Ecosystems and Land Use Stakeholders Engagement Group (ELSEG) Draft Workshop Report

Monday 14th November 2016, Conference Room 2, Victoria Quay, Edinburgh

Overview

The aim of the workshop was to give stakeholders from organisations with an interest in ecosystem services and land use an opportunity to become better informed about, and inform, our research in the Scottish Government Strategic Research Programme, specifically research on Biodiversity and Ecosystem Services (WP1.3) and Sustainable and Integrated Management of Natural Assets (WP1.4). The workshop was to complement, not replace, on-going knowledge exchange within specific projects. The workshop was a mixture of plenary presentations, discussion and break-out workshops. Overall, most participants found the event useful and stimulating and most wanted to continue to engage with the research. However, there is a need for more direct interaction on specific projects beyond coming together to consider progress annually.

Contents

Morning Plenary

Following an overview of the Theme on Natural Assets (covering strategic research on Soils, Waters, Biodiversity and Land Use), there were presentations on the structure and content of WP1.3 and WP1.4 (see Appendix One for the slides). There were a few questions about the research:

Q. How will the planned social science inform work on how to engage with local communities? Can we expect new insights regarding how groups and public respond?

A. There are a number of pieces of work ongoing involving stakeholders and communities and their attitudes and preferences. We make results on these topics available as they are written up into briefs or papers.

Q. How flexible can we be regarding changing the direction of research? There are likely to be a lot of things happening in the next 5 years, can we react to that?

A. Although it's a 5 year programme it will be reviewed annually. It's reasonably flexible but research needs some time to produce results. In general, the Centres of Expertise are more responsive to policy needs whilst the programme is about building longer-term research capacity. The purpose of groups like this is to see how we can align our work to ensure we are as relevant as possible.

Q. The presentation looks logical and rational but rural policy is constantly changing and more chaotic than illustrated. Is there any research confronting political science questions?

A. There are political science questions within the overall interest in institutional delivery but this is just part of our focus. We are interested in how to align institutional arrangements, both formal and informal, and we anticipate that things may change rather fast in the next few years given BREXIT etc.

Morning Workshop 1: RD 1.3.3 - Resilience of biodiversity and ecosystems

Glenn Iason

Participants: Heather McCabe, Ruth Mitchell, David Michie, Matt Smedley, Ken Loades, Jenny Johnson, Sally Thomas, Magdalena Bertilsson, Colin Edwards, Jerry Wilson, Glenn Iason, Joanna Drewitt, Alessandro Gimona, Paula Novo, Robin Mathews, Rob Brooker, Andy Ford, Debbie Bassett, Emma Wright, Sandra Marks, Susan Davies, Kirsty Blackstock.

Facilitators: Glenn Iason, Alessandro Gimona, Ruth Mitchell, Paula Novo

Summary

After a brief presentation outlining the scientific view of the resilience concept and its broad scope, the aims of the workshop were identified and the group of 22 divided into two groups for discussion of 1) what do we mean by resilience? 2) how can the concept be applied to management of Scottish biodiversity and ecosystems? and 3) which Scottish ecosystems, communities or species might be candidates for actions to enhance resilience?

There was remarkable agreement on the basic idea underlying ecological resilience between the two discussion groups as well as similarity in the caveats and limitations identified independently by them. One group (Group A) was notably less willing to identify habitats that would benefit from enhancing their resilience whereas the other (Group B) was more forthcoming. This probably represents compositional differences between the two groups.

There was agreement on a meaning of the concept as applied to ecosystems and biodiversity, and that it may be a useful framework for assessing a system's responses to external changes, particularly a single short-term stimulus, and its propensity or ability to return to a previous state. There were however, question marks over its usefulness, whether it is desirable for a system to return to a previous state, or adapt to change, and therefore whether resilience represents a positive or negative attribute, or indeed whether is it of any use at all. Rigorous assessment and parameterization for comparison of a system's resilience are likely to be difficult due to resilience consisting of multiple components.

With appropriate caveats and definition of aims, focal system components or properties, and methods of assessment, the resilience concept could be applied more easily to manage, quantify or enhance resilience of designated areas, and assess species or habitat components of interest, more readily than for resilience of a service or services. This is because current conservation legislation focuses on system components such as species or habitats with an explicit aim for them to remain in or return to a pre-defined state. Whether planning for or enhancing resilience contributes to a future revision of this conservation paradigm, by for example aiming to conserve ecosystem function or services, remains a question. Some habitats that might be vulnerable and therefore might benefit from enhancement of their resilience were identified and listed.

Rationale

'Resilience' is widely used in common parlance and the concept is applied with varying degrees of specificity in several diverse technical and scientific contexts, notably ecology and environmental science, economics, materials science, systems science, health especially mental health, psychology and social sciences. Reviews of resilience in the environmental context, of which there are many, are often prefaced by statements about its complexity or contentious nature, and this arises partly from its embodiment of several related ideas and terms, a gradual extension of its use from a narrower ecological definition to apply to wider socio-ecological systems, or simply loose use of the term by some authors. As part of Research Deliverable 1.3.3 (Resilience of Ecosystems and Biodiversity) in the Strategic Research Programme we aim to analyse current knowledge and key concepts of resilience, consider its application to and measurement in Scottish ecosystems, and investigate the likely effectiveness for enhanced resilience of intervention policies (selected in discussion with stakeholders).

