



# **Ecosystem accounting: Integrated System of Natural Capital and Ecosystem Services Accounting in the EU (INCA)**

Ekkehard PETRI, Eurostat  
2016 EFGS conference, Paris, 15-17 November 2016

# Content

- Quick introduction to ecosystem accounting
- Why do we do ecosystem accounting?
- What can you do with ecosystem accounting?
- Data challenges
- National and EU examples



NYC Parks

# New York City Street Tree Map


Explore and Care For NYC's Urban Forest

[Share](#) [Tweet](#) [Favorite](#) [Report Problem](#)

## Callery Pear ●


---

*Pyrus calleryana*



[Species Map and Details](#)

**ID Number:** 578291  
**Trunk Diameter:** 11 inches  
**Closest Address**  
136 WEST 18 STREET, NEW YORK,  
NY 10011

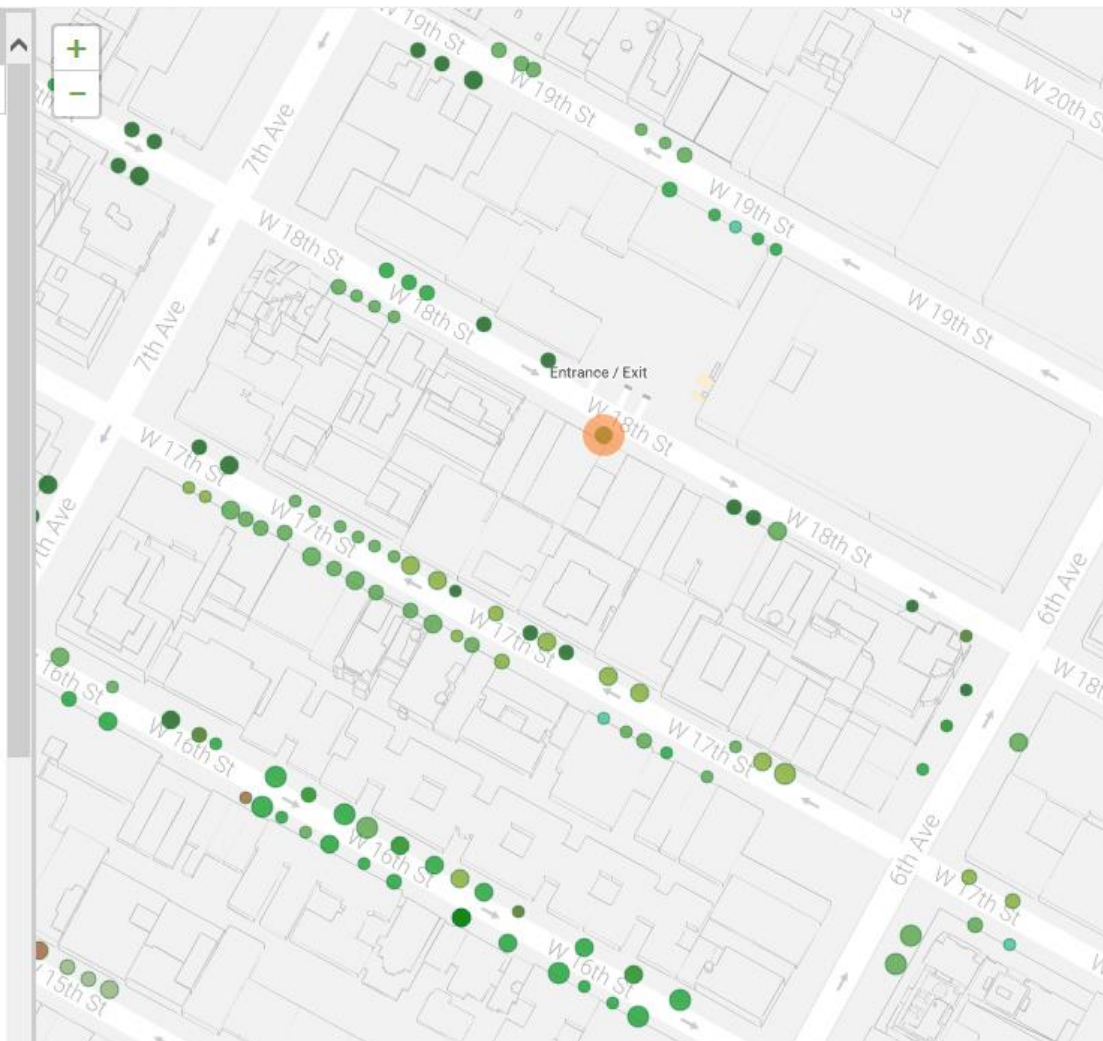


Google © 2018 Google Nutzungsbedingungen Problem melden

### Tree Care Activity

There are no activities reported for this tree.

Record Your Care





## Tree Care Activity

There are no activities reported for this tree.

Record Your Care

## Ecological Benefits

Benefits are calculated using formulas from the U.S. Forest Service. Learn more about the [benefits of trees to NYC](#)

