

An Ecosystem Approach to the management of land, water and living resources in the UK

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Ecosystem services

derived from inland rivers, lakes and wetlands

Provisioning services

<i>Food</i>	fish, game, fruit, grain etc.
<i>Fresh water</i>	storage, retention, provision
<i>Fibre and fuel</i>	timber, fuel, peat, aggregates
<i>Biochemicals</i>	materials from living things
<i>Genetic materials</i>	medicine, resistance to pathogens, ornaments

Supporting services

<i>Biodiversity</i>	habitats
<i>Soil formation</i>	retention, accumulation
<i>Nutrient cycling</i>	storage, processing
<i>Pollination</i>	habitat & support

Cultural services

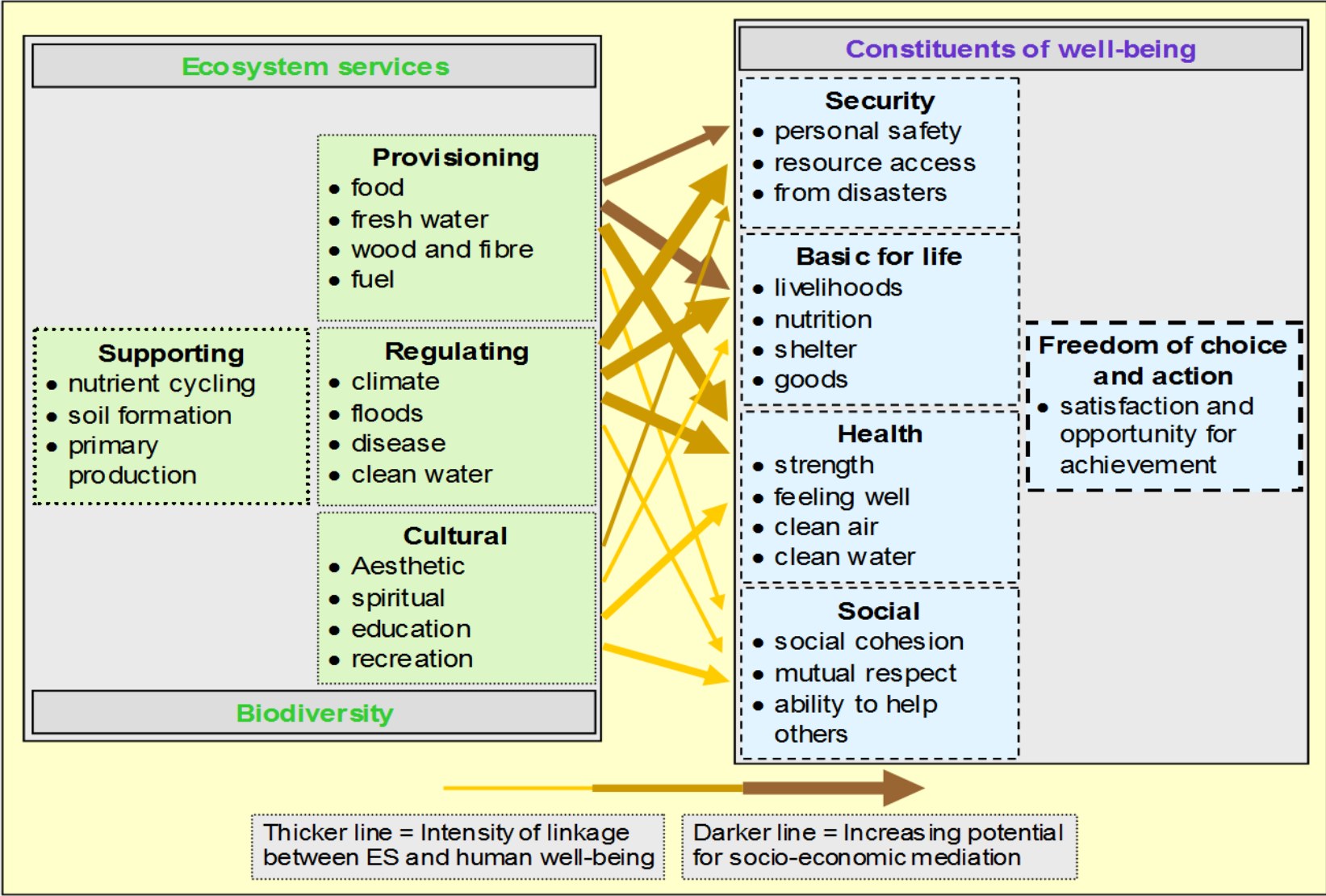
<i>Spiritual</i>	well-being, religion
<i>Recreation</i>	tourism, activities
<i>Aesthetic</i>	appreciation
<i>Education</i>	opportunities

