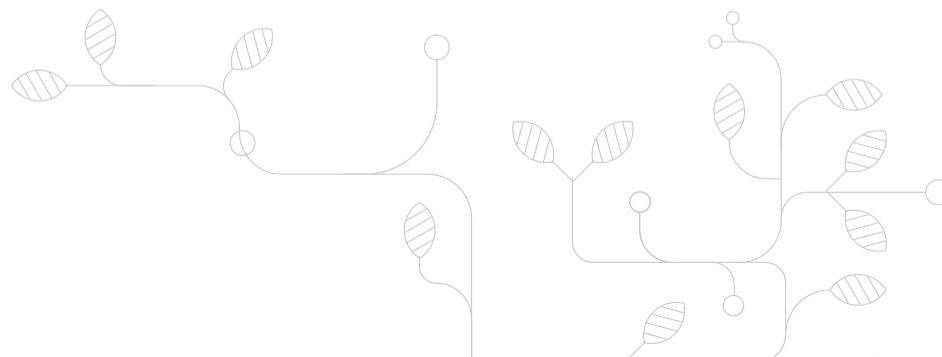


Chris Steenmans

European Environment Agency





CLC+

a suite of new pan-European
Copernicus land monitoring
services and products

Chris Steenmans - EEA



Copernicus
ECOSYSTEM
WORKSHOP 2018
BRUSSELS, 9+10 OCTOBER





Land
Monitoring

CLC+ A SUITE OF NEW PAN EUROPEAN LAND MONITORING PRODUCTS



Source: Sinergise, Sentinel 3 mosaic

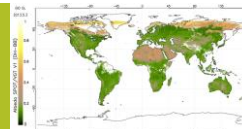


Land
Monitoring

Copernicus Land Monitoring Services (CLMS)



Systematic biophysical monitoring



Land cover & land use mapping



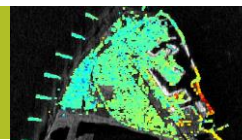
Thematic hotspot monitoring



Reference data mapping



Ground Motion monitoring



European Environment Agency



European
Commission

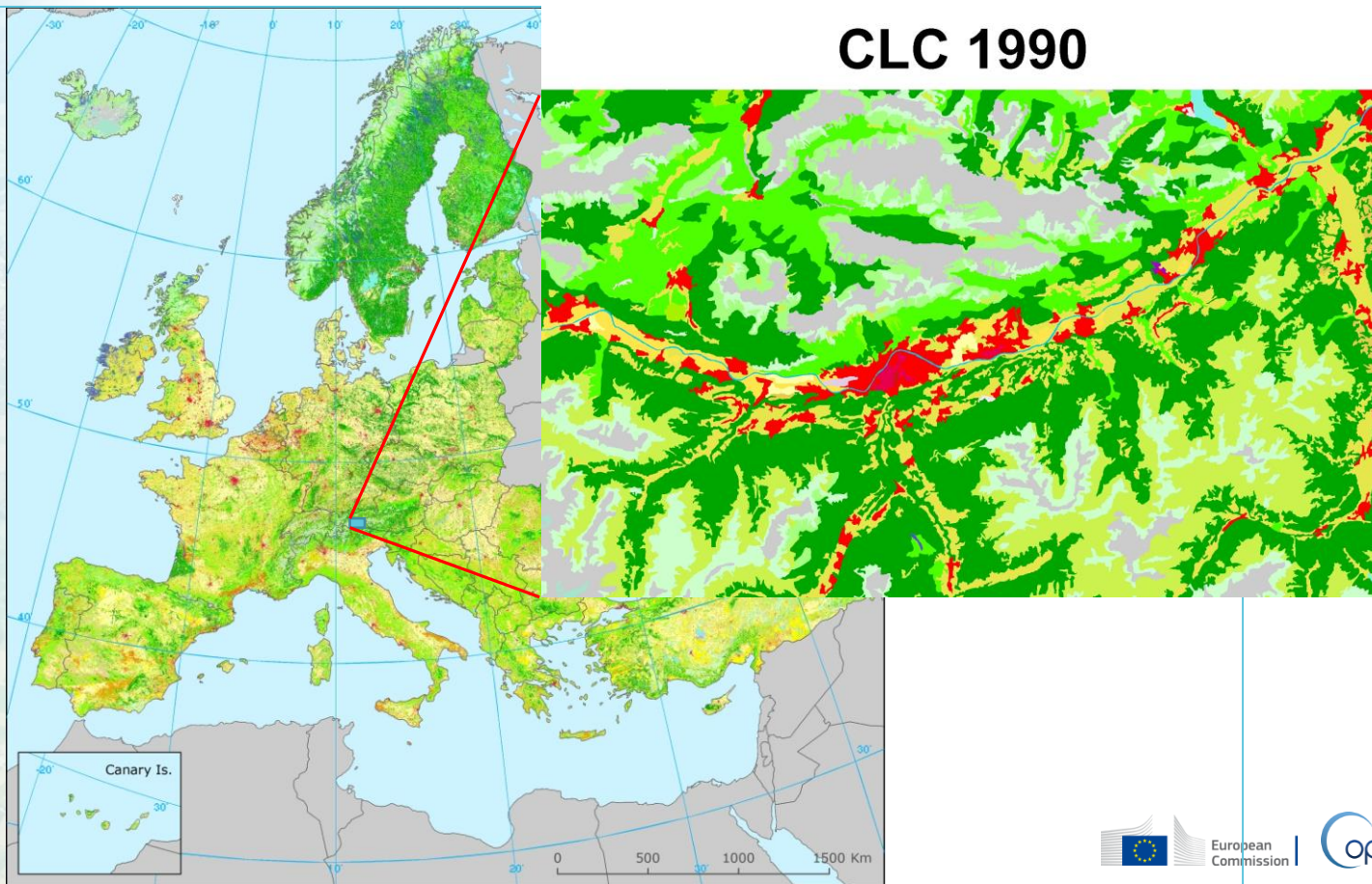
Copernicus
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CORINE Land Cover time series: 1990 – 2000 – 2006 – 2012 – 2018 -

