

Value of Biodiversity Related Ecosystem Services - Enhancing the integration of biodiversity into policy and decision-making

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Structure of the presentation

- **Introduction**
 - what are biodiversity related ecosystem services?
 - why do they matter?
 - how and where do they fit in with policy and decision-making?
- **Biodiversity & economy**
 - how and to what extent is our economy dependent on biodiversity?
 - why is the value of biodiversity so hard to capture?
- **Socio-economic costs of biodiversity loss**
 - what are the implications of biodiversity & ecosystem services loss?
 - what does losing biodiversity cost?
- **Integrating biodiversity into policy and decision-making**
 - why should biodiversity aspects form an integral part of decision-making?
 - what tools do we have and how should we use them?
 - what does / should the future hold?

Introduction

Biological diversity, biodiversity & biodiversity loss

"Biological diversity" means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.

CBD Article 2

Biodiversity loss is "the long-term or permanent qualitative or quantitative reduction in components of biodiversity and their potential to provide goods and services, to be measured at global, regional and national levels"

CBD COP VII/30

Biodiversity related ecosystem services

Types of ecosystem services = benefits and services that ecosystems provide to people, outcomes of ecosystem functioning

Provisioning Services
Food, fibre, fuel
Biochemicals, natural medicines, and pharmaceuticals
Ornamental resources
Fresh water
Regulating services
Air quality maintenance
Climate regulation - temperature and precipitation, carbon storage etc.
Water regulation - flood prevention, timing and magnitude of runoff, aquifer recharge etc.
Erosion control
Water purification and waste management
Regulation of human diseases
Biological control and pollination
Natural hazards control / mitigation - storm and avalanche protection, fire resistance etc.
Cultural services
Cultural diversity, spiritual and religious values, educational values, inspiration, aesthetic values, social relations, sense of place and identity, cultural heritage values
Recreation and ecotourism
Supporting services
Primary production, nutrient cycling, soil formation

According to MEA 05

From biodiversity to ecosystem services

Ecosystem components:

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    graph TD
      EC[Ecosystem components] --> ES[Ecosystem structure]
      EC --> EP[Ecosystem processes]
      ES --> EF[Ecosystem functions]
      EP --> EF
      EF --> ES[Ecosystem services]
  
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What aspects of biodiversity matter:

- genetic material / diversity (gene pool)
- species richness / diversity (both as an individual component and diversity in/of itself)
- species composition
- species characteristics (e.g. dominant and keystone species)
- species interactions (e.g. competition, facilitation, mutualism, diseases, predation)

Classification based on: de Groot et al 2002

Trends in ecosystem services supply 1/2


- Only a few ecosystem services improved** (through anthropogenic influence)
 - crops and livestock provisioning
 - aquaculture
 - carbon sequestration (in part)
- Several degraded**
 - capture fisheries
 - timber production
 - water supply and purification
 - waste treatment
 - natural hazard protection
 - regulation of air quality
 - climate and erosion
 - a wide range of cultural benefits
- Underlying reasons behind trends**
 - intensive utilisation / overexploitation of services
 - trade-offs between the use of different services => using / enhancing one service degrades another
 - ecosystem degradation

E.g. according to MEA 2005, Kettunen & ten Brink 2006

Trends in ecosystem services supply 2/2

- Direct drivers of biodiversity/ecosystem services loss**
 - habitat change
 - climate change
 - invasive alien species
 - overexploitation
 - pollution
- Impact of these drivers constant or increasing**
- Underlying drivers of biodiversity/ecosystem services lost**
 - unsustainable management of resources
 - sectorally oriented policies / development activities
 - lack of comprehensive, ecosystem based planning
 - Value of biodiversity / ecosystems not internalised in markets, or in many policies


E.g. according to MEA 2005, Kettunen & ten Brink 2006



Biodiversity, ecosystem services & policy/decision-making ^{1/2}

Development of the ecosystem services concept

- 1960-1970: first references appear
- 1990s: wider application of the concept
(e.g. Daily 1997 & 2000, Costanza et al. 1997, Pimentel and Wilson 1997)
- 2000 onwards: broader uptake, e.g. at policy and decision-making level
(e.g. MEA 2005)



