Recommendations for landscape-level adaptive management for ecological, economic, and social outcomes: findings from five case studies

Research briefing RD1.4.3aD6

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Executive summary

Improving the management of Scotland's natural assets at a landscape-level for ecological, economic, and social outcomes is a priority for the Scottish Government and its partners. Adaptive management is one way to achieve this objective and is about connecting the 'doing' of natural resource management with 'learning' about the context of the management situation, and the responses and effects of the management actions. In a previous briefing, we provided an overview of adaptive management and its practical use in the Scottish context. Previous studies have highlighted that the implementation of adaptive management has been challenging for many stakeholders. Therefore, this briefing focusses on lessons learnt to support stakeholders who wish to work with others to take a more adaptive approach to managing at the landscape scale.

This research briefing summarises lessons learned from five ongoing case studies utilising landscape-level management of natural resources for ecological, economic, and social outcomes. These case studies are from research projects funded through the Scottish Government Strategic Research Programme. The five cases cover a range of landscape-level management situations, including upland and lowland areas. These vary from improving agricultural land management in a small east coast catchment (3500 ha) to the management of White-tailed eagles over large areas of the west coast including Argyll & Lochaber and Skye & Lochalsh. Our findings are based on interviews and workshops with natural and social science researchers involved in these five case studies, and feedback from 11 stakeholders representing organisations involved in landscape-level management.

We have made 14 specific recommendations (Table 1) based on three overarching recommendations for the need to: understand the situation, direct stakeholders, and shared purpose; focus on the social relationships of landscape-level management; and assess ecological, economic, and social outcomes at every step of the adaptive management cycle (Figure 1). We believe the diversity of our cases suggests that these recommendations are relevant for most landscape-level management situations in Scotland and potentially internationally. We present a checklist to aid the implementation of these recommendations (Appendix 4).

Having decided that adaptive (co-)management is required for landscape-level management, now consider…

Landscape-level adaptive management

1. Understand the situation, direct stakeholders, and shared purpose
1.1 Identify and understand the direct decision-making stakeholders
1.2 Develop a shared understanding of the situation
1.3 Identify and agree the shared purpose

3. Assess ecological, economic, and social outcomes at every step
3.1 Understand the role of data collection and knowledge sharing
3.2 Think and plan for long-term interventions and their legacies
3.3 Recognise what has or may change as part of the learning process

2. Focus on the social relationships of landscape-level management
2.1 Identify and secure human and financial resources
2.2 Distinguish between coordination and collaboration
2.3 Identify and support local leaders
2.4 Understand the influence of national organisations
2.5 Understand the influence of indirect stakeholders

Site-level adaptive management

Plan actions and monitoring

Implement actions and monitoring
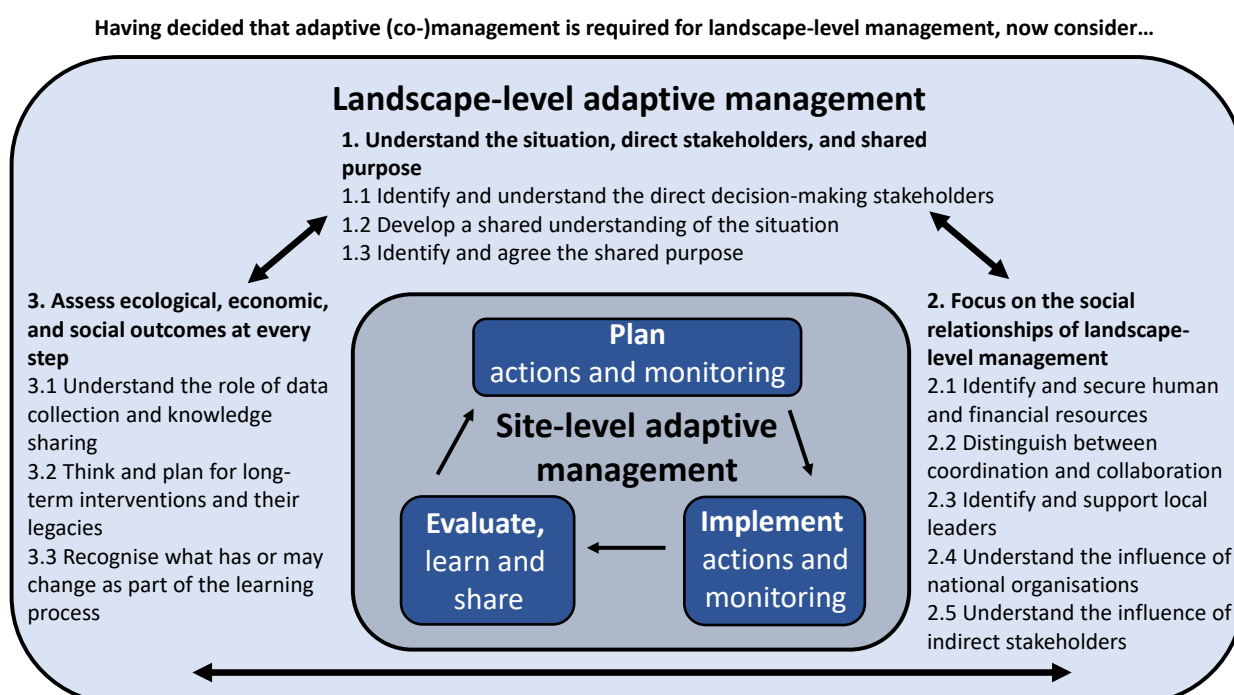
Evaluate, learn and share

Figure 1. Steps and recommendatons for adaptve management at the landscape-level.

Table 1. Recommendations when considering landscape-level management.

1.Understand the situation, direct stakeholders, and shared purpose

Expect to spend significant time and resources understanding the situation, identifying and engaging possible direct stakeholders, and agreeing a shared purpose and desired outcomes before work 'on the ground' can start; revisit this recommendation in future adaptive management cycles.

1.1 Identify and understand the direct decision-making stakeholders

Try and understand the main decision-making stakeholders (often land managers) and their perspective in terms of their objectives and preferences, before trying to agree a shared purpose and how it may be achieved - as a basis for a trusted and equitable partnership.

1.2 Develop a shared understanding of the situation

When starting to plan landscape-level adaptive management, consider what the landscape comprises in terms of diverse ownership and management arrangements, and establish a shared understanding of the current condition of the natural assets and the pressures they face.

1.3 Identify and agree the shared purpose

There is not always agreement over the exact nature of the problem to be managed, and it can take time to develop a shared purpose and to identify shared opportunities. If there is no existing shared problem framing and purpose, then more time and resources (including facilitation) may be needed.

2.Focus on the social relationships of landscape-level management

Social relationships are at the heart of landscape-level adaptive management and are closely connected to achieving successful ecological outcomes and therefore relationships need explicit support and resources.

2.1 Identify and secure human and financial resources

Landscape-level adaptive management requires human and financial resources for the interventions and for the processes of coordination or collaboration; these resources may need to be long term if the coordinated or collaborative action is needed for several years to ensure social and ecological outcomes.

2.2 Distinguish between coordination and collaboration

It is important not to conflate landscape-level interventions with collaboration (where individuals work as a group); so, recognise when adaptive management occurs through coordination (where individual actions are coordinated by one individual) and when it is collaboration. These processes need different types of support and both need to be resourced.

2.3 Identify and support local leaders

Depending on the purpose and situation, careful consideration is needed of who takes leading roles and how leadership can be supported and sustained over time.

2.4 Understand the influence of national organisations

There is a need to understand how national organisations' objectives and remits (even when not directly involved) may influence adaptive management processes. It is important to recognise their influence on decision making (e.g. as a regulator or as a supporter).

