The European Commission's science and knowledge service

Joint Research Centre

MAES initiative and environmental data integration across Europe

Sara Vallecillo, Grazia Zulian, Chiara Polce & Joachim Maes

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Contents

- EU biodiversity strategy to 2020: Target 2
- Mapping and Assessment of Ecosystem Services (MAES): Action 5
- MAES (Action 5) ➡ GI prioritization (Action 6)
- Biodiversity data integration across Europe

EU 2020 Biodiversity Strategy

- Adoption of a **long term (2050)** vision: '*biodiversity and the ecosystem services it provides are protected, valued and appropriately restored...*`

- Adoption of a **mid term (2020)** headline target:

> *Halting the loss of biodiversity **and the degradation of ecosystem services in the EU by 2020, and restoring them in so far as feasible**, ...*

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

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Action 5. Improve the knowledge of ecosystems and their services in the EU (MAES)

"*Member States, with the assistance of the Commission, will map and assess the state of ecosystems and their services in their national territory by 2014, assess the economic value of such services, and promote the integration of these values into accounting and reporting systems at EU and national level by 2020*"

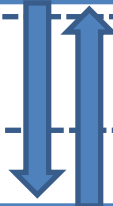# Action 6. Set priorities to restore and promote the use of green infrastructure

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Other targets (Target 1, 3, 4, 5, 6...)

Knowledge base

Action 5
• Mapping and assessment of ecosystems and services (by 2014)
• Economic value assessment and integration into accounting and reporting systems (by 2020)

Policy tools and initiatives

Action 6
• Restoration and prioritisation framework
• Green Infrastructure Strategy

Target 2
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The MAES approach

MAES working group
- Conceptual model linking biodiversity to human well-being
- Typologies for ecosystems and ecosystem services (CICES 4.3)
- Common Assessment Framework

EU institutions
- EEA: mapping and assessment of ecosystem and ecosystem condition, BISE
- JRC: Mapping ecosystem services
- ENV: Guidance and training
- RTD: Horizon 2020

Member States (MS)
- MAES started in almost all MS
- Some MS have completed a national scale mapping
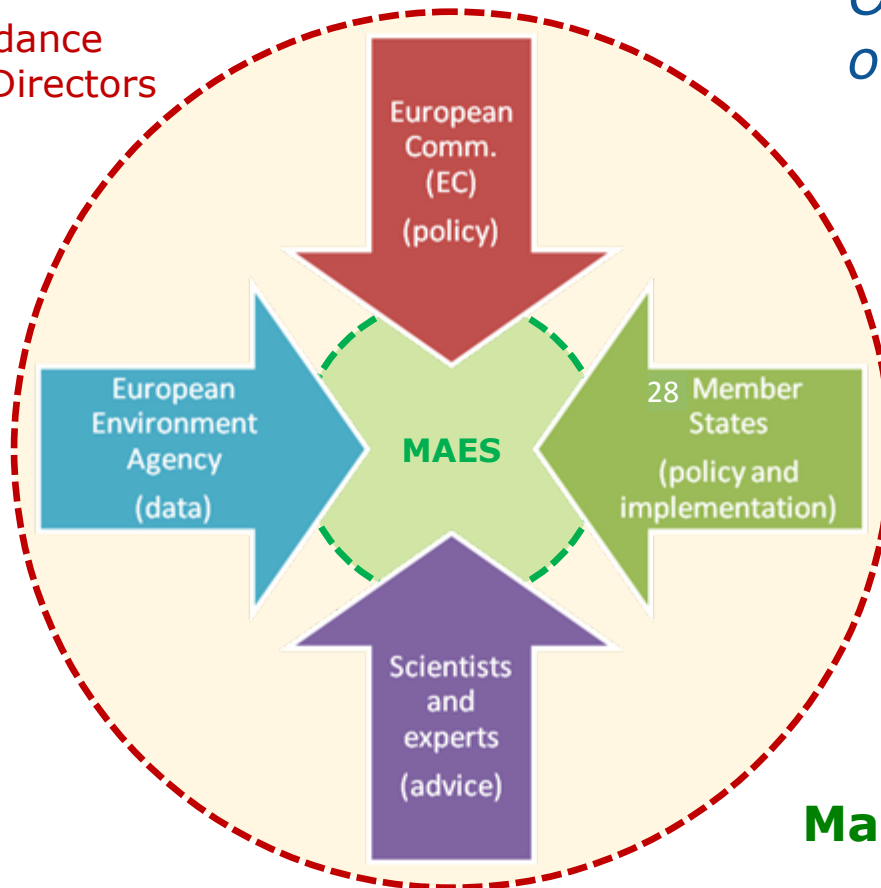- Many MS have regional case studies, cities

Science Policy Interface
- ESMERALDA: A dedicated coordination and support action
- FP7 projects OpenNESS, OPERAs, MARS
- Ecosystem Services Partnership,
- IPBES

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Working group MAES on Mapping and Assessment of Ecosystems and their Services

Overall guidance
by Nature Directors

Oversees implementation of Action 5

European Comm. (EC) (policy)

European Environment Agency (data)

MAES

28 Member States (policy and implementation)

Scientists and experts (advice)

