



The Global Land Project Nodal Office on Integration and Modelling, Aberdeen, UK

GLP Workshop on 'Representation of ecosystem services in the modelling of land systems'

Post Workshop Report



Introduction

On 19th – 20th March 2010, the Global Land Project (GLP) Nodal Office for Integration and Modelling held their workshop on ‘Representation of ecosystem services in the modelling of land systems’ at Jurys Inn, Aberdeen. The event was an international affair with researchers from China, France, Italy, Belgium and Germany and as well as representatives from the Ecology, Soils, Catchment Management and Integrated Land Use Systems groups of the Macaulay Land Use Research Institute and UoA and CEH.

Ecosystem services are seen as benefits people obtain from ecosystems and often discussions revolve around economic value and health and well being of humans. This workshop recognised the need to understand how ecosystem services should be represented in modelling. Models in which ecosystem services are an integral part of land systems are needed, both to adequately capture complex dynamics of human-environmental processes, and to explore consequences of land change in provision and management of ecosystem services. This workshop explored the measurement and representation of ecosystem services in land systems and models for application in policy and practice.

The workshop was divided into 3 sessions which consisted of a limited number of presentations. This report provides a brief description of each presentation. Discussions and issues which arose over the two day workshop are summarised at the end of the report along with the next step plan.

Abstracts, power-point presentations together with this report are available on the GLP Aberdeen Nodal Office Website <http://glp.macaulay.ac.uk/Completedevents.php>

Workshop Sessions

The workshop was opened by Richard Aspinall with a brief introduction to the Global Land Project, their science plan, aims and objectives. An overview of the role of the Nodal Office for Integration and Modelling was also presented before he addressed the premise for the workshop.

Session 1.

Presentations in this session included:

Modelling the influence of land use and land cover change in ecosystem services by Peter Verburg, VU University, Amsterdam. This opening presentation provided an overview of land system modelling, how we represent land systems in models and the challenges for ecosystem services research which were identified as quantification and mapping, modelling and communicating and discussing.

Trade-offs between ecosystem services under conditions of changing land use: the urban perspective by Dagmar Haase, Humboldt University Berlin. Based on an EU-project

PLUREL, Dr Haase explored the challenges of urban ecosystem services and the modelling of the supply and demand of ecosystem services in the urban region of Leipzig-Halle.

Modelling ecosystem services dynamics in mountain grassland and analysing trade-offs by Pénélope Lamarque, Laboratoire d'Ecologie Alpine. Pénélope presented a conceptual model of mountain grasslands socio-ecological system. The presentation highlighted the different perceptions of ecosystem services among individuals with an activity or interest in the area.

From biodiversity to ESS research – Building on BIOTA for TREES by Gertrud Schaab, Karlsruhe University of Applied Sciences. Dr Schaab talked about the BIOTA, an East African project which focuses on three East African rainforests investigating the effects of fragmentation, disturbance and human impact; comparison within and among forests.

Session 2.

Presentations in this session included:

Representation and Mapping of Ecosystem Services in Land Systems by Richard Aspinall, Macaulay Land Use Research Institute. This presentation discussed ways to measure and represent ecosystem services that are based on stocks and flows, functions, and supply and demand.

Trade-offs between land use change for agricultural production and carbon sequestration by Jo Smith, University of Aberdeen. Dr Smith talked about the ECOSSE model and how has been used to examine the changes in soil C stocks associated with land use change, assess the land use changes most likely to reduce carbon losses and then provide output based on various mitigation scenarios.

Practical application of the Ecosystem Service approach: A case study of the UK Environmental Change Network by Jan Dick, Centre of Ecology and Hydrology. This talk detailed the inventory approach undertaken for ECN sites in the UK and the ecosystem services attributed to each site. The presentation drew out how local management will affect ecosystem services available from the site and differences between the potential and realised ecosystem services from landscapes.

Developing an iterative multi-scale landscape modelling framework for ecosystem services by Marie Castellazzi, Macaulay Land Use Research Institute. This presentation demonstrated an iterative approach based upon the LandSFACTS toolkit to generate land use change scenarios. A case study was provided based on three scales – Grampian region, Dee catchment and Tarland sub-catchment.

Session 3.

Presentations in Session 3 included:

A multi-scale approach for analysing landscape service dynamics – Louise Willemen, Joint Research Centre – European Commission. Dr Willemen talked about a model framework which simulated the spatial and temporal dynamics in service supply within a changing landscape and changing societal demand. The case study used was the transitional rural area, Gelderse Vallei in Netherlands.

Integrated ecological effects in land use change during 1986-2006 in Lijiang County of China by Jian Peng, Peking University. Dr Peng presented the research progress on assessing ecological effects of land use change. The presentation showed the models considering area ratio and spatial pattern dimensions used for assessing integrated ecological effects of land use change in Lijiang County of China.

A process-based model for soil multifunctionality by Matt Aitkenhead, Macaulay Land Use Research Institute. Dr Aitkenhead's presentation covered the function and process handling of a new soil model, detailing the processes, operation and model outputs.

