

using space data to provide space for the environment

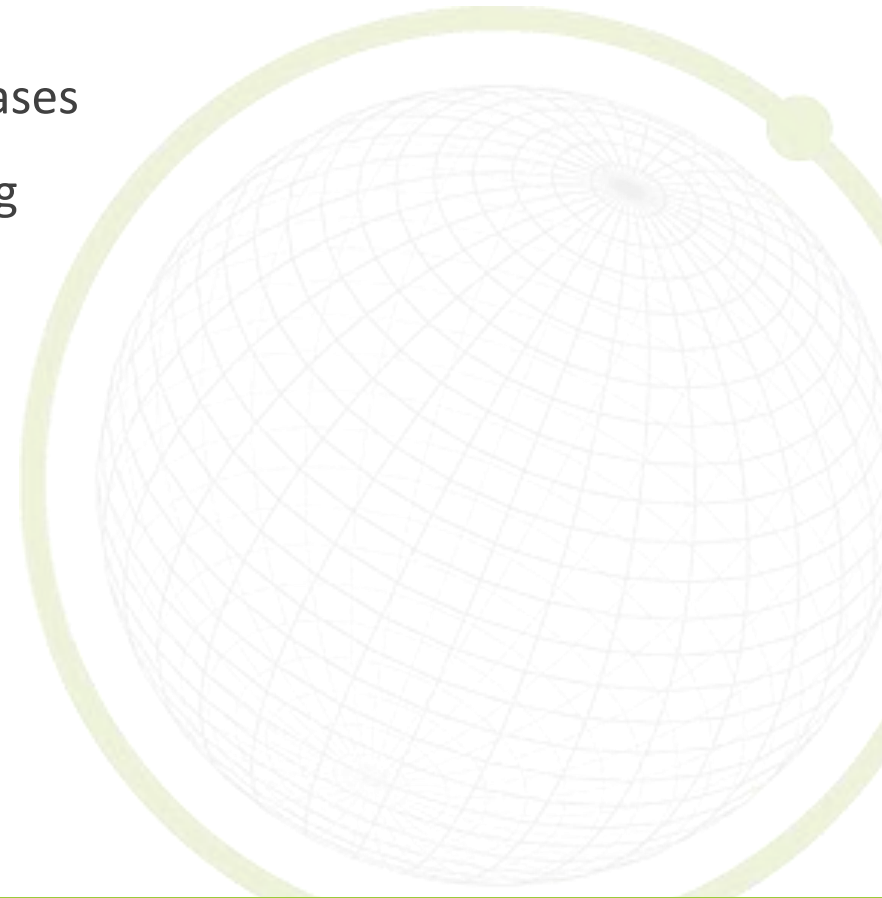
space **4** environment

LIS-L – A land information system for Luxembourg

STEFAN KLEESCHULTE (S4E)

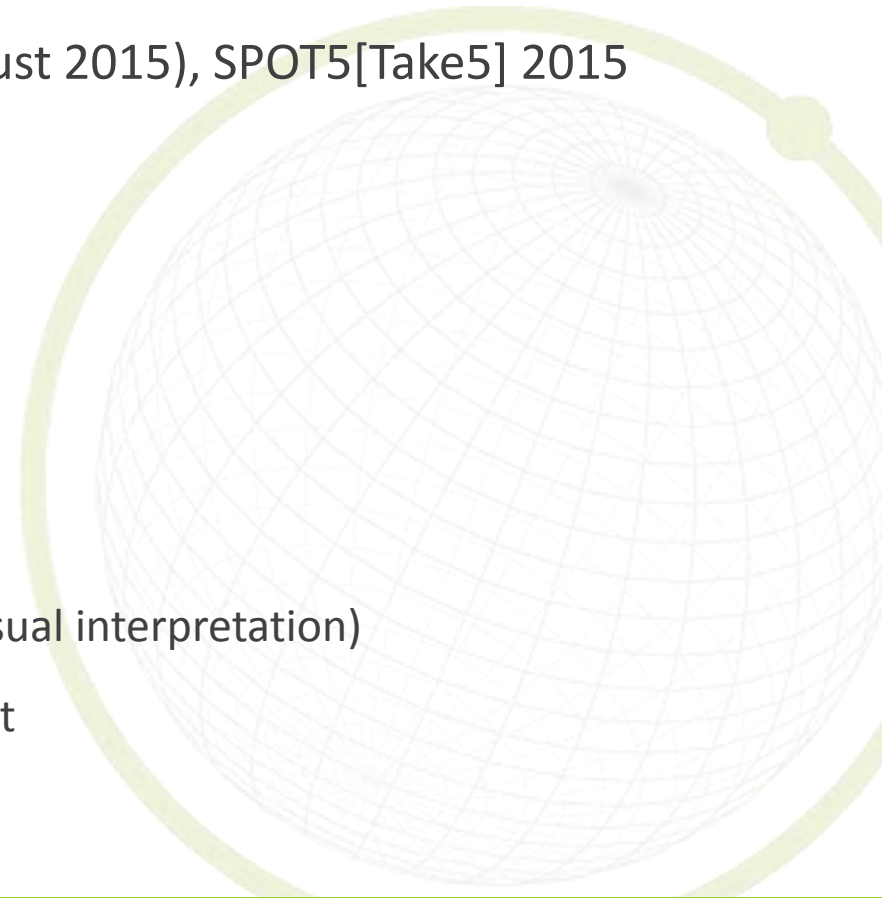
Project context and objectives

- ESA funded project
- Implemented by space4environment & LIST
- Duration: 24 months (October 2016 to September 2018) in 2 phases
- Phase 1: 8 months user requirements, specifications, prototyping
- Phase 2: Implementation
- Main objectives:
 - Update of OBS;
 - Land Information System.



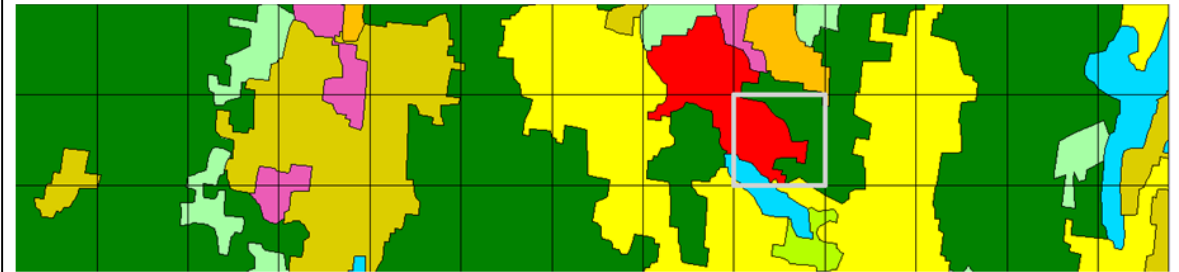
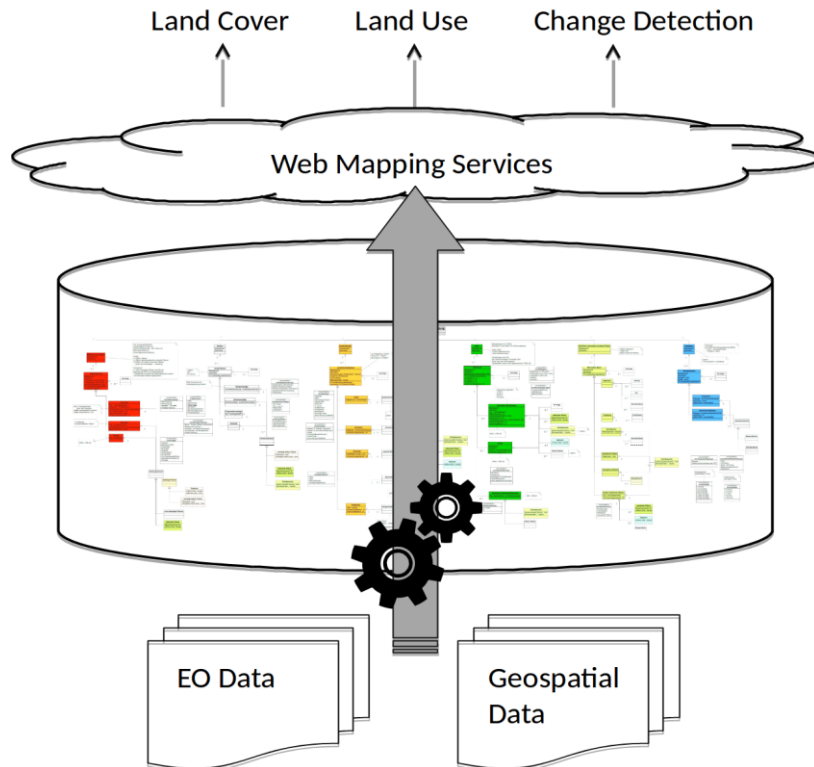
OBS update

- Last updated in 2007 based on IKONOS VHR data (1m)
- **New update for the year of 2015:** Pleiades VHR data (1 & 3 August 2015), SPOT5[Take5] 2015 and Orthophotos 2016
- **Characteristics of the new OBS maps:**
 - Separation of land cover & land use inventories
 - Ensure backwards compatibility with old OBS nomenclature
 - Integration of other national data sources (forest, biotope, ...)
 - Use of vector objects (semi-automatic classification instead of full visual interpretation)
 - Provision of reliable and more detailed statistics of land development
 - Regular updates (max. 3 years)