As a first step we will produce a position paper setting out the usefulness of Resilience in the context of management of Scottish ecosystems and biodiversity, to be progressed via different stages including a scientific workshop (held in October 2016 and which informed a short presentation to this workshop),a literature review and stakeholder consultation.

Workshop Aims

This stakeholder workshop aimed to:

- Clarify and reach a common understanding of resilience between scientists and stakeholders, such that this might be used when considering :
    - How the concept might be strategically applied in the management of Scottish biodiversity and ecosystems.
    - Identification of specific Scottish ecosystems, communities or species that might be vulnerable or candidates for actions to enhance resilience.

Workshop structure

After a brief presentation outlining the scientific view of the resilience concept and its potential scope, the aims of the workshop were identified (above), and the group of 22 divided 'randomly' into two groups for discussion.

Results

1. Resilience – what are we talking about?

Defining the concept

The two groups agreed on the common understanding of resilience as meaning *a systems' return to a previous state or condition following a perturbation*, but that it also includes related components of the concept such as resistance (propensity to remain unchanged by an environmental perturbation), and adaptation (ability to change to new circumstances, a new function or composition).

Clarification, refinement and limitations to the definition and use of the concept

There should be no assumption that the return of a system to a previous state or condition is desirable. Resilience should therefore not imply a value of a system or be considered alone as a positive or negative attribute. Any intervention to promote resilience should always express a desired outcome, rather than assuming that a return to the status quo is required. An exception to this is where the focal system e.g. a habitat, species, a particular locality, has a level of protection that specifies that it should remain in a particular state e.g. a European Protected Species, monitoring features of interest at designated sites such as a particular species or habitat at e.g. SSSI, Natura 2000 or RAMSAR sites. If the starting condition or state of a system is considered to be 'healthy' or 'good' and it is considered desirable to return to it, the concept of resilience is clearly applicable, otherwise its benefits are less clear. A system that is resilient to change may be difficult to alter by intention.

It is important that we define related ecological concepts and their relationships with resilience. Sustainability (of which resilience forms a sub-set), is used in many domains including parts of the RESAS Strategic Research Programme such as Sustainable agricultural production, and it forms a cornerstone of modern forestry (Sustainable forest production). Other related terms that need to be defined and a glossary of terms produced, include vulnerability, resistance to change, adaptation, recovery and stability. We need to consider and state whether each of these is viewed as a positive or negative, and under

which circumstances. Vulnerability is probably negatively related to resilience but is closer to the inverse of resistance – vulnerable is considered to be something that will tend to respond by changing quickly and in relation to a small stimulus, and usually for the worst.

It is accepted that knowledge of a whole system, its components and how they interact is required for a full understanding of how it might respond to environmental or management changes, and its stability and resilience. But such a level of detail is rarely available. Levels of redundancy of function of system components are rarely known.

Considerations of resilience involve recovery following a single relatively short-lived environmental perturbation such as a pollution or extreme weather event or resulting flood. However the concept is less suited to considering response to a long-term sustained perturbation such as elevated CO2, or temperature change, unless it is considered to embody adaptation to a new set of environmental conditions, rather than attempted return or recovery to a previous state.

If we are assessing resilience or seeking to enhance resilience then, we must define precisely which system characteristics we are targeting.

The timescale over which a system's resilience is to be assessed or improved should be given. The time frame for consideration of and implementation of any actions to improve resilience are likely to be long-term, but government frameworks are often set for shorter-term results. This should be recognised if any environmental improvement scheme aims to promote resilience.

Other comments and observations
It is doubted that the resilience of a system could be described with a single parameter.
From the management perspective the aspects of a system that need to be retained should be defined and prioritised e.g. economic, social, ecological, and it can be assessed in terms of the outputs/services, its components or the way it functions. The mutli-factorial nature of this means that a collaborative approach is likely needed.

There is an explicit acceptance that social and ecological systems are linked and Resilience theory recognises and accounts for this, but in a rather abstract way, that is not readily applicable. We need to relate resilience of ecosystems to resilience of other policies/government structures/social frameworks.

Some systems are less resilient but may deliver greater environmental benefits or services, e.g. compacted soils.

If trying to enhance system resilience then it is worthwhile considering what the source of perturbation to that system is or is likely to be, since it may be resilient to some pressures but not others. Its resilience to future as yet unknown pressures may be lessened by intervention.

2. Can we apply 'resilience' in Scotland?

What might it be useful for?
Assessment of whether protected areas or protected species are resilient to environmental change. A DEFRA paper on which priority habitats are least resilient to climate change e.g. Atlantic oak woods and the bryophytes associated with them may be helpful.

Caveats/comments
However resilience is used, we need to be clear about what our targeted end point is.

The group agreed that the current conservation framework aims to conserve the status quo but allowing systems to change, for example in response to global climate change, might be desirable. The habitats directive is 'up for consultation', but it was concluded that some such framework for conservation of the natural environment was needed.

Protected areas were not designated for services but for a particular species or habitat at a particular point in time. Current legislation does not cope with change in species/habitat or with the possibility that what we currently have may not be what we want – there may be a better option. It is not always clear as to what our priorities are with respect to ecosystems e.g. protected areas versus services; although legislation covers the former.

Species components of a system might be