



# Environmental Land Monitoring in the frames of Copernicus programme

## Hungary

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# Environmental Land Monitoring

**Environmental management** aims at selecting and applying policy solutions that provide a balance between sustainable use of our natural resources and satisfying the needs of society. This requires thorough **planning** supported by reliable **data** and **models** that allow forecast of decisions' consequences. **Land cover** maps acquired with help of **Earth observation** (satellite images) for large areas in a **fast, reliable** and **cost-efficient** manner provide information on our resources to be managed.

**Land monitoring services** provide geographical information on land cover and on variables related, for instance, the vegetation state or the water cycle. The objective of the **Copernicus Land Monitoring Service** is to provide European land-cover information to users in the field of environmental and other terrestrial applications.

FÖMI plays a key role in the national and - as member of supporting institutional network of the European Environmental Agency (EEA) - in the European land monitoring as well.

# Participation in **national** and **European** land monitoring

- National segment of **European CLC update & change mapping** as **NRC land cover**
- Verification & enhancement of **HR land cover layers**
- **National 1:50.000 scale CORINE Land Cover** mapping (CLC50)
- Working for **European Environment Agency (EEA)** as participating in **European Topic Centres** since 2001:
  - 2001-2006: European Topic Centre - Terrestrial Environment (ETC-TE)
  - 2006-2010: European Topic Centre - Land Use & Spatial Information (ETC-LUSI)
  - 2011-2014: European Topic Centre - Spatial Information and Analysis (ETC-SIA)
  - 2015- : European Topic Centre – Urban, Land and Soil systems (ETC-ULS)
- Participation in the **technical coordination** of European land cover mapping activities (methodological developments, QA/QC, training of 39 national teams)
- Participation in the development and testing of LC/LU related **environmental indicators** (land take, imperviousness & change)
- Participation in the development of a **European land monitoring strategy (EAGLE** working group, **FP7 HELM** project

# Copernicus programme

GMES (Global Monitoring for Environment & Security)

Copernicus is a joint initiative of the EC and ESA to develop a high-quality European Earth observation capacity. Its objective is to provide relevant information services to policy-makers and other users, particularly in relation to environment and security

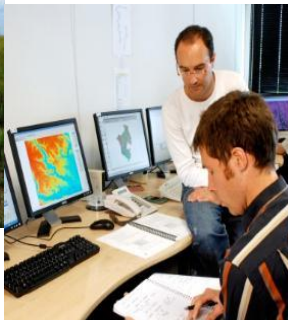
## Copernicus components



- Space segment (e.g. Sentinel satellites)



- In-situ observations



- Information services



Source: EEA

# Copernicus land components

## ■ Global component

bio-physical parameters (Essential Climate Variables (ECVs), food security (Africa) etc.

## ■ Pan-European component

Satellite image mosaics, CORINE land cover & changes, High Resolution layers (HRL)

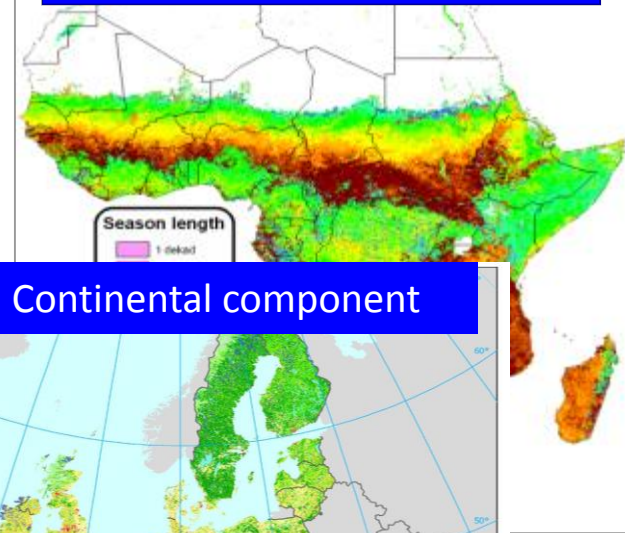
## ■ Local component (hot spot mapping)

Urban Atlas + HR land cover for Riparian zones / Natura 2000 areas / Coastal zones

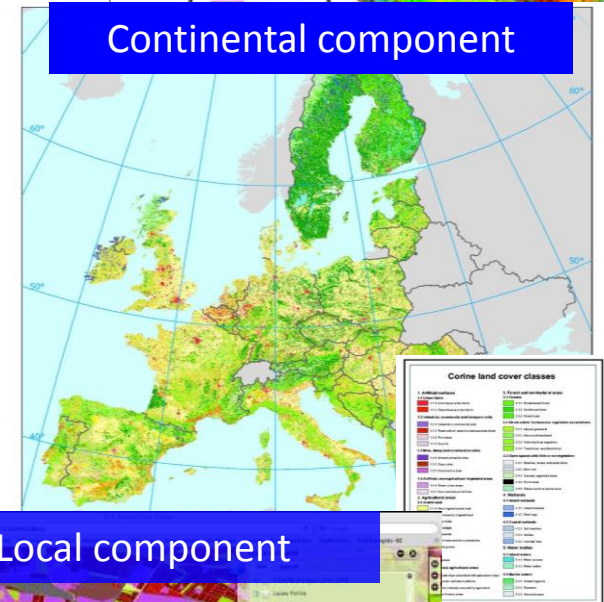
## ■ In-situ component

National ortho-photos, topo& thematic maps, cadastral maps, LPIS data, Eurostat LUCAS survey, ...