**Stormwater intercepted each year**

**2,031 gallons** Value: \$20.11

**Energy conserved each year**

**1,153 kWh** Value: \$145.52

**Air pollutants removed each year**

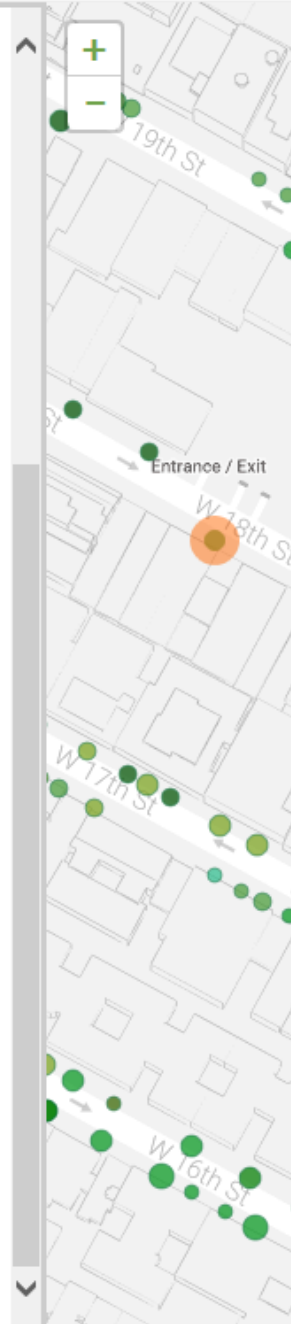
**3 pounds** Value: \$15.32

**Carbon dioxide reduced each year**

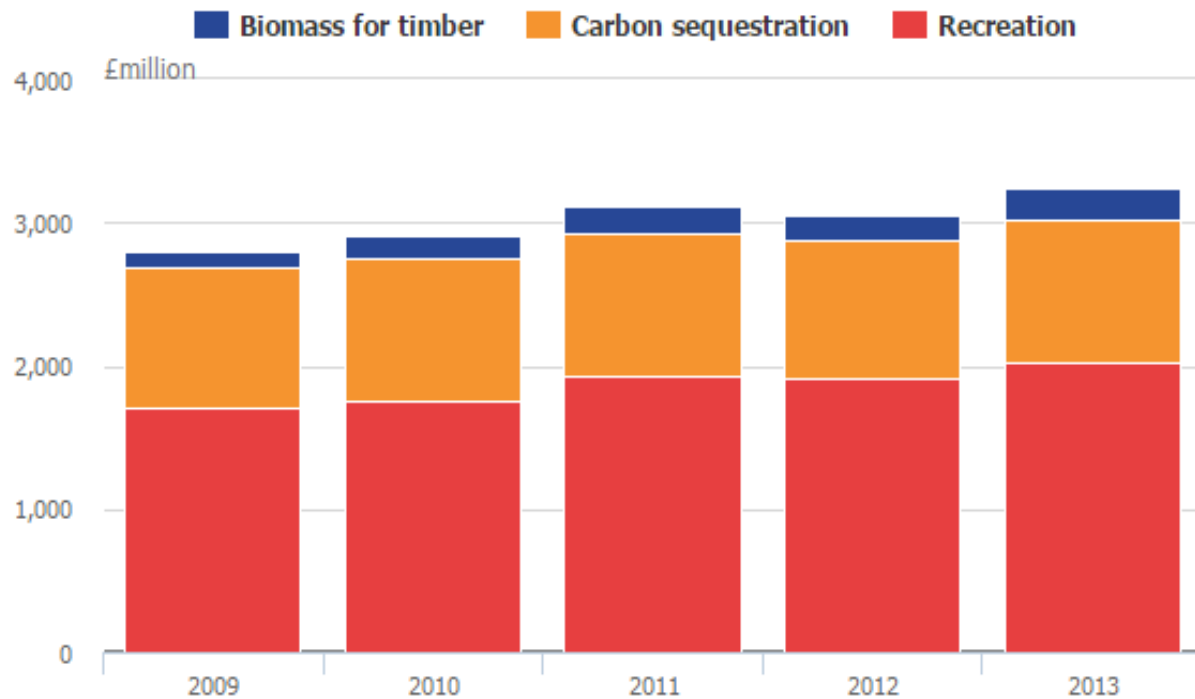
**1,378 pounds** Value: \$4.60

**Total Value of Annual Benefits**

**\$190.16**



# The Value of a Tree: ecosystem services in UK woodland



## Benefits of natural capital accounting

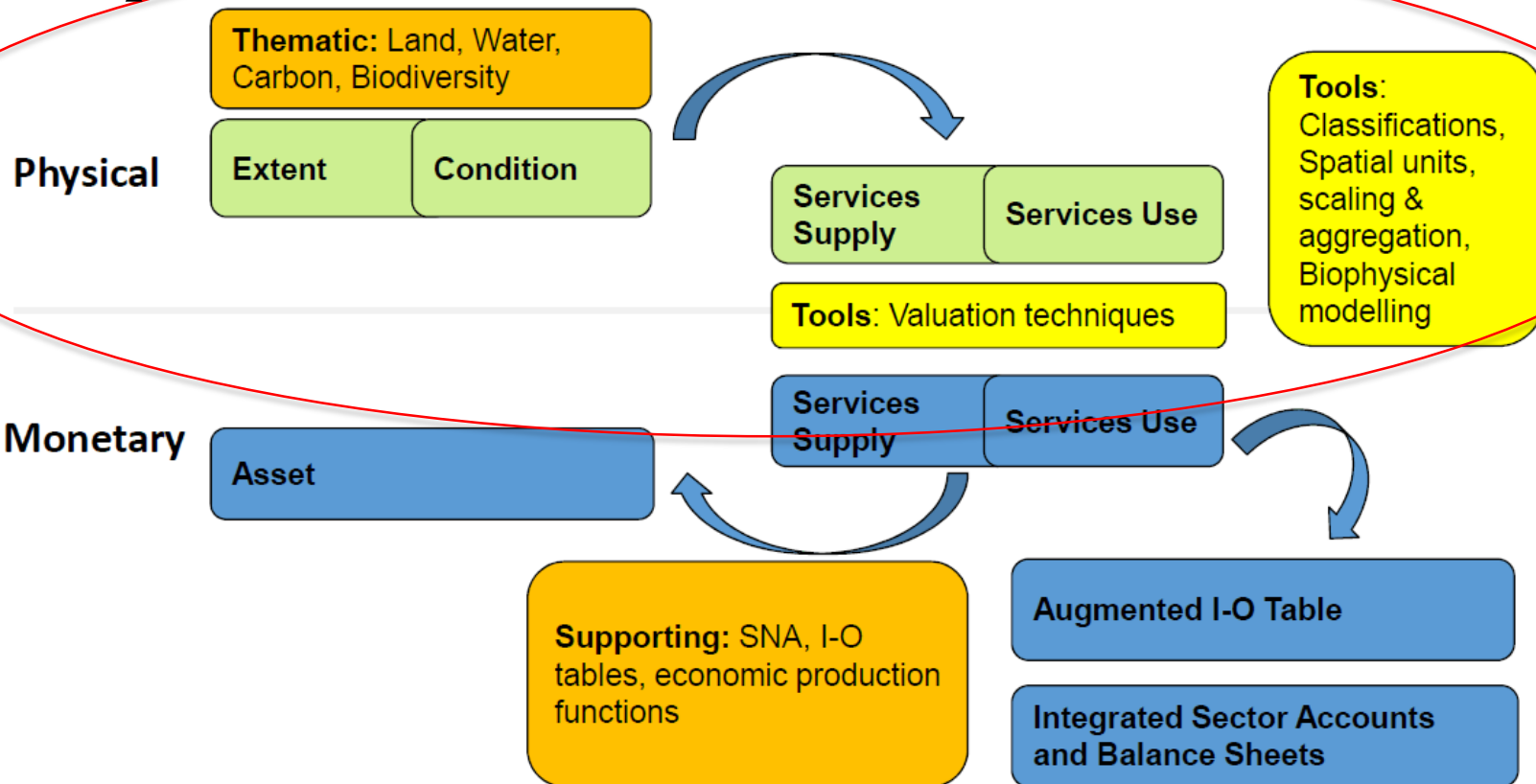
- Monitor the status of natural capital;
- Show interdependencies and 'trade-offs' between natural capital and economic activities;
- Indicate specific ecosystems or aspects of biodiversity under particular threat;
- Allow measurement of the changes in these elements over time;
- Monitor the effectiveness of various policies;
- Provide input to economic policies by showing the dependency of economic sectors on natural capital;
- Supports the development of macro-indicators for natural capital or the monetary valuation of natural capital;

