



Applying ecosystem services in practice

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THE "SILENT HIGHWAY"-MAN



**Hurricane Agnes' floodwaters were within inches of
overtopping Sunbury's flood wall**
(Photo courtesy SRBC archives)

The rise of ecosystems thinking

1960s...

1980s...

2004/5

- Millennium Ecosystem Assessment

2009-2011

- NEA, NVP, NEF, two White Papers...
- An overnight success in 25-50 years!

‘What have rivers ever done for us?’



- Intuitive
- Linking people’s needs/economics benefits with ecosystems
- Making the ‘triple bottom line’ understandable and tractable

The MA ecosystem services classification...

Provisioning services
Fresh water
Food (eg crops, fruit, fish, etc)
Fibre and fuel (eg timber, wool, etc)
Genetic resources (used for crop/stock breeding and biotechnology)
Biochemicals, natural medicines, pharmaceuticals
Ornamental resources (eg shells, flowers, etc)

Regulatory services
Air quality regulation
Climate regulation (local temp. /precipitation, GHG sequestration, etc)
Water regulation (timing/scale of run-off, flooding, etc)
Natural hazard regulation (ie storm protection)
Pest regulation
Disease regulation
Erosion regulation
Water purification and waste treatment
Pollination

Cultural services
Cultural heritage
Recreation and tourism
Aesthetic value
Spiritual and religious value
Inspiration of art, folklore, architecture, etc
Social relations (eg fishing, grazing, cropping communities)

Supporting services
Soil formation
Primary production
Nutrient cycling (water recirculation in landscape)
Water recycling
Photosynthesis (production of atmospheric oxygen)
Provision of habitat



How do you address ecosystem services in the 'real world'?

- How to demonstrate the value of ecosystem services?
- How to 'operationalise' for busy decision-makers?
- 'Real world' demonstration of costs and benefits
 - ➔ Starting off with a series of case studies



What doesn't qualify as an ecosystem services case study?

- Old model of narrowly-framed management for single/few services
 - ❑ “We’re doing one/a few of these services already” ...
 - ❑ ...but are you considering impacts across the integrated system
- Using the new ‘ecosystems’ language is not enough!
 - ❑ Land Use Consultants with GHK Consulting (2009) for the EA
 - Four ‘important’ services...
 - ..and thereby assumed all others as ‘not important’
 - Benefits and blind spots... good old ‘exploitation economics’!

What does qualify an ecosystem services case study?

- Must address the whole system
- Defra 'An introductory guide to valuing ecosystem services' (2007)

Defra 2007 'likelihood of impact' weighting system

<u>Score</u>	<u>Assessment of effect</u>
++	Potential significant positive effect
+	Potential positive effect
O	Negligible effect
-	Potential negative effect
--	Potential significant negative effect
?	Gaps in evidence / contention



Pragmatic handling of economic valuation

Risks to avoid:

- 'Ignoring most of the system' (exploitation economics)
- Valuing only readily-exploitable services (exploitation economics +)
- Double counting
- Giving the impression that money values have absolute meaning
 - Our approach was to seek to value ALL SERVICES...
 - ...but being explicit about how double-counting is avoided

Ecosystem services case studies used in this review

- TAMAR 2000 (catchment restoration)... also... ALKBOROUGH FLATS (managed realignment)
 - ❑ <http://publications.environment-agency.gov.uk/pdf/SCHO0409BPVM-E-E.pdf>
- RIVER GLAVEN Sea Trout Restoration Project
 - ❑ <http://publications.environment-agency.gov.uk/pdf/SCHO01110BRTZ-e-e.pdf>
- Upper BRISTOL AVON Buffer Zone (just 330 metres)
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 - ❑ Environment Agency report (in press)
- Options appraisal for WAREHAM HARBOUR coastal defence scheme
 - ❑ EFTEC study (see Defra 2007 *An introductory guide to valuing ecosystem services*)
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- Valuing Ecosystem Services in the East of England (FIVE CASE STUDIES)
 - ❑ Glaves, P., Egan, D., Harrison, K. and Robinson, R. (2009). *Valuing Ecosystem Services in the East of England*. East of England Environment Forum, East of England Regional Assembly and Government Office East England.
- The proposed Pancheshwar Dam, India/Nepal
 - ❑ http://www.ies-uk.org.uk/resources/papers/pancheshwar_dam_report.pdf