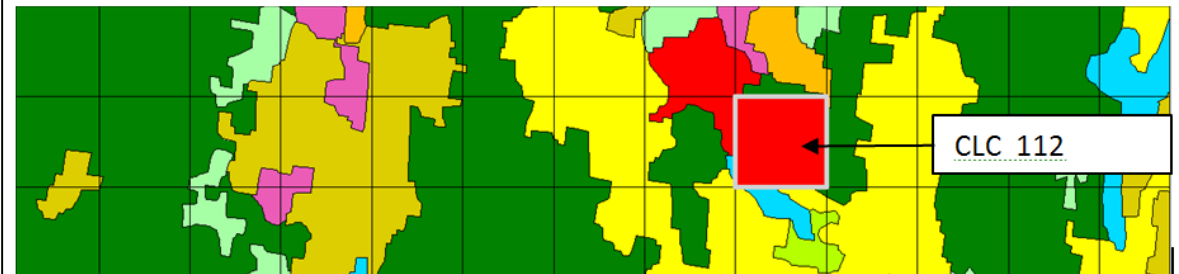


Land Information System

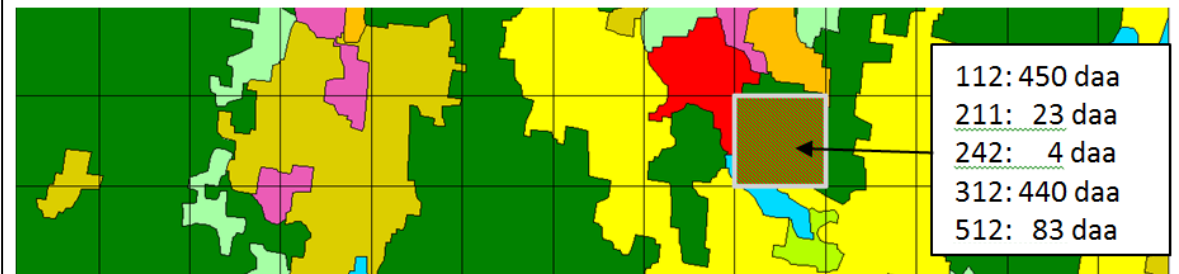
➤ Grid database & web viewing tool



CLC with 1 km raster/grid superimposed



Raster representation: A single class is assigned to each pixel

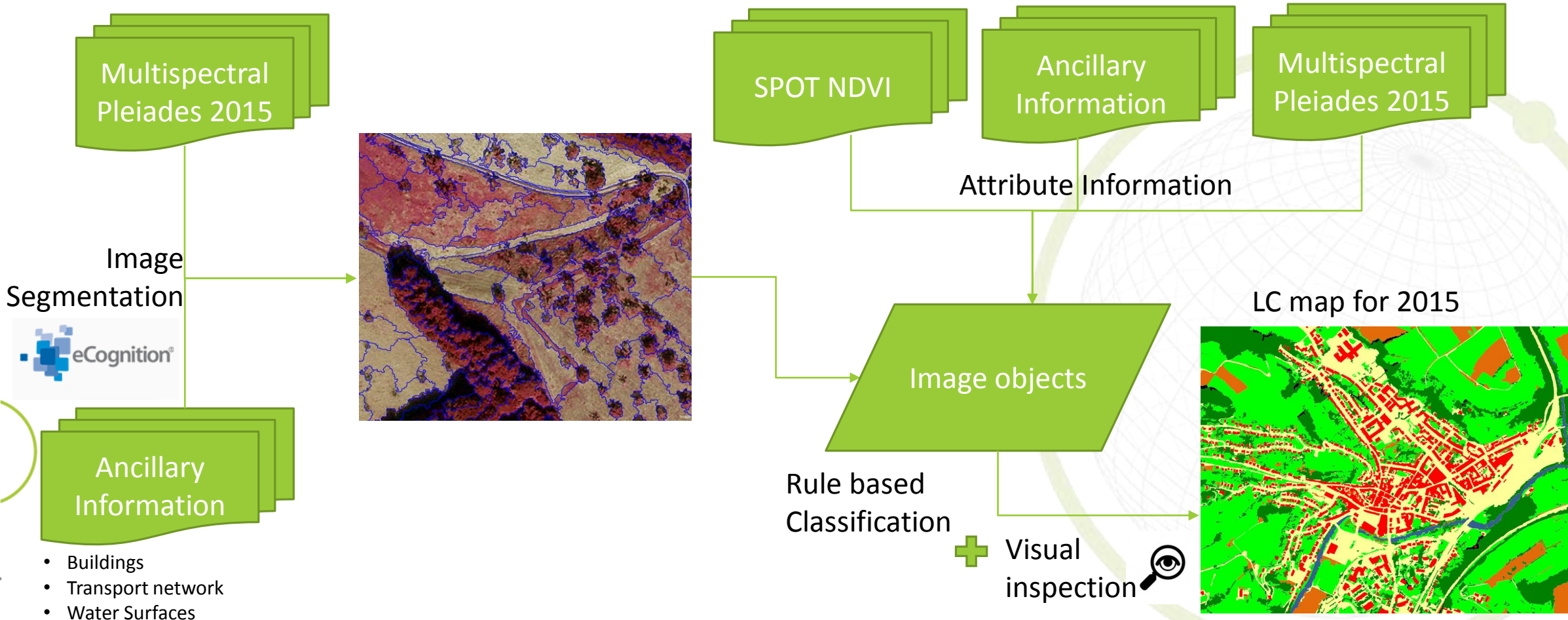


112: 450 daa
211: 23 daa
242: 4 daa
312: 440 daa
512: 83 daa

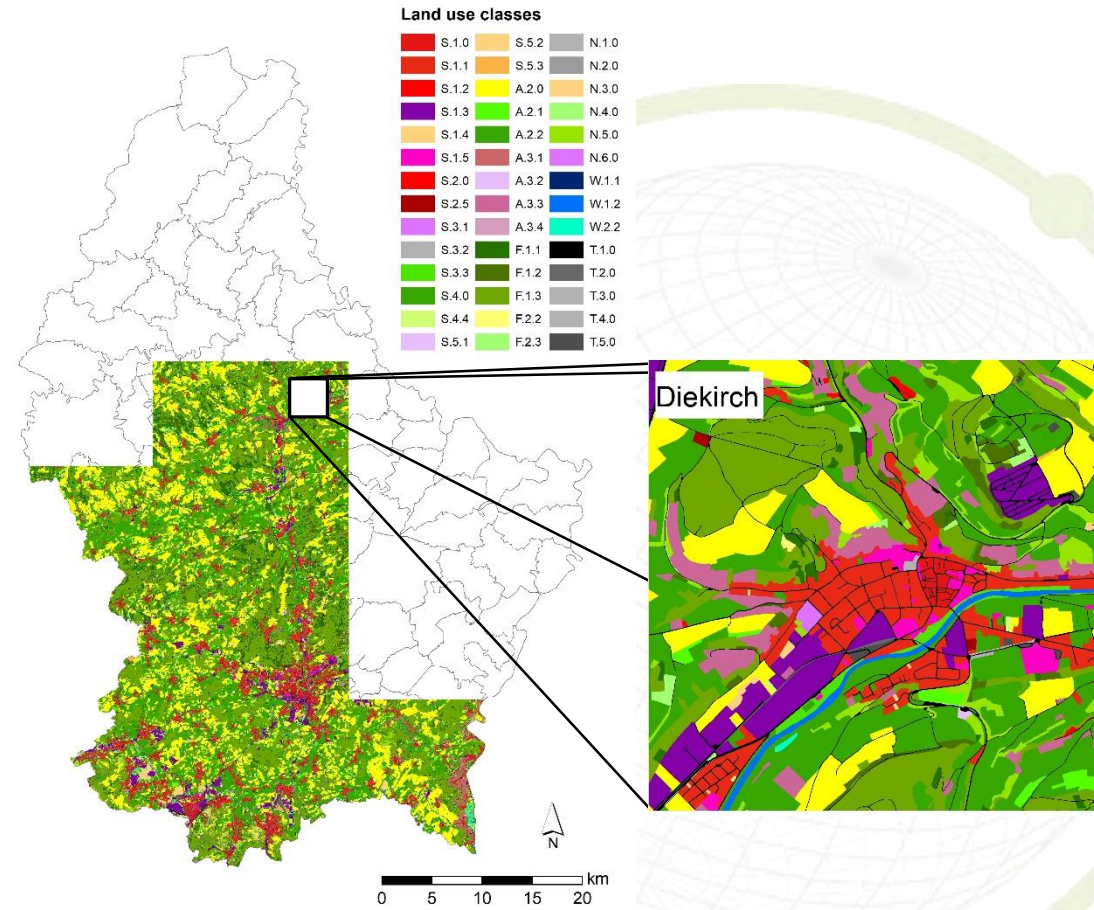
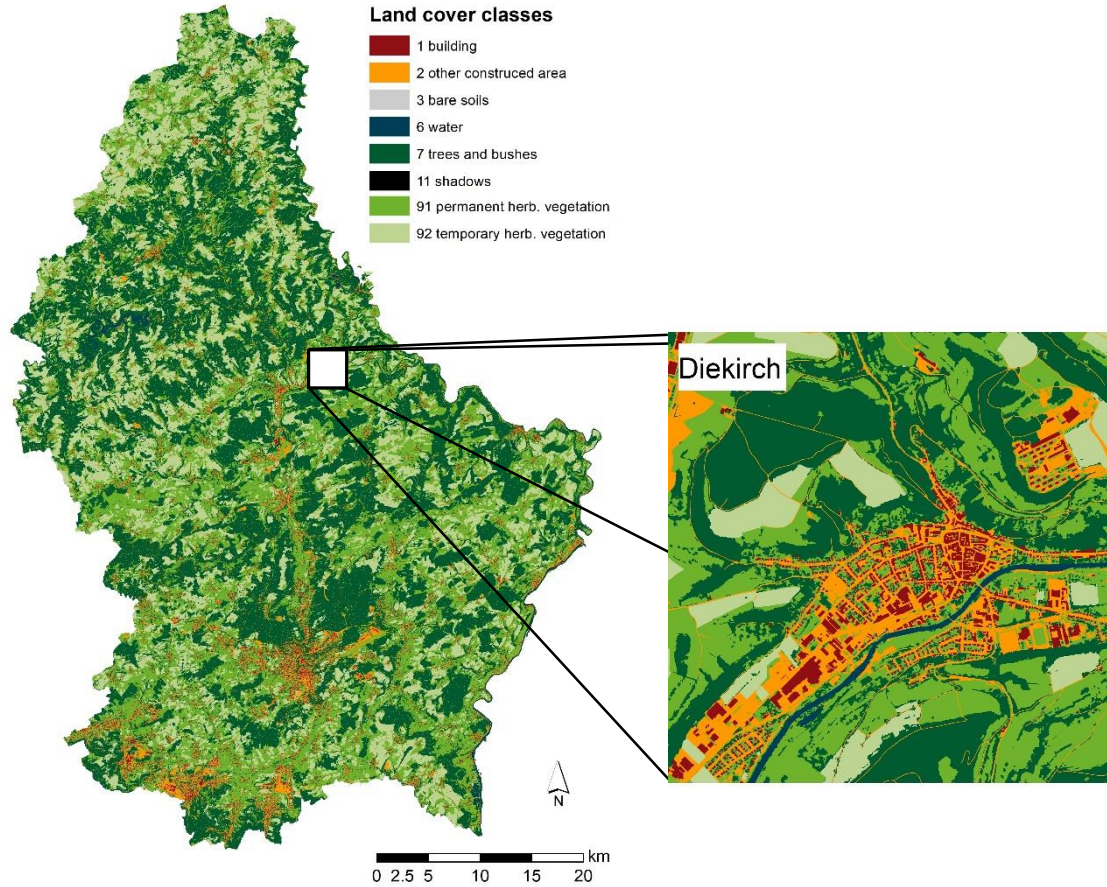
Grid representation: The internal composition of the grid cell is kept as an attribute vector.

