The European Commission's science and knowledge service

Joint Research Centre
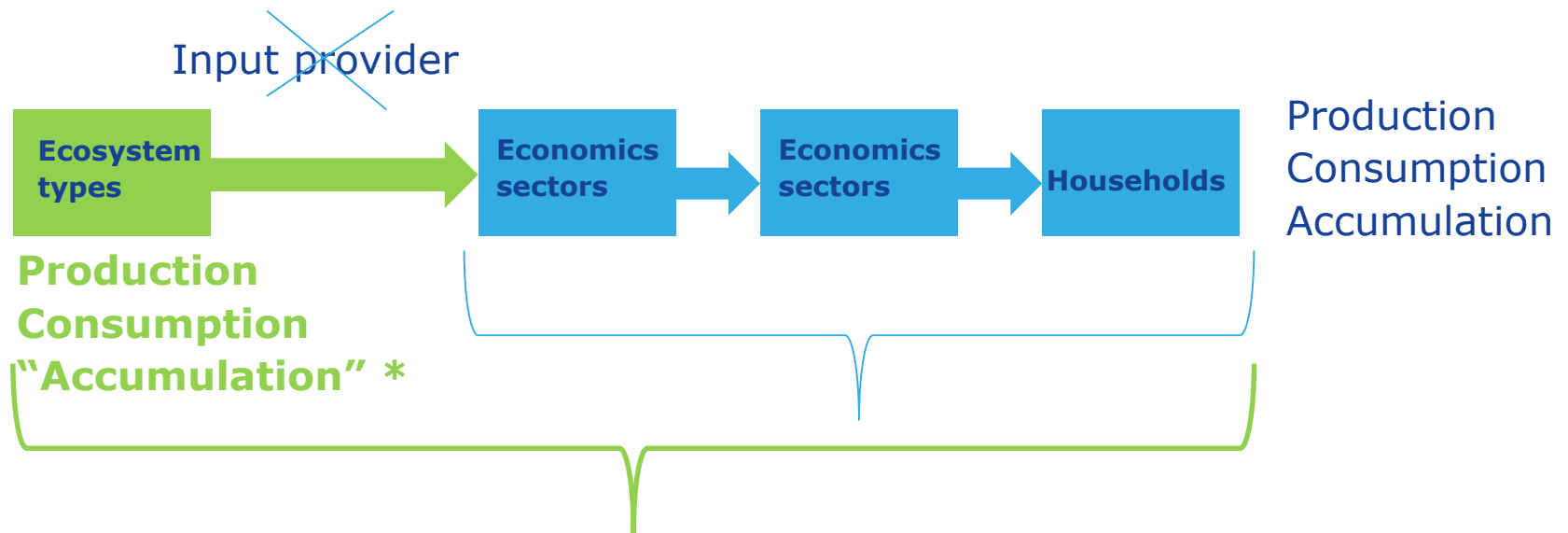
An ecosystem typology for capacity accounts

Alessandra La Notte,
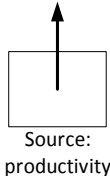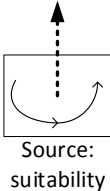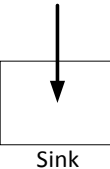*Sara Vallecillo,*
Alexandra Marques,
Joachim Maes
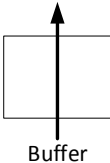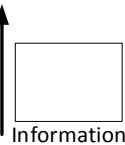
24th Meeting of the London Group on Environmental Accounting, Dublin, 1-4 October 2018

European Commission

Background concept: extending the production boundaries

Where does the production process start?

Input provider

Ecosystem types		Economics sectors		Economics sectors		Households

Production Consumption "Accumulation" *

Production Consumption Accumulation

* consumption of fixed capital
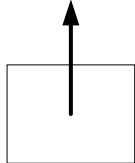
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Role of the ecosystem	Fate of matter/energy/information	Description	Examples
Source: productivity	Net delivery of biomass or energy eventually leaving the ecosystem	Ecosystems act as sources of matter and energy in the form of biomass. Reference with other classification systems: provisioning services.	Generation of mass and biomass
Source: suitability	Delivery of biomass and energy generated within the ecosystem	Ecosystems act as sources of matter and energy by providing suitable habitats. Reference with other classification systems: regulating services (CICES), supporting services (MA), habitat services (TEEB)	Habitat maintenance, pollination, pest control and diseases control
Sink	Matter or energy absorbed by the ecosystem	Ecosystems act as sink to store, immobilize or absorb matter. Reference with other classification systems: regulating services (CICES and TEEB), supporting services (MA).	Absorbing pollutants, carbon, nutrients, heat assimilation
Buffer	Matter or energy flowing through the ecosystem	Ecosystems act as a transformer changing the magnitude of flows of matter or energy. Reference with other classification systems: regulating services.	Water retention, flood control
Information	Information delivered by the ecosystem	Ecosystems deliver information The information generated does not modify the original state of the ecosystem. Reference with other classification systems: cultural services.	Scenic view, outdoor recreation activities, scientific investigation

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Background concept:
the accounting mechanism
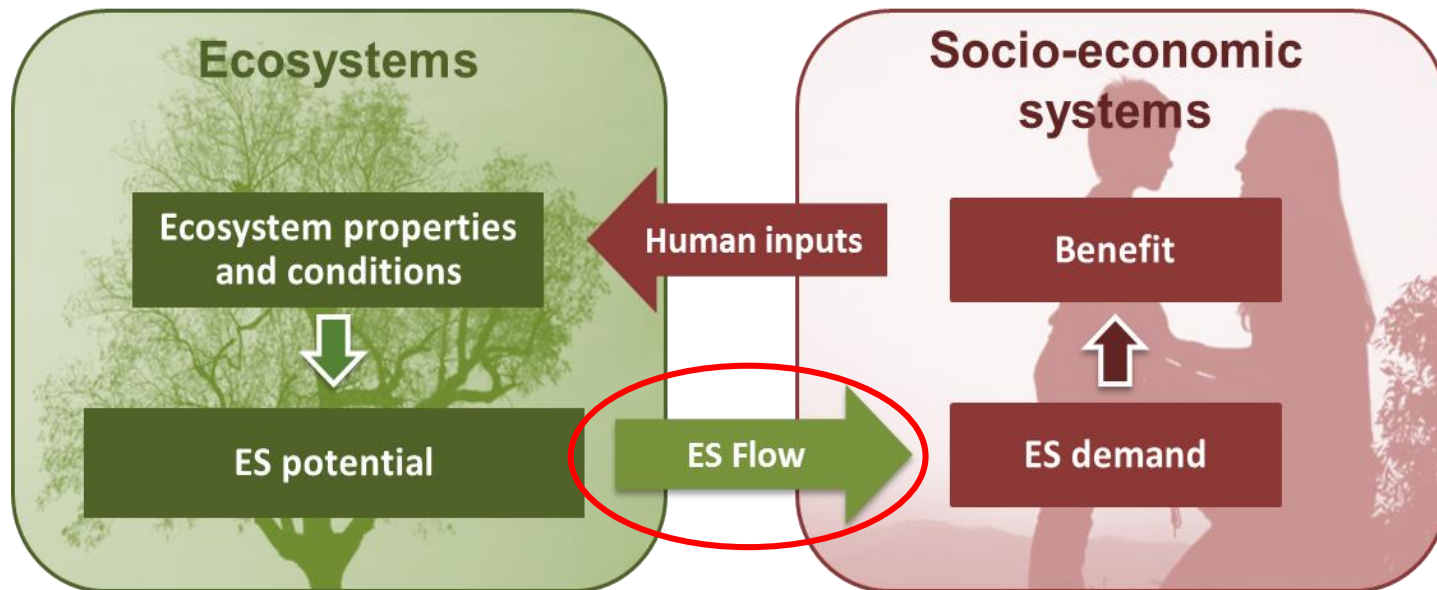
Source-productivity