2.5 Understand the influence of indirect stakeholders

In addition to identifying and working with direct stakeholders (1.1) and national organisations (2.4), it is important to take account of indirect stakeholders, including public opinion, and how these views can influence the appetite for and success of adaptive management.

3. Assess ecological, economic, and social outcomes at every step

As learning takes place across every step of the adaptive management cycle, it is important to monitor ecological, economic, and social outcomes, and to analyse and reflect on learning throughout the cycle rather than wait until there are ecological outcomes to assess.

3.1 Understand the role of data collection and knowledge sharing

A landscape-level adaptive management process needs to consider how data will be used, and by whom for what purpose. Improving how knowledge is generated, collectively interpreted and shared is likely to improve the adaptive management processes.

3.2 Think and plan for long-term interventions and their legacies

Supporting landscape-level management needs to recognise the long-term nature of the management actions and their legacies, and plan for long-term interventions even when funding is short-term. Thinking long-term requires regular reviews of purpose and process.

3.3 Recognise what has or may change as part of the learning process

Ensure that all changes, whether positive or negative, intended or unintended, are captured and learnt from. Any learning also needs to recognise when changes have not or will not occur in the current situation.

1. Introduction, purpose and audience

Learning how to manage Scotland's natural assets at a landscape-level for ecological, economic, and social outcomes is a priority for the Scottish Government and its partners - as reinforced in the second Land Use Strategy (Scottish Government, 2016). Adaptive management is one way to achieve this objective; where adaptive management is a structured and systematic approach to supporting decision making, planning, action and evaluation of those actions (Figure 1). Adaptive management is about connecting the 'doing' of natural resource management with 'learning' about the context of a management situation, and the ecological, economic, and social outcomes of the management actions. Adaptive management can be undertaken within a property (areas managed by a single individual or organisation) and is increasingly used to intervene at a 'landscape' level involving multiple properties and social actors. In this research, we have focused on landscape-level management of natural assets across multiple properties and involving multiple actors.

A previous review of approaches to adaptive management for individual wildlife species (Bunnefeld et al., 2015) highlighted that the implementation of adaptive management had been challenging for stakeholders. In their report, the authors suggested using a checklist before engaging in adaptive management: is it appropriate, is it feasible, and can it be successful? Taking an adaptive management approach is appropriate when understood as a process of learning and improving understanding through monitoring actions taken on the ground. This briefing extends the provision of support to stakeholders to help them implement adaptive management at the landscape-level. When applying adaptive management to complex socio-ecological systems, such as multifunctional landscapes, it is important to consider social and institutional learning; and how interactions between different actors, networks, organisations and institutions develop and adapt in pursuit of desired goals.

In our previous briefing 'Adaptive management: an overview of the concept and its practical application in the Scottish context' we highlighted the importance of the question 'is adaptive management required?' (Macleod et al., 2016b). We suggested that a set of principles were needed to implement a series of five

steps (Figure 1): involve stakeholders, develop and cultivate partnerships, embrace learning, document your decisions, and adjust as necessary. For example, to implement landscape-level management, it is important to iterate through the adaptive management cycle (Figure 1) and document the learning at each step.
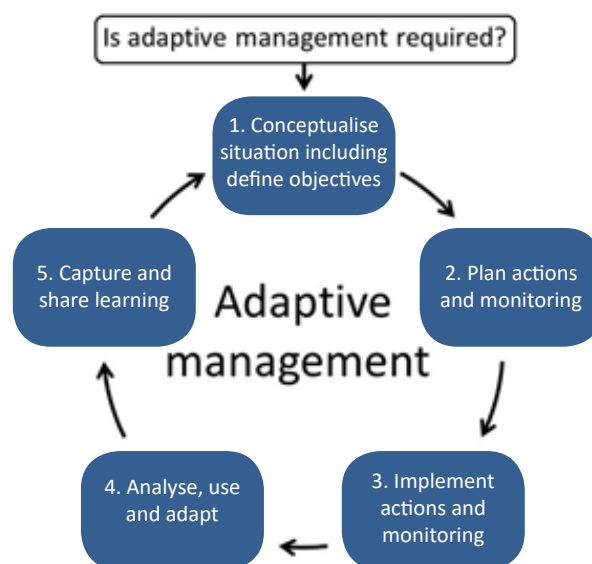

Figure 1. Steps in a classic adaptive management approach (from Macleod et al 2016b).

1.1 Purpose and audience

The purpose of this briefing is to provide practical insights to support policy makers and practitioners interested in implementing landscape-level management for ecological, economic, and social outcomes. This research briefing summarises lessons learned from five ongoing case studies utilising landscape-level management of natural resources for ecological, economic, and social outcomes. We present our findings and recommendations to enable greater shared understanding of what you may need to consider when implementing or supporting landscape-level adaptive management. In summary, this briefing illustrates what additional issues need to be considered when working adaptively at a landscape-level with multiple partners.

These five case studies are from research projects funded through the Scottish Government Strategic Research Programme's (SRP) work package 'Integrated and Sustainable Management of Natural Assets' (WP1.4) which is addressing the question 'how can we support delivery of multiple benefits in practice'? Our findings are determined by the nature of these cases, and the common set of questions we explored with the researchers involved in each of these case studies (Appendix one).

We envisage the audience for this research briefing to include a broad range of policy makers and practitioners e.g. Scottish Natural Heritage (SNH), Scottish Environment Protection Agency (SEPA), National Park Authority (NPA) staff; non-governmental organizations (NGO) e.g. Royal Society for the Protection of Birds (RSPB) and Game & Wildlife Conservation Trust (GWCT); and relevant membership associations e.g. National Farmers Union, Scotland (NFUS) and Scottish Land & Estates (SLE). These organisations have a shared interest in understanding and supporting collective management of Scotland's natural assets at the landscape-level. These national and regional organisations have an important influence on the implementation of adaptive management in Scotland, even when they are not directly involved in the projects themselves. This briefing may also be useful to those land managers directly involved in collective landscape-level management – for example, using the recommendation in Section 3 and the stakeholder suggestions in Section 4 as a checklist for their projects.

2. Case study research process

The five cases cover a range of landscape-level management situations, including upland and lowland areas. These vary from improving agricultural land management in a small east coast catchment (3500 ha) to the management of White-tailed eagles over large areas of the west coast including Argyll & Lochaber and Skye & Lochalsh. The five cases are summarised in Table 1 and further information on where the cases are located, the collective grouping and backgrounds to the landscape-level management are provided in Appendix two.

Table 2 illustrates the research steps carried out to produce this briefing and how this built on earlier reports: a review of adaptive management and its practical application in the Scottish context (Macleod et al., 2016b), draft adaptive management evaluation framework (Macleod et al., 2016a), and a summary of our landscape-level cases (Macleod et al., 2018).

Table 1. Summaries of the case contexts: what landscapes, who and when.

	Balruddery	**Cairngorms Connect**	**East Cairngorms Moorland Partnership**	**Lunan**	**White-tailed Eagle**
Approximate area (ha)	3500	60000	100000	13400	Argyll & Lochaber; Skye & Lochalsh; 100000s
Land cover/ use	Arable with some soft fruit and livestock.	Moorland, native woodland, coniferous forestry, sporting and tourism.	Moorland, native woodland, coniferous forestry, sporting and tourism.	Arable with some horticulture and livestock.	Hill sheep farming, commercial forestry, and tourism.
Who involved	12 farms (tenanted and owners; Forestry Commission own one).	Five estates owning around eight land parcels (private, RSPB and others).	Six estates (private and NGO- National Trust; Crown Estates).	Four riparian owners directly involved (three private and one NGO) and others involved in catchment partnership.	Organizations, crofts, farms and forestry owners represented (on the National Sea Eagle Stakeholder Group and wider partnership).
Start	**Started in 2016.** Evolution of Hutton agro-ecological work since ~2008.	**Started in 2016.** Evolution of NGO and public bodies and transformation of one private estate's mission.	**Started in 2014.** Evolution of CNPA objectives.	**Started in 2016.** Evolution of Hutton catchment work since 2005.	**Started in 2014.** Evolution to deal with conflict following from reintroductions in 1975.
Timescale	Annual to five-year focus for farm management (incl. AECS grant cycle).	Vision of 200 years.	Vision of five years or longer.	Long term (25 years).	Action Plan (2017 – 2022), revision of management proposal in 2021.