Classification approach: an overview

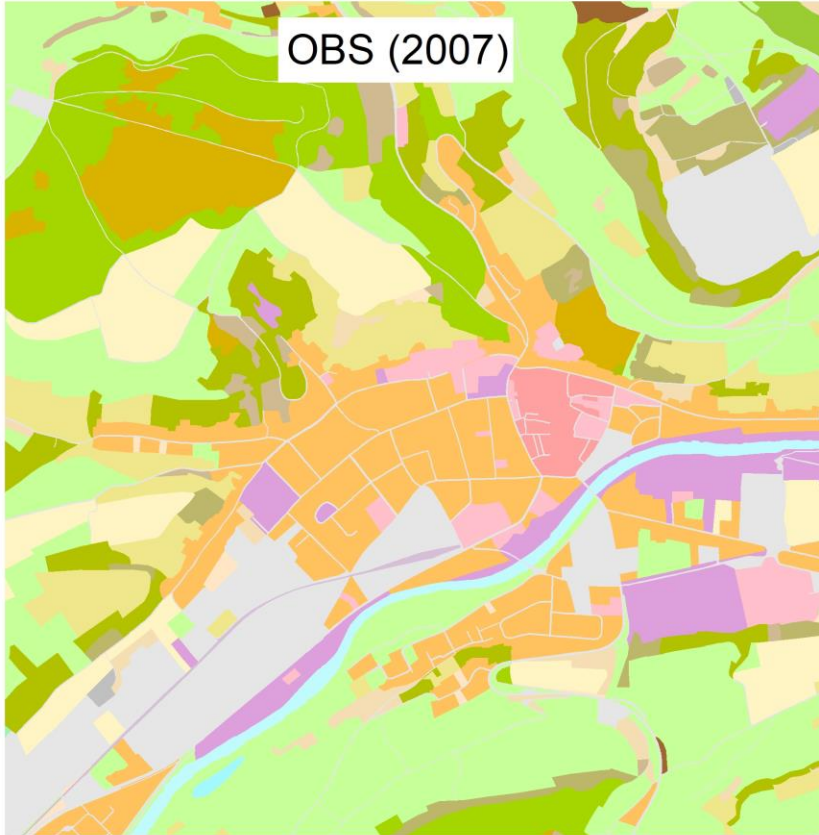
space 4 environment



Results



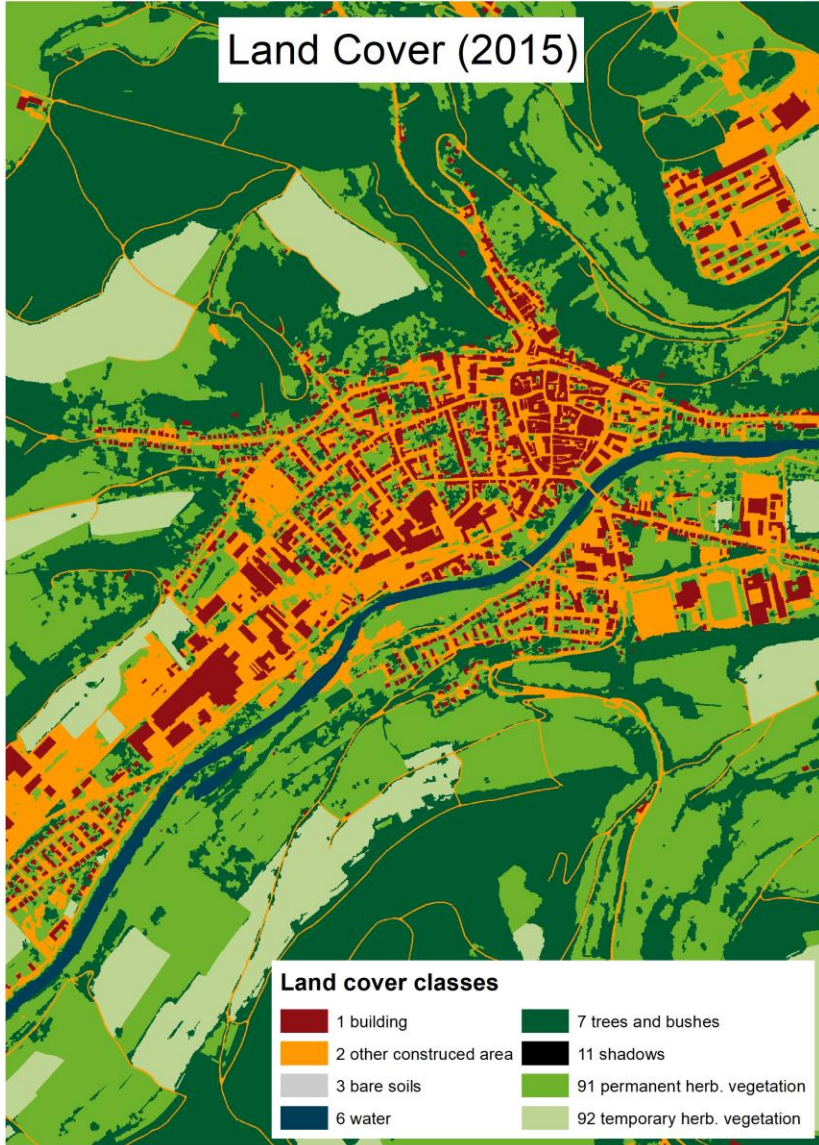
OBS (2007)



OBS classes

1.1.1	1.2.1.3.1	1.3.1	2.1.1.2	3.1.1.4	3.1.3.4	3.2.4.4	5.1.2.1
1.1.2.1.1	1.2.1.3.2	1.3.2.1	2.2.1.1	3.1.1.5	3.2.1.1	3.2.4.5	5.1.2.2
1.1.2.1.2	1.2.1.3.3	1.3.2.2	2.2.1.2	3.1.1.6.1	3.2.1.2	3.3.2	5.1.2.3
1.1.2.2	1.2.1.4	1.3.2.3	2.2.2.1	3.1.1.6.2	3.2.1.3	3.3.2.1	5.1.2.4
1.1.2.3.1	1.2.2.1.1	1.3.2.4	2.2.2.2	3.1.2.1	3.2.2	4.1.1.1	5.1.2.5.1
1.1.2.3.2	1.2.2.1.2	1.4.1.1	2.3.1.1	3.1.2.2	3.2.3.1	4.1.1.2	5.1.2.5.2
1.1.2.4	1.2.2.2	1.4.1.2	2.3.1.2	3.1.2.3	3.2.3.2	4.1.1.3	
1.2.1.1.1	1.2.3	1.4.2.1	3.1.1.1	3.1.3.1	3.2.4.1	5.1.1.1.1	
1.2.1.1.2	1.2.4.1	1.4.2.2	3.1.1.2	3.1.3.2	3.2.4.2	5.1.1.1.2	
1.2.1.2	1.2.4.2	2.1.1.1	3.1.1.3	3.1.3.3	3.2.4.3	5.1.1.2	

Land Cover (2015)