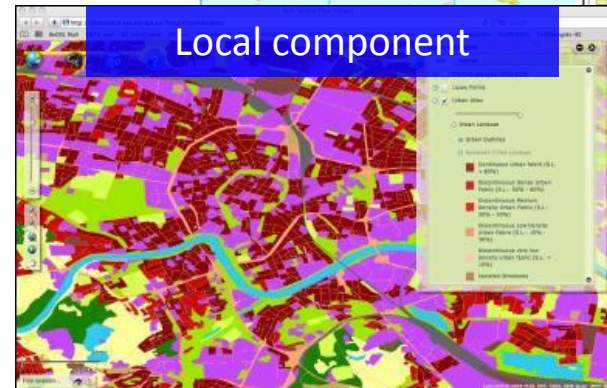
### Global component



### Continental component



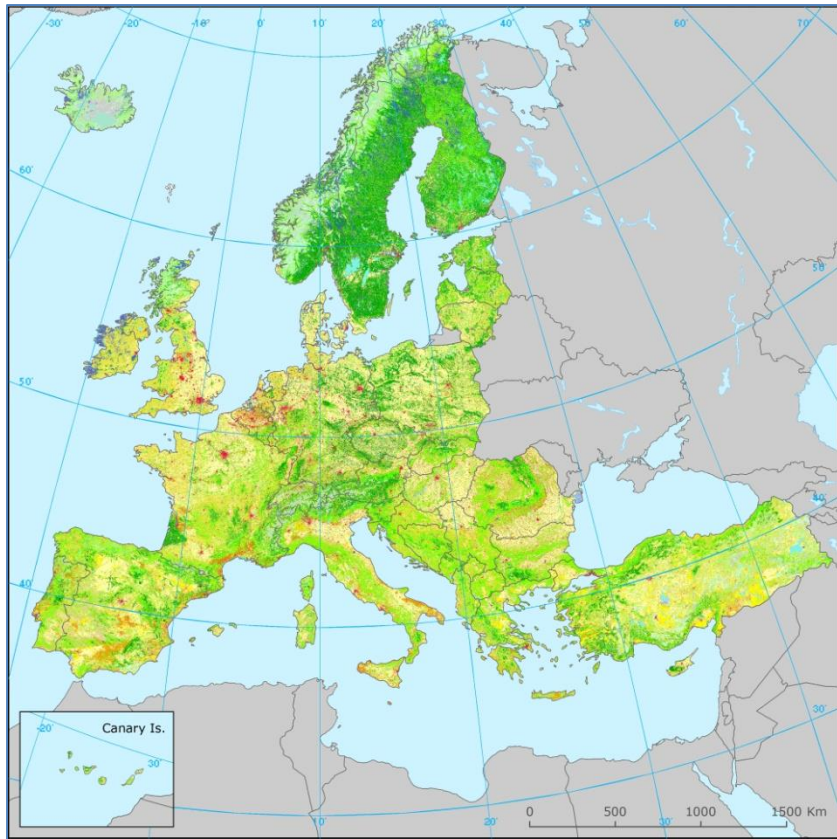
### Local component



Source: EEA

# CORINE land cover (CLC) mapping

CORINE = Co-ordination of Information on the Environment



Time-series:

CLC1990, CLC2000, CLC2006, CLC2012, [CLC2018](#), ...

Purpose: To provide quantitative, consistent and comparable information on land cover

Applications: Land cover is a basic data source for environmental modelling, regional planning and orientation of the environmental policy in Europe

