Landscape as a focus for integrating human and environmental processes

- Paul Selman (University of Sheffield) & Robin Matthews (Macaulay Institute)

The RELU Context

Matthews – Development of a rural economy and land use simulation modelling strategy (Development Activity)

Selman – Landscape as an integrating framework for rural policy and planning (Development Activity)

- Concern in current presentation is with the rural, cultural – even ‘agricultural’ – landscape in Europe (though ideas are essentially transferable)

Two main foci for rural landscape research

Action for landscape:

- e.g. planning, management, protection as *per* European Landscape Convention

Action through landscape

- our main area of interest for this paper – scope for landscape units and networks to serve as frameworks for policy delivery, interdisciplinary research, integrated rural development, holistic modelling, etc.

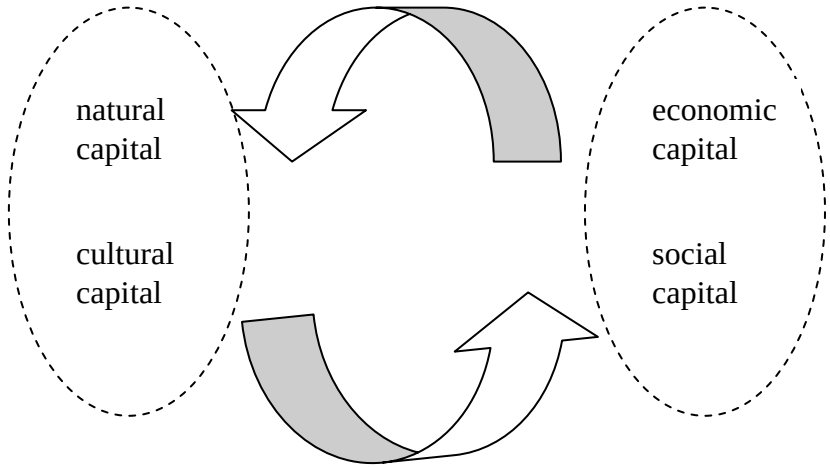
Some ways in which a landscape-centred approach can assist research and intervention

- conducting inter- and transdisciplinary science and policy;
- affording a transparent and consistent basis for guiding development, policy and land management decisions;
- integrating economic, socio-cultural, historical and natural components factors within the evidence base and subsequent applications;
- furnishing a focus for partnerships between agencies and other stakeholders;
- providing relatively homogeneous units for monitoring critical change in landscapes and biodiversity;
- facilitating community involvement by relating action to areas that have meaning, identity and value for people;
- implementing conservation strategies in a way that reflects the irrelevance of political boundaries to wild species and environmental processes;
- targeting resources for biodiversity action, woodland creation and farm support;
- assisting the more balanced treatment of natural, aesthetic, cultural and socio-economic attributes of rural areas.

Aiming for sustainable rural landscapes

Our argument:

- cultural landscapes generally created by land uses and localised community structures/ economies that are obsolescent, leading to ‘vicious circles’ of deterioration – need to reinstate ‘virtuous circles’
- landscapes are examples of complex ‘socio-ecological systems’ whose sustainability can be understood in terms of resilience
- common ground between ‘virtuosity’ and ‘resilience’
- landscapes – even where ‘protection’ is the overriding objective – are highly dynamic, hybrid entities



Alternative ‘stable’ states

- Seeking ‘sustainable’ landscapes – but acknowledge that there is no single ‘resilient’, ‘equilibrium’ state.
- Role of science and policy is to steer landscapes towards a resilient condition in keeping with social, economic and environmental conditions and trends???

