Spatial domain

EAGLE Data Model

© EEA, EAGLE

EAGLE concept and its application in the LIFE CROLIS project

LIFE CROLIS: Visibility Event, 3. October 2023, Zagreb

Gebhard Banko

CONTENT

- Why do we need EAGLE?

- European examples
  - EEA: COPERNICUS LULUCF instance

- CROLIS application

- Start:
  - 2009: SIOSE – spanish data model
- From CORINE Land Cover → CLC+
- From Classification to Description
  - EAGLE / LCML Parameterized data models
- From single data layers to integrated datasets

- → recent EEA-LULUCF workshop:
  - 19. September 2023

- Due to increased policy requirements
  - LULUCF, CAP, biodiversity strategy, soil monitoring law, restoration, Urban Agenda

- Due to increased technical capabilities
  - Data input: Copernicus/Sentinel 1+2
  - Cloud processing: DIAS, AWS, …
  - Analysis methods: new modern classifiers (deep learning, big data)

- Due to advanced semantic description systems
  - EAGLE data model – EiONET Action Group on Land Monitoring in Europe
  - LCCS – updating ISO 19144-2 standard (Land cover classification system)

CLC2018_WM

Corine Land Cover 2018 vector

- 111: Continuous urban fabric
- 112: Discontinuous urban fabric
- 121: Industrial or commercial units
- 122: Road and rail networks and associated land
- 123: Port areas
- 124: Airports
- 131: Mineral extraction sites
- 132: Dump sites
- 133: Construction sites
- 141: Green urban areas
- 142: Sport and leisure facilities
- 211: Non-irrigated arable land
- 212: Permanently irrigated

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

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

III.) CHARACTERISTICS – CH
spatial pattern, bio-physical parameters, cultivation measures, land management practices, status/condition etc.
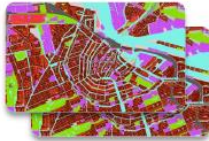
The CLMS product portfolio

Land Monitoring

Urban Atlas
2006-12-18

Riparian Zones
2012-18

N2K
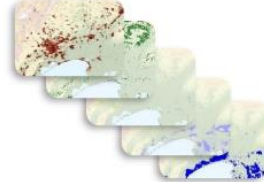2006-12-18

Coastal Zones
2012-18

CLC & CLCC
1990-2000-06-12-18

CLC+ Backbone
2018

High Resolution Layers
2006-09-12-15-18

Biophysical parameters
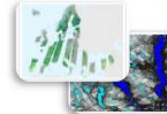
European Ground Motion Service