Land
Monitoring

CLC 1990

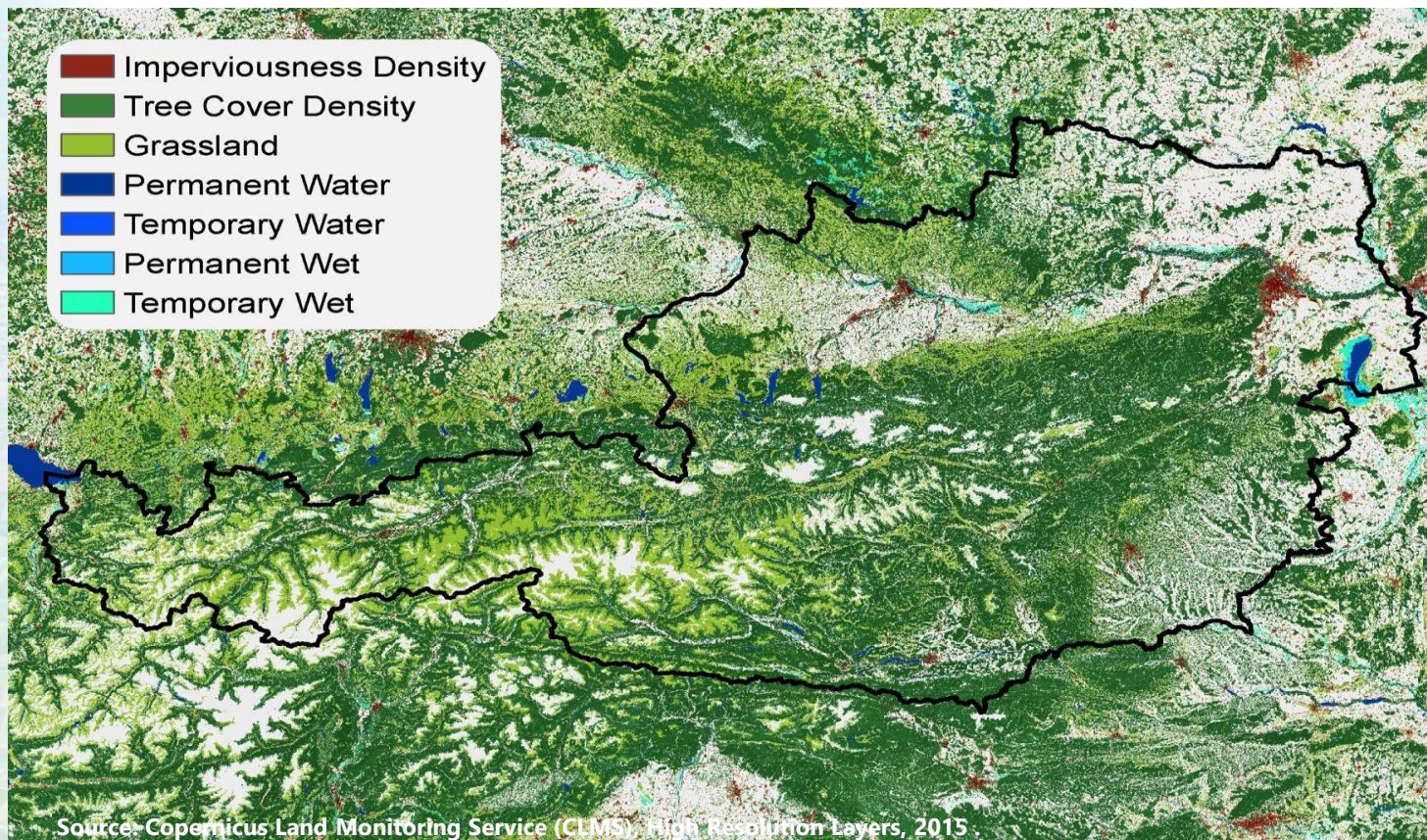


European
Commission

Copernicus
Europe's eyes on Earth



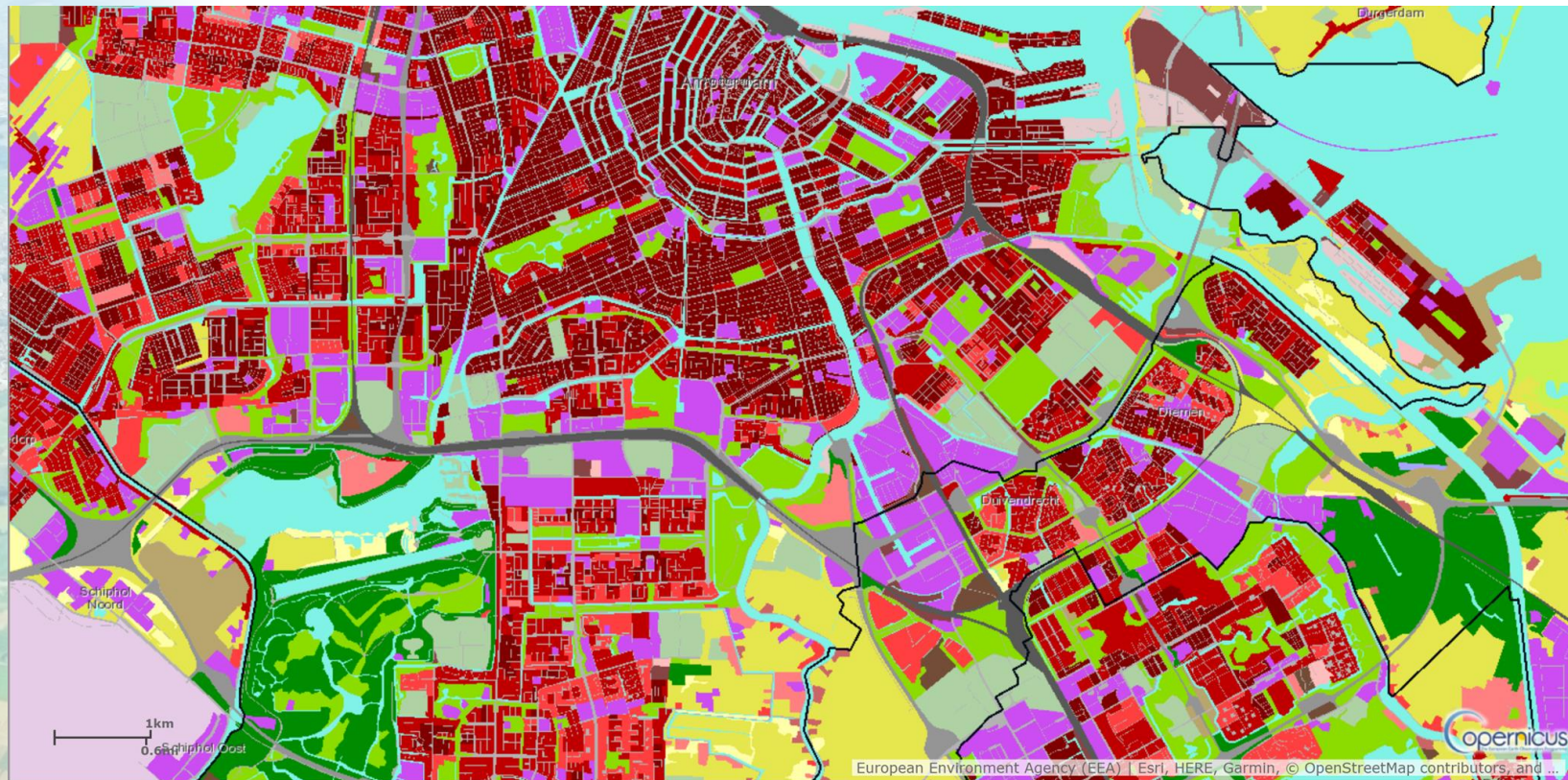
Land Cover High Resolution Layers 2006 - 2009 - 2012 - 2015 -





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Monitoring

Urban Atlas land use/cover 2006 - 2012 - 2018 -



European Environment Agency (EEA) | Esri, HERE, Garmin, © OpenStreetMap contributors, and ...

