Valuing ecosystem services

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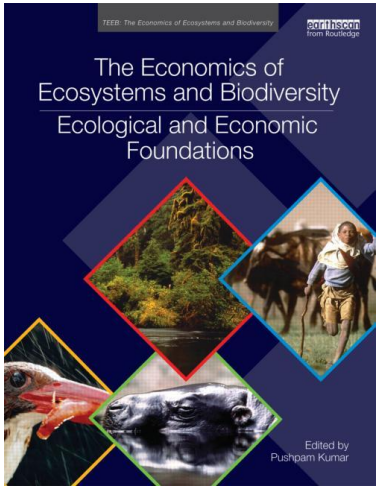
Overview

- Why value ecosystem services
- Ecosystem services assessments
- Valuation methods
- ESS valuation case study: DURESS

Why value ecosystem services?

‘The problem’

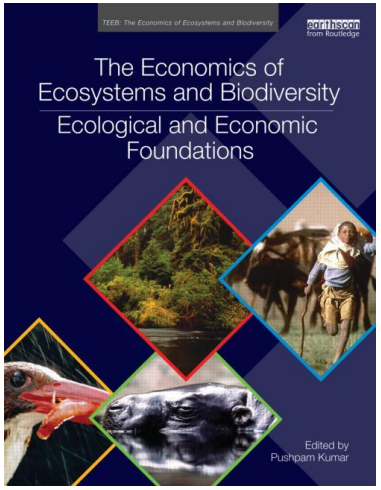


Pavan Sukhdev
TEEB study leader

‘*Modern society’s predominant focus on economic markets … ignores third part effects (externalities) …*

This in turn leads to serious human and economic costs that are now being felt’

‘Valuing nature’



Pavan Sukhdev
TEEB study leader

‘*Economic valuations, in particular, communicate the value of ecosystem services and biodiversity and their largely unpriced flows of public goods and services in* ***the language of the world’s dominant economics and political model***’

The case for valuing nature

- Over past couple of decades, the academic, business and policy-making communities have advocated incorporating economic values of biodiversity and ecosystem services into all levels of decision-making

- WHY?
  - People attain a wide range of social, economic, cultural, spiritual and health benefits from biodiversity – often termed ‘ecosystem services’

  - These benefits are often ‘un-priced’ and therefore risk being ignored in decision making.
  - Ignoring these benefits may impact people’s welfare and company profits.

