



Viewpoint

Encouraging collaboration for the provision of ecosystem services at a landscape scale—Rethinking agri-environmental payments

Katrin Prager^{a,*}, Mark Reed^{b,1}, Alister Scott^{c,2}^a Socio-Economic Research Group, The James Hutton Institute, Craigiebuckler, Aberdeen AB15 8QH, United Kingdom^b School of Geosciences, University of Aberdeen, St Mary's, Aberdeen AB24 3UF, United Kingdom^c School of Property, Construction and Planning, Birmingham City University, Birmingham B42 2SU, United Kingdom

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ABSTRACT

In this viewpoint we draw on insights from participatory agri-environmental policy making, spatial planning and collaborative approaches to environmental management. We propose steps for planning, design and implementation of agri-environmental payment schemes that will encourage collaboration and co-ordinated actions at a landscape scale to contribute more effectively to the continued provision of ecosystem services.

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Introduction

The concept of ecosystem services has advanced since the Millennium Ecosystem Assessment (MA, 2003). It requires an integrated approach because multiple, overlapping ecosystem services can exist in a landscape. Although there is growing interest in the concept of ecosystem services, it has yet to be mainstreamed into everyday landscape planning, management and decision making (de Groot et al., 2010). In particular, little attention has been paid to the transfer of the ecosystem services approach into landscape management through government support (Burkhard et al., 2010).

Scale lies at the heart of this challenge. Certain ecosystems need to be managed at a landscape scale to optimise the provision of services such as flood prevention, freshwater provision, climate regulation, and habitats for species of both commercial and conservation value (Goldman et al., 2007; Samways et al., 2010). The European Landscape Convention defines a landscape as “An

area as perceived by people, whose character is the result of the action and interaction of natural and/or human factors.” ‘Landscape scale’ therefore refers to a spatial scale above the field-, farm- and local scale; it can be a catchment, an area of coherent landscape character or a sub-unit of a natural region. Landscape scale management is the exception rather than the rule (Selman, 2006) as it requires co-ordination between land owners and managers³ at scales rarely operationalised or actively encouraged. By considering ecosystem services within a spatial planning framework we can identify potential connectivities and interdependencies set within complex adaptive systems (Opdam et al., 2002; Berkes et al., 2003). Here, Hillier (2010, p. 454) introduces the concept of strategic navigation; “it evolves, it functions, it adapts, somewhat chaotically, always pragmatically, concerned with what can be done. . . how new foldings and connections can be made experimentally but still in contact with reality.” This has important “implications for the identification of objectives for rural land policy and for the institutional arrangements that can promote more socially desirable land

* Corresponding author. Tel.: +44 01224 395386; fax: +44 01224 395010.

E-mail addresses: katrin.prager@hutton.ac.uk (K. Prager), m.reed@abdun.ac.uk (M. Reed), Alister.Scott@bcu.ac.uk (A. Scott).¹ Tel.: +44 01224 274165.² Tel.: +44 01213 315631.³ In the remainder of the text, we use ‘managers’ as an inclusive term for land owners and other people whose land management decisions and actions influence the provision of ecosystem services.

uses, and hence for the governance of rural land” (Hodge, 2007, p. 417).

Although scale is at the core of our discussion in this paper, other – partially connected – challenges cannot be neglected. They include trade-offs between different ecosystem services, uncertainties about ecosystem services provision, and the non-excludability and non-rivalry of most ecosystem services. We believe that some of our suggestions for collaboration and coordination can help address these, for example by identifying socially accepted ways of deciding when facing trade-offs or uncertainties.

In this viewpoint paper we illustrate how future policies could be designed to encourage collaboration and co-ordinate actions at landscape scale to enhance the provision of ecosystem services. We combine insights from research on participatory agri-environmental policy making and scheme uptake, with research on collaborative approaches to environmental planning and management. These types of collaboration will involve both coordinating actions of land managers, as well as communication between land managers, government agencies and stakeholders from other spheres of society. We reiterate a need for participatory and collaborative approaches that facilitate a process of communication, negotiation and feedback, and we propose steps for planning, design and implementation of agri-environmental payment schemes⁴ that will contribute to more effective provision of ecosystem services at a landscape scale.

