



Harmonização da COS de acordo com as especificações INSPIRE

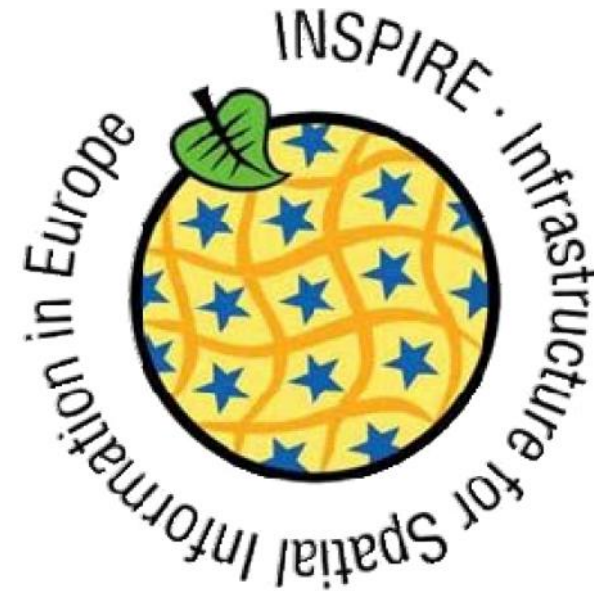
Teresa Zuna

teresa.zuna@gmail.com

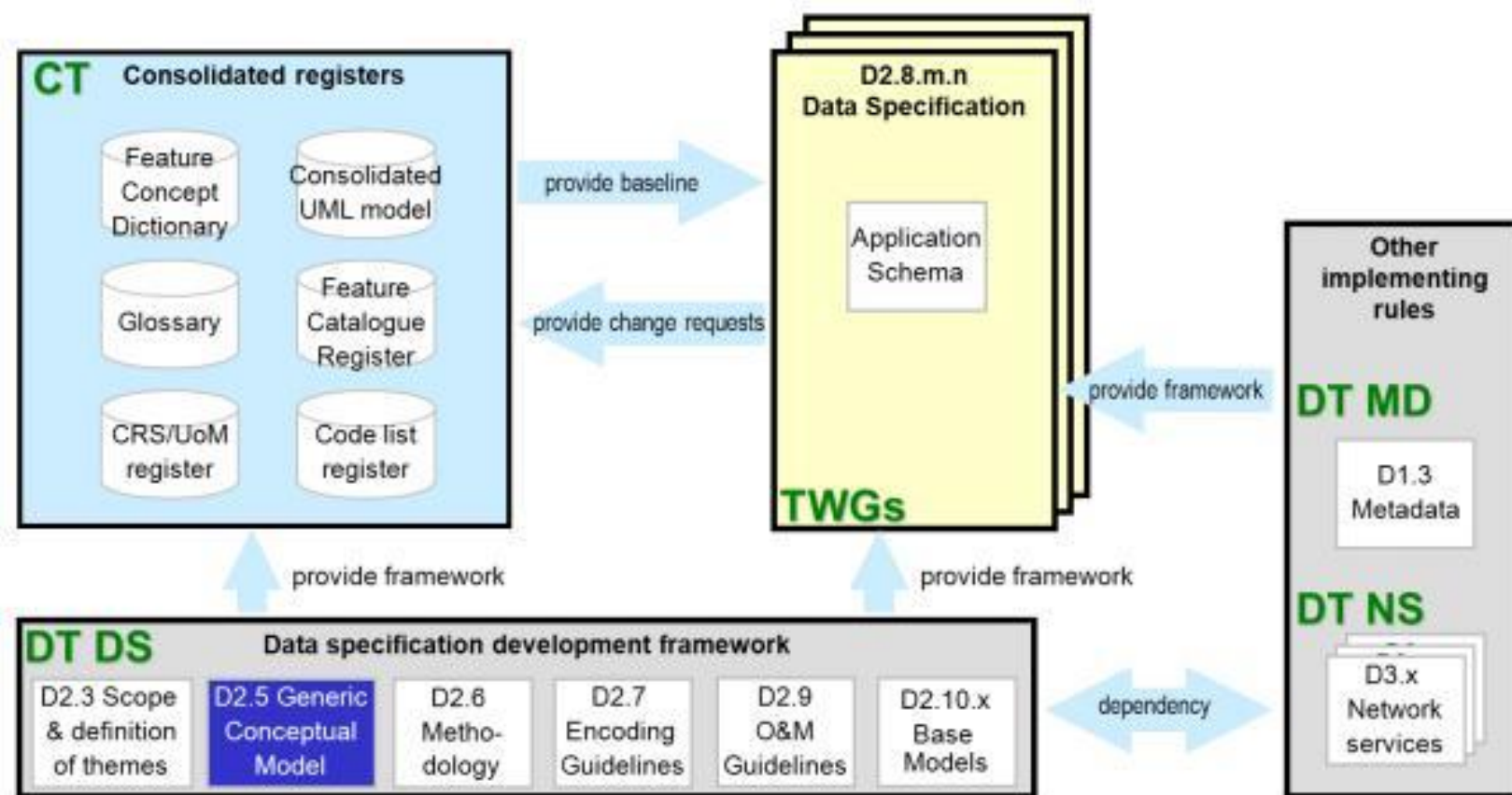


Directiva INSPIRE: Harmonização de CDG

- Permitir a harmonização de CDG e serviços
- Documentação produzida no âmbito da Directiva INSPIRE:
 - Especificações de dados
 - Metadados
 - Serviços de rede
 - Partilha de dados e serviços
 - Monitorização e elaboração de relatórios