Mapping surface features at scale 1:100.000 based on physical characteristics

Minimum Mapping Unit (status): **25 ha**

Minimum Mapping Unit (changes): **5 ha**

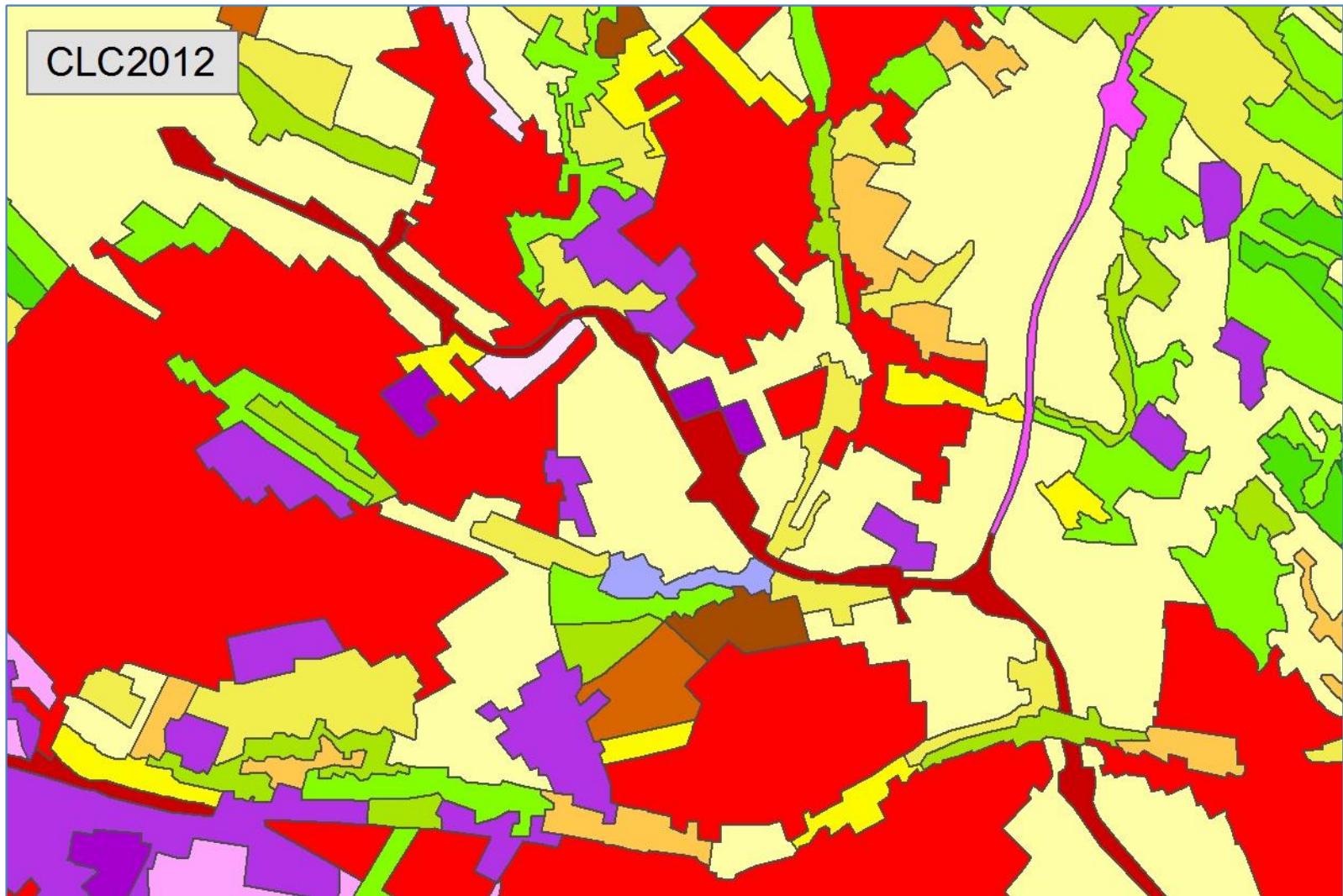
Minimum Mapping Width: **100 m**

Nomenclature: 3 levels, 44 classes for Europe

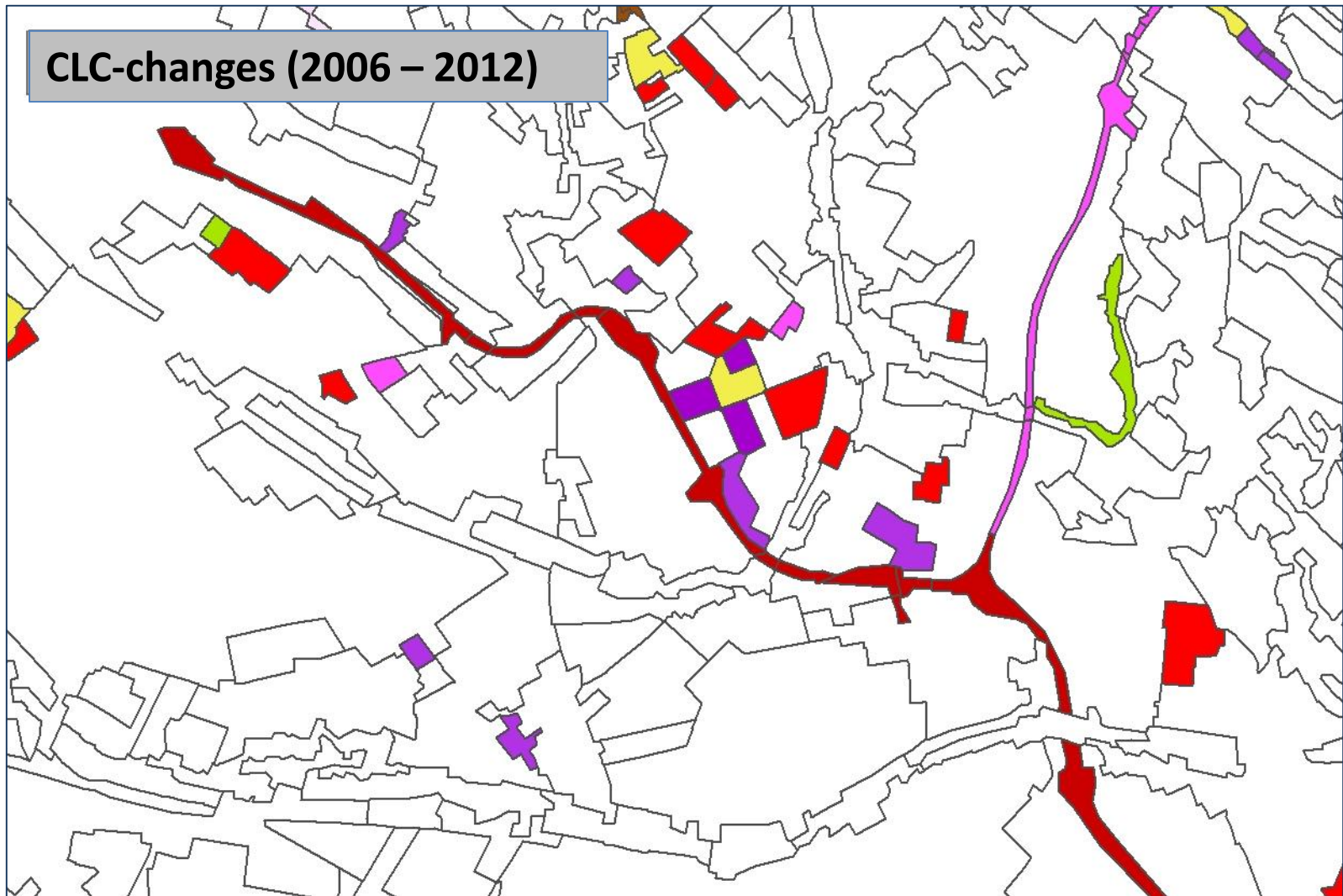
Method: visual photointerpretation of satellite data