## What is ecosystem accounting?

- Ecosystem = spatial area combining biotic and non-biotic components functioning together
- Ecosystems have an extent (=size) and a condition (=state or quality).
- They produce a **bundle of ecosystem services** (= contributions to human benefits and well-being – excludes flows that benefit nobody or only other ecosystems)
- They also have a potential (= ability to produce more ecosystem services than are demanded, or produce a different basket = can be converted within limits)
- Based on classifications (= lists of ES and ESS, the latter = CICES)

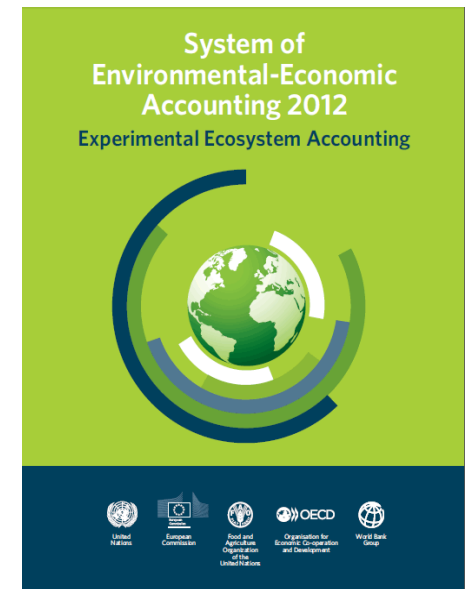
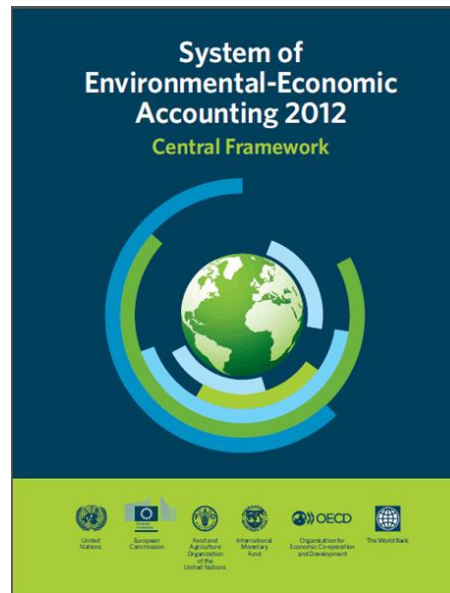
## Components of ecosystem accounting (SEEA-EEA)

Current  
focus

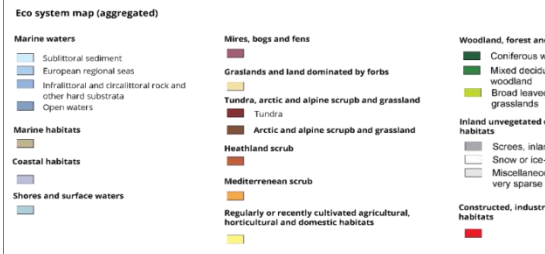




# EU and UN Accounting frameworks



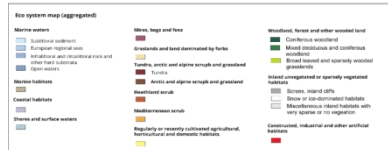
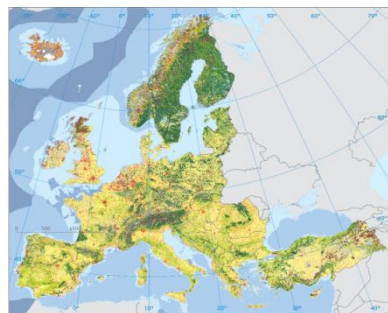
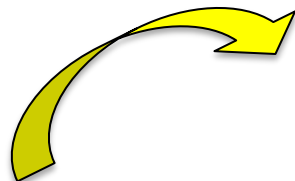
**(...from accounting tables to better policies)**