Regulating services

Climate	GHGs, temp., rain, CO ₂ .
Hydrology	recharge, discharge, storage
Pollution	retention, removal, recovery
Erosion	protection, retention
Natural hazards	floods, storms



Links between Ecosystem Services and human wellbeing

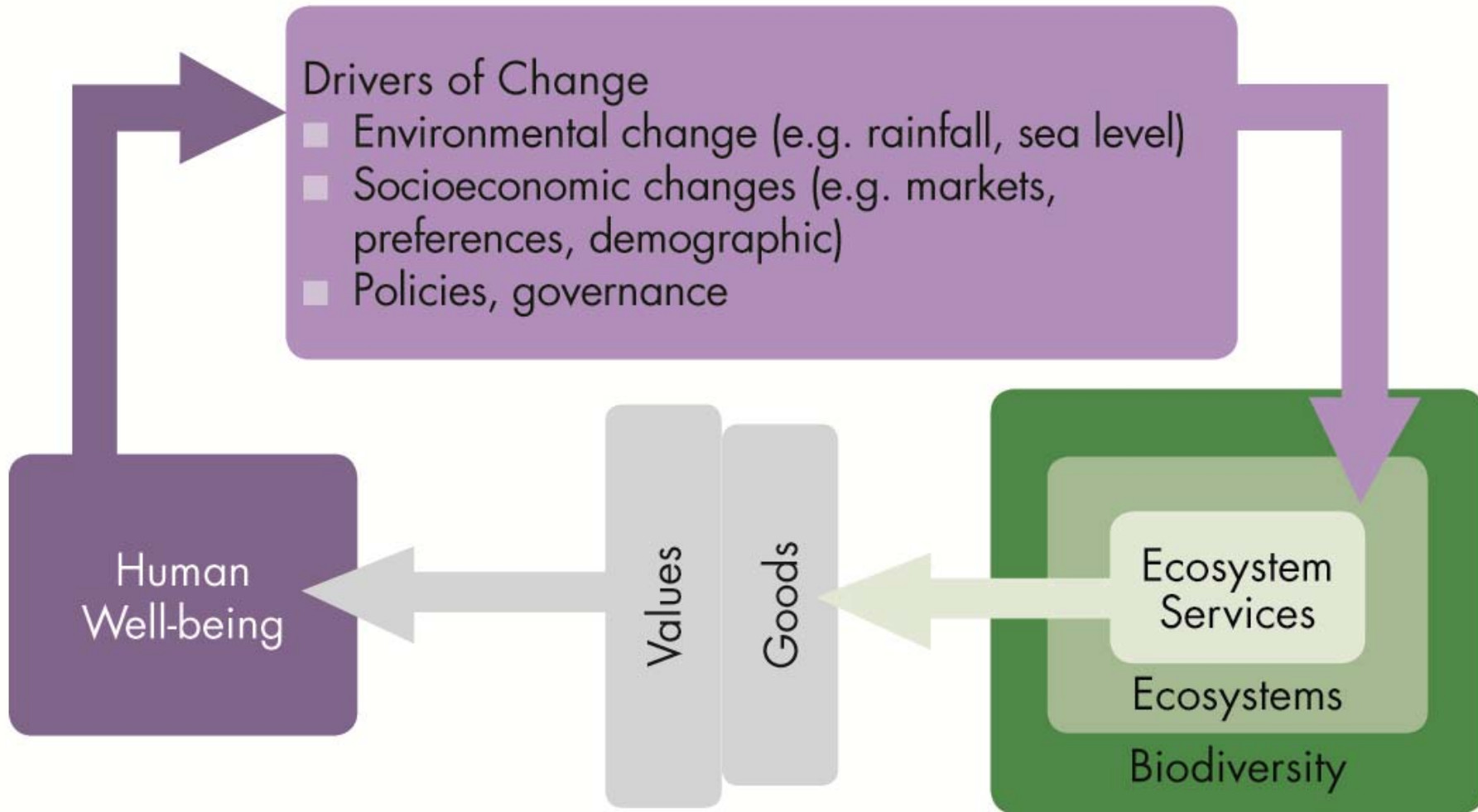


Adapted from Millennium Ecosystem Assessment



Figure 1. UK NEA conceptual framework

Social feedbacks



UK NEA

- Historic dehydration of the land
- Wetland ecosystems highly fragmented
- Runoff accelerated
- Resiliency reduced in face of climate change
- 42% natural floodplains disconnected(England)
- 30% all ecosystem services declining
- Emphasis change from flood defence to flood risk management.