European Environment Agency



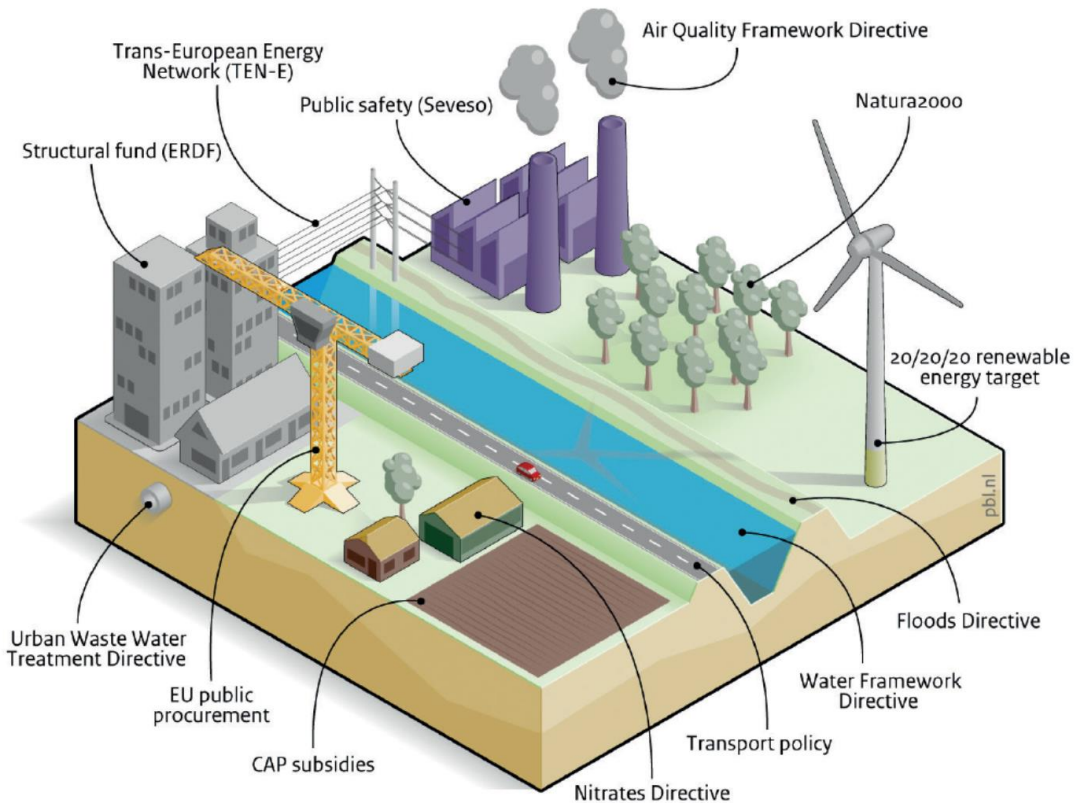
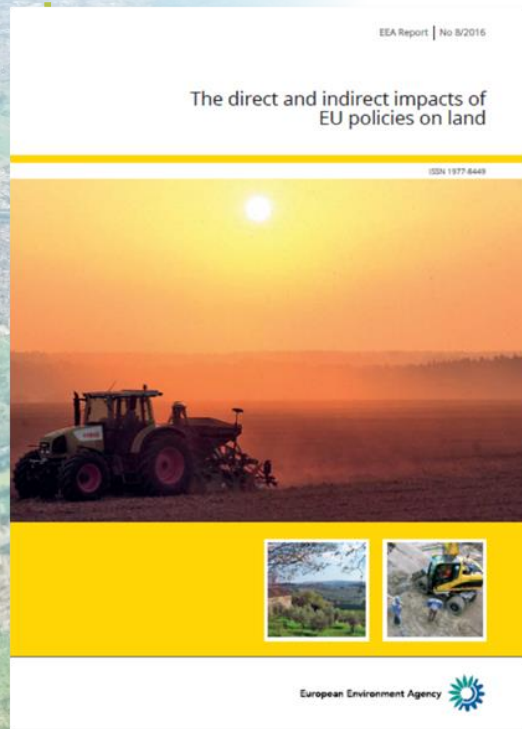
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Land
Monitoring

MONITORING DIRECT AND INDIRECT IMPACTS OF EU POLICIES ON LAND



Source: Evers, D & J. Tennekes, 2016



Land
Monitoring

CLC+ PRIORITIES COPERNICUS LAND MONITORING SERVICE EVOLUTION





Land
Monitoring

MONITORING CO₂ FROM LAND USE - LULUCF

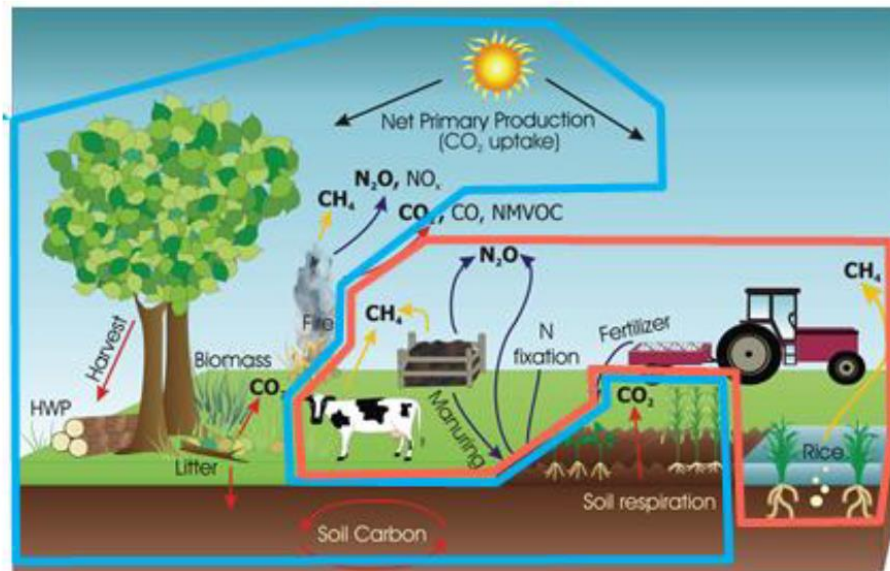
Land use and agriculture in EU climate policies:

CO₂ from Land Use: Land Use, Land Use Change and Forestry (LULUCF)

Agriculture non-CO₂ (CH₄, N₂O):
Effort Sharing Regulation

Partly human induced
(linked to
global natural
carbon cycle)

↓
Uncertainties?
Additionality?
Permanence?
Leakage?



