

The ecosystem approach: improving resource use & sustaining ecosystem services

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The James Hutton Institute

- Est. 2011; Macaulay Int. & SCRI; >600 scientists and staff



Resource use efficiency and an Ecosystem Approach

- Consider how EA is related to efficient use of resources and sustainability
- Look at research issues across the scale from biophysical processes to land use decision making
- ~~• Contrast upland and lowland environments in Scotland~~
- Defining research gaps

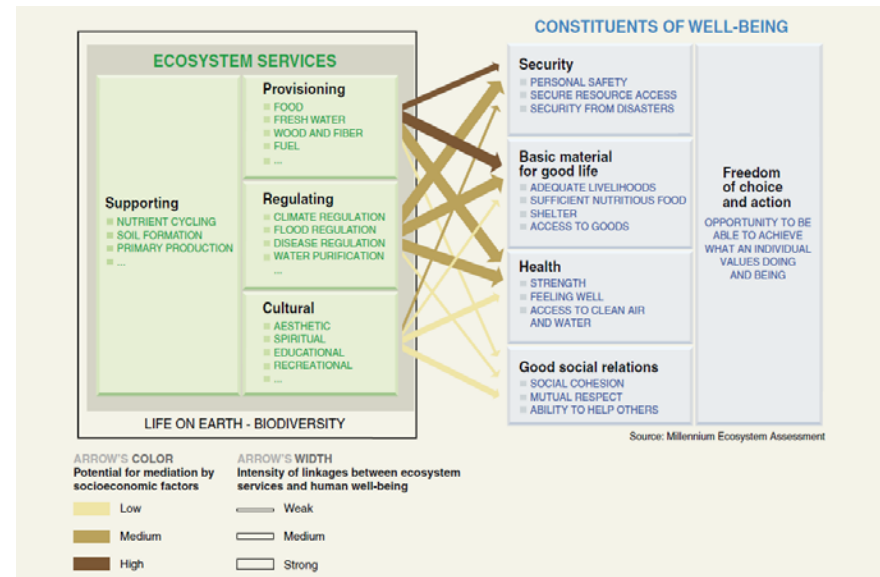
Ecosystem Approach – What's in a name?

Terminology is still uncertain

- The Ecosystem Approach – CBD focussed
- Ecosystems Approach – Emphasises its overarching nature
- Ecosystem-based Approach – Emphasis on management implications
- Ecosystem Services Approach – Focus on sustainable production

Fundamentals include:

- Engagement of stakeholders in decision making
- Recognition of the multiple services and goods delivered by natural systems
- Conservation of biodiversity and ecosystems
- Management at appropriate scales