Many of these cases do not label themselves explicitly as an 'adaptive management' case. However, they share many of the characteristics of adaptive management, as these cases have set out on processes of collective learning regarding how to best manage their natural assets. Adaptive management is about the process of managing change: understanding why change is occurring, and the people and resources involved in enabling (or resisting) change. Furthermore, these cases share commonalities around land use or land management change; and all involve multiple stakeholders and the use of learning to improve practices. In these cases, a range of approaches were attempted to initiate and support landscape-level management (and governance). In two of our cases, researchers were the primary driving force behind the proposed management interventions (Balruddery and Lunan) and in the other three cases the researchers were observing management interventions implemented by other individuals and organisations. All cases started the adaptive management cycle (Figure 1) relatively recently and are generally at Step 2 (planning) or Step 3 (implementation) rather than having completed a cycle, let alone undertaken multiple learning cycles. However, all these cases were building on longer term shared knowledge of natural asset management. This combination of similarities and differences provides a fruitful way to consider common lessons learnt for the use of adaptive management in Scotland at the landscape-level.

Following on from sharing an earlier draft of this briefing, including a presentation to a broad audience of policy makers and practitioners (Stage 6 in Table 2); written feedback from 11 stakeholders was used to finalise this briefing and its recommendations. Examples of their feedback can be found in Section 4 and Appendix three. This briefing has been edited to clarify areas that were unclear and to ensure the recommendations were useful (e.g. the addition of a checklist, Appendix four).

Table 2. Summary of the research stages leading to this briefing.

What stage	How carried out	When
1. Engaged with researchers studying landscape-level management.	Individual researchers in the five cases, observed or directed landscape-level management and co-developed our methodology.	2016-2020
2. Review of practical adaptive management and draft evaluation framework.	Summarised adaptive (co-) management (and governance) research and practice.	2016-2017
3. Co-production of interview questions with research and non-research stakeholders.	Researcher workshop and stakeholder feedback on case summaries.	July-December 2018
4. Interviews with researchers (natural and social science perspectives[1]).	Recorded semi-structured interviews with researchers involved in each case (Appendix one contains questions asked).	March-May 2019
5. Comparative analysis using framework approach.	Transcripts analysed using NVivo12: coded by three researchers using deductive node structure; framework approach to compare the results using two researchers (not the interviewer); and peer review of the findings by the co-authors in a research workshop.	September-November 2019
6. Draft policy briefing for policy and management stakeholders.	Drafted and shared with stakeholders (involved in setting interview questions), including presentation to over 30 stakeholders.	December 2019-April 2020

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[1] Due to illness, the WTE case only involved social science perspectives.

3. Lessons learnt (findings and recommendations)

In all our cases there was a desire for landscape-level approaches to managing natural assets for multiple ecological, economic, and social outcomes. Reflecting on our structured analysis of interviews and workshops (Table 2), we placed our findings in three overarching groups: the first covers 'understanding the situation, participants and purpose'; the second focuses on the 'social relationships of landscape-level management'; and the third reflects the need to 'assesses ecological, economic, and social outcomes at every step' that were, or will be, achieved in these cases (Table 3). Within each recommendation group, the main findings are summarised followed by specific recommendations.

3.1 Understanding the situation, direct stakeholders, and shared purpose

Reinforcing the importance of asking 'is adaptive management appropriate' and then contextualising the situation (Figure 1), our research suggests: taking time to establish a shared understanding of the situation – including legacies of 'bottom up' choices like previous land use, and prior 'top down' policy interventions; careful identification of direct i.e. key decision-making stakeholders; and to build a shared understanding of the purpose is extremely important. Implementing these recommendations can be quite time-consuming and resource intensive, however investment in the planning stage can minimise inaction or conflict later, and it is likely this recommendation will need to be revisited throughout the project. We found a great deal of learning takes place at Step 1 (Figure 1) and can help achieve ecological outcomes.

Recommendation: Expect to spend significant time and resources understanding the situation, identifying and engaging possible direct stakeholders, and agreeing a shared purpose and desired outcomes before work 'on the ground' can start; revisit this recommendation in future adaptive management cycles.

Implementing overarching recommendation 3.1 requires considering recommendations 3.1.1-3.1.3, as these are interconnected in landscape-level management - as a shared purpose requires a collective understanding of situation and building of trust.

3.1.1 Identify and understand the direct decision-making stakeholders

Land managers may collaborate around a shared landscape-level project but can still have diverse objectives; these can be affected by how their natural assets are currently (and historically) managed and governed. In our cases, the land managers in the east coast catchments were similar farm businesses with a varied range of land and water management objectives; however, some land was also owned or managed by NGOs or the public sector. Our upland cases in the Cairngorms, included owners and land managers operating a variety of decision-making arrangements including single tenants, boards, families and trusts. The White-tailed eagle case, involved large numbers of public and private actors covering multiple sectors including forestry, farming and tourism.

Recommendation: Try and understand the main decision-making stakeholders (often land managers) and their perspective in terms of their objectives and preferences, before trying to agree a shared purpose and how it may be achieved - as a basis for a trusted and equitable partnership.

3.1.2 Develop a shared understanding of the situation

The spatial scale of landscapes in our cases varied tremendously (Table 1); in all our cases landscape-level management was characterised by working across land ownership boundaries, involving multiple types of land managers and owners (public sector, NGO, or private), and often involved heterogenous land cover and use within a single case study. For example, our cases varied from arable dominated catchments on the east coast, that included four to 12 land managers discussing a new practice, to groups of five to six upland estates discussing new practices in the Cairngorms National Park - covering tens to hundreds of thousands of hectares. To understand how landscapes function, requires awareness of the range of views and values held by land managers and other residents. In some cases, there were differences in how people perceived the condition of natural assets in the landscapes. Therefore, establishing a 'baseline' is not only about having data on the state of the natural assets pre-management intervention, but understanding how the historical intertwining of land management, natural asset condition, and governance shapes different stakeholders' perspectives on natural assets and how they should be managed.

> **Recommendation:** When starting to plan landscape-level adaptive management, consider what the landscape comprises in terms of diverse ownership and management arrangements, and establish a shared understanding of the current condition of the natural assets and the pressures they face.

3.1.3 Identify and agree the shared purpose

Adaptive management at the landscape-level needs common shared issue framing and objective setting. Though all our cases were motivated to improve the current situation (including the state of land, water and biodiversity) using specific interventions, there was not always consensus on the problem, for example, balancing the need to understand and reduce predation on livestock with maintaining the conservation status of White-tailed eagle populations. Consensus was also lacking with some of the proposed interventions, such as in the Lunan case. Cases with externally initiated interventions were more contested than those which self-identified problems and had a vision for their management interventions, for example Cairngorms Connect have a shared long-term vision of supporting habitat regeneration processes. In other cases, there has been limited action due to the length of time spent trying to agree if and how to intervene, for example in the Lunan case and in the East Cairngorms Moorland Partnership.

> **Recommendation:** There is not always agreement over the exact nature of the problem to be managed, and it can take time to develop a shared purpose and to identify shared opportunities. If there is no existing shared problem framing and purpose, then more time and resources (including facilitation) may be needed.