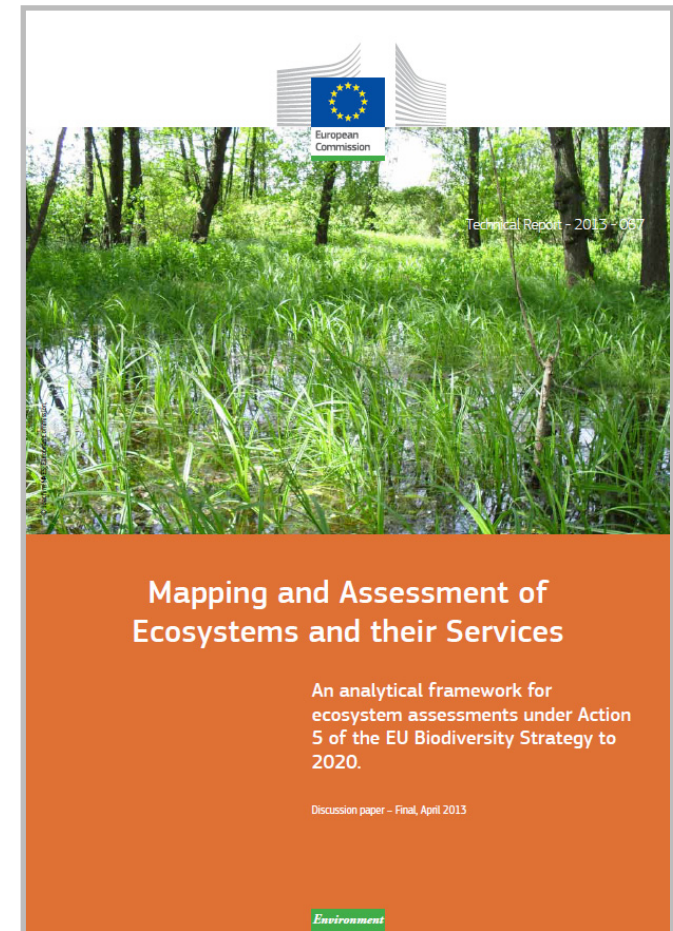**Main output: 4 MAES reports**

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The MAES approach: providing guidance to the Member States

1st MAES report

Coherent analytical framework:

CICES classification of ESs

Mapping and Assessment of Ecosystems and their Services

An analytical framework for ecosystem assessments under Action 5 of the EU Biodiversity Strategy to 2020.

Discussion paper – Final, April 2013
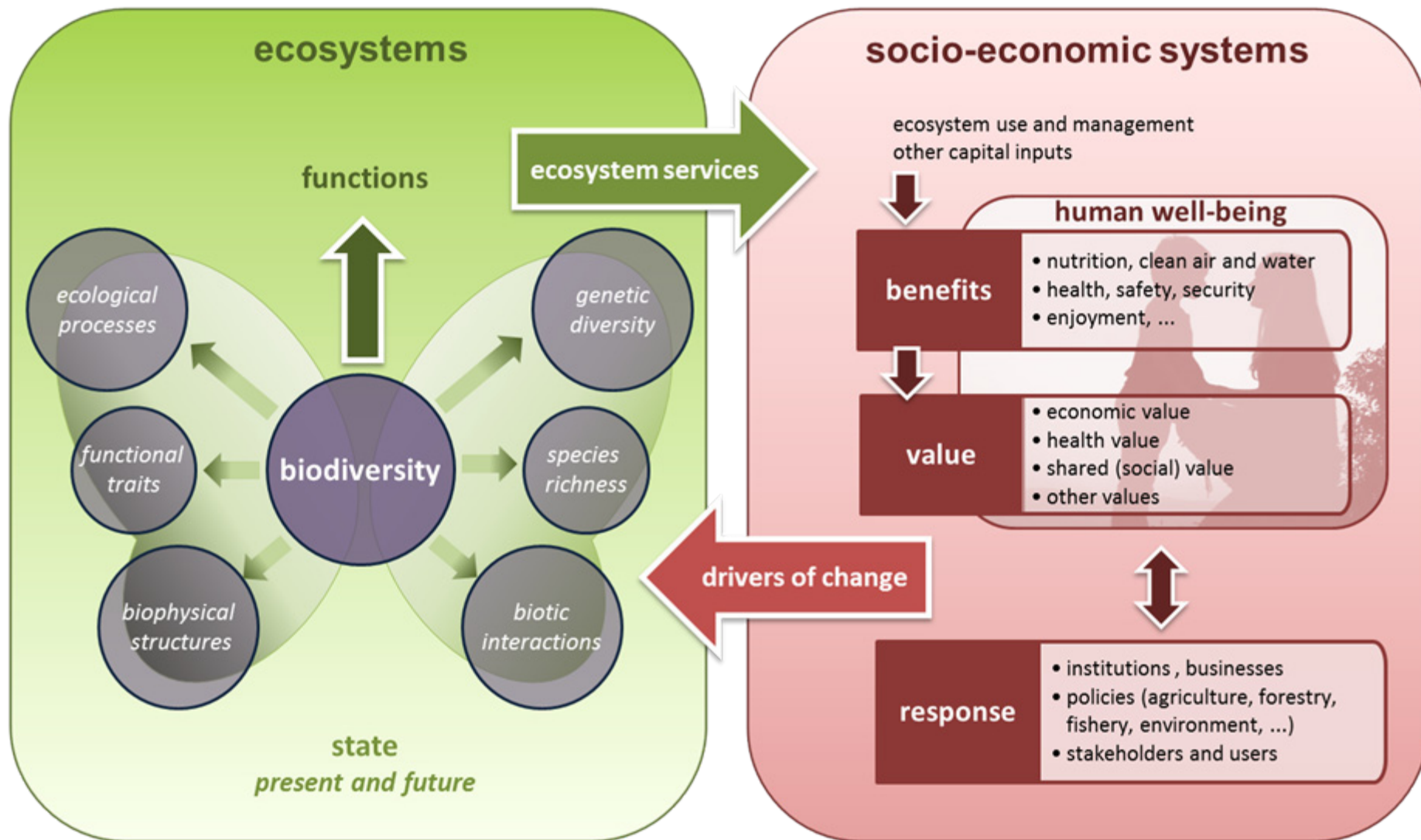
2ⁿᵈ MAES report

Indicators towards an integrated assessment

Mapping and Assessment of Ecosystems and their Services

Indicators for ecosystem assessments under Action 5 of the EU Biodiversity Strategy to 2020

2nd Report - Final, February 2014

(1) Map ecosystems

	Land use land cover data, e.g.
Urban	Corine Land Cover
Cropland	Copernicus high resolution data
Grassland	Elevation data
Woodland and forest	Seabed maps
Heathland and shrub	National datasets
Sparsely vegetated land	
Wetlands	
Rivers and lakes	Models for spatially delineating wetlands or natural, unmanaged systems
Marine inlets and transitional waters	
Coastal	
Shelf	
Open ocean	

(2) Assess the condition of ecosystems

| Indicators	Data
Conservation status of habitats and species	Art.17 assessment
Ecological status of water bodies	WFD assessment
Environmental status of seas	MSFD assessment
Ecosystem status and biodiversity	data including air pollutant concentration, habitat connectivity, land use change, soil degradation, ...