Role of the ecosystem	Fate of matter/energy/information	Description	Examples
Source: productivity	Net delivery of biomass or energy eventually leaving the ecosystem	Ecosystems act as sources of matter and energy in the form of biomass. Reference with other classification systems: provisioning services.	Generation of mass and biomass

There is a regeneration rate that can be exceeded

European Commission
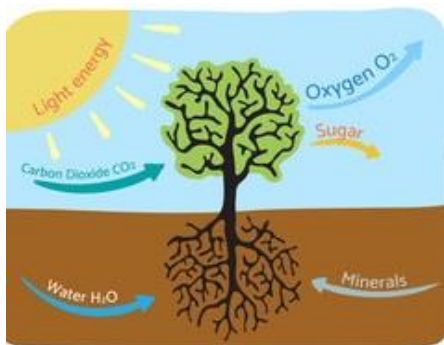
Crop provision

Crop provision
POTENTIAL FLOW

DEMAND for
crop provision

SEEA EEA
supply and
use tables

Use (Actual flow)

BENEFIT

European
Commission
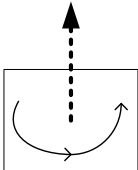
Ecosystem Contribution to crop provision
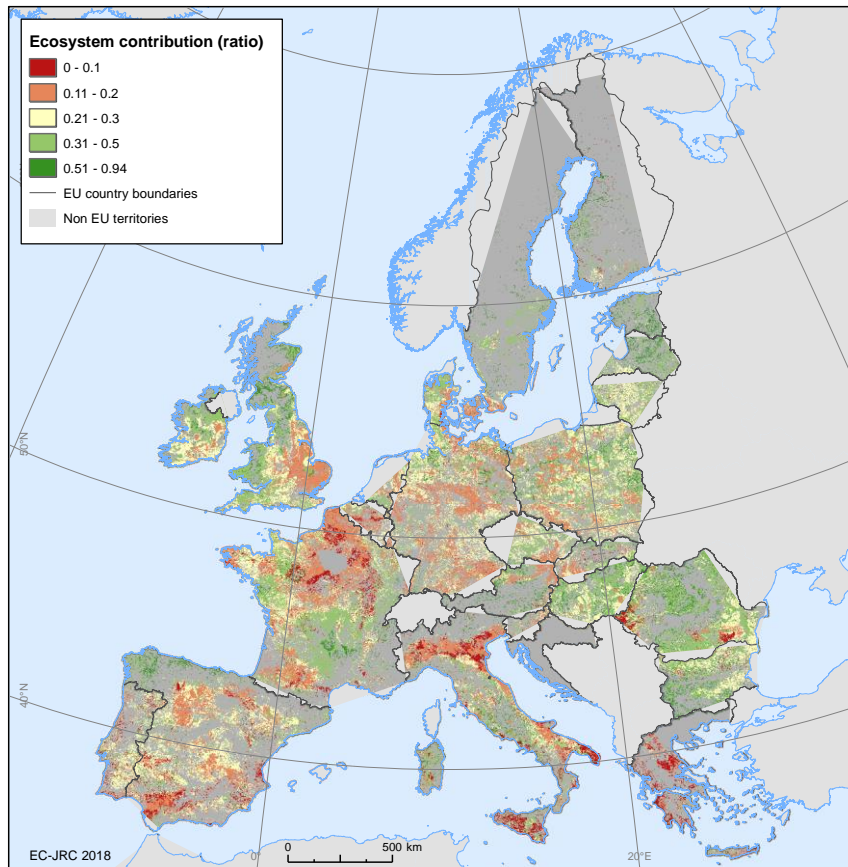
Crop provision actual flow

Ecosystem contribution (ratio)
- 0 - 0.1
- 0.11 - 0.2
- 0.21 - 0.3
- 0.31 - 0.5
- 0.51 - 0.94
- EU country boundaries
- Non EU territories

EC-JRC 2018

Yield derived from the ecosystem contribution (ton/km^2 in 2008)
- 0 - 25
- 26 - 100
- 101 - 200
- 201 - 500
- > 500
- Non EU territories
- No data

EC-JRC 2018

European Commission
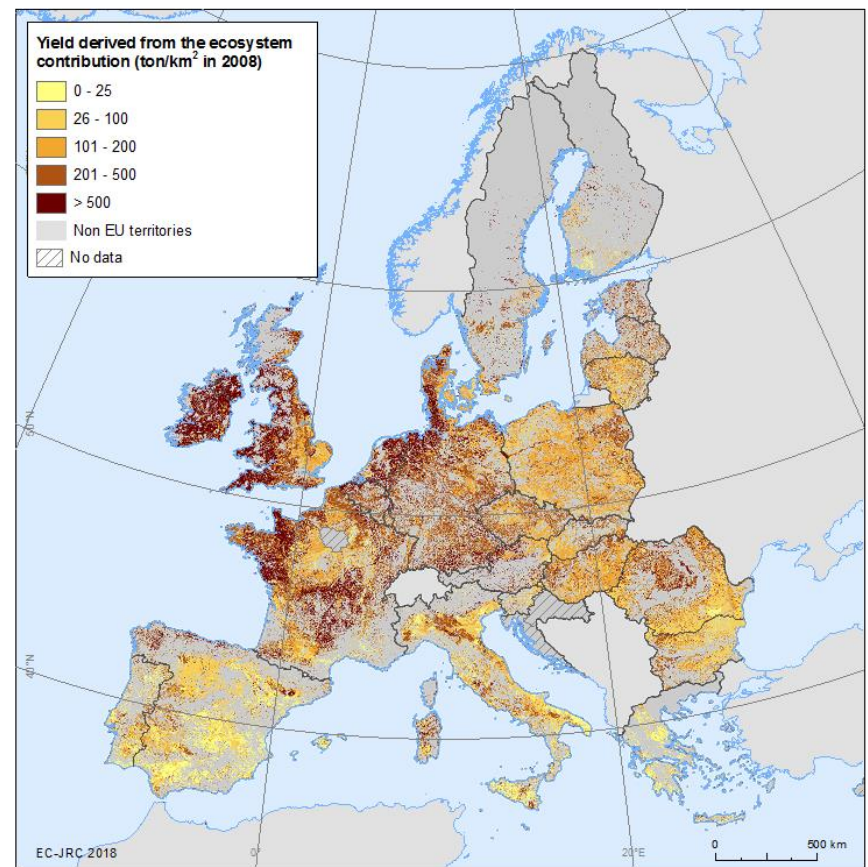
Source-suitability

Role of the ecosystem	Fate of matter/energy/information	Description	Examples
Source: suitability	Delivery of biomass and energy generated within the ecosystem	Ecosystems act as sources of matter and energy by providing suitable habitats. Reference with other classification systems: regulating services (CICES), supporting services (MA), habitat services (TEEB)	Habitat maintenance, pollination, pest control and diseases control