3.2 Focus on the social relationships of landscape-level management

The tasks of planning, doing and reflecting, is at the heart of adaptive management to improve the management of natural assets in our cases. Our findings suggest that data collection, analysis and knowledge generation are shaped by social relationships, many of which relate to the cases' complex governance situations. This group of recommendations relate to social relationships, they span: the importance of human and financial resources, distinguish between coordination and collaboration, the importance of local leadership, the influence of national

organisations, and the influence of indirect stakeholders. Overall, our findings suggest that when working at a landscape-level, involving multiple stakeholders, the social processes of how individuals and organisations relate and work together, and how these are influenced by stakeholders not directly involved in landscape interventions, needs to be given more attention. As with 'Understanding the situation, direct stakeholders, and shared purpose' (see 3.1), it is important to document and learn about the social processes involved, even before there are changes in the ecological condition of natural assets. Explicit attention to understanding these relationships is fundamental to adaptive management and which social factors facilitate positive ecological outcomes.

> **Recommendation:** Social relationships are at the heart of landscape-level adaptive management and are closely connected to achieving successful ecological outcomes and therefore relationships need explicit support and resources.
>
> Implementing overarching recommendation 3.2 requires considering recommendations 3.2.1 – 3.2.5: as landscape-level management requires resources and leadership, and collective action is influenced by national organisational objectives and indirect stakeholders including the general public.

3.2.1 Identify and secure human and financial resources

Whilst land managers can, and do, undertake environmental improvements without economic incentives, action at a landscape-level across multiple property boundaries tends to require human and financial resources. In our cases we found a range of approaches to resourcing landscape-level management from encouraging collaborations to financially supporting a coordinator or providing contractors to collect data or undertake the interventions. In most cases, support for the management intervention was increased when aligned with economic incentives via the Scottish Rural Development Programme, private investment, research grants, and potential payments for ecosystem services. For example, Cairngorms Connect's activities can now accelerate as they have secured a large grant for restoration conservation. Resources are not just about finance for actions, for example, farmers in Balruddery benefitted from help with their Agri-Environment Climate Scheme applications. However, there is a mismatch between the time taken to achieve the desired ecological

outcomes and availability of funding, with the latter often limited to between annual and five-year cycles.

Recommendation: Landscape-level adaptive management requires human and financial resources for the interventions and for the processes of coordination or collaboration; these resources may need to be long term if the coordinated or collaborative action is needed for several years to ensure social and ecological outcomes.

3.2.2 Distinguish between coordination and collaboration

One of the aspects our cases illustrated was an important difference between collaborative arrangements, whereby individuals voluntarily worked together collectively to implement actions; and coordinated arrangements, whereby landscape-level interventions are achieved, but mainly through a coordinator working one-to-one with the natural asset managers in the relevant area. More of our cases appeared to involve coordinated arrangements (e.g. East Cairngorms Moorland Partnership) than collaborative arrangements (e.g. Cairngorms Connect), although it seems that coordination can build interest and momentum that may evolve into more of a collaborative process (e.g. in Balruddery). In general, employing a paid coordinator is more resource-intensive and less resilient as it relies on the coordinator, but it is possibly the most appropriate option when initiating complex landscape-level interventions with diverse participants and contested objectives. It is important that the choice between coordination and collaboration is understood and clarified.

Recommendation: It is important not to conflate landscape-level interventions with collaboration (where individuals work as a group); so, recognise when adaptive management occurs through coordination (where individual actions are coordinated by an individual or organisation) and when it is collaboration. These processes need different types of support and both need to be resourced.

3.2.3 Identify and support local leaders

The dynamism of landscape-level management in our cases was influenced by who was leading it and their leadership style. These cases included examples of coordination being supported by dedicated staff in the East Cairngorms Moorland Partnership and White-tailed eagle cases, and by research organisation staff

in the Balruddery and Lunan cases. In the Cairngorms Connect case, there was no dedicated project officer initially, but committed staff, with organisational or owner backing, drove forward a shared collaborative vision together. In at least one of our cases e.g. White-tailed eagle, then charismatic and trusted leaders from the partners, including SNH and the land management community, were key to the success of implementing the management activities. However, if a trusted leader steps away from a management process, this can have a negative effect e.g. paused activities until they are replaced appropriately. Changes in leadership can provide opportunities for reflection and learning e.g. the formation of a new Skye White-tailed eagle management group with a wider representation of interest groups. To be successful, the leader needs to be trusted by the land managers and be able to inspire the change agreed in recommendation 3.1.

Recommendation: Depending on the purpose and situation, careful consideration is needed of who takes leading roles and how leadership can be supported and sustained over time.

3.2.4 Understand the influence of national organisations

National organisations associated with the cases had an important influence on the adaptive management processes. Beyond being associated with the provision of resources for coordination and/or interventions as noted in 3.2.1 above, these organisations implement national or EU policy (public sector) or national objectives (NGOs or corporations). For example, national level organisations (SEPA and SNH) were found to both positively and negatively influence the process of agreeing on the management intervention in the Lunan catchment. On the one hand, officers supported and advocated the intervention, but land managers were also wary of these agencies due to ongoing disputes about flood management practices in the wider region. In the White-tailed eagle, Cairngorms Connect and East Cairngorms Moorland Partnership cases, some of the NGOs had to reconcile national priorities with the specific needs of the partnerships.

Recommendation: There is a need to understand how national organisations' objectives and remits (even when not directly involved) may influence adaptive management processes. It is important to recognise their influence on decision making (e.g. as a regulator or as a supporter).

3.2.5 Understand the influence of indirect stakeholders

Indirect stakeholders such as local and national interest groups, researchers, and local communities can influence the purpose, process, and outcomes of management interventions. We found that wider public opinion (including national campaigning organisations) was mentioned in all cases, for example changing views on the roles of land managers to provide public goods for public financial support or changing public attitudes to field sports. This influenced why individuals and organisations felt the need to work collectively to manage their natural assets, and why more attention was being paid to making their actions visible to others. For example, whilst the interventions in Balruddery were extremely localised (field margins to provide habitat for invertebrates) the actions were also responding to global issues like the climate emergency and the biodiversity crisis.

Recommendation: In addition to identifying and working with direct stakeholders (3.1.1) and national organisations (3.2.4), it is important to take account of indirect stakeholders, including public opinion, and how these views can influence the appetite for and success of adaptive management.

3.3 Assess ecological, economic, and social outcomes at every step

Figure 1 doesn't explicitly mention outcomes, but Steps 4 and 5 imply that some results have been achieved, and evaluation and reflection have taken place to see if these results have generated the ecological, economic, and social outcomes desired when the cycle began at Step 1 (see 3.1.3 on shared purpose above). In our cases there was limited evidence of changes in desired ecological outcomes that the projects set out to achieve. This was due to a range of reasons; partly, the cases were about reversing long term environmental trends and so the outcomes may take years or decades to be realised. Furthermore, due to issues around 'Understanding the situation, direct stakeholders, and shared purpose' (see 3.1), some cases had not actually implemented many changes required in order to achieve the planned ecological outcomes. However, what was more apparent were the social outcomes that were necessary to enable longer term ecological outcomes, as well as being a result in themselves. Therefore, this section is structured in terms of how cases used data and knowledge, how

they planned for the long-term, and recognised what has or may change as part of the learning process. Overall, the findings suggest that learning and reflection should take place at every step of the cycle, not just at Step 5 (see Figure 1 above).

Recommendation: As learning takes place across every step of the adaptive management cycle, it is important to monitor ecological, economic, and social outcomes, and to analyse and reflect on learning throughout the cycle rather than wait until there are ecological outcomes to assess.

Implementing overarching recommendation 3.3 requires considering recommendations 3.3.1 – 3.3.3: as landscape-level management requires understanding the role of data collection and knowledge sharing, thinking and planning for long-term interventions, and regular assessment of what has or may change.