Functional connectivity across whole catchment

Groundwater-fed slope wetlands.

Carbon sequestration
Floodwater detention

Upland peat bogs.

Floodplain modified for agriculture.

Deepwater lake.
In-filled lake.

'Natural' river channel with levees.

Depressional (bottomland) wetlands in floodplain.

Wooded river marginal (floodplain) wetlands.

Nutrient & contaminant transformation

Reservoir

Marshland with drainage channels.

Lowland raised mire.

Food chain support

Shallow lake occupying depression.

Fenland.

Straightened channel.

Channel marginal wetlands.

Brackish water marsh.

Groundwater up-welling supporting reedbeds in estuary margin.



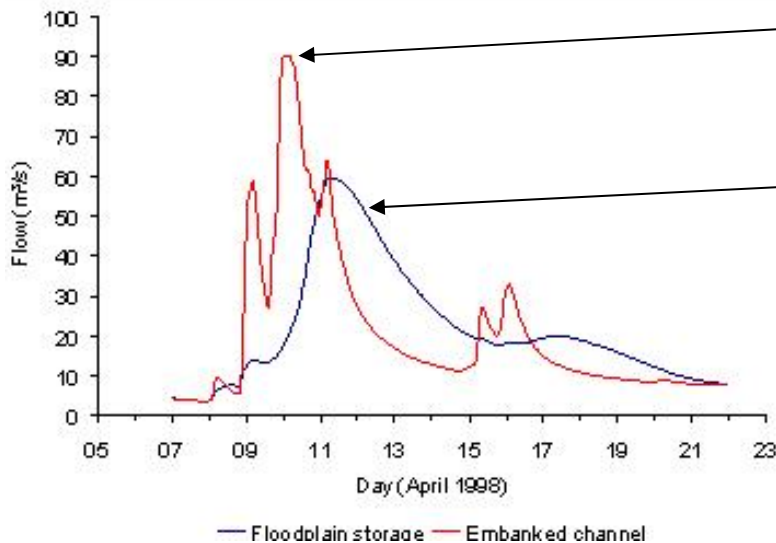
Good ✓



Bad X



Cherwell floodplain



with no floodplain