Biodiversity, ecosystem services & policy/decision-making ^{2/2}

- Traditionally not taken into consideration
- Biodiversity links to the economy weak and badly understood
- Aim to put biodiversity into the socio-economic context – give biodiversity “a voice” in decision-making process

Policy level

- Wide take-up in international / EU / national biodiversity policies (since MEA)
- Forms the basis for current EU biodiversity policy
- Up-take / integration into other policy areas to be improved


Regional/local decision-making

- Increasing awareness – but more remains to be done
- Lack of tools and methods to address the issue



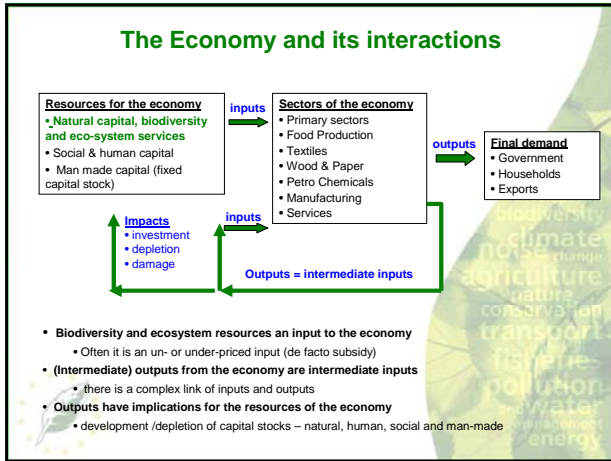
Biodiversity & economy

Building on ongoing work for DGENV, by GHK, CE and IEEP. Links between the environment, economy and jobs. IEEP responsible for (inter alia) biodiversity aspects.
Some data ongoing and will be revised, please do not quote tables at this stage. Comments welcome!



How and to what extent is our economy dependent on biodiversity?

- **Modern myth:** current European societies are not dependent on biodiversity
- **Common perception:** one or two economic sectors are dependent, but most not.
- **Often thought:** biodiversity inputs are useful input but substitutable and not essential or unique.
- **What do you think?**

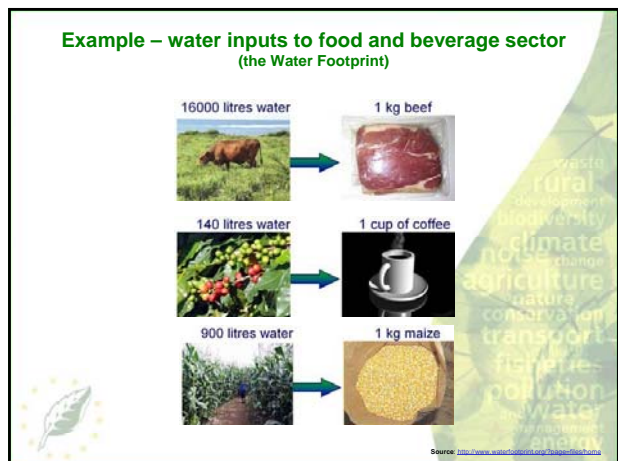



Our economy in 42 slices – where is biodiversity important input?

1 Agriculture, (eg fisheries, aquaculture, forestry)	27 Retailing
2 Coal; 3, Oil & Gas; 4, Other Mining	28 Hotels & Catering
5 Food, Drink & Tob.	29 Land Transport etc
6 Text., Cloth. & Leath.	30 Water Transport
7 Wood & Paper	31 Air Transport
8 Printing & Publishing	32 Communications
9 Manuf. Fuels	33 Banking & Finance
10 Pharmaceuticals	34 Insurance
11 Chemicals	35 Computing Services
12 Rubber & Plastics	36 Prof. Services (Inc.R&D)
13 Non-Metal Mineral Products	37 Other Bus. Services
14 Basic Metals; Metal Goods; Mech. Engineering ; Electronics; Elec. Eng. & Instrum.; Motor vehicles; Oth. Transp. Equip; Manuf. nes	38 Public Admin. & Def. (eg defence, public security, fire services)
22 Electricity	39 Education
23 Gas Supply	40 Health & Social Work
24 Water Supply	41 Misc. Services (collection and treatment of waste/sewage, recreation, culture, nature reserve activities, sports, artistic creation)
25 Construction	42 Unallocated
26 Distribution	