3.3.1 Understand the role of data collection and knowledge sharing

The collection of data through monitoring (Step 3 in Figure 1) is integral to adaptive management in order to analyse and adapt (Step 4 in Figure 1) and to learn (Step 5 in Figure 1). Our findings suggest that we need to understand data and knowledge beyond just considering what is collected, but also think about how the data is collected, by whom, how it is understood, how it is shared and how it is used to improve shared understanding of the system. There are different sources of socio-ecological data, including from non-scientific sources.

In all our cases monitoring and data sharing was judged to be important. For example, maps of the Balruddery catchment, including information on existing natural asset state, stimulated interest from the land managers. In the White-tailed eagle case, the monitor farms were fundamental to improving understanding of current predation levels and the potential effectiveness of management actions. In the Lunan, a shared model (an explicit form of knowledge) of how water moves through the catchment seemed to increase acceptance of the proposed intervention. However, data alone was not sufficient, in each case it was important to have social processes that allowed data to be interpreted and discussed, and the combination of scientific knowledge with local and experiential knowledge from land managers improved collective understanding of the system.

Recommendation: A landscape-level adaptive management process needs to consider how socio-ecological data will be used, and by whom for what purpose. Improving how knowledge is generated, collectively interpreted and shared is likely to improve the adaptive management processes.

3.3.2 Think and plan for long-term interventions and their legacies

In all our cases landscape-level management was viewed as a long-term social-ecological process. In some cases, this was seen as an enabler e.g. long-term vision of Cairngorms Connect encouraged a commitment to a project where results might not be seen for over a decade. However, in others, the uncertainty associated with sustaining commitment for many years was a barrier e.g. lack of suitable long-term institutional arrangement for the proposed weir in the Lunan catchment. Recognising, and planning for, how to support interventions over the longer term is an important social outcome in itself. However, it is important that the cases remain adaptive and revisit their shared purpose periodically, as situations and stakeholders evolve, and lessons are learnt from the processes (see 3.1).

Recommendation: Supporting landscape-level management needs to recognise the long-term nature of the management actions and their legacies, and plan for long-term interventions even when funding is short-term. Thinking long-term requires regular reviews of purpose and process.

3.3.3 Recognise what has or may change as part of the learning process

Understanding adaptive management is being open to what may and what has changed, in terms of ecological, economic and social outcomes. There is already evidence of habitat restoration outcomes in the Cairngorms Connect case and increased understanding of interactions between livestock and White-tailed eagle predation, whilst within the Balruddery catchment case, there was increased uptake of agri-environmental measures and the potential to join a carbon-offsetting scheme. However, the Lunan and East Cairngorms Moorland Partnership cases had seen less changes due to contested ideas about what needs to change and how; in the Lunan case there was greater understanding of land and water issues- if not agreement on the solutions. In some cases, individuals chose not to adapt their land use or land management to provide a wider range of outcomes, which made implementing adaptive management difficult, this is still an outcome and something to learn from. Recording and learning from negative changes can be difficult.

Recommendation: Ensure that all changes, whether positive or negative, intended or unintended, are captured and learnt from. Any learning also needs to recognise when changes have not or will not occur in the current situation.

4. Ideas for further research stimulated by stakeholder comments

Some of the feedback from the stakeholders suggested the need for more nuanced discussion of individual points, which was beyond the scope of this briefing. Other feedback suggested new ways of thinking that were not visible in our data but are interesting aspects to explore in future research. We summarise both types of comments here, so that these valuable insights were not lost:

4.1 Understanding the situation, direct stakeholders, and shared purpose

- As the adaptive management cycle is iterative, it is useful to consider whether the group is just starting up or has a longer history e.g. prior relationships and/or shared management interventions.

- Purpose is often an emergent property of how land managers interpret their own objectives within national policy and social drivers (e.g. climate emergency) – this speaks to who initiates and leads the adaptive management and whether land managers can innovate freely (without strict regulatory constraints). If the process is too dominated by national policy or too driven by local concerns, this could result in misallocation of resource, effort, and potentially impact any outcomes.

- More attention could be paid to who are 'direct stakeholders' (implying a formal commitment to the adaptive management situation) and who are 'indirect stakeholders' (who have an influence or

are affected by adaptive management but may not be participating). It is important to distinguish between those initiating or funding adaptive management activities, and those leading the adaptive management process as these may be different organisations.

4.2 Focus on the social relationships of landscape-level management

- The influence of the public could also be recast as considering the users or beneficiaries of the ecosystem services being produced.

- Although direct community, of place, engagement was only evident in the White-tailed eagle case, this is becoming increasingly important, and will be required as part of Local Place Planning in the future. However, public criticism of land managers could prevent innovation and adaptation.

- Communication and building trust are important and demonstration sites might help with this. However, sometimes adaptive management is adopted due to environmental conflicts, where trust and conflict resolution is the outcome, not the starting conditions. Therefore, seeing adaptive management as a process of building trust and improving relationships is more useful than assuming trust is there from the start.

- There is a tension between trust and ensuring less obvious voices are heard, and that adaptive management can enable change rather than support the status quo.

- Adaptive management processes may need to consider how to allow disagreement or agreement with conditions to take account of diverse opinions (accommodation rather than full consensus).

- There are potential skills gaps including the availability of locally trusted, expert facilitation support for leaders and expertise in landscape scale change as part of Scotland's 'just transition'.

- There is concern that we, currently, do not have a suitable cadre of landscape-level expertise to support local management in all situations in Scotland. The Stewardship Facilitation Fund has been influential in the formation of farmer clusters in England; maybe we should be testing out the same in Scotland.

- Indirect stakeholders may rally public opinion to particular causes, and this can lead to broad criticism of land managers, which could slow progress towards resolution. Need to explain that adaptive management provides a framework for testing, assessment and learning what works. Example - fractured views on deer management to the extent that public may view this as cruel and unnecessary despite the absence of natural predators and the need to reduce habitat impacts.

4.3 Assess ecological, economic, and social outcomes at every step

- Land managers may have good knowledge, holistic understanding, records of the local condition of natural assets or be able to supplement national monitoring with local site monitoring. However, interpretation of data and perspectives on what outcomes are desired may vary between stakeholders.

- Consider timescales over which adaptive management is assessed; and distinguish between short, medium, and long-term trends given there may be some difficulty in assessing trends over the short-term.

- There is a role for collaborative data collection and analysis, but we need to consider what are the circumstances that will underpin the need for collaborative data collection, who will benefit and what are the potential risks? There may need to be audit arrangements to ensure the quality of data collected in this way.

- Review and evaluation are often difficult to achieve, let alone given the appropriate attention in programmes, and there is a need for guidance or formal tools (e.g. an issues log) to help reflective learning in such projects, perhaps guided by a third party. Practitioners can report on what has happened, i.e. as part of their work. But building in reflection and reflective practice to enable learning could require a bigger mindset shift on top of the process of sharing this info.

- Need for greater long-term support from Government. Changes to agri-environment schemes over the years have not been helpful in this respect.

- Need to balance top-own (strategic), prescriptive management requirements with local leadership to create bottom-up engagement. Too much from either direction could lead to misallocation of resource, effort, and potentially impact on outcomes.

4.4 General advice

- The recommendations could be structured or sorted depending on whether they are operational or strategic; or by their resonance with the processes, people or structures associated with each case.

- Consider how adaptive management relates to risk and uncertainty – iterative change may appeal to land managers who may consider the status quo as successful for their objectives, blocking more radical change; yet radical experiments may be deemed too uncertain to deliver statutory policy objectives.

- In work focussed on the Strathard area, the ecosystems approach helped with identifying who used services provided by land management and therefore affected by the management decisions.