Current state of collaborative approaches

Although a landscape approach is essential to the conservation of ecosystem services in working landscapes (MA, 2003), existing incentive programmes such as EU agri-environment schemes, typically neither require nor encourage landscape level coordination but favour a farm scale approach leading to individual, disconnected actions. In the UK, attempts to encourage collaboration at landscape scales and across ownership boundaries have proven largely elusive (Blackstock et al., 2007; Selman, 2006). Collaborative provision of ecosystem services is hampered by a mismatch between the current scale of management and the scale of the ecological processes (Cumming et al., 2006; Mc Morran, 2008). Patterns of land ownership and tenure further complicate diverging administrative and ecosystem boundaries to increase transaction costs for coordinated landscape management (Goldman et al., 2007; Young, 2002). Collaborative environmental planning is normally based on voluntary co-operation without any statutory footing. Therefore commitment to such endeavours is often weak and, for example in spatial planning, there is often little coordination across administrative boundaries particularly where designations or green belts are concerned (Scott and Carter, 2011). In addition, a lack of trust between stakeholders (Folke et al., 2005) and the attitudes of land managers may not facilitate the kind of collaboration required (Glass et al., in press).

There is evidence that it may be more economically efficient to spatially target payments according to the ecosystem service potential of the land at relevant scales, than current approaches that are not spatially differentiated (Wünscher et al., 2008). However, this is usually only considered for specific ecosystem services e.g. prioritising areas for biodiversity conservation (Rodrigues et al., 2003) or land preservation for contiguous habitat (Parkhurst and Shogren, 2007). For example, Sites of Special Scientific Interest in the UK and other designations at EU level such as Special Areas of Conservation prioritise biodiversity conservation in cer-

tain locations, while the EU's Water Framework Directive spatially targets the management of water quality, through the negotiation of River Basin Management Plans. However, effective collaboration between land managers and other stakeholders has been difficult, and there has been little attempt to consider the wider and sometimes competing suite of ecosystem services affected by management strategies primarily designed to improve water quality or biodiversity (Reed et al., 2009a).

Part of the challenge of spatially targeting payments for ecosystem services is the fact that priorities and demand for different ecosystem services varies from region to region. For example, DEFRA's UK Biodiversity Action Plan study (Christie et al., 2010) showed how it is possible to derive spatially explicit information about the value people put on different ecosystem services from different locations across the UK. These priorities and demand for different ecosystem services may also differ between social groups within a region and may change over time. For this reason, it may be necessary to extend the focus beyond land managers to rural communities, relating to notions that participatory approaches are necessary to create stewardship and sustainable rural systems (Robinson, 2008b). This implies a fundamental rethinking of the process of designing support for the management of the rural landscape. To date, agri-environment schemes are designed by experts according to assessed conservation priorities. However, expert knowledge can readily bypass local expertise and generate increased state-local tensions (Reed, 2008); hence the need to bring different types of knowledge together, to seek joint learning opportunities and to develop plans and programmes in a collective manner (Bruckmeier and Tovey, 2008). The consequent outcomes may lead to new understandings and capabilities, resulting in a more optimal, multifunctional land use (Van Gossum et al., 2005).

Planning and scheme design

Several countries have experimented with participatory approaches to agri-environmental management. Insights can be gained from, for example, Environmental Programmes in Canada (Robinson, 2008a), participatory agri-environmental policy development in Germany (Prager and Freese, 2009), and the National Landcare Program in Australia (Cary and Webb, 2001). In addition, literature on land manager behaviour and the factors that influence the adoption of environmentally friendly farming practices and conservation measures (e.g. Macgregor and Warren, 2006; Pannell et al., 2006; Prager and Posthumus, 2010) suggests the prerequisite steps needed before designing a scheme to encourage collaborative provision of ecosystem services (Box 1). The relevant spatial and temporal scales of analysis need to be identified and combined, recognising the need for a long term view (50–100 years) to inform decisions that facilitate intergenerational equity, in addition to the shorter decision frames typically used by land managers (up to 30 years) and politicians (who may be elected for a 5 year term) (Low, 2002). If these considerations imply that a funding scheme is the appropriate approach to incentivise the collaborative delivery of ecosystem services, the design and implementation process can be initiated. Fig. 1 depicts such a process, where phases overlap rather than follow clear cut steps.

It is imperative that the ecosystem service approach is embedded within other frameworks. Spatial planning theory and practice allow us to exploit significant additionalities that expand agri-environment spaces to consider their interrelationships with other spaces, places, stakeholders and environments (Albrechts, 2004). For example, green infrastructure represents a useful concept to help connect agri-environment scheme landscapes through green corridors thereby connecting urban communities to their wider natural environments (Natural England, 2009).