1998 flood flow at Oxford

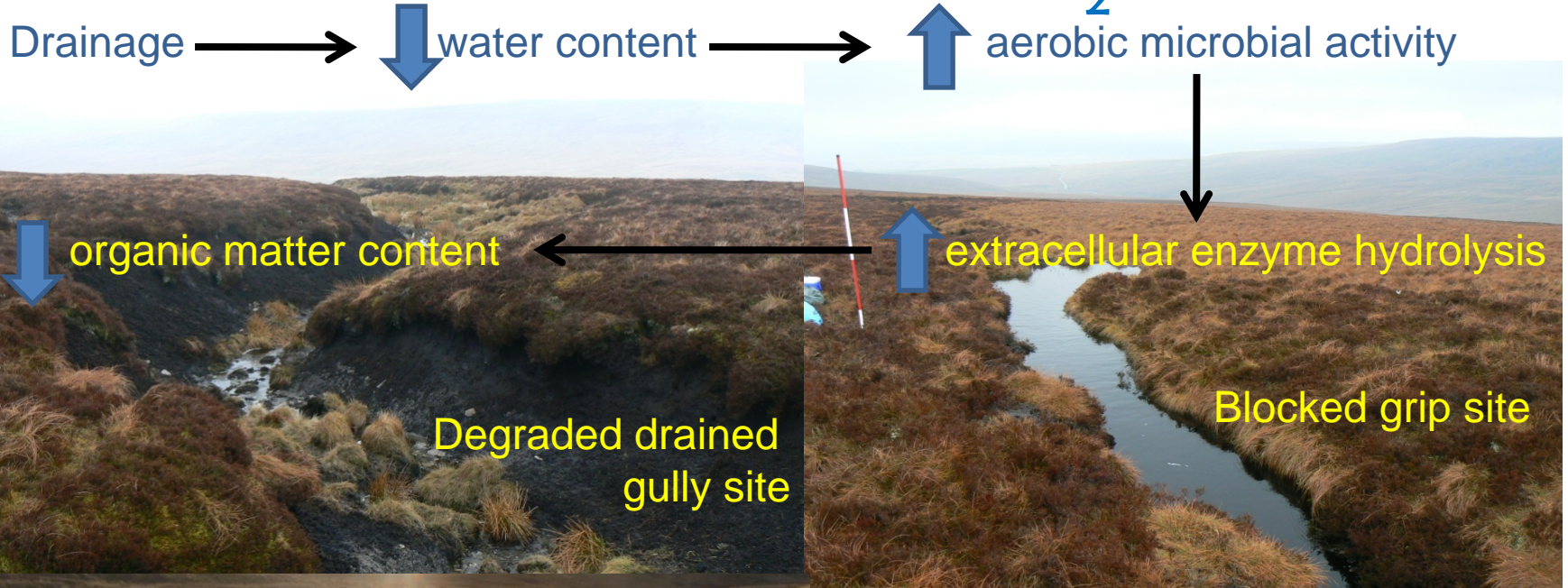
Courtesy of Mike Acreman



Centre for Ecology & Hydrology

NATURAL ENVIRONMENT RESEARCH COUNCIL

Peatland restoration



Loss of carbon as dissolved organic carbon (DOC) affects water quality



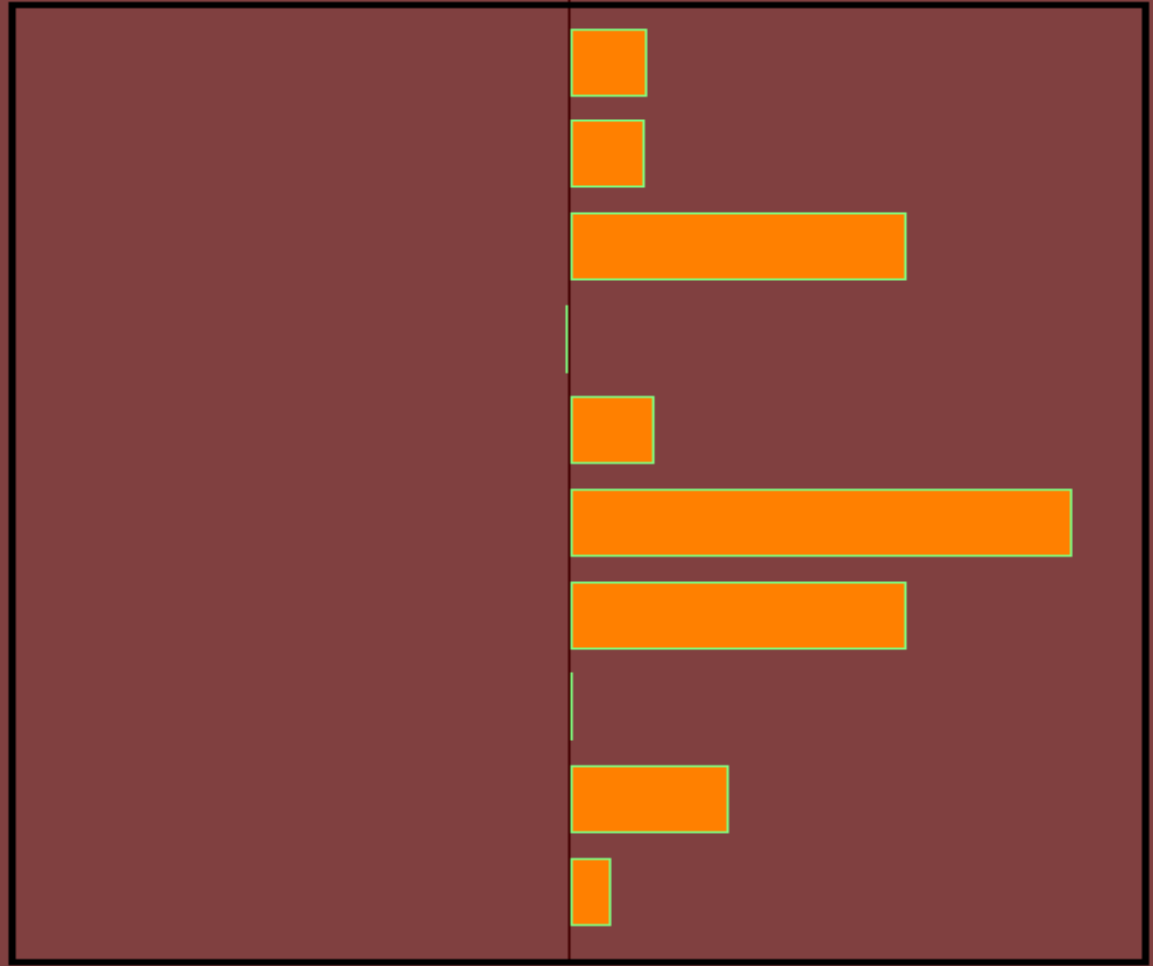
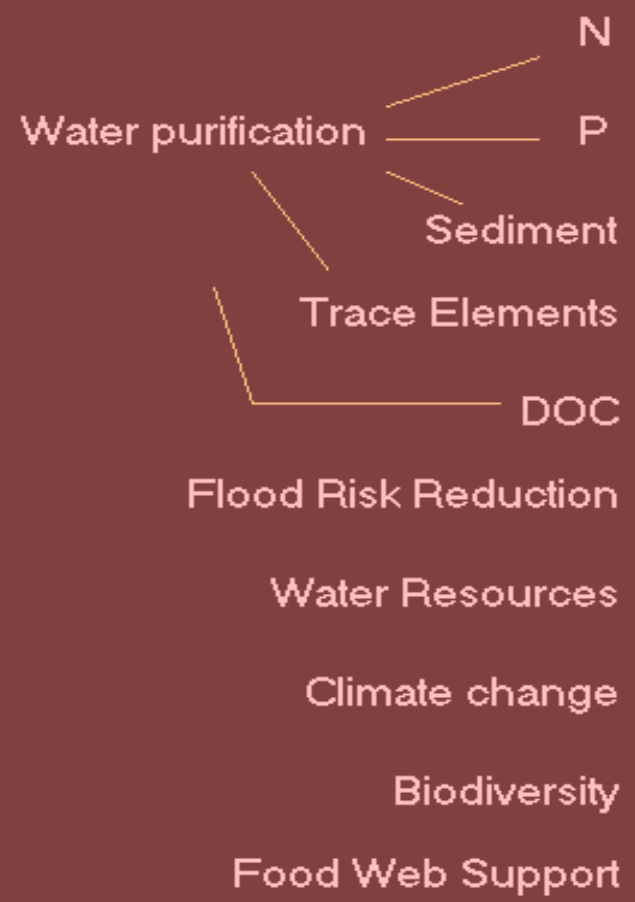
Provision of Ecosystem Services