All
human-
induced





Land
Monitoring

MONITORING CO₂ FROM LAND USE - LULUCF

		before					
		forest land	cropland	grassland	wetlands	settlements	other land
after	forest land	managed forest land	afforested land	afforested land	afforested land	afforested land	afforested land
	cropland	deforested land	managed cropland	managed cropland	managed cropland	managed cropland	managed cropland
	grassland	deforested land	managed grassland	managed grassland	managed grassland	managed grassland	managed grassland
	wetlands	deforested land	managed cropland	managed grassland	managed wetland	managed wetland	managed wetland
	settlements	deforested land	managed cropland	managed grassland	managed wetland		
	other land	deforested land	managed cropland	managed grassland	managed wetland		

Source: ETC/ACM Working Paper, 2018

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Land
Monitoring

MANAGEMENT AND EVALUATION COMMON AGRICULTURE POLICY



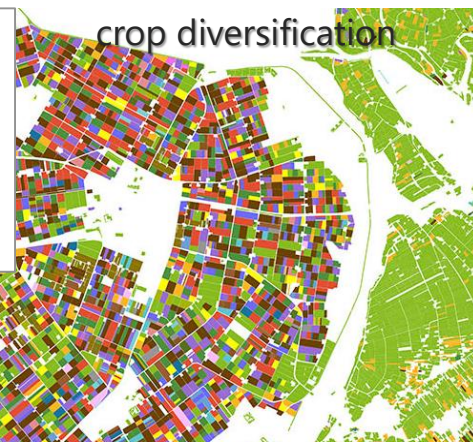
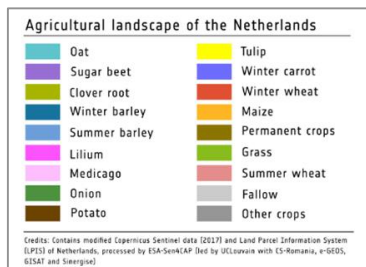


Land
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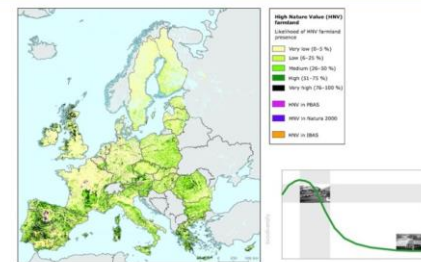
MANAGEMENT AND EVALUATION COMMON AGRICULTURE POLICY



mapping of permanent grassland



High nature value farmland



precision farming

environment and climate indicators

© modified Copernicus Sentinel data (2017), processed by ESA-Sen4CAP (led by UCLouvain with CS-Romania, e-GEOS, GISAT and Sinergise)

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Land
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Natural capital and ecosystem services accounting

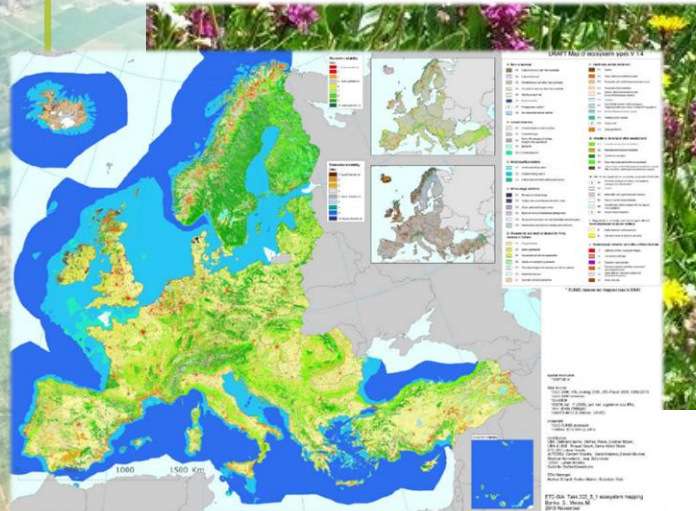
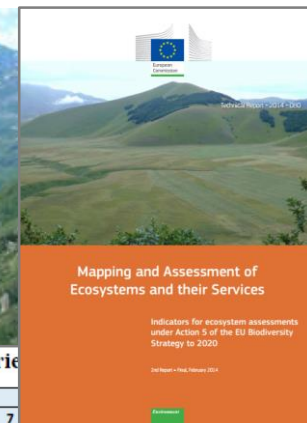
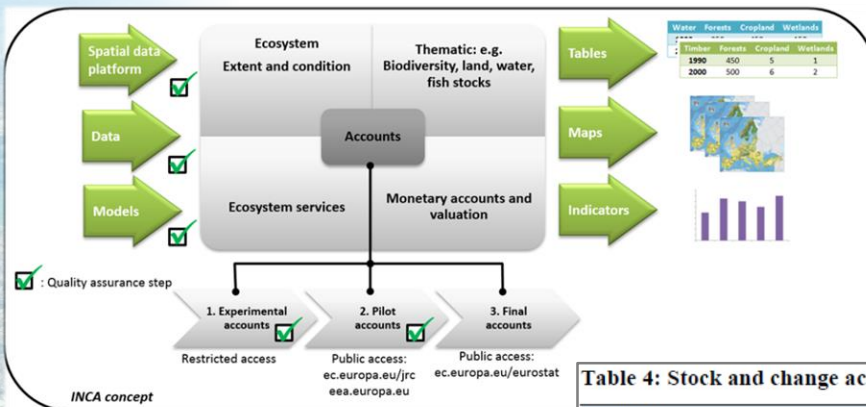


