The Price of Nature
Valuing and Using
Ecosystem Services
in Decision Making

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Paying for Nature?

What is your view on Paying for Nature
• Positive aspects?
• Negative aspects?

Can you think of a specific planning/policy decision where payment for nature would have helped?
Paying for Nature?

• Valuing Nature
• Beyond Value or Valueless Nature
Total Economic Value (TEV)

Ecosystem Services

- **Use Value**
  - Direct use value: Market value resulting from direct usability of environment products such as raw materials and food.
  - Indirect use value: Value derived from direct ecosystem services such as environmental self-regulation and flood control.
- **Non-use Value**
  - Option value: Future value derived from a complete, healthy environment. (Example: genetic resources)
  - Legacy altruistic value: Value of leaving the environment for the rest of humanity and future generations.
  - Intrinsic value: Satisfaction derived from the existence of nature.
Ecosystem Services

‘services provided by the natural environment that benefit people.’
Ecosystem Services

What are the key Ecosystem Services of a Woodland?
Types of Ecosystem Services and Valuations

Types of Ecosystem Services:

- Provisioning Services
- Regulating Services
- Cultural Services
- Supporting Services

Adapted from Millennium Assessment
Levels of Valuation

Level 1 – Qualitative
• Identify important/significant

Level 2 – Semi-quantitative
• existing area data and indicative values

Level 3 - Quantitative and verified
• new targeted surveys
Approach to Valuing Ecosystem Services

Valuation approach needs to be:

• Robust
• Representative
• Transferable

Valuation contributes to:

• Policy
• Planning
• Decision Making  European, National, Regional, Local
Ecosystem Service Valuation Approach

**Biophysical Structure or Process**
(e.g. woodland habitat or net primary productivity)

**Function**
(e.g. slow passage of water, or biomass)

**Service**
(e.g. flood protection or harvestable products)

**Benefit (Value)**
(e.g. willingness to pay for woodland protection or for more woodland or harvestable products)

**Capital Types**
Assets, stocks etc

**Use of Capital Assets**

**Service Gained**

**Economic Value of Benefit**
Ecosystem / Land Types

Physical / Geographical

Historical

Cultural / Aesthetic

Land Use

Direct uses

Provisioning

Indirect Uses

Regulating

Non-use / Existence

Cultural

Support

Actual / Market Value

Transfer of a Proxy Value

Ordinal / Indicative Value

Narrative / Descriptive Value
## Total Economic Valuation Approach

<table>
<thead>
<tr>
<th>Gross / Total Economic Value</th>
<th>Direct Use</th>
<th>Indirect Use</th>
<th>Non-Use</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Consumptive Use</td>
<td>Supporting / Regulating Ecosystem Services</td>
<td>Option</td>
</tr>
<tr>
<td></td>
<td>Non-Consumptive Use</td>
<td></td>
<td>Existence</td>
</tr>
<tr>
<td></td>
<td>Products harvested</td>
<td>Nutrient Cycling; Flood Control; Water regulation</td>
<td>Resilience; Bio-prospecting</td>
</tr>
<tr>
<td></td>
<td>Cultural / Spiritual; Recreation / Tourism; Health; Education; Information</td>
<td></td>
<td>Cultural; Stewardship; Bequest</td>
</tr>
</tbody>
</table>

**Benefits**
- True value

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### Glossary
- **Gross / Total Economic Value**: The total value of a project or asset, including all direct and indirect contributions.
- **Consumptive Use**: Utilization of natural resources for immediate consumption.
- **Non-Consumptive Use**: Utilization of natural resources without immediate consumption, such as cultural or spiritual benefits.
- **Indirect Use**: Benefits derived from ecosystem services, such as nutrient cycling or flood control.
- **Non-Use**: Benefits derived from the mere existence of an ecosystem or resource, such as cultural or stewardship benefits.
- **Option**: Benefits that are available but not actively chosen by users.
- **Existence**: Benefits that are derived from the mere existence of the ecosystem or resource.
- **Benefits**: The total economic value of a project or asset, considering all direct and indirect contributions.
## Example Values