GL1

Service

NEGATIVE

POSITIVE



Exit

Outcome Form

Previous HG MU <

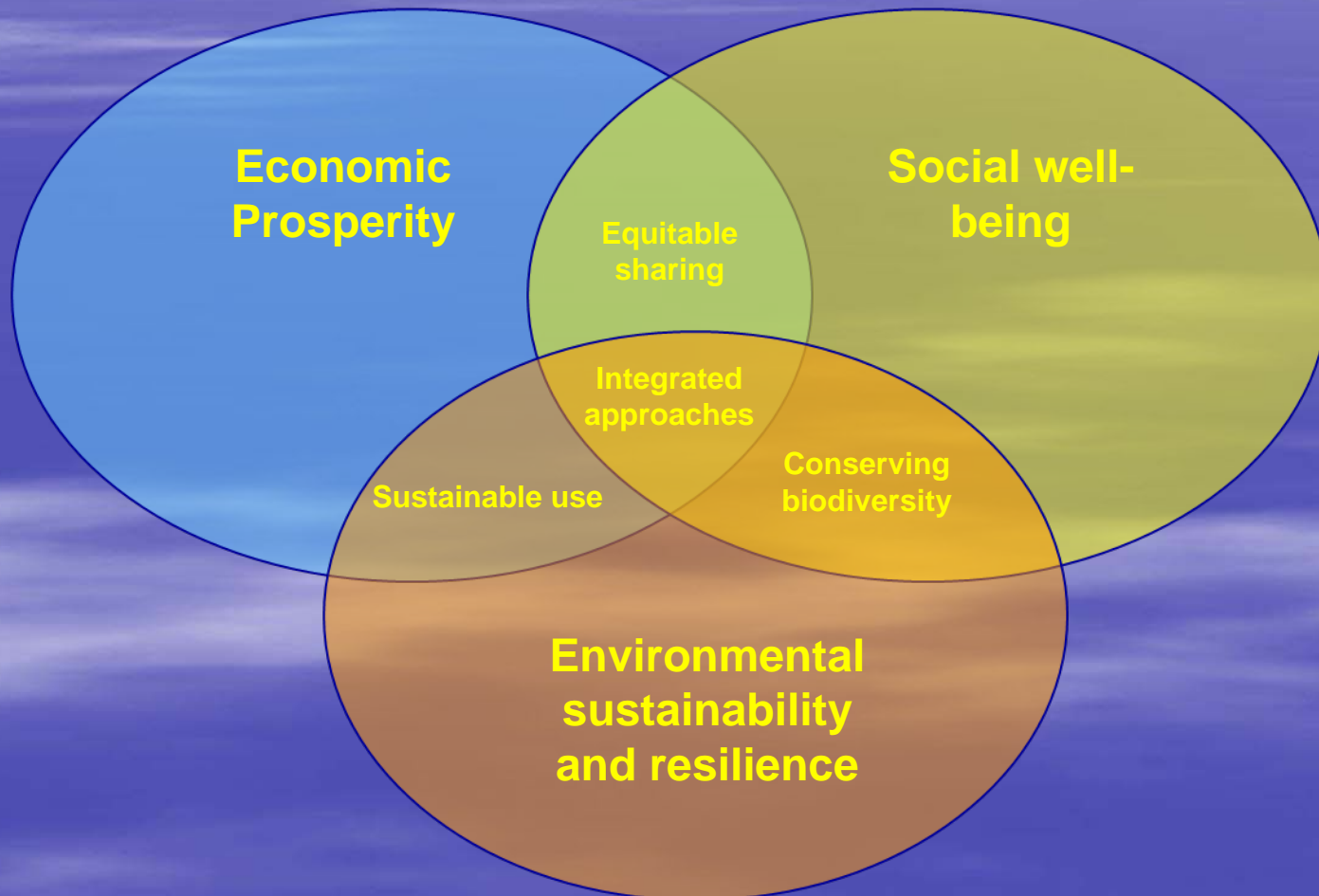
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Structure and outcomes of the Ecosystem Approach

Strategy for the integrated management of land, water and living resources to achieve sustainable development in an equitable way



EA Principle	Requirement for implementation
Societal Choices	Stakeholder / Community engagement
Management decentralised to lowest appropriate level.	Balance local interests with wider public interest. Responsibility, ownership, accountability, participation, use of local knowledge. Key role of Rivers Trusts, third sector alongside EA
Consider effects of activities on adjacent and other ecosystems.	May require new organisational arrangements for decision-making. From uplands to sea.
Need to understand and manage the ecosystem in an economic context.	Rectify the cost – benefit disconnect. Realignment of incentives.
Conservation of ecosystem structure and function to deliver ecosystem services high priority target.	Resilience Natural water retention measures. Wider benefits
Ecosystem must be managed within limits of their functioning.	Functional assessment.
	Continued:

EA Principle	Requirement for implementation
<p>Ecosystem Approach should be undertaken at appropriate spatial scale.</p>	<p>Catchment scale and interconnectivity</p>
<p>Objectives set for the long term</p>	<p>Avoid conflict with short term gains / immediate benefits.</p>
<p>Recognise that change is inevitable</p>	<p>Apply adaptive management, avoid foreclosure of options and consider mitigating actions to deal with climate change.</p>
<p>Appropriate balance between an integration of conservation and use of biological diversity.</p>	<p>“Productive” vs “Protected” balance and more flexible integration of habitats to optimise ecosystem services.</p>
<p>Consider all forms of relevant information.</p>	<p>Consultation</p>
<p>Involve all relevant sectors of society and scientific disciplines.</p>	<p>To deal with complex systems with many interactions.</p>

Economic, Environmental & Social Benefits of Tamar 2000 (WRT)

DIRECT BENEFITS predominantly to farmers - average £2,300 per farm, for example through optimising farm inputs, water separation and leak reduction, improved stock health, diversification.

INDIRECT BENEFITS to community, tourist & anglers - difficult to value, examples include improved water quality, flow regime, improved wildlife habitats and fisheries.



