INSPIRE Land Cover and Land Use Data Specifications

Lena Hallin-Pihlatie
Facilitator of the Land Cover and Land Use INSPIRE Thematic Cluster

www.jrc.ec.europa.eu

Serving society
Stimulating innovation
Supporting legislation
INSPIRE

- Based on technical standards (ISO, OGC)
  - Re-use of standards
    - metadata, data modelling models, data encoding and for services (WMS, WFS, WCS, etc.)
  - INSPIRE specific requirements and extensions

- Defines its own semantic standards for
  - Data models in 34 themes
  - Applications schemas (xsd)
  - Code lists (classification values to use)
  - Layer naming (WMS) requirements

- Obligation on MS data providers to meet all requiements
  - Annex I datasets 11/2017
  - Annex II (Land Cover) and III (Land Use) datasets 10/2020
INSPIRE Land Cover and Land Use

**Land Cover**

*Definition*: Physical and biological cover of the earth's surface including artificial surfaces, agricultural areas, forests, (semi-)natural areas, wetlands, water bodies. [Directive 2007/2/EC, Annex II]

*Description*: Land cover is an abstraction of the physical and biophysical cover on the earth's surface. [Technical Guidelines on LC]

**Land Use**

*Definition*: Territory characterised according to its current and future planned functional dimension or socio-economic purpose (e.g. residential, industrial, commercial, agricultural, forestry, recreational). [Directive 2007/2/EC, Annex III]

*Description*: Land Use is defined as the use and functions of a territory. Land Use is itself split up into two different types: **Existing Land Use** and **Planned Land Use** [Technical Guidelines on LU]
INSPIRE Data Specifications

- Guidance documents to support implementation
- All legal obligations included in the Implementing Rule on Interoperability of Spatial Data Sets and Services (IR)

<table>
<thead>
<tr>
<th>INSPIRE Infrastructure for Spatial Information in Europe</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>D2.8.II.2 Data Specification on Land Cover – Technical Guidelines</strong></td>
</tr>
<tr>
<td><strong>Title</strong></td>
</tr>
<tr>
<td><strong>Creator</strong></td>
</tr>
<tr>
<td><strong>Date</strong></td>
</tr>
<tr>
<td><strong>Subject</strong></td>
</tr>
<tr>
<td><strong>Publisher</strong></td>
</tr>
<tr>
<td><strong>Type</strong></td>
</tr>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td><strong>Contributor</strong></td>
</tr>
<tr>
<td><strong>Format</strong></td>
</tr>
<tr>
<td><strong>Source</strong></td>
</tr>
<tr>
<td><strong>Rights</strong></td>
</tr>
<tr>
<td><strong>Language</strong></td>
</tr>
<tr>
<td><strong>Coverage</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>INSPIRE Infrastructure for Spatial Information in Europe</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>D2.8.III.4 Data Specification on Land Use – Technical Guidelines</strong></td>
</tr>
<tr>
<td><strong>Title</strong></td>
</tr>
<tr>
<td><strong>Creator</strong></td>
</tr>
<tr>
<td><strong>Date</strong></td>
</tr>
<tr>
<td><strong>Subject</strong></td>
</tr>
<tr>
<td><strong>Publisher</strong></td>
</tr>
<tr>
<td><strong>Type</strong></td>
</tr>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td><strong>Contributor</strong></td>
</tr>
<tr>
<td><strong>Format</strong></td>
</tr>
<tr>
<td><strong>Source</strong></td>
</tr>
<tr>
<td><strong>Rights</strong></td>
</tr>
<tr>
<td><strong>Language</strong></td>
</tr>
<tr>
<td><strong>Coverage</strong></td>
</tr>
</tbody>
</table>
INSPIRE Land Cover - overview

- Source: INSPIRE Consolidated UML Model

Informative only
Schema not endorsed
Land Cover Nomenclature

• Requirement to provide:
  ▪ an Identifier, that is the localId + namespace + possible versionId of the Land Cover Classification
  ▪ the URI to the Land Cover Classification in use
  ▪ information on the party responsible for the classification using the Related Party data type
  ▪ the description of the classification by using the embeddedDescription attribute OR the externalDescription attribute
    – embeddedDescription uses ISO 19144 LCML
    – ExternalDescription uses the DocumentCitation data type
Land Cover Vector: Dataset & Unit

- **LandCoverDataset**
  - localId + namespace + possible versionId of the dataset
  - the extent using EX_Extent
  - use LandCoverNomenclature application schema
  - if available also:
    - **lifeCycleinfo**
    - **ValidFrom, validTo**

- **LandCoverUnit**
  - localId + namespace + possible versionId of a single spatial object
  - geometry provided as GM_Point or GM_Surface
  - landCoverObservation (see next slide)
  - if available:
    - **lifeCycleinfo**
Land Cover Vector: Observation

- **LandCoverObservation**
  - provide the class attribute using [http://inspire.ec.europa.eu/codelist/LandCoverClassValue](http://inspire.ec.europa.eu/codelist/LandCoverClassValue)
  - if available
    - Provide the observation date (DateTime)
  - If applicable
    - All the land cover classes in percentages (integer values) within the unit. Each percentage has to be lower than 100.
Land Cover Class code list

**ID:**
http://inspire.ec.europa.eu/codelist/LandCoverClassValue

**This version:**
http://inspire.ec.europa.eu/codelist/LandCoverClassValue:1

**Latest version:**
http://inspire.ec.europa.eu/codelist/LandCoverClassValue

**Label:**
Land Cover Class

**Definition:**
Land cover code list or classification.

**Description:**
An empty code list that act as a container for Corine, other european, national or local code list for LC nomenclature.