<table>
<thead>
<tr>
<th>Ecosystem Type</th>
<th>Ecosystem Service Type</th>
<th>England £ million per annum 2007 prices</th>
<th>East of England £ million per annum at 2007 prices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmland</td>
<td>Food</td>
<td>8,213</td>
<td>1,856.88</td>
</tr>
<tr>
<td></td>
<td>Non – food produce</td>
<td>1,119</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other agricultural/non-agricultural activities</td>
<td>984</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>10,316</td>
<td>1,856.88</td>
</tr>
<tr>
<td></td>
<td>Sports shooting Expenditure: 1,098 GVA: 204</td>
<td></td>
<td>Expenditure: 110 GVA: 30</td>
</tr>
<tr>
<td>Freshwater wetland</td>
<td>Food (fishing and fish farming)</td>
<td>401</td>
<td>36.09</td>
</tr>
<tr>
<td>Coastal and floodplain</td>
<td>Flood control and storm buffering</td>
<td>1,243.04</td>
<td>241.33</td>
</tr>
<tr>
<td>Wetlands</td>
<td>Carbon sequestration</td>
<td>4,583</td>
<td>0.902</td>
</tr>
<tr>
<td>Woodland</td>
<td>Fibre (logging)</td>
<td>392</td>
<td>43.12</td>
</tr>
<tr>
<td></td>
<td>Carbon sequestration</td>
<td>997.98</td>
<td>110.25</td>
</tr>
<tr>
<td></td>
<td>Air quality regulation (health benefit)</td>
<td>17,950 - 645,190</td>
<td>2,998 – 106,864</td>
</tr>
</tbody>
</table>
Additive Total ES Values

Total Value \((V)\) of Ecosystem Services \((ES)\) in \(€ \ ha^{-1} \ yr^{-1}\) for ecosystem type \(k\) is \(V(ES)_k\)

\[
V(ES_k) = \sum_{i=1}^{n} A(LU_i) \times V(ES_{ki})
\]

Where

- \(A(LU_i)\) = Area of \(i\) (Land Use in hectares)
- \(V(ES_{ki})\) = Annual value of \(k\) ES (Ecosystem Services) for each \(i\) LU\(i\) (\(€ \ ha^{-1} \ yr^{-1}\)).
Economic Valuation Methods

Revealed preferences
• Market values – current and future

Stated Preferences
• Contingent valuations - Willingness to pay
• Travel cost methods etc.
• Hedonic pricing
• Replacement costs
• Travel cost method
• Losses forgone
Non-economic valuation

- Consultative methods
- Deliberative methods
Relative or Absolute Values?
• Gross Added Value

• Nett added Value
  Marginal costs
Translation of ecosystem service valuation from a broad policy commitment into a practical local decision making tool now (2010).
Ecosystem Service Valuation

Concerns:

• Implications of placing economic values on some services
• Many ecosystem services had not previously been valued - questions the validity of the values
• The robustness of the values gained can be questioned

A single off the shelf approach to Ecosystem Services Valuation is not recommended. The approach needs to be fit for purpose

Level of approach depends on – objectives, timescale, budget
Levels of Approach

Level 1 – Qualitative
- Identify significant ES

Level 2 – Semi-quantitative
- existing area data
- indicative values

Level 3 – Quantitative & verified
- new targeted surveys
Ecosystem Based Valuation Approach

1. Identify the ecosystems present
2. Map - extent / characteristics each ecosystem
3. Identify the Ecosystem Services for each ecosystem
4. Identify significant ES
5. For significant ES identify local data*
6. Gap analysis - potential transferable values*
7. Establish benefit values*

* often difficult to do locally at this point in time
Example ES Valuation – Forest of Marston Vale
IEEP approach – rapid assessment
Marston Vale
Audit – Current Ecosystems

Woodland:

The area of woodland until recently only accounted for <4% of land cover. Through active management it is now just over 7%. Most historic woodlands are small fragments which are designated as ancient woodland sites.

Since 1991 600 ha woodland – one million trees and shrubs - have been planted, including small farm woodland and larger wooded blocks. Future plans are for 30% woodland cover, mainly on farmland.