Cover	Urban and associated		Rainfed herbaceous cropland		Forest tree cover		Inland water bodies		Open wetlands	Total
Use	Infrastructure	Residential	Permanent crops	Maintenance	Forestry	Protected	Infrastructure	Aquaculture	Maintenance	
Ownership	Government	Private	Private	Private	Private	Government	Government	Private	Government	
Units	hectares									

[illegible]Table 4.4 Ecosystem services supply account (LCEU by CICES)

# Example: Ecosystem extent accounts



AREA in KM2	MAES ECOSYSTEM TYPES									Total
	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	
<b>Ecosystem extent 2006</b>	<b>232,494</b>	<b>2,035,766</b>	<b>652,817</b>	<b>2,009,117</b>	<b>279,496</b>	<b>344,585</b>	<b>129,079</b>	<b>141,319</b>	<b>27,858</b>	<b>5,852,532</b>
Reductions to initial ecosystem extent	2,539	11,812	4,722	69,766	1,253	2,181	189	272	84	92,817
Additions to initial ecosystem extent	8,259	6,867	3,246	70,394	586	1,913	248	1,256	48	92,817
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	185,635
Total turnover as % of initial year	4.6	0.9	1.2	7.0	0.7	1.2	0.3	1.1	0.5	3.2
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	5,759,715
% of ecosystem stock that was stable	98.9	99.4	99.3	96.5	99.6	99.4	99.9	99.8	99.7	98.4
<b>Ecosystem extent 2012</b>	<b>238,215</b>	<b>2,030,821</b>	<b>651,342</b>	<b>2,009,746</b>	<b>278,829</b>	<b>344,316</b>	<b>129,138</b>	<b>142,303</b>	<b>27,822</b>	<b>5,852,532</b>
source: EEA/CLC V18.5 DD calculation										

# Political framework - EU Biodiversity Strategy

**Target 2: By 2020, ecosystems and their services are maintained and enhanced by establishing green infrastructure and restoring at least 15% of degraded land**

**Action 5: Integrate the economic value of ecosystems and their services into accounting and reporting systems at EU and national level (by 2020)**

## Structure of the EU 2020 Biodiversity Strategy





# Ecosystem accounting for SDG monitoring

## SUSTAINABLE DEVELOPMENT GOAL 2

End hunger, achieve food security and improved nutrition and promote sustainable agriculture



## SUSTAINABLE DEVELOPMENT GOAL 14

Conserve and sustainably use the oceans, seas and marine resources for sustainable development



## SUSTAINABLE DEVELOPMENT GOAL 15

Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss




## 2.4

By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality

## 15.1

By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements



Indicator 15.1.2 Proportion of important sites for terrestrial and freshwater biodiversity that are covered by protected areas, by ecosystem type

## 8.9

By 2030, devise and implement policies to promote sustainable tourism that creates jobs and promotes local culture and products

## 14.2

By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans

## 15.9

By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts





# Project KIP INCA

## **Knowledge Innovation Project on an Integrated System of Natural Capital and Ecosystem Services Accounting in the EU**

Design and Implement an integrated accounting system for ecosystems and services at EU level

- Address EU policy needs linked to ecosystems and natural capital and strengthen the knowledge base for the implementation of the 7th EAP;
- Test international environmental accounting guidelines (SEEA);
- Integrate existing EU data sources and MS reporting exercises; identify gaps and needs for adjustment;
- Further harmonise ecosystem-accounting activities between EU and MS
  - Develop EU level accounts and support MS in developing accounts;
  - Provide a shared ecosystem accounting platform for MS to build on
  - Some MS already advancing (NL, UK especially, also DE, FR, FI.....)



## Main characteristics of INCA

- **Data quality and architecture:**
  - Integrated geo-spatial data platform. Include CORINE/Copernicus data at a Minimum Mapping Unit of 1ha, and possibility higher resolutions.
  - Works with existing EU level data (Copernicus, LUCAS, agriculture and other statistics, administrative, environment monitoring data)
  - Optional MS data (national regional) to link-in to EU layer
- **Ecosystem Services:**
  - Minimum set of ecosystem services: **provisioning, regulatory and cultural services:** crops, timber, fish, pollination, water purification, air filtration, carbon sequestration, flood and erosion control, recreation/tourism.
- **Types of accounts:**
  - **ecosystem extent; ecosystem condition; ecosystem service supply and use,** experimental asset accounts in monetary terms.

# Main data sources: present situation

Many different & separate & expensive data collection exercises which are not tailored to mapping and assessing ecosystems and which are undertaken by different institutions:

LUCAS  
(ground observation)

Biodiversity  
monitoring

COPERNICUS  
(satellite images)