- SEPA's experience of partnership working e.g. Effective Partnership Working training course, identified three key ingredients: 1-What the partnership is doing… the projects and the funding to achieve its goals; 2-We need to remember that people prefer to communicate in various ways. Some people love 'blue skies' thinking, others the practical details. Central to this ingredient is trust; and importance of 3-Structure as this binds the partners together, expressed in a constitution or agreement, meetings and procedures.

- Bear in mind, too, that the process is never really over: there will be consequences, and the stakeholders are probably more sensitive to this than the researchers; and one's research work will be used/misused by stakeholders subsequently. So, researchers need to be aware of: what is your role?

5. Concluding discussion

We have presented 14 recommendations spanning 'Understanding the situation, direct stakeholders, and shared purpose' (see 3.1); the importance of a 'Focus on the social relationships of doing landscape-level management' (see 3.2); and the need to 'Assess ecological, economic, and social outcomes at every step' (see 3.3; Table 3). We believe the diversity of our cases suggests that these recommendations are relevant for most landscape-level adaptive management cases in Scotland - seeking to adapt and learn in order to improve the quality and extent of their natural assets, to support sustainable land-based industries and vibrant communities. In Appendix four we present a checklist to aid the implementation of these recommendations.

The recommendations from these cases illustrate that 'process' is at the heart of effective and efficient landscape-level management. In the extensive adaptive (co-) management (and governance) literatures (see (Macleod et al., 2016b) for a summary) the importance of social process to landscape management is widely acknowledged. For example, the importance of social process in relation to explaining outcomes (over half of results and a third of ecological effect variability) has been shown for four biosphere reserves (two in Canada and two in Sweden) (Plummer et al., 2017). However, there is less evidence that this finding has permeated into policy and practice in Scotland, hence this briefing to make it more explicit and provide practical guidance on how to achieve this.

Therefore, the initial adaptive management cycle (Figure 1) (simplified to plan – implement – evaluate and learn) and set of principles (Section 1), typically implemented by one actor on one site, has been adapted to indicate the additional aspects to consider when implementing adaptive management at the landscape-level with multiple actors (see Figure 2), including the need to record decisions and learning at each step. The adaptive management cycle implicit covers the lifecycle of a project or partnership, moving from 'starting' through 'doing' to 'reflecting', but our work does not extend to initiation of projects and partnerships, nor the ending or exiting of projects or partnerships. The cycle is iterative, with learning used to improve the next iteration of the cycle rather than assuming a single revolution will suffice.

The recommendations are designed to be strategic level

prompts for discussion and thinking rather than specific guidance for partnership or project management, given that many useful guides already exist (e.g. The Place Principle, Scottish Government, 2019 or PRINCE2 project management principles). Our cases often inhabit a niche that is neither a formal constituted partnership nor an informal social arrangement and may not adopt the formal conventions of project planning and management. Therefore, we recommend that these ideas are used to supplement more formal guidance on community engagement, place-based approaches and partnerships.
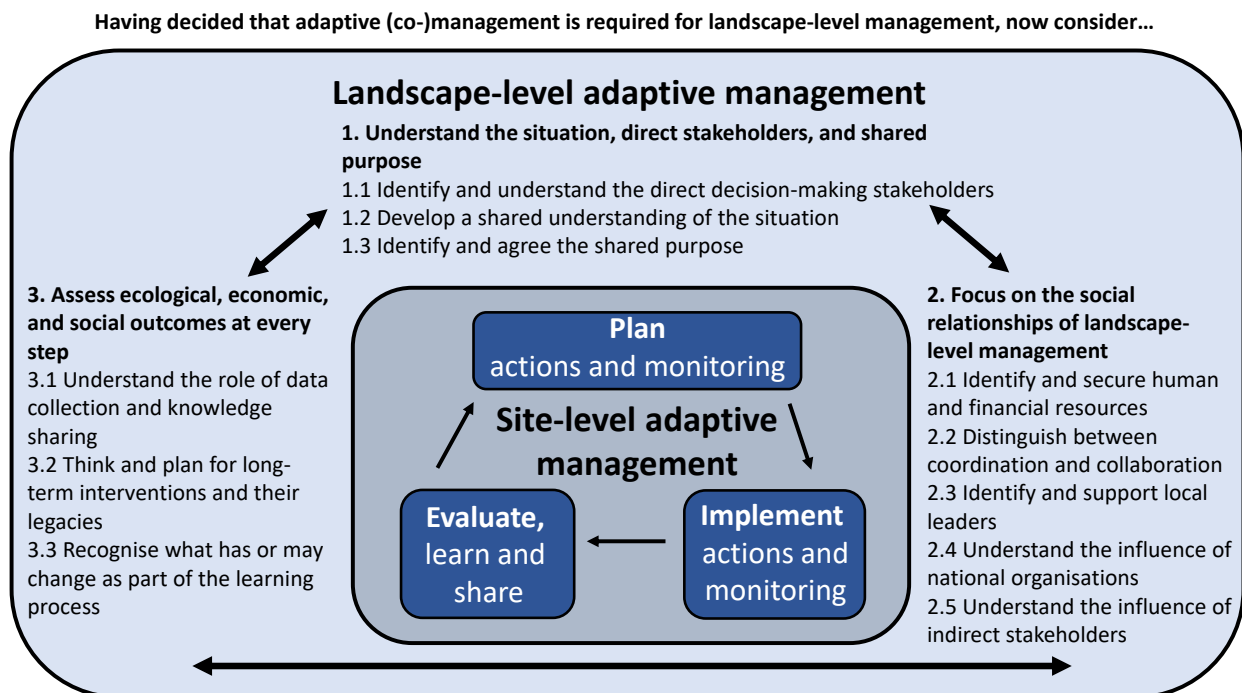
Having decided that adaptive (co-)management is required for landscape-level management, now consider…

Landscape-level adaptive management

1. Understand the situation, direct stakeholders, and shared purpose
1.1 Identify and understand the direct decision-making stakeholders
1.2 Develop a shared understanding of the situation
1.3 Identify and agree the shared purpose

3. Assess ecological, economic, and social outcomes at every step
3.1 Understand the role of data collection and knowledge sharing
3.2 Think and plan for long-term interventions and their legacies
3.3 Recognise what has or may change as part of the learning process

Site-level adaptive management

Plan actions and monitoring

Evaluate, learn and share

Implement actions and monitoring

2. Focus on the social relationships of landscape-level management
2.1 Identify and secure human and financial resources
2.2 Distinguish between coordination and collaboration
2.3 Identify and support local leaders
2.4 Understand the influence of national organisations
2.5 Understand the influence of indirect stakeholders

Figure 2. Steps and recommendations for adaptive management at the landscape-level.

Table 3. Recommendations when considering landscape-level management.

1.Understand the situation, direct stakeholders, and shared purpose

Expect to spend significant time and resources understanding the situation, identifying and engaging possible direct stakeholders, and agreeing a shared purpose and desired outcomes before work 'on the ground' can start; revisit this recommendation in future adaptive management cycles.

1.1 Identify and understand the direct decision-making stakeholders

Try and understand the main decision-making stakeholders (often land managers) and their perspective in terms of their objectives and preferences, before trying to agree a shared purpose and how it may be achieved - as a basis for a trusted and equitable partnership.

1.2 Develop a shared understanding of the situation

When starting to plan landscape-level adaptive management, consider what the landscape comprises in terms of diverse ownership and management arrangements, and establish a shared understanding of the current condition of the natural assets and the pressures they face.

1.3 Identify and agree the shared purpose

There is not always agreement over the exact nature of the problem to be managed, and it can take time to develop a shared purpose and to identify shared opportunities. If there is no existing shared problem framing and purpose, then more time and resources (including facilitation) may be needed.

2.Focus on the social relationships of landscape-level management

Social relationships are at the heart of landscape-level adaptive management and are closely connected to achieving successful ecological outcomes and therefore relationships need explicit support and resources.