(3) Assess te ecosystem services delivered by ecosystems

Indicators	Data and models
Supply indicators: Indicators of stock and flow of ecosystem functions and ecosystem services	Different sources of environmental data and models
Demand indicators: Indicators for the human demand for ecosystem services	Different socio-economic statistics

(4) Integrated ecosystem assessment:
How does condition relate to services provision?
How do the various ecosystem types interact to provide services?

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3rd MAES report

Mapping and assessment the condition of Europe's ecosystems
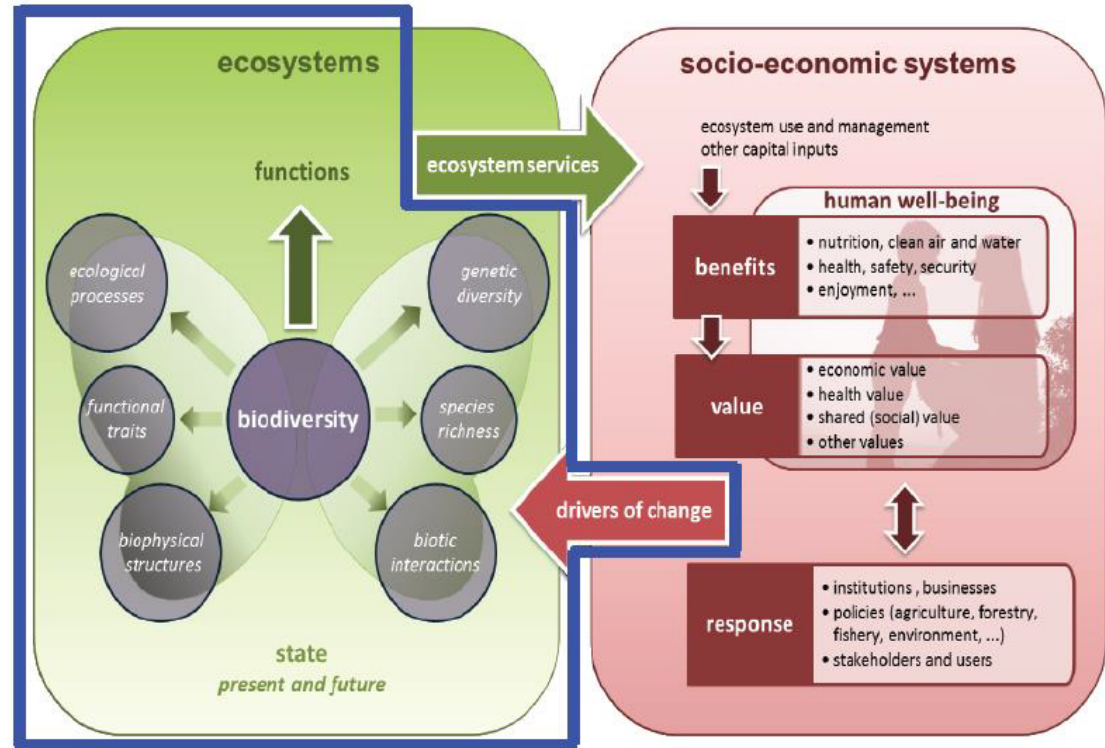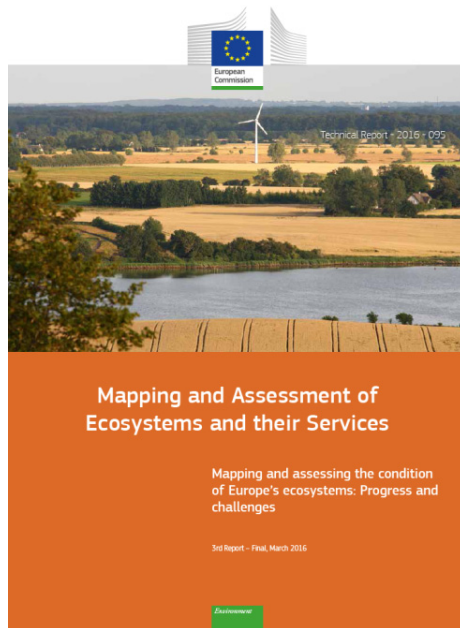
Pressures (direct impacts: invasive alien species...) and condition (conservation status and trends for habitats and species) for the MAES ecosystems
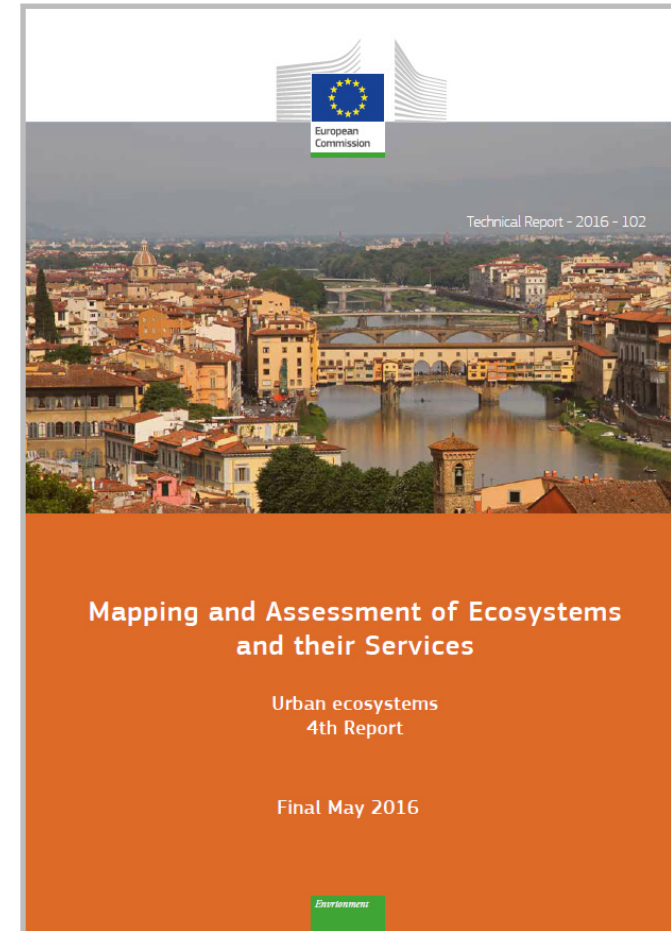
4th MAES report