conserve

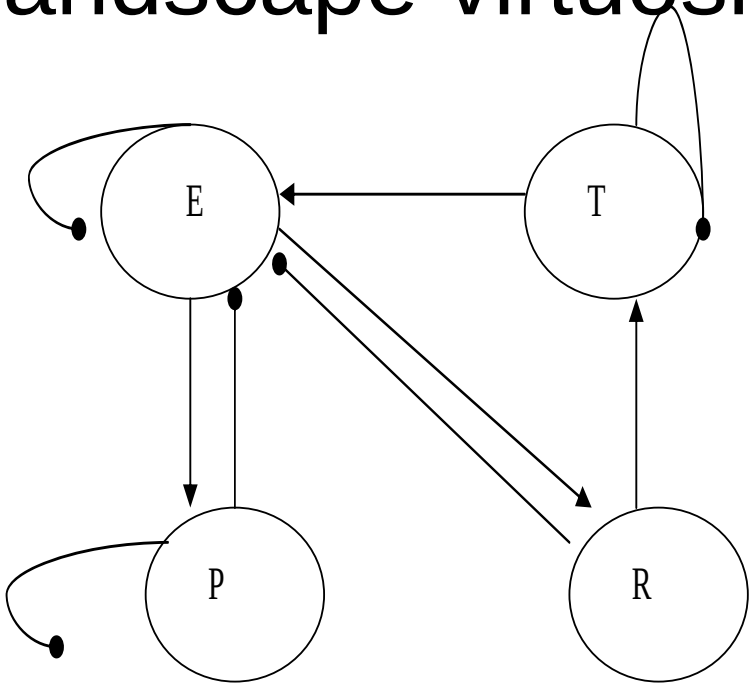
create

strengthen/ enhance

restore

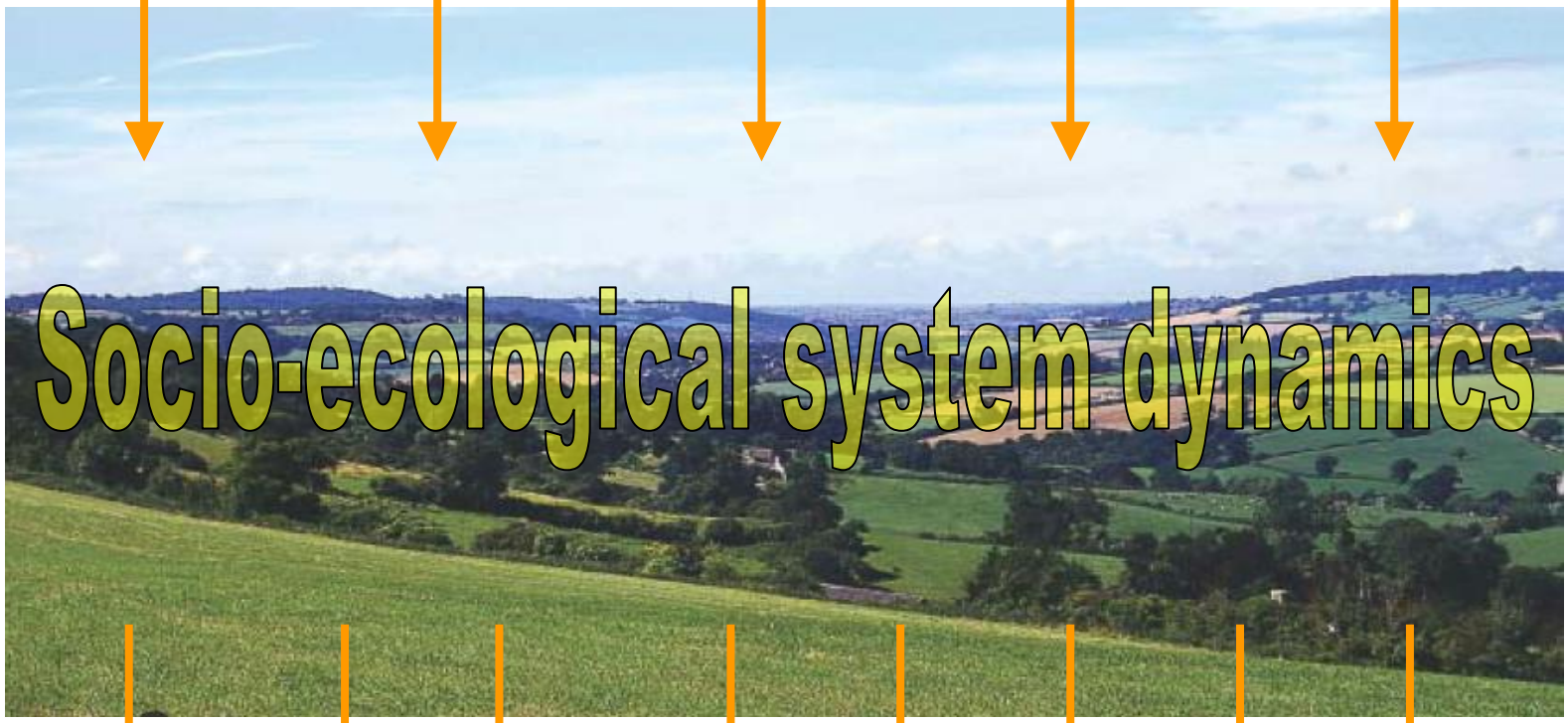
A simple model of landscape virtuosity

A simple sign graph permits an exploration of linkages between socio-economic and natural-cultural capitals, and, most importantly, shows positive and negative feedback loops. For example, in a ‘loop analysis’ of marginal aquatic systems in the Po Valley (Italy), Bodini *et al* (2000) mapped feedbacks between economy, local