Ecosystem services assessment of Tamar 2000

SUPPORT



MA ecosystem service category	Annual benefit assessed	Notes
Provisioning services	Approx £578,000	Fresh water accounted for £304,000 with savings of food production contributing £263,319, in addition to £8,269 for fish stock sales and £2,511 for fuel and fibre
Regulatory services	Approx £2,475,000	Valued services included £2,455,304 for climate regulation with a further £12,500 for natural hazard regulation and £7,151 for erosion regulation
Cultural services	Approx £320,000	Includes £2,511 for cultural heritage and £317,966 for recreation and tourism
Supporting services	Approx £502,000	Includes £360,360 for water recycling, £69,114 for provision of habitat, £66,032 for nutrient cycling and £6,269 for soil formation
Gross annual ecosystem services benefits	Approx £3,875,000	

Ecosystem services assessment of Alkborough Flats managed realignment



MA ecosystem service category	Annual benefit assessed	Notes
Provisioning services	Approx £1,700	Loss of £28,075 from arable conversion, offset by a gain of £26,820 for fibre production (wool production minus loss of straw sales) plus £3,000 sales of rare breeds stock
Regulatory services	Approx £15,000 (except flood regulation which has a substantial 100-year costed benefit of £12.26 million)	£14,553 benefit from climate regulation, noting that flood regulation is valued differently in the formal benefit-cost justification for this scheme
Cultural services	Approx £160,000	£164,830 for recreation and tourism (ignoring informal recreation), with a net COST of £5,000 for protecting navigation
Supporting services	Approx £758,000	£749,438 for provision of habitat plus £8,160 for primary production
Gross annual ecosystem services benefits	Approx £934,000 excluding contribution to substantial flood regulation value	

Ecosystem services assessment of River Glaven sea trout restoration



MA ecosystem service category	Annual benefit assessed	Notes
Provisioning services	Approx £20,000	Largely related to payments for transition from ELS to HLS agri-environment payments
Regulatory services	Approx £67,000	£53,810 in climate regulation, £11,400 in water regulation, and £1,140 in erosion regulation
Cultural services	Approx £167,000	£123,459 from recreation and tourism (fishing, shooting and ecotourism), £36,500 as an addendum service of local amenity and informal enjoyment, and £7,200 for social relations (largely volunteer activities)
Supporting services	Approx £21,000	Related to provision of habitat
Gross annual ecosystem services benefits	Approx £275,000	

Ecosystem services assessment of upper Bristol Avon buffer zone



MA ecosystem service category	Annual benefit assessed	Notes
Provisioning services	Approx £500	£400 for 'fresh water' and £108 for savings on 'food' production
Regulatory services	Approx £1,800	£240 in 'climate regulation', with £1,600 on 'erosion regulation' (£1,000 for costs of soil loss from the field and £600 for removal from river)
Cultural services	Approx £4,600	£2,975 from 'recreation and tourism' (of which £828 is angling benefit and £2,147 is tourism), £208 as an addendum service of local amenity and informal enjoyment, and £1,450 (32%) for social relations (largely volunteer activities)
Supporting services	Approx £1,600	All related to costs averted in 'provision of habitat'
Gross annual ecosystem services benefits	Approx £8,600	

Ecosystem services assessment of the Mayes Brook restoration



Ecosystem service	Benefit assessment
Gross annual provisioning service benefits	Unlike related rural ecosystem services case studies (Everard, 2009a, 2010 and submitted; Everard <i>et al.</i> , 2009; Everard and Jevons, 2010), the provisioning service outcomes of this urban river ecosystem restoration are assessed as zero (£0) though some development options are highlighted for 'fibre and fuel'.
Gross annual regulatory service benefits	The substantial (Approx) £26,500 regulatory service benefits stemming from habitat enhancement in this urban park relate almost entirely to public health and risk management, demonstrating the significant role of Mayesbrook Park in enhancing the wellbeing of the neighbourhood
Gross annual cultural service benefits	Contribution of the park restoration to cultural services is significant given its urban location and dense adjacent population, providing substantial benefits in terms of recreation, social relations and educational opportunities estimated at some (Approx) £337,000
Gross annual supporting service benefits	The supporting services enhanced by restoration of this currently environmentally-impooverished parkland are of significance in enabling other more readily-valued services to be performed, but also in terms of nutrient recycling and provision of habitat with a cumulate evaluated benefit of (Approx) £30,600
Total ecosystem services across the four categories	Approx £394,000