2.1 Identify and secure human and financial resources

Landscape-level adaptive management requires human and financial resources for the interventions and for the processes of coordination or collaboration; these resources may need to be long term if the coordinated or collaborative action is needed for several years to ensure social and ecological outcomes.

2.2 Distinguish between coordination and collaboration

It is important not to conflate landscape-level interventions with collaboration (where individuals work as a group); so, recognise when adaptive management occurs through coordination (where individual actions are coordinated by one individual) and when it is collaboration. These processes need different types of support and both need to be resourced.

2.3 Identify and support local leaders

Depending on the purpose and situation, careful consideration is needed of who takes leading roles and how leadership can be supported and sustained over time.

2.4 Understand the influence of national organisations

There is a need to understand how national organisations' objectives and remits (even when not directly involved) may influence adaptive management processes. It is important to recognise their influence on decision making (e.g. as a regulator or as a supporter).

2.5 Understand the influence of indirect stakeholders

In addition to identifying and working with direct stakeholders (1.1) and national organisations (2.4), it is important to take account of indirect stakeholders, including public opinion, and how these views can influence the appetite for and success of adaptive management.

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3. Assess ecological, economic, and social outcomes at every step

As learning takes place across every step of the adaptive management cycle, it is important to monitor ecological, economic, and social outcomes, and to analyse and reflect on learning throughout the cycle rather than wait until there are ecological outcomes to assess.

3.1 Understand the role of data collection and knowledge sharing

A landscape-level adaptive management process needs to consider how data will be used, and by whom for what purpose. Improving how knowledge is generated, collectively interpreted and shared is likely to improve the adaptive management processes.

3.2 Think and plan for long-term interventions and their legacies

Supporting landscape-level management needs to recognise the long-term nature of the management actions and their legacies, and plan for long-term interventions even when funding is short-term. Thinking long-term requires regular reviews of purpose and process.

3.3 Recognise what has or may change as part of the learning process

Ensure that all changes, whether positive or negative, intended or unintended, are captured and learnt from. Any learning also needs to recognise when changes have not or will not occur in the current situation.

6. Next steps

This briefing will be circulated to relevant audiences and we will provide a summary as a SEFARI case study - that will be disseminated via the SEFARI Gateway social media to all programme stakeholders.

Acknowledgements

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Appendix one: Interview guide and questions

As part of our Scottish Government research on landscape-level collective arrangements for the management of natural assets for ecological, economic, and social outcomes, we are interviewing researchers leading a series of case studies:

• Cairngorms Connect

• East Cairngorms Moorland Partnership

• Balruddery Sustainable Catchment Programme

• Lunan – water for all project

• White-tailed Eagle Action Plan

In each case, we are interviewing at least one Hutton researcher from a social science department and one from a natural science department. These questions will enable us to provide a synthesis of findings from these cases related to landscape-level adaptive management of natural assets. In the interviews we plan to explore a series of questions about the planned outcomes and process of change.

To ensure that views are accurately captured, we would like to record the interview. If you prefer not to be recorded, please tell me now and I will take fieldnotes. You can request a copy of the notes or transcript for checking if you wish, but I will not send them out without your request to reduce your workload. Because those interviewed will also be contributing to the analysis and writing up of the material, we have not utilised a conventional research ethics process. However, the interview process will still adhere to standard social research ethics, namely:

• You understand the purpose of the study and can ask questions about your participation.

• Your contributions – such as ideas and information collected during interviews – will be used to inform the WP1.4.3a research project and subsequent outputs.

• Your participation in the interviews is voluntary and you can withdraw at any time without suffering personal consequences.

- The interview voice recording and transcription will be stored in a secure folder that is only available to members of 1.4.3a research team in compliance with the 95/46/EC Directive and EU regulation 2016/679 – GDPR.

- Whilst your identity will be accessible due to authorship on outputs arising, individual points will not be directly attributable to any individual, unless you agree to this during the analysis and writing stage.

- By allowing the interview to proceed, I indicate my agreement with the above points and consent to take part.

Q1) What are the characteristics of the case (their biophysical setting, main land use activities, location)?

Q2a) What change(s) are involved in terms of both processes and outcomes?

Q2b) What types of change have taken place?

Q3a) Who is involved in these landscape scale initiatives?

Q3b) What role do they play in deciding whether change is desired and setting the objectives?

Q4a) Who is leading the initiative?

Q4b) How did they come to lead?

Q4c) What is the role of the researcher in this context?

Q5a) What interaction does this case have with national and regional institutions (e.g. policies, market drivers and public opinion)?

Q5b) To what extent are existing institutions driving change or constraining the options for change?

Q6a) How was the group able (or not) to adaptively manage the situation?

Q6b) Did change occur or is it likely to do so? Have the desired outcomes been achieved or are likely to be achieved? Why or why not?

Appendix two: Brief summaries of the case studies

These summaries focus on the characteristics of the cases, including: the collective grouping and the changes taking place.

2.1 Balruddery Sustainable Catchment Programme

Summary of the case

This case study is exploring the potential for collaboration between farmers within the catchment to improve the effectiveness of agri-environmental management.

Figure 3: A view over the Balruddery catchment

Where is the case located (and size)?

The Balruddery Catchment is an area of approximately 3500 ha situated to the west of Dundee City on the north of the River Tay. It extends to about 12 km from WNW – ESE and 3 km in a NNE – SSW direction (Figure 3).

What is the collective grouping related to the case?

An informal group of neighbouring farmers that has the general purpose of gaining and sharing knowledge about each other's practices and that of the James Hutton Institute Balruddery Research Farm which lies at the geographical centre of the catchment.

What is the background to the landscape-level collective arrangements for multiple benefits?

Unlike the above cases, there are no explicit collective arrangements already in place. However, the motivation

is to share experiences and gain insight from the activities of the James Hutton Institutes' Balruddery Research Farm and the work of the institute more generally. The Balruddery Sustainable Catchment Programme was initiated by Graham Begg, and Euan Caldwell was instrumental in engaging with neighbouring farmers to create the farmer group.

2.2 Cairngorms Connect

Summary of the case

This case study is based on Cairngorms Connect: a voluntary partnership between neighbouring land managers; Glenfeshie Estate (WildLand Ltd), Inshriach (FCS), Invereshie & Inshriach (SNH), Rothiemurchus (FCS), Glenmore (FCS) and Abernethy (RSPB) (Figure 4). The case study is part of a wider research project which explores what influences bring about changes in management, and what impacts formal and informal collective arrangements have on landscape-level management and its adaptation to change.

Figure 4: Natural regeneration at Abernethy National Nature Reserve

Where is the case located (and size)?

In the Cairngorms National Park, covering an area of approximately 60000 ha. It contains the largest remnant of ancient Caledonian pinewood forest in the UK.

What is the collective grouping related to the case?

The collective grouping is a mixture of both private landowners and managers (Wildland Ltd), public (Forestry Commission Scotland, Scottish Natural Heritage) and non-governmental organisation (Royal

Society for the Protection of Birds) partners.

What is the background to the landscape-level collective arrangements for multiple benefits?

It was formally established in 2016 by like-minded land managers and owners with a common goal to enhance and improve the condition of the species, habitats and ecological processes across their estates/properties. Their long-term restoration plans are aimed at the landscape scale, connecting different ecosystems and processes to deliver multiple benefits including flood regulation, carbon storage and recreation.

2.3 East Cairngorms Moorland Partnership

Summary of the case

This case study is based around a group of private, public and non-governmental organisation owned estates in the Cairngorms National Park including Mar Lodge (National Trust for Scotland), Mar, Invercauld, Balmoral, Glenavon and Glenlivet (Crown Estates Scotland) (Figure 5). This case study is part of a research project which explores what influences bring about changes in management, and what impacts formal and informal collective arrangements or groups may have on landscape-level management and its adaptation to change.