Policy context

Biodiversity policy

Biodiversity continues to decline

Focus on services demonstrates need to conserve biodiversity

Promotes cross-sectoral support for conservation

Food security agenda

Increasing resource costs

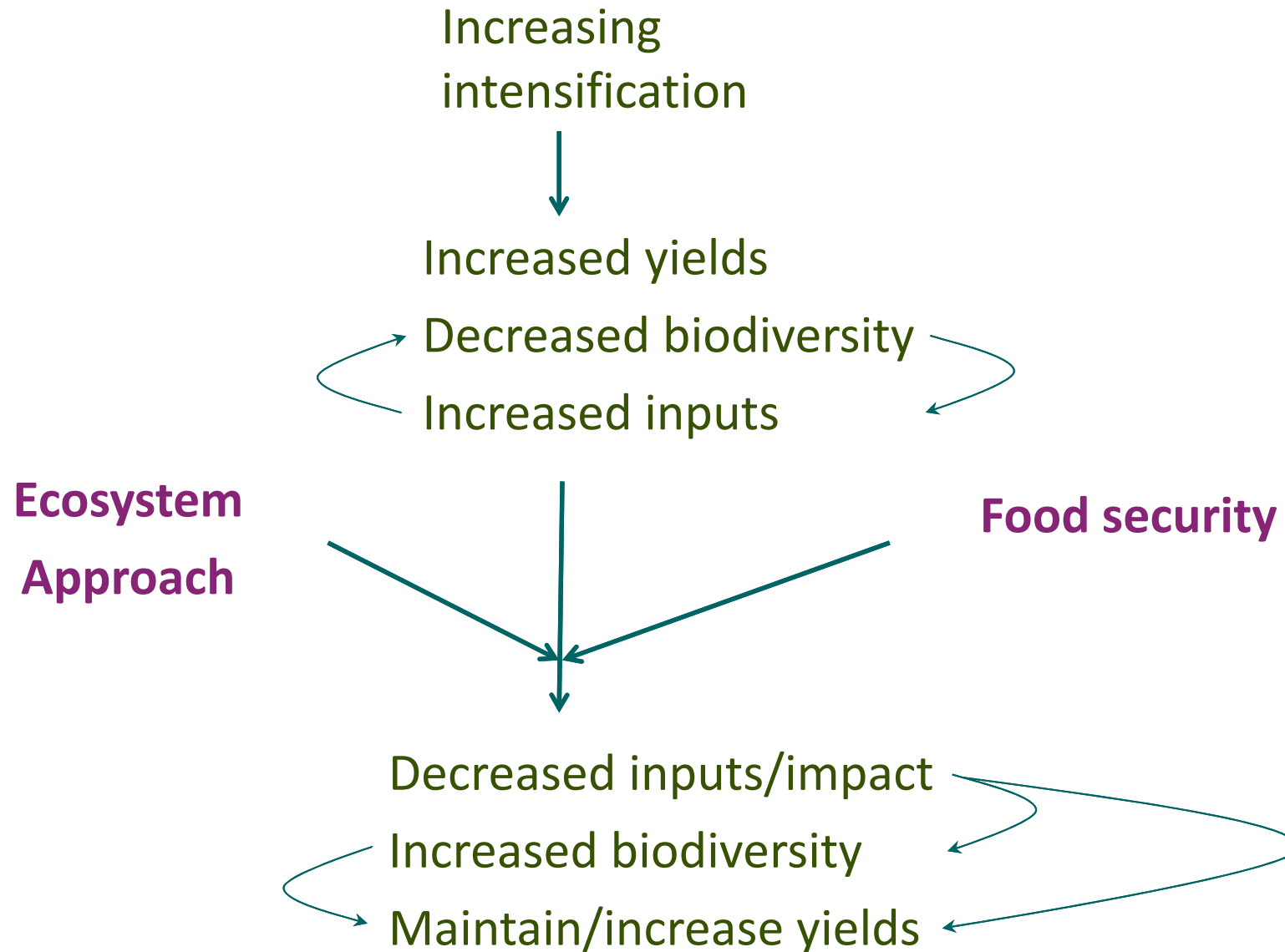
Disincentives for inefficient resource use (e.g. WFD)

Promote increasing resource efficiency & sustainability (?)