Forest statistics

CORINE Land Cover

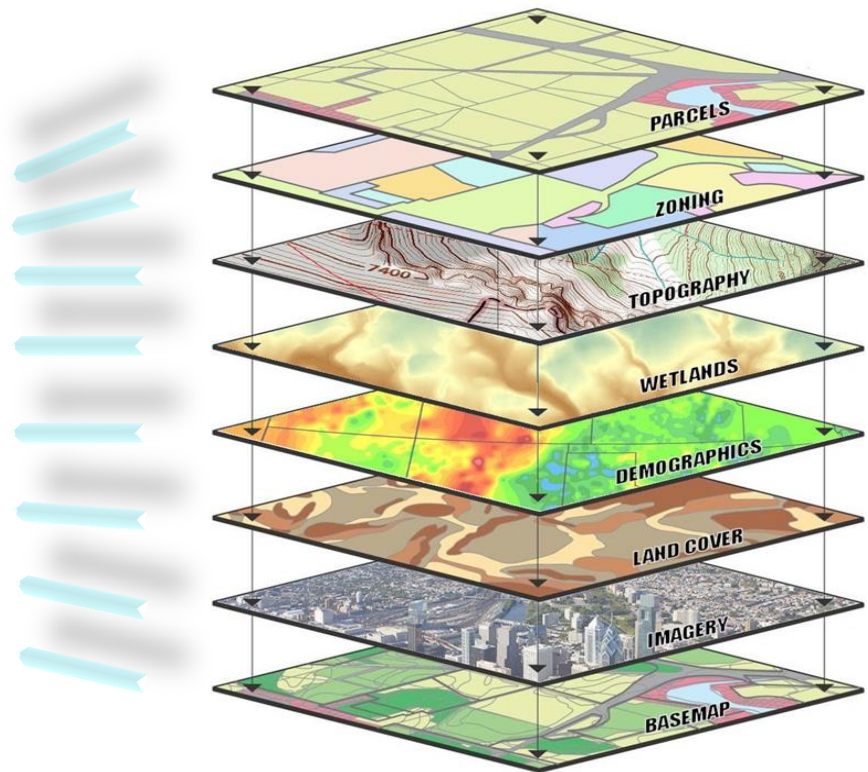
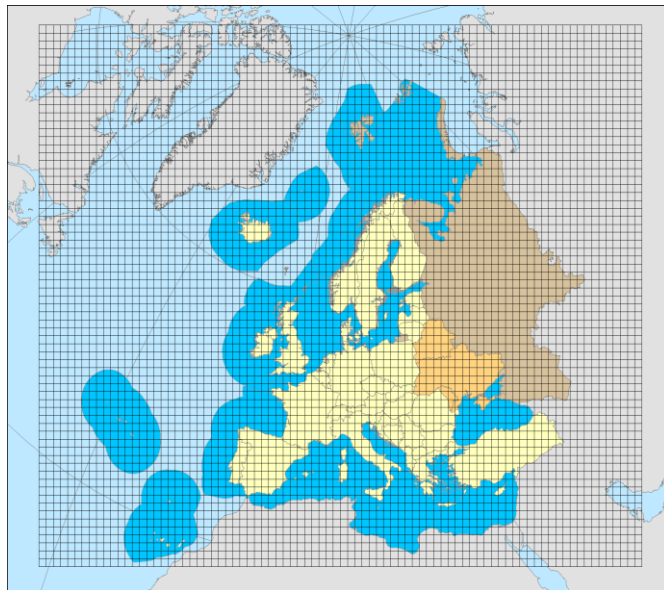
Water Framework  
Directive reporting

Farm Structure Survey  
(agricultural census)

Natura 2000  
reporting

...(others)

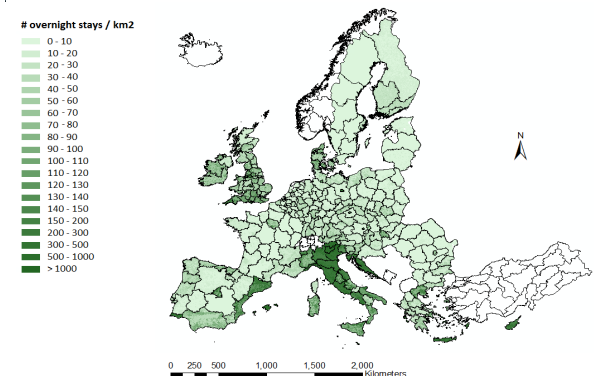
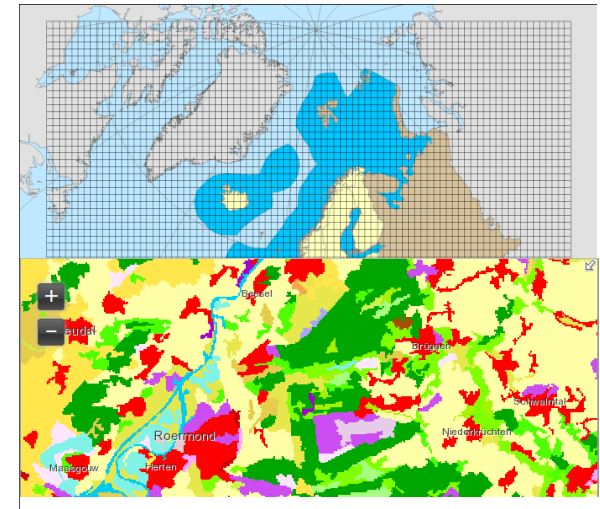
# Geospatial data platform – Basic spatial units to integrate different datasets



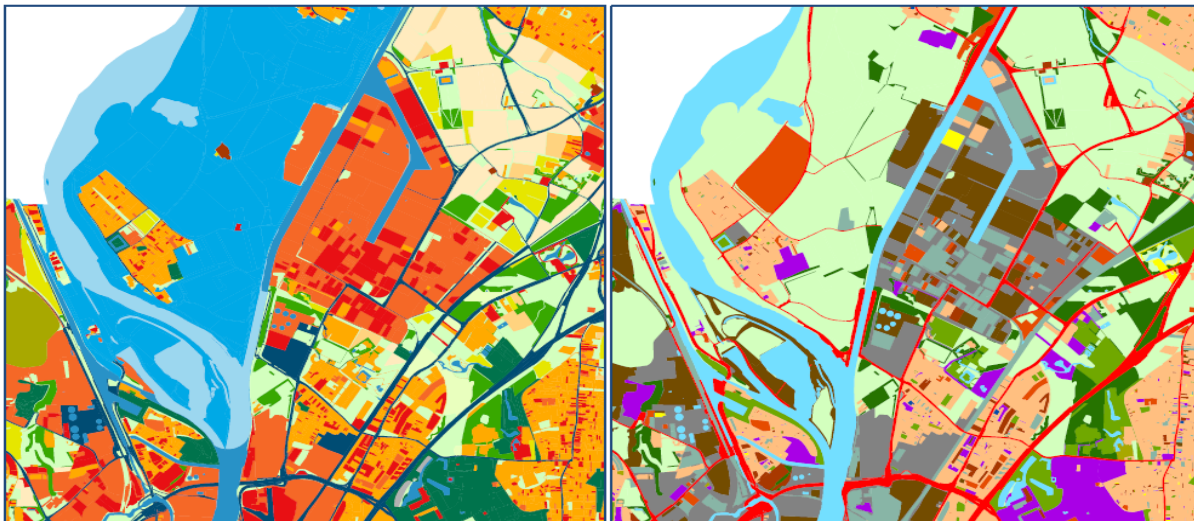
Note: Shared data semantics & other standards required for full data integration.

