JRC Vision and Mission Statements

**Vision:**
"To play a central role in creating, managing and making sense of the collective scientific knowledge for better EU policy."

**Mission:**
"As the science and knowledge service of the Commission our mission is to support EU policies with independent evidence throughout the whole policy cycle."
A FAO-UN LCCS Story

- FAO TCP/BUL/8922
- First time use of LCCS in Europe
- Pilot LC mapping with VHR (IK)

**Same type of land – different classes**

<table>
<thead>
<tr>
<th>LCCS name</th>
<th>Grassland/Shrubs/Trees</th>
<th>Grassland with shrubs and trees</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LCCS level</strong></td>
<td>A2A10B4C1E5 / A4A11B3C1 / A3A11B2C1</td>
<td>A2A10B4C1E5F2F5F10G2F2F6F10G3-B12G6G9</td>
</tr>
<tr>
<td><strong>LCCS code</strong></td>
<td>20194 / 20023 / 20015</td>
<td>21277-104773</td>
</tr>
<tr>
<td><strong>Cartographic mix</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Functional mix</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1:50 000                    1:10 000
LCLU datasets – Early Lessons learnt

Thematic content of the “map” depends mainly on the scope and purpose of the LCLU product

For statistics
For land inventory
For spatial planning
For damage assessment
For accountability

Same apply to the product quality
- > it is domain-specific

“Land” in the CAP

INSPIRE DIRECTIVE EU 2/2007:

Land cover: Physical and biological cover of the earth’s surface including artificial surfaces, agricultural areas, forests, (semi-) natural areas, wetlands, water bodies.

⇒ Art 4.1.e of 1307/2013

Land use: Territory characterised according to its current and future planned functional or socio-economic purpose (e.g. residential, industrial, commercial, agricultural, forestry, recreational)

⇒ Art. 17.1 of 640/2014
**LC, LU and eligibility**

Eligible ≡ LC (agricultural area), LU (purpose) and all conditions = OK

<table>
<thead>
<tr>
<th>Land Use</th>
<th>pasture</th>
<th>afforestation</th>
</tr>
</thead>
<tbody>
<tr>
<td>grassland</td>
<td>eligible</td>
<td>ineligible</td>
</tr>
<tr>
<td>tree cover</td>
<td>ineligible</td>
<td>Eligible, IF on 2008 SPS land</td>
</tr>
<tr>
<td>managed land (e.g. golf course)</td>
<td>ineligible</td>
<td>ineligible</td>
</tr>
</tbody>
</table>

* LPIS mapping Application/OTSC → IACS attribute

*: IACS processes a combination of LC and LU concepts through spatial and alphanumeric attributes!

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**Typical CAP semantic challenge: permanent grassland**

*Permanent grassland and permanent pasture, defined as land under herbaceous vegetation.*

One European legend key is not feasible:
- Difference in intensity (arctic to Mediterranean).
- Heterogeneity and occurrence of contaminations.
- Difference in land use (hay land, pasture, fodder crop,...).

How precise can one accurately measure/quantify such land types?
Or in financial terms: how much margin of 40 bn € can one tolerate?
→ To locate and quantify the area, each member state operates its land parcel identification system (LPIS) at scales better than 1/5.000?
Application of FAO-UN LCCS in LC class definition

Eligibility profile
Inventory of the land forms considered by each MS
- Local name/code
- LCCcode ≡ EU mapping key!
- eligibility: 100% / 0%/pro-rata

A success!

BUT, issues with complex land types

Agro-forestry

Landscaping Features

Country and landscape specific!!

Agro-Forestry - QU type “B” (PT)
LCCcode: 20317-13218-
Zt2303[1][2307][1][2309][1][Z2317]
Woodland with Open Medium to Tall
Herbaceous Layer
Floristic Aspect: Cork Oak or Holm Oak or
Pyrenean Oak

Field Crops (DE)
LCCcode: 20278-13313-T2[1][Z701]
Medium High Trees with Medium High Shrubs
Floristic Aspect: Groups of Plant Species
User-defined attribute: Area Less than or
equal to 2000 m2
Complexity of MS eligibility profiles - ratio of Z-attributes

119 class entries with user-defined Z-attributes from a total of 929 (13%)
- out of them 65 are related to landscape features

Data capturing challenge: Earth Observation vs. physical phenomenon

Observation from above is often considered to offer a correct and complete representation of the physical land cover object (phenomenon) on Earth - > not always true!!