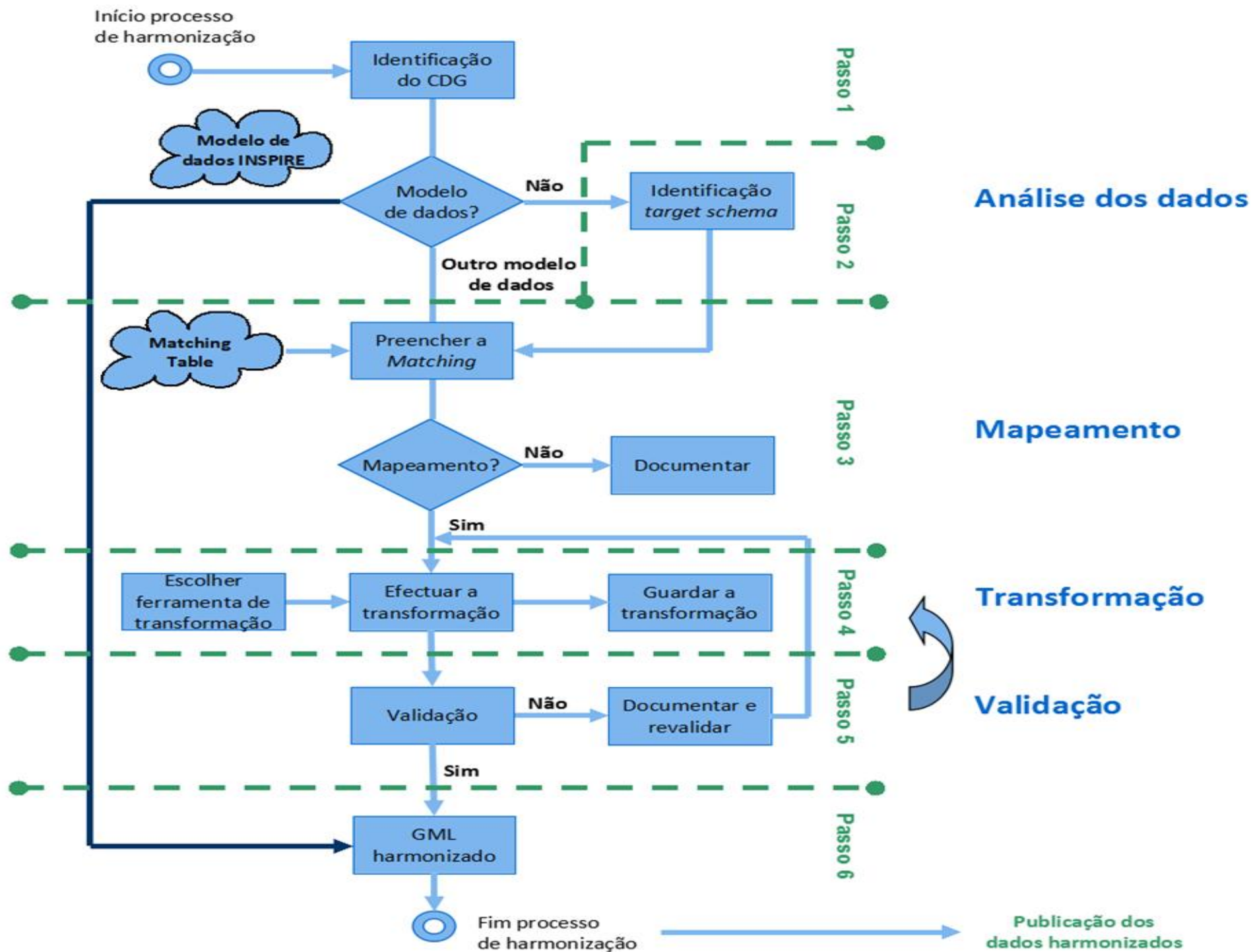


Directiva INSPIRE: Harmonização de CDG



Directiva INSPIRE: Harmonização de CDG

- Especificações dos dados na Directiva INSPIRE:
 - Relação entre objetos;
 - Atributos e nomenclaturas;
 - Harmonização geométrica (topologias, sistema de referência, representação)
 - Identificação dos objetos - INSPIRE Registry;
 - Dimensão temporal dos dados;
 - Qualidade (metadados, qualidade da representação geométrica)
 - Listas de códigos
 - Actualização
 - ATS



1. Análise do
CDG

2.
Mapeamento

3.
Transformação
do CDG

4. Validação



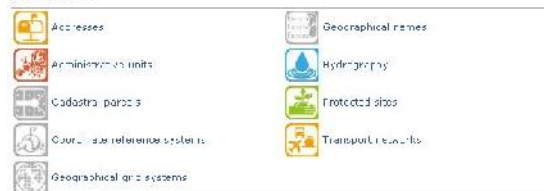
1. Análise do CDG

- Interpretação dos dados de origem (*source schema*)
 - Formato dos dados
 - Representação espacial
 - Atributos
 - Sistema de Coordenadas
 - Metadados

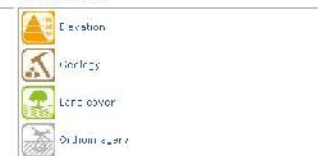
1. Análise do CDG

- Identificação do tema na Directiva INSPIRE
- Interpretação dos documentos INSPIRE
 - General Conceptual Model
http://inspire.ec.europa.eu/documents/Data_Specifications/D2.5_v3.4rc3.pdf
 - Data Specifications
<http://inspire.ec.europa.eu/index.cfm/pageid/2>

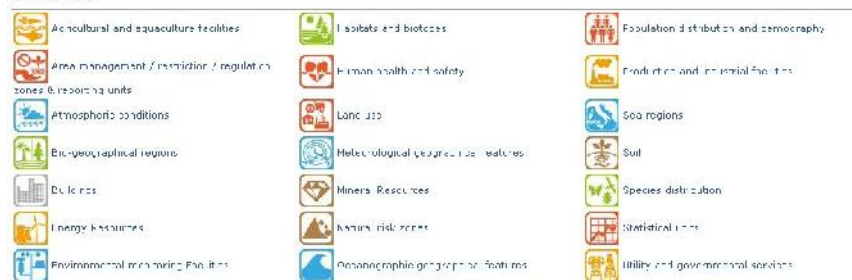
ANNEX 1



ANNEX 2



ANNEX 3



INSPIRE
Infrastructure for Spatial Information in Europe

D2.8.II.2 Data Specification on Land cover – Draft Technical Guidelines

Title	D2.8.II.2 INSPIRE Data Specification on Land cover – Draft Technical Guidelines
Creator	INSPIRE Thematic Working Group Land cover
Date	2013-02-04
Subject	INSPIRE Data Specification for the spatial data theme Land cover
Publisher	INSPIRE Thematic Working Group Land cover
Type	Text
Description	This document describes the INSPIRE Data Specification for the spatial data theme Land cover. This version (version 3, release candidate 3) reflects the content of the draft international Commission Regulation (EU) No 1095/2013 for the Annex III spatial data themes as submitted to the INSPIRE Committee.
Contributor	Members of the INSPIRE Thematic Working Group Land cover
Format	Portable Document Format (pdf)
Source	
Rights	Public
Identifier	D2.8.II.2_v3.Drc3
Language	En
Relation	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)
Coverage	Project duration

1. Análise do CDG

- Criação da BD de raiz de acordo com os requisitos INSPIRE
 - Feature catalog (Catálogo de objectos)
 - Diagrama UML
 - Matching table (Tabela de correspondências)
 - Application Schema .XML

Data Specifications

Legislation Who Consultations Testing Roadmap Library News Themes

Data Models xml schemas

Legislation

- ▶ [Commission Regulation \(EU\) No 1312/2014 of 10 December 2014 amending Regulation \(EU\) No 1089/2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial data services](#) 11.12.2014
- ▶ [COMMISSION REGULATION \(EU\) No 1253/2013 of 21 October 2013 amending Regulation \(EU\) No 1089/2010 implementing Directive 2007/2/EC as regards interoperability of spatial data sets and services](#) 10.12.2013
- ▶ [COMMISSION REGULATION \(EU\) No 102/2011 of 4 February 2011 amending Regulation \(EU\) No 1089/2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial data sets and services](#) 05.02.2011
- ▶ [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](#) 08.12.2010

1. Análise do CDG:

Carta de Ocupação do Solo 2010

Cartografia temática que pretende caracterizar com grande detalhe a ocupação e uso do solo no território de Portugal Continental