Where is biodiversity important - the easy answers

Sector	Importance	What do most of us think when asked ? Example of ecosystem service / contribution	...and what else, upon reflection ? Additional ecosystem service / contributions
1. Agriculture, (eg fisheries, aquaculture, forestry)	>50%	Genetic resources and stock availability (fish, seeds, resources for horticulture); Pollination; Seed dispersal	As left
5. Food, Drink & Tobacco	>50%	Food: crops, livestock, capture fisheries, aquaculture products, Fibre: tobacco	Wild plant (eg in drinks) and animal products / genetic diversity (variety, security) + sector is dependent on the provisioning of fresh water
6. Text., Cloth. & Leather	<25%	Fibre: cotton, hemp, silk, leather	Water supply (provisioning), purification and waste control (regulation) (=) avoided costs of supply and purification)
7. Wood & Paper	>50%	Fibre: timber, pulp, wood fuel	Water supply, purification and waste control (=) avoided costs of purification)
41. Misc. Services	<25%	Water supply, purification and waste control (=) avoided costs at waste / sewage treatment sector); nature reserve activities	As left






Why is the value of biodiversity so hard to capture? (1/2)

- **Most of the ecosystem services are not paid for - water purification, flood control, carbon capture, etc.**
- **In some cases there are payments, but a rarity**
 - payments for environmental services for biodiversity rich agriculture
 - payments for entry to nature parks, grazing rights, hunting licences, fishing licences (or quotas)
 - Very few cases of water abstraction charges to cover resource value / social costs
- **In some cases there are benefit valuations**
 - Generally for tourism related activities (supporting or increasing demand)

Ecosystem services – are values picked up in the market?

Types of ecosystem services	Is the value integrated into market prices?
Provisioning Services	
Food, fibre, fuel	Generally yes (in the EU)
Biochemicals, natural medicines, and pharmaceuticals	Resource value (PR) & future potential not
Ornamental resources	Generally yes (in the EU)
Fresh water	Resource cost general not
Regulating services	
Air quality maintenance	Generally not
Climate regulation - temperature and precipitation, carbon storage etc.	
Water regulation - flood prevention, timing and magnitude of runoff, aquifer recharge	
Erosion control	
Water purification and waste management	
Regulation of human diseases	
Biological control and pollination	
Natural hazards control / mitigation - storm and avalanche protection, fire resistance etc.	
Cultural services	
Cultural diversity, spiritual and religious values, educational values, inspiration, aesthetic values, social relations, sense of place and identity, cultural heritage values	Only sometimes (through access fees)
Recreation and ecotourism	
Supporting services	
Primary production, nutrient cycling, soil formation	Almost never




Why is the value of biodiversity so hard to capture? (2/2)

- **Some of the value becomes known only when the service is lost and cost implications become clear, e.g.**
 - cost of replacement/clean up
 - increased costs of provision of the good (e.g. pre-treatment of water costs rise)
 - increased cost through need for substitutes (e.g. desalination plant)
 - loss of revenue – tourists no longer spend/visit.

Need to look at the socio-economic costs of biodiversity loss



Socio-economic costs of biodiversity loss




The value of biodiversity / ecosystem services — the Big Numbers to get attention

Value of ecosystem services globally to human welfare

- \$ 33 trillion / year (1994 \$US)
- \$ 42 trillion / year (2004 \$US)

Costanza, R. et al. 1997. The value of the world's ecosystem services and natural capital. *Nature* 387 (6630), 253-260.