Initial conditions matter

European Commission

Crop pollination by wild insects

Wild bees

Pollinator-dependent crops

Pollination **POTENTIAL**

DEMAND for pollination

SEEA EEA accounting tables

USE of crop pollination

BENEFIT

European Commission
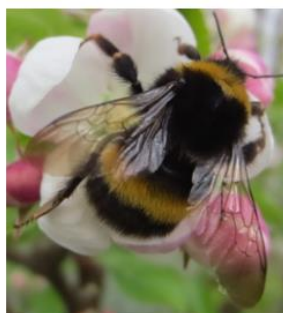
Crop pollination potential
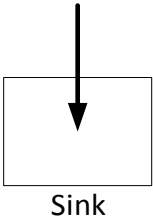
Actual flow of crop pollination

Pollination potential
0.55
0.02
Non EU territories

EC-JRC 2017

Actual flow in 2006
kg/year
8,525 - 10,000
10,001 - 15,000
15,001 - 30,000
> 30,000
Non EU territories

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Legend

- **A.** High potential, high demand
- **B.** High potential, medium demand
- **C.** High potential, low demand
- **D.** High potential, no demand
- **E.** Medium potential, high demand
- **F.** Medium potential, medium demand
- **G.** Medium potential, low demand
- **H.** Medium potential, no demand
- **I.** Low potential, high demand
- **J.** Low potential, medium demand
- **K.** Low potential, low demand
- **L.** Low potential, no demand
- **M.** No potential, high demand
- **N.** No potential, medium demand
- **O.** No potential, low demand
- *No data*
- Non EU territories

EC-JRC 2017

0 500 km

Unused potential and unmet demand

European Commission

Sink

Role of the ecosystem	Fate of matter/energy/information	Description	Examples
Sink	Matter or energy absorbed by the ecosystem	Ecosystems act as sink to store, immobilize or absorb matter. Reference with other classification systems: regulating services (CICES and TEEB), supporting services (MA).	Absorbing pollutants, carbon, nutrients, heat assimilation

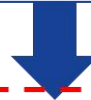## There is an absorption rate that can be exceeded

European Commission
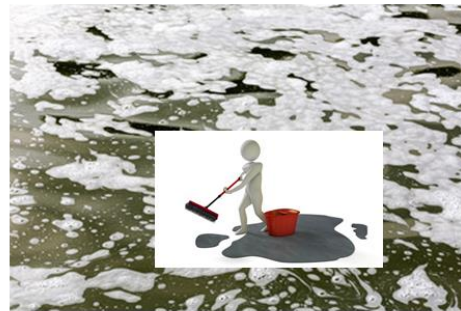
Water purification by inland waters