Ecosystem service weightings from the Wareham managed realignment case study (after EFTEC, 2007)

Option	Do nothing	Do minimum	Improve defences (rebuild)	Managed Realignment (vision)	Managed Realignment (unconstrained)
<i>Supporting services</i>					
Soil formation	+	+	0	+	+
Primary production	+	+	-	+	+
Nutrient cycling	+	+	-	++	++
<i>Provisioning services</i>					
Ecosystem goods	+fish/-agri	+fish/-agri	-fish	+fish/-agri	+fish/-agri
Fresh water	0	0	0	0	0
Biochemicals/genetics	?	?	?	?	?
<i>Regulating services</i>					
Air-quality regulation	0	0	0	0	0
Climate regulation	+	+	-	+	+
Water regulation	+	+	-	+	+
Water purification	+	+	-	+	+
Pest regulation	?	?	?	?	?
Disease regulation	?	?	?	?	?
Pollination	+	+	-	+	+
Erosion regulation	+	+	--	++	++
<i>Cultural services</i>					
Recreation and tourism	-	-	0	++/-	++/-
Aesthetic	+/-	+/-	+	+	+
Educational	0	0	0	+	+
Cultural heritage	--	--	0	-	-



Five East of England ecosystem services case studies (Glaves *et al.*, 2009)



Case study	'Scenarios': marginal impacts of whether or not a planned initiative
Marston Vale	Implementation of the Forest of Marston Vale Plan to 2031
Cambridgeshire Fens	Positive Catchment Scenario Testing (a set of linked positive management initiatives)
Blackwater Estuary	With and without Coastal Realignment in the Blackwater Estuary
Norwich	Conversion of the Deal Ground/Utilities site into open space or development for housing
Great Yarmouth	Impact on health deprivation of increasing and/or improving the Ocean Space provision in Great Yarmouth

Ecosystem services assessment of the proposed Pancheshwar Dam, India/Nepal



MA ecosystem service category	Overall assessment of likely ecosystem service impacts
Provisioning services	The overall balance of benefits of the proposed Pancheshwar Dam scheme are equivocal or negative across the provisioning services, when implications for diverse ecosystems and their dependent stakeholders are assessed in parallel across local and catchment scales. The picture emerging is that some local gains are balanced by other local impacts. However, catchment-scale impacts, which seem not to have framed scheme design, are likely to be overwhelmingly negative. This raises issues of equity in access to the various benefits and costs of the dam scheme, and the extent to which wider ramifications beyond narrowly-defined benefits have been considered along with alternative methods for their achievement
Regulatory services	Assessment of regulatory service impacts, both at the dam site and at catchment scale, reveals substantially negative likely consequences for ecosystems and the interests of the many people dependent upon them, even for the planned benefits for local populations
Cultural services	Assessment of impacts of the dam on cultural services suggests almost unanimous significantly negative outcomes at both dam and catchment scales
Supporting services	Assessment of impacts of the dam on supporting services suggests unanimous significantly negative outcomes at both dam and catchment scales, degrading ecosystem integrity and functioning and the wider resilience and societal benefits that it is able to provide

Applying ecosystem services in the 'real world'

1. Time and resources are tight
2. Many decisions have to be taken, often quickly...
 - i. 8,000+ water bodies each with multiple 'issues' in WFD!
3. Increasing need for transparency and engagement...
 - i. Public comprehension and engagement
 - ii. Understanding multiple interdependent consequences
4. Risk-based approaches are required
 - i. Major, contested and uncertain decisions require detailed study, but...
 - ii. Most decisions require simple operational rules
5. Putting the 'rules in the tools'
 - i. Need for new tools, but much could be done to expand existing ones...

Lessons for applying ecosystem services in practice

1. System-level consideration may lead to different outcomes
2. Ecosystem restoration maximises value across all ecosystem services
3. Recognition of all stakeholders in decision-making
4. Communicate/engage in socially meaningful terms
5. Local schemes in catchment context can contribute to sustainability
6. Markets have a key role to play
7. Mainstreaming systemic perspectives into pragmatic tools

Protecting and restoring aquatic ecosystems delivers tangible societal value...
...failing to do so forecloses societal options for the future...
...but this only has 'teeth' if it changes Treasury rules!

Discuss!

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