Implemented by member states, coordinated by EEA

# CLC time-series (suburban area north from Budapest)

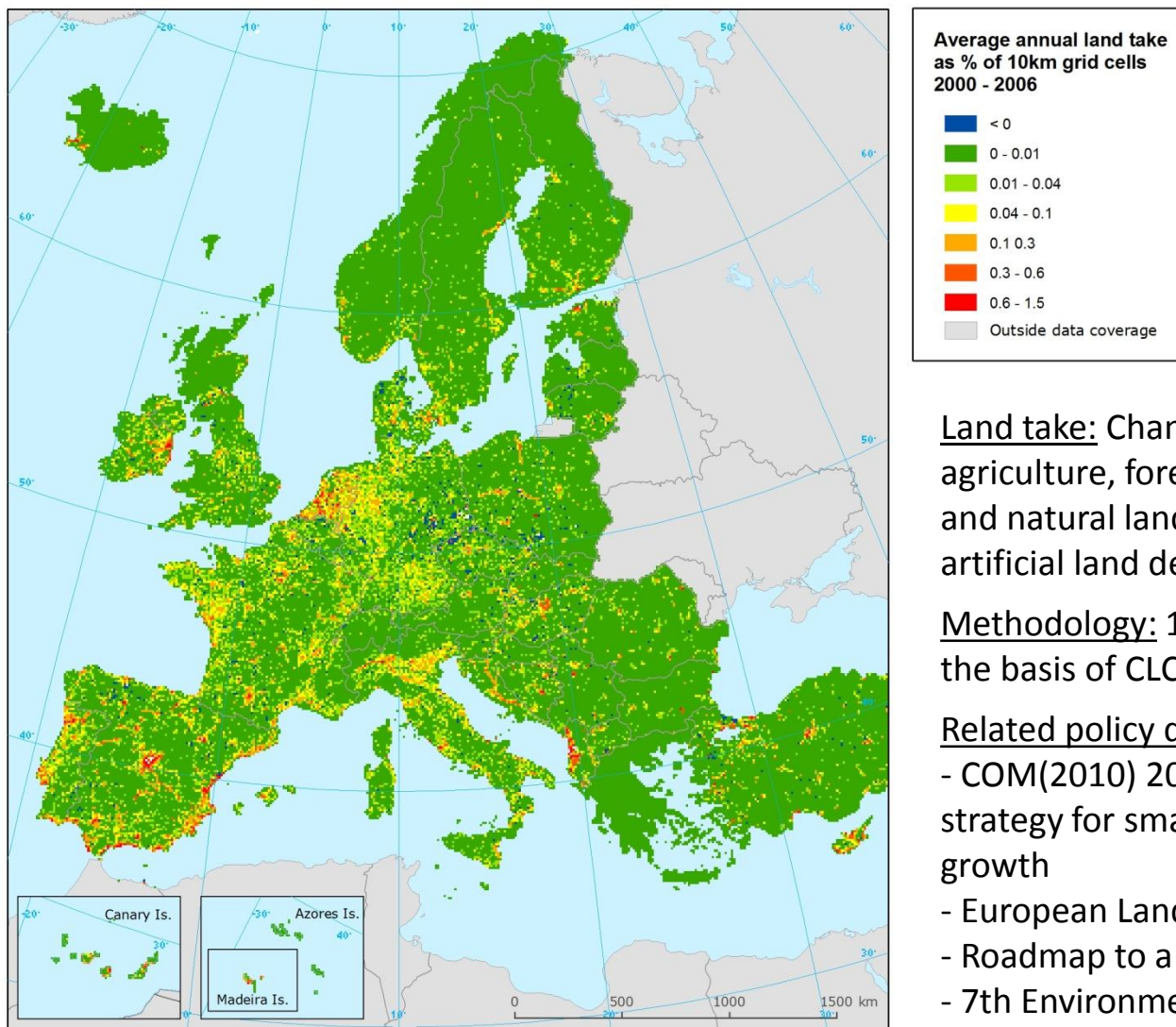


# CLC-changes (suburban area north from Budapest)





# Average annual land take between 2000-2006 in Europe



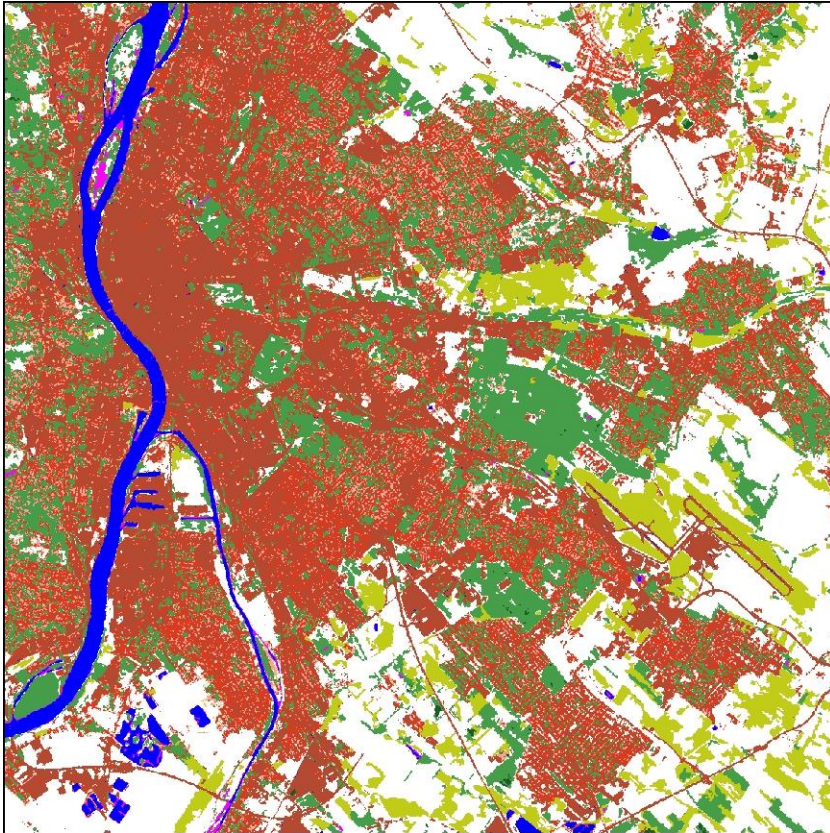
**Land take:** Change of the amount of agriculture, forest and other semi-natural and natural land taken by urban and other artificial land development.