Water Purification
POTENTIAL FLOW

Water purification
enabling actors
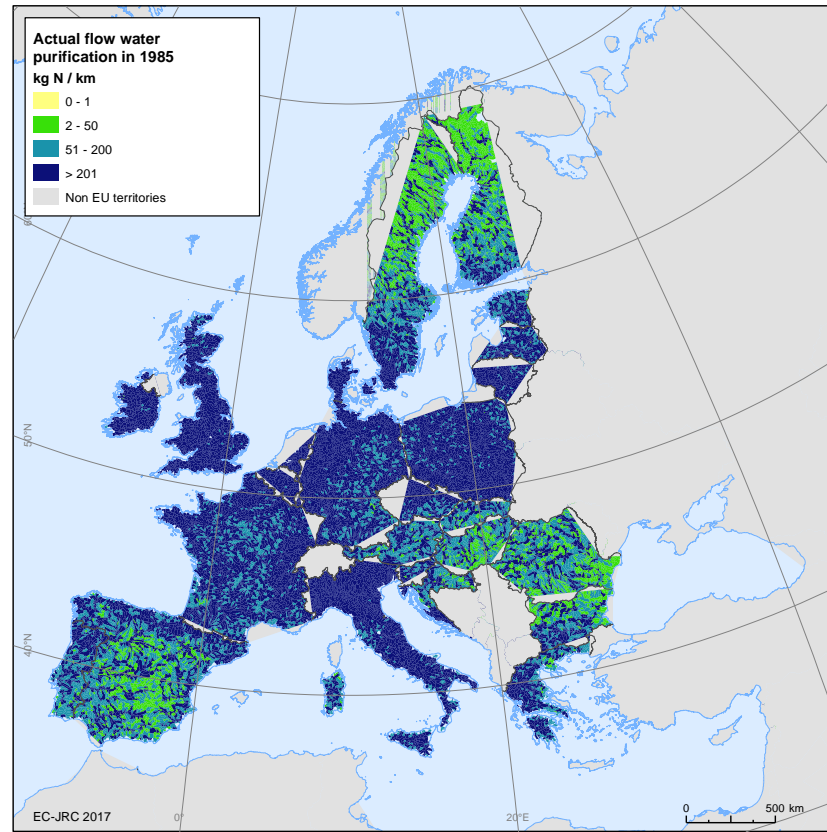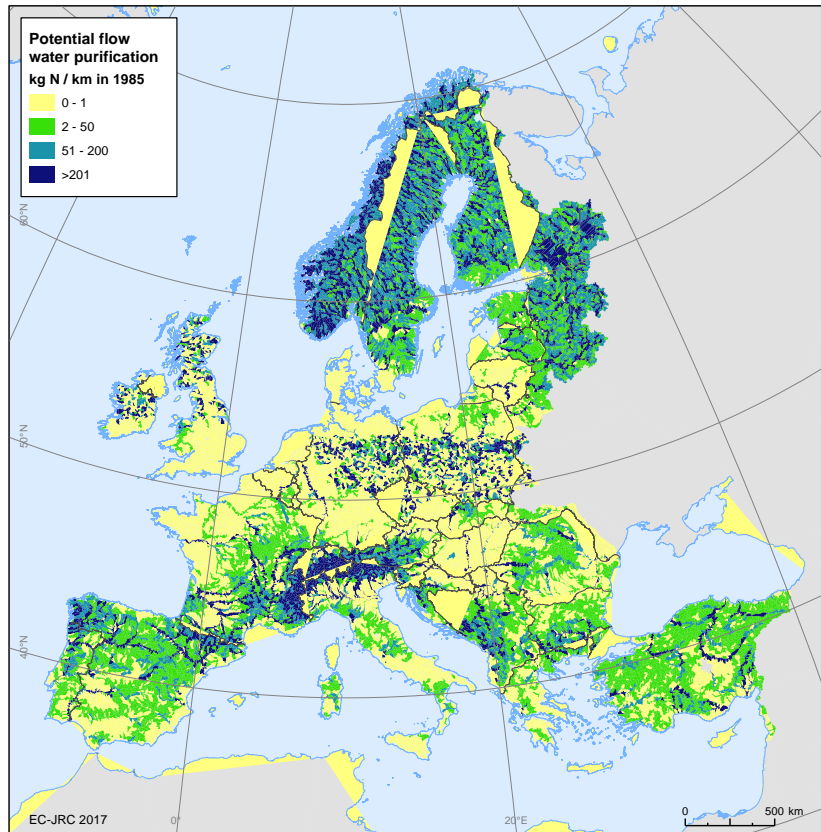
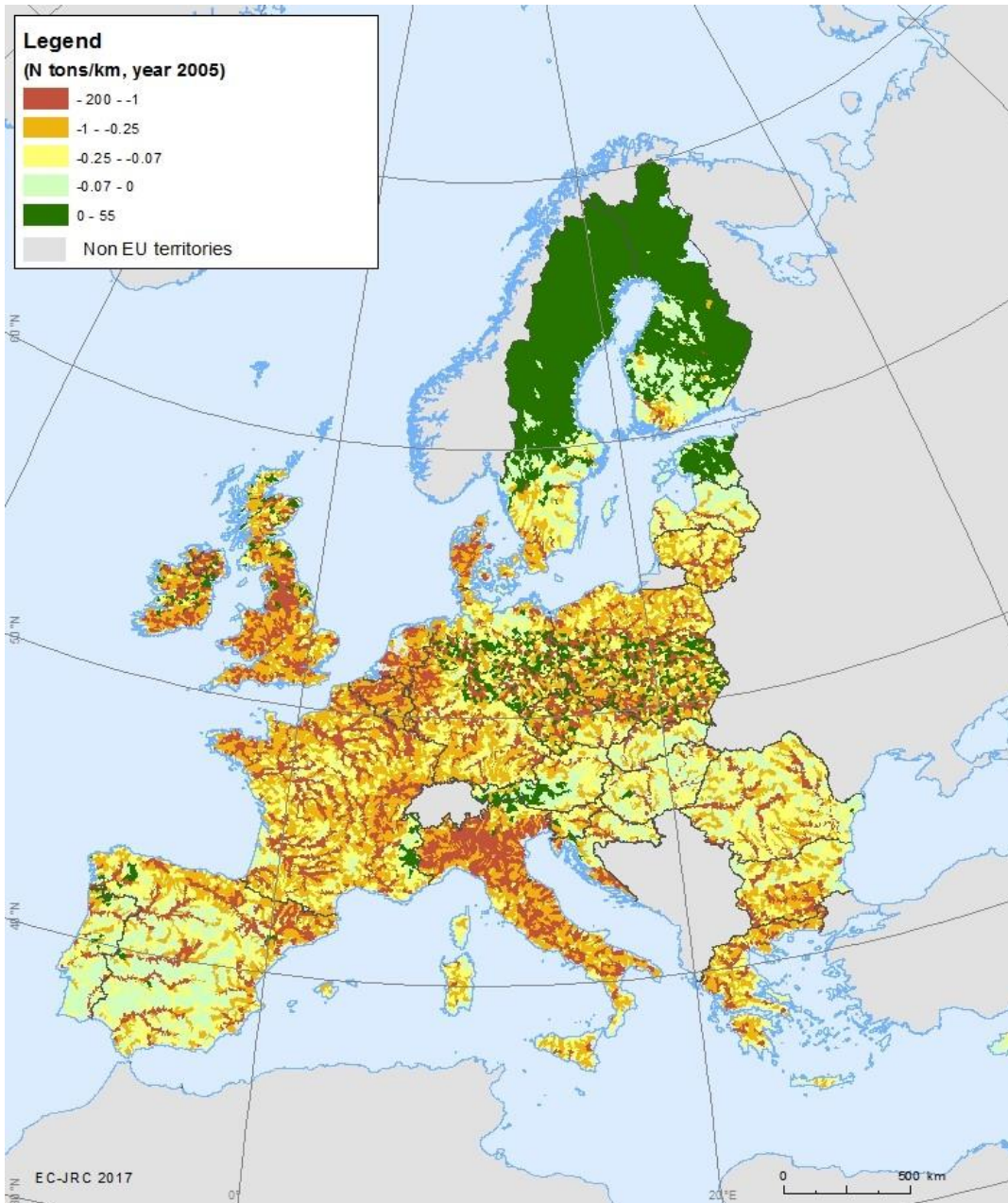**Use** (Actual flow)

SEEA EEA
supply and
use tables

BENEFIT

European
Commission

Water purification

potential flow

actual flow
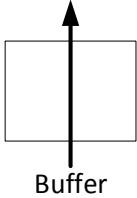
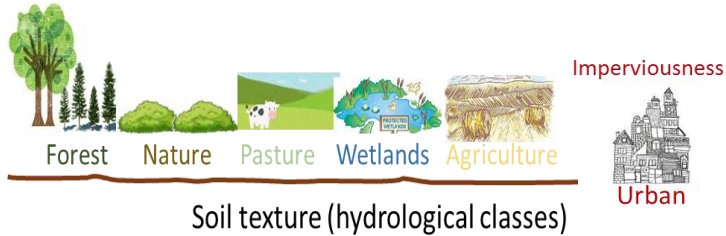Considering a threshold of 1mg/l

Overused service

Legend
(N tons/km, year 2005)
- 200 - -1
-1 - -0.25
-0.25 - -0.07
-0.07 - 0
0 - 55
Non EU territories

EC-JRC 2017

0   500 km

European Commission

Buffer

Role of the ecosystem	Fate of matter/energy/information	Description	Examples
Buffer	Matter or energy flowing through the ecosystem	Ecosystems act as a transformer changing the magnitude of flows of matter or energy. Reference with other classification systems: regulating services.	Water retention, flood control

Initial conditions matter

Flood control

Runoff retention by ecosystems

Imperviousness

Forest Nature Pasture Wetlands Agriculture

Soil texture (hydrological classes)

Urban

Economic assets in flooding areas

Flood control **POTENTIAL**

Service Providing Areas (SPA)

DEMAND for flood regulation

Service Benefiting Areas (SBA)