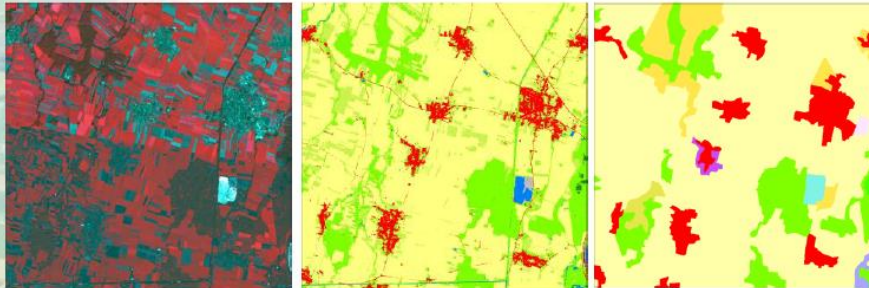**EU-DEM**

EU-Hydro

C L C +   R a s t e r — K e y   s p e c i f i c a t i o n s

Land Monitoring

- 10m spatial resolution wall-to-wall for the EEA38 (2018 UK still incl.) land cover map with 11 classes
- Focused on land cover (i.e. not land use) and the dominant class (in space and time) for each pixel
- 91.9% overall accuracy > best in its category
- Ancillary layers on density of input data, classification uncertainty and post-processing
- 2018 edition available, 2021 to be finalized in Q4 2023
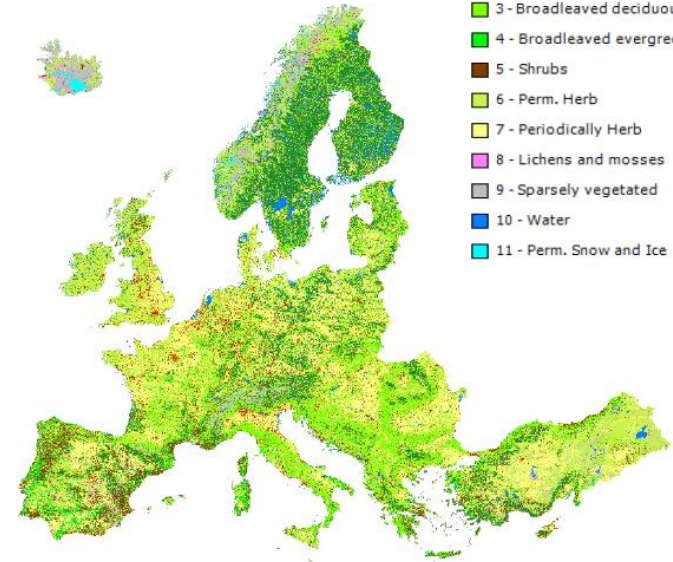
1 - Sealed
2 - Coniferous
3 - Broadleaved deciduous
4 - Broadleaved evergreen
5 - Shrubs
6 - Perm. Herb
7 - Periodically Herb
8 - Lichens and mosses
9 - Sparsely vegetated
10 - Water
11 - Perm. Snow and Ice

VHR IMAGE 2018

CLC+ Raster Product 2018

CLC 2018

European Environment Agency

European Commission

Copernicus
Europe's eyes on Earth

EEA ACTIVITIES

- CLC+ Core
  - 100m Grid database
  - Integration of national + Copernicus data
  - Harmonized thematic content according to EAGLE concept

- Various use cases
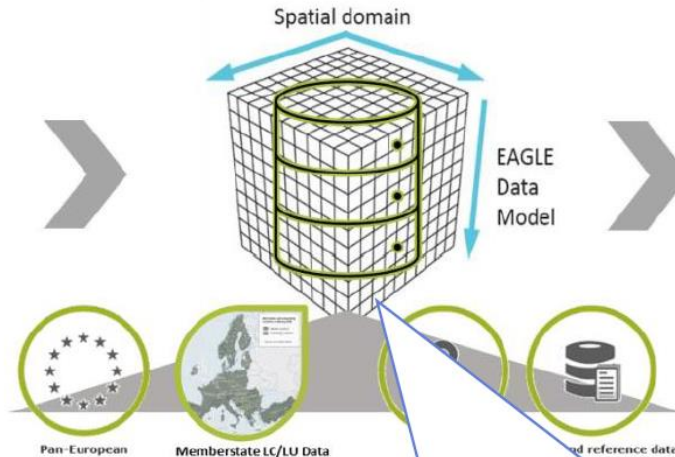 - CORINE Land Cover instance
  - LULUCF instance

CLC+ Core in a nutshell

Land Monitoring

CLC+ Backbone

CLC+ Core

CLC+ Instance

Spatial domain

EAGLE Data Model

Pan-European Memberstate LC/LU Data ...d reference data

Eg. National LULUCF realisation

Figure 0-1: The CLC+ Product suite (from left to right) with the CLC+ ...tion (middle) hosting integrated CLMS, ancillary

What is the special thing with the grid?
For every pixel we know the input classification on a percent coverage.

Pixel 100mE1025N22000 (EEA Grid):
CLC2018-Class 101: 100%
Imperviousness 2018: 2% (and many more...)

European Commission | Copernicus
Europe's eyes on Earth

MAPPING TO EAGLE NOMENCLATURE

- **Ingestion**
  - „Input datasets" → harmonized to EAGLE

- **Extraction**
  - „output datasets" → query using EAGLE terminology

LULUCF Beta Version – geospatial input data

Land Monitoring

Geospatial input data used for the CLC+ LULUCF Instance beta version (ingested into the CLC+ Core System)

Product Category	Product Name	Reference year	Data format
CLMS HRLs 2018			
Imperviousness	Degree of Imperviousness	2018	Raster
Forest	Tree Cover Density	2018	Raster
Forest	Dominant Leaf Type	2018	Raster
Grassland	Grassland	2018	Raster
Water and Wetness	Water and Wetness	2018	Raster
Small Woody Features	Small Woody Features	2018	Raster
CLMS CLC / CLC+ Backbone 2018			
CLC Raster	Corine Land Cover	2018	Raster
CLC+ Backbone Raster	Corine Land Cover Plus Backbone	2018	Raster
CLMS Local Components 2018			
Urban Atlas	Urban Atlas LC/LU	2018	Vector
Riparian Zones	Riparian Zones LC/LU	2018	Vector
Natura 2000	Natura 2000 LC/LU	2018	Vector
Coastal Zones	Coastal Zones LC/LU	2018	Vector
Other products			
EU CROPMAP 2018	d'Andrimont et al 2021	2018	Raster