Complex 3-dimensional natural features can have more than one equivalent area
- A1 (environmental performance)
- A2 (aid scheme compliance)
Towards LCCS 3, based on LCML

- Standardized (ISO 19144-2)
- User-friendly
- No need for standalone z-attributes
- Scalable and modular (no fixed ranges)
- LU concepts present
- And clearly separated from LC

Example – Agro-forestry (PM)

Prepared with LCCS3
The tegon concept

"horizontally homogeneous, physical spatial object with a notable spatial dimension and a specific life cycle, characterized by the presence of a substrate, and possibly one or more vertical biotic or abiotic strata."

• Extends typically over some square meters
• Represents a well-defined, distinct and measurable material reality

Traditional land cover observations correspond to "polytegons"
• Homogeneous (similar tegons e.g. a forest has only tree type tegons)
• Heterogeneous (different tegons, e.g. savannah has herbaceous type and tree type tegons)

Generic tegon structure
• Shape: a n-gonal prism with base (D) and height (H) from the top part of the soil O horizon to the "solid" face of the Earth surface as seen from above.
  • Matter: irreducible biophysical constituent of the substrate that the tegon represents. Matter is further characterised by:
    1. Material: the substance that builds-up the matter. biotic (vegetation) or abiotic (water, artificial construction, mineral deposit).
    2. Appearance: the condition in which the material appears (outward impression). It is material-specific: physiognomy for the vegetation; surface aspect for the bare soil or rock; physical state for the water.
    3. Life cycle: definite time period with unchanged characteristics of material or appearance.
• Footprint: base of the nadir-projected n-gonal prism.
• Strata: set of layers within the topological space of the substrate holding various layers of solid matter.
Looking at the substrate

TEGON+LCML

Still LCML semantics are focused in modelling LC class definition within a mapping product.

Applying LCML semantics through the TEGON strata structure would better tackle the physical feature itself.

TEGON+LCML could introduce additional rules for stratum and functional entity for automation of the semantic classification.
Test exercise: GAEC WS in Prague 2016
Field case n.3 - interpretations

Application of TEGON approach for modelling of 3D physical nature of the landscape feature

The whole landscape feature is a composition of a number of tegons of these 3 types (polytegon)
It can still be named in line with the country context (for example "patches of trees")
Modelling of case No.3 with combined TEGON and LCML (Land Cover Meta Language) approach

Tegon 1 (T1)
- 3 layers of permanent natural vegetation
  - Grass, shrubs, trees
  - Compact patches densely distributed

Tegon 2 (T2)
- 2 layers of permanent natural vegetation
  - Grass, low trees
  - Compact patches sparsely distributed

Tegon 3 (T3)
- 1 layer of permanent managed grassland
- Linear strip at the border to arable land

All 3 tegon types form functional entity!!

Outcomes of the exercise

- Defining the proper semantics is a key prerequisite for efficient data capturing of land features

- We need to understand and model the 3D bio-physical substrate of land cover and its functional relationship before data are collected and their cartographic products are derived
  - only then the information captured could be used efficiently

- The Land Cover Meta Language combined with TEGON concept can be the solution
  - TEGON already applied in the context of the IACS
  - LCML seems to provide much more intuitive and comprehensive description of the land cover phenomena comparing to LCCS

What about land use?
Recording land use in LCML

Land use information can be assigned as separate characteristic the land cover feature

- In EU CAP LC-LU cardinality can be one to many (but not the inverse)

**Essential for the introduction of CAP monitoring to substitute the current on-the-spot control**

Link with GSAA and OTSC

Can be integrated within the GSAA and the controls

Farmer can provide annual in-situ information through the Geospatial Aid Application (GSAA)

- Fully in place in all EU Member States from 2018
Summary and follow up

- LCML has great potential in the future EU CAP context
  - Establishment of LC-LU relationship
  - Semantic interoperability for CAP impact/performance assessment
  - Integration of field (farmer) and EO (service) data for CAP monitoring
  - Can support in-situ component of COPERNICUS in general

- But more work is needed
  - In close collaboration with ISO / INSPIRE / FAO
  - Using TEGON concept developed by JRC D5
  - Towards Land Characterization Meta Language?

“We adore chaos because we love to produce order.”

M.C. Escher, Waterfall, 1961