SEEA EEA accounting tables
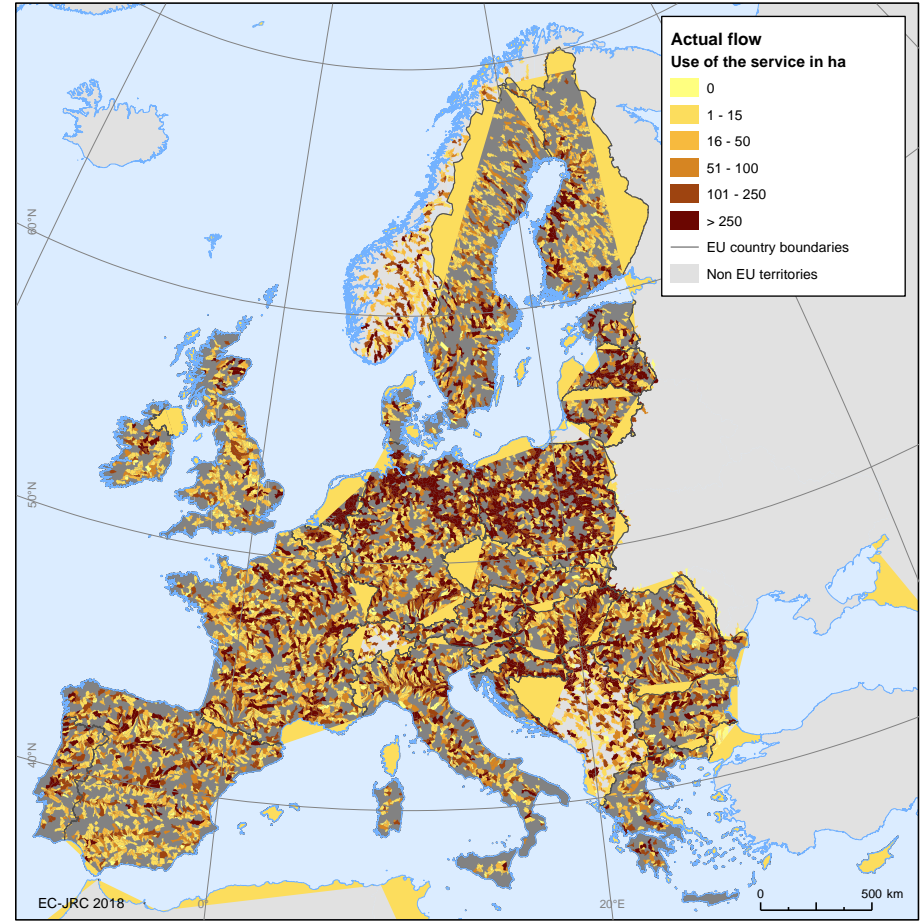
USE (Actual flow)
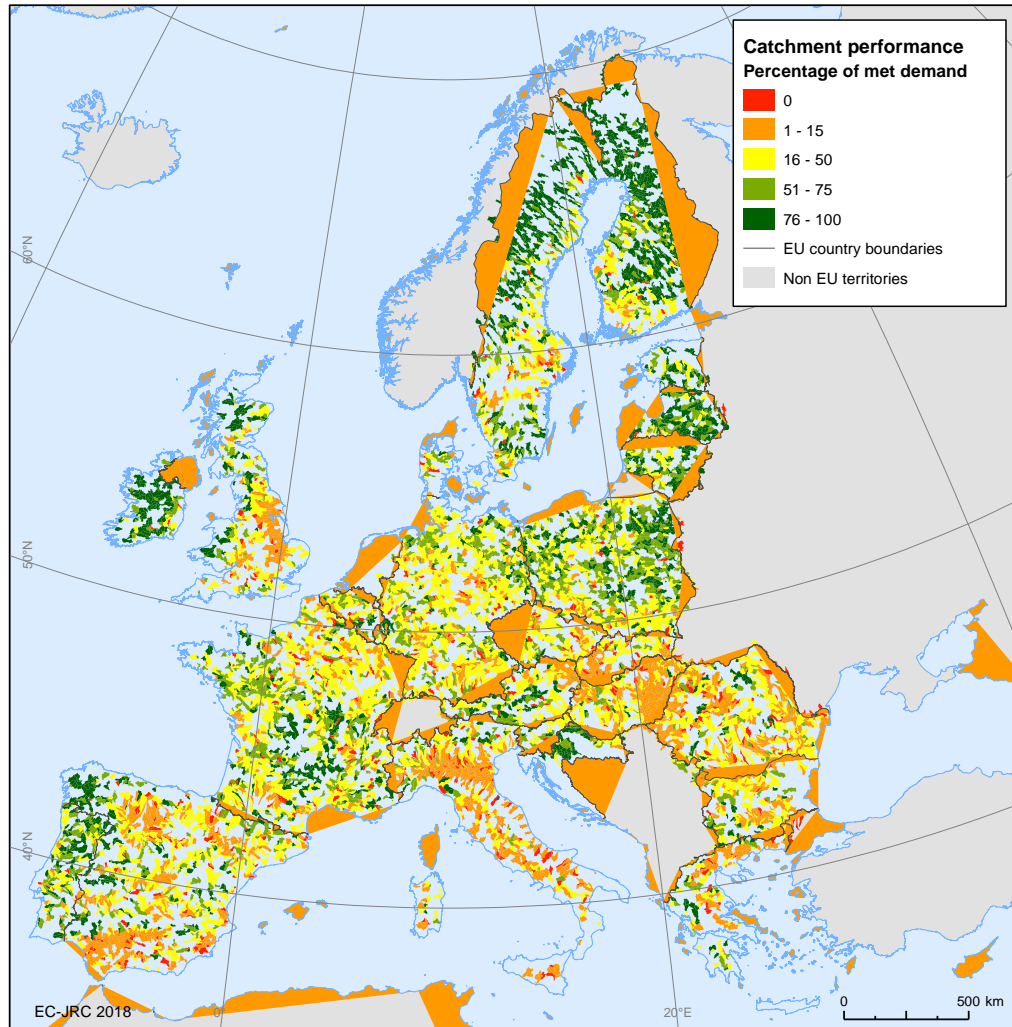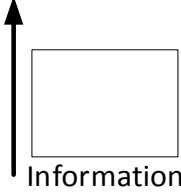
European Commission
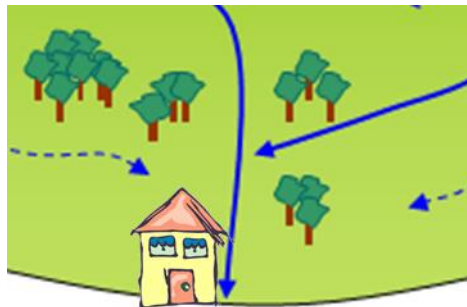
Flood control potential

Flood control actual flow

Unmet demand

Information

Role of the ecosystem	Fate of matter/energy/information	Description	Examples
Information	Information delivered by the ecosystem	Ecosystems deliver information The information generated does not modify the original state of the ecosystem. Reference with other classification systems: cultural services.	Scenic view, outdoor recreation activities, scientific investigation

Initial conditions matter

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Nature-based local outdoor recreation

Ecosystem-based

Land cover, water quality, protected areas)

+

Human inputs

Proximity (roads, urban areas)

People

Potential
('Areas for daily recreation')

Demand

SEEA EEA accounting tables

Use (actual flow)