⁴ Although calling them agri-environmental schemes, we have arrangements in mind that sit between the traditional AES, payments for ecosystem services, and landscape management schemes.

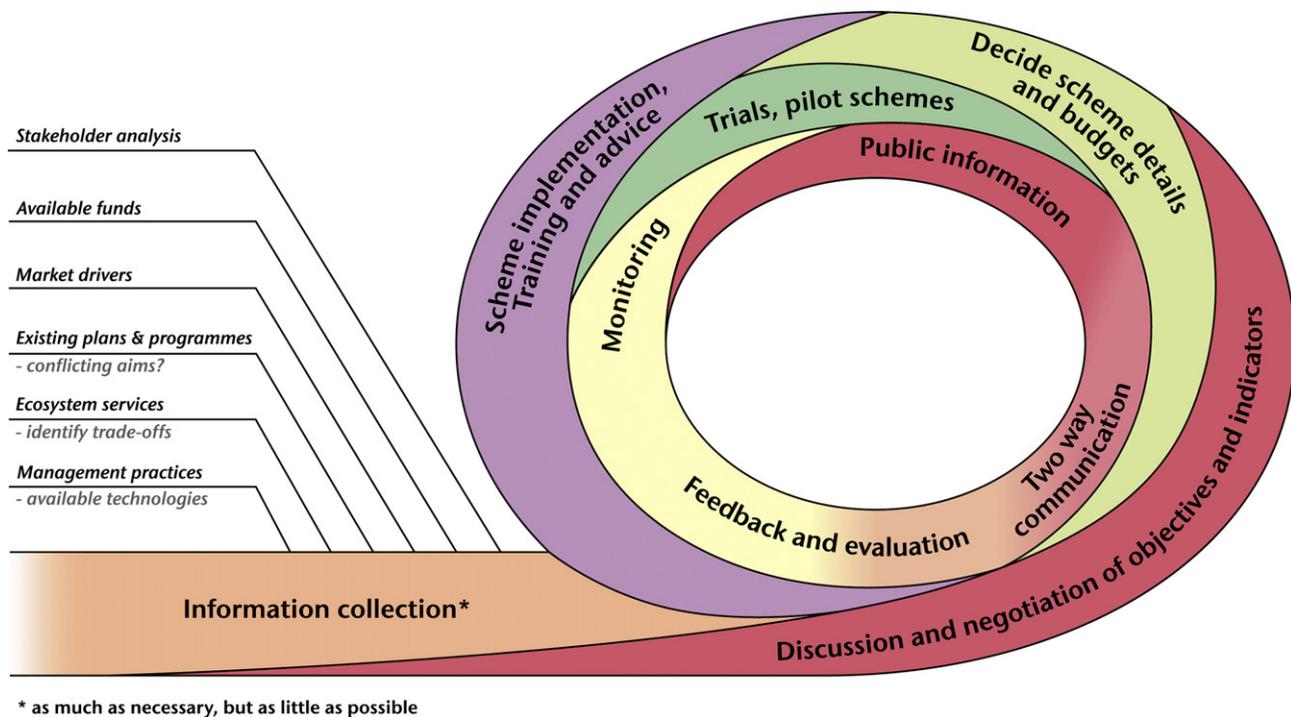


Fig. 1. Design and implementation of a scheme for collaborative provision of ecosystem services (Figure by K.Prager).

Box 1: Prerequisite steps.

- i) Gauge the extent to which land managers perceive (a) there is a problem, and (b) the problem relates to the scales at which ecosystems are managed currently. If the problem perception is lacking or marginal, there needs to be a phase of awareness raising activities, which will probably have to be factored in continuously, especially with persistent, non-visible (so called 'wicked') problems such as soil degradation;
- ii) Understand what land managers think could be done to improve the current status, and extent to which they are able and willing to collaborate with others to manage ecosystem services at wider spatial scales than they currently do. If ability or willingness is lacking, it will be difficult to generate the necessary motivation and commitment.
- iii) Ensure that land managers would be provided with the opportunity to trial a new approach or management practice to minimise associated risks, by either witnessing trials (demonstration areas) or creating opportunities to trial activities and approaches on their own land (pilot project);
- iv) Consider land tenure issues: it is important to know if tenants can make independent decisions about land use and management, and if they are able to implement decisions. For example, absentee landlords, hobby farmers or land-owning communities might need to be approached differently; and
- v) Identify formal institutional barriers to a collaborative approach (administrative, political, legal, property rights).