Check the news related to the HTTP/HTTPS URIs for the INSPIRE registry at http://inspire.ec.europa.eu/news/httphttps-inspire-registry
Extensions of Land Cover Class code list

- Corine Land Cover

- Urban Atlas 2012
Land Cover Raster

- LandCoverGridCoverage
  - **INSPIRE extension of RectifiedGridCoverage**
  - `localId + namespace + possible versionId of the dataset`
  - **extent using EX_Extent**
  - use LandCoverNomenclature application schema
  - If available also:
    - `lifeCycleinfo`
    - `ValidFrom, validTo`

- Constraint: `rangeSet = LandCoverClassValue`
## INSPIRE Land Use - overview

- **Application schemas:**
  - **Existing Land Use**
    - Existing Land Use (ELU) - polygons
    - Gridded Land Use (GLU) - raster
    - Sampled Land Use (SLU) - points
  - **Planned Land Use**
    - Planned Land Use (PLU)
  - **Nomenclature**
    - Land Use Nomenclature

<table>
<thead>
<tr>
<th>Geometry</th>
<th>Vector data</th>
<th>Temporal reference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Polygons</td>
<td>Existing Land Use</td>
</tr>
<tr>
<td></td>
<td>Polygons, lines, points</td>
<td>ELU</td>
</tr>
<tr>
<td></td>
<td>Points</td>
<td>Planned Land Use</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PLU</td>
</tr>
<tr>
<td>Raster data</td>
<td></td>
<td>Points</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SLU</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Raster data</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GLU</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PLU</td>
</tr>
</tbody>
</table>

*Table 3 – Classification of the Land Use application schemas according to their temporal reference and geometry definition*
Use of HILUCS code list values mandatory

- Theme-specific Requirement
  - Any Land Use data sets shall assign to each polygon, pixel or location a land use type from the Hierarchical INSPIRE Land Use Classification System (HILUCS) at the most appropriate and detailed level of the hierarchy. (Source: INSPIRE legislation)

- HILUCS 1 hierarchy level:

<table>
<thead>
<tr>
<th></th>
<th>eu-legal</th>
<th>Valid</th>
</tr>
</thead>
<tbody>
<tr>
<td>primary production</td>
<td>eu-legal</td>
<td>Valid</td>
</tr>
<tr>
<td>residential use</td>
<td>eu-legal</td>
<td>Valid</td>
</tr>
<tr>
<td>secondary production</td>
<td>eu-legal</td>
<td>Valid</td>
</tr>
<tr>
<td>tertiary production</td>
<td>eu-legal</td>
<td>Valid</td>
</tr>
<tr>
<td>other uses</td>
<td>eu-legal</td>
<td>Valid</td>
</tr>
</tbody>
</table>
Existing Land Use

- **ExistingLandUseDataSet**
  - `localId + namespace + possible versionId of the dataset`
  - **the extent** using GM_MultiSurface
  - name of the dataset
  - if available also:
    - **lifeCycleinfo**
    - **ValidFrom, validTo**

- **ExistingLandUseObject**
  - `localId + namespace + possible versionId of the spatial objects`
  - **geometry** provided as GM_MultiSurface
  - provide HILUCSValue 1..* for each spatial object
  - if available also:
    - **lifeCycleinfo**
    - use HILUCSPresence data type
    - Provide 1..* values of another LU classification (LandUseClassificationValue)
    - use SpecificPresence data type
    - provide observation date
    - **ValidFrom, validTo**
Land Use Nomenclature

- Makes it possible to provide information on the presence of HILUCS classes and LU classes of another LU classification (LandUseClassificationValue, SpecificPresence, SpecificPercentage)
Sampled Land Use

- Application schema for point datasets
  - Geometry of ExistingLandUseSample = GM_Point
- Otherwise, the same attributes as Existing Land Use application schema
Gridded Land Use

- **ExistingLandUseGrid**
  - INSPIRE extension of RectifiedGridCoverage
  - name
  - localId+namespace+possible versionId
  - Extent using EX_Extent
  - If available also:
    - lifeCycleinfo
    - ValidFrom, validTo

- Constraints: typo?

NOTE: Range is based on either HILUCS or on a specific land use classification system defined by the data provider
Summary

- A lot of commonalities, but also some differences, for example:

  - **Land Cover**
    - Any land cover classification can be used
    - The endorsed application schemas support only the use of one classification at a time

  - **Land Use**
    - HILUCS classification has to be used
      - IR requirement: Any *Land Use* data sets shall assign to each polygon, pixel or location a land use type from the Hierarchical INSPIRE *Land Use* Classification System (HILUCS) at the most appropriate and detailed level of the hierarchy
    - In addition another classification can be used