Benefits

Well being

Opportunities for business

European Commission

Outdoor recreation potential
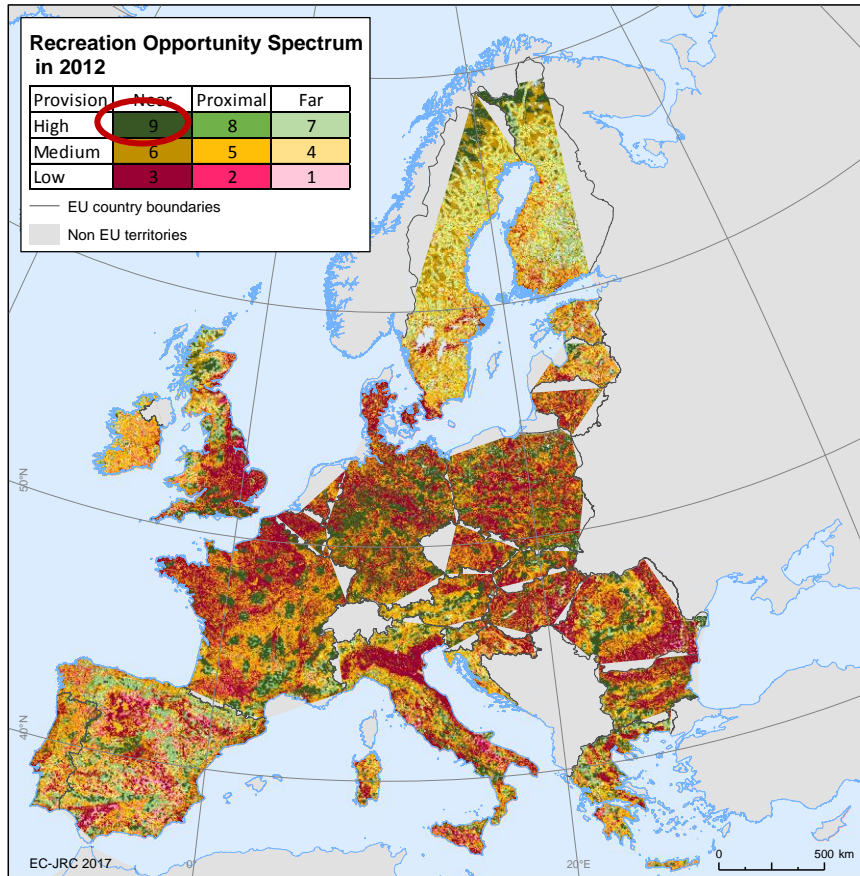
Outdoor recreation actual flow
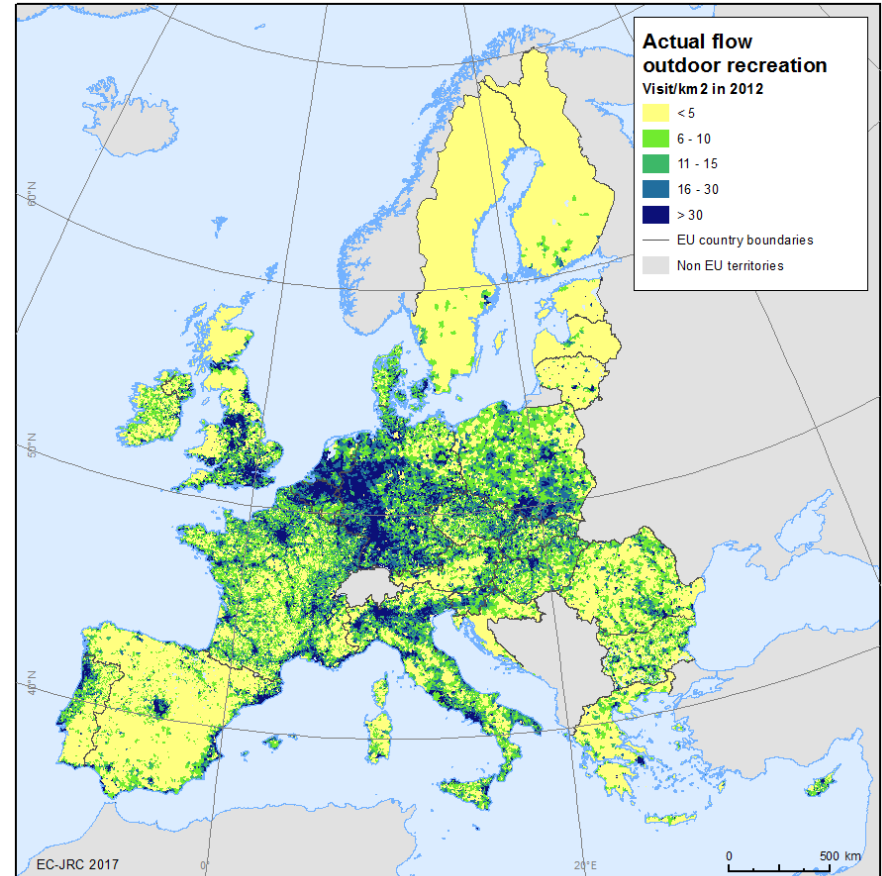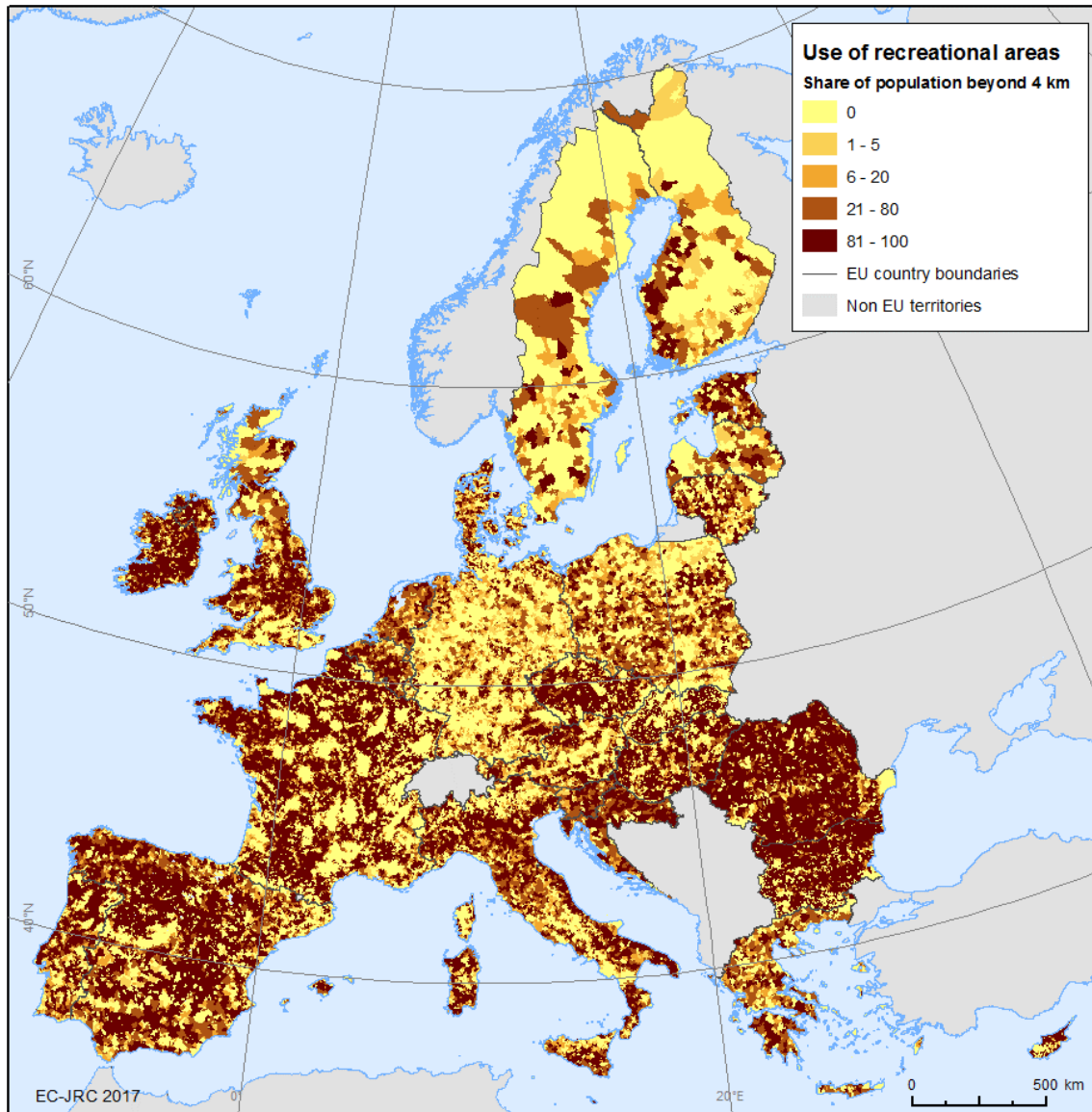
Recreation Opportunity Spectrum in 2012