tourism, environmental protection and recreation, and were able to relate these to management strategies aimed at ‘tipping’ the balance of the system in the direction of virtuosity



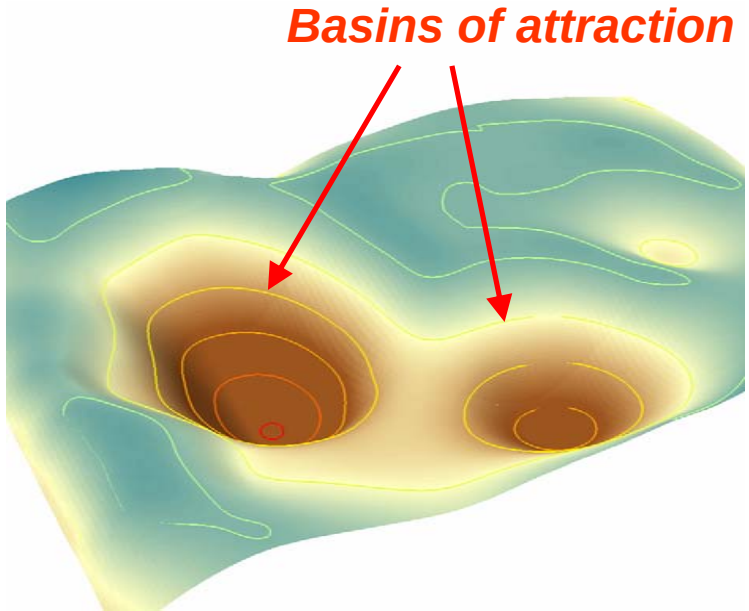
Loop analysis of marginal aquatic systems in the Po Valley in Italy, where E is economy, T is tourism, P is protection of the environment, and R is recreation. Arrows are positive relationships and circle tipped lines are negative feedbacks (from Bodini et al., 2000).