Ecosystem Services Assessments

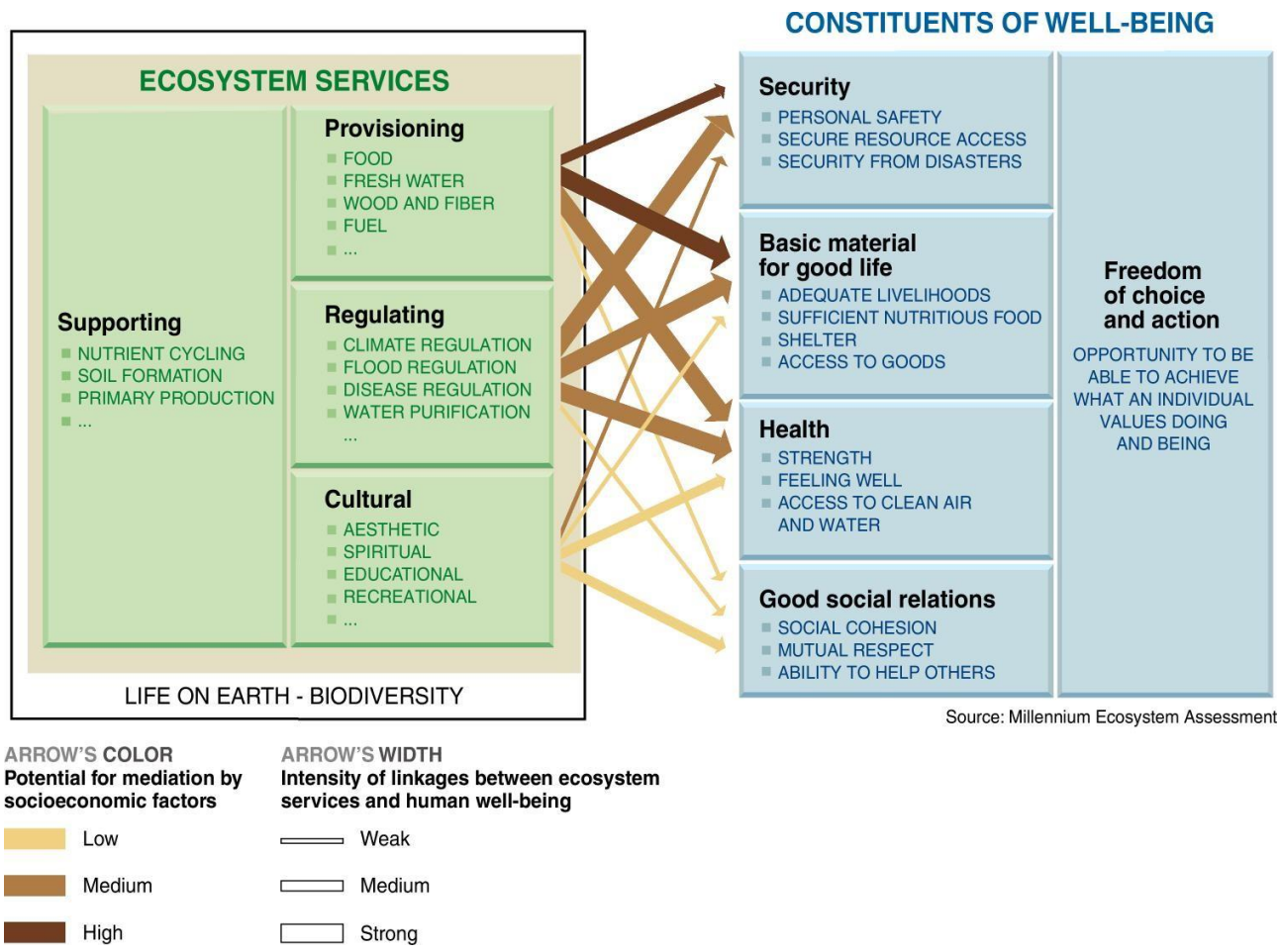
Ecosystem approach to valuation

‘An ecosystems approach to valuation provides a framework for looking at **whole ecosystems** in decision making, and for **valuing the ecosystem services they provide**, to ensure that we can maintain a healthy and resilient natural environment now and for future generations.’

(Defra, 2007)

Ecosystem services from nature

These ecosystem services provide both direct and indirect benefits to people, and therefore need to be accounted for in decision



An 'Ecosystem Services Approach' to valuing biodiversity

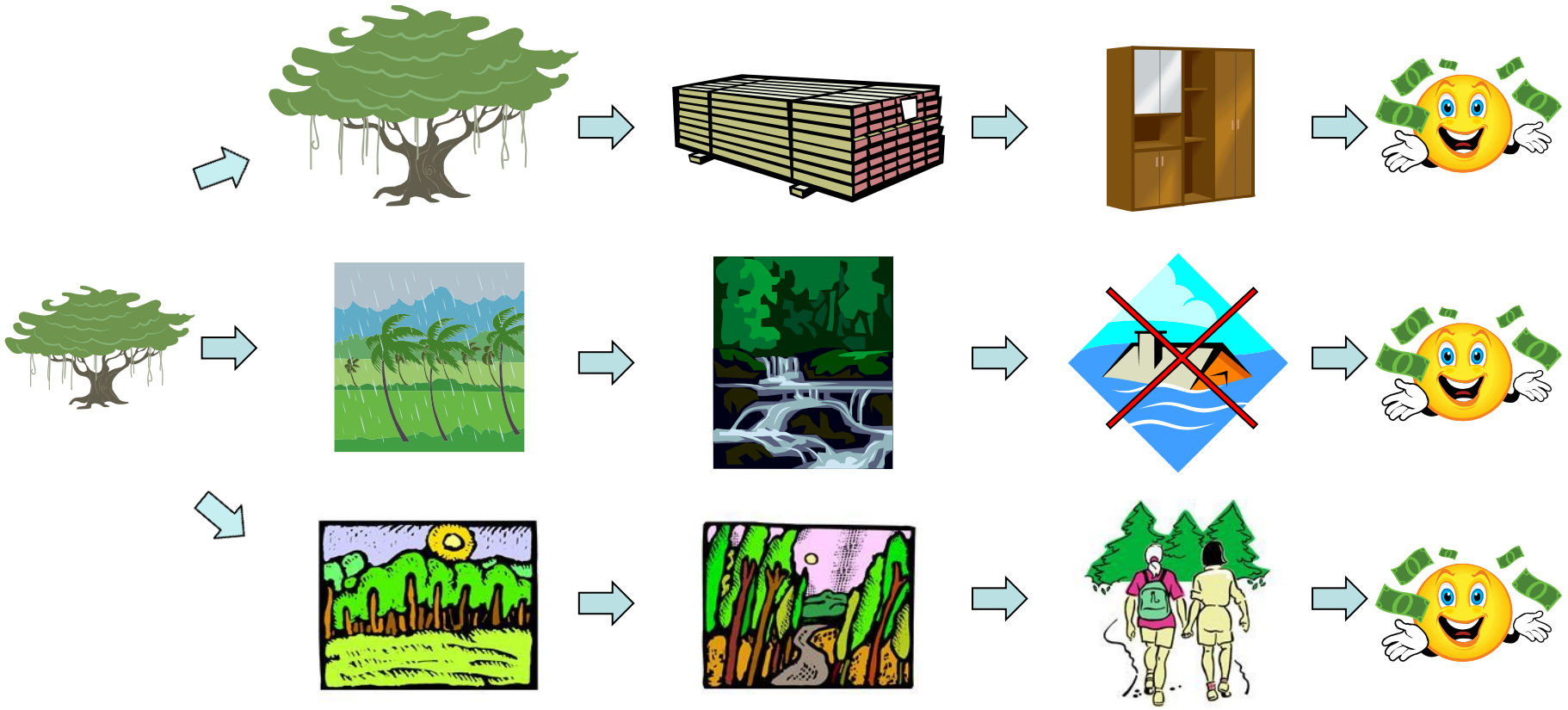
Millennium Ecosystems Assessment (2005)

