

## New LC/LU Prototypes

The prototypes for new LC/LU products are more related to the potential evolution of the CLC datasets. User improvements required were taking into account, since the 2018 ITT is not released yet, and they can be listed as follow:

- **Input data:** Use of one-year coverage only, from optical data (combination of S-2A and S-2B) for 2017, to head towards more frequent updates;
- **Production:** Improved level of automation for faster production, related to the latter point; Harmonization between pan-European and global layers (for which MRLC are envisioned)

**One prototype** was developed for the WP 45: a **new land cover (NLC) layer at 10m**, with 7 classes (grassland, cropland, forest, water, urban area, bare soil and natural grassland) – but that should be modified in Phase II in order to take into account the latest recommendations of CLC+ workshops. For further information on the sites produced in phase 1 and 2, see Table 1.

**Table 1: Demonstration sites for the new land cover prototypes – 3rd site: to be determined later**

Prototype Forest – Demonstration Sites					
Site	NORTH	CENTRAL	WEST	SOUTH-WEST	SOUTH-EAST
<b>Countries</b>	Sweden	Germany, Austria, Switzerland	Belgium, France	France, Spain	Greece, Bulgaria, Macedonia, Serbia
<b>Biogeographic Region</b>	Boreal	Continental, Alpine	Atlantic, Continental	Atlantic, Alpine, Mediterranean, Continental	Mediterranean, Continental, Alpine
<b>Phase 1</b>				X	
<b>Phase 2</b>		X		X	

### **NEW LAND COVER (NLC) LAYER AT 10M**

The NLC layer is a new product that could or could not be integrated in the HRL portfolio, however, it should pave the way for the potential evolution of the CLC+ dataset.

In Phase 1, a status layer at 10 m was produced on the South-West site. For Phase II it is planned to produce a second iteration, with an expanded set of classes and at the same spatial resolution over the same site, as well as a layer over the Central site, and on one of the African sites. Depending on the 2018 ITT requirements for CLC+, a change layer over the South-West site could be envisioned as well.

Optical-only datasets were used as **input data** sets, based on S-2 images from January 2017 to November 2017, that was split into 3-month periods. Additional **ancillary datasets** such as Open Street Map (OSM), EU-Hydro, 2015 HRLs (Water and Wetness, TCD, IMD), as well as the CLC2012 and the LPIS 2016 for agricultural inputs have been utilized.

**Temporal and spectral features** (NDVI, NDWI, brightness index and their maximum, minimum, mean, standard deviation as well as 10<sup>th</sup>, 25<sup>th</sup>, 75<sup>th</sup>, 90<sup>th</sup> percentiles for 3-month periods) were derived from the optical S-2 images and fed into a **random forest classifier**, while the ancillary data serve as a hard skeleton basis regarding permanent objects in the landscape, and a soft skeleton, created using a large scale mean shift segmentation for persistent objects. After merging the results, a majority filter has been applied to




smooth the map. The thematic accuracies ranges from 82.39% to 99.98% for the PA, and from 89.35% to 97.52% for the UA following the various classes.

**Improvements in Phase 2** are planned to be focused on adapting the prototype to the most recent nomenclature specifications, the integration of S-1 datasets in the processing chain, and on the potential creation of a change layer over the South-West site between 2017 and 2018.

## Prototype Specifications

**Table 2: Detailed specifications for primary 10m NLC status layer**

<b>Products</b>
New Land Cover 2017 – NLC_2017_10m
<b>Extent</b>
Demo site South-West
<b>Geometric resolution</b>
Pixel resolution 10m, grid to fully conform to the EEA Reference Grid.
<b>Coordinate Reference System</b>
European ETRS89 LAEA projection
<b>Geometric accuracy (positioning scale)</b>
Less than one pixel (According to ortho-rectified satellite image base delivered by Theia.)
<b>Thematic accuracy</b>
90.00% of overall accuracy
<b>Data type</b>
8bit unsigned Raster, compressed with LZW
<b>Minimum mapping unit (MMU)</b>
One pixel (10m*10m)
<b>Necessary attributes</b>
Raster value, count, class name
<b>Raster coding (Thematic pixel values)</b>
New Land Cover 2017 – NLC_2017_10m  1: grassland 2: cropland 3: forest 4: water 5: urban area 6: bare soil 7: natural grassland 255: outside Area
<b>Metadata</b>
XML metadata files are to be produced according to INSPIRE metadata standards
<b>Delivery format</b>
GeoTIFF

New Land Cover 2017 – NLC_2017_10m					
Class Code	Class Name	Red	Green	Blue	
1	Grassland	152	230	0	
2	Cropland	255	255	0	
3	Forest	38	115	0	
4	Water	0	77	168	
5	Urban area	255	0	0	
6	Bare soil	130	130	130	
7	Natural grassland	255	170	0	
255	Outside Area	0	0	0	