Farmland:

Open intensive arable production dominates the area – accounting for 73% cover. Most of the agricultural land in the vale rated as Grade 3a, with areas of grade 2 land in the north-west (Kempston Rural) and the east (Willington and Cople)

Changes in farm management, including creation of large fields in the 1960s, 1970s and early 1980s, and decline of spring crops has had an impact on farmland. 30% of farmland was managed under environmental stewardship.
Marston Vale
Identification of Services

Current ecosystem services classified:

<table>
<thead>
<tr>
<th>Highly significant ecosystem service type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderately significant ecosystem service type</td>
</tr>
<tr>
<td>Low significance/insignificant ecosystem service type</td>
</tr>
</tbody>
</table>
### Marston Vale

**Significant Service Identification**

<table>
<thead>
<tr>
<th>Types of Service</th>
<th>Woodland</th>
<th>Farmland</th>
<th>Grasslands</th>
<th>Freshwater wetlands</th>
<th>Riverine</th>
<th>Parks and Gardens</th>
<th>Urban Green Space</th>
<th>Brownfield Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Provisioning services</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food</td>
<td>Wheat, barley, rape, linseed, beans</td>
<td>Fuel crops Stubble as biofuel</td>
<td>Some grazing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fibre and Fuel</td>
<td>Firewood Timber – currently small but growing</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Biodiversity/Genetic resources</strong></td>
<td>Conservation of local genetic resources, Community Tree Trust - collection of seed, nurture &amp; plant (commercial potential)</td>
<td>Conservation of local genetic resources</td>
<td>Conservation of local genetic resources, Biodiversity of farms – 30% stewardship Declining farm species</td>
<td>Conservation of local genetic resources</td>
<td>Conservation of local genetic resources</td>
<td>Conservation of local genetic resources</td>
<td>Conservation of local genetic resources</td>
<td></td>
</tr>
<tr>
<td>Biochemicals, natural medicines, pharmaceuticals</td>
<td>Some very small scale traditional markets</td>
<td>Aquifer on green sand ridge</td>
<td>Aquifer on green sand ridge</td>
<td>Maintenance of water table</td>
<td>Maintenance of water table</td>
<td>Aquifer on green sand ridge</td>
<td>Disused Clay &amp; Gravel Pits – see freshwater</td>
<td></td>
</tr>
<tr>
<td>Ornamental resources</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fresh water</td>
<td></td>
<td>Aquifer on green sand ridge</td>
<td>Aquifer on green sand ridge</td>
<td>Maintenance of water table</td>
<td>Maintenance of water table</td>
<td>Aquifer on green sand ridge</td>
<td>Disused Clay &amp; Gravel Pits – see freshwater</td>
<td></td>
</tr>
<tr>
<td>Saline water</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New environmental products/markets</td>
<td>Biofuels</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>New nature conservation sites</td>
</tr>
<tr>
<td>Others</td>
<td>Coppice – small but increasing Woodland burials?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**DELPHI ANALYSIS**
# Marston Vale

## Detailed Breakdown of Significant Benefits

<table>
<thead>
<tr>
<th>Current Significant Service Types</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Woodland</strong></td>
<td></td>
</tr>
<tr>
<td>Provisioning</td>
<td>None identified</td>
</tr>
</tbody>
</table>
| Regulating                        | Buffer / connectivity
   | Buffer to agricultural land and water/wetland |
| Cultural                          | Recreation and tourism
   | Important for walking cycling and game shooting, and events e.g. annual wood fair |
| Aesthetic values                  | Ancient woodlands as part of historic landscape, |
| Scientific                        | Ancient woodland SSSIs |
| Supporting                        | Primary production
   | Small area but important functionally |
| **Farmland**                      |         |
| Provisioning                      | Food
   | Wheat, barley, rape, linseed, beans |
| Regulating                        | None noted |
| Cultural                          | Employment
   | Arable employment, mutual support of farmers within farming communities, landscape, arable biodiversity |
| Supporting                        | Primary production
   | Crop yields, commercial shooting |
| **Grassland**                     |         |
| Provisioning                      | None noted |
| Regulating                        | None noted |
| Cultural                          | Aesthetic value
   | Traditional grasslands, landscape |
| Scientific                        | SSSIs and county wildlife sites |
| Supporting                        | Soil formation
   | Soil fixing and stabilising |
|                                   | Primary production
   | For grazing |
# Marston Vale Ecosystem Service Values

