Temporal and spatial issues in the delivery and assessment of ecosystem services

13-14 January 2009 St William's College, York

Temporal and spatial issues in the delivery and assessment of ecosystem services

13-14 January 2009 St William's College, York

1. ATTENDANCE

Catherine Baldock, University of Yok
Jasmin Godbold, University of Aberdeen
Caroline Hattam, Plymouth Marine Lab
Nick Hardiman, RSPB
Alison Holt, University of Sheffield
Meg Huby, University of York
Tiziana Luisetti, UEA
Sephen Mangi, Plymouth Marine Lab
Dave Raffaelli, University of York
Jim Smart, University of York
Martin Solan, University of Aberdeen
Ruth Swetnam, University of Cambridge
Piran White, University of York
Jessica Wiegand, University of York

2. INITIAL AIMS

This seminar will focus on temporal and spatial issues in the delivery and assessment of ecosystem services. We will consider:

- GIS-based mapping of ecosystem services in terms of where they are provided and where the benefits are derived
- process-based mapping of how different coastal wetland ecosystem services map onto different microhabitats, processes and functions
- some aspects of social and economic factors in relation to ecosystem service provision and availability
- case studies.

The working time during the first seminar will be split into three sessions - Tuesday afternoon, Wednesday morning, and a short Wednesday afternoon.

On the Tuesday afternoon, we will have a few presentations, with speakers including:

Ruth Swetnam (University of Cambridge)
- Valuation of ES in Tanzania: incorporating spatial and temporal dynamics of change

Tiziana Luisetti (UEA)

- Coastal Ecosystem Valuation: A sequential decision support system

Stephen Mangi (PML)
- ES in the coastal and marine environment how important are they?

Jim Smart (University of York)
- Tools for quantifying temporal trends in service delivery

Martin Solan (University of Aberdeen)
- Towards integrated measures of biodiversity, ecosystem functions and ES

Some of these talks will focus on coastal wetland ecosystems, while others will discuss methodologies relevant to process-based or spatial mapping of ecosystem services, or the assessment of ecosystem services and trends in delivery over time.

During the course of the talks, the whole group will identify areas for further discussion or potential research activity. On the Wednesday morning, the plan is to split the group into 3-4 working groups, who would then discuss a selection of the themes identified by the whole group on the previous day. On the Wednesday afternoon, we will summarise progress including key research challenges, before leading in to the next seminar in the series, which is due to be hosted by UEA and concerned with economic and social valuation of ecosystem services.

3. PRESENTATIONS

3.1 Piran White, University of York

Aims:

- Evaluate implications of change for the provision of ES for coastal wetlands
- Identify links between:
    - biodiversity and the conservation of ES
    - CWES and public welfare
    - CWES and other components of sustainable development

- Gain understanding of how to inform policy decisions regarding ES maintenance
- Build collaboration and further research priorities

More aims:
- Identify CW functions and processes
- Identify ES in CW
- Investigate spatial and temporal relationships between functions and services
- Investigate how to determine the value placed by society on ES G&S derived from coastal wetlands

Gaps in knowledge
- How to quantify ES?
- The role of biodiversity and processes in maintaining ES G&S
- Impact of environmental change
- Role of ES for public welfare
- What is the most effective policy for ES conservation?

Review papers in progress from previous CWES seminars

Review Paper One
"Functions, services and benefits from CWES: framing the research and policy agenda"

1. What is an ES approach?
2. Application to CW
3. Research and policy challenges
4. Importance of ES to society
    a. What do people want?
    b. Who benefits, who provides?
    c. How do we measure the benefits?
    d. Can the ES approach reduce inequalities?
    e. How does the ES approach match with biodiversity conservation?
    f. Do we manage for ES, or goods provided by ES?

Review Paper Two
"Redefining the spatial and temporal context of conservation through ES"

1. Bridging the gap between the science and policy interface
2. Mismatch between current legislation and the ES approach
3. Current EA practices
4. Investigating the problem of using multiple ES to define management

3.2 Stephen Mangi (PML)

"ES in the coastal and marine environment how important are they?"