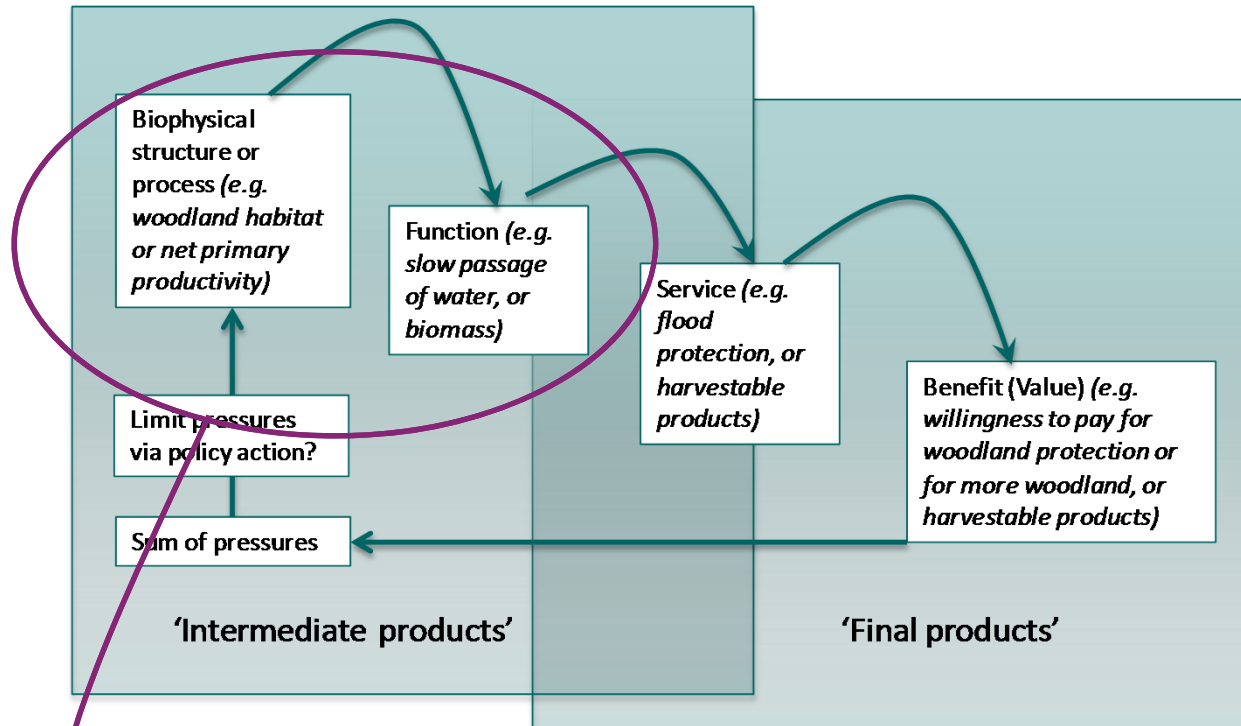
CBD 2010

FOCAL AREA: Status and trends of the components of biological diversity		
↘	Trends in extent of selected biomes, ecosystems, and habitats	★★★
↘	Trends in abundance and distribution of selected species	★★★
↘	Change in status of threatened species	★★★
↘	Trends in genetic diversity of domesticated animals, cultivated plants, and fish species of major socio-economic importance	★
↗	Coverage of protected areas	★★★
FOCAL AREA: Ecosystem integrity and ecosystem goods and services		
↘	Marine Trophic Index	★★★
↘	Connectivity – fragmentation of ecosystems	★★
↓ ↗	Water quality of aquatic ecosystems	★★★
FOCAL AREA: Threats to biodiversity		
↗	Nitrogen deposition	★★★
↗	Trends in invasive alien species	★
FOCAL AREA: Sustainable use		
↘	Area of forest, agricultural and aquaculture ecosystems under sustainable management	★
↗	Ecological footprint and related concepts	★★★

Why is an EA linked to resource use efficiency?



Research “chain”



The ecosystem service cascade. Redrawn from Haines-Young & Potschin (2010).

- How does “biodiversity” underpin production?
- Can it be managed to enhance resource use efficiency

Soil biodiversity and food production

Q: How does soil biodiversity regulate crop production?

Interactions between soil biota and crop species

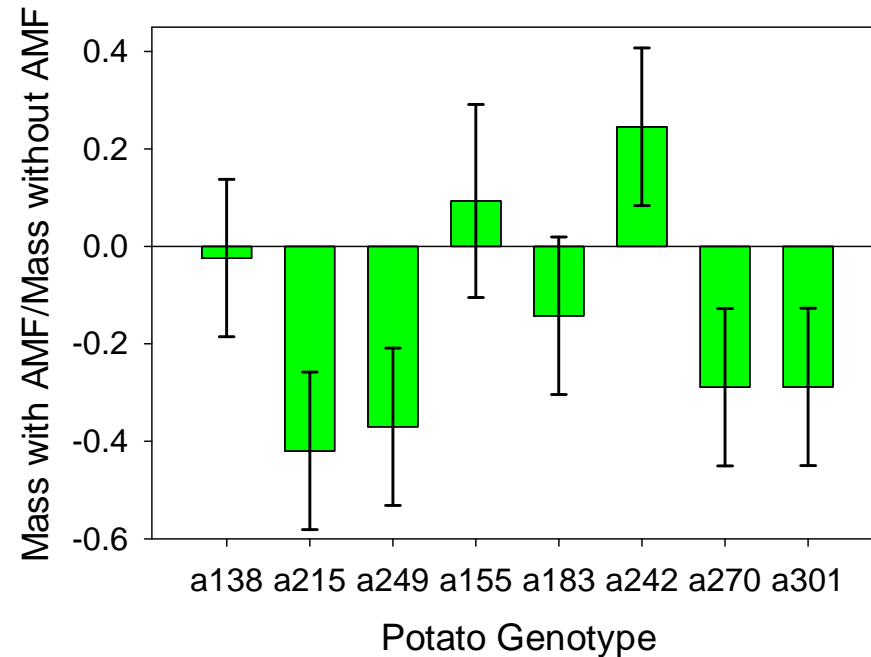
Big response for potatoes, limited response for barley

