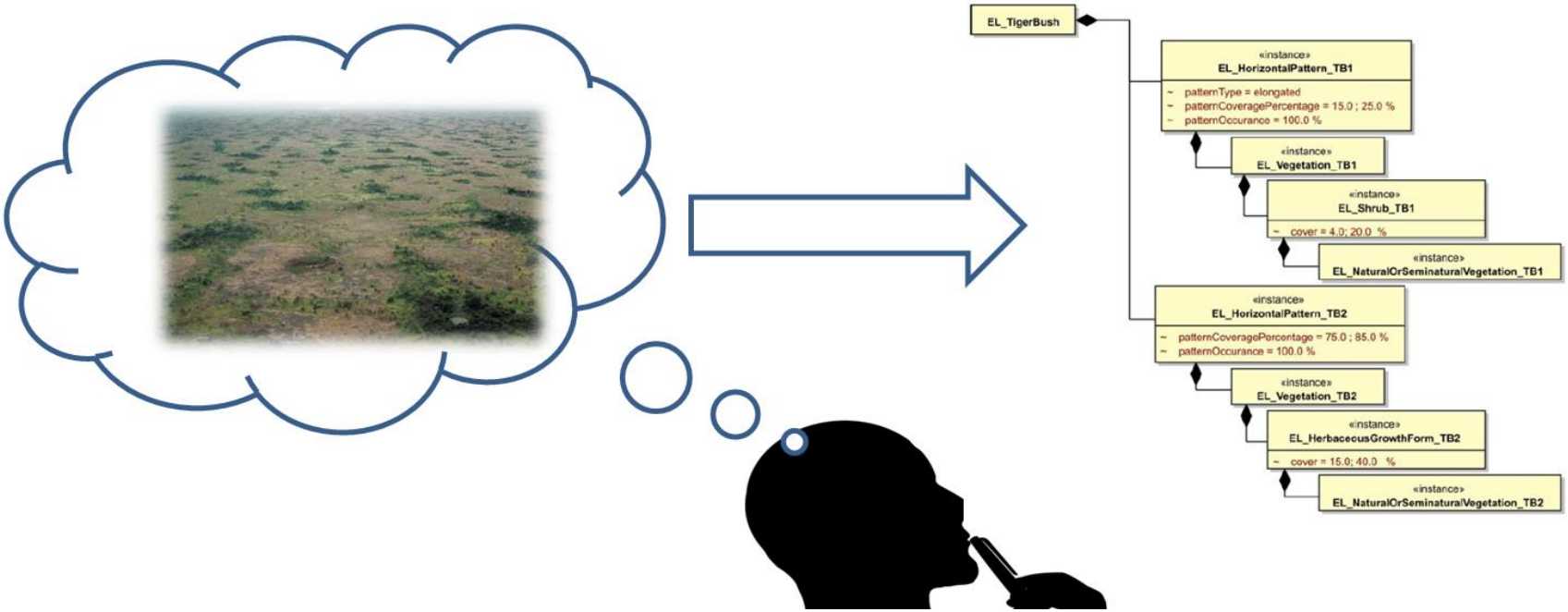

UPDATE 19144-2- LAND COVER META LANGUAGE

ARGUMENTS FOR THE REVISION OF ISO19144-2

WORKSHOP:LAND USE/LAND COVER PRODUCTS: CHALLANGES AND OPPORTUNITIES

15. NOVEMBER 2017

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PERSPEKTIVEN FÜR UMWELT & GESELLSCHAFT umweltbundesamt

ARGUMENTS FOR THE REVISION OF ISO19144-2

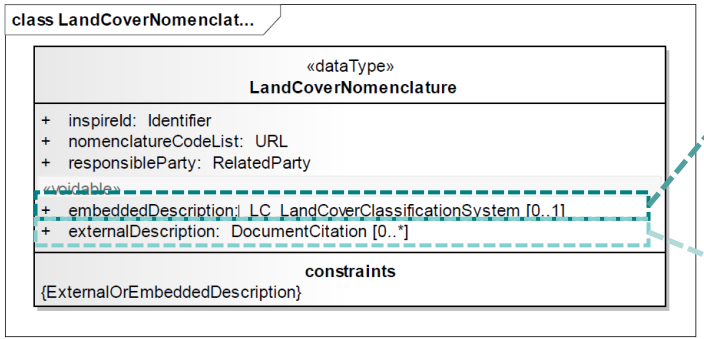
- *Priority 1 (P1) for upcoming LCML revision*
- Shortcomings arise when working with LCML in practice.