LULUCF Beta Version – Technical Specifications

Land Monitoring

LULUCF Beta 1.1 2018 Raster product	
File name	
CLC+_Instance_LULUCF_2018_beta_100m_03035_*HU*_V1.1.tif (*2-digt country code)	
Reference year	
2018	
Geometric resolution	
Pixel resolution 100m x 100m, fully conforming with the EEA reference grid in 100m	
Coordinate Reference System	
European ETRS89 LAEA projection	
Thematic accuracy	
TBD	
Data type	
8bit unsigned raster with LZW compression	
Minimum Mapping Unit (MMU)	
n/a	
Extent	
EU27	
Classified feature	
LULUCF Instance based on pan-European data for the six main LULUCF categories Forest Land, Cropland, Grassland, Wetland, Settlements and Other Land including several subclasses	
NoData	
No NoData value shall be set for any of the products	
Attributes	
Raster value, pixel count per class, class name, area (in kha) per class	
Raster coding (thematic pixel values) (see right)	
Metadata	
XML metadata files according to INSPIRE metadata standards	
Mode of Delivery	
FTP - Download	
Delivery format	
GeoTIFF	

Raster coding (thematic pixel values)

- 11 S Burnt areas
- 12 S Settlements
- 13 S Green urban areas
- 14 S Other settlements
- 21 FL Burnt areas
- 22 FL Transitional woodland
- 23 FL Deciduous trees
- 24 FL Coniferous trees
- 25 FL Other forestland
- 31 CL Burnt areas
- 32 CL Annual crops
- 33 CL Perennial crops
- 34 CL Other cropland
- 41 GL Burnt areas
- 42 GL Pasture
- 43 GL Shrubs
- 44 GL Natural grassland
- 45 GL Other grassland
- 51 WL Wetland managed
- 52 WL Wetland unmanaged
- 53 WL Water managed
- 54 WL Water unmanaged
- 61 OL Bare soil and rocks
- 62 OL Permanent ice and snow
- 63 OL Lichens and mosses
- 64 OL Other otherland
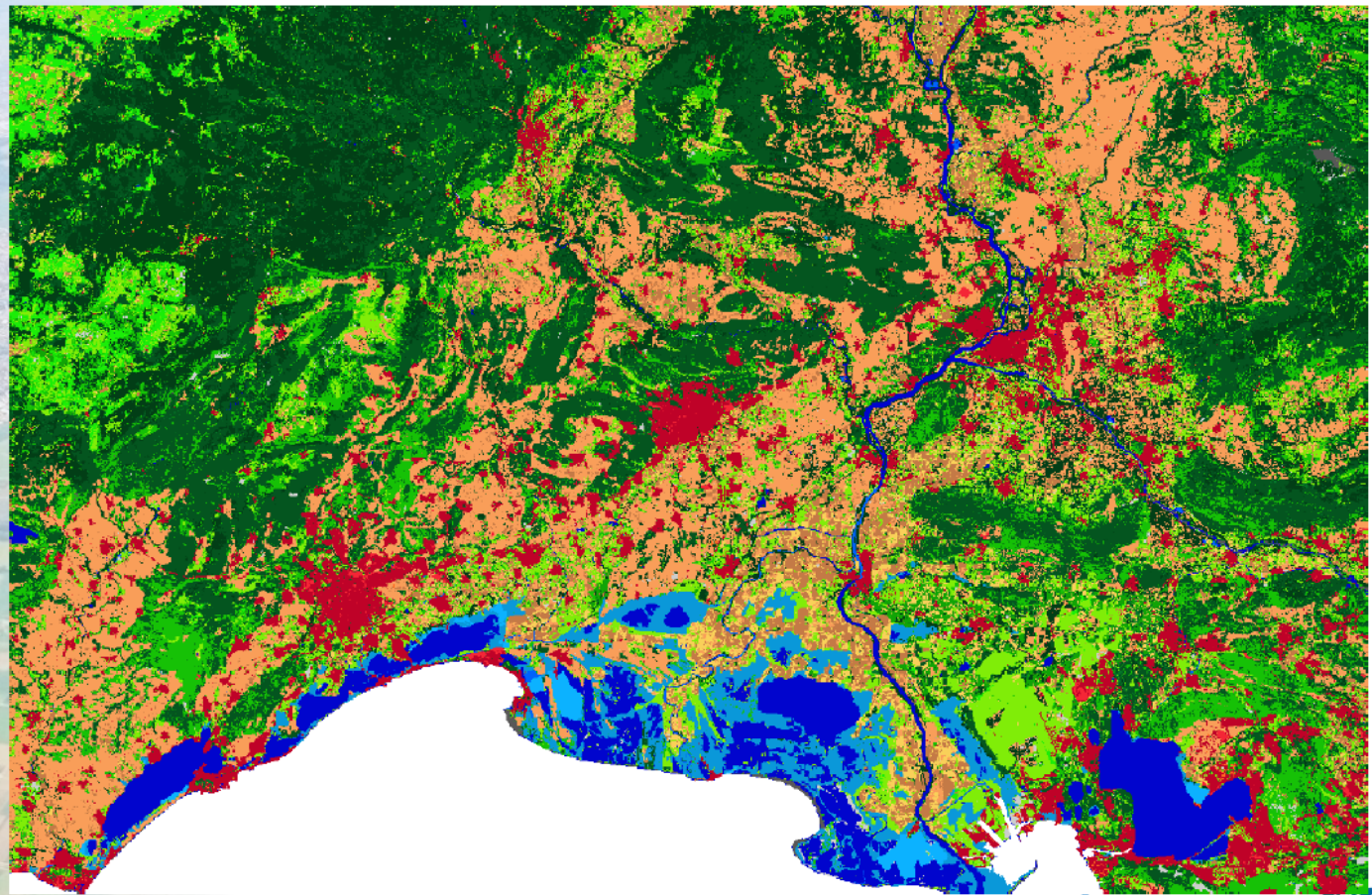- 254 Unclassified, clouds
- 255 Outside area

