Copernicus Services

addressing business cases on land and climate change

Stefan Jensen
Head of group

supported by
the EEA Copernicus team and thematic colleagues

Rotterdam 25.5.2015
"Living well, within the limits of our planet"
Copernicus and the role of EEA – producer

Delegation agreement 2014-2020, €87 M
pan-European component – CORINE land cover

- **EEA flagship land cover** and land use product (most downloaded dataset of EEA)
- **Level of detail**: Minimum mapping unit (MMU): 25 ha (5 ha for changes)
- **Nomenclature**: 5 main groups, three levels, 44 level-3 classes
- **Implemented by national teams**, mainly based on photointerpretation.
pan-European component – High Resolution Layers (HRL’s)

**Imperviousness**
- Degree of Imperviousness 2012 (20 m and 100 m)
- Impervious density change 2009-2012 (100 m)
- Degree of imperviousness, values from 1-100 %
- Mapping degree of change over time, values from -100 to +100 %

**Forest**
- Tree cover density (20 m and 100 m)
- Forest Type (20 m and 100 m)
- Tree cover density, values from 1-100 %
- Mapping dominant leaf type: coniferous and broadleaved

**Natural and semi-natural grassland**
- Natural and semi-natural grassland (20 m and 100 m)
- Mapping natural and semi-natural grassland

**Wetlands**
- Wetland (20 m and 100 m)
- Mapping wetlands

**Water bodies**
- Permanent water bodies (20 m and 100 m)
- Mapping permanent water bodies, including small water bodies

+ wetlands and water bodies
Local component

- Urban Atlas (UA)
- Riparian zones
- Natura2000 (selection of grassland rich sites)
Potential use of Copernicus services for SOER

Improving trends dominate
Trends show mixed picture
Deteriorating trends dominate

5–10 year trends
Protecting, conserving and enhancing natural capital
Resource efficiency and the low-carbon economy
Safeguarding from environmental risks to health

20+ years outlook
Terrestrial biodiversity
Land use and soil functions
CC impact on ecosystems
CC and environ. health risks

Atmosphere Monitoring;
Marine Environment Monitoring;
Land Monitoring;
Climate Change;
Emergency Management;
Security;

European Environment Agency
7th EAP land related priorities - published examples

• Land take indicator
  – Based on Corine LC change flows
  – Most recent update 2015 for period 2006-2012 (3rd generation)

• Imperviousness and imperviousness change indicator
  – Based on Copernicus HRL Imperviousness change
  – Most recent update 2006-2009 -> 2009-2012 planned
Chart — Annual average increase in soil sealing, 2006-2009, relative to country area

**Imperviousness and imperviousness change**

Update for 2009-2012 in preparation
Examples – published … and in work

• Land take indicator
  – Based on Corine LC change flows
  – Most recent update 2006-2012

• Imperviousness and imperviousness change indicator
  – Based on Copernicus HRL Imperviousness change
  – Most recent update 2006-2009 -> 2009-2012 planned

• Urban sprawl ‘indicator’ (in preparation, draft 2016)
  – Based on Urban Atlas and HRL Imperviousness 2009

• Land recycling ‘indicator’ (in preparation, draft 2016)
  – Based on Corine LC and Urban Atlas LC change flows 2006-2012

• Landscape fragmentation (2017)
  – Based on crossing Corine LC with transport and ecological networks
Urban Sprawl in Europe

Scattered urban areas continue to expand

Joint report EEA-FOEN (2016)

- 39 Countries
- 312 NUTS-2 Regions
- 1-km$^2$ EEA Reference Grid
Weighted Urban Proliferation

WUP in the NUTS-2 Regions 2009
Land cover flows – from mapping to accounting

Change matrix (44x43=1932 changes) summarised into flows

Land cover flows
- LCF1 Urban land management
- LCF2 Urban residential sprawl
- LCF3 Sprawl of economic sites and infrastructures
- LCF4 Agriculture internal conversions
- LCF5 Conversion from other land cover to agriculture
- LCF6 Withdrawal of farming
- LCF7 Forests creation and management
- LCF8 Water bodies creation and management
- LCF9 Changes due to natural & multiple causes