Modelo de dados	Vectorial
Estrutura de dados	Polígonos
Sistema de referência	ETRS89 (European Terrestrial Reference System 1989) PT-TM06
Unidade Mínima Cartográfica (UMC)	1 ha
Unidade Mínima Cartográfica Distância mínima entre linhas	20 metros
Nomenclatura	Nomenclatura hierárquica com 5 níveis de detalhe e 226 classes

1. Análise do CDG:

Carta de Ocupação do Solo 2010

Designação dos atributos	Terminologia/ Formato
Área (ha)	AREA/ Float (19 algarismos/10 casas decimais)
Identificador único	FID/ OID (4 caracteres)
Classe de Ocupação do Solo	USO/ String (10 caracteres)
Geometria de cada polígono	THE_GEOM (Shapefile, geometry)

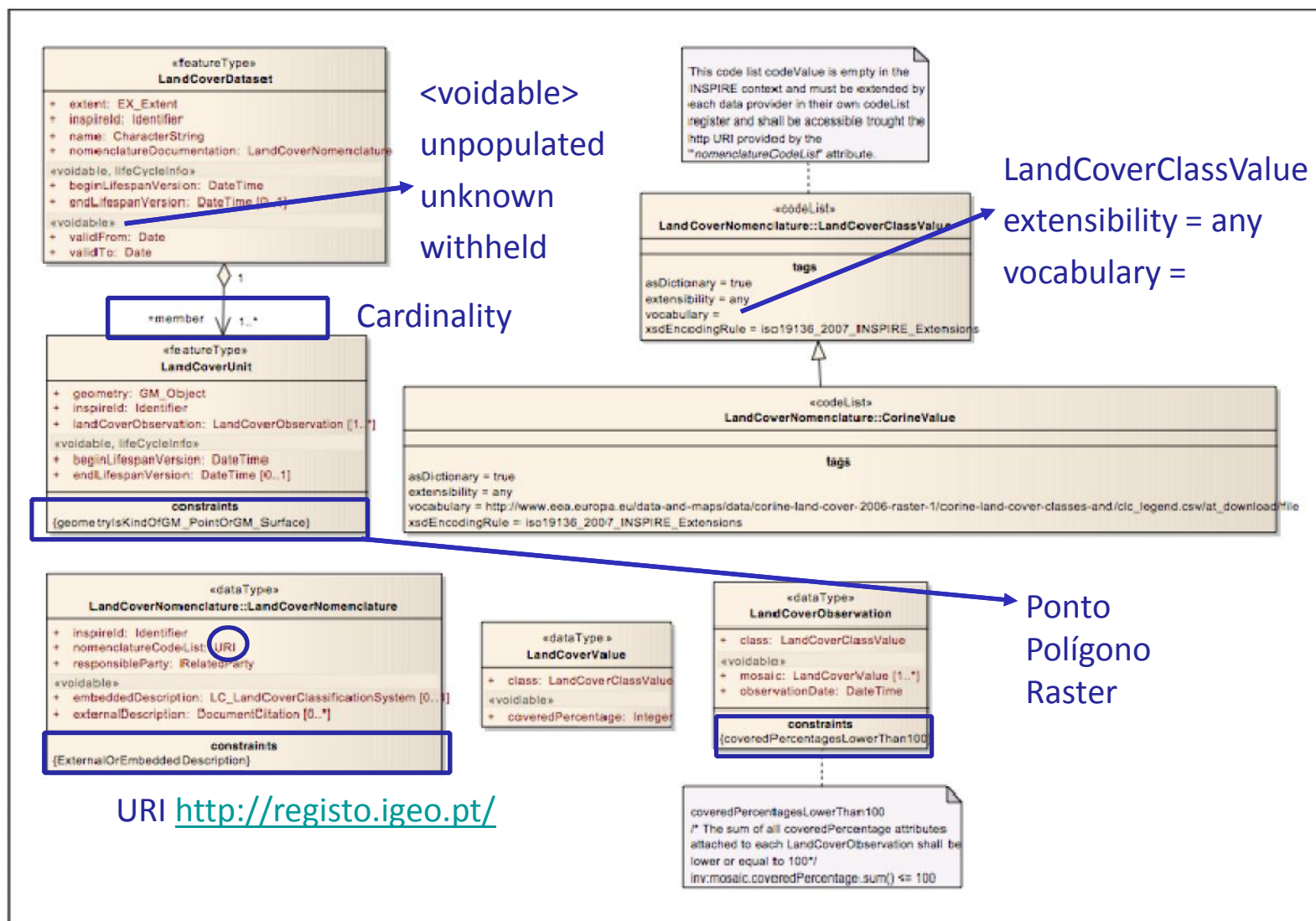
1. Análise do CDG: *Target data model*

- Tema INSPIRE – II.2 Ocupação do Solo
 - D2.5. INSPIRE Generic Conceptual Model versão 3.4rc3
 - INSPIRE Data Specification on Land Cover (DS LC) - Draft Technical Guidelines, versão 3.0rc3
 - Diagrama UML
 - Catálogo de objectos
 - Application schema .XSD

1. Análise do CDG: *Target data model*

ETRS89-TM29		
Elipsoide de referência:	GRS80	Semi-eixo maior: $a = 6\,378\,137\text{ m}$ Achatamento: $f = 1 / 298,257\,222\,101$
Datum	European Terrestrial Reference System 1989	
Projeção cartográfica:	UTM zona 29N	
Área geográfica	Entre os 12°W e os 6°W	
Latitude da origem das coordenadas:	0	
Meridiano Central	-9	
Falsa origem das coordenadas:	Em M (distância à Meridiana): 500000 m Em P (distância à Perpendicular): 0 m	
EPSG	3041 (http://spatialreference.org/ref/epsg/3041/)	

1. Análise do CDG: *LandCoverVector.xsd*



1. Análise do CDG: *LandCoverVector.xsd*

- Campos vazios/*No data*
 - Ausência de valores nos atributos:
 - A característica não estar presente no objecto espacial e não existir no mundo real. [Multiplicity \[0..\]](#)
 - A característica não estar presente no objecto espacial mas poder existir no mundo real – [Voidable](#)
- *Voidable*
 - Unpopulated
 - Unkown
 - Withheld

1. Análise dos dados:

LandCoverNomenclature

- Code list (lista de códigos)
 - É permitida apenas uma nomenclatura para a COS 2010
 - Os valores são geridos fora da application schema *LandCoverVector.xsd*
 - A especificação de dados não recomenda nenhuma nomenclatura
 - extensibility= any vocabulary=
 - Lista hierárquica (parent value)
 - INSPIRE register (http://inspire.ec.europa.eu/codelist_register/codelist)
 - <http://registo.igeo.pt/listadecodigo/CartaOcupacaoSoloValue>
 - URI, legenda



