation.
- In the second case the procedure to be followed is to use one of the many available metadata editors.

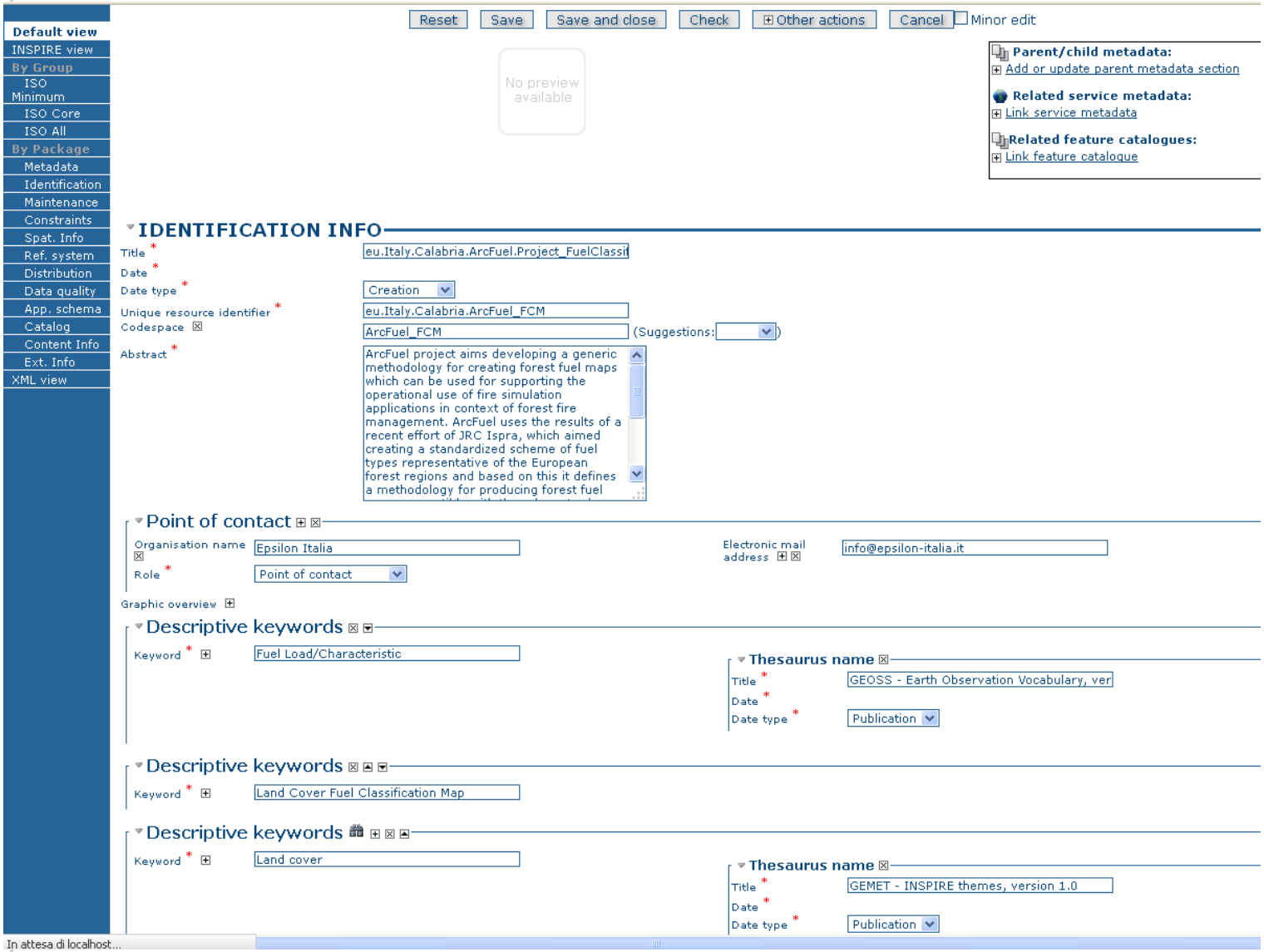
Metadata Editing

- Among the many editing tools available, a quick overview is given on two of them:
  - INSPIRE Geoportal Metadata Editor, a free online metadata editor (http://inspire-geoportal.ec.europa.eu/editor/)
  - GeoNetwork opensource, a catalog application to manage spatially referenced resources. It provides powerful metadata editing and search functions as well as an embedded interactive web map viewer. (http://geonetwork-opensource.org/)

Metadata Editing



Metadata Editing



Summary

- 1. Principles of Data and Metadata harmonisation
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- 3. Mapping tables
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Principles of validation of transformed data and metadata

Once data/metadata is assembled and transformed, a validation process is essential to assess conformance to relevant requirements.

Data validation:

Requirements	How to assess conformance
Commission Regulation (EU) No 1089/2010 of 23 November 2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial data sets and services and its sub-sequent amendments (Commission Regulation (EU) No 102/2011 of 4 February 2011 and Commission Regulation (EU) No 1253/2013 of 21 October 2013)	Implement the Abstract Test Suite (ATS) included in Annex A – Part 1 of Data Specifications Technical Guidelines
INSPIRE Data Specifications Technical Guidelines for the Annex I, II and III Spatial Data Themes	Implement the Abstract Test Suite (ATS) included in Annex A – Part 2 of Data Specifications Technical Guidelines

Principles of validation of transformed data and metadata

Metadata validation:

Requirements	How to assess conformance
COMMISSION REGULATION (EC) No 1205/2008 of 3 December 2008 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards metadata	INSPIRE Geoportal Metadata Validator
COMMISSION REGULATION (EU) No 1089/2010 of 23 November 2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial data sets and services and its sub-sequent amendments (Commission Regulation (EU) No 102/2011 of 4 February 2011 and Commission Regulation (EU) No 1253/2013 of 21 October 2013)	Manually verify the presence of the required metadata.