Landscapes as socio-ecological systems



Stability ‘landscapes’

- SESs hypothesised as being located on *stability landscapes* which contain *basins of attraction* representing a range of possible states
- SES moves within a particular basin of attraction, passing through various phases – *exploitation*, *consolidation*, *creative destruction* (triggered by external shocks), and *reorganisation* (Walker et al, 2004)
- Following reorganisation, the SES may remain in the same basin of attraction, or *transform* into a neighbouring basin of attraction
- Different trajectories may exist at different levels and timescales (collectively termed a *panarchy*).
- Interactions between these ‘fast’ and ‘slow’ trajectories can trigger sudden crises from within the system itself, particularly when *thresholds* are reached, resulting in entry into the creative destruction and reorganisation phases (Walker & Meyers, 2004)



System ‘resilience’

System resilience

- Amount of effort required to move from one basin of attraction into a neighbouring one
- No connotations of value associated with the ideas of basins of attraction and resilience – they are merely properties of the system, neither intrinsically good nor bad
- Value enters when particular basins are considered more desirable than others
- Resilience can then be seen as either good or bad depending on whether is is maintaining the system in a desirable basin (or *virtuous* circle) or undesirable basin (or *vicious* circle).

Sustainability

- Maintaining the system in a desirable basin (i.e. avoiding transformation into undesirable basins)
- Managing the system in such a way as to manoeuvre it towards a desirable basin

Adaptability

- Degree to which the components of the system can influence its internal dynamics and hence its resilience
- Stability landscape itself is not static – can co-evolve along with the systems it contains
- An adaptation strategy may be to alter the stability landscape to make it easier for the system to enter another basin of attraction (Walker *et al.*, 2004).