Table 4: Stock and change account for European ecosystems, EEA 39 countries

AREA IN KM2	MAES ECOSYSTEM TYPES								
	1 Urban	2 Cropland	3 Grassland	4 Woodland and forest	5 Heathland and shrub	6 Sparsely vegetated land	7 Inland wetlands	8 Rivers and lakes	9 Marine inlets and transitional waters
Ecosystem extent 2006	232,494	2,035,766	652,817	2,009,117	279,496	344,585	129,079	141,319	27,858
Reductions to initial ecosystem extent	2,539	11,812	4,722	69,766	1,253	2,181	189	272	84
Additions to initial ecosystem extent	8,259	6,867	3,246	70,394	586	1,913	248	1,256	48
Net additions to ecosystem extent (additions - reductions)	+ 5,720	- 4,945	- 1,476	+ 628	- 667	- 268	+ 59	+ 984	- 36
Net additions as % of initial year	+ 2.5	- 0.2	- 0.2	+ 0.0	- 0.2	- 0.1	+ 0.0	+ 0.7	- 0.1
Total turnover of ecosystem extent (reductions + additions)	10,798	18,680	7,968	140,161	1,839	4,094	436	1,528	132
Total turnover as % of initial year	4.6	0.9	1.2	7.0	0.7	1.2	0.3	1.1	0.5
Stable ecosystem stock in KM2	229,956	2,023,954	648,096	1,939,351	278,243	342,404	128,891	141,047	27,774
% of ecosystem stock that was stable	98.9	99.4	99.3	96.5	99.6	99.4	99.9	99.8	98.4
Ecosystem extent 2012	238,215	2,030,821	651,342	2,009,746	278,829	344,316	129,138	142,303	27,822

source: EEA/CLC V18.5 DD calculation

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CLC+ Key elements of requirements review outcome

- Based on needs EU policies (DGs ENV, CLIMA, REGIO, AGRI, MARE, etc.)
 - A higher performance pan-European mapping product (timely, targeted)
 - 2nd generation CLC within Copernicus portfolio
 - Suite of land monitoring products complementing mapping products
- Summary of requirements review
 - MMU 0.5 to 5 ha
 - Change layer and status layer same MMU
 - Revised thematic content (more flexible classes, increased characterisation)
 - Yearly to 3 yearly update cycle
 - Pan-European coverage (minimum EEA-39)



Land
Monitoring

CLC+ Conceptual design

- Multi-stage process
- Multiple products
- Different production philosophies
- Different resource models
- Industrial and Member State involvement



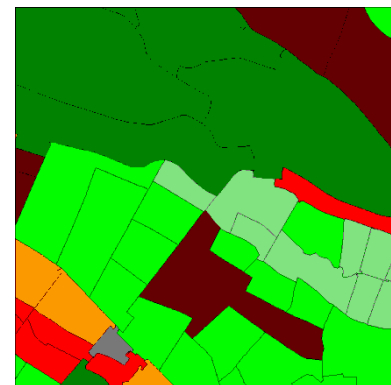


Land
Monitoring

CLC-Backbone



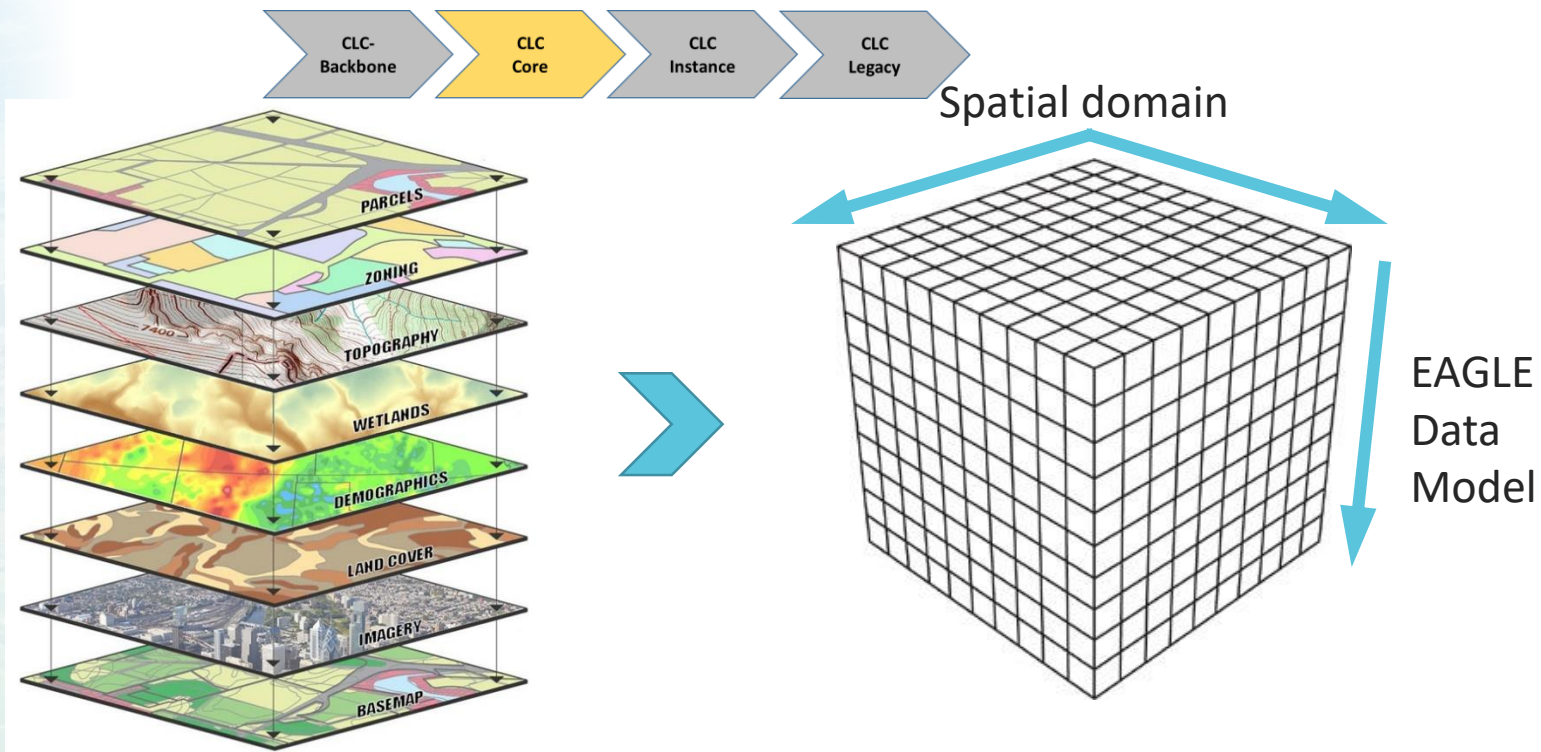
- Basic land cover inventory
- Vector format, object oriented
- Based on digital cartography and EO
- Geometric backbone
- thematic detail – limited, but robust
- Framework to build other products
- Foreseen to start production end 2018