<table>
<thead>
<tr>
<th>Service Type</th>
<th>Service Values where available</th>
<th>Details and Source of data</th>
<th>Textual Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Woodland:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provisioning</td>
<td></td>
<td></td>
<td>Values currently small but growing</td>
</tr>
<tr>
<td>Buffer and connectivity</td>
<td>Residents are willing to pay £7680 per household for views of broadleaved forests</td>
<td>Amion 2008</td>
<td></td>
</tr>
<tr>
<td>Regulating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Climate regulation</td>
<td>Carbon sequestration £981/ha/yr</td>
<td>O’Gorman &amp; Bann 2008</td>
<td></td>
</tr>
<tr>
<td>Air quality</td>
<td>Health related benefits of urban tree cover £29/ha/yr</td>
<td>O’Gorman &amp; Bann 2008</td>
<td></td>
</tr>
<tr>
<td>Cultural</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recreation and tourism</td>
<td>£1.66-2.78 per visit to woodland £2.00 per visit to woodland £34/ha/yr £14.50 for rural leisure visits £35.69 rural tourism visits</td>
<td>Amion 2008 Scarpa 2003 O’Gorman &amp; Bann 2008 ELBS 2005 ELBS 2005</td>
<td></td>
</tr>
<tr>
<td>Aesthetic value</td>
<td>£5.18 (4.13-6.22) /ha/yr £8.27 (6.86-9.67) /ha/yr</td>
<td>Landscape value of trees</td>
<td>Values included under aesthetic values and recreation values above.</td>
</tr>
<tr>
<td>Scientific</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supporting</td>
<td>?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Using Valuation in Future Planning

Pressure / Change

Change in Biophysical Structure or Process
(e.g. woodland habitat or net primary productivity)

Change in Function
(e.g. slow passage of water, or biomass)

Change in Service
(e.g. flood protection or harvestable products)

Change in Benefit (Value)
(e.g. willingness to pay for woodland protection or for more woodland or harvestable products)
Valuation in Scenario Testing

Approach

- Current Baseline Ecosystem Services & Values
- Scenario to be tested (& timescale)
- Likely Future Trends (over timescale)
- Scenario – Future with scenario
- Scenario – Future without scenario
- Comparisons
- Trends (in terms of values & services)
- Impacts (in terms of values & services)
- Conclusions & Recommendations
Marston Vale
Scenario Testing

Impact on Ecosystem Services of Marston Vale Plan (to 2031)

Scenario 1
With plan implemented

Scenario 2
Without plan
## Marston Vale

### Scenario Analysis Matrix

<table>
<thead>
<tr>
<th>Future ES Services WITHOUT Scenario – Plan</th>
<th>ES trends WITH Scenario / Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Significant Services</td>
<td>Changes to Ecosystem Service Value of Scenario</td>
</tr>
<tr>
<td>Trend</td>
<td></td>
</tr>
</tbody>
</table>

### Woodland:

- **Provisioning**
  - Current: 0
  - Trend: +
  - Changes: Products from thinning, new coppice etc.
  - Trend: +

- **Regulating**
  - Buffer and connectivity: 0
  - Trend: +
  - Changes: Increased connectivity and buffering
  - Trend: ++
  - Climatic regulation: 0
  - Trend: +
  - Changes: Increased woodland carbon sequestration
  - Trend: ++

- **Cultural**
  - Recreation and tourism: +
  - Changes: From larger areas of woodland
  - Trend: ++
  - Aesthetic value: 0
  - Trend: +
  - Changes: As part of linked landscape and Brownfield planting
  - Trend: ++
  - Scientific: -
  - Changes: Maintenance of ancient woodland and enlargement of woodland area
  - Trend: ++

- **Supporting**
  - Primary production: +
  - Changes: Increased woodland cover
  - Trend: ++
## Marston Vale

Marston Vale Fens without (-) and with (+) the Forest Plan (2031)

### Ecosystem Service types

<table>
<thead>
<tr>
<th>Main Ecosystem Types</th>
<th>Provisioning Services</th>
<th>Regulating Services</th>
<th>Cultural Services</th>
<th>Supporting Services</th>
<th>Overall Ecosystem Service</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Woodland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farmland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grasslands</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freshwater wetlands</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Riverine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parks and Gardens</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban green space</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brownfield</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

The table displays the changes in ecosystem services for different areas under the Marston Vale Forest Plan (2031). The arrows indicate the direction of change, with a red triangle for a decrease, a yellow triangle for an increase, and a green triangle for no change. The overall ecosystem service change is indicated by the direction of the arrow in the last column.
Ecosystem Services
a more sustainable approach?

- Ecosystem Services = constraint & opportunity
  - Realising services – gap/barrier analysis

- Wider coverage than existing approaches - SEA
  - Covers non-planning issues
  - e.g. Agricultural change
Buy in for Ecosystem Services

Need to be able to demonstrate how Ecosystem Services can:

• **Input** into existing approaches

• **Add value** to existing approaches

• **Simplify or replace** existing approaches