Crop mixtures can more effectively utilise resource pools

Issues:

- Effects may be dependent on **context**
- Do biodiversity gains fully **replace** reduced inputs?

Alison Bennett, JHI Dundee



A wider concept of benefits

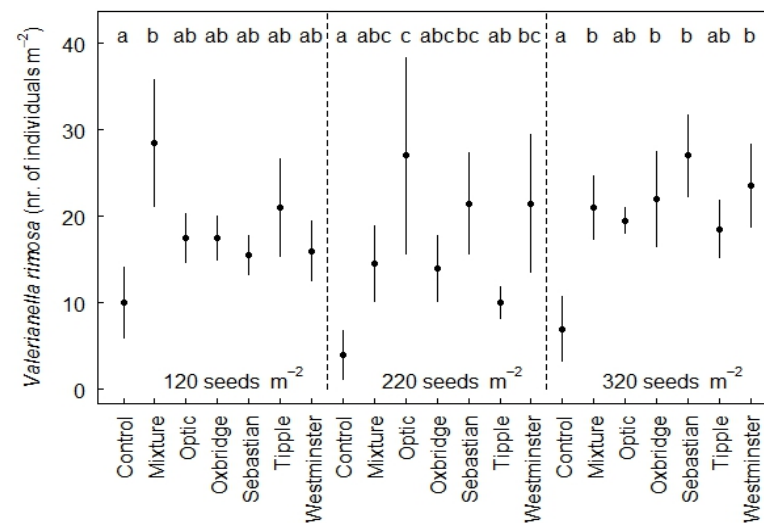
Q: How does crop production trade off against other benefits?

Valerianella rimosa (Broad-fruited corn salad) benefits from being beneath barley

Effect is strong for **barley genotype mixtures at low sowing densities**

EA suggests resource use efficiency/sustainability needs to be measured using **multiple benefits**