Land recycling indicator – from CLC to Urban Atlas

Corine Land Cover

Urban Atlas

Example: Prague
Landscape fragmentation – update from 2009
Conflicts between transportation corridors and wildlife movement

Landscape fragmentation per NUTS-X region (2009)

Number of meshes per 1 000 km² ($S_{m}$)

- < 0.10
- 0.11–0.25
- 0.26–0.50
- 0.51–1.00
- 1.01–5.00
- 5.01–10.00
- 10.01–25.00
- 25.01–50.00
- 50.01–100.00
- > 100

Outside data coverage

Landscape fragmentation per country (2009)

Number of meshes per 1 000 km² ($S_{m}$)

- < 0.1
- 0.1–0.5
- 0.6–1.0
- 1.1–2.0
- 2.1–4.0
- 4.1–7.0
- 7.1–10.0
- 10.1–20.0
- 20.1–35.0
- 35.1–75.0
- 75.1–100.0
- > 100

Outside data coverage
**Phenology**: periodic plant life cycle events, e.g. start of vegetation growing season. Can be derived from time series of satellite images e.g. Sentinel 2.
Planned EEA reports

- ‘Land recycling’, EEA report (Q2 2016) – with ETC ULS.
- ‘Land resource efficiency’, EEA report (Q1 2017) – with ETC ULS and JRC.
- ‘Urban sprawl typology’ EEA/FOEN joint report, April 2016
Big potential for Copernicus products
Full uptake of land monitoring services and beyond

- Security, defence
- Environment, pollution and climate
- Oil and gas
- Maritime
- Agriculture
- Fisheries
- Emergency services
- Utilities (water, electricity, waste)
- Forestry
- Minerals and mining
- Local and regional planners
- Humanitarian Operations & Health
- Communications
- Insurance and finance
- Real estate management
- Construction
- Transportation
- Alternative energy
- Retail and geo-marketing
- Travel, tourism, and leisure
- News and media
- Education, training and research
- Real estate management
.... They shall provide information to increase the knowledge base to support adaptation and mitigation policies.... (DA, 2014)
Provisional timing

Stage 0 - Proof of Concept

Stage I - Pre-Operational

Stage II - Operational ~20 types climate variables, sectoral specific information for 5-6 Sectors

Stage III - Operational ~30 types of climate variables, sectoral specific information for 10 sectors

Proof of Concept + Pre-operational Phase

Operational Phase
EEA and Copernicus Climate Change Service

Data for analysing climate change impacts

Information for supporting adaptation

Active user

Climate change indicators and assessments

Climate – ADAPT information system

Providing feedback to shape the Service
Global and European temperature in EEA climate change impacts report

Temperature anomalies 1979 - 2015

Temperature anomalies in 2015
Climate – ADAPT - climate data visualisation
Monitoring Atmospheric Composition and Climate since Sept. 2009:

MACC-III was funded under Horizon2020 (Aug. 2014 – July 2015), “pre-operational”

→ CAMS is now operational!
ACC has used MACC results to compare and improve methodologies for producing annual European-wide maps for major air pollutants. Such maps are the basis for ACC’s human health and vegetation impact assessments.

MACC produces modelled European now/forecasts which were used in the Eye-on-Earth viewer. ACC plans to use them again in updated versions of the up to date air quality viewer.

- ACC provides CAMS (MACC) with validated historical air quality data (from AirBase). This data is essential for CAMS to analyse past air quality situations. We have delivered yearly AirBase packages since 2010.

- ACC provides MACC with provisional up to date (UTD) air quality data (former near real-time data).
Where are we with Copernicus services today?

Copernicus is...

... here to stay
... going to impact our business
... available to support a large amount of topics
... complementing and better integrating our data
... providing different data frequent and fast
... increasingly used by all of us
... only at the beginning of its monitoring journey