1. Análise dos dados:

LandCoverNomenclature

```
<value id="http://registo.igeo.pt/listadecodigo/CartaOcupacaoSoloValue/1.1.1.01.1">
  <thisversion>http://registo.igeo.pt/listadecodigo/CartaOcupacaoSoloValue/1.1.1.01.1</thisversion>
  <latestversion>http://registo.igeo.pt/listadecodigo/CartaOcupacaoSoloValue/1.1.1.01.1</latestversion>
  <label xml:lang="pt">Tecido urbano contínuo predominantemente vertical</label>
  <governance-level id="http://inspire.ec.europa.eu/registry/governance-level/eu-legal">
    <label>eu-legal</label>
  </governance-level>
  <codelist id="http://registo.igeo.pt/listadecodigos/CartaOcupacaoSoloValue">
    <label xml:lang="pt">Lista de códigos da Carta de Ocupação do Solo</label>
  </codelist>
  <theme id="http://registo.igeo.pt/tema/cos">
    <label xml:lang="pt">Carta de Ocupação do Solo</label>
  </theme>
  <applicationschema id="http://inspire.ec.europa.eu/applicationschema/lcn">
    <label xml:lang="pt">Nomenclatura da Carta de Ocupação do Solo</label>
  </applicationschema>
  <itemclass uri="listadecodigos">
    <label xml:lang="pt">Lista de códigos</label>
  </itemclass>
  <status id="http://inspire.ec.europa.eu/registry/status/valid">
    <label xml:lang="en">Valid</label>
  </status>
  <register id="http://registo.igeo.pt/listadecodigos">
    <label xml:lang="pt">Registo da lista de códigos INSPIRE-PT</label>
    <registry id="http://registo.igeo.pt">
      <label xml:lang="pt">Registo INSPIRE-PT</label>
    </registry>
  </register>
</value>
```

1. Análise do
CDG



2.
Mapeamento



3.
Transformação
do CDG



4. Validação

2. Mapeamento

- Preenchimento da matching table
 - Download: <http://inspire.ec.europa.eu/data-model/approved/r4618ir/mapping/LandCoverVector%20Mapping%20Table.xml>
 - Importar para folha de cálculo

Application Schema "LandCoverVector" (version 1.0)						Application Schema "COS2010_N5"						
Feature type		Feature type description		Feature type definition		Stereotype	Dataset		Dataset definition		Status	Rn
Application schema	Documentation	Attribute/Association role/Source role	Attribute/Association role/Source role	Value/Enumeration	Multiplicity		Attribute name	Documentation	Attribute/Association role/Source role	Value/Enumeration		
LandCoverUnit	The LandCoverUnit is a vector data model representing the land cover of a geographical area.	id	id	id	1		id		id	PT_COS2010_N5_1	Not available	
		name	name	name	1		name		name	PT_COS2010_N5_1	Not available	
		geometry	geometry	geometry	1		geometry		geometry	PT_COS2010_N5_1	Not available	
		begin_of_season/Year	begin_of_season/Year	begin_of_season/Year	1	required	begin_of_season/Year		begin_of_season/Year	PT_COS2010_N5_1	Not available	
		end_of_season/Year	end_of_season/Year	end_of_season/Year	1	required	end_of_season/Year		end_of_season/Year	PT_COS2010_N5_1	Not available	
		geometry	geometry	geometry	1	required	geometry		geometry	PT_COS2010_N5_1	Not available	
LandCoverValue	The LandCoverValue is a vector data model representing the land cover value of a geographical area.	id	id	id	1		id		id	PT_COS2010_N5_1	Not available	
		name	name	name	1		name		name	PT_COS2010_N5_1	Not available	
		geometry	geometry	geometry	1		geometry		geometry	PT_COS2010_N5_1	Not available	
		begin_of_season/Year	begin_of_season/Year	begin_of_season/Year	1	required	begin_of_season/Year		begin_of_season/Year	PT_COS2010_N5_1	Not available	
		end_of_season/Year	end_of_season/Year	end_of_season/Year	1	required	end_of_season/Year		end_of_season/Year	PT_COS2010_N5_1	Not available	
		geometry	geometry	geometry	1	required	geometry		geometry	PT_COS2010_N5_1	Not available	
LandCoverObservation	The LandCoverObservation is a vector data model representing the land cover observation of a geographical area.	id	id	id	1		id		id	PT_COS2010_N5_1	Not available	
		name	name	name	1		name		name	PT_COS2010_N5_1	Not available	
		geometry	geometry	geometry	1		geometry		geometry	PT_COS2010_N5_1	Not available	
		begin_of_season/Year	begin_of_season/Year	begin_of_season/Year	1	required	begin_of_season/Year		begin_of_season/Year	PT_COS2010_N5_1	Not available	
		end_of_season/Year	end_of_season/Year	end_of_season/Year	1	required	end_of_season/Year		end_of_season/Year	PT_COS2010_N5_1	Not available	
		geometry	geometry	geometry	1	required	geometry		geometry	PT_COS2010_N5_1	Not available	
LandCoverValue	The LandCoverValue is a vector data model representing the land cover value of a geographical area.	id	id	id	1		id		id	PT_COS2010_N5_1	Not available	
		name	name	name	1		name		name	PT_COS2010_N5_1	Not available	
		geometry	geometry	geometry	1		geometry		geometry	PT_COS2010_N5_1	Not available	
		begin_of_season/Year	begin_of_season/Year	begin_of_season/Year	1	required	begin_of_season/Year		begin_of_season/Year	PT_COS2010_N5_1	Not available	
		end_of_season/Year	end_of_season/Year	end_of_season/Year	1	required	end_of_season/Year		end_of_season/Year	PT_COS2010_N5_1	Not available	
		geometry	geometry	geometry	1	required	geometry		geometry	PT_COS2010_N5_1	Not available	

2. Mapeamento

gml: identificador único

Application
schemas

Descrição
application schema

Member - LandCoverUnit

Multiplicity

Voidable

Atributos

Descrição dos atributos

Application schema	Documentation	Attribute/ Association role/ Constraint	Attribute / Association role / Constraint documentation	Values / Enumerations	Multiplicity	Voidable / Non-Voidable
gmlBase	The attribute gml:id supports provision of a handle for the	id		gml:id	1	
LandCoverUnit	An individual element of the LC dataset represented by a point or polygon. Every unit support Land Cover information.	id		gml:id	1	
		inspireId	External object identifier of the Namespace uniquely identifying the data source of the spatial object.	localId		
		version	The identifier of the particular version of the spatial object.	version	1	
		beginLifespanVersion	Date and time at which this version of the spatial object.	DateTime	1	voidable
		endLifespanVersion	Date and time at which this version of the spatial object.	DateTime	0..1	voidable
		geometry	Spatial representation of the Land Cover unit.	GM_Object	1	
		landCoverObservation	Land cover information at a specific time and place.	LandCoverObservation	1..*	
LandCoverDataset	A vector representation for Land Cover data. This representation allows Land Cover data being supported by a vector geometry.	inspireId	External object identifier of the spatial object. NOTE: An Namespace uniquely identifying the data source of the spatial object.	localId		
		version	The identifier of the particular version of the spatial object, with a maximum length of 25.	version	1	
		beginLifespanVersion	Date and time at which this version of the spatial object.	DateTime	1	voidable
		endLifespanVersion	Date and time at which this version of the spatial object.	DateTime	0..1	voidable
		extent	Contains the extent of the data set.	EX_Extent	1	
		name	Name of the Land Cover data set.	CharacterString	1	
		nomenclatureDocumentation	Information about the nomenclature used in this data set.	LandCoverNomenclature	1	
		validFrom	The time when the phenomenon started to exist in the real world.	Date	1	voidable
		validTo	The time from which the phenomenon no longer exists in the real world.	Date	1	voidable
		member	A Land Cover Unit being part of the data set.	LandCoverUnit	1..*	
LandCoverObservation	Land Cover information interpreted at a specific time and place.	class	The assignment of a land cover class to a land cover unit through a classification.	LandCoverClassValue	1	
		mosaic	List of classification values describing into details a land cover unit, associated with percentages.	LandCoverValue	1..*	voidable
		observationDate	The observation date associated of an observation.	DateTime	1	voidable
LandCoverValue	Generic class supporting Land Cover value and percentage.					