Costanza et al. 2007. Biodiversity and ecosystem services: A multi-scale empirical study of the relationship between species richness and net primary production. *Ecological Economics*, 61, 478 – 491



Estimated value of biodiversity / ecosystem services 1/3

TOURISM		
Example	Estimated value and/or potential/occurred loss	Reference
Reintroduction of vultures, FR	Revenue from vulture related tourism 0.7 million EUR / year	Ligue pour la Protection des Oiseaux, 1995. Socio-economic value of vultures in the Grands Causses
Reintroduction of sea eagles, UK	Revenue from sea eagles related tourism 2.13 -2.48 million EUR / year	Dickie I, Hughes, J., Esteban, A. 2006. Watched like never before – the local economic benefits of spectacular bird species
Tourism in Murlitz National Park, DE	Revenue from the tourism 12 million EUR / year, support to ~ 628 jobs	Job et al. 2005. Ökonomische Effekte von Großschutzgebieten
Whale watching, Scotland	Revenue from whale watching tourism ~ 11.7 million EUR / year ~12% of total tourism income	Warburton et al. 2001. Whale watching in West Scotland
Whale watching, FR- IT Mediterranean coast	Revenue for 23 whale watching tourism companies ~ 1.73 million / year (2005)	P. Mayol, P. Beaubrun, F. Dhersmin, J.-M. Bonnyol, Souffleurs d'Écume, EPHÉ et Océanides, Groupe d'Étude des Cétacés de Méditerranée


Several examples from BirdLife: Wellbeing through wildlife in the EU (2007)



Estimated value of biodiversity / ecosystem services 2/3

RIVER / FLOODPLAIN ECOSYSTEMS		
Example	Estimated value and/or potential/occurred loss	Reference
Morava floodplain grassland, SK & CZ	Value of the <u>removal of nitrogen</u> 0.7 million EUR / year	Seller, J. & Slavová, V. eds. 1999. Morava River Floodplain Meadows - Importance, Restoration and Management.
Elbe river, DE	Value of nitrates pollution reduction by restoring floodplains 585 EUR / hectare Potential total value of restoration (<u>water quality & species conservation</u>) 162 – 278 million EUR / year	Meyerhoff, J., Dohrhardt, A. 2004. The restoration of floodplains along the river Elbe.
River Bassees floodplain, FR	Value of <u>flood control services</u> 91.47 – 304.9 million EUR / year	Agence de l'Eau Seine Normandie, Ministry of Ecology and Sustainable Development.
Saltmarshes in Scotland	Input of saltmarsh to the shellfish industry a marginal value of 1087 EUR / hectare / year	Codrough et al. 2003. The potential for fisheries enhancement associated with management realignment.
River Skjern, DK	Value of river restoration 32.1 million EUR / year	http://www.skjern.dk/objekt.asp?objekt=skjerns%20delt
Inland fisheries, UK	Total value of <u>inland fisheries</u> in England and Wales 4,854 million EUR	Murray, M. and Simcox, H. 2003. Use of wild living resources in the United Kingdom: a review.

Several examples from BirdLife: Wellbeing through wildlife in the EU (2007)



Estimated value of biodiversity / ecosystem services 3/3

FOREST ECOSYSTEMS		
Example	Estimated value and/or potential/occurred loss	Reference
Value of trees in NY city, US	NY City's street trees provide benefit – \$122 million / year \$ 5.60 benefits / \$ 1 dollar spent on trees	NY City Park Department (2007) http://www.dcp.nyc.gov/2007/04/measuring_the_value/
Natural forests in Bavaria, DE	Value of provisioning <u>good quality water</u> 500 million EUR / year	Natur ist Mehr-Wert, Ökonomische Argumente zum Schutz der Natur. BfN Skripten 154 (2005)
Woodlands, UK	Total value of environmental and social services 42,924 million EUR	Willis et al. 2003. The Social and Environmental Benefits of Forests in Great Britain
Forest ecosystems, FI	Value of forest ecosystem services 2,690 million EUR / year (period 1995 – 2000)	Mäkelä & Saastamoinen. 2007. In search of marginal environmental valuations — ecosystem services in Finnish forest accounting. <i>Ecological Economics</i> .