(Source: own compilation)

Various types of information (including input from prerequisite steps, Box 1) need to be collected, and fed into the discussion and negotiation process. For example, all relevant stakeholders involved in the planning and ecosystem management of a defined area should be systematically identified (Reed et al., 2009b), utilising existing networks with expertise in coordination and implementation of landscape management. There is evidence that front-loading participation within programme design builds trust and co-operation, leading to more durable decisions, because they utilise a wider range of relevant knowledge(s) and experience (Raymond et al., 2010). This approach also reveals previous or current conflicts between stakeholders and between different priorities at different scales (Hein et al., 2006), which need to be acknowledged and negotiated if a scheme wants to encourage local buy-in and ownership (Prager, 2010). In the UK, this sort of participation is increasingly becoming institutionalised through integration with spatial planning practice. For example Pillar 2 payments under the Common Agriculture Policy may be used for farm diversification purposes that are subject to planning regulations which require up front consultation (Scott and Shannon, 2006) with relevant stakeholders.

It is necessary to be clear in advance about how success is going to be evaluated at different scales, and can be measured at reasonable cost, in order to meet the accountability requirements of governments. Indicators need to be agreed on at the design stage, but will need revisiting if experience with the scheme shows them to be inappropriate or unavailable.

The level of funding for collaborative programmes should be compatible with the required task and societal expectations. Investing in process i.e. coordination for meetings, facilitation, advice, is as important as direct payments to land managers in any scheme where collaboration is central to achieving objectives. To elicit societal expectations (and to explain about the purpose of the envisaged schemes) it seems essential to involve the public in scheme design. However, it is questionable to what degree lay citizens can and should be motivated to input in scheme design and determine budgets as they might lack knowledge of land man-

Crucially, the complex interplay of horizontal (sectoral) and vertical (global to neighbourhood) scales within a long term perspective demands an understanding of flows and relationships facilitating policy optimisation.

agement practices and effects on ecosystems. Well planned and managed participation processes are required to avoid the pitfalls of participation but may be too costly and time-consuming, or hindered by conservative-minded administrators and policy makers (Beierle and Konisky, 2001; Wood, 2008; Prager, 2007).

Scientific research and previous experience with agri-environmental schemes provide information on factors determining scheme uptake (Defrancesco et al., 2008; Dobbs and Pretty, 2008). The financial incentives (level of payment) or broader economic considerations such as reducing production costs, increasing yield, saving time and labour, have been identified as central in uptake decisions. Payment levels therefore need to consider competing payments available to land managers from other incentive schemes or the higher commodity prices that could be obtained for selling a product. Transaction costs (e.g. arising from learning about new schemes and required practices, adjustment to current management, administrative and reporting requirements) and the degree of flexibility in management options, have also been identified as important depending on the individual, the farm, and the practice to be adopted (Falconer, 2000; Vanslebrouck et al., 2002).

Implementation

Integrating feedback loops in design and implementation of a scheme for the enhanced provision of ecosystem services is important because both ecosystems and social systems are not in a stable state but subject to disturbances and both gradual and abrupt change (Folke, 2006). An effective communication and two-way information flow is essential to facilitate this. Improved communication is needed for coordinating actions among groups of land managers, and to maintain their joint commitment. Communication includes vertical communication between land managers and the administering authority, policy designers and implementers, horizontal communication between and within groups of land managers, and even communication with the public. At its core this means that those designing the programme listen to feedback from the grassroots about the impacts of the scheme and its administrative arrangements (Fig. 1), which is essential to ensure buy-in and ownership of a way of managing the land. Fish et al. (2011) detail how participatory processes can be used as part of an ecosystems approach to decision making.

The capacity of the administering authority (including trained personnel, staff time for site visits, processing and feedback, resources, equipment) will be one of the limiting factors in determining what kind of objectives can be set and monitored. However, not all tasks need to rest with the administering authority. A partnership group could be established to facilitate knowledge exchange, awareness raising, public information, scheme promotion, and monitoring. Alternatively, an existing group or network of groups would be an excellent partner to share this task. Again, there are examples from around the world, including Landcare in various countries (Catacutan et al., 2009), environmental cooperatives in the Netherlands (Franks and Mc Gloin, 2007; Slangen and Polman, 2002), or watershed collaboratives in the US (Moore and Koontz, 2003). Folke et al. (2005) describe these as 'bridging organisations' that seem to lower the cost of collaboration and enable social learning. Most of these models involve facilitators co-ordinating groups of land managers and facilitating dialogue with other stakeholders, authorities and networks (Compton et al., 2009; Lane et al., 2009).