**Methodology:** 1km grid based calculation on the basis of CLC-change data

**Related policy documents:**

- COM(2010) 2020 final, Europe 2020: A strategy for smart, sustainable and inclusive growth
- European Landscape Convention
- Roadmap to a Resource Efficient Europe
- 7th Environment Action Programme
- ...

# Copernicus High Resolution Layers



## 5+ Thematic land cover layers (2012):

1. Imperviousness
2. Tree Cover Density+ Forest types + additional support layer
3. Natural and semi-natural grasslands
4. Wetlands
5. Permanent Water Bodies

Method: Semi-automatic classification of satellite imagery

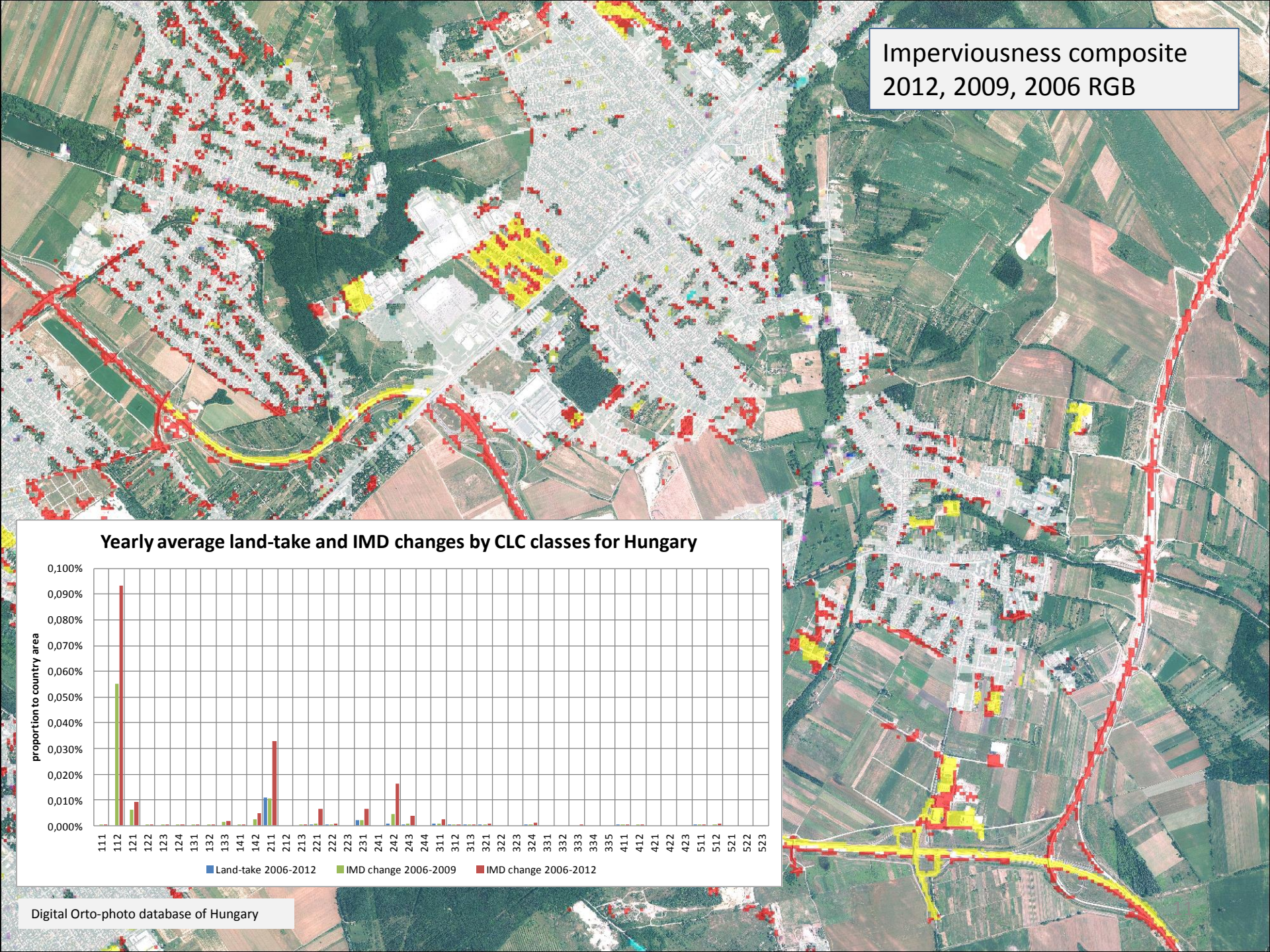
Resolution: **20m / 100m**

Minimum Mapping Unit (Forest types only): **0,5 ha**

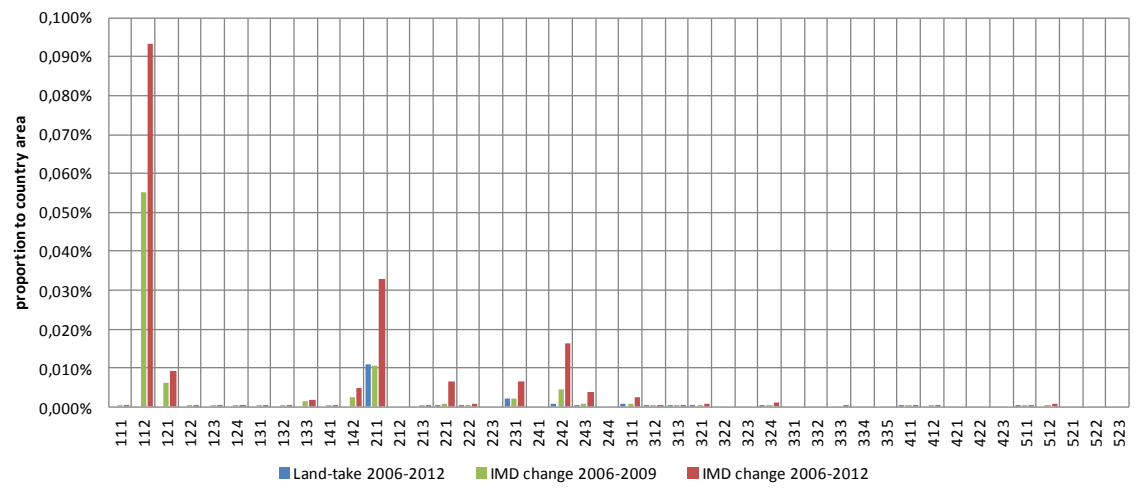
Minimum width of mapped linear elements: **20 m**