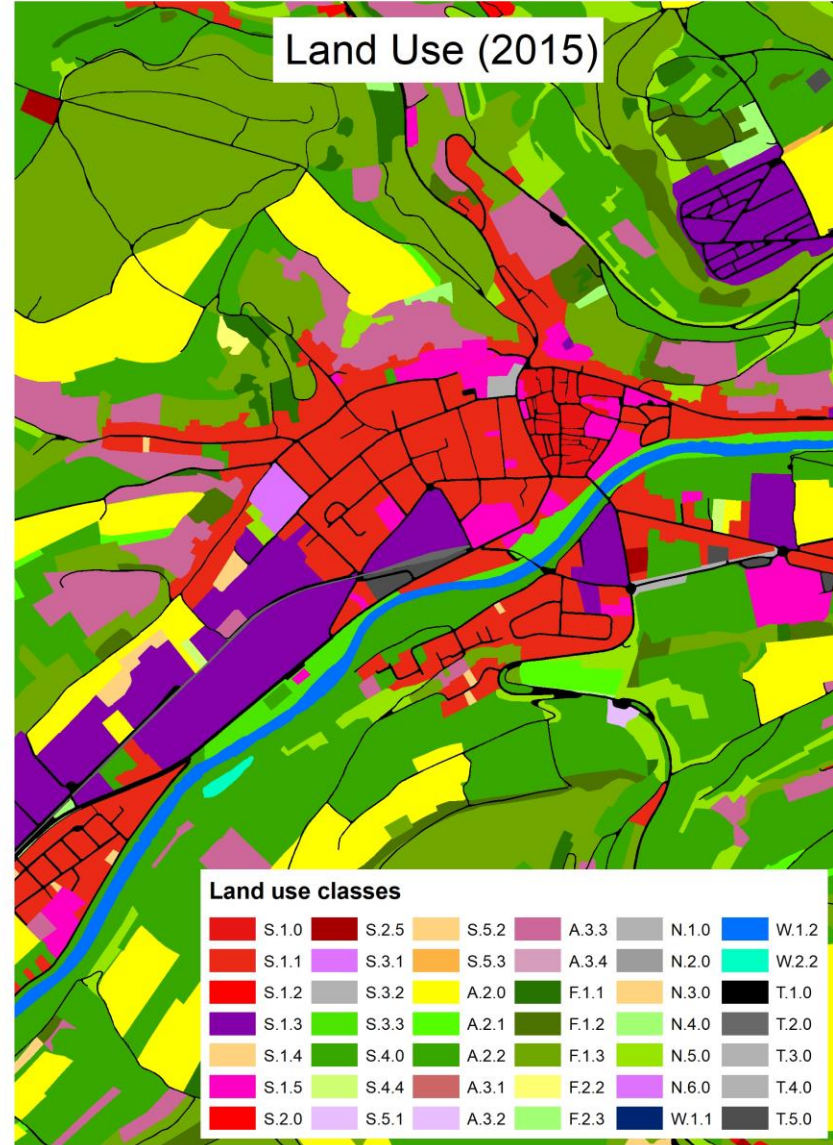


Land cover classes

1 building	7 trees and bushes
2 other constructed area	11 shadows
3 bare soils	91 permanent herb. vegetation
6 water	92 temporary herb. vegetation



Land Use (2015)

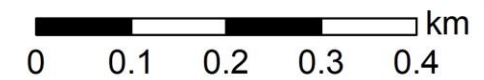
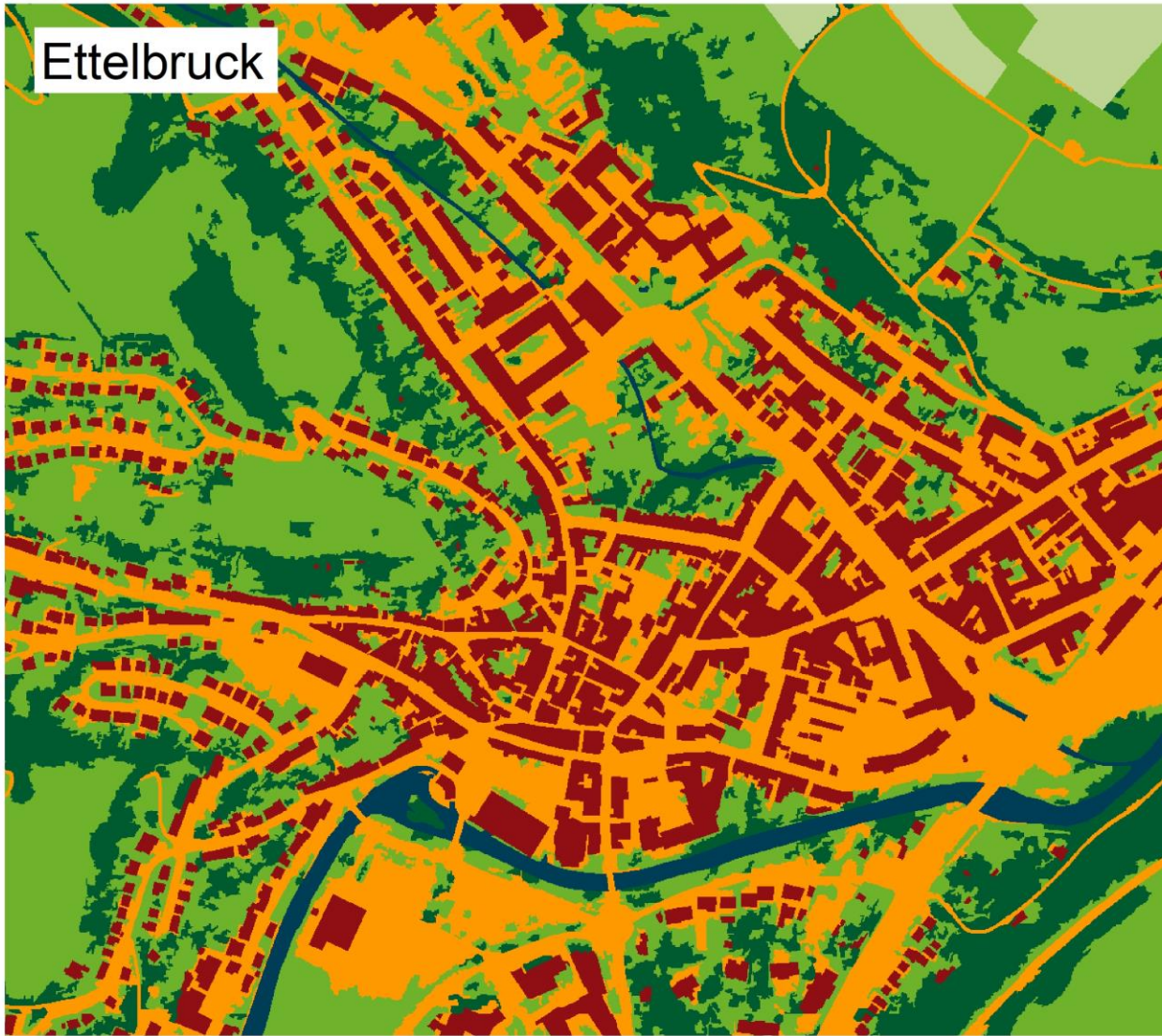


Land use classes

S.1.0	S.2.5	S.5.2	A.3.3	N.1.0	W.1.2
S.1.1	S.3.1	S.5.3	A.3.4	N.2.0	W.2.2
S.1.2	S.3.2	A.2.0	F.1.1	N.3.0	T.1.0
S.1.3	S.3.3	A.2.1	F.1.2	N.4.0	T.2.0
S.1.4	S.4.0	A.2.2	F.1.3	N.5.0	T.3.0
S.1.5	S.4.4	A.3.1	F.2.2	N.6.0	T.4.0
S.2.0	S.5.1	A.3.2	F.2.3	W.1.1	T.5.0