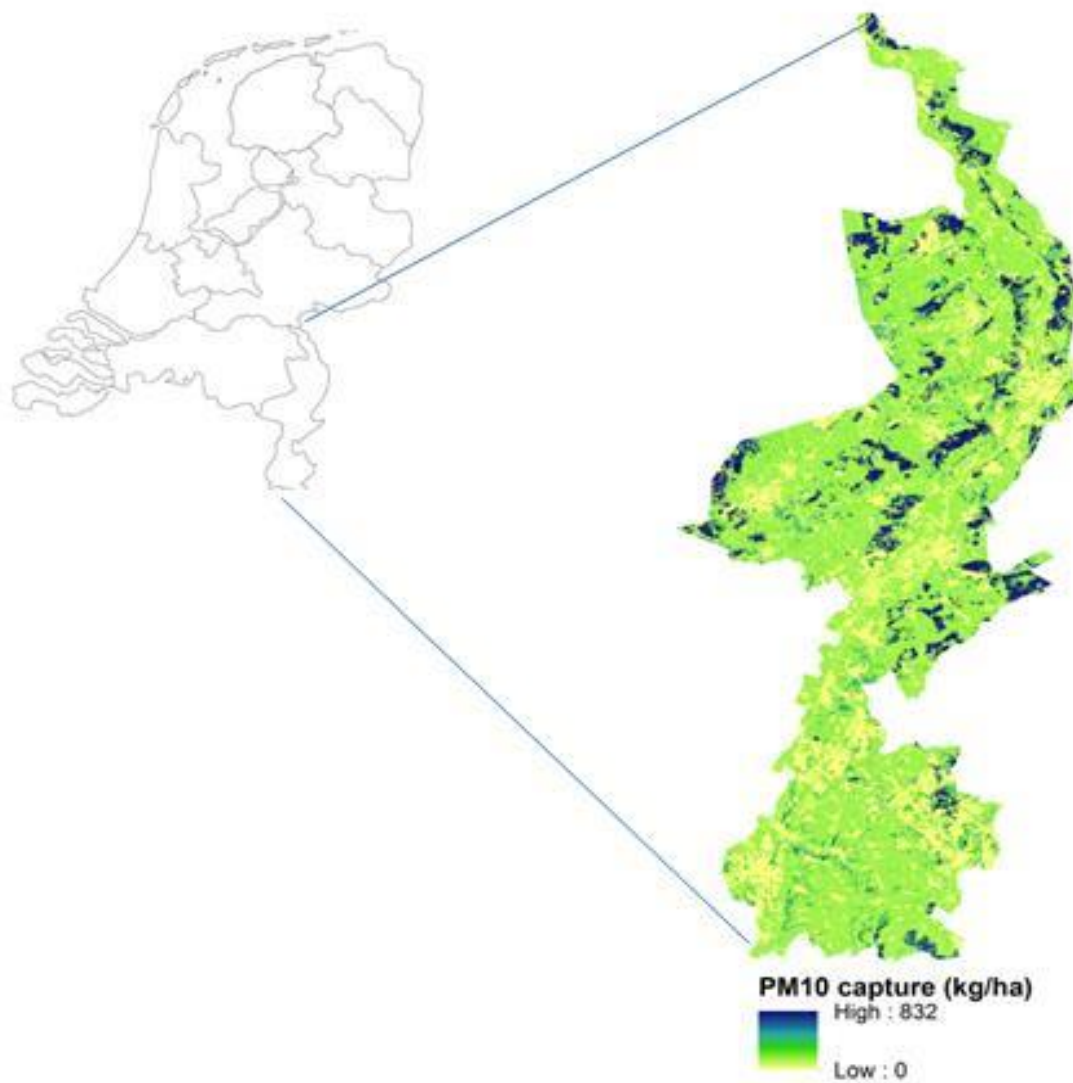
# Geospatial data platform - system of geographies for ecosystem accounting

- Basic spatial units (=small unit, e.g. 1km<sup>2</sup> grid cells)
- Land cover/ecosystem functional units (= ecosystems)
- Accounting units (= e.g. administrative regions)