Figure 5: Glen Geldie in Mar Lodge Estate

Where is the case located (and size)?

The case in located in the Cairngorms National Park. Altogether, the six estates cover around 100000 ha.

What is the collective grouping related to the case?

The main objective of the partnership is to showcase best practice moorland management across a landscape, whilst recognising the different management objectives

of different estates and a need to maintain viability of estate enterprises (i.e. grouse and deer shooting).

What is the background to the landscape-level collective arrangements for multiple benefits?

The East Cairngorms Moorland Partnership was initiated by Cairngorms National Park Authority to develop (and try to influence) best practice examples of moorland management in the National Park. Their main objectives are to enhance wood expansion, restore peatland, conserve raptors and other priority species, and enhance the landscape. The partnership aims to deliver across a landscape and number of private and public benefits.

2.4 Lunan – Water for all Project

Summary of the case

This case is based on a research project that aimed to introduce a new water management scheme to provide multiple benefits in the catchment area. These benefits were to improve water quality to protect biodiversity in wetlands, reduce flood risks and improve water availability for irrigation. This scheme required collaboration and agreement amongst the multiple stakeholders (riparian owners, farmers and their representatives, conservation agencies looking after the wetlands, rivers trust concerned with fisheries, local council responsible for flood management) around the installation/modification of hydraulic structures and their funding and management. It also required ongoing development of a catchment scale hydraulic model of the impact of management on flows.

Figure 6: A view over the Lunan catchment

Where is the case located (and size)?

This case is in the Lunan Water catchment area, between Montrose and Forfar in Angus, eastern Scotland, UK. The Lunan Water drains an intensively farmed mixed arable catchment of 13400 ha from its source near Forfar to the Lunan Bay (Figure 6).

What is the collective grouping related to the case?

A Lunan Water Catchment Management Group was set up in April 2016 to provide steering and oversight to the project, as well as to highlight any other catchment issues in need of consideration. This was chaired by the local authority (Angus Council) and members included the main regulatory bodies (Scottish Environment Protection Agency, Scottish National Heritage) and local interest groups (Balgavies Loch Committee, Scottish Wildlife Trust, Esk Rivers and Fisheries Trust) and members of the Water for all research team.

What is the background to the landscape-level collective arrangements for multiple benefits?

The main leaders of this project are the James Hutton Institute, with a focus on research, Angus Council with an interest in flood management and Scottish Natural Heritage with an input into wetland conservation. The Lunan Water Catchment Management Group meets two to three times per year to discuss and guide progress on the project development and adaptation. A survey was carried out to assess local attitudes and willingness to pay for innovative water management as well as preferences for the governance model.

2.5 White-tailed Eagle Action Plan

Summary of the case

The case is based around a national partnership that implements adaptive management through the White-tailed Eagle Action Plan (2017 – 2020) in a long-term conflict around the re-introduction of White-tailed eagles (Figure 7) and sheep farming.

Where is the case located (and size)?

The case is located on the west coast of Scotland, covering parts of the Highlands and Islands region. The current management is focused in the areas of Skye and Lochalsh, and Argyll (and the Isle of Mull) and Lochaber. Additional cases in the Western Isles and in Wester

Ross are being integrated in the management scheme, although no separate management groups have been established.

Figure 7: White-tailed Eagles

What is the collective grouping related to the case?

At a national level, Scottish Natural Heritage coordinates The National Sea Eagle Stakeholder Group that comprises representatives from Royal Society for the Protection of Birds, National Farmers Union of Scotland, Scottish Crofting Federation, Forestry Commission Scotland, Scottish Government Rural Payments and Inspections Division, and Scotland's Rural College. At a local level, two stakeholder groups were set up in Argyll and Lochaber and Skye and Lochalsh. The local groups comprise of representatives from farming and crofting communities and from the organisations in the national group.

What is the background to the landscape-level collective arrangements for multiple benefits?

The partnership in the case study was established in 2014 to manage an escalating conflict over white-tailed eagle predation of sheep, with wider discussions on the legitimacy of re-introductions. The National Sea Eagle Stakeholder Group developed a national strategy, the White-tailed Eagle Action Plan (2017 – 2020), to establish management objectives that would deliver sustained co-existence between white-tailed eagle conservation and sheep farming. At a local level, stakeholder groups oversee the implementation of the Sea Eagle Management Scheme (2015-2019) that supports measures to mitigate against eagle predation impacts, while also trialling management alternatives in line with goals set in the action plan.

Appendix three: Feedback from stakeholders

The draft briefing was presented at a workshop in January 2020 and the briefing sent to all attendees, as well as stakeholder previously expressing an interest in the topic. Eleven responses were received from five Scottish Government agency staff members, two science-policy experts, and four non-governmental organisation representatives. Respondents were asked if they agreed, neither agreed or disagreed, or disagreed with the draft recommendations and were asked to provide comments.

In general, respondents were in agreement, although sometimes selecting 'neither' option then adding comments to help us improve the wording of the recommendation or the way we discussed them. Only one respondent disagreed, noting that in the case of two recommendations they needed to be clarified and reworded before they could agree with them. In all cases, the comments provided were helpful in rewording recommendations and providing further areas for analysis.

In some cases, respondents wanted recommendations to be broken down into more detail with more nuance e.g. Section 3.1.1 "Identify and understand the direct decision-making stakeholders" could consider not only land managers but also the role played by facilitators or advocates for change in public and private organisations. The latter we would consider as 'local leaders' (3.2.3) or 'national organisations' (3.2.4) but the point remains that there is a great deal of detail surrounding who implements adaptive management and why that could be developed.

In other cases, respondents were keen that we connect our recommendations to other, existing, frameworks and approaches that exist. These included: project management guidance, partnership working guidance, science-policy interactions, participatory or stakeholder engagement guidance and guidance on the place-based approach in new development planning policy. All of these are useful complementary resources and have been noted in Section 4. However, our cases are not always formal projects, or formal partnerships, they act in the context of policy but are not always policy driven, are not always participatory in the sense of involving the wider public, nor do they fall under the remit of development planning policy. We found it really useful to see the parallels with other guidance, but this briefing

is designed to capture the situations for these more informal processes involving multiple actors managing landscape-level natural assets in a rural setting.

It was particularly useful to hear that the findings resonated with this audience, with respondents recognising common themes with their own experiences and helping to vindicate their own sector or organisational training or frameworks (e.g. "Your findings will really help with our ongoing development and delivery of the programme" or "It is useful to have a framework that brings it all together in a more generic way than the specific examples, and also to see it applied to different situations").

Appendix four: Checklist to implement the recommendations

These are presented as a series of questions based on the 14 recommendations (Tables 3 and 4). Ideally, you would be able to answer yes to these. If you are unable to answer yes, then this may suggest further thinking and discussion may help you achieve your ecological, economic and social outcomes.

Table 4. Checklist to implement landscape-level management recommendatons.

1. Do you understand the situation including the direct stakeholders, and have a shared purpose?
1.1 Have you identified and understood the direct decision-making stakeholders?
1.2 Have you developed a shared understanding of the situation?
1.3 Can you identify the agreed shared purpose?
2. Have you focussed on and understood the social relationships of landscape-level management?
2.1 Can you identify and secure the required human and financial resources?
2.2 Is coordination or collaboration required or possible?
2.3 Can you identify and support local leaders?
2.4 Do you understand the influence of national organisations?
2.5 Do you understand the influence of indirect stakeholders?
3. Have you assessed the ecological, economic, and social outcomes at every adaptive management step?
3.1 Do you understand the role of data collection and knowledge sharing?
3.2 Have you thought about and planned for long-term interventions and their legacies?
3.3 Have you recognised what has or may change as part of the learning process?