6 main LULUCF classes

- Forest Land
- Cropland
- Grassland
- Wetlands
- Settlements
- Other Land

European Environment Agency

European Commission

LULUCF Beta Version - Examples

Land Monitoring

11 S Burnt areas
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62 OL Permanent ice and snow
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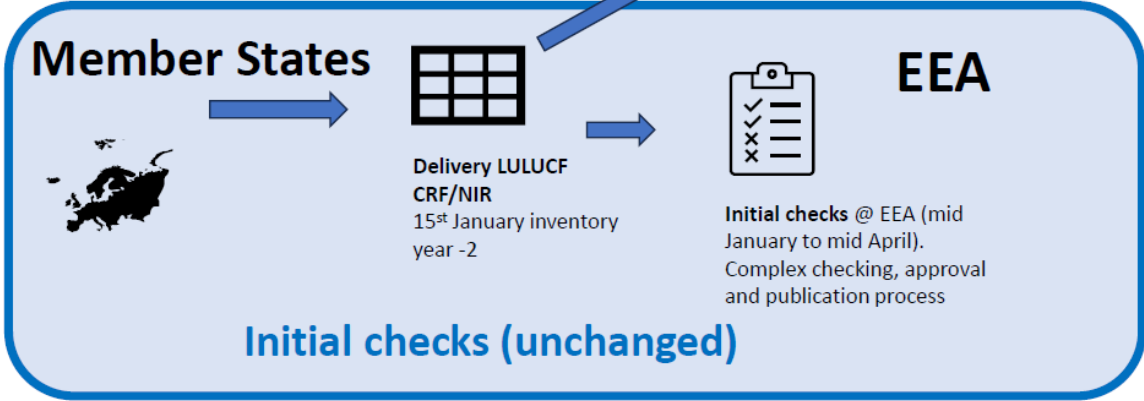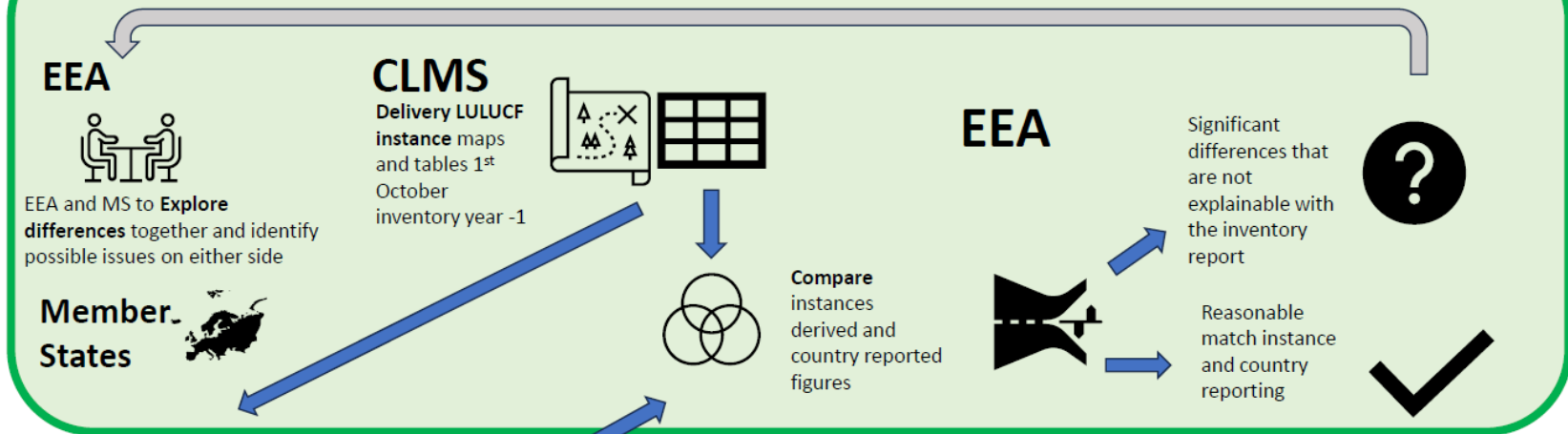FR 3859786,2316528 almost all classes mapped in this extent