Declining provisioning vs. increasing cultural service delivery



Christian Schoeb *et al.*, JHI Aberdeen

Understanding consequences of management decisions

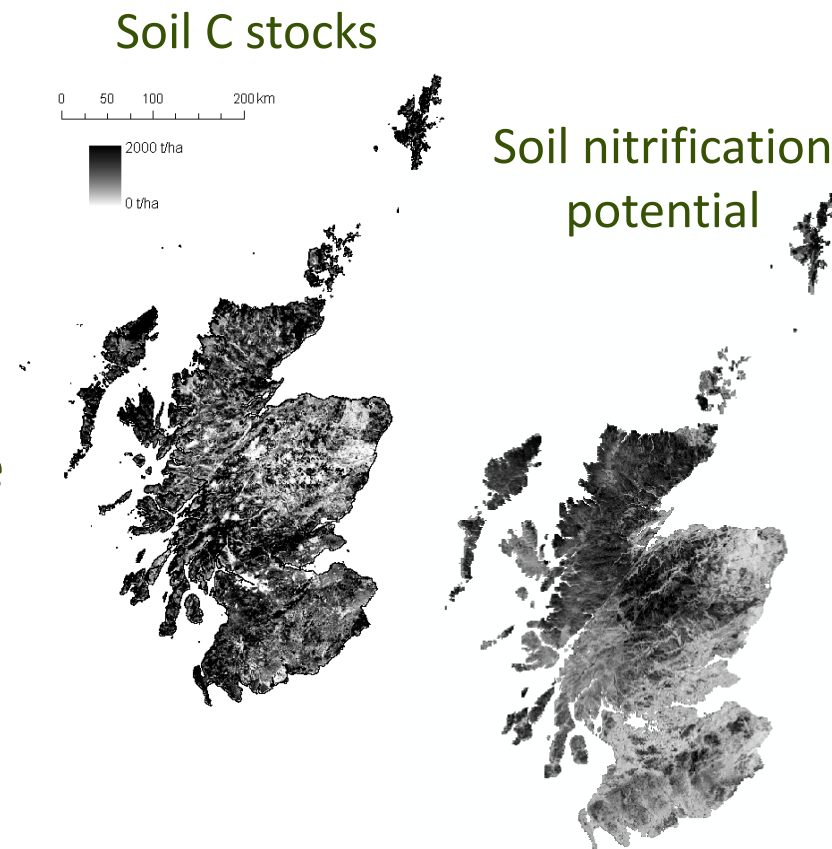
Q: Can we map ecosystem services to feed into decision making

EA necessitates data:

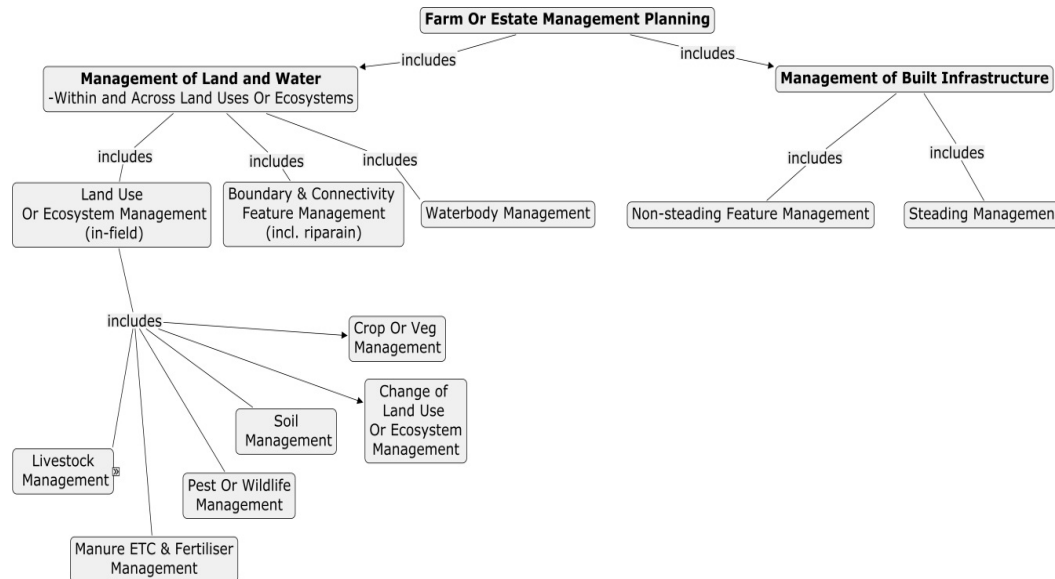
1. At an appropriate scale
2. That enables assessment of wider effects of management

Review of ES indicators:

- Data availability highly variable
- Stocks vs. function vs. benefits
- In many cases using uncertain proxies
- Data quality varies markedly between habitats/policy areas



Integrating new knowledge into decision making processes



Kit Macleod *et al.*, JHI Aberdeen

- Many *think* stakeholders find the terms off-putting and use alternatives
- Good process design with on-going dialogue allows stakeholders to understand and relate to the concepts
- Raises questions of capacity to engage in policy debates

How did it get so late so soon?*

- Can we develop a “uniform currency”: issues of valuation (monetary and non-monetary) and benefits transfer
- Contrasting upland and lowland:



*Dr Seuss

Conclusions

Implementing an/the EA is clearly related to enhancing resource use efficiency and sustainability

It challenges us to work at new scales – decisions must operate over

- A wider spatial extent
- Consider a wider suite of benefits within assessments
- Involve stakeholders in decision making

Many research challenges...