Time series: 2006, 2009 (Imperviousness only), 2012 (5+ layers), **2015, 2018...**

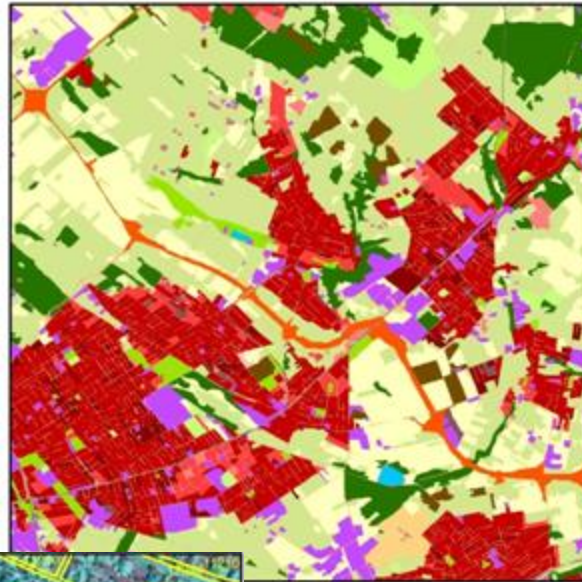
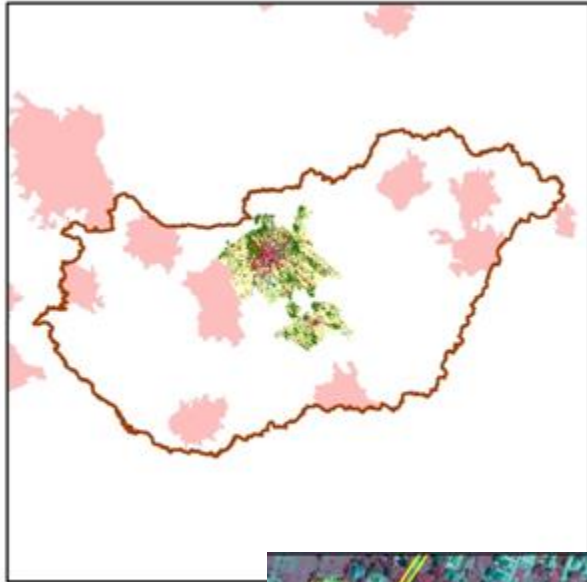
Imperviousness composite  
2012, 2009, 2006 RGB