An overview of goods and services provided by UK marine biodiversity

Good/Service	Monetary value (per annum, UK £ 2004)	Under / Over estimate	Link to biodiversity low (1)-high (5)
Food provision	£313 million	Under estimate	3
Raw materials	£81.5 million	Under estimate	3
Leisure and recreation	£11.77 billion	Over estimate	3
Resilience and resistance	Valuation data not available	Valuation data not available	5
Nutrient cycling	£900 - £2320 billion (once off costs)	Use with caution	4
Gas and climate regulation	£0.4 - £8.47 billion	Under estimate	5
Bioremediation of waste	Valuation data not available	Valuation data not available	5
Biologically mediated habitat	Valuation data not available	Valuation data not available	5
Disturbance prevention and alleviation	£0.3 billion	Under estimate	4
Cultural heritage and identity	In addition to £17-£32 billion capital costs	Valuation data not available	3
Cognitive values	Valuation data not available	Valuation data not available	5
Option use value	£317 million*	Over estimate	4
Non-Use values – bequest and existence	Valuation data not available	Valuation data not available	5
	£0.5 – 1.1 billion	Under estimate	5

Source: Beaumont et al. 2006. Marine Biodiversity: An economic valuation

- ### Study by Kettunen & ten Brink - intro
- Kettunen & ten Brink. 2006. *Value of biodiversity - Documenting EU examples where biodiversity loss has led to the loss of ecosystem services*. IEEP, Brussels, Belgium. 131 pp. (http://www.ieep.eu/publications/pdfs/2006/Value_of_biodiversity-June_06.pdf)
 - Objective:** to bring together EU examples where biodiversity loss → loss / degradation of ecosystem services → economic costs and / or social losses
 - Why:** several examples exists but not documented
 - Illustrate costs & benefits of environmental conservation **VS. cost** & benefits of development initiatives
 - Methodology:** questionnaire survey
 - 37 relevant examples → 10 studies selected
 - Ecosystem services lost identified (according to MEA)
 - Aim to find “monetary evidence”

- ### Study by Kettunen & ten Brink – cases 1/2
- Decline / disappearance of three European native crayfish species** (Atlantic area, Scandinavia and Circum-alpine regions)
 - Loss of ecosystem services provided by the Danube River basin & delta** (Germany, Romania)
 - Loss of ecosystem services provided by former Lake Karla** (Greece)
 - Depletion of the North Sea provisioning services**
 - Loss of ecosystem services provided by peat bogs** (UK & Finland)

- ### Study by Kettunen & ten Brink – cases 2/2
- Loss of ecosystem services due to the plantation of non-native monoculture forests** (Portugal)
 - Loss of ecosystem services due to eutrophication of coastal marine ecosystems** (Sweden)
 - Value of cultural ecosystem services – case study on the recovery of ospreys** (the UK)
 - Loss of a keystone species - the cost and benefits of beaver reintroduction** (Germany)
 - Loss of provisioning ecosystem services in lagoon of Venice** (Italy)




Study by Kettunen & ten Brink – bd / services lost

Biodiversity lost

- Loss / degradation of natural ecosystems / habitats - both drastic and gradual
- Declined species population levels
- Loss / decline of keystone species
- Change of dominant species / dominant species characteristics
- Loss due to introduction of exotic species


Ecosystem services lost

- Generally:** almost all ecosystem services identified by MEA
- Most commonly:** food and fresh water
- Water purification and waste management
- Nutrient cycling
- A range of cultural services