Biophysical underpinning; Multiple benefits incl. cultural services;
Data availability; Participatory decision making processes

Key question: will application of an EA enable **conservation of biodiversity and resource use efficiency?**

Acknowledgements



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- Contributors of work/images for this talk

The “Ecosystem Approach” - Principles

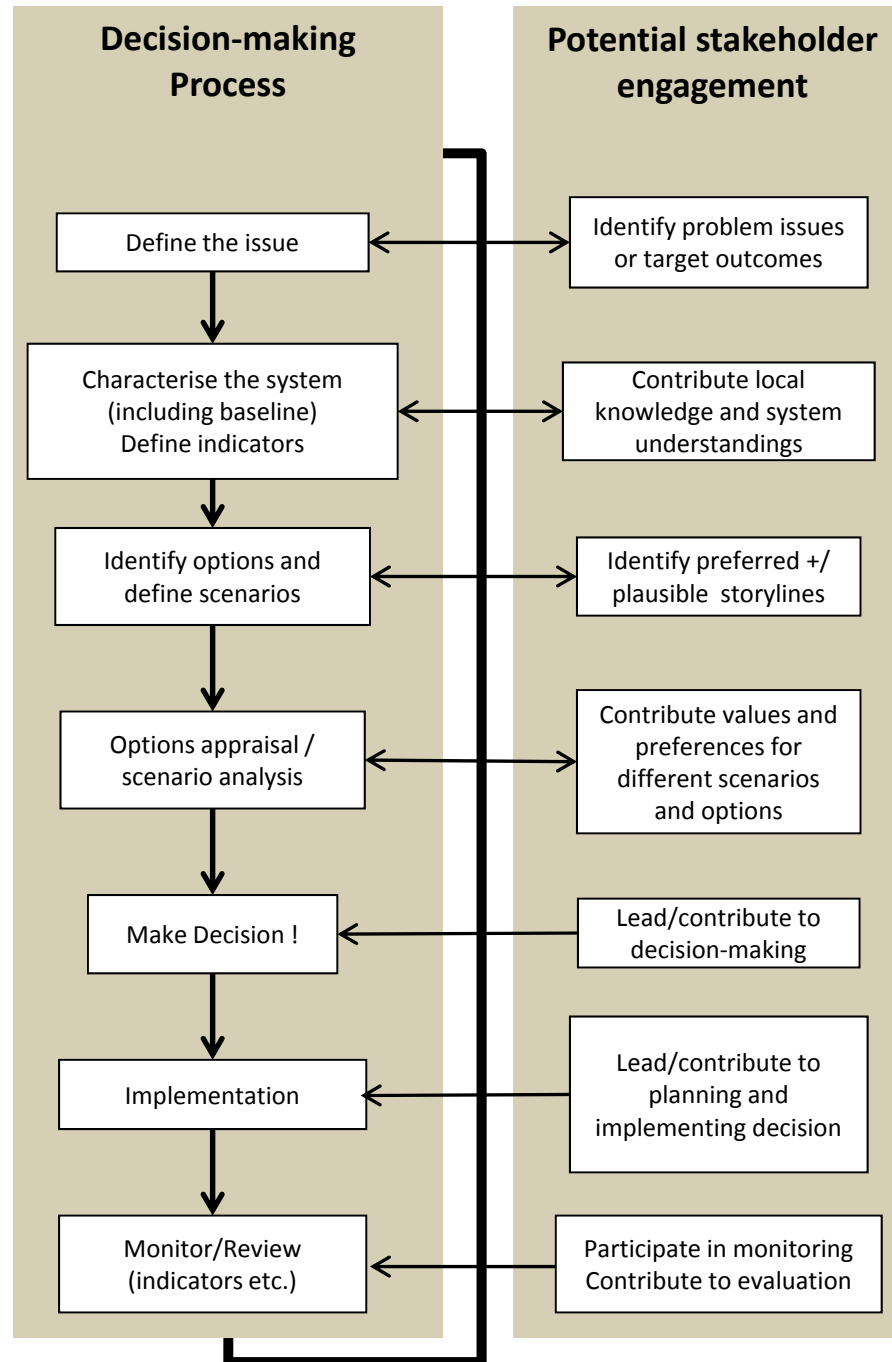
Principles of the Ecosystem Approach – key points:

1. Management objectives are a matter of **societal choice**.
2. Management should be **decentralised** to the lowest appropriate level.
3. The **wider effects** (actual or potential) of management should be considered.
4. Any ecosystem-management programme should:
 - a. **Reduce market distortions** that adversely affect biological diversity;
 - b. **Align incentives** to promote biodiversity conservation and sustainable use;
 - c. **Internalise costs and benefits** in the given ecosystem
5. **Conservation of ecosystems** should be a priority target
6. Managed ecosystems **within the limits of their functioning**.
7. EA should be applied at an **appropriate management scale**.
8. **Long-term** objectives should be set.
9. Recognise that **change is inevitable**.
10. **Seek balance between conservation and use** of biological diversity.
11. Consider **all forms of relevant information**: scientific and indigenous and local knowledge
12. **Involve all relevant sectors** of society and scientific disciplines.

Adopted by COP to the CBD at its Fifth Meeting, Nairobi, 15-26 May 2000.

Ecosystem Approach

Investigating the **tools and methods** that can be used to apply an EcA in case study areas and explore the **barriers** to its implementation

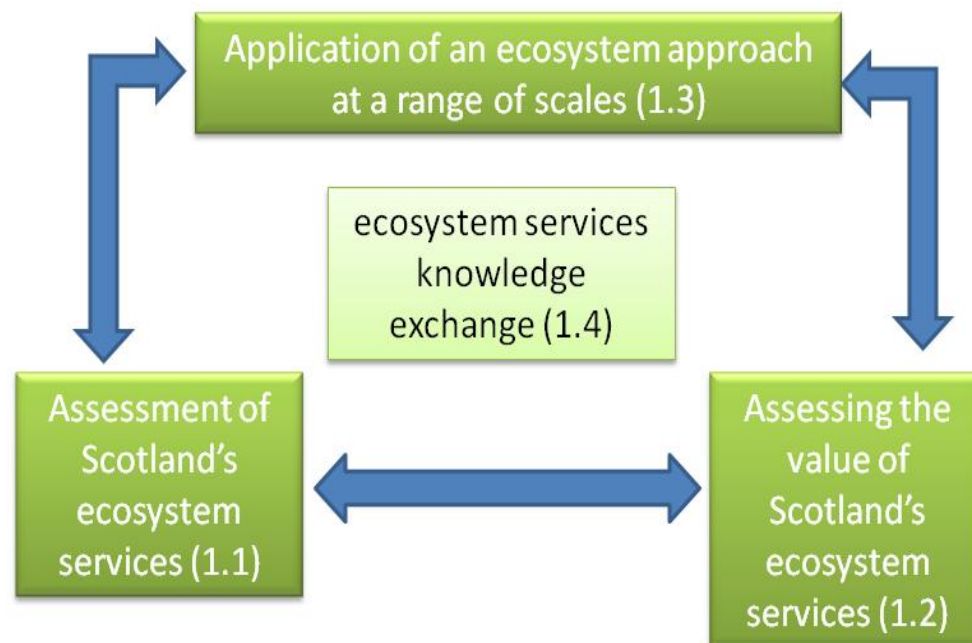


Ecosystem Services Theme - Scotland

Scottish Government Strategic Research Programme – ES Theme

SCOTLAND'S ENVIRONMENTAL ASSETS, BIODIVERSITY AND ECOSYSTEM SERVICES ARE IDENTIFIED AND VALUED TO INFORM DECISION MAKING

... undertake strategic science to identify and develop scientific methods and approaches that understand the essential structure, functions and interactions among organisms and the environment and how these deliver human benefits at a variety of scales from local to national.



Q: Can we take an ecosystem approach to land use decision making?