Determining values provides the route to assessing and quantifying the socio economic benefits of ES

Project: Costing the impact of demersal fishing on marine processes and biodiversity

Valuation conducted through a stakeholder workshop, where each participant was given 20 points to assign to different categories, to determine the relative weightings of the services

Integrated valuation methodologies

- socio-cultural valuation
- economic indirect valuation
- economic contingent valuation
- ecological valuation

Contingent valuation

- 2000 surveys
- Willingness to prevent 10% or 25% species loss
- Mean WTP
- Found regional differences, but not taxon differences
- There were effects of income, and the differing numbers of species at each site
- Need to consider the effects of changing monetary values over time

Project: The monetary value of the contribution of the Isles of Scilly to gas and climate regulation

- apply damage costs avoided with remote sensing, benthic habitat mapping and ecological production from literature

Socio-cultural valuation:

- discourse analysis; q-methodology
- discursive perspectives; areas of SH consensus and divergence
- four main SH perspectives
    - management
    - contingent value
    - future policy
    - ES

3.3 Martin Solan (University of Aberdeen)

"Towards integrated measures of biodiversity, ecosystem functions and ES"

There is an accelerated interest in the links between biodiversity and ecosystem function. The number of publications and citations within and outside the field has increased dramatically.

BUT there is an issue with connectance to the 'real world'

Flow of information:
Talk-theory-methods-lab and field experiments-observations-application

Several dilemmas:

1. What contributes to ES?
2. Scale and context
3. Data resolution
4. Technology, manpower and resources

3.4 Ruth Swetnam (University of Cambridge)

"Valuation of ES in Tanzania: incorporating spatial and temporal dynamics of change"

Looked at the aspects of the ecosystem utilised to produce human well-being, mapping the costs and benefits of conserving services
Service flow:

1. where the stocks are
2. where they're used

Need to remember that it's a biophysical system sitting in a socio-political context
Determine future social scenarios and how this will impact the biophysical terrain
Implement scenarios of change determined by models driven by landcover change

Current land use 2000 → future land use 2025

Then looked at the implications for conservation

- where to target resources for maximum benefit
- how different economic futures may have a positive or negative effects on Tanzania
- How to achieve equitable treatment to people maintaining the services
- There is money potentially available to feed directly back into conserving habitats

"PEOPLE ARE AT THE HEART OF ECOSYSTEM SERVICES"

3.5 Jim Smart (University of York)

"Tools for quantifying temporal trends in service delivery"

Questions:

- Is there a trend?
- Are explanatory variables responsible for this trend?
- Are different time series data linked or interacting
- Are there any sudden changes?
- Are there cyclic patterns?
- Can we predict future trends and/or future values?

Problems:

- serial correlation in errors
- inappropriate statistical inference
- prediction rather than understanding
- statistical validity requires 25-30 observations minimum which is a problem when dealing with ecological data

LOESS smoothing
MinMax autocorrelation factor analysis (MAFA): identifies underlying trends in multiple time series data

3.6 Tiziana Luisetti (UEA)

"Coastal Ecosystem Valuation: A sequential decision support system"

Blackwater Estuary

Problem: sea level rise and coastal squeeze

Wetland class → intermediate service → final service → benefit to humanity

Potential benefits:

Flood defence (maintenance costs)
Carbon storage (damage cost avoidance)
Fisheries production (market analysis)
Amenity and recreation (stated preference techniques)

There is a need to know the threshold and tipping points of a system "safe minimum standard"

4. WORKSHOPS

4.1 Uncertainty

About what?

Biodiversity → ecosystem processes → ecosystem services

Data:

- measurement error
- variation in natural and social systems
- indicator choice: mostly chosen simply because data is there

Future scenarios:

- The future: how will the world be in 20 years time?
- predictive science for ES difficult without knowing what the world will be like
- economically
- tipping points
- further into the future looked, the less certain the outcome
- unknown unknowns…

1. Dealing with uncertainty
    a. Models; simulation
    b. Sensitivity analysis (Chris Costello, Minnesota)
    c. Use all possible scenarios (!)
2. Adaptive Management
    a. Monitor and change policy accordingly
3. Conveying uncertainty to policy makers/stakeholders
    a. Probabilistic predictions BUT this could cause a loss of confidence in science: credibility
4. Build resilience
    a. Real options theory
    b. Don't close doors/options

How much uncertainty is ok?

It becomes an issue when it makes a difference to society
Increases with scale; spatial and temporal

→ set desired future states
    Uncertainty in how to get to those future states. The future is planned; the uncertainty is in trying to obtain it

Who decides goals?

- equity
- power issues
- values change

4.2 Space and time

1. statistical technique issues
2. legislative boundaries; different scales
3. what data is required; what form will the data take?
4. indicators of service?