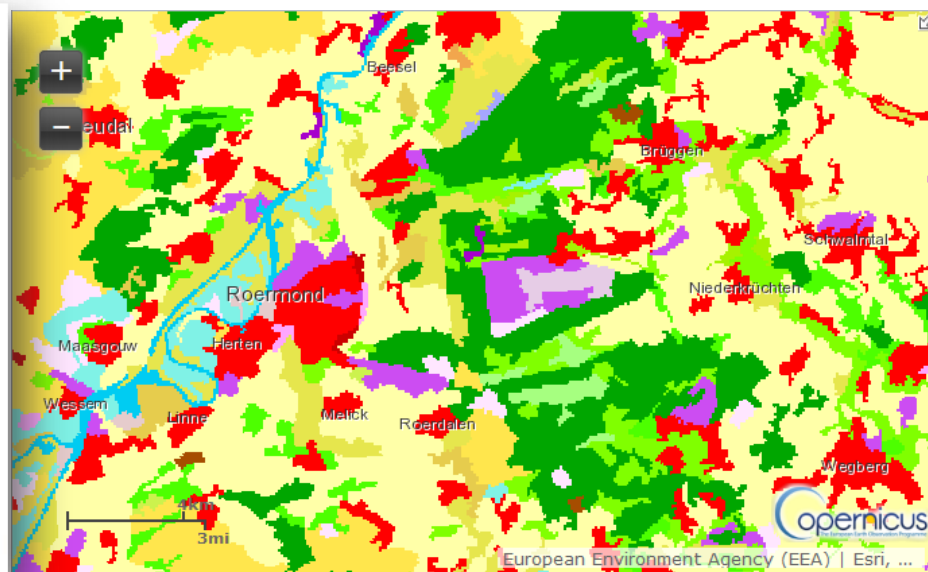
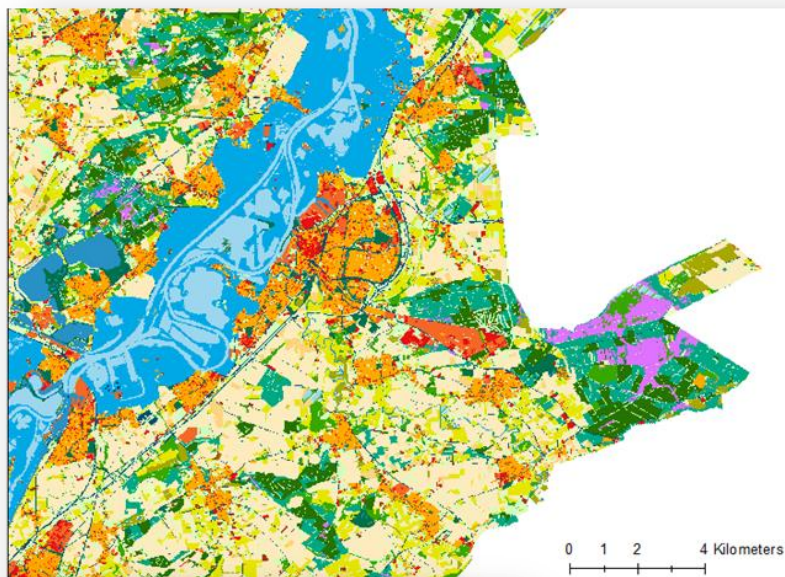
# Ecosystem units in an ideal world







# National champions vs. EU reality



## Legend

### EU Units

<all other values>

### LCEU

- |   |   |
|---|---|
| Landbouw: eenjarige gewassen                | Grasland, geen weiland                                  |
| Landbouw: meerjarige gewassen               | Openbaar groen  |
| Landbouw: kassen                            | Overig onverhard terrein                                |
| Landbouw: grasland voor veeteelt            | Uiterwaarden  |
| Landbouw: faunairand                        | Wetlands  |
| Landbouw: bebouwd                           | Woongebied  |
| Duinen met vaste begroeiing                 | Kantoren en bedrijven; industrie                        |
| Strand, droogvallend zand en actieve duinen | Kantoren en bedrijven; services                         |
| Looftbos                                    | Kantoren en bedrijven; overheid                         |
| Naaldbos                                    | Wegen, parkeerterrein, overig verhard terrein           |
| Gemengd bos                                 | Kantoren en bedrijven; bosbouw                          |
| Heide                                       | Kantoren en bedrijven; vissersij                        |
| Zand  | Kantoren en bedrijven; niet-commerciële dienstverlening |
| Wetlands                                    | Zee   |
|   | Meren, plassen, overig binnenwater                      |
|   | Rivieren  |
|   | Onbekend  |