Ecosystems, services and values

ESManage

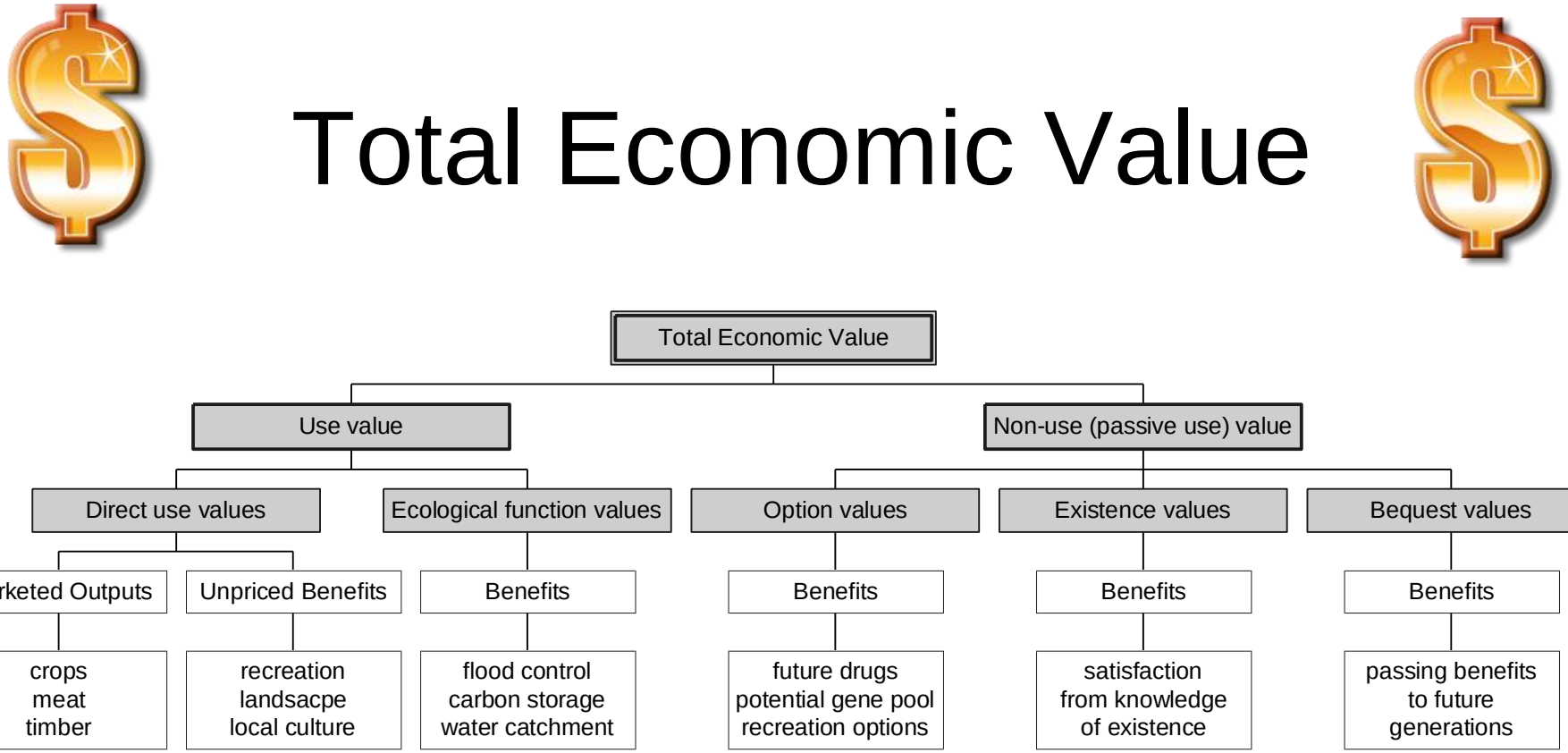
epaResearch
Climate - Water - Sustainability
Identifying pressures • Informing policy • Developing solutions