Provision	Near	Proximal	Far
High	9	8	7
Medium	6	5	4
Low	3	2	1

— EU country boundaries
⬜ Non EU territories

EC-JRC 2017

0 — 500 km

Actual flow outdoor recreation
Visit/km 2 in 2012

- < 5
- 6 - 10
- 11 - 15
- 16 - 30
- > 30
— EU country boundaries
⬜ Non EU territories

EC-JRC 2017

0 — 500 km

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Unmet demand

Use of recreational areas
Share of population beyond 4 km
- 0
- 1 - 5
- 6 - 20
- 21 - 80
- 81 - 100
- EU country boundaries
- Non EU territories

EC-JRC 2017

0   500 km

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When mismatch occurs

Issue #1: accounting identity

The accounting identity is not violated.

Complementary accounts (potential flows + mismatch flows) are not recorded as actual transaction; they only matters when calculating the "depreciation of fixed capital" for ecosystem types

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Example:
water purification actual flow and mismatch accounts

Role of enabling actors: who drives changes in the actual flow…

…what is the impact of these changes?

EU 25					
Agriculture	18,467.93	18,417.70	18,372.09	18,317.43	18,223.31
Other sectors	355.71	357.98	360.24	353.31	331.71

water bodies	-11,737.75	-11,494.03	-11,943.97	-10,777.94	-9,165.49
other land	-	-	-	-	-

Actual Flow (Euro/km)

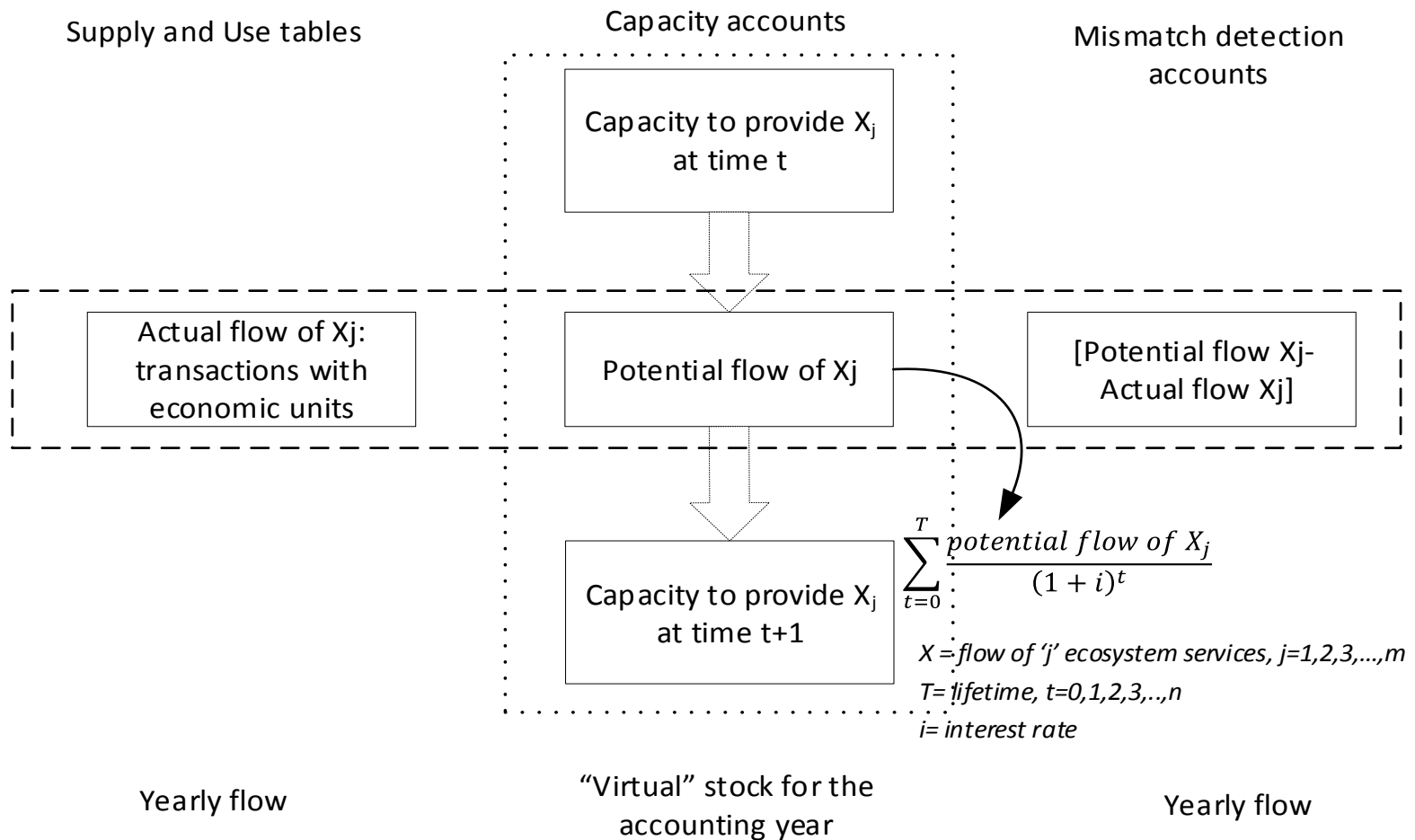Sustainability path (Euro/km)