2. Mapeamento

Attribute name	Documentation	Attribute Association role Constraint	Attribute / Association role / Constraint documentation	Values / Enumerations	Multiplicity	Voidable / Non-Voidable	Status	Remarks
gml id				PT_COS2010N5_1..*			Not available	
				PT_COS2010N5_LCU_1..*			Not available	
Id		internal feature nr id		1..1505			Not available	
				PT.IGEO.LC.COS2010_PTCON_N5			Not available	
						unpopulated	Not available	
							Not available	
							Not available	
the_geom		polygon					1:1	

Campos adicionados

Status

1:1	Match
Easy	Necessita de algum processamento
Difficult	Necessita de processamento mais complexo
Not available	Quando não consta na COS 2010 nível 5

							Not available	
							Not available	

2. Mapeamento

- Escolha da ferramenta ETL - Extract-Transform-Load

- Open Source

- HALE
- Geokettle



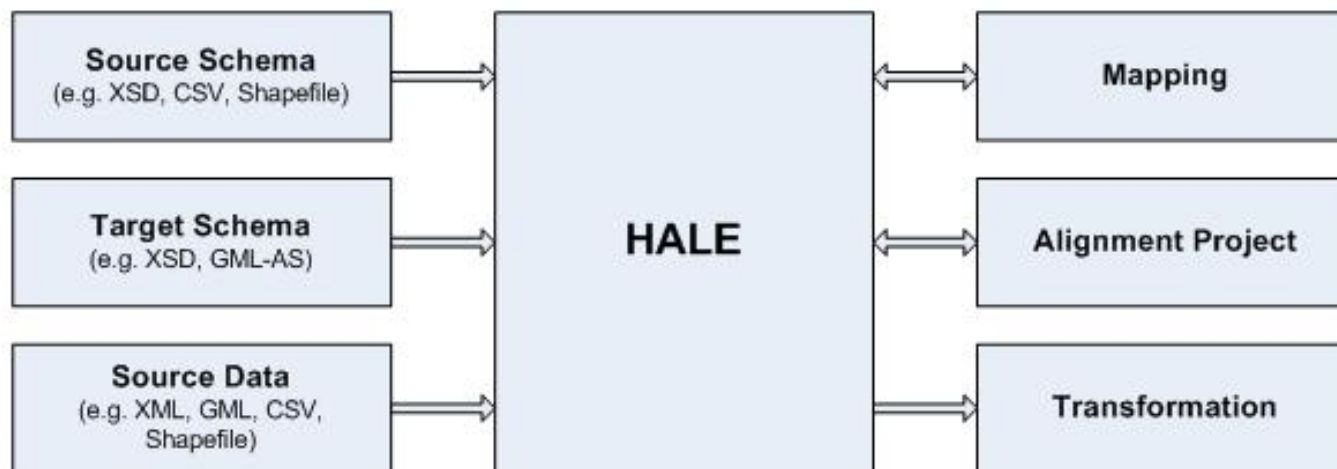
- Software proprietário

- FME
- ArcGIS Data Interoperability



Hale – HUMBOLDT Alignment Editor (v2.9.4)

- Define, avalia e executa mapeamento entre modelos de dados:
 - Ferramenta ETL Open Source
 - Bom suporte de XML/GML e
 - Adaptações feitas relativamente à Directiva INSPIRE (Code Lists e outras características)
 - Transformação em tempo real com feedback
 - Validação online
 - Permite a criação de scripts