- *Priority 2 (P2) – Harmonization of LCML and EAGLE Concepts*
- LCML and the EAGLE matrix represent two very similar concepts with the same scope
  - ***ISO 19144*** specifies a Land Cover Meta Language (LCML) expressed as a UML metamodel that allows different land cover classification systems to be described based physiognomic aspects. A LC-Class is described by the overall LC_Class Characteristics and a set of land cover meta-elements and their characteristics.
  - ***The EAGLE matrix*** is a concept for analytic decomposition of class definitions and semantic translation between land cover nomenclatures. It is structured in three blocks: land cover components (LCC), land use attributes (LUA) and further characteristics (CH).

P1: LCML & INSPIRE

- LCML used in the dataType „LandCoverNomenclature“ for the embeddedDescription

TG Requirement 3	Each nomenclature used by a Land Cover Data set shall be described by at least one of the two attribute *externalDescription* or *embeddedDescription*.



embeddedDescription
it allows using ISO 19144-2 (LCML metalanguage) to provide a description of the classification system with this common metalanguage.
LC_LandCoverClassificationSystem is the root class from ISO 19144-2 *to* ***instantiate*** a definition of a nomenclature with LCML.

externalDescription
this attribute allows to provide a set of URL pointing to the documentation (specification or other document) describing the classification system used and the nomenclature used.

P1: LCML – LEVEL OF ABSTRACTION

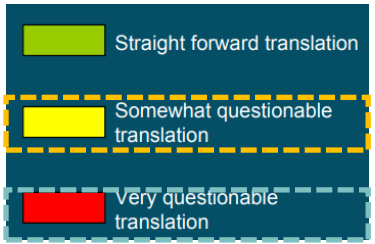
- No ISO 19144-2 xsd-Schema available at the official ISO TC211 register
- XMG – XML Maintenance Group
- ISO Process: XSD automatically derived from the Harmonized Model
- Adaption of UML Diagrams is needed.
- Alternative: Modification of INSPIRE DS Land Cover
  - Adapt Data Type for LC-nomenclatures documented with LCCS Software Version 3

P1: LCML - AMBIGUOUS CLASS DOCUMENTATION

- Shortcomings of LCML are documended in the Study “Translation of the CORINE Land Cover nomenclature to the Land Cover Meta Language using LCCS3”

CODE	Designation	Adaptation to Portugal	Translation process	User defined structure
111	Continuous urban fabric			
112	Discontinuous urban fabric			
121	Industrial or commercial units			
122	Road and rail network and associated land			Yes
123	Port areas			
124	Airports			
131	Mineral extraction sites			
132	Dump sites			
133	Construction sites			
141	Green urban areas			Yes
142	Sport and leisure facilities			
211	Non-irrigated arable land			Yes
212	Permanently irrigated arable land	Includes Drip irrigation type; Excludes irrigated permanent crops (e.g. Irrigated Orchard)		
213	Rice fields			
221	Vineyards			
222	Fruit trees and berry plantations			
223	Olive groves			
231	Pastures			
241	Annual crops associated with permanent crops			
242	Complex cultivation patterns			
243	Land principally occupied by agriculture, with significant areas of natural vegetation			
244	Agro-forestry areas	Tree cover > 10%		
311	Broad-leaved forest			
312	Coniferous forest			
313	Mixed forest			
321	Natural grasslands			
322	Moors and heathland	Geographic distribution		
323	Sclerophyllous vegetation	Geographic distribution		
324	Transitional woodland/shrub	Tree cover > 10%		Yes

331	Beaches, dunes and sand plains			
332	Bare rocks			
333	Sparsely vegetated areas			
334	Burnt areas	Excludes burnt 321		
335	Glaciers and perpetual snow	Unexisting in Portugal		
411	Inland marshes			
412	Peat bogs			
421	Salt marshes			
422	Salines			
423	Intertidal flats			
511	Water courses			
512	Water bodies			
521	Coastal lagoons			
522	Estuaries			
523	Sea and ocean			



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Quelle http://land.copernicus.eu/eagle/files/eagle-related-projects/pt_-clc-translation-to-lcml-using-lccs3_dec2010, last visit 14.11.2017

P1: LCML - AMBIGUOUS CLASS DOCUMENTATION

Final considerations CLC-LCCS Study:

- There is more than one correct form to describe a Land Cover class using LCCS
- Its not clear when to stop in detailing class descriptions
- The “User defined structures” are very helpful to better describe the CLC classes
  - Critical for semantic interoperability based on the fact that any vocabulary (e.g. Land use vocabulary) could be used
  - Dealing with Horizontal and Vertical patterns is not very intuitive an increase the complexity of LCCS

Reference: http://land.copernicus.eu/eagle/files/eagle-related-projects/pt_clc-conversion-to-fao-lccs3_dec2010, last visit 14.11.2015