It is important to ensure that the new approach and the scheme, as well as the reasons for the shift to it are well understood by the administering bodies, addressees of the programme and the wider public to generate sustained commitment and support for realignment of public expenditure. Awareness-raising activities (Box 2) as

Box 2: Considerations for awareness-raising activities.

- Recognising and utilising preferred sources of information for people involved and targeted;
- Signage of established sites and collaboratives to make the wider public aware of activities and funding body, reward participants, explain purpose, attract new cooperating land managers and sponsors;
- Creating a logo or easy recognisable programme title (a word or phrase that is easy to remember and strikes a chord with people); and
- Establishing a promoting and fund-raising organisation similar to Landcare Australia Ltd. (www.landcareonline.com.au).

well as training and advice for land managers, facilitators, administrators and other stakeholders will need to be ongoing.

In order to know whether the scheme implemented has actually achieved its objectives it is necessary to monitor changes that are attributed to the scheme. In a collaborative scheme, it may be worth considering collaborative approaches to monitoring, which may reduce the overall cost of data gathering and evaluate success more effectively (Reed et al., 2006). Monitoring (and compliance) will be facilitated if land managers understand and agree with the chosen indicators and the methods of measuring. Extending monitoring activities beyond scientists and selected experts to include scheme participants, schools, environmental and community groups can help negotiation through multi-party feedback loops and involves stakeholders in fine-tuning and adjusting the scheme in line with the ideas of adaptive co-management (Muñoz-Erickson et al., 2007; Berkes, 2009).

Conclusions

This viewpoint paper has highlighted aspects that need to be considered in the preparation, design and implementation of future agri-environmental payment schemes if they are to enhance the provision of ecosystem services at a landscape scale. It identifies a lack of collaboration across ownership boundaries and scale mismatches between existing schemes and management approaches, and the required scale for provision of ecosystem services, due to cultural, institutional, and administrative barriers. Collaboration and co-ordinated action are best achieved by actively managing communication and feedback processes and generating commitment from stakeholders at various levels, allowing for joint monitoring, learning, and scheme adjustments. While not easy to achieve (Box 3), we believe that genuine participation in agri-environmental policy making and collaborative approaches to environmental planning and management need to be combined across levels. To do this, it will be necessary to draw on insights from different disciplines (e.g. Hodge, 2007; Folke et al., 2005; de Groot et al., 2010). We propose a rethink of the design and implementation of agri-environment payments for ecosystem service provision that encourages collaborative management and focuses on the process as much as on the outcome.

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Box 3: Moving towards implementation.

To date, there are no real world examples where the proposed model design and implementation process has been applied. Hence, we can only guide the reader to cases where single aspects of our model have been applied.

- The “Model Ecosystem Framework” developed by [Aspinall et al. \(2010\)](#) features phases similar to the process suggested in [Fig. 1](#). The development of the “Field Guide to an Ecosystem Approach” has been complemented by road-testing of the Model Ecosystem framework through case studies in northeast Scotland. Researchers investigated the potential of the Ecosystem Approach to become better incorporated into land use and spatial planning frameworks (e.g. the Land Use Strategy in Scotland). The practical examples focussed on mapping all ecosystem services but did not actually implement a real world scheme with decision making and trade-offs on the ground – it progressed through what is the ‘information’ stage in [Fig. 1](#).
- [Fish et al. \(2011\)](#) provide a detailed guide on how to use participatory and deliberative techniques in order to embed an ecosystems approach into decision making. The guide demonstrates the types of questions that would need to be addressed to link generic stages in a decision making process. Examples of cases are provided where suggested techniques have been applied, however, none of these cases covers the whole process we propose including decision making and scheme implementation. The techniques described in the guide are applicable in several phases of our model but note that Fish et al. emphasise that the design and application of participatory techniques is highly context specific.
- [Genskow and Wood \(2011\)](#) describe an example of incentive programs to tackle non-point source pollution threatening water quality in the US. A process was started to develop social indicators as performance measures for programs in 6 different states. A participatory process led to a set of indicators and a clearer conceptual model of data needs. The pilot projects collected data at multiple points in time. Experiential and local knowledge of landowners, state and NGO staff is used to verify and supplement scientific data. This example illustrates how the indicator definition and monitoring phase could be implemented.
- Natural England is currently undertaking case study research to demonstrate the potential application of the ecosystem approach (<http://www.naturalengland.org.uk/ourwork/research/ecosystemapproach.aspx>).