Yearly average land-take and IMD changes by CLC classes for Hungary

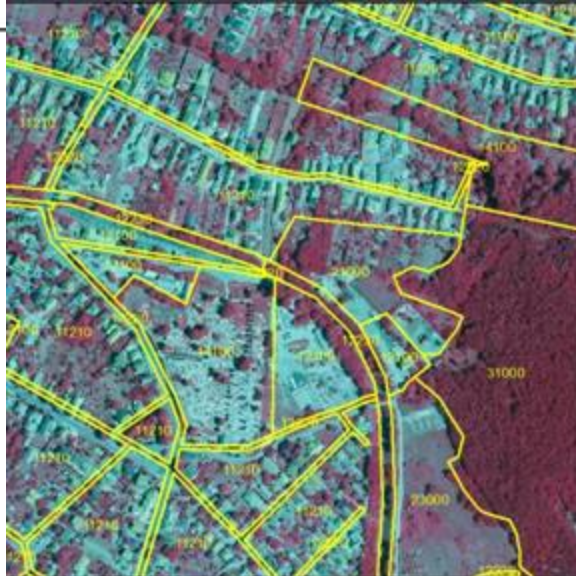


# Local component: Urban Atlas 2006 / 2012 & changes



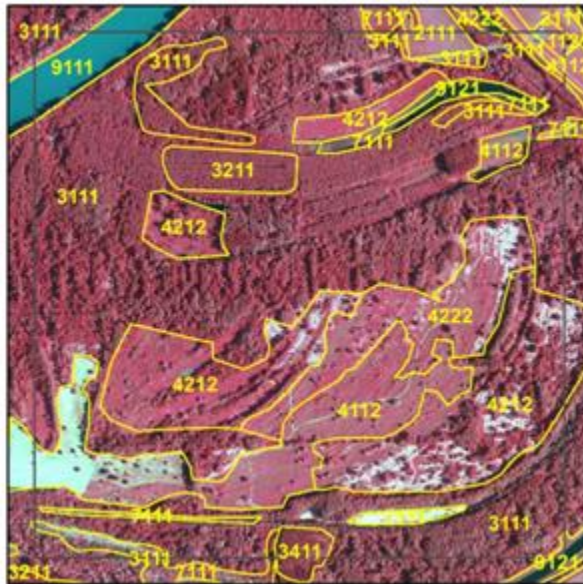
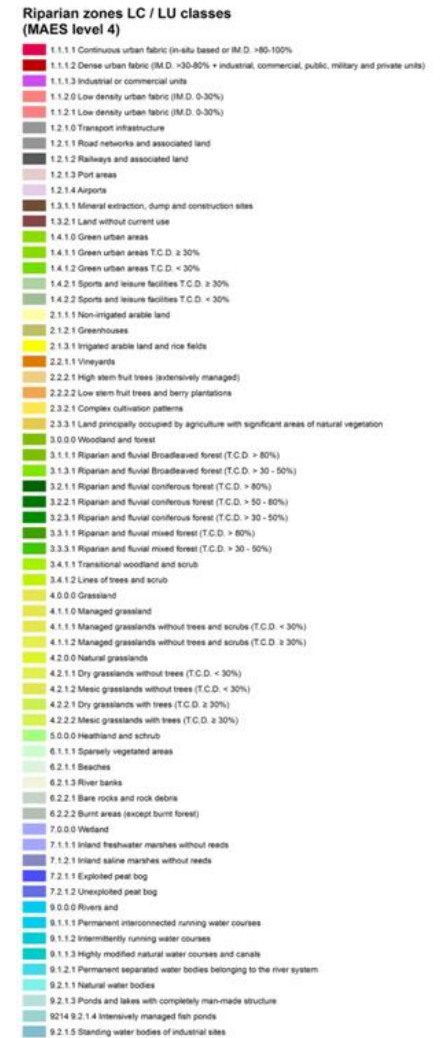
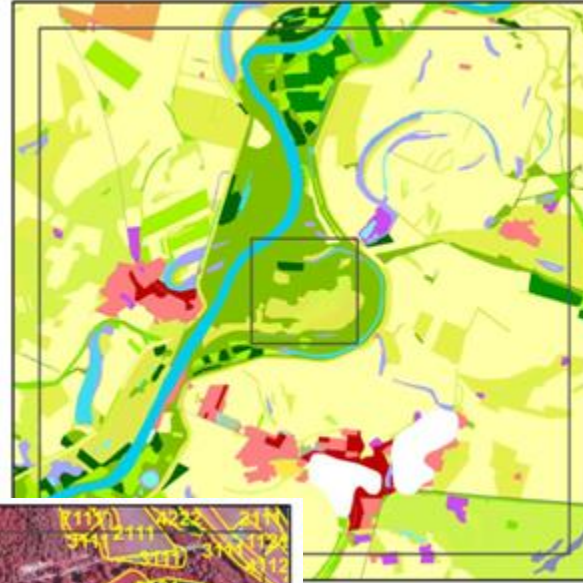
## Urban Atlas LC / LU classes

- 11100: Continuous urban fabric (S.L. > 80%)
- 11210: Discontinuous dense urban fabric (S.L.: 50% - 80%)
- 11220: Discontinuous medium density urban fabric (S.L.: 30% - 50%)
- 11230: Discontinuous low density urban fabric (S.L.: 10% - 30%)
- 11240: Discontinuous very low urban density fabric (S.L. < 10%)
- 11300: Isolated structures
- 12100: Industrial, commercial, public, military and private units
- 12210: Fast transit roads and associated land
- 12220: Other roads and associated land
- 12230: Railways and associated land
- 12300: Port areas
- 12400: Airports
- 13100: Mineral extraction and dump sites
- 13300: Construction sites
- 13400: Land without current use
- 14100: Green urban areas
- 14200: Sports and leisure facilities
- 21000: Arable land (annual crops)
- 22000: Permanent crops
- 23000: Pastures
- 31000: Forest
- 32000: Herbaceous vegetation associations
- 40000: Wetlands
- 50000: Water



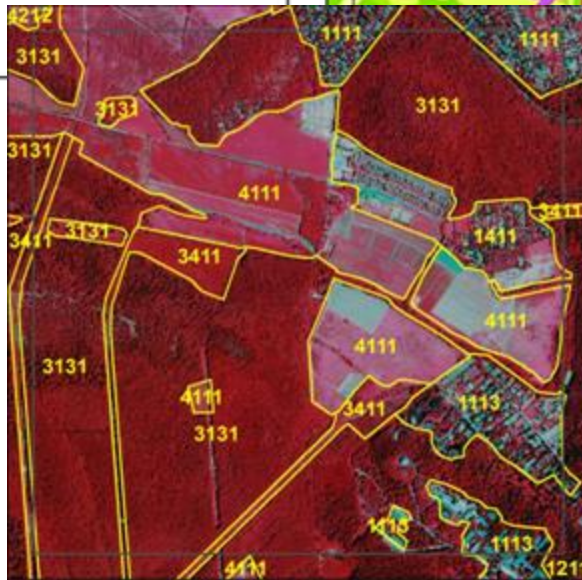
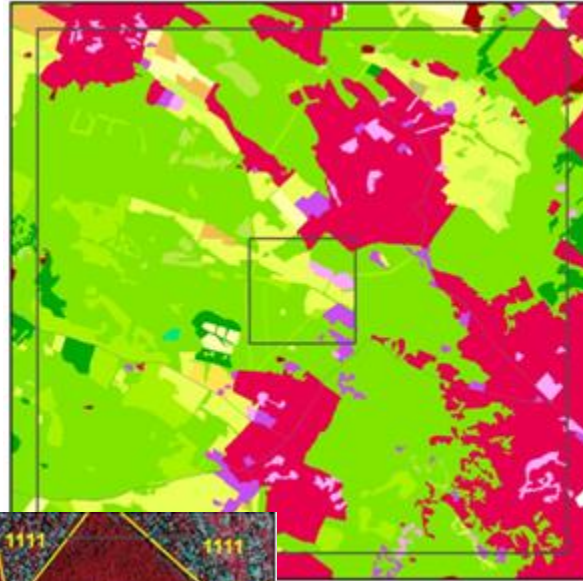
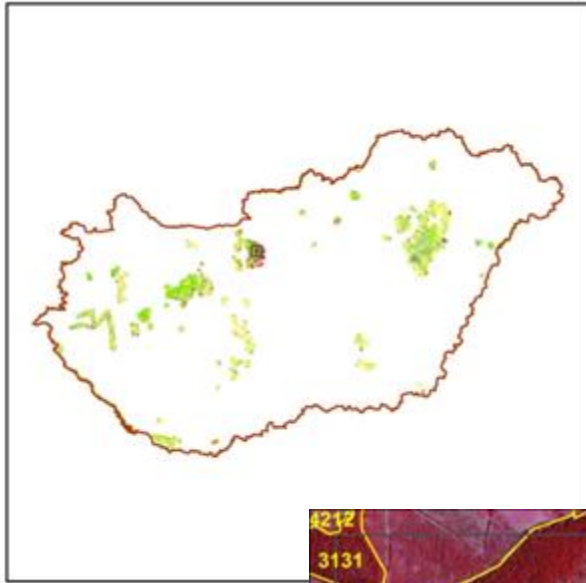
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# Local component: Riparian Zones land cover 2012