PRIORITY 1 GOALS FOR UPCOMING LCML REVISION

- Generate and provide an official XSD for LCML / LCCS on the ISO TC211 register
- Reduce the existing ambiguities of LCML
- Guarantee backwards compatibility of LCML
  - Existing Software implementation based on LCML

  → LCCS Version 3

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Reference: http://land.copernicus.eu/eagle/files/eagle-related-projects/pt_clc-conversion-to-fao-lccs3_dec2010, last visit 14.11.2015

P2: HARMONISE LCML & EAGLE CONCEPTS

- Bringing LCML and EAGLE World together

LCML-World

EAGLE-World

Talking about the same phenomena, using similar concepts but different semantic ☹

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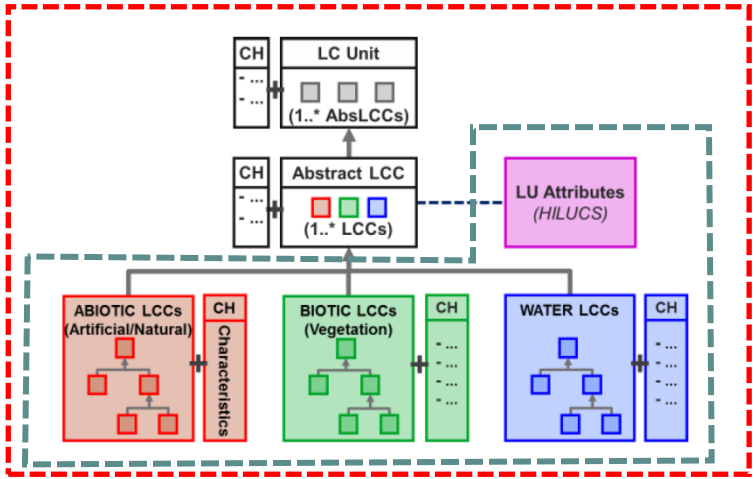
Reference: http://land.copernicus.eu/eagle/files/eagle-related-projects/pt_clc-conversion-to-fao-lccs3_dec2010, last visit 14.11.2015

P2: HARMONISE LCML & EAGLE CONCEPTS

GENERAL EAGLE CONCEPT: EAGLE PROVIDE A

- ***EAGLE Land Cover Data model*** using the semantics of the ***EAGLE matrix*** (main difference to LCML)
- ***EAGLE matrix*** represent Land Cover Class definitions in a machine-readable way (vice versa LCCS)
- ***LC Datasets*** which are instanced/encoded based on the EAGLE Land Cover Data Model can be automatically transformed in any LC-Nomenclature which is documented with the EAGLE matrix.



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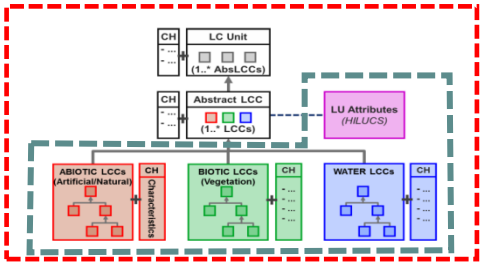
Reference: http://land.copernicus.eu/eagle/files/eagle-related-projects/pt_clc-conversion-to-fao-lccs3_dec2010, last visit 14.11.2015

P2: HARMONISE LCML & EAGLE CONCEPTS

- Relationship between EAGLE Concepts and LCML



LM_LandCoverMetaLanguage

<<instantiate>>

SPECIFIC LC CLASS DESCRIBED WITH LCCS VERSION 3

LM_LandCoverClassificationSystem (LCCS)