Participatory Strategic Planning Using A Virtual Reality Environment – David Miller, Macaulay Land Use Research Institute. This presentation by Prof Miller included a demonstration of the Virtual Landscape Theatre at the Macaulay Land Use Research Institute. Prof Miller discussed its role in communicating and visualising land use change and how it can be used to engage different communities and assist planners and decision-makers.



Workshop delegates attending a participatory presentation by David Miller of the Virtual Landscape Theatre at the Macaulay Land Use Research Institute.

Discussions

Services and functions

How do you define ecosystem services such as a sense of place to measure qualities? This question was raised by Dr Jan Dick during her presentation. It prompted some discussion regarding cultural services, which is difficult to measure and define i.e. inspiration, sense of place as they are based on an individual's perception. It highlighted the challenge with cultural ecosystem services in terms of assessment and incorporation in trade offs.

Relationships between services

The EU Eururalis model presented in Peter Verburg's presentation used spider diagrams to provide a visualisation of trade-offs based on the various scenarios. This had proven a good way, in their study in disseminating results. This led to discussions around the best communication and visualisation methods which are detailed later in this report. During the workshop delegates visited the Macaulay Land Use Research Institute for a demonstration of the Virtual Landscape Theatre and a discussion of its role in engaging a

broad range of stakeholders. Many felt the tool used will be governed by the stakeholder group you were trying to engage.

Further discussion about stakeholder participation was prompted by Dagmar Haase's presentation and the possibility of ranking ecosystem services when assessing trade-offs. It was pointed out that any merits of a ranking system are limited by the bias of the stakeholders involved.

Modelling

Data availability was a common problem cited by many of the researchers. Two factors were considered attributable to this problem; 1) many datasets incorporate data which relates to individuals (households) and therefore data protection issues apply and 2) data is often viewed as financial property by the researcher(s), driven by the policies/opinions of their institutions. 3) The nature of some ecosystem services, like mentioned above. Some debate arose regarding whether a common dataset could be made available for testing ideas through the GLP website? This gave rise to concerns about the range of data required to run models and the need for specific data for operational projects. Discussions also revolved around data quality and whether this should be peer reviewed.

Top down and bottom up approach models were presented. For top down models discussions included incorporating local decision making in the models. We also discussed how radical changes could be included into models and how models can be coupled.

Some debate arose regarding the challenges of working within a multi-discipline group. Discussions revolved around how we go about pulling together work on ecosystem services when different concepts and methodologies are used by modellers and social scientists.

Visualisation and communication, participation.

A common theme gathered from several presentations were issues regarding terminology and definition. Researchers engaged in participatory studies found that at a local level a better recognition and understanding was derived when the terms 'environmental services' or 'landscape services' were adopted, instead of 'ecosystem services'. This led to some debate about the definition of ecosystem services and should ecosystem services be classified as those which are 'pure'? Many people, including some members of the scientific community, do not recognise that managed ecosystems produce ecosystem services, therefore food provision through agriculture is not regarded by some as an ecosystem service. It was suggested that the terminology used should be 'system services' as it is system analysis that is required to understand ecosystem services. A clear agreement on the terminology and definition of ecosystem services needs to be made among the integrated land science community.

Discussions included the different perceptions of ecosystem services among stakeholder groups, as demonstrated by some of the case studies presented. Perceptions were governed by the amount and type of activity engaged in within the study area and impacted on land management practices. Perceived ideals about ecosystem services between experts and stakeholders led to difficulties when analysing potential trade-offs. However local knowledge is essential when evaluating the ecosystem services which can be derived from an area/region. Often local stakeholders can identify ecosystem services which are relevant to the area, but are not apparent to the experts/scientists. An example was given in Pénélope Larmarque's presentation on the mountain grasslands of Central French Alps, where vole regulation was seen as an important ecosystem service by the locals.

Key Issues

Defining services and functions

- measurement of services
- land functions (and links to land cover, use and management)
- relationships between services and functions (and processes)

Quantifying relationships between services

- trade-offs
- cross mapping relative to a baseline
- rural-urban gradients

Modelling

- data availability
- Integration with process-based models of services
- comparison and integration of top down and bottom up approaches
- Dealing with uncertainties
- Choice of model
- targets of modelling

Scale Issues

- observation/measurement or proxies of ecosystem services
- local, regional, urban region
- scale effects

Visualisation and communication, participation.

Issues:

- terminology and definitions
- perceptions of value
- spider diagrams

Next Steps and Publications

The delegates identified the need to produce a review paper on the coupling of land use change modelling with ecosystem services. The nodal office will drive the production of the paper, prepare the abstract and put together a timetable for its production and publication. Further research identified by the review paper should be considered as forming the basis of collaborative research proposal. Delegates from the workshop would be the core leads on the proposal and investigations will be made into the upcoming EU proposal call.

Another workshop in 2 years time to review the progress in ecosystem services modelling may be considered following the publication of the review paper.

Delegates were encouraged to participate at the GLP Open Science Meeting in Arizona in October 2010.