- Berkes, F., Colding, J., Folke, C. (Eds.), 2003. *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change*. Cambridge University Press, Cambridge, UK.
- Blackstock, K.L., Brown, K., Davies, B., Shannon, P., 2007. Individualism cooperation and conservation in Scottish farming communities. In: Cheshire, L., Higgins, V., Lawrence, G. (Eds.), *Rural Governance. International Perspectives*. Routledge, London, New York, pp. 191–207.
- Bruckmeier, K., Tovey, H., 2008. Knowledge in sustainable rural development: from forms of knowledge to knowledge processes. *Sociologia Ruralis* 48 (3), 313–329.
- Burkhard, B., Petrosillo, I., Costanza, R., 2010. Ecosystem services – bridging ecology, economy and social sciences. *Ecological Complexity* 7, 257–259.
- Cary, J., Webb, T., 2001. Landcare in Australia: community participation and land management. *Journal of Soil and Water Conservation* 56, 274–278.
- Catacutan, D., Neely, C., Johnson, M., Poussard, H., Youl, R., 2009. *Landcare: Local Action – Global Progress*. World Agroforestry Centre, Nairobi, Kenya.
- Christie, M., Hyde, T., Cooper, R., Fazey, I., Dennis, P., Warren, J., Colombo, S., Hanley, N., 2010. Economic Valuation of the Benefits of Ecosystem Services delivered by the UK Biodiversity Action Plan. DEFRA, London.
- Compton, E., Prager, K., Beeton, R.J.S., 2009. Landcare bowling alone: finding a future in the “Fourth” phase. In: Lane, M.B., Robinson, C., Taylor, B. (Eds.), *Contested Country: Local and Regional Environmental Management in Australia*. CSIRO Publishing, Melbourne, pp. 147–160.
- Cumming, G.S., Cumming, D.H.M., Redman, C.L., 2006. Scale mismatches in social-ecological systems: causes, consequences, and solutions. *Ecology and Society* 11, 14. <http://www.ecologyandsociety.org/vol11/iss11/art14/>.
- de Groot, R.S., Alkemade, R., Braat, L., Hein, L., Willemse, L., 2010. Challenges in integrating the concept of ecosystem services and values in landscape planning, management and decision making. *Ecological Complexity* 7, 260–272.
- Defrancesco, E., Gatto, P., Runge, F., Trestini, S., 2008. Factors affecting farmers’ participation in agri-environmental measures: a northern Italian perspective. *Journal of Agricultural Economics* 59, 114–131.
- Dobbs, T.L., Pretty, J., 2008. Case study of agri-environmental payments: The United Kingdom. *Ecological Economics* 65, 765–775.
- Falconer, K., 2000. Farm-level constraints on agri-environmental scheme participation: a transactional perspective. *Journal of Rural Studies* 16, 379–394.
- Fish, R., Burgess, J., Chilvers, J., Footitt, A., Haines Young, R., Russel, D., Turner, K., Winter, D.M., 2011. *Participatory and Deliberative Techniques for Embedding an Ecosystems Approach into Decision Making*. Full Technical Report to DEFRA (Project Code: NR0124).
- Folke, C., Hahn, T., Olsson, P., Norberg, J., 2005. Adaptive governance of socio-ecological systems. *Annual Review of Environmental Resources* 30, 441–473.
- Folke, C., 2006. Resilience: the emergence of a perspective for social-ecological systems analyses. *Global Environmental Change* 16, 253–267.
- Franks, J.R., Mc Gloin, A., 2007. Environmental co-operatives as instruments for delivering across-farm environmental and rural policy objectives: lessons for the UK. *Journal of Rural Studies* 23, 472–489.
- Genskow, K.D., Wood, D.M., 2011. Improving voluntary environmental management programs: facilitating learning and adaptation. *Environmental Management* 47, 907–916.
- Glass, J.H., Scott, A.S., Price, M.F. Developing a sustainability assessment tool for upland estates. In: Marrs, S.J., Foster, S., Hendrie, C., Mackey, E.C., Thompson, D.B.A. (Eds.), *The Changing Nature of Scotland*. The Stationery Office, Edinburgh.
- Goldman, R.L., Thompson, B.H., Daily, G.C., 2007. Institutional incentives for managing the landscape: inducing cooperation for the production of ecosystem services. *Ecological Economics* 64, 333–343.
- Hein, L., van Koppen, K., de Groot, R.S., van Ierland, E.C., 2006. Spatial scales, stakeholders and the valuation of ecosystem services. *Ecological Economics* 57, 209–228.
- Hillier, J., 2010. Strategic navigation in an ocean of theoretical and practice complexity. In: Hillier, J., Healey, P. (Eds.), *The Ashgate Research Companion to Planning Theory: Conceptual Challenges for Spatial Planning*. Ashgate, pp. 447–480.
- Hodge, I., 2007. The governance of rural land in a liberalised world. *Journal of Agricultural Economics* 58, 409–432.
- Lane, M.B., Robinson, C., Taylor, B., 2009. *Contested Country: Local and Regional Environmental Management in Australia*. CSIRO Publishing, Melbourne.
- Low, N., 2002. Ecosocialisation and environmental planning: a Polanyian approach. *Environment and Planning A* 34, 43–60.
- MA (Millennium Ecosystem Assessment), 2003. *Ecosystems and Human Well Being*. Island Press, Washington, DC.
- Macgregor, C.J., Warren, C.R., 2006. Adopting sustainable farm management practices within a nitrate vulnerable zone in Scotland: the view from the farm. *Agriculture, Ecosystems & Environment* 113, 108–119.
- Mc Morran, R., 2008. Scale mis-matches in social-ecological systems: a case study of multifunctional forestry in the Cairngorms region of Scotland. *Aspects of Applied Biology* 85, 41–48.
- Moore, E.A., Koontz, T.M., 2003. A typology of collaborative watershed groups: citizen-based, agency-based, and mixed partnerships. *Society and Natural Resources* 16, 451–460.
- Muñoz-Erickson, T.A., Aguilar-González, B., Sisk, T.D., 2007. Linking ecosystem health indicators and collaborative management: a systematic framework to evaluate ecological and social outcomes. *Ecology and Society* 12, 6. <http://www.ecologyandsociety.org/vol12/iss12/art16/>.
- Natural England, 2009. *Cannock Chase to Sutton Park Draft Green Infrastructure Action Plan*, Report by Land Use Consultants. Sheffield, Natural England.