Study by Kettunen & ten Brink – EUR lost ^{1/2}

Crayfish	<ul style="list-style-type: none"> ✓ 40% decline of native populations in FR during the last 6 years ✓ 95% decline of native populations in SE since ~1900
Danube Delta (Romania)	<ul style="list-style-type: none"> ✓ Value of restored river fisheries ~\$16 million ✓ Value provided by restored habitat for nitrogen and phosphorous absorption and cycling ~\$112.5 million and ~\$18.2 million respectively / year ✓ Value of tourism resulting from restored wetland habitat ~\$16 million / year
Lake Karla (Greece)	<ul style="list-style-type: none"> ✓ Loss of entire fish catch of 80 kg / ha
North Sea	<ul style="list-style-type: none"> ✓ Cod spawning stock biomass declined from a peak of 250,000 tonnes in the early 1970s to less than 40,000 tons in 2001
Peat bogs (Northwest England)	<ul style="list-style-type: none"> ✓ Restoration is expected to help improve drinking water quality proving benefits between € 1.8 and 3.6 million / year




Study by Kettunen & ten Brink – EUR lost ^{2/2}

Forest fires (Portugal)	<ul style="list-style-type: none"> ✓ During 1980-2004 fires disrupted about 2.7 million ha of forest ✓ Costs arising from loss of primary production ~€30 million / year (2000-2004)
Coastal eutrophication (Sweden)	<ul style="list-style-type: none"> ✓ Overall benefits of the improvement of water quality would amount to €6 – €54 million / year (summer Secchi depth) ✓ Annual costs of removing dead algae are €8119 / km of beach ✓ Costs of mechanical harvesting of algal mats ~€7145 / year
Osprey tourism (the UK)	<ul style="list-style-type: none"> ✓ Osprey tourism is estimated to bring additional expenditure of £3.5 million/year
Reintroduction of beaver (Germany)	<ul style="list-style-type: none"> ✓ Increased revenues from tourism in the area can sum up to ~€0.55 million/year ✓ Estimated additional retention of 2800 kgN/a in the river and of 1900 kgN/year in the floodplains
Clam fishing (Lagoon of Venice, Italy)	<ul style="list-style-type: none"> ✓ ~40 % decline in the catch between 2000 and 2001 due to declined clam stocks




Study by Kettunen & ten Brink – insights

- Through out Europe a variety of ecosystems lost / degraded
 - wide range of biodiversity-related services lost
- Evidence of socio-economic costs exists
- Loss of biodiversity / ecosystem services not generally included in decision making
- If the cost and benefits arising from ecosystems services would have been considered
 - more complete view of costs and benefits
 - different decision taken



Conclusions – counting our losses ^{1/2}

- **General**
 - Often very difficult / impossible to form a complete picture of the real losses and benefits
 - Calculated values often for existing biodiversity / services
 - Value for loss often estimated through costs of restoration
 - Aggregate estimates for whole ecosystem highly sought after but often misleading
- **Losses are not often directly apparent**
 - 'Long run' effects of tradeoffs
 - Cost and benefits occur in different ecosystem and / or socio-economic sectors
- **Distribution of costs and benefits is biased between different stakeholders**
 - benefits obtained on a private level VS. the associated costs often of more social nature




Conclusions – counting our losses ^{1/2}

- **Limitations of knowledge**
 - What is the relationship between biodiversity and ecosystem properties?
 - What are the factors influencing environmental values?
- **Values from one ecosystem cannot be easily transferred to another ecosystem**

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- **When estimating the losses**
 - Need to consider qualitative evidence
 - Need to be pragmatic and "inventive"



Integrating biodiversity into policy & decision-making



Areas where (more) action is needed evidence and knowledge

- **Ecological Analysis / Research**
 - further analysis of ecosystems & ecosystem services
 - further understanding of critical natural thresholds and issues of irreversibility
- **Economy-Ecology research**
 - further analysis of the value of ecosystem services and the potential cost of policy inaction
 - => a Stern type review for biodiversity is needed
 - further development of indicators of ecosystem losses, and importance of natural capital losses to the economy (e.g. genuine savings approach, footprints)
 - further analysis of how ecosystems are an integral part of our economies, and our societies
 - development of biodiversity accounts and links to SNAs