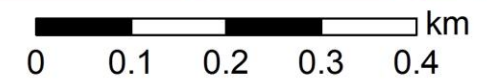
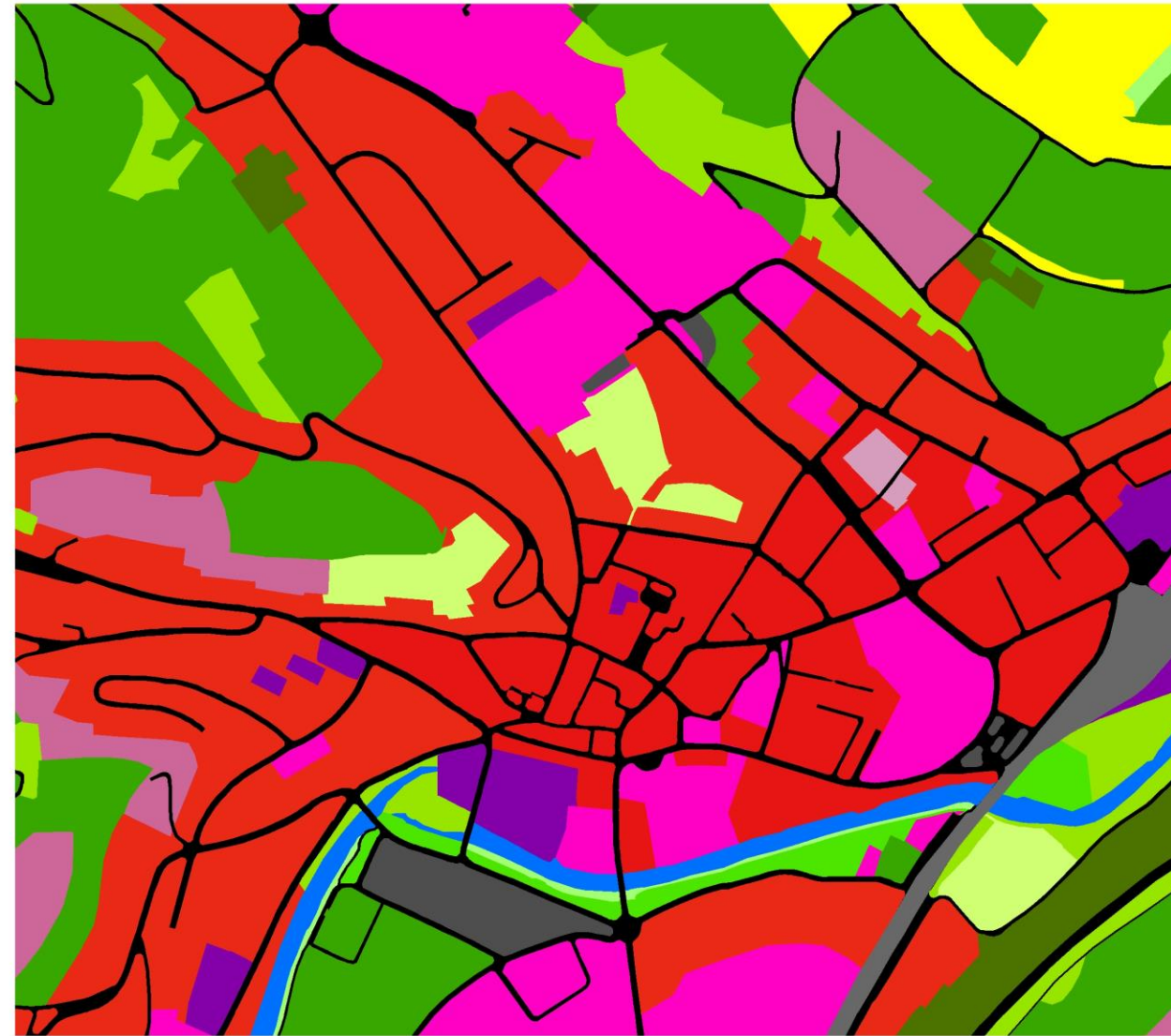
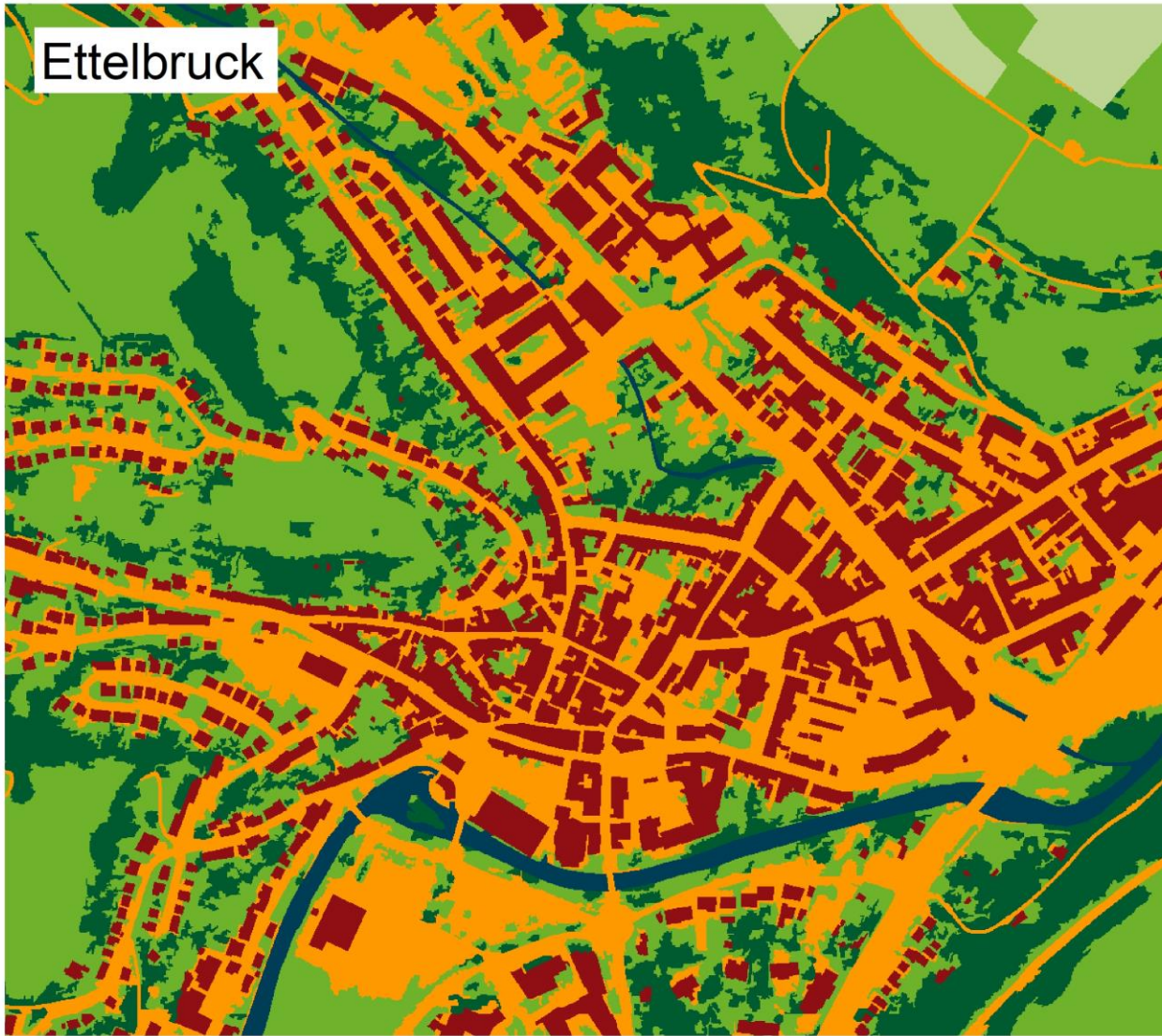
2015 Land Cover Classification overview for the urban area

Pleiades true colour composition



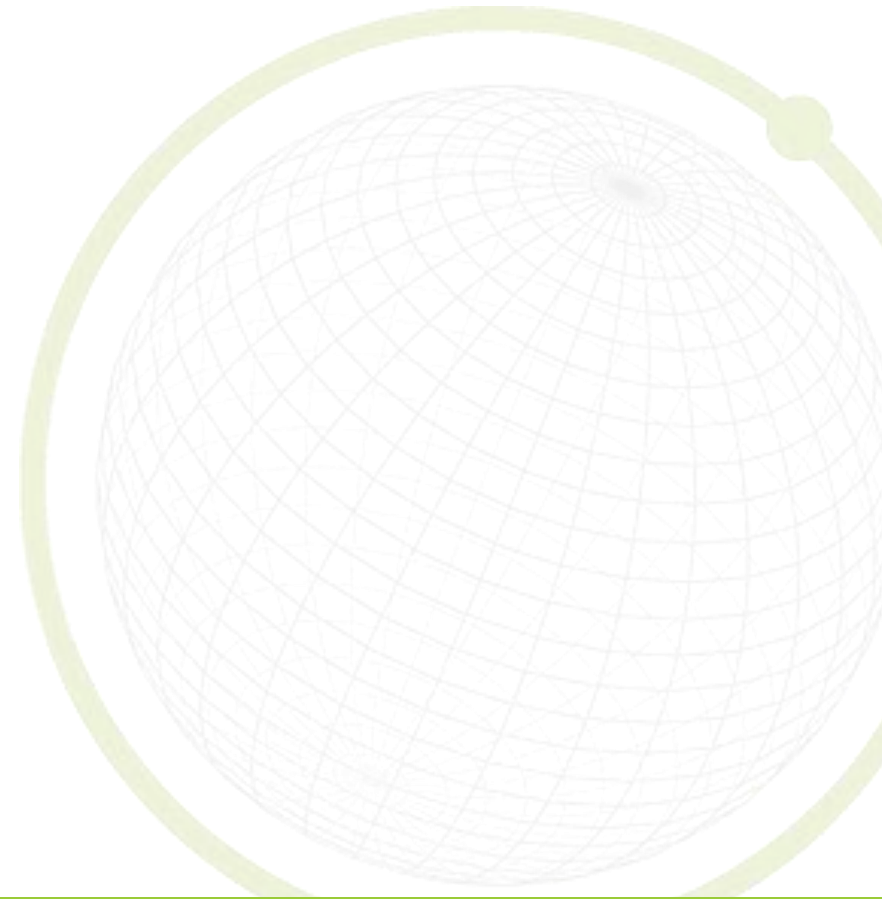
2015 Land Cover Classification overview for the urban area