Issues of scale:
- funding scales
- interdisciplinary prevention by the funding council remits

Scale:
- service dependent; use data appropriate to the service we're interested in
- Need to be bound by what is needed, not by what's been done before; THEN generate data/indicators required to answer the question
- Need to determine receivership of costs and benefits
- Note: are scales on which we can collect data relevant to legislative boundaries and scales?

4.3 Holistic measures and approaches

Useful:
- Stakeholders: understanding process and simple awareness raising
- Decision makers: quick overview of complex matters
- Researchers: consider beyond own specialism and guide future research

BUT:
- danger of over-reliance on figures and values
- benefits transfer issue
- the 'art' of consultation, engagement and involvement can influence outcomes
- How much do we want to be led by SH priorities?

Surrogate values:
- how precise data resolution is required?
- Data is ultimately rated/ranked subjectively according to whether it is 'good' or not, so is fine resolution necessary?
- Who rates/ranks?
- Precision is dependent on what the data is used for
- Is there a conflict between precision and holistic approaches?

Learn by doing:
- case study approaches very valid

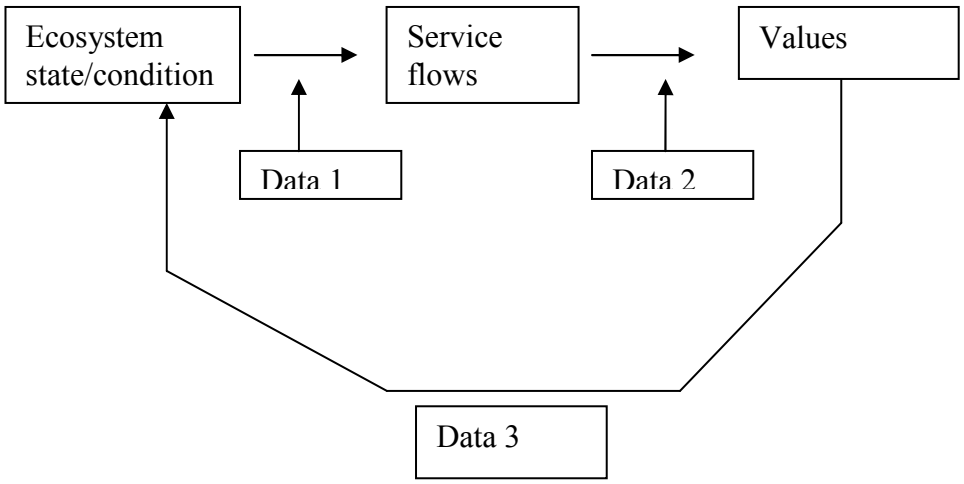
- ES approach can have perverse consequences as we are currently managing degraded ecosystems
    - Eg Ythan: ↑ nitrogen, : ↑ mussels, : ↑ birds
    - ↓ nitrogen, ↓ mussels, ↓ birds (THIS is the pristine state!)

5. POLICY AND PROPOSAL DEVELOPMENT

5.1 Links to policy:

- more emphasis on ES?
- What numbers are important to policy makers?
- What numbers are recognised by policy makers?
- Is non-monetary valuation acceptable in policy?
- How to make the transition from theory to the real world?
- Does science inform policy, or does policy inform science?
- Policy makers do like numbers, as it gives some basis to discriminate between different options. £s are tangible
- BUT other options would still be valid IF they were robust
- Need to have expertise across all areas to ensure total credibility with decision makers
- New links and interfaces needed to transmit information to policy makers
- Scientists need a better understanding of how policy makers work

5.2 Proposal development:



For example:
Service flow chosen = food: fish species eaten
Fish require: temperature, food etc (biophysical model)
Fish valued: markets (£), number of people employed by industry etc

How do these values affect the state of the ecosystem?

Qu 1: What are the ES flows in the area in question?
Qu 2a: What are the biological processes that give rise to these ES, and how are these affected by the state and condition of the ecosystem? (Data 1) Generic for many areas providing those services
Qu 2b: What data are required to determine the values of the service flows? (Data 2). These are site and context specific.
Qu 3: How is the state and condition of the ecosystem affected by the values placed on the service flows? (Data 3)

One types of each service chosen:

- supporting
- regulating
- cultural
- …

Can use two types of approaches:

1. mechanistic model
2. case study approach

Added value is the incorporation of Data 1, 2 and 3 explicitly; full pathways researched. Need to consider how to present and incorporate policy makers from the start of the project.