Waste and resources: using the ecosystem services framework

Steve Albon, Co-chair
James Hutton Institute, Scotland

Resource Recovery from Waste
London, 14 March 2013
UK NEA published in 2011

- Synthesis & Key findings - June
- Technical report - November
  - 1,465 pages in 27 Chapters – some 5 kg!
  - 500 authors
  - Most comprehensive sub-global assessment to date
  - But more to do on valuation (especially non-monetary) and decision-making “tools”

Millennium Assessment about Human Well-being

ECOSYSTEM SERVICES

- Provisioning
  - Food
  - Fresh water
  - Wood and fiber
  - Fuel
  - ...

- Supporting
  - Nutrient cycling
  - Soil formation
  - Primary production
  - ...

- Regulating
  - Climate regulation
  - Flood regulation
  - Disease regulation
  - Water purification
  - ...

- Cultural
  - Aesthetic
  - Spiritual
  - Educational
  - Recreational
  - ...

CONSTITUENTS OF WELL-BEING

- Security
  - Personal safety
  - Secure resource access
  - Security from disasters

- Basic material for good life
  - Adequate livelihoods
  - Sufficient nutritious food
  - Shelter
  - Access to goods

- Freedom of choice and action
  - Opportunity to be able to achieve what an individual values doing and being

- Health
  - Strength
  - Feeling well
  - Access to clean air and water

- Good social relations
  - Social cohesion
  - Mutual respect
  - Ability to help others

Source: Millennium Ecosystem Assessment

UK National Ecosystem Assessment
Conceptual Approach – socio-ecological system

Requires interdisciplinary research

Natural scientists

- Biophysical Structure
- Ecosystem Function

Social and Economic Scientists

- Ecosystem Service
- Ecosystem Goods

- Long-term in situ experimentation, (where possible networked)
- Specific ex situ experiments
- Dynamic process-based models
- Benefits for human well-being
- Economic valuation of goods

Adapted from Haines-Young & Potschin 2007
Conceptual Framework – evolution from the MA

Social feedbacks, institutional interventions and responses

Drivers of Change (Direct and Indirect)
- Demographic, economic, socio-political, technological and behavioural
- Management practices
- Environmental changes

Future scenarios for the UK

Human Well-being:
- Economic value
- Health value
- Shared (social) value

Good(s)*

Ecosystem Services
- Ecosystems
- Air, land, water and all living things

UK National Ecosystem Assessment
Conceptual Framework – focus on well-being

<table>
<thead>
<tr>
<th>Ecosystem processes/Intermediate services</th>
<th>Final ecosystem services</th>
<th>Good(s)*</th>
<th>Well-being value</th>
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Figure 10 The full set of ecosystem processes, services, goods/benefits and values used in the UK NEA. Note that some ecosystem services can be both intermediate and final services. For simplicity, in this figure, services are shown only in the most final position that they occupy. Services such as pollination and climate regulation that also play important roles further back in the chain are not represented here. Cells with no colour are ecosystem processes/services that were not in the Millennium Ecosystem Assessment classification. *Note that the term good(s) includes all use and non-use, material and non-material outputs from ecosystems that have value for people. Source: adapted from Fisher et al. (2008).
Most ecosystems deliver multiple services
UK NEA Ecosystems (Broad Habitats)

Mountains/Moors/Heaths

Semi-natural grasslands

Woodlands

Enclosed farmland

Freshwater/Wetlands

Urban (settlement)

Coastal margins

Marine

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# Importance and Trends in Drivers affecting Services

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River water quality 2006 – 2008

a) General chemical

b) Biological

After Maltby & Ormerod, Chapter 9 Technical Report

Boundaries Crown copyright 1991
Chemical measures: EA & SEPA copyright
Quality measures: EA copyright
Kringing interpolation, Durance (Cardiff University 2010)
Delivering multiple services: waste water/biomass

After Avery, James Hutton Institute
Interacting Drivers: Acid deposition and Grazing

1996-1998

Nitrogen deposition

2004-2006

After Van der Wal, Chapter 5 Technical Report
Pre-cautionary Principle: Detoxifying the Toxic!

- Dioxins
- Pesticides
- Polycyclic aromatic hydrocarbons (PAH)
- Polychlorinated biphenyls (PCB)
- Polybrominated diphenyl ethers (PBDE)

- Alkyl phenols (detergents)
- Plastics – (phthalates)
- Bisphenol A

ALL OF THEM!

After Rhind et al, James Hutton Institute
Sewage sludge: Endocrine Disrupting Compounds

After Rhind et, James Hutton Institute
UK NEA Summary

1. Already enough information to manage our ecosystems more sustainably and good evidence of the benefits of doing so.

2. But a more sustainable development will require changes in individual and societal behaviour and adoption of a more integrated approach to ecosystem management.

3. A priority is to improve our understanding of how changes in our ecosystems, and in particular the interaction of drivers, influences the delivery of ecosystem services.

4. Non-market values, as well as market values, from ecosystem services can influence the economics of decision-making, but also need to develop methods to incorporate health and social values.
Acknowledgements

• 500 natural, economic and social scientists!
• UNEP-WCMC Secretariat –
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• Georgina Mace, Ian Bateman - Conceptual Framework