1. Análise do
CDG



2.
Mapeamento



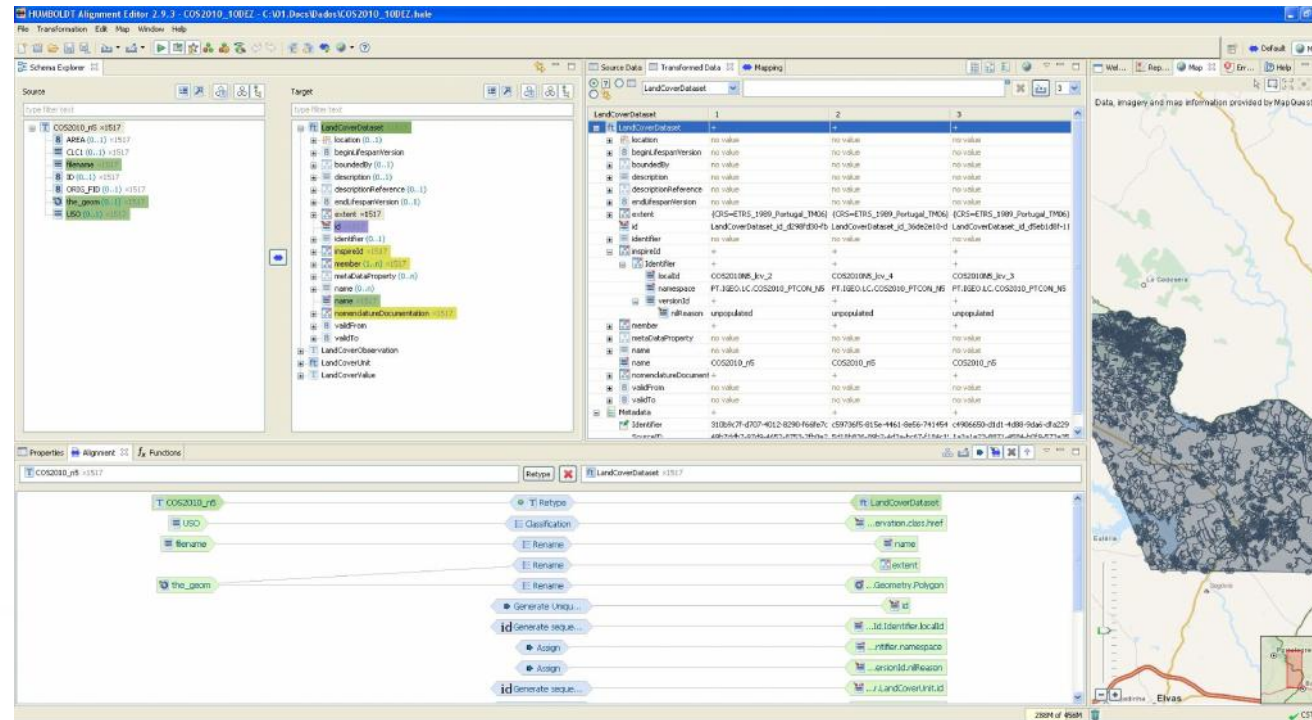
3.
Transformação
do CDG



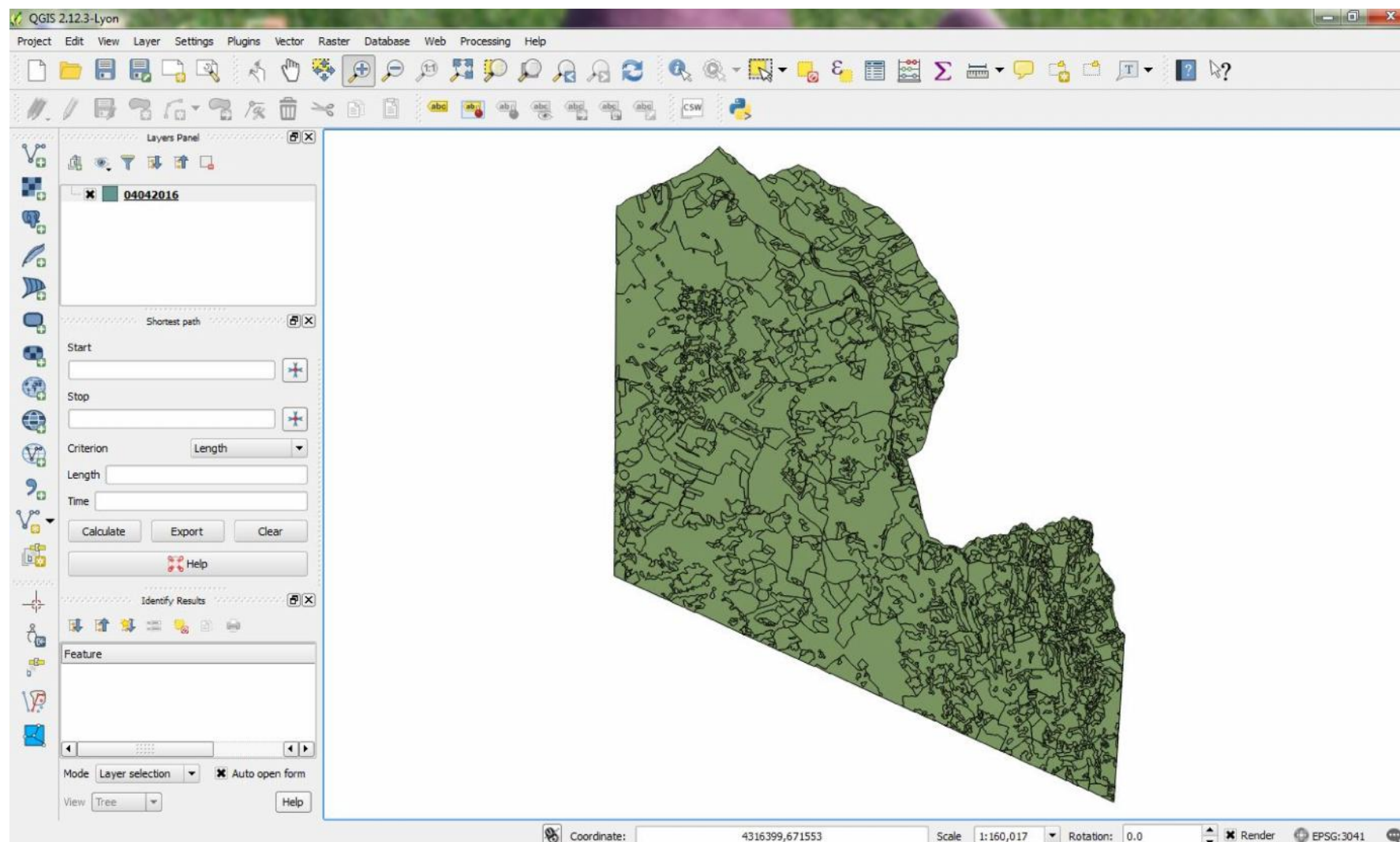
4. Validação

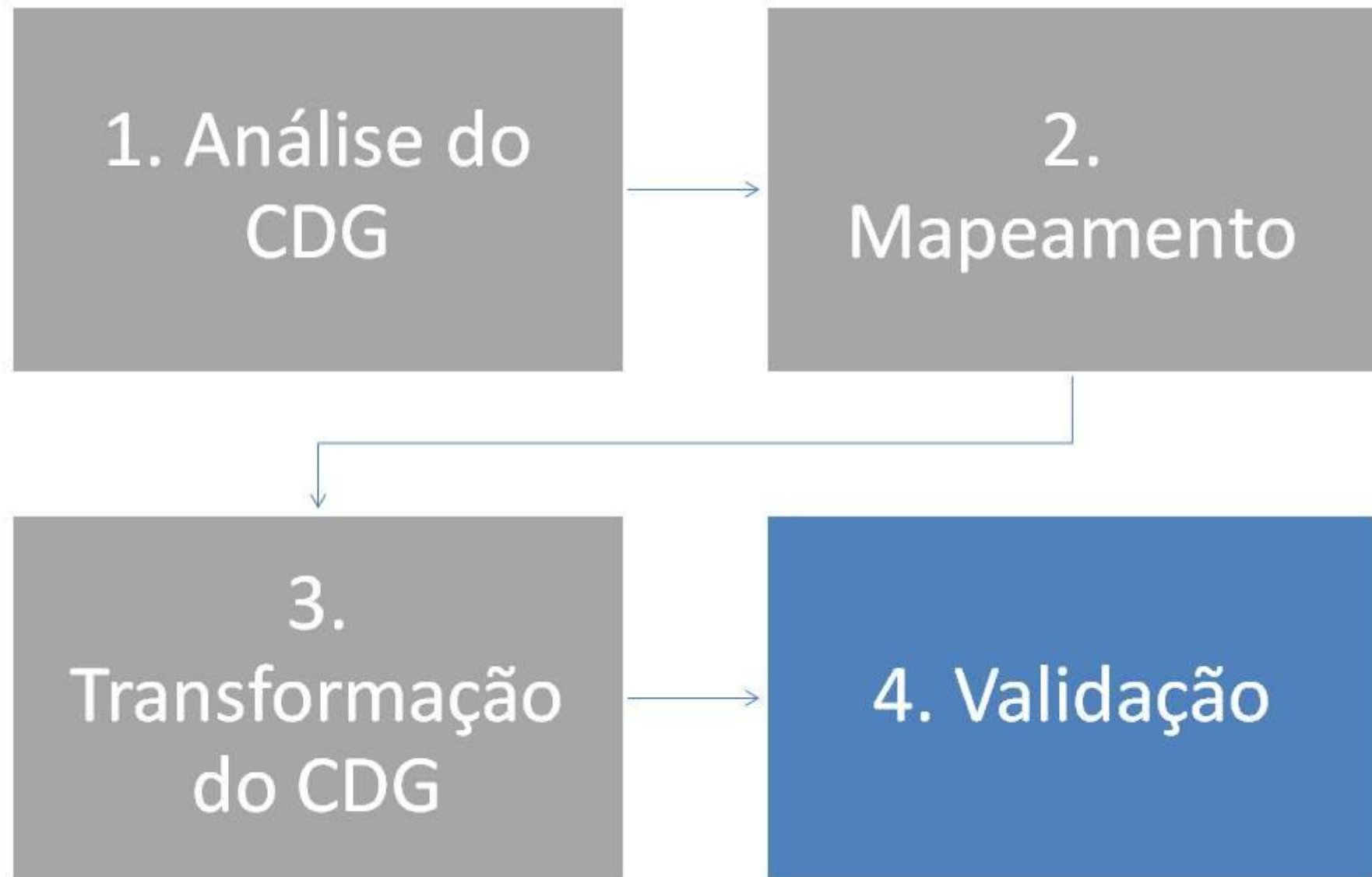
3. Transformação do CDG

- Hale
 - Identificação das funções de mapeamento
 - Definir mapeamento
 - Exportação para GML 3.2.1



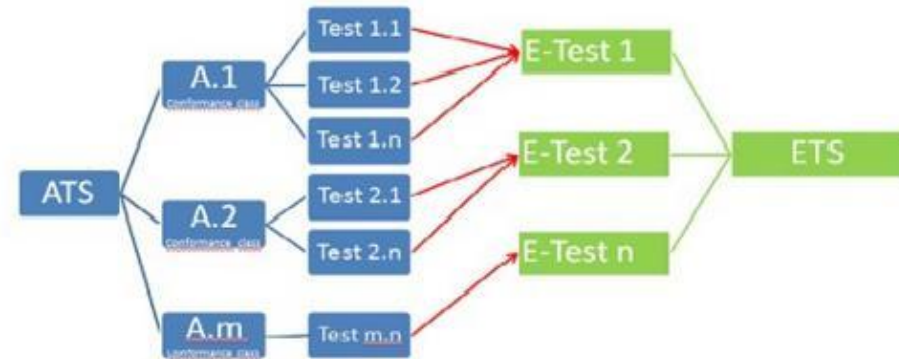
3. Transformação do CDG



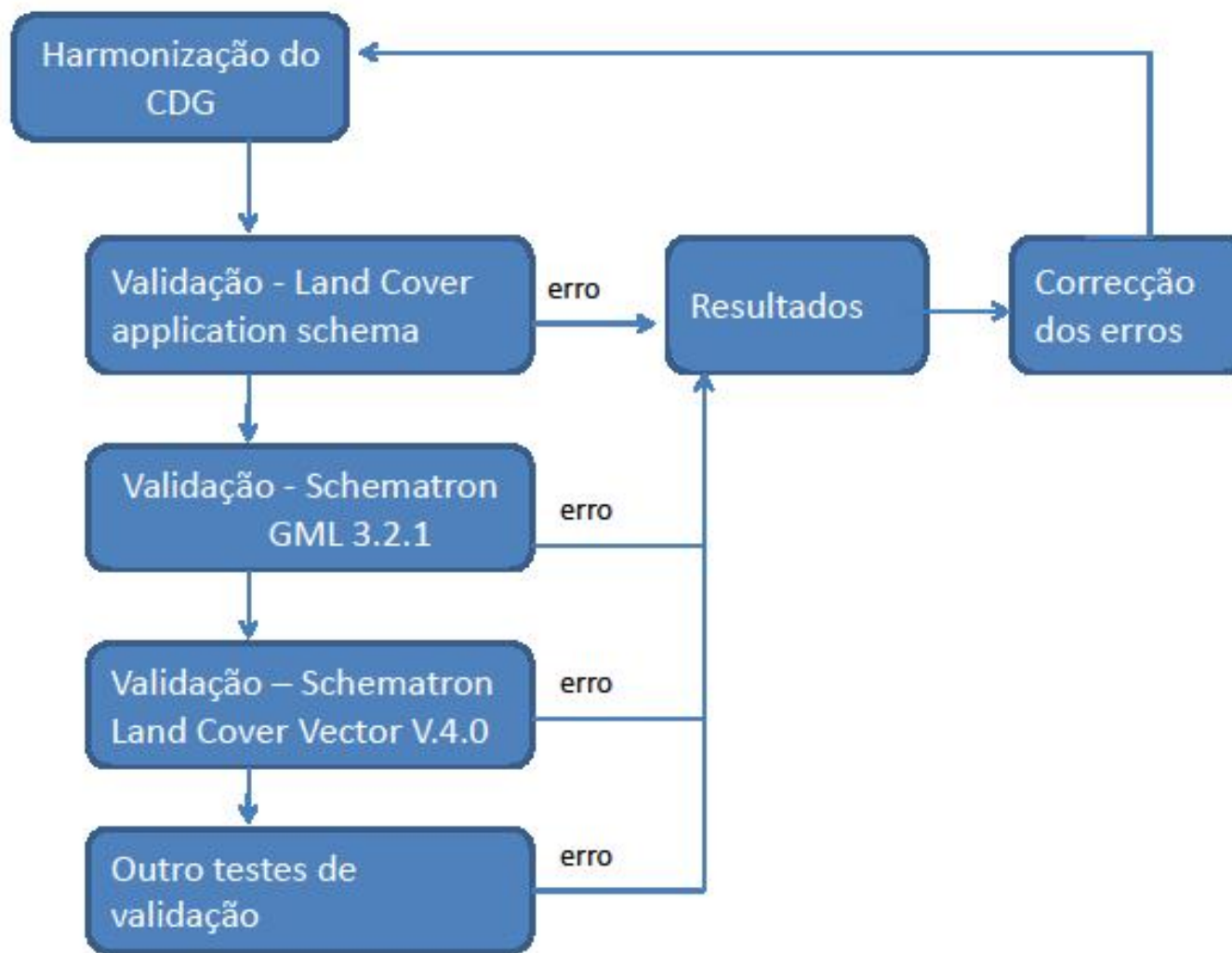


4. Validação

- Anexo A das especificações de dados
 - Abstract Test Suite (ATS)
 - Grupo 1 – normativo
 - Grupo 2 – informativo
 - Agrupados em diferentes *classes de conformidade*



4. Validação



4. Validação

- Validação automática do GML
 - LandCoverVector.xsd
 - GML Schematron 3.2.1
 - LandCover Schematron 4.0
- Validação manual do GML
 - Verificação manual da existência no gml, das características especificadas pelos ATS