2015 Land Use Classification overview of the urban area

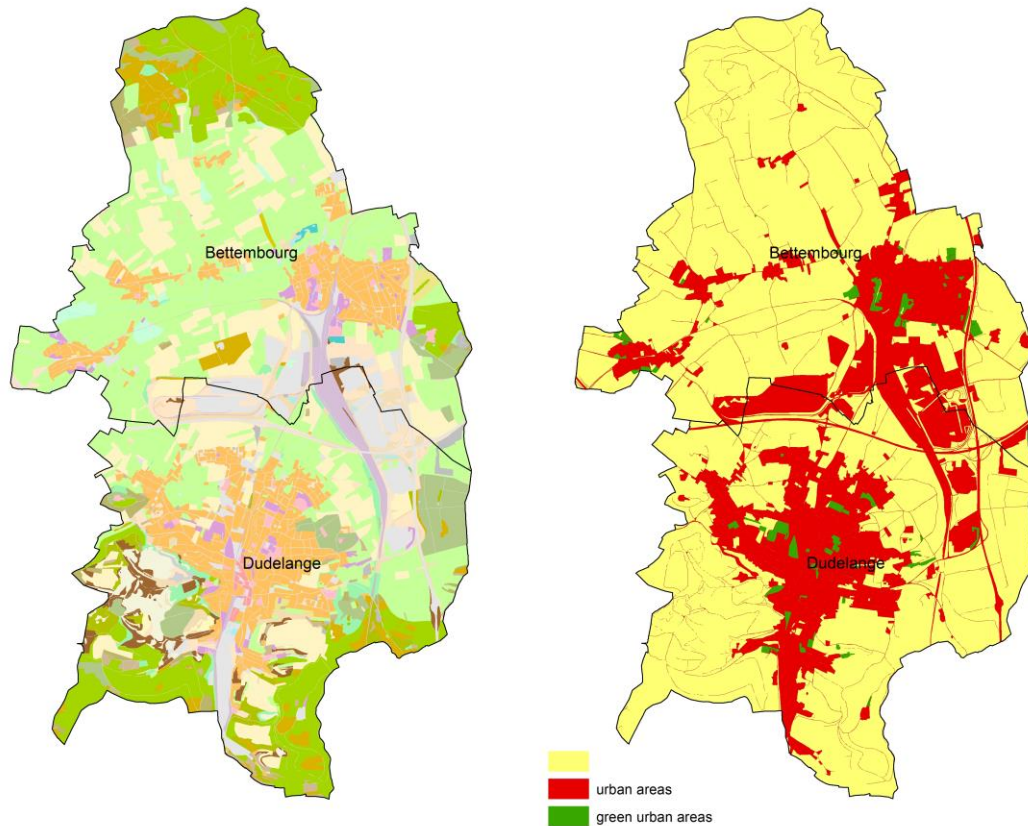


Improved statistics

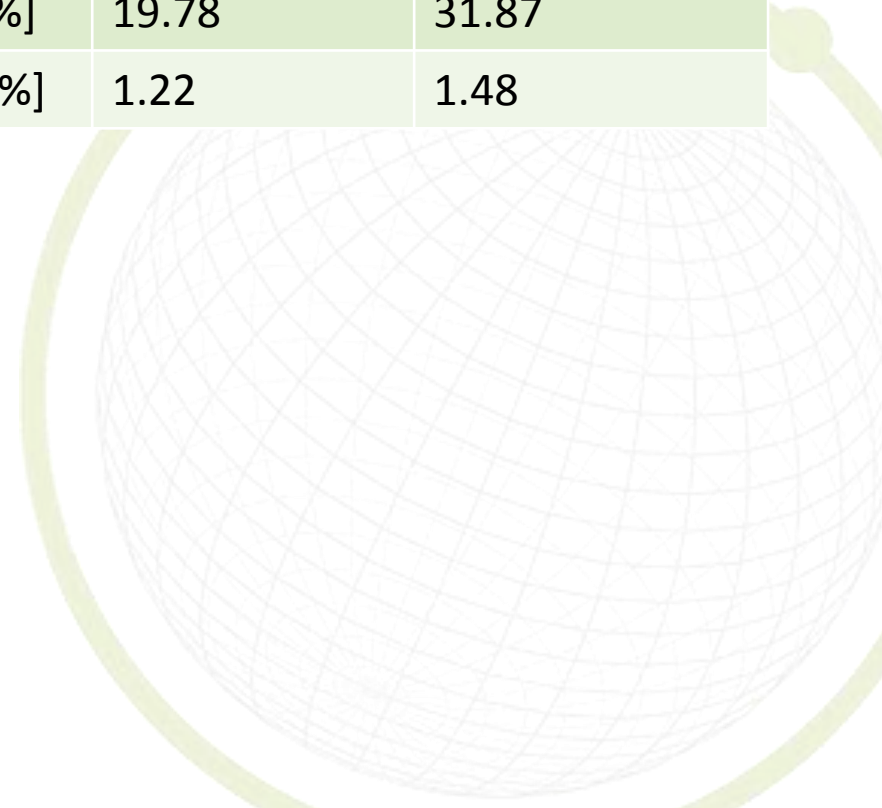
- Dudelage and Bettembourg
- Share of “urban areas” based on OBS:
- Share of artificial land cover within “OBS urban”:
- Share of green vegetation in “OBS urban”:



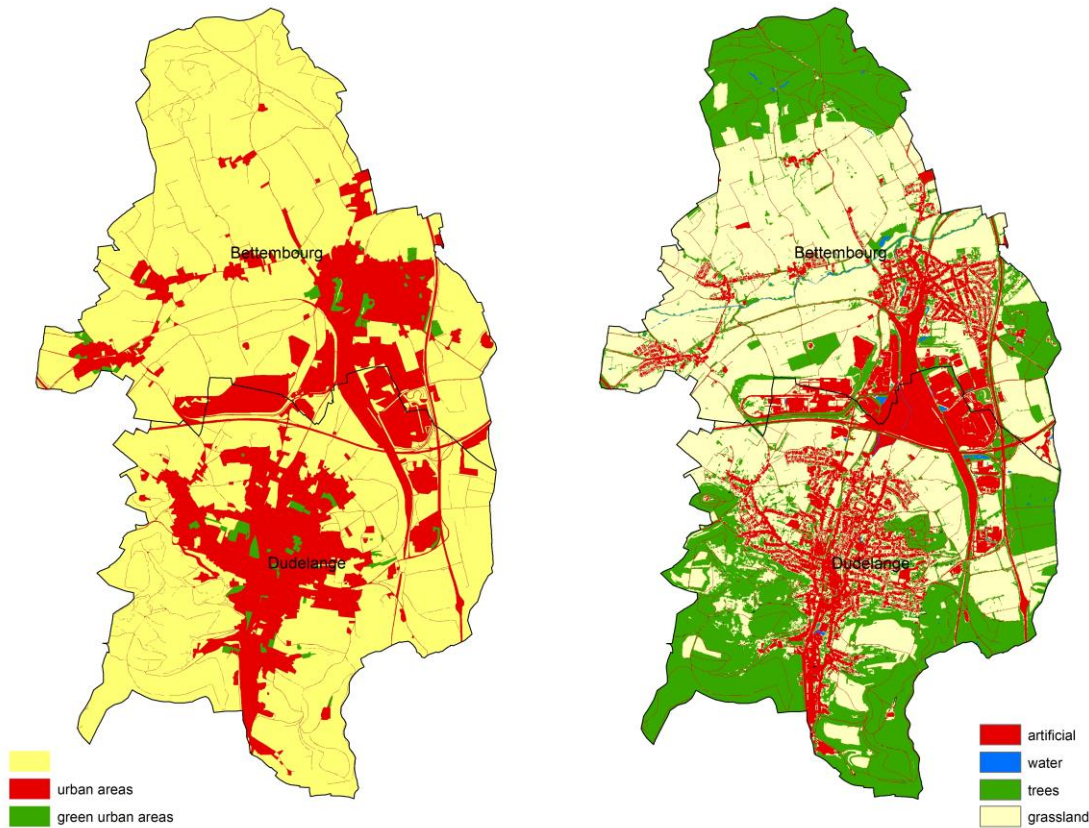
Settlement in OBS data vs. Land Cover



Commune	Bettembourg	Dudelange
Urban areas [%]	19.78	31.87
Green urban [%]	1.22	1.48