LC CLASS DESCRIBED BY EAGLE MATRIX

<<derived>>

<<instantiate>>

<<fixed Model >>
<<based on sematic of EAGLE Matrix>>

APPLICATION SCHEMA DERIVED FROM LCCS DESCRIBTION

LM_LandCoverApplicationSchema

EAGLE MODEL

<<instantiate>>

SPECIFIC LCCS LC INSTANCE

LM_ApplicationSchemaInstance

EAGLE LC DATASET INSTANCE

LCML-concept

EAGLE-concept

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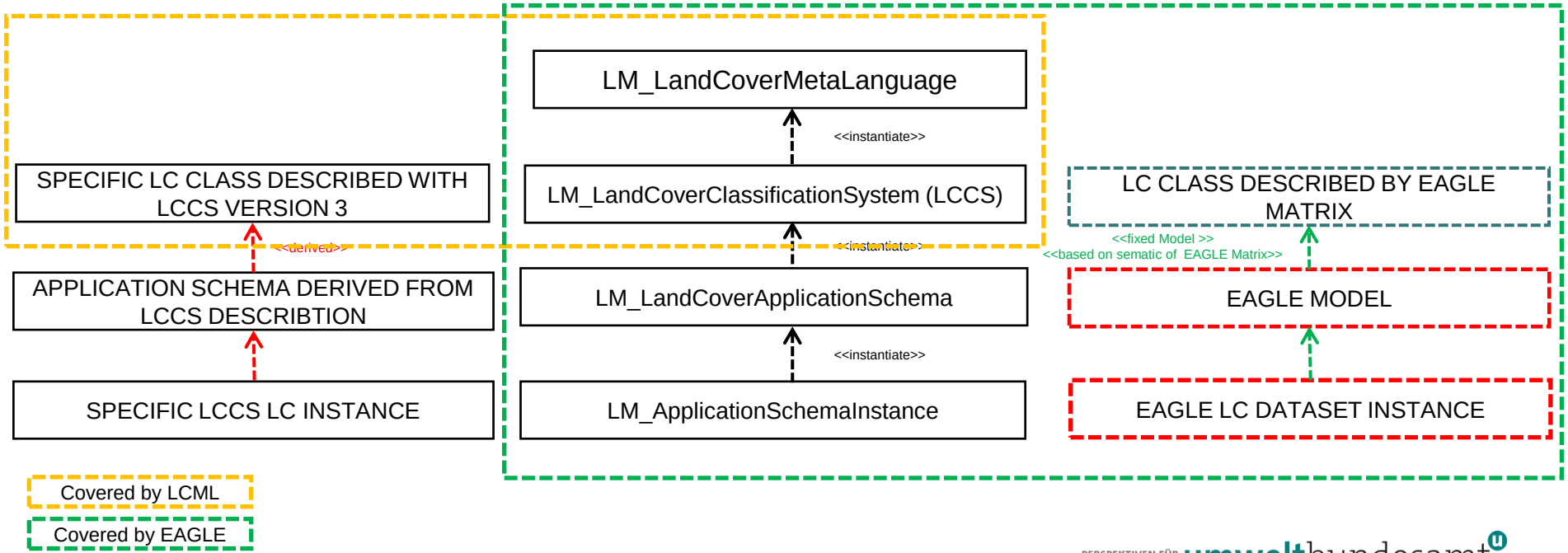
Reference: http://land.copernicus.eu/eagle/files/eagle-related-projects/pt_clc-conversion-to-fao-lccs3_dec2010, last visit 14.11.2015

P2: HARMONISE LCML & EAGLE CONCEPTS

- Relationship between EAGLE Concepts and LCML



Reference: http://land.copernicus.eu/eagle/files/eagle-related-projects/pt_clc-conversion-to-fao-lccs3_dec2010, last visit 14.11.2015

P2: HARMONISE LCML & EAGLE CONCEPTS

Semantic of the EAGLE Matrix is more restrictive

- user defined structures are not allowed
- e.g. Land Use is restricted to HILUC Classes

Documentation of Land cover nomenclature is much more intuitive

- Only one “vertical pattern” is available
- Documentation of a LC-Class is build up as a “linear workflow”
- Documentation of a LC-Class using LCCS is more decision tree oriented
  → ending in ambiguous LC class descriptions.

Shortcomings of the EAGLE Matrix

- Definition of value ranges (e.g. Tree Cover Density between 30% and 70%) is not covered

Reference: http://land.copernicus.eu/eagle/files/eagle-related-projects/pt_clc-conversion-to-fao-lccs3_dec2010, last visit 14.11.2015

PRIORITY 2 GOALS FOR LCML REVISION

Bringing the LCML and EAGLE World together would…….

- decrease the confusion within the LC community
- increase the sematic interoperability for land cover following on of the two concepts

Possible reviewing/harmonization strategies at ISO TC211

- Establishing a sematic harmonization between the terms and definitions of the eagle components and LCML meta classes
  - Based on a semantic mapping
  - Modification of the eagle matrix
  - Modification of LCML (more critical – backward compatibility aspects)
- Establishing the EAGLE Matrix using the profiling mechanism of ISO TC 211
- Publication of the EAGLE Model as realization of the EAGLE Matrix Profile (informal ANNEX of ISO 19144-2)
- Topic Land Use?

LONG TERM PERSPECTIVE

Establishing a Project 0 at ISO/TC211

- Bringing together the domain experts of LC and LU
  - Develop a cross domain understanding of LC and LU
  - How to deal with the semantic and conceptual harmonization issues between LCML and EAGLE
  - Discuss what standards are needed to increase the needless information exchange between the child themes Land Cover and Land Use

For both, priority 1 and priority 2 revision of LCML

funding is needed!!

WORKSHOP:LAND USE/LAND COVER PRODUCTS: CHALLANGES AND OPPORTUNITIES

15. NOVEMBER 2017

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