Copernicus
Europe's eyes on Earth

European
Environment
Agency

European
Commission

New LULUCF instance based additional checks (under development)

EEA

EEA and MS to **Explore differences** together and identify possible issues on either side

Member States

CLMS

Delivery LULUCF instance maps and tables 1st October inventory year -1

Compare instances derived and country reported figures

EEA

Significant differences that are not explainable with the inventory report

Reasonable match instance and country reporting

Member States

Delivery LULUCF CRF/NIR 15st January inventory year -2

EEA

Initial checks @ EEA (mid January to mid April). Complex checking, approval and publication process

Initial checks (unchanged)

European Environment Agency

CROLIS APPLICATION

- Awareness of EAGLE concept

- Capacity building for EAGLE mapping

- User training → EEA CLC+ Core

- Developing options for national collaboration programmes (COPERNICUS)

- Developing in depth knowledge for european LULUCF instance

- Understanding of strength and weaknesses of European LULUCF approach
  - E.g land cover vs. land use oriented approach

CLC-Class:
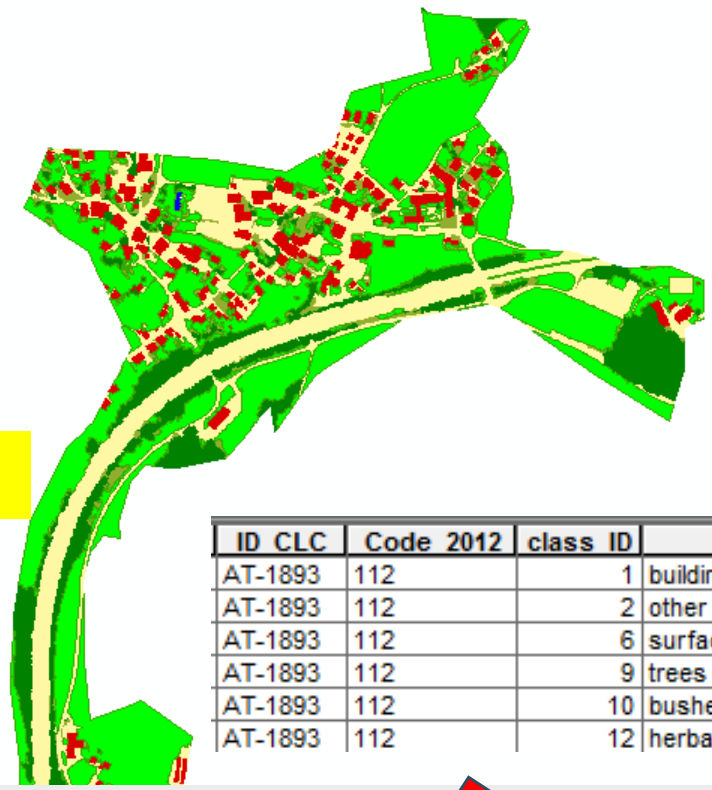112 - Discontinuous urban fabric