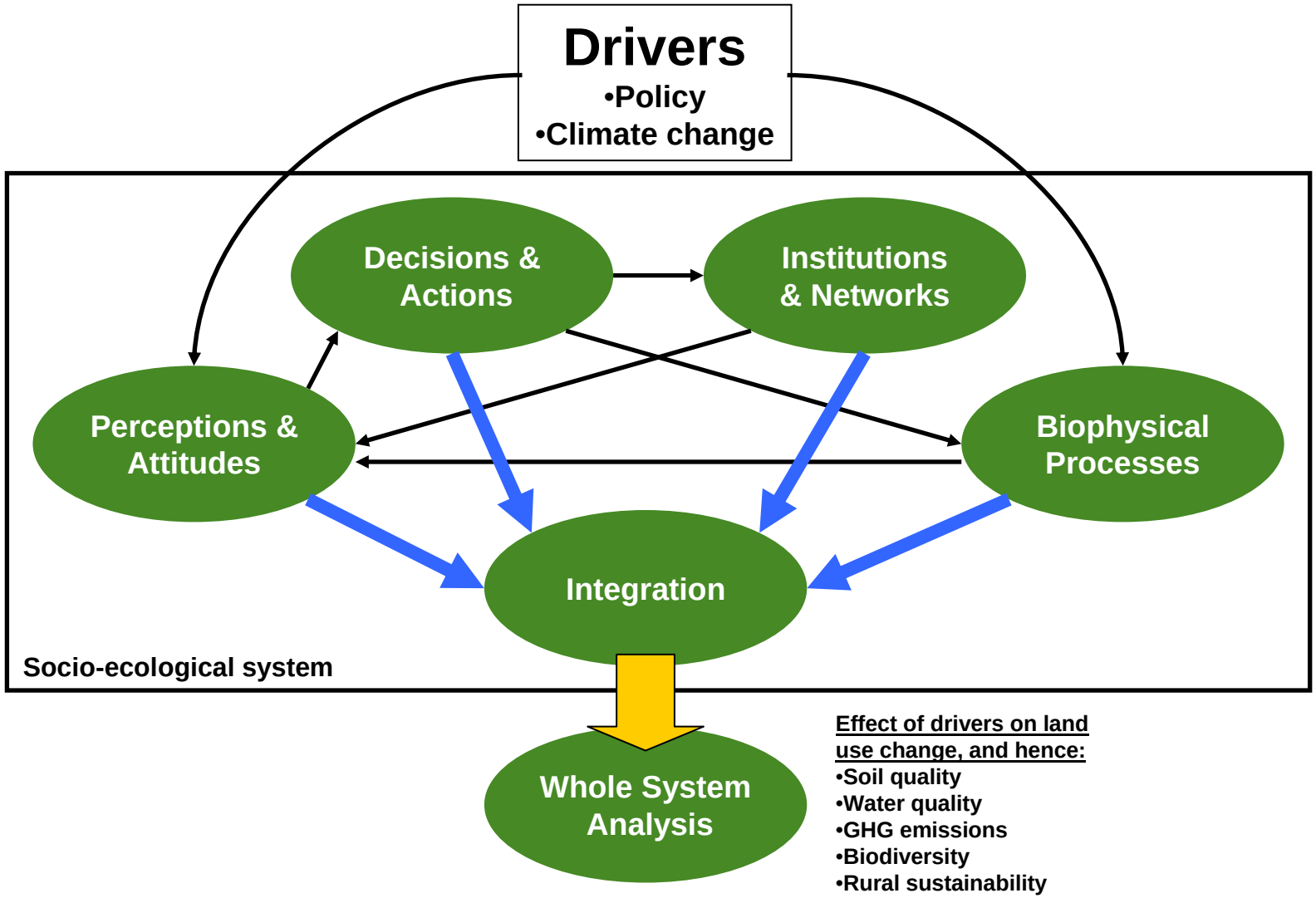
Incorporating human behaviour

Dominant factor influencing the dynamics of socio-ecological systems (SESs), compared to other ecosystems, is the presence of humans

- ability to remember and learn from the past
- ability to perceive both current and future states of their biophysical and social environment
- ability to communicate with each other
- ability to establish institutions that govern their behaviour so that specific goals can be achieved

As most landscape change is the result of human decisions and actions, we need a more realistic understanding of the processes by which these decisions and resulting behaviour are made, on the factors which influence them, and on their consequences for the evolution of landscapes.

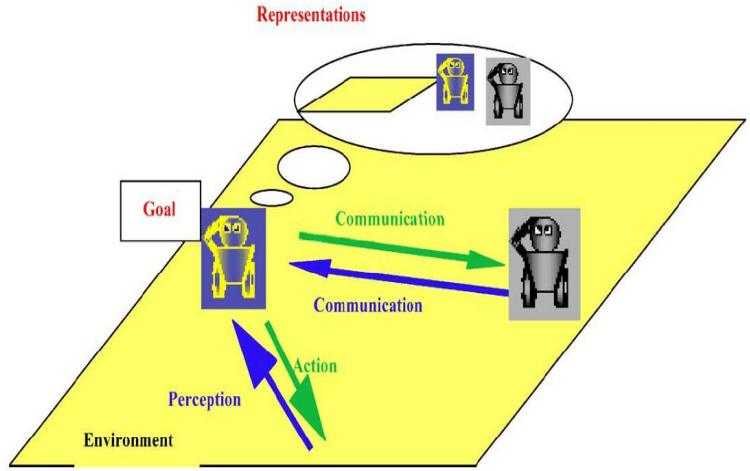
Modelling SESs



Agent-based modelling

ABM: a number of ‘intelligent’ virtual agents which:

- have the ability to communicate and exchange information with each other
- can interact with their environment
- have the ability to change their actions as a result of these interaction
- have only partial knowledge of the system as a whole (bounded rationality)



ABM offers a way to couple social, economic, and ecological models:

- Social interaction
- Micro-level decision-making
- Multiple-scale level decision-making
- Population level adaptation
- Co-evolution between agents and their environment

Future Needs and Directions

- How do perceptions and attitudes influence decision-making in relation to the planning and management of socio-ecological systems?
- How are the decisions of landscape actors (e.g. land managers, land users) influenced by new information, regulations, and incentives?
- How do institutions and social networks evolve (form, operate, interact, adapt, decay, and disappear) in relation to the drivers of the system?
- What possible institutional arrangements and social networks are appropriate for delivering desired visions of landscape and rural communities?
- How do we link processes that occur at different spatial and temporal scales – what and how much information should be transferred between scales?
- Can we determine the position of a socio-ecological system on a stability landscape?