Biodiversity | Ecosystem Function | Ecosystem Service | Benefit | Value



Economic valuation of nature

Total Economic Value



- **Methods available to value nature**
  - Market prices
  - Revealed preference
    - Travel cost method
    - Hedonic pricing
  - Stated preference
    - Contingent valuation
    - Choice experiments
  - Cost-based approaches
    - Replacement costs approaches
    - Damage cost avoided approaches
    - Production function approaches
  - Value transfer

Ecosystem services valuation case study

DURESS

Diversity of Upland Rivers for Ecosystem Service Sustainability

Aim: To investigate how biodiversity supports the provision of river ecosystem services

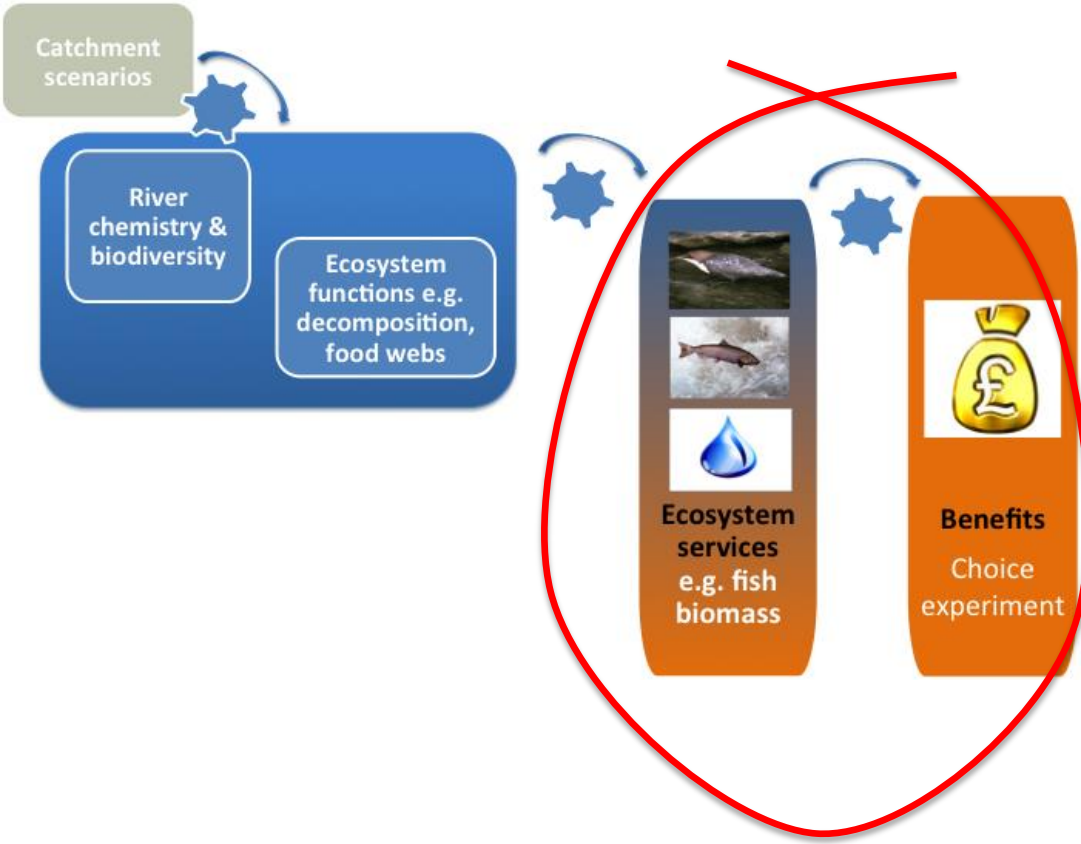
Key Objectives:

1. Assess how changes in catchment land use/management and climate might affect river biodiversity

2. Quantify the link between biodiversity and ecosystem processes and services

3. Identify potential thresholds in service delivery and factors of resilience

4. **Evaluate the economic and health benefits (costs) associated with changes to provisioning, regulating and cultural services**