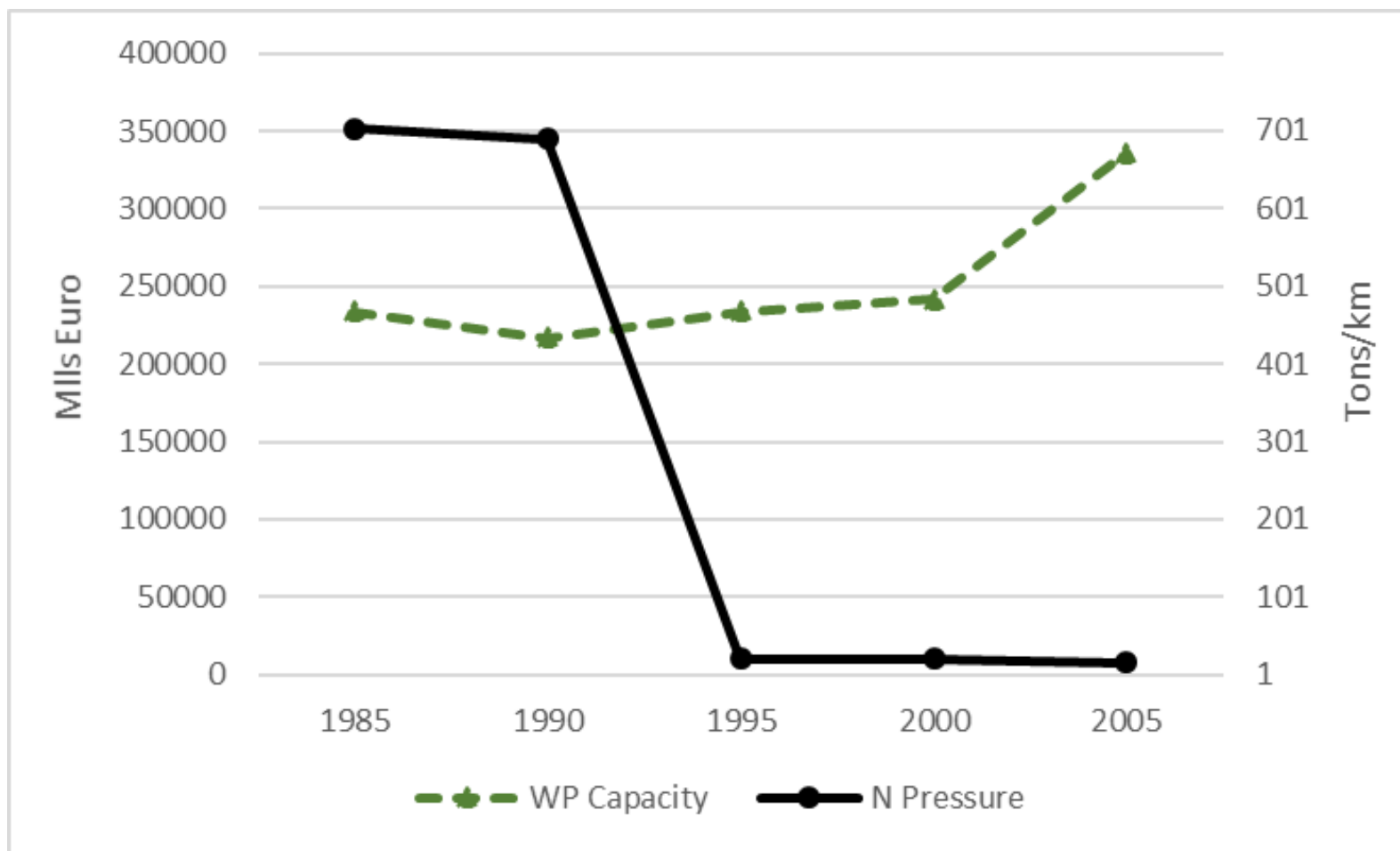European Commission
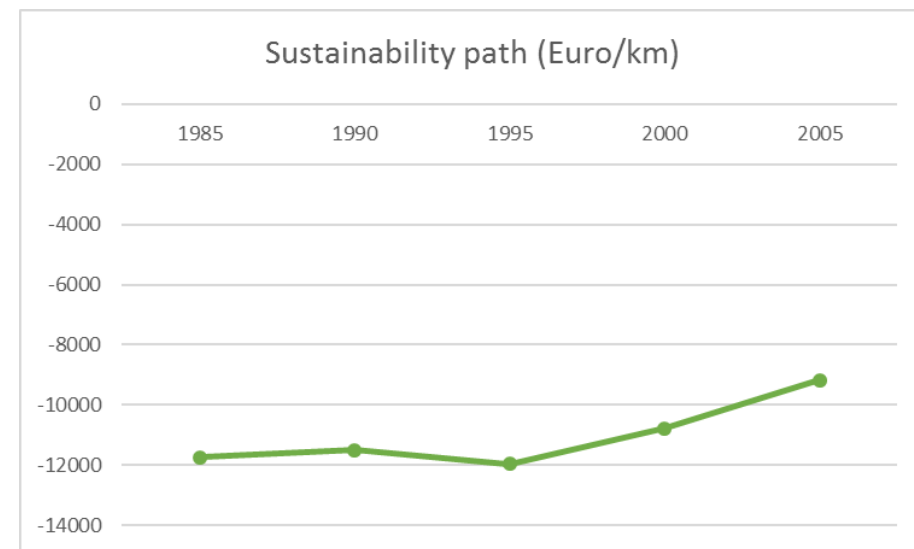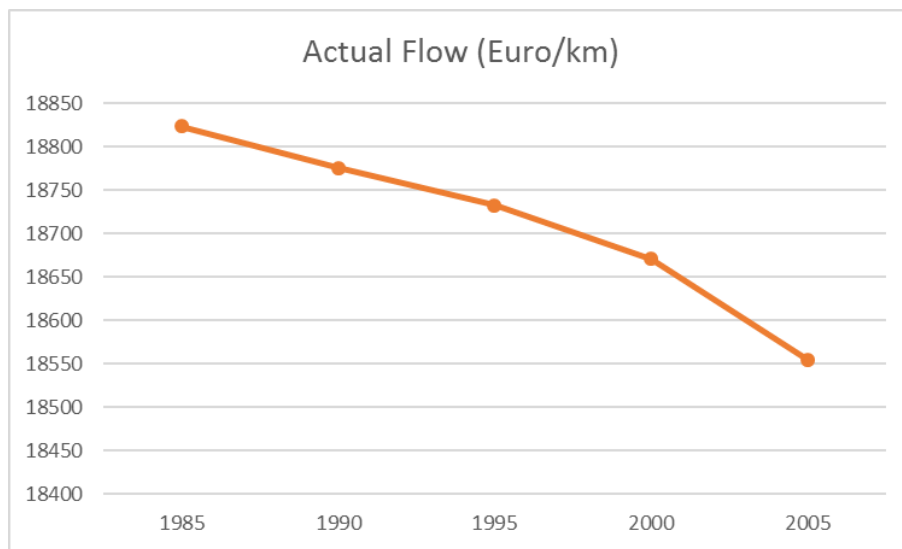
Issue #2: what is the "big deal"?

The calculation of Capacity in monetary terms as NVP:

- should consider the potential flow rather than the actual flow for source-productivity and sink services
- should consider the actual flow for all the other service

How?

Supply and Use tables

Capacity accounts

Mismatch detection accounts

Capacity to provide X_j at time t

Actual flow of Xj: transactions with economic units

Potential flow of Xj

[Potential flow Xj- Actual flow Xj]

Capacity to provide X_j at time t+1

$$\sum_{t=0}^{T} \frac{potential\ flow\ of\ X_j}{(1+i)^t}$$

X = flow of 'j' ecosystem services, j=1,2,3,...,m
T= lifetime, t=0,1,2,3,..,n
i= interest rate

Yearly flow

"Virtual" stock for the accounting year

Yearly flow

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Example: water purification capacity

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