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References

- Aspinall, R., Black, H., Blackstock, K., Brown, I., Cooksley, S., Ferrier, R., Gill, E., Gimona, A., Glenk, K., Hastings, E., Hester, A., Langan, S., Matthews, K., Miller, D., Eleanor, M., Pakeman, R., Stannard, C., 2010. *A Field Guide to an Ecosystem Approach in Scotland*. Macaulay Land Use Research Institute. Final Report to Scottish Government, Aberdeen, 89pp.
- Albrechts, L., 2004. Strategic (spatial) planning reexamined. *Environment and Planning B: Planning and Design* 31, 743–758.
- Beierle, T.C., Konisky, D.M., 2001. What are we gaining from stakeholder involvement? Observations from environmental planning in the Great Lakes. *Environment and Planning C: Government and Policy* 19 (4), 515–527.
- Berkes, F., 2009. Evolution of co-management: role of knowledge generation, bridging organizations and social learning. *Journal of Environmental Management* 90, 1692–1702.

- Opdam, P., Foppen, R., Vos, C., 2002. Bridging the gap between ecology and spatial planning in landscape ecology. *Landscape Ecology* 16, 767–779.
- Pannell, D.J., Marshall, G.R., Barr, N., Curtis, A., Vanclay, F., Wilkinson, R., 2006. Understanding and promoting adoption of conservation practices by rural landholders. *Australian Journal of Experimental Agriculture* 46, 1407–1424.
- Parkhurst, G.M., Shogren, J.F., 2007. Spatial incentives to coordinate contiguous habitat. *Ecological Economics* 64, 344–355.
- Prager, K., 2007. Communication Processes in Agri-Environmental Policy Development and Decision Making. Margraf, Weikersheim.
- Prager, K., Freese, J., 2009. Stakeholder involvement in agri-environmental policy making – learning from a local- and a state-level approach in Germany. *Journal of Environmental Management* 90, 1154–1167.
- Prager, K., 2010. Local and regional partnerships in natural resource management – the challenge of bridging institutional levels. *Environmental Management* 46, 711–724.
- Prager, K., Posthumus, H., 2010. Socio-economic factors influencing farmers' adoption of soil conservation practices in Europe. In: Napier, T. (Ed.), *Human Dimensions of Soil and Water Conservation. A Global Perspective*. Nova Science Publishers, pp. 203–223.
- Raymond, C.M., Fazey, I., Reed, M.S., Stringer, L.C., Robinson, G.M., Evely, A.C., 2010. Integrating local and scientific knowledge for environmental management. *Journal of Environmental Management* 91, 1766–1777.
- Reed, M.S., Fraser, E.D.G., Dougill, A.J., 2006. An adaptive learning process for developing and applying sustainability indicators with local communities. *Ecological Economics* 59, 406–418.
- Reed, M.S., 2008. Stakeholder participation for environmental management: a literature review. *Biological Conservation* 141, 2417–2431.
- Reed, M.S., Bonn, A., Slee, W., Beharry-Borg, N., Birch, J., Brown, I., Burt, T.P., Chapman, D., Chapman, P.J., Clay, G., Cornell, S.J., Fraser, E.D.G., Holden, J., Hodgson, J.A., Hubacek, K., Irvine, B., Jin, N., Kirkby, M.J., Kunin, W.E., Moore, O., Moseley, D., Prell, C., Quinn, C., Redpath, S., Reid, C., Stagl, S., Stringer, L.C., Termansen, M., Thorp, S., Towers, W., Worrall, F., 2009a. The future of the uplands. *Land Use Policy* 26S, S204–S216.