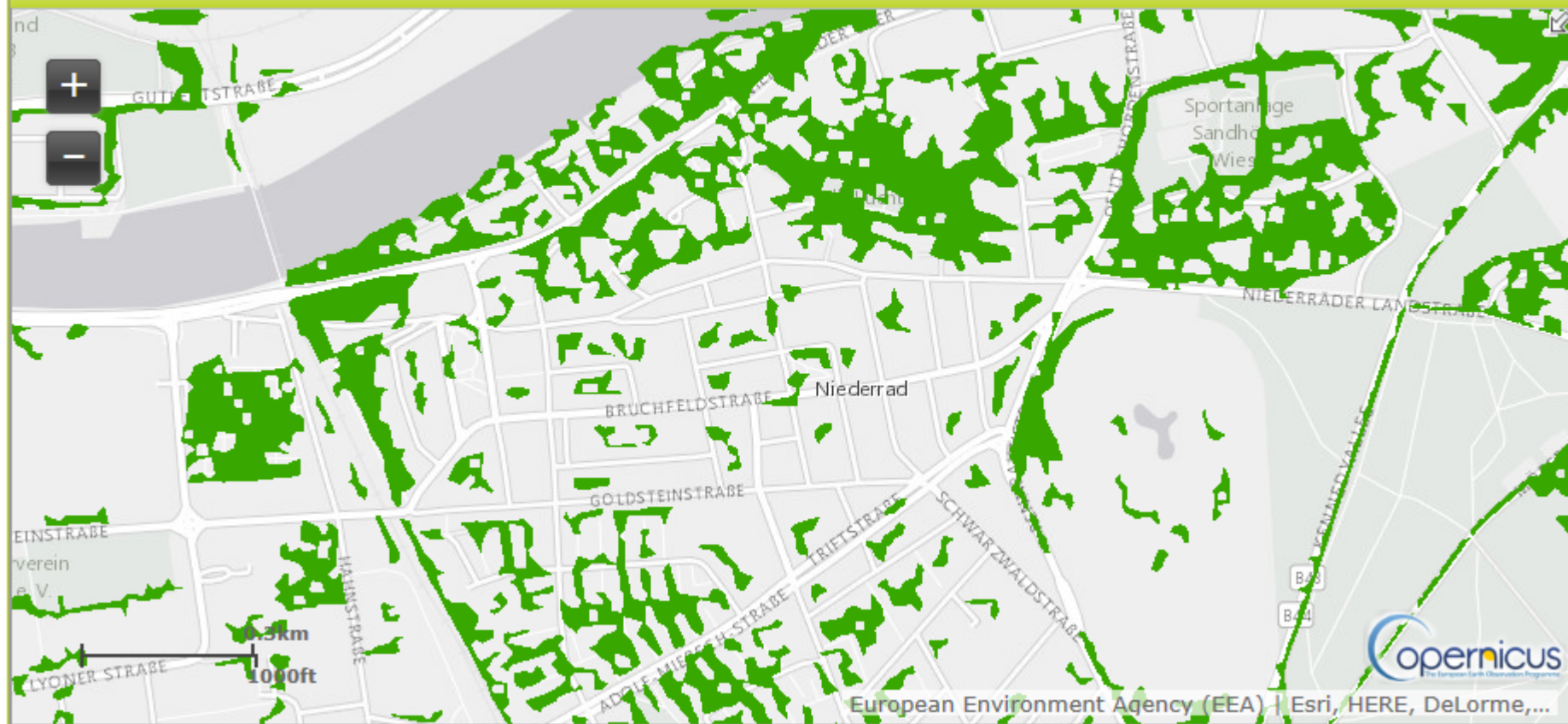


## Street Tree Layer (STL) Not yet validated.

Print

**Map View** Metadata Download

**Legende** Web services





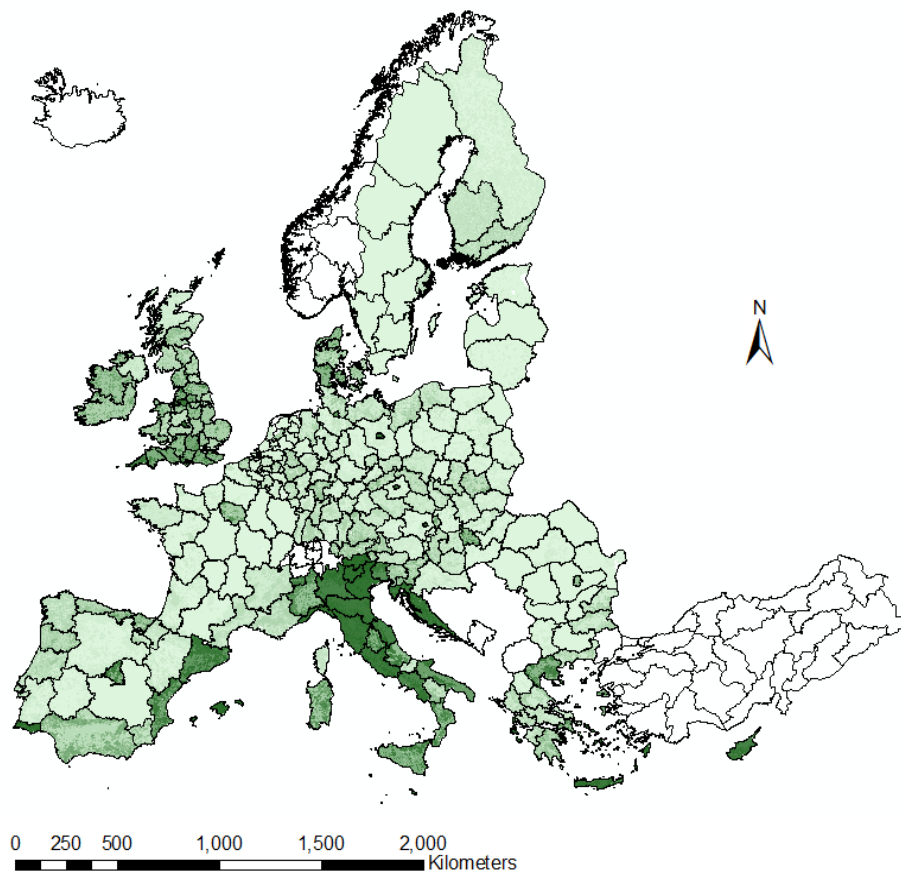
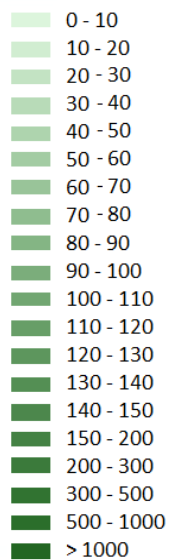
## Example for one ecosystem service - tourism

- **Input data**
  - Overnight stays (NUTS 2) related to nature (Eurostat);
  - Recreation Opportunity Spectrum (ROS) map, based on CORINE (JRC model)
    - 5.5 mio. polygons with recreation potential value based on attractiveness and accessibility
  - Ecotourism from national NUTS 2 data based on surveys (DE, NL, UK, HR, HU, RO, FI, SE:  $\Sigma 163$  NUTS 2 areas);
- **Calculate # of eco nights / km<sup>2</sup>**

## Results

<b>NUTS2 region, for example:</b>	<b>Total tourism overnight stays (million)</b>	<b>Ecotourism overnight stays (million)</b>	<b>Average ecotourism overnight stays per km<sup>2</sup></b>	<b>Value added generated by ecotourism stays (euro/year)</b>	<b>Employment generated by ecotourism stays (number of FTE)</b>
ITC1	12.8	2.6	101		
ITC2	29.8	0.6	183		
ITC3	13.3	2.7	491		

# overnight stays / km<sup>2</sup>



## INCA outlook

- Start building the EU data integration platform in 2017;
- Create first draft of ecosystem extent accounts and condition accounts in 2017 and 2018;
- Review of data and models for ecosystem services accounts in 2017,
- Ecosystem services accounts and monetary accounts will start in 2017;
- Implementation of operable system until 2020 (+ beyond..)

## Summary

- The protection and enhancement of natural capital (ecosystems and their services) are a top environmental priority for the EU.
- The ecosystems perspective should become mainstream in all land-related EU, national and regional policies (e.g. land planning, flood reduction, climate adaptation, agriculture, cohesion policy);
- Key challenge is the availability of sufficiently detailed data (resolution and classification).
- Alignment of EU and Member State into a common system will be essential for wide use and acceptance.