321 Natural grassland or 231 Pasture / meadow?

Natural lake or a reservoir?

Forest or just a group of trees?
Complex Landscape Situations

112 Discontinuous urban area?

141 Green “urban” area, or 324 Shrubs?
Probably 121 Industrial complex, but heathland on roof
311 Broadleaved forest or
411 / 412 Wetland type?
Ambiguity of Classification systems

Crown cover density [%]

Minimum tree height in [m]

Source: Comber et al. (2005)
Decomposition of objects into characteristics (1)

From classification to object-oriented description

Fotos: © Copyright Ursus Wehrli
Decomposition of objects into characteristics (2)

Characterization

- Growth form
  - Homogeneous
  - Heterogenous
- Growth density
  - Closed
  - Sparsely
- Soil condition
  - Wet
  - Dry
  - Acidic
- Use / Function
  - Pasture
  - Recreation
  - Sport
  - Air traffic
- Ecosystem type
  - Wetland, swamp
Background and given situation

- Description of landscape unit is challenging
- Broad variety of applications of LC/LU data
  => various different classification systems (on national or European level)
- Effects:
  - Emphasises on specific feature type groups
  - Incomplete mixture of LC and LU classes
  => Lack of comparability between definitions hamper exchange of information between nomenclatures and datasets
Pillars of vision for paradigm shift

- Initiated by group of NRCs, LM experts & EEA
- Shift from classification to descriptive characterisation
- Agree on voluntary common specifications
- Put into practise bottom up / top down approach
- Respond to advancing requirements on LC / LU data for smart and sustainable decision making in Europe
- Develop a future-oriented, flexible and multi-purpose concept for harmonised Land Monitoring Framework
Schema for European LM Framework

European Level
- CLC
- Urban Atlas
- HR Layers
- LPIS
- LUCAS

EAGLE Concept

INSPIRE LC+LU compliant

National (A) Land Survey
- National CLC
- National (B) Habitat Monitoring

Regional (a) Land Monitoring
- Regional (b) Land Monitoring
Data Model Criteria

- Clear separation between LC and LU
- Complete coverage of themes LC and LU
- Object-oriented description instead of classification
- Modelling of temporal phenomena
- Scale independent
- Applicable on national & European levels
- Backwards compatibility
Content of EAGLE Matrix

Information on landscape described with three separate blocks:

I.) LAND COVER Components – LCC
Abiotic (Artificial + Natural), Vegetation, Water Surfaces

II.) LAND USE Attributes – LUA
Agriculture, Forestry, Mining, Residential, Transportation etc.

III.) CHARACTERISTICS – CH
spatial pattern, bio-physical parameters, cultivation measures, land management practices, status/condition etc.
Structure EAGLE Matrix

I. LCC block
II. LUA block
III. CH block

CLC classes
EAGLE data model

- ABIOTIC LCCs (Artificial/Natural)
  - Characteristics

- BIOTIC LCCs (Vegetation)
  - Characteristics

- WATER LCCs
  - Characteristics

LU Attributes (HILUCS)
**EAGLE Matrix population & comparison tool**

### Mandatory
- **Herbaceous**
  - Biotic/Vegetation
  - No Economic Use
  - Surface Water
- **Biotic/Vegetation**
- **Water**
  - Surface Water
  - Saturated Ground

### Characteristics (CH)
- **Surface Water**
  - (Bio-)Physical Characteristics → Water Characteristics → Wetness
- **Saturated Ground**
  - (Bio-)Physical Characteristics → Water Characteristics → Wetness

### Optional
- **Inland Water**
  - Water → Liquid
  - Land Use not defined...
  - Characteristics not defined...
- **Lichens, Mosses, Algae**
  - Biotic/Vegetation
  - Land Use not defined...
  - Characteristics not defined...
- **Succulent and Others**
  - Biotic/Vegetation
  - Land Use not defined...
  - Characteristics not defined...

### Excluded
- **Artificial**
  - Abiotic/Non-Vegetated
  - Land Use not defined...
  - Characteristics not defined...
<table>
<thead>
<tr>
<th>Nomenclature</th>
<th>Land Use / Cover Area Frame Survey</th>
<th>Urban Atlas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code</td>
<td>A10</td>
<td>11100</td>
</tr>
<tr>
<td>Class</td>
<td>Roofed Built-up Area</td>
<td>Continuous Urban Fabric (S.L. &gt; 80%)</td>
</tr>
</tbody>
</table>

**Mandatory**

- Buildings
- Primary Production Sector
- Industries (Secondary Sector)
- Services (Tertiary Sector)
- Transport Networks, Logistics, Utilities
- Conventional Buildings
- Permanent Residential
- Other Residential

**AND**

- Open Sealed Surfaces
- Road Network (Incl. Parking Lots)

**Optional**

- Specific Buildings
  - Residential
  - Transport Networks, Logistics, Utilities
- Inland Water
  - Urban Greenery And Parks

**Excluded**

- Other Constructions
- Biotic / Vegetation

**Woody**

- Urban Greenery And Parks

**Herbaceous**

- Urban Greenery And Parks

**Succulent and Others**

- Urban Greenery And Parks

**Mosses Lichens**

- Urban Greenery And Parks
**Use cases of EAGLE concept**

- Hungarian bottom-up CLC generation: Creation of CLC-classes out of national data sources through EAGLE concept
- German DLR: Extension of EAGLE model’s artificial surfaces for hyperspectral urban surface recognition
- German land surveying authorities: Semantic Analysis of the Feature Type Catalogue “Recent Land Use”, preparations for separate “land cover” module
- Rhineland-Palatinate [DE]: “NatFlo”, Ministry of Environment: Remote sensing based landscape objects for nature protection and habitat database
- IIASA: Comparison of OpenStreetMap land use types with EAGLE
Technical specifications for the implementation of a new land-monitoring concept based on EAGLE.

- EEA & DG GROW funded.
- Information engine at the core built on the EAGLE data model.
Thank you very much for your attention!