Land
Monitoring

CLC-Core



Source: CSU,
<http://heleneloyan.cikeys.com/update/gis-layers/>



Land
Monitoring

CLC-Core



- A consistent, multi-use repository for environmental information
- Grid database 100 m x 100 m, with EAGLE data model
- Populated with a broad range of land cover, land use and ancillary data, forming the information content
- Integrating Copernicus and external sources
- Member States in situ data (e.g. land use, habitats, etc.)
- Engine to deliver tailored thematic information.
- Reference year: 2018
- Production year: 2019 (TBC)

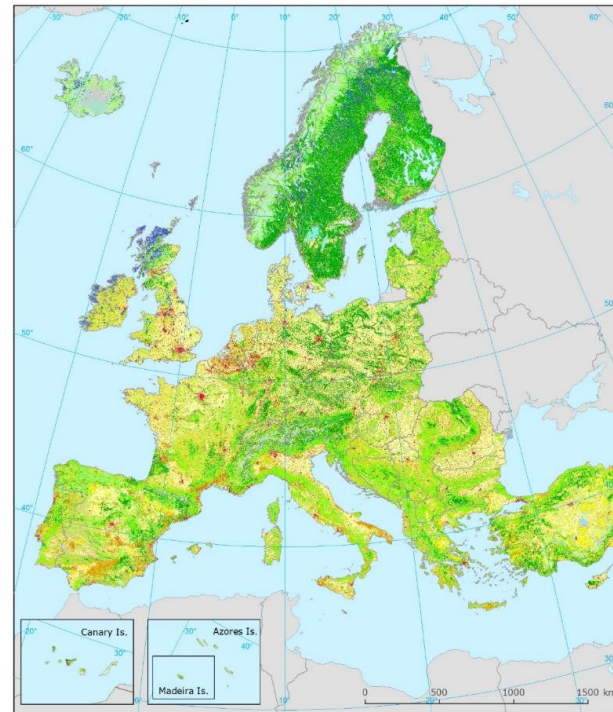


Land
Monitoring

CLC-Instance



- An improved LULC monitoring product relative to CLC
- Multi-functional
- Addressing a broad range of user requirements at European, national and local scales
- Raster and vector format
- Update cycle: TBD
- Reference year: 2018
- Production year: TBC



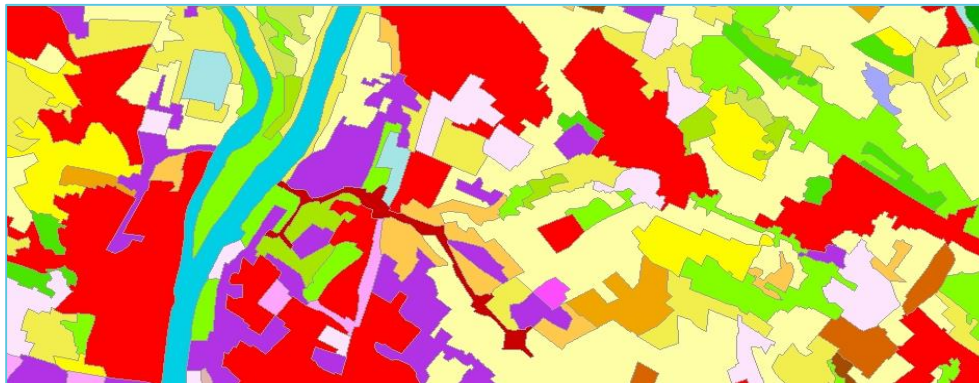


Land
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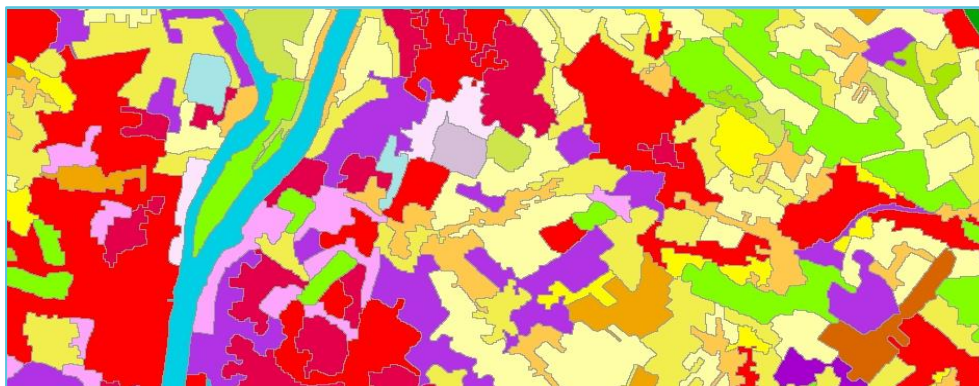
CLC-Legacy