EAGLE:
 attributed information
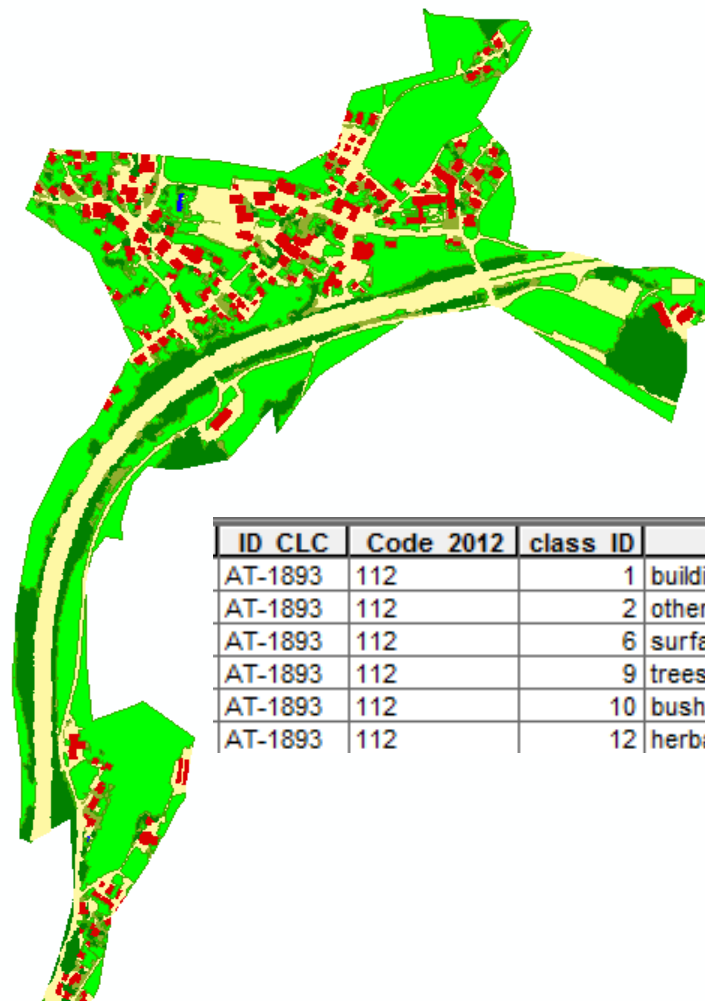
ID_CLC	Code_2012	class_ID	class_name	Eagle_Prozen
AT-1893	112	1	building	0,089202
AT-1893	112	2	other constructed area	0,25784
AT-1893	112	6	surface water	0,000723
AT-1893	112	9	trees	0,155782
AT-1893	112	10	bushes	0,047732
AT-1893	112	12	herbaceous vegetation	0,448721

plausibility test: Are preconditions for CLC-class code (112) fulfilled?

Class 1+ class 2 >=30 %
8,9 % + 25,8 % = 34,7 %

ID CLC	Code 2012	class ID	class name	Eagle Prozen
AT-1893	112	1	building	0,089202
AT-1893	112	2	other constructed area	0,25784
AT-1893	112	6	surface water	0,000723
AT-1893	112	9	trees	0,155782
AT-1893	112	10	bushes	0,047732
AT-1893	112	12	herbaceous vegetation	0,448721

Description: 1.1.2._Discontinuous_Urban_Fabric

Equivalent To ⊕

● (Artificial_Surfaces_and_Constructions some xsd:double[> "0.3"^^xsd:double , <= "0.8"^^xsd:double])
   and (Conventional_Buildings some xsd:double[> "0.0"^^xsd:double])
   and (Open_Sealed_Surfaces some xsd:double[> "0.0"^^xsd:double])
   and (Biotic/Vegetation some xsd:double[> "0.0"^^xsd:double])
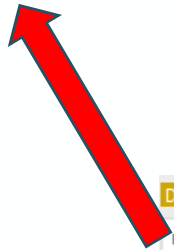
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