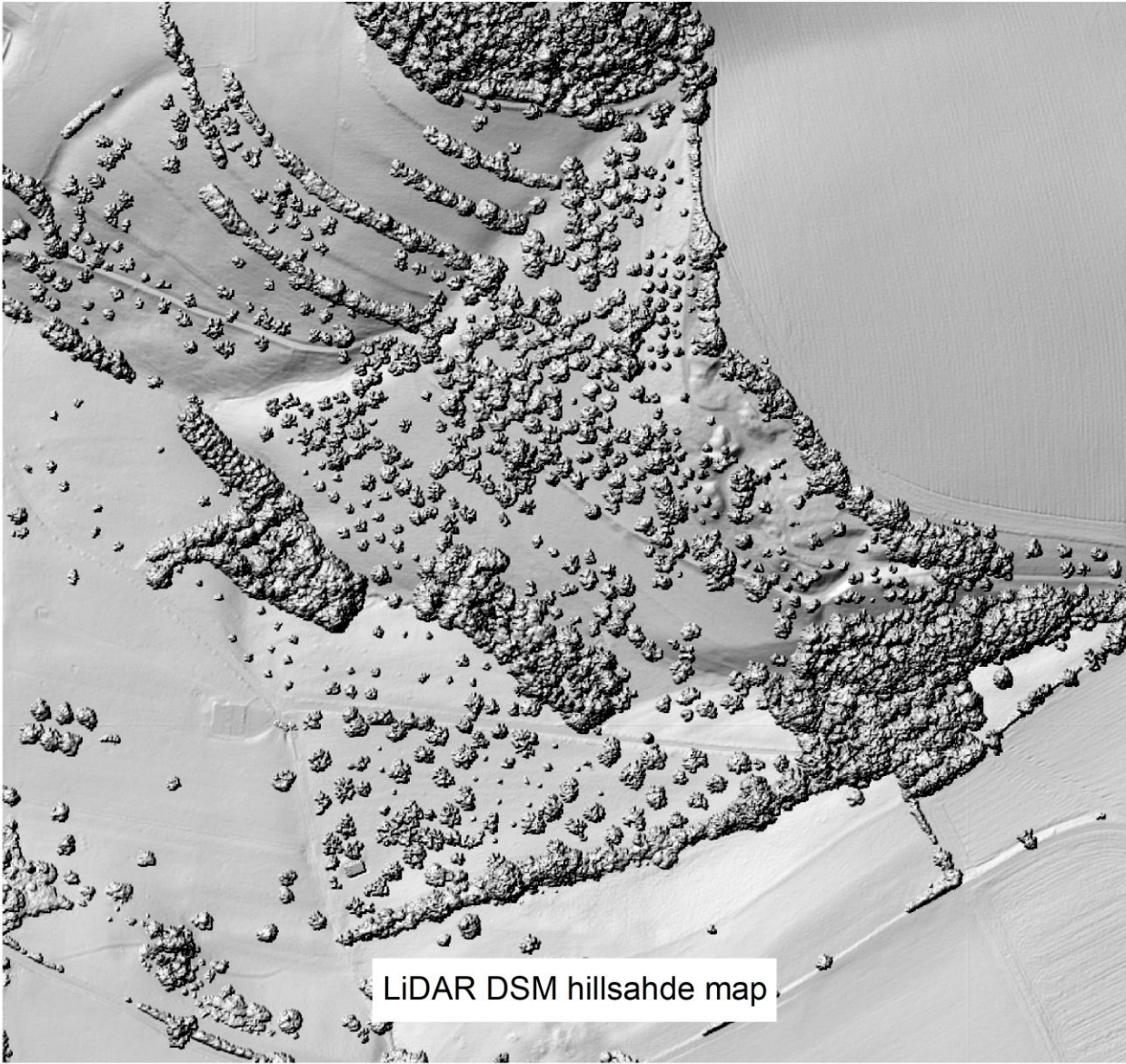
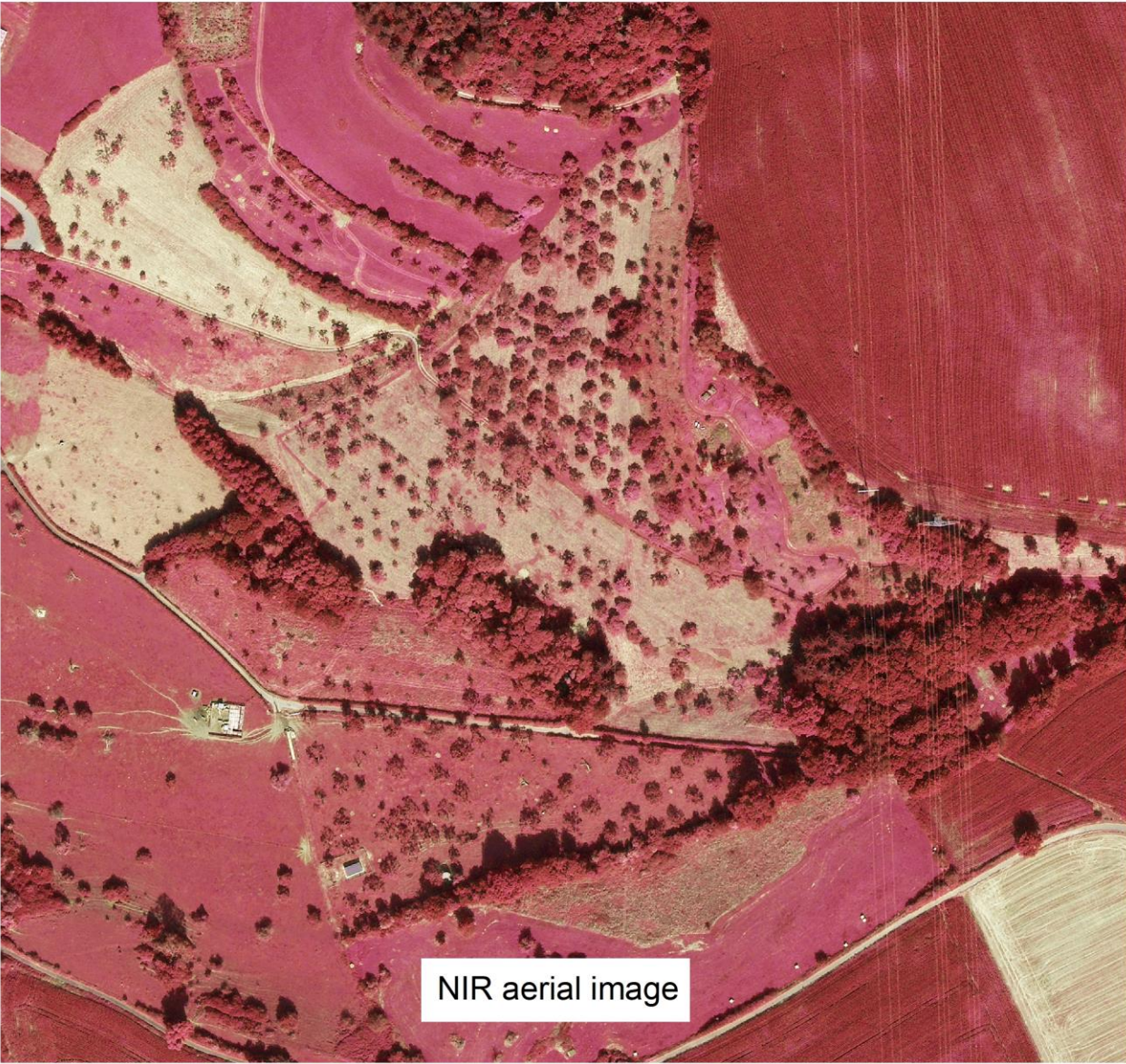


Settlement in OBS data vs. Land Cover

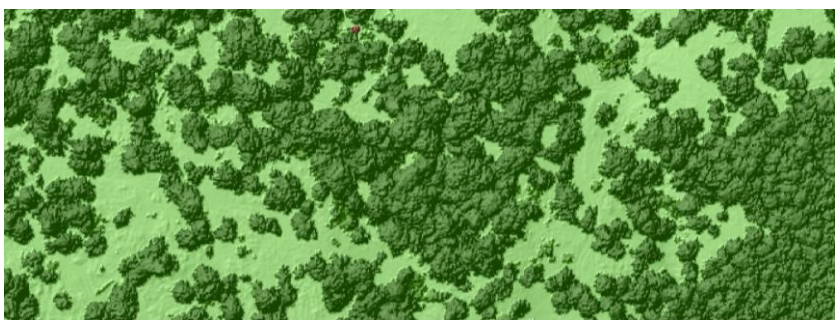
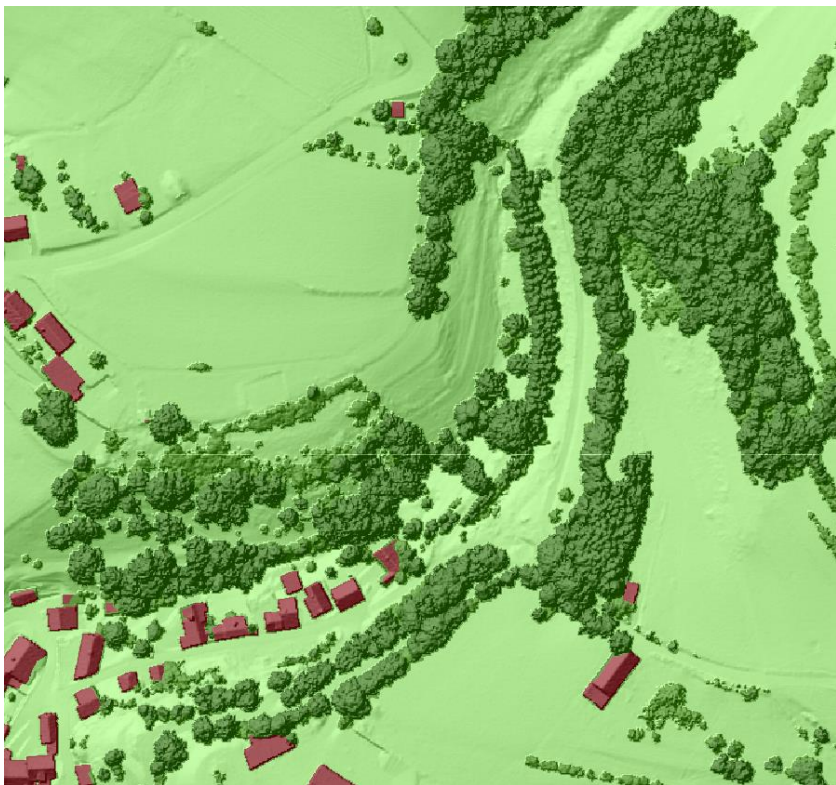


Commune	Bettembourg	Dudelange
Urban areas [%]		
Artificial	60.60	62.72
Trees	9.7	9.91
Grassland	29.49	26.99
Green urban [%]		
Artificial	19.68	27.06
Trees	31.80	24.57
Grassland	47.78	46.56

Representation of vegetation on LiDAR data

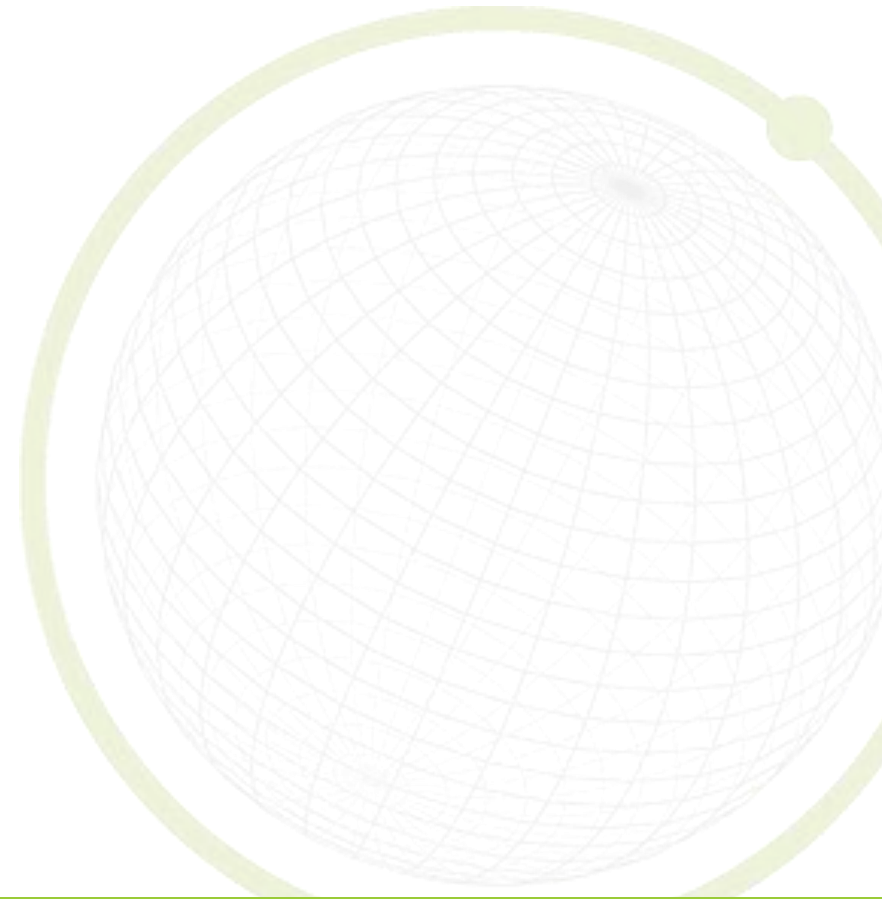


Identification of single or small groups of trees/shrubs on agriculture and urban areas with LiDAR data