CLC2012
25 ha



Bottom-up CLC
25 ha



High-resolution
20 m pixel



Land
Monitoring

Involvement of Member States in production

- Input to and review of the conceptual framework and technical specifications
- Support to population of thematic information in CLC-Core
- Change monitoring activities
- Member State benefits
 - CLC-Backbone aligned to national / local mapping requirements
 - CLC+ support to national reporting





Land
Monitoring

Involvement of Industry in production

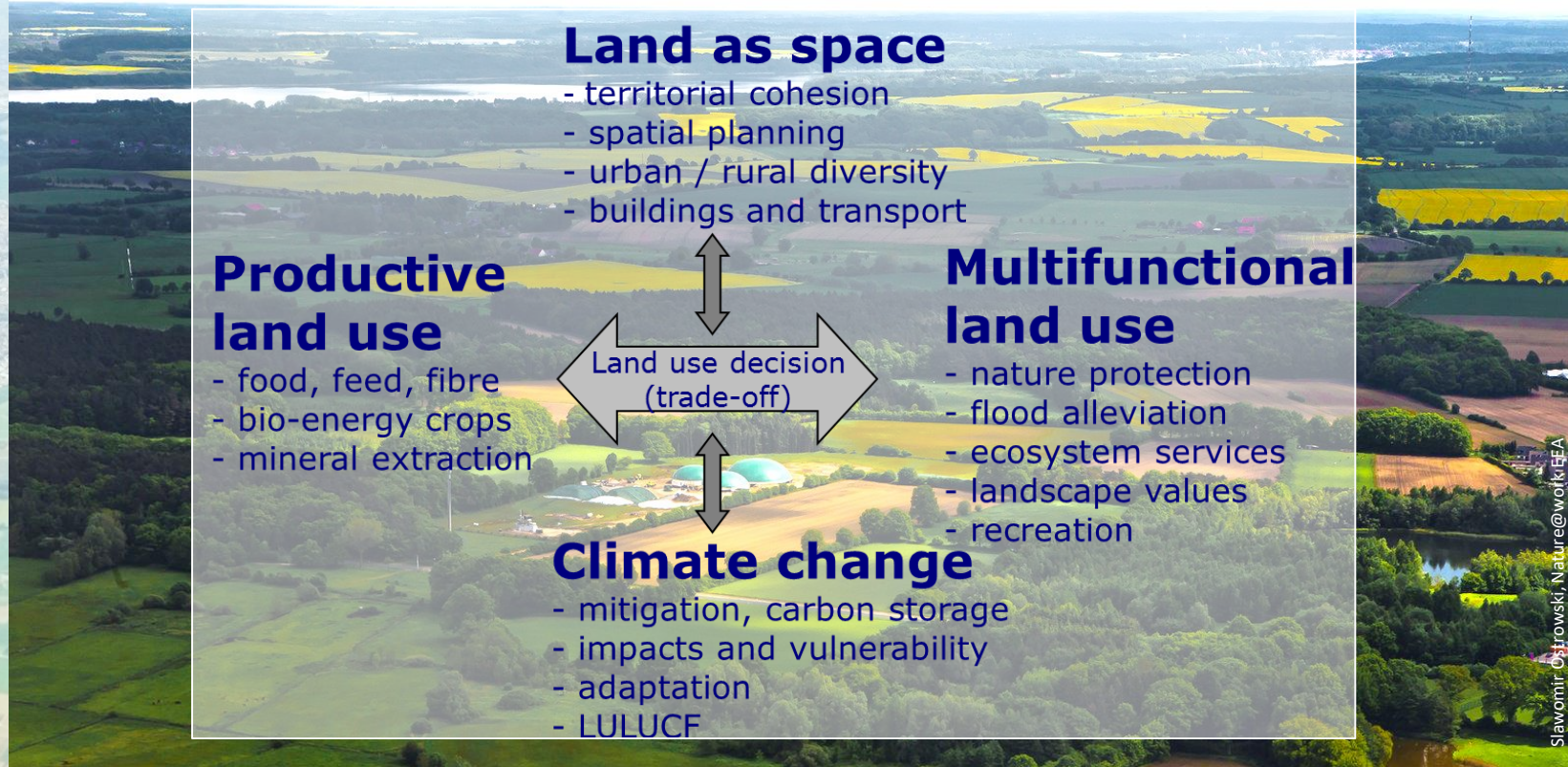
- Production of CLC-Backbone
- Support production of other products
- Implementation and maintenance DB infrastructure
- Validation of products
- Industry benefits
 - Increased awareness of EO capabilities across stakeholder community
 - Additional Copernicus products and services to support downstream application development by commercial sector





Land
Monitoring

CONCLUSION — AN INNOVATIVE INTEGRATED APPROACH ON LAND



Source: EEA



Thank you!



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