ATS	Conformance classes	Abstract Tests	Related ET
Part 1 (normative)	A.1 Application Schema Conformance Class	A.1.1 Schema element denomination test	E.1
		A.1.2 Value type test	E.1
		A.1.3 Value test *	E.1
		A.1.4 Attributes/Associations completeness test	E.1
		A.1.5 Abstract spatial object test	E.1
		A.1.6 Constraints test *	E.1
		A.1.7 Geometry representation test*	E.1
	A.2 Reference Systems Conformance Class	A.2.1 Datum test *	E.1
		A.2.2 Coordinate reference system test *	E.1
		A.2.3 Grid test	E.2
		A.2.4 View service CRS test	E.2
		A.2.5 Temporal reference system test	E.2
		A.2.6 Units of measurements test	E.2
	A.3 Data Consistency Conformance Class	A.3.1 Unique identifier persistency test	E.3
		A.3.2 Version consistency test	E.3
		A.3.3 Life cycle time sequence test*	E.1
		A.3.4 Validity time sequence test *	E.1
		A.3.5 Update frequency test	E.3
	A.4 Metadata IR Conformance Class	A.4.1 Metadata for interoperability test	E.4
	A.5 Information Accessibility Conformance Class	A.5.1 Code list publication test	E.5
		A.5.2 CRS publication test *	E.1
		A.5.3 CRS identification test *	E.1
		A.5.4 Grid identification test	E.5
	A.6 Data Delivery Conformance Class	A.6.1 Encoding compliance test	E.1
	A.7 Portrayal Conformance Class	A.7.1 Layer designation test	E.6
Part 2 (informative)	A.8 Technical Guideline Conformance Class	A.8.1 Multiplicity test	E.1
		A.8.2 CRS http URI test	E.7
		A.8.3 Metadata encoding schema validation test	E.8
		A.8.4 Metadata occurrence test	E.8
		A.8.5 Metadata consistency test	E.8
		A.8.6 Encoding schema validation test	E.1
		A.8.7 Coverage multipart representation test	E.9
		A.8.8 Coverage domain consistency test	E.9
		A.8.9 Style test	E.10

4. Validação

- Ferramentas:

- Hale - LandCoverVector.xsd



- oXygen XML Editor

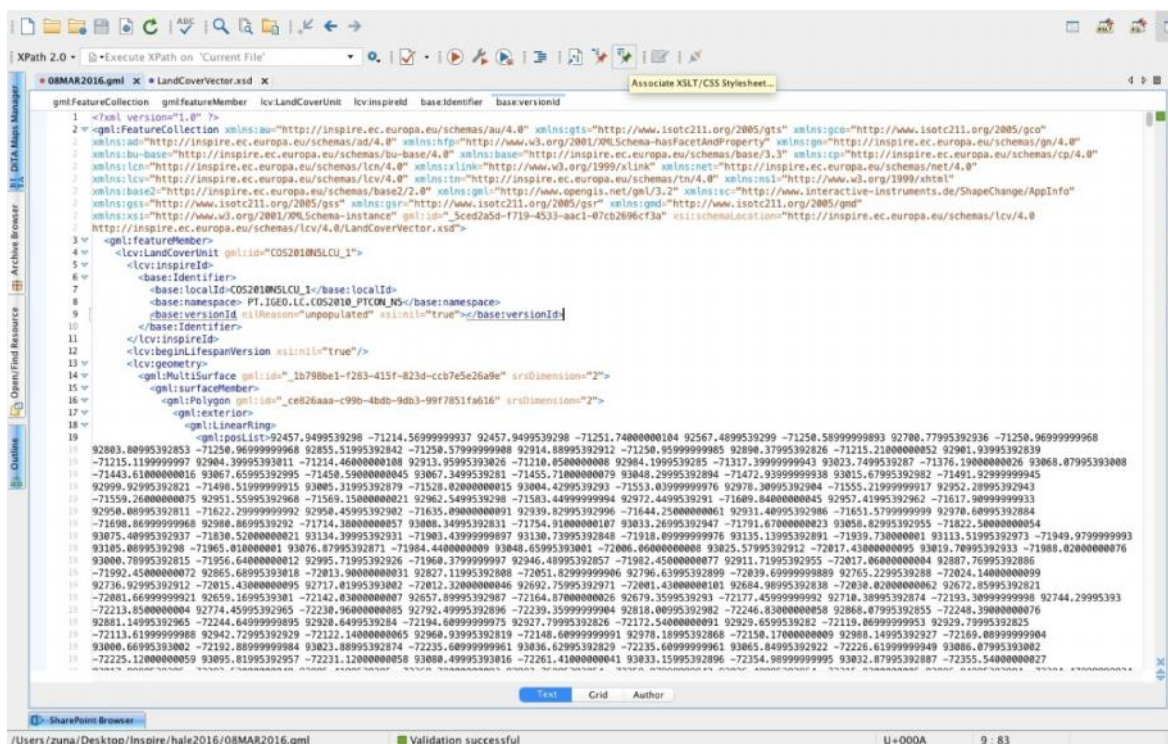


- Online ETS – eEnvPlus Validator Service



4. Validação: oXygen

- Validação com os seguintes esquemas:
 - LandCoverVector.xsd
 - GML Schematron 3.2.1
 - Land Cover Schematron 4.0



4. Validação: eENVplus

- Online ETS – eEnvPlus Validator Service
 - Plataforma do eENVplus (<http://showcase.eenvplus.eu>)
 - Epsilon Italia Cloud Infrastruture for INSPIRE (<http://cloud.epsilon-italia.it>)
- Permite executar os ETS que implementam os ATS especificados pela Directiva INSPIRE
- Guia metodológico sobre o processo de validação

4. Validação: eENVplus

- Carregamento do CDG:
 - Recurso local
 - Recurso online
 - WFS (Get feature request)
- Representação gráfica dos resultados

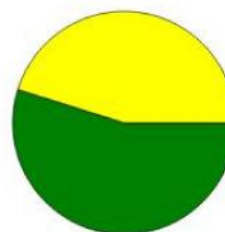
TestNG Results

[Results overview](#)
[Reporter output](#)

gml32-3.2.1-r18	55%
0 Groups	
0 / 17 / 31	
■ All GML application schemas	
■ GML application schemas defining features and feature collections	
■ GML application schemas defining spatial geometries	
■ GML application schemas defining time	
■ GML application schemas defining spatial topologies	
■ GML Documents	

Test suites overview

■ Failed (%)
■ Passed (55%)
■ Skipped (45%)



gml32-3.2.1-r18	0	17	14	31	55%
All GML application schemas	0	7	0	7	100%
GML application schemas defining features and feature collections	0	2	0	2	100%
GML application schemas defining spatial geometries	0	2	0	2	100%
GML application schemas defining time	0	0	2	2	%
GML application schemas defining spatial topologies	0	0	2	2	%
GML Documents	0	6	10	16	38%

Caso prático



Notas finais

- Conhecimentos sobre XML/GML, UML, XSD
- Compreensão do princípio de harmonização de conjuntos de dados geográficos
- Leitura e interpretação dos documentos INSPIRE
 - Implementing Rules e Technical Guidelines
 - Application schemas

Discussão