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# Local component: Land cover 2006 / 2012 of Natura 2000 sites



## Natura 2000 LC / LU classes (MAES level 4)

- 1.1.1.1 Urban fabric (predominantly public and private units)
- 1.1.1.3 Industrial, commercial and military units
- 1.2.1.1 Road networks and associated land
- 1.2.1.2 Railways and associated land
- 1.2.1.3 Port areas
- 1.2.1.4 Airports
- 1.3.1.1 Mineral extraction, dump and construction sites
- 1.3.2.1 Land without current use
- 1.4.1.1 Green urban areas and leisure facilities
- 2.1.1.1 Arable irrigated and non-irrigated land
- 2.1.2.1 Greenhouses
- 2.2.1.1 Vineyards
- 2.2.2.1 Fruit trees and berry plantations
- 2.2.3.1 Olive groves
- 2.3.1.1 Annual crops associated with permanent crops
- 2.3.2.1 Complex cultivation patterns
- 2.3.3.1 Land principally occupied by agriculture with significant areas of natural vegetation
- 2.3.4.1 Agro-forestry
- 3.1.2.1 Broadleaved swamp forest
- 3.1.3.1 Other natural and semi natural broadleaved forest
- 3.1.4.1 Broadleaved evergreen forest
- 3.1.5.1 Highly artificial broadleaved plantations
- 3.2.2.1 Coniferous swamp forest
- 3.2.3.1 Other natural and semi natural coniferous forest
- 3.2.4.1 Highly artificial coniferous plantations
- 3.3.2.1 Mixed swamp forest
- 3.3.3.1 Other natural and semi natural mixed forest
- 3.3.4.1 Highly artificial mixed plantations
- 3.4.1.1 Transitional woodland and scrub
- 3.4.1.2 Lines of trees and scrub
- 3.5.1.1 Damaged forest
- 4.1.1.1 Managed grassland
- 4.2.1.1 Semi-natural grassland with trees (T.C.D. ≥ 30%)
- 4.2.1.2 Semi-natural grassland without trees (T.C.D. < 30%)
- 4.2.2.1 Alpine and sub-alpine natural grassland
- 5.1.1.1 Heathlands and Moorlands
- 5.1.1.2 Other scrub land
- 5.2.1.1 Sclerophyllous vegetation
- 6.1.1.1 Sparsely vegetated areas
- 6.2.1.1 Beaches
- 6.2.1.2 Dunes
- 6.2.1.3 River banks
- 6.2.2.1 Bare rocks and rock debris
- 6.2.2.2 Burnt areas (except burnt forest)
- 6.2.2.3 Glaciers and perpetual snow
- 7.1.1.1 Inland freshwater marshes
- 7.1.2.1 Inland saline marshes
- 7.2.1.1 Exploited peat bog
- 7.2.1.2 Unexploited peat bog
- 8.1.1.1 Salt marshes
- 8.1.1.3 Salines
- 8.1.2.1 Intertidal flats
- 8.2.1.1 Coastal lagoons
- 8.2.2.1 Estuaries
- 9.1.1.1 Interconnected running water courses
- 9.1.1.3 Highly modified natural water courses and canals
- 9.1.2.1 Separated water bodies belonging to the river system (dead side-arms, flood ponds)
- 9.2.1.1 Natural water bodies
- 9.2.1.3 Ponds and lakes with completely man-made structure
- 9.2.1.4 Intensively managed fish ponds
- 9.2.1.5 Standing water bodies of industrial sites
- 10.1.1.1 Marine (other)

# Copernicus land monitoring workplan 2016 - 2020

**Principles:** continuity, timeliness, lessons learnt, cooperation with MS

## **Pan-European component**

CORINE land cover production: Implementation CLC2018 started with preparations

- Timeliness: CLC2018 map to be ready at end of 2018
- Supporting bottom-up creation
- Proposed extension to European Neighbourhood countries

HRL production: For the reference year 2015 ( $\pm 1$  year) started, 2018 in preparation

- (Re-)analysis of imperviousness & changes for 2006/2009/2012 establish full coherence with 2015 layer
- Forest & change products
- Re-defined grassy and non woody vegetation product
- Re-defined wetness & water products
- New layer: Small woody features
- Proposal for a new phenology product



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# Copernicus land monitoring workplan 2016 - 2020

## Local component

- Extension of Urban Atlas 2012 to EEA39 + integration of 3rd dimension
- Extension of Riparian zones mapping (full hydrographic network)
- Extension of land cover mapping in Natura2000 sites (relevant habitats in agreement with DG ENV)
- Development of coastal zone monitoring service
- Development of snow & ice monitoring service

## Further activities

- Verification of local component data by interested Member States
- Creative thinking needed on “enrichment” of local component products to further increase usability
- Need for the harmonization of local component layers (nomenclatures , scale, ..)



# Useful links

COPERNICUS programme: <http://www.copernicus.eu/>



COPERNICUS land monitoring (information & available data):

<http://land.copernicus.eu/>

Copernicus land monitoring data for Hungary:

<http://www.fomi.hu/portal/index.php/projektjeink/foldfelszin-monitorozas-corine>

Land take indicator:

<http://www.eea.europa.eu/data-and-maps/indicators/land-take-2/>

Imperviousness change indicator:

<http://www.eea.europa.eu/data-and-maps/indicators/imperviousness-change/>

# Thank you for your attention!

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