Areas where (more) action is needed policies and tools

- Better decision making to ensure that wider impacts taken into account
 - Better analysis to make sure important links not overlooked
 - Better integration in regional development assessments - including use of SWOTs
 - Better integration in regional development decisions
- Payments for environmental services (PES) (e.g. biodiversity rich agriculture)
- Charges for resources – water, fishing rights
- Charges / taxes / penalties for pollution / damage to natural capital
- Better EIA and liability rules & compensation requirements
- Scope for SEAs to address these issues better
- Greater integration of issues implicit in footprints in trade deals

Example: too narrow analysis / decision frame

- At Lake Slawskie (Poland): large-scale intensive agricultural production, including animal farms, butchery and meat industry.
- The lake - from 1997 to 2004 overgrown with algae.
- Looks like typical 'acceptable' trade-off: **win (economics) – loss (environment)**
- Historically - lake a valuable tourist destination, with 35-40,000 tourists in the summer, supporting about 1,000 jobs in the tourist industry.
- There has also been a fishing industry (25-30 tonnes of fish per year) and the lake is a refuge for species facing extinction; it is also a breeding ground for 130 bird species.
- A lot lost due to pollution from the intensive agriculture
- The win (economics) – loss (environment) is loss-loss**

Example: SWOT Analysis can integrate biodiversity in regional development


Strengths	Weaknesses
(a) what are the natural resources that already or potentially contribute (the 'opportunities') to society and its human, social and economic welfare and development, (b) ensure that these resources are built upon or safeguarded and not compromised by other policies or actions.	(a) Are there any critical environmental issues in the region? (b) Are there critical trends or thresholds (c) Can they be influenced positively or negatively by proposed projects or policies? (d) Issues there a need to compensate those facing the loss or invest to develop/extend another site to substitute for the loss.
Opportunities	Threats
(a) Are there any opportunities to 'build on' the natural capital? (b) Are there any opportunities to protect this natural capital?	(a) What threats are there to biodiversity and eco-system services? (b) Where are we particularly close to a threshold? (c) Do developments / projects / policies threaten the natural capital and system viability?

Example: SWOTs in the UK

- In the UK, most RDPs (regional development programmes) have SWOTs that include environmental issues.
- RDPs often contain a section entitled 'Environmental Profile' (or similar) which outlines the environmental baseline, highlighting environmental issues of importance.
- In some cases a full environmental SWOT is included, however, usually there is a general SWOT for the whole programme.
- In the general SWOTs consideration of the environment ranges from very limited with one or two elements mentioned to more comprehensive

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Real potential to build on existing system and strengthen it



Example: PES for agriculture

Agriculture and biodiversity – the problems

- Intensification (monocultures, loss of features)
- Abandonment

Agriculture and biodiversity – the benefits

- Some agricultural practices support biodiversity / ecosystem services
- Some landscape, cultural values


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- Need to think broadly – agriculture is not just provider of food
- PES: in paying for maintaining biodiversity / related services: can address some of the intensification risks. (complex to estimate for abandonment).
- In EU: European Agricultural Fund for Rural Development (EAFRD) providing payments and moving towards giving opportunities to pay for broader issues than just production.



Next steps

- Greater understanding is needed of the often complex links between biodiversity and the ecosystem services
- Greater understanding is needed of the often complex interactions between biodiversity, the ecosystem services and society
- Greater understanding is also needed of the risks to the biodiversity and risks of us undermining our own welfare
- A Stern type review could be helpful to raise awareness
- Policies need to be systematically reviewed to ensure that the type of ecosystem service benefits and losses are appropriately integrated
- Existing and new tools and instruments should be used to help with incentives, signalling, and decision-making



Questions for you

- Research: **What other research would you suggest be done?**
- Policies and tools: **What other policies and tools would you suggest ?**
- Next steps: **What is the one most important thing that you'd like to see happen to address the challenges ?**



Thank you!

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