- Reed, M.S., Graves, A., Dandy, N., Posthumus, H., Hubacek, K., Morris, J., Prell, C., Quinn, C.H., Stringer, L.C., 2009b. Who's in and why? A typology of stakeholder analysis methods for natural resource management. *Journal of Environmental Management* 90, 1933–1949.
- Robinson, G.M., 2008a. Participation and stewardship: sustainability in two Canadian environmental programmes. In: Robinson, G.M. (Ed.), *Sustainable Rural Systems. Sustainable Agriculture and Rural Communities*. Ashgate, Aldershot, pp. 185–201.
- Robinson, G.M., 2008b. Sustainable rural systems: an introduction. In: Robinson, G.M. (Ed.), *Sustainable Rural Systems. Sustainable Agriculture and Rural Communities*. Ashgate, Aldershot, pp. 3–39.
- Rodrigues, A.S.L., Andelman, S.J., Bakarr, M.I., Boitani, L., Brooks, T.M., Cowling, R.M., Fishpool, L.D.C., Fonseca, G.A.B., Gaston, K.J., Hoffman, M., Long, J., Marquet, P.A., Pilgrim, J.D., Pressey, R.L., Schipper, J., Sechrest, W., Stuart, S.N., Underhill, L.G., Waller, R.W., Watts, M.E.J., Xie, Y., 2003. Global gap analysis: towards a representative network of protected areas. *Advances in Applied Biodiversity Science*, vol. 5. Conservation International, Washington, DC.
- Samways, M.J., Bazelet, C.S., Pryke, J.S., 2010. Provision of ecosystem services by large scale corridors and ecological networks. *Biodiversity and Conservation* 19, 2949–2962.
- Scott, A.J., Carter, C., 2011. The rural-urban Fringe Forgotten Opportunity Space. *Town and Country Planning* June/July.
- Scott, A.J., Shannon, P., 2006. Rural Diversification in Aberdeenshire, Report to SEERAD 203909.
- Selman, P., 2006. *Planning at the Landscape Scale*. Routledge, London.
- Slangen, L.H.G., Polman, N.B.P., 2002. Environmental cooperative: a new institutional arrangement of farmers. In: Hagedorn, K. (Ed.), *Environmental Co-operatives and Institutional Change: Theories and Policies for European Agriculture*. Edward Elgar, Cheltenham, UK, pp. 69–90.
- Van Gossom, P., Luyssaert, S., Serbruyns, I., Mortier, F., 2005. Forest groups as support to private forest owners in developing close-to-nature management. *Forest Policy and Economics* 7L, 589–601.
- Vanslebrouck, I., Van Huylbroeck, G., Verbeke, W., 2002. Determinants of the willingness of Belgian farmers to participate in agri-environmental measures. *Journal of Agricultural Economics* 53, 489–511.
- Wood, C., 2008. Progress with development plan documents: lessons learnt in England? *Journal of Planning & Environmental Law* 3, 265–274.
- Wünscher, T., Engel, S., Wunder, S., 2008. Spatial targeting of payments for environmental services: a tool for boosting conservation benefits. *Ecological Economics* 65, 822–833.
- Young, O.R., 2002. *The Institutional Dimensions of Environmental Change: Fit, Interplay and Scale*. MIT Press, Cambridge.