MAES pilot for urban ecosystems

Multi-methods approach

- **Survey**
- **Literature review**

Networking (workshops)

Technical Report - 2016 - 102

Mapping and Assessment of Ecosystems and their Services

Urban ecosystems
4th Report

Final May 2016

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The role of the JRC within MAES

- **Leadership** of the MAES reports on ecosystem services

- **Scientific support** to the MAES working group and MS

- European based **assessment of ecosystem services:**

ESTIMAP
Collection of spatially explicit and
dynamic models for ecosystem services

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Section	Group	Indicator	Spatial scale	
			European	Urban
Provisioning	Water	**Water consumption by sectors**	X	X
Regulation and maintenance	Mediation by ecosystems	**Capacity of ecosystem to remove air pollutants**		X
	Mass flows	**Capacity of the Land Cover to prevent soil erosion**	X	
	Liquid flows	**Capacity of coastal ecosystem to protect against inundation and erosion from waves, storm or sea level rise**	X	
		Capacity for retention of water in the landscape	X	
	Lifecycle maintenance, habitat and gene pool protection	**Capacity of ecosystems to sustain insect pollinators activity**	X	X
		Habitat quality for common birds	X	
	Pest and disease control	**Richness of pest-control providers**	X	
Cultural	Physical and experiential interactions	**Recreation and cultural services**	X	X

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# Changes in ecosystem services under a References Scenario 2014 for Europe
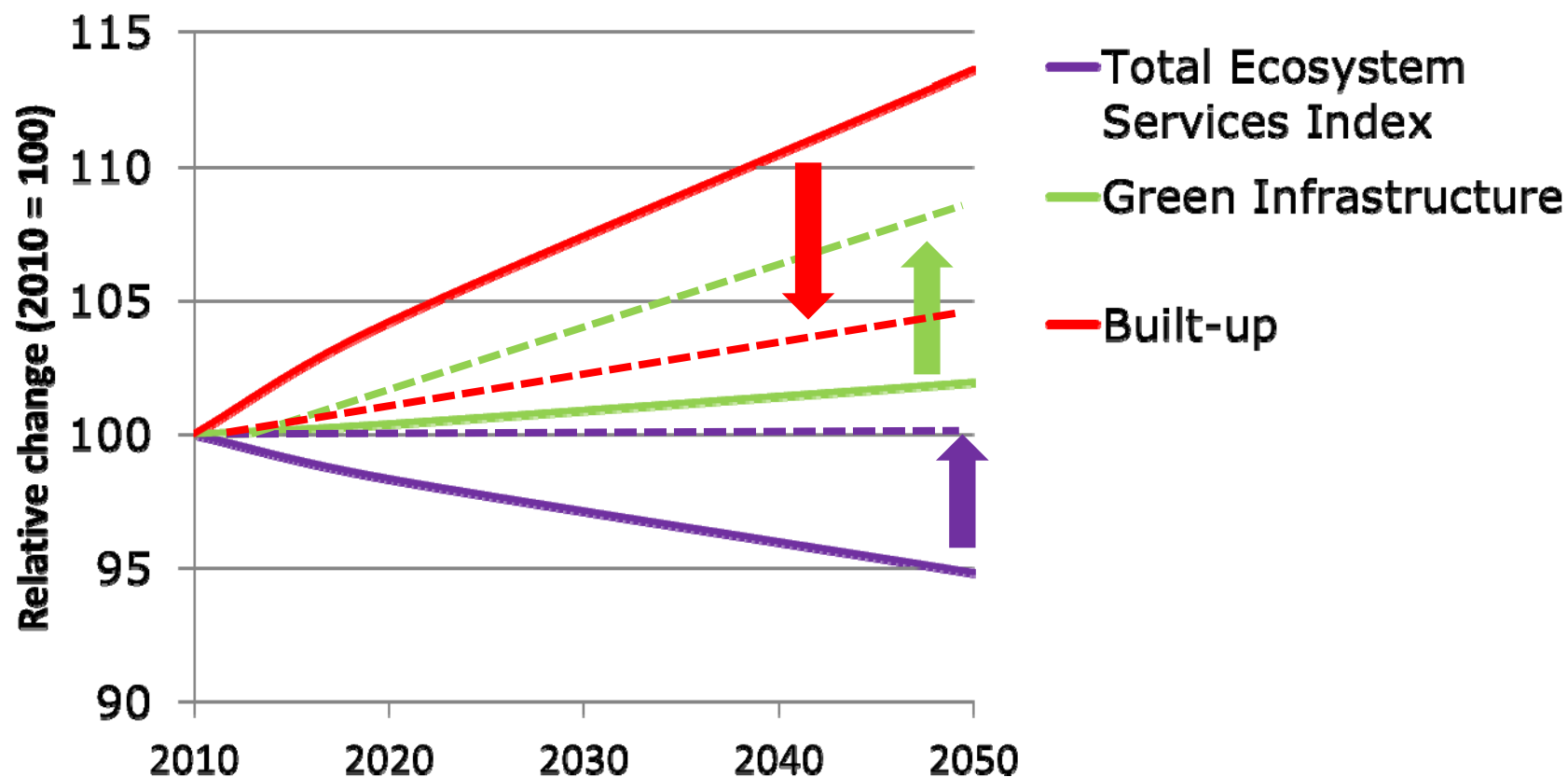
Maes *et al.* (2014) More green infrastructure is required to maintain ecosystem services under current trends in land-use change in Europe. Landscape Ecology