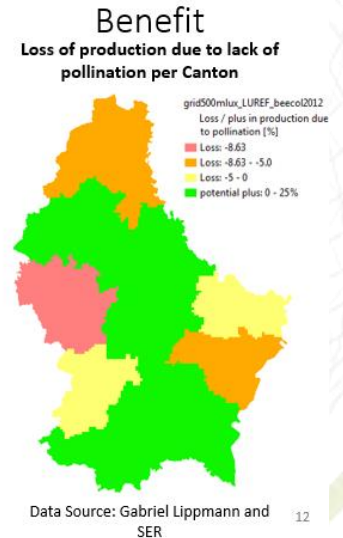
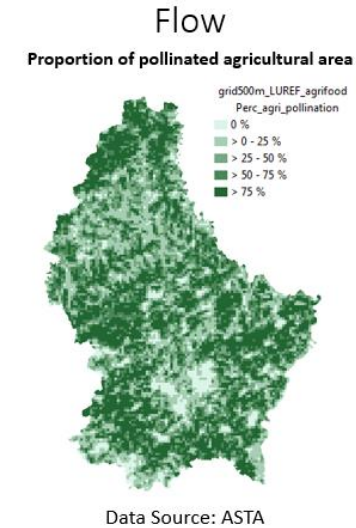
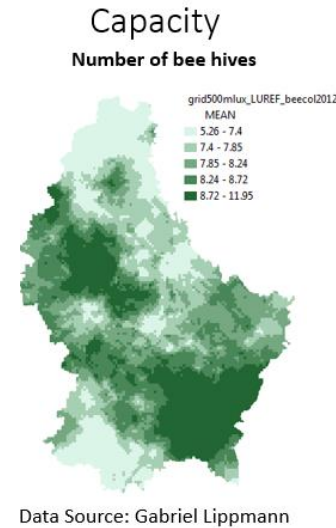
Next steps

- Land cover: available now
- Land use: before the summer
- Test data for collection of feedback: end of April
- Information system: September



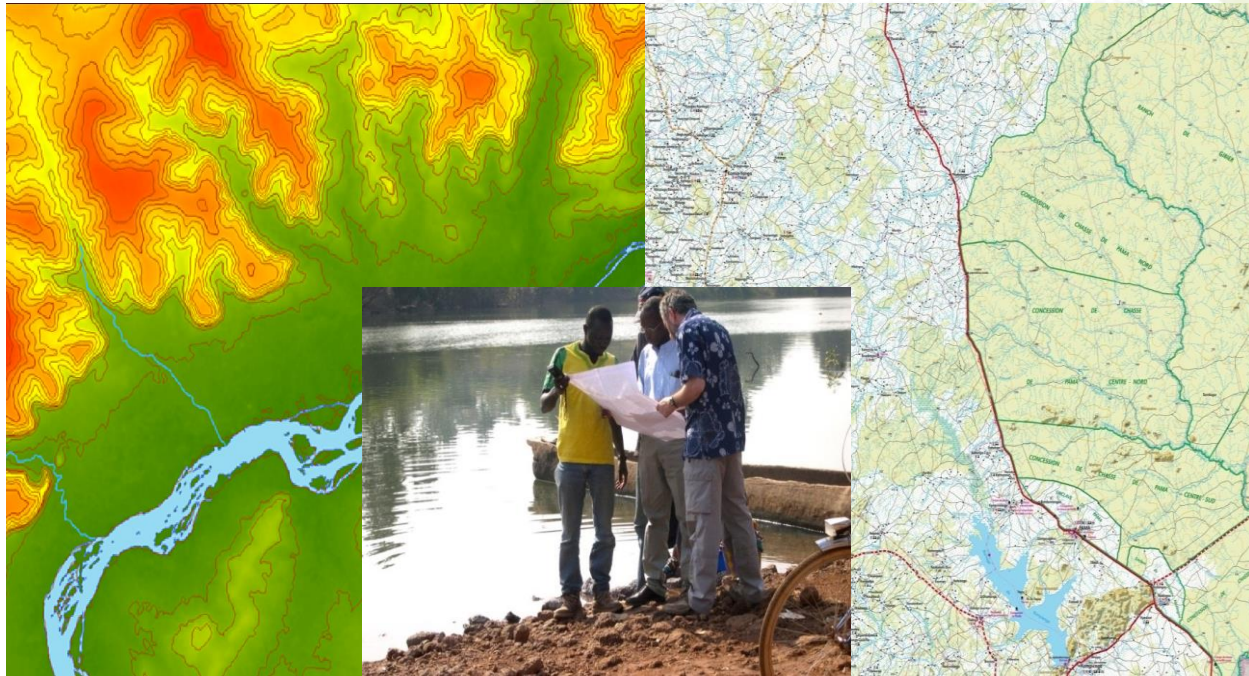
Mapping and Assessment of Ecosystems & Services

- Client: Ministère du Développement durable et des Infrastructures
- Context: Biodiversity Strategy to 2020
 - Target 2, Action 5: Mapping and Assessment of Ecosystem Services by 2014 & economic valuation by 2020
 - Target 2, Action 6a: Restoration and prioritisation framework for 15% of degraded ecosystems
 - Target 2, Action 6b: Establishment of a Green Infrastructure network
- Activities:
 - Mapping of ecosystems (location / condition)
 - Mapping of 13 national priority ecosystem services



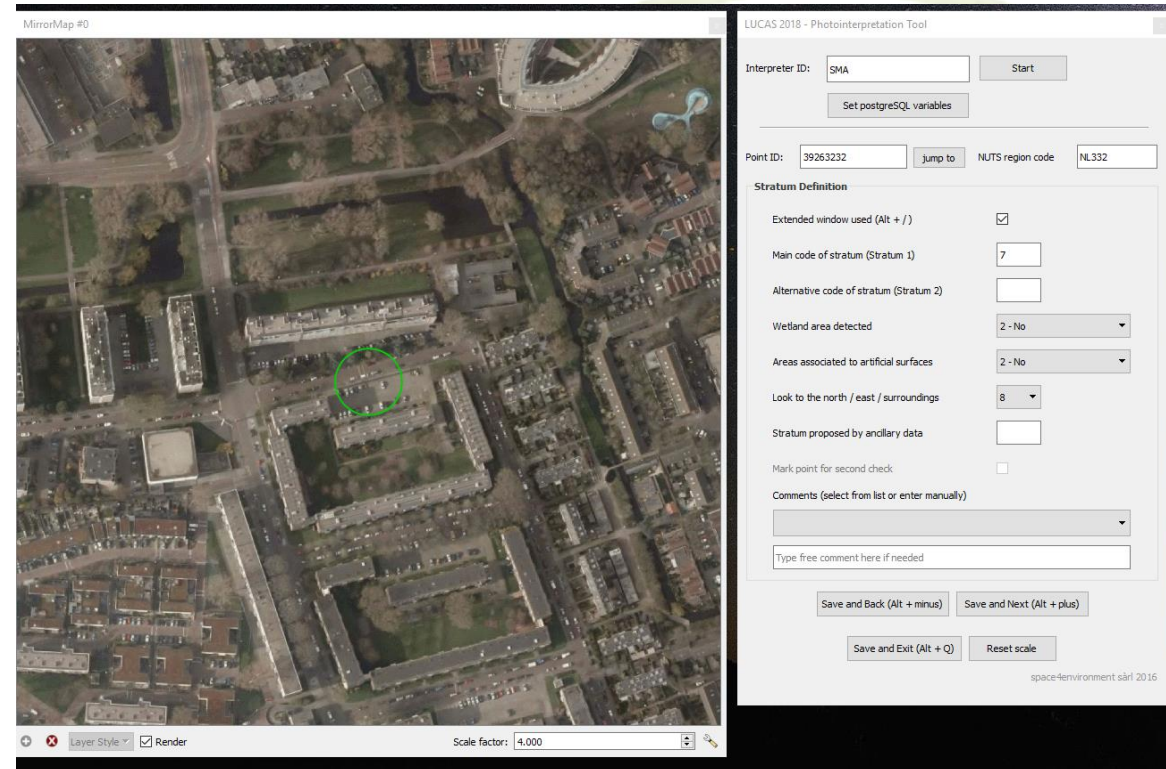
Global Hotspot Mapping – Validation

- Client: Joint Research Centre (JRC, Ispra)
- Context: Copernicus for Africa
 - High resolution land cover mapping of areas of interest (protected sites)
- Activities:
 - Independent quality control
 - Technical and logical consistency
 - Look & feel assessment (qualitative approach)
 - Accuracy assessment (quantitative approach)
 - Sampling based
 - Photo-interpretation of points (blind & plausibility)
 - Statistics



LUCAS 2018 Mastergrid

- Client: Eurostat
- Partners: **LuxSpace** (LU), **INDRA** (ES)
- Context: LUCAS survey
- Activities:
 - Collection of national orthophotos from 28 countries
 - Extraction of 500x500m image chips
 - **Photo-interpretation of +/- 720,000 image chips**
 - Database development
 - Storage of photo-interpretation results
 - **Quality control**



Thank your for your attention

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