Rivers Trusts: Examples of Tamar 2000 Outputs

- 1000+ farmers & landowners given advice
- 700+ Integrated Land & River Management Plans
- 100 km+ vulnerable riverbank fenced
- 16 wetlands restored/improved
- 32+ km ditches prioritised for re-vegetation
- 200+ sites of accelerated erosion controlled
- 14 demonstration sites developed and operational
- 180+ sites of habitat improvement
- 50+ buffer zones created...





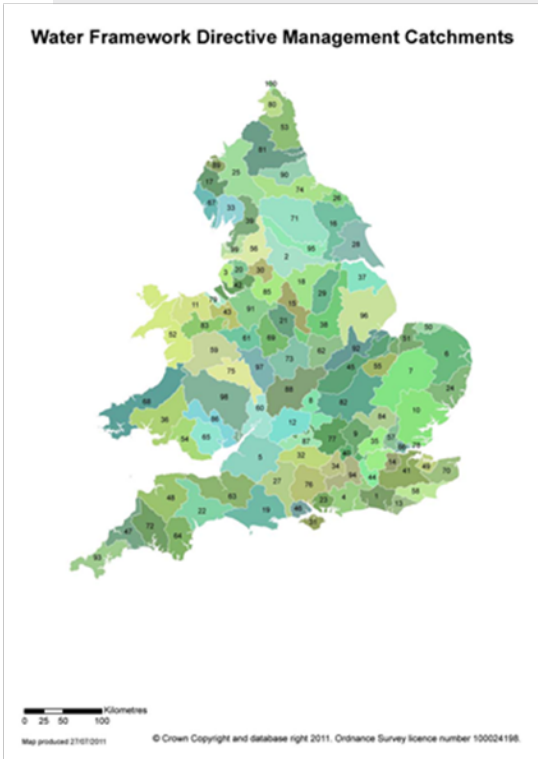
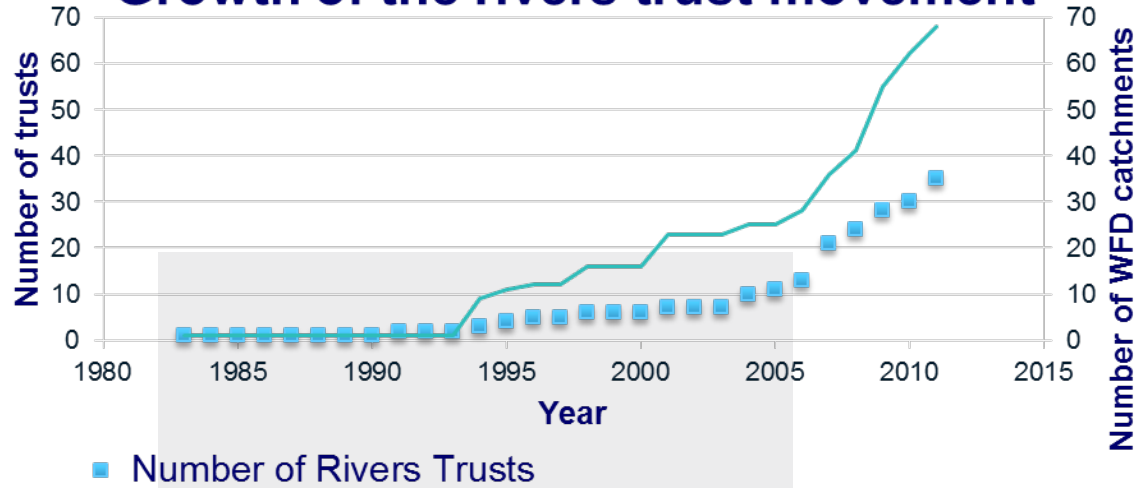
Working in partnership
with Rivers Trust and
National Parks

.... A voluntary scheme which rewards the land manager for effective water protection by minimising nutrient, manure and pesticide losses to watercourses.....benefits may extend to flood risk and drought management.

River Basin Management Plan includes provision for moorland restoration to enhance CO₂ capture and create wetlands with hydrological benefits.

Cost to customers +65p on bill c.f. Willingness to pay UK £1.80 for additional environmental projects

Growth of the rivers trust movement



Rivers Trust Locations



Responding to the challenges

To reverse declines in ecosystem services:

- Need more resilient systems especially to deal with extremes
- Appropriate balance between production and other services

Better understanding of the value of the full range of ecosystem services.

Partnership working at the catchment scale with strong community engagement in flexible delivery mechanisms.



Source: Engineering News Record 20 Sept 1993