Ecosystem services investigated in the choice experiment

1. Riverbank vegetation

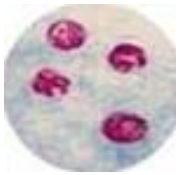
2. Invertebrates

3. Protected fish species

4. Recreational fish species

5. River birds

6. Water colour



7. Health related water quality

- The condition of each ES was described using a standard 5-point scale:
  - (1) worst condition ⟷ Best condition (5)

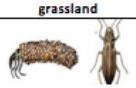
- At each river, this scale was used to report the condition of each ES under 3 scenarios:
  - Status quo (continued decline)
  - Moderate improvement
  - Major improvement

- These scenarios were then be used to design the choice experiment

Valuation study

- A choice experiment was used to value 7 river ecosystem services;
  - •5 biodiversity services;
  - •2 water quality services.
- Levels of services related to 3 future scenarios (and bespoke for each river):
  - •Current
  - •Moderate Improvement
  - •Major Improvement

Example of choice task

River Characteristics	Option A	Option B	Baseline
Riverbank vegetation: Type of vegetation within 5m of river	 ☑☑☑☑☑ Complex structure comprising **grasses, reeds, shrubs and trees**	 ☑☑☑☐☐ Simple structure comprising **grasses and reeds**	 ☑☑☐☐☐ Uniformed structure comprising **rough grassland**
Invertebrates: Number and diversity of invertebrate species that live in river water	 ☑☑☐☐☐ **10 types of invertebrates** found in river	 ☑☑☐☐☐ **10 types of invertebrates** found in river	 ☑☑☐☐☐ **10 types of invertebrates** found in river
Protected fish species: Number and diversity of **Bullheads, Eels and Lampreys**	 ☑☐☐☐☐ **No Bullheads, Eels or Lampreys** found in 100m of river	 ☑☑☐☐☐ **2 Bullheads, Eels or Lampreys** found in 100m of river	 ☑☐☐☐☐ **No Bullheads, Eels or Lampreys** found in 100m of river
Fishing: Number and size of **Salmon and Trout**	 ☑☑☐☐☐ **30 small salmon or trout** found in 100m of river	 ☑☑☑☑☐ **70 small salmon or trout** found in 100m of river	 ☑☐☐☐☐ **10 small salmon or trout** found in 100m of river
River birds: **Kingfishers, Dippers and Wagtails**	 ☑☑☑☑☐ **High probability** of seeing at least one of the river bird species	 ☑☑☑☑☑ **Very high probability** of seeing at least one of the river bird species	 ☑☑☐☐☐ **Low probability** of seeing at least one of the river bird species
Water colour	 ☑☐☐☐☐ Bottom of river is **not visible** in shallow sections	 ☑☑☑☑☑ Bottom of river **visible** and **water is clear**	 ☑☐☐☐☐ Bottom of river is **not visible** in shallow sections
Health related water quality: Risks of picking up stomach bug from swallowing river water	 ☑☑☑☑☑ Very low risk of infection if swallow water	 ☑☐☐☐☐ Very high risk of infection if swallow water	 ☑☐☐☐☐ Very high risk of infection if swallow water
Increase in water bill (per annum for 5 years)	£ 150	£ 50	£ 0

RESULTS: WTP (£/yr) for river ecosystem services

Moderate improvement	Conway	Teifi	Tywi	Wye	All 4 rivers
Riverbank vegetation	60.06	41.97	107.88	72.15	63.43
Invertebrates	61.19	~	70.72	93.04	43.03
Protected Fish Species	36.94	31.49	29.50	57.85	35.69
Recreational Fish	~	~	~	~	~
River Birds	~	~	~	~	~
Water colour	42.18	~	44.90	~	29.83
Health related water quality	77.81	93.17	53.15	69.38	86.53
Total	**278.19**	**166.63**	**306.14**	**292.42**	**258.51**

Major improvement	Conway	Teifi	Tywi	Wye	All 4 rivers
Riverbank vegetation	81.89	65.04	142.32	96.60	84.84
Invertebrates	~	~	~	50.74	~
Protected Fish Species	53.27	48.80	71.09	43.20	55.94
Recreational Fish	~	~	64.75	78.22	38.20
River Birds	44.69	~	69.93	54.69	52.03
Water colour	97.80	130.32	144.25	133.14	118.22
Health related water quality	135.88	156.87	182.95	137.82	148.24
Total	**413.54**	**401.03**	**675.28**	**594.40**	**497.49**

- Water quality services were valued higher than biodiversity
- Clear evidence of scale effects with Major improvements > moderate improvements
- Significant differences in WTP were found between rivers

Economic valuation of biodiversity and ecosystem services

Any questions?