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Modelling ecosystem services: Support to regional policy

Investment for jobs and growth
Promoting development and good governance in EU regions and cities

Sixth report on economic, social and territorial cohesion

July 2014

Figure 3.14 Green infrastructure and the delivery of ecosystem services, EU NUTS 2 regions

Green Infrastructure (% of total land surface)
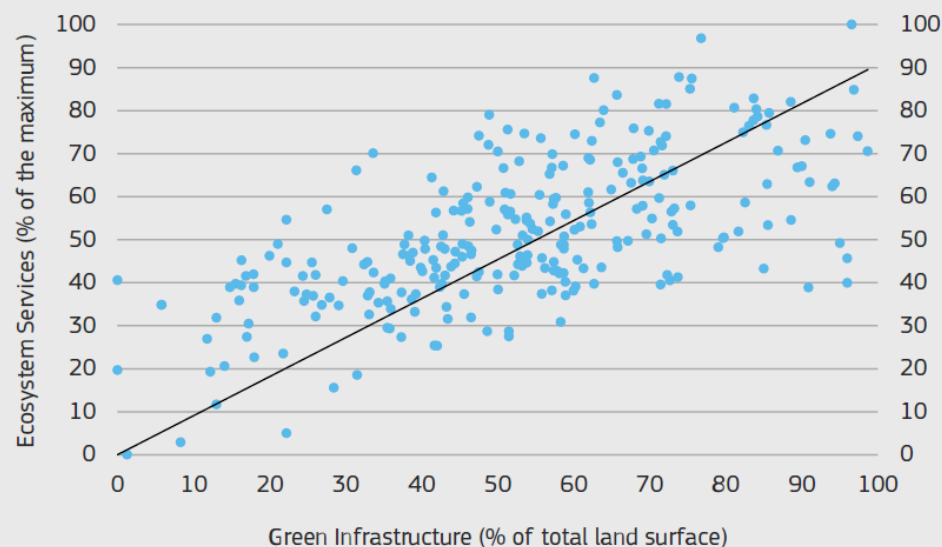
Source: Maes, J. et al. (2012)

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Prioritisation framework for investment in Green Infrastructure (FP7-OpenNESS)

1. Define functional GI network:

- Guarantee the delivery of ESs
- Support biodiversity

2. Cost-benefit assessment of different restoration measure for decision support at EU level

Systematic Conservation Planning: optimize the selection of key areas

Marxan
Informing Conservation Decisions Globally

Objectives to prioritize GI	
ECOSYSTEM SERVICES MODELLED WITH ESTIMAP	
Section	**Indicators (units)**
Regulation and maintenance	Capacity of ecosystems to avoid soil erosion (dimensionless between 0-1)
	Water Retention Index (dimensionless between 0-10)
	Pollination potential (dimensionless between 0-1)
	Habitat quality for forest common birds (dimensionless ratio)
	Habitat quality for farmland common birds (dimensionless ratio)
	Potential pest control by bird species (species richness)
	Net ecosystem productivity (normalised index between 0-1)
Cultural	Outdoor recreation potential
BIODIVERSITY	
Important areas for biodiversity	Groups
	Amphibians
	Birds
	Mammals

Biodiversity important areas

- Priority species from **Birds and Habitats Directives**

- Land suitability for priority species **(BIOSCORE)**

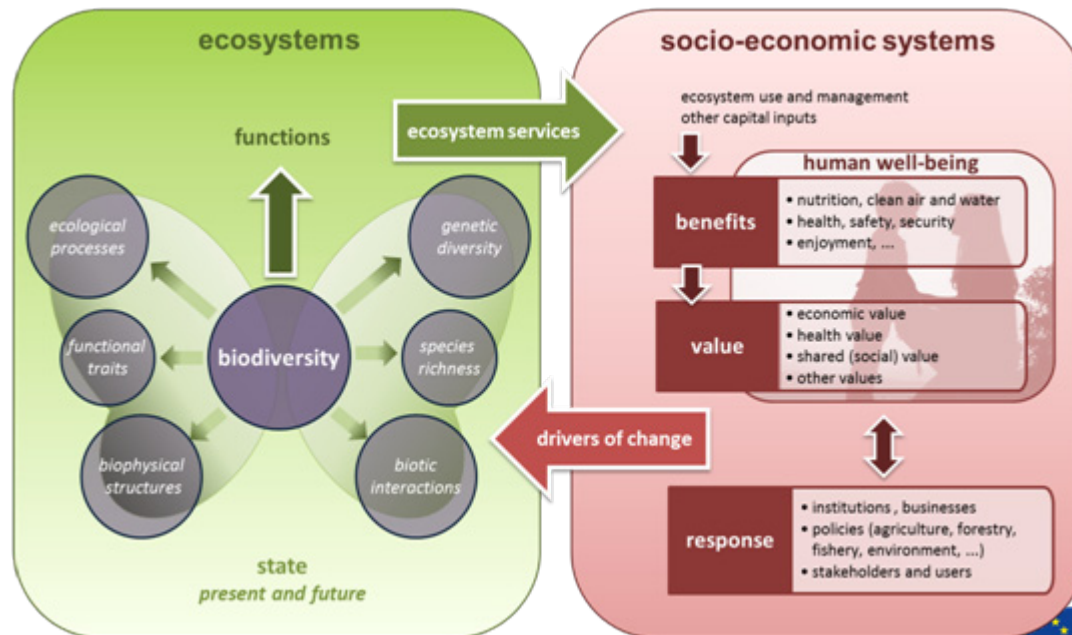- Species richness (**IUCN, BirdLife International**)


Importance for Biod.
High
Low

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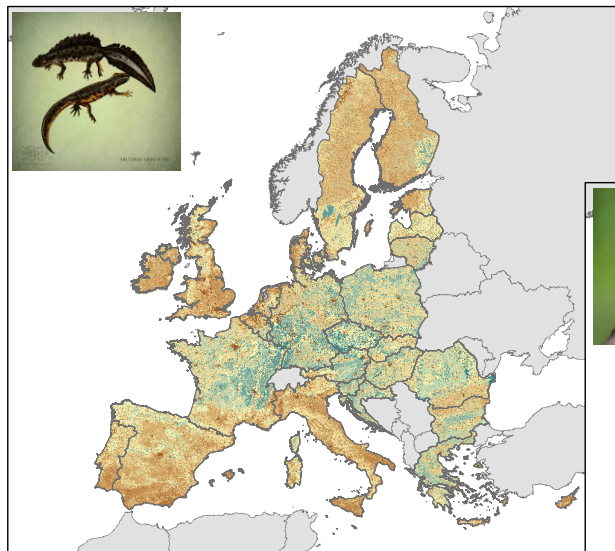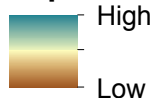
Scenarios for GI

|	'Nature for nature'	'Nature for people'	'Nature to restore'
Objectives	Regulation and maintenance ESs Outdoor recreation potential Biodiversity		
Spatial constrains	No spatial constrain	**Closer to populated areas**: reinforce the link to benefit socio-economic systems	**Drivers of change**: areas under bad conservation status

Solutions

'Nature for nature'

'Nature for people'

'Nature to restore'

Solutions overlay
- 0
- 1
- 2
- 3
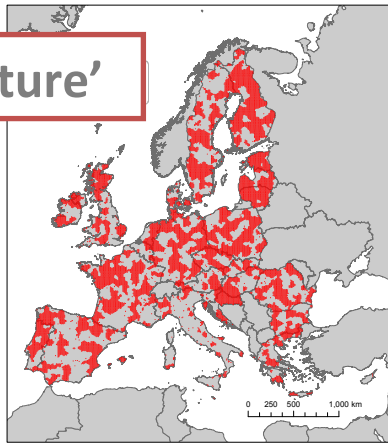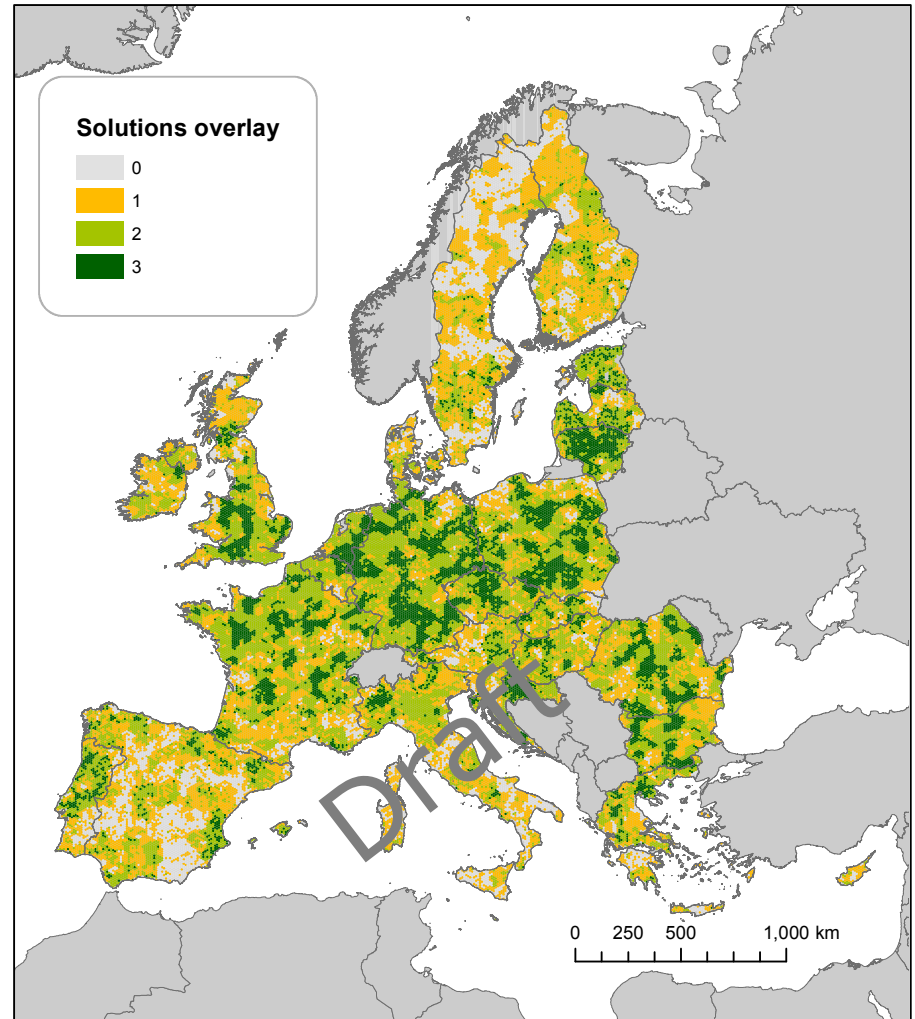
Priority areas

↓

Cost-benefit analysis

RESTORATION MEASURES

•Removal of invasive alien species

•Rewetting

•Replanting trees

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Cost-benefit analysis

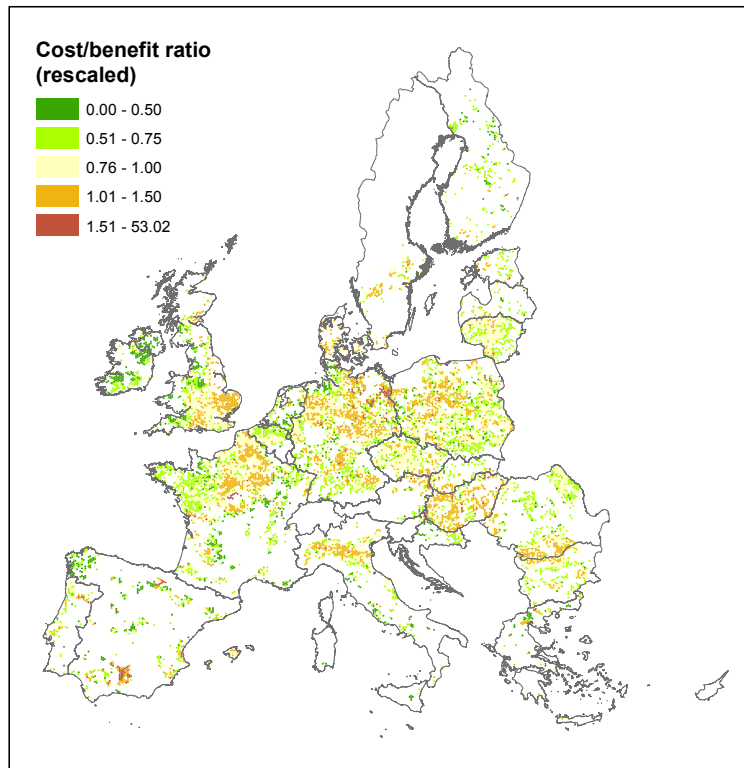|	Cost	Benefit
Restoration	Monetary: •Based on Dietzel & Maes (2015)	Non-monetary: •Based on ΔProb. Favourable conservation status (Maes 2013)
Restoration (LU-conversion)	Monetary: •Opportunity Cost (value of agricultural land) •Conversion costs	Monetary: •Value Transfer function (for forest as an example)

JRC TECHNICAL REPORT

Costs of restoration measures in the EU based on an assessment of LIFE projects

Andreas Dietzel, Joachim Maes
2015
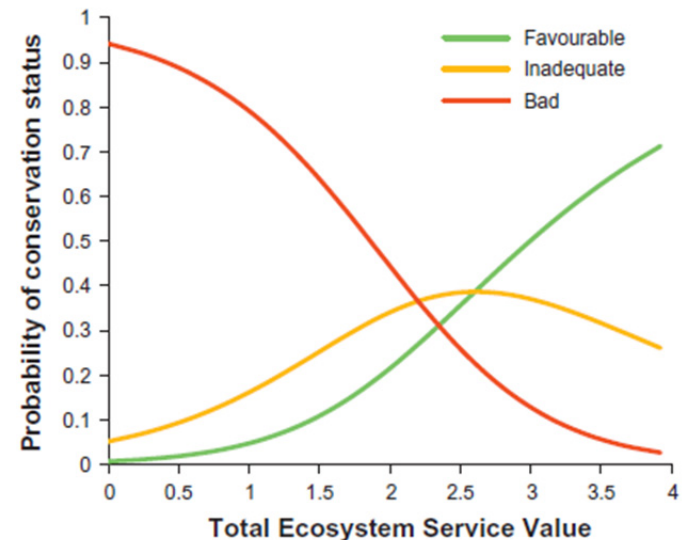
Maes et al. (2012) Biological Conservation

Cost/benefit removal of Invasive Alien Species

Average cost: ~ 900 €/ha

(weighted by the risk of invasion)

Benefit: ∆Prob. Fav. conservation status

Cost/benefit ratio (rescaled)

- 0.00 - 0.50
- 0.51 - 0.75
- 0.76 - 1.00
- 1.01 - 1.50
- 1.51 - 53.02

Cost and benefit values were rescaled between 0 and 1 to make units comparable (Euros vs. $P_{(Fv)}$)

Preliminary results

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Habitat conservation status from Art. 17 data

Habitats 2000-2006

- Favourable 17%
- Unfavourable-Inadequate 28%
- Unfavourable-Bad 37%
- Unknown 18%

Habitat conservation status FV %

- 9.7 - 0.0
- 26.2 - 9.8
- 46.3 - 26.3
- 72.7 - 46.4
- 100.0 - 72.8

0   500 km

Percentage of habitats in good status per assessment unit
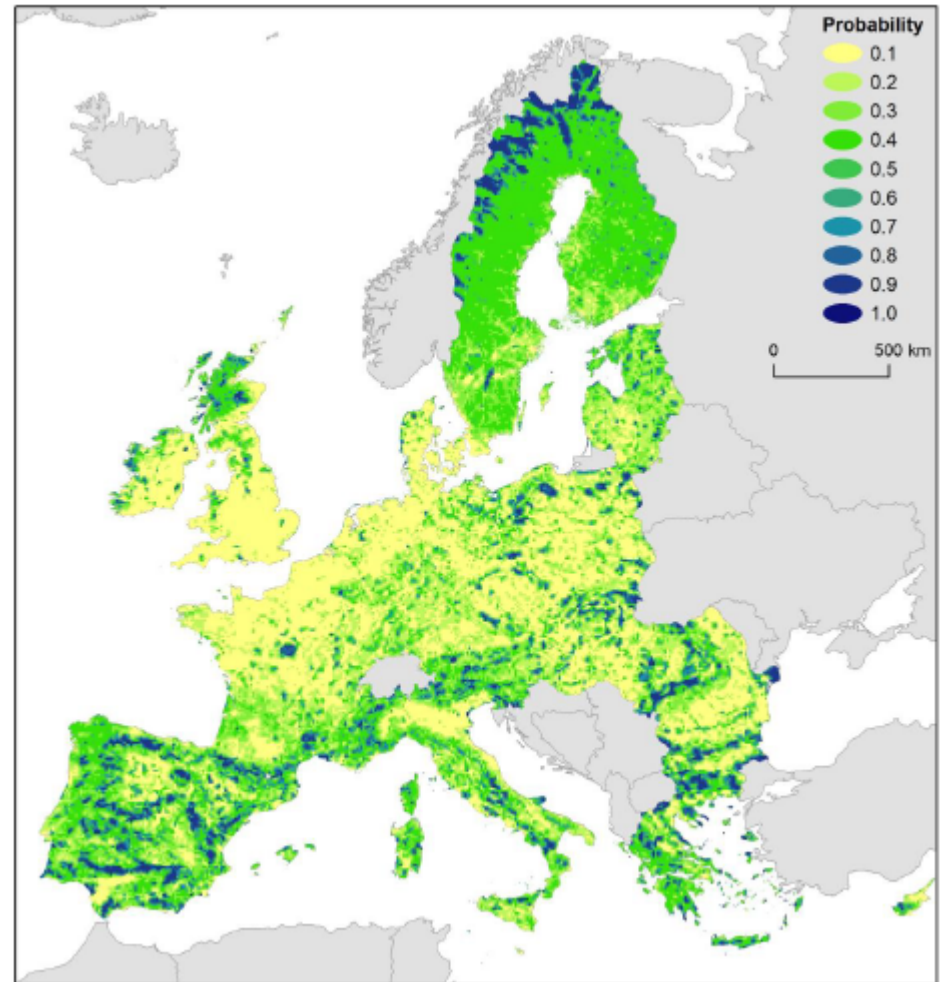
Multinomial logistic regression

⬇

probability of favourable conservation status

Drivers-pressures:

- % land uses: built-up, arable, pastures, N2000
- exceedance of load for nitrogen
- grazing, abandonment of the pastoral system, drainage and invasion of alien species (presence/absence)
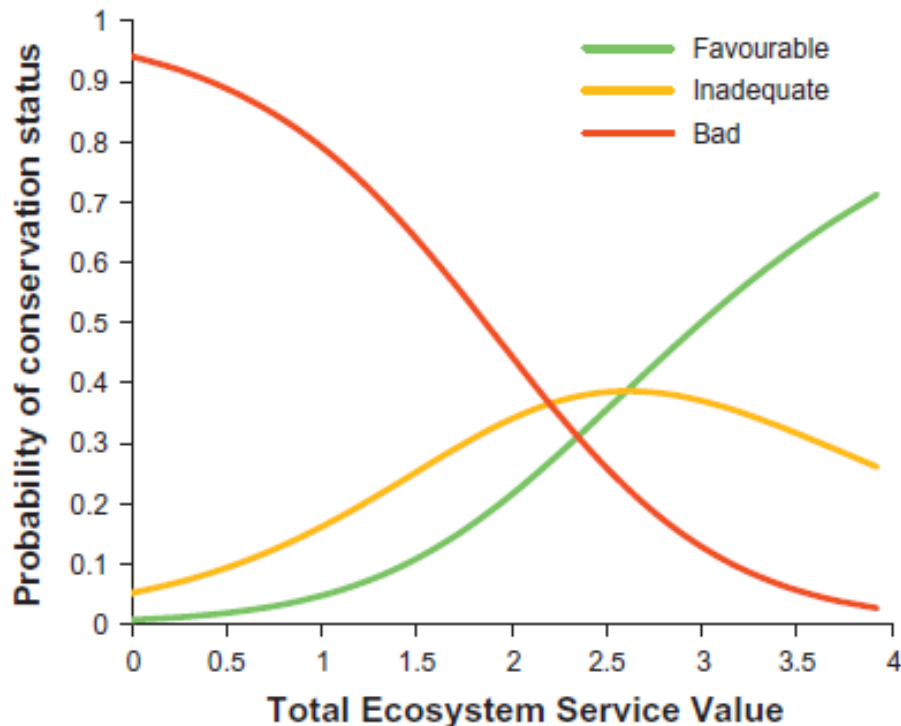
Modelled habitat conservation status

Maes, J. (2013) A model for the assessment of habitat conservation status in the EU. Report EUR 26186 EN. Joint Research Centre of the European Commission, Publications Office of the European Union.

Applications of the model

- Use of Art. 17 data for ecosystem condition and restoration

Restoration measures

Modified hydrographic functioning	yes	no	no	no	no	no
Grazing	no	no	yes	yes	yes	yes
Abandonment of the pastoral system	yes	yes	yes	no	no	no
Drainage	yes	yes	yes	yes	no	no
Invasion of alien species	yes	yes	yes	yes	yes	no
Urban and agriculture development 20% artificial, 35% arable, 5% pasture 5% Natura2000, 300 eq. ha^{-1} AAE	0.003	0.004	0.004	0.01	0.02	0.08
Agricultural mosaic 5% artificial, 15% arable, 10% pasture 17% Natura2000, 250 eq. ha^{-1} AAE	0.02	0.02	0.02	0.06	0.12	0.32
Rural pasture 2% artificial, 0% arable, 10% pasture 50% Natura2000, 50 eq. ha^{-1} AAE 2%	0.10	0.11	0.12	0.21	0.32	0.60
Nature 0% artificial, 0% arable, 0% pasture 100% Natura2000, 50 eq. ha^{-1} AAE	0.35	0.41	0.43	0.54	0.66	0.85

Improvement in the habitat conservation status

Applications of the model

- Seeking win-win situations for biodiversity and ecosystem services (link Target 1 to Target 2)

Maes et al. (2012) Synergies and trade-offs between ecosystem service supply, biodiversity and habitat conservation status in Europe. Biological Conservation.

Thank your for your attention...

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http://ec.europa.eu/environment/nature/knowledge/ecosystem_assessment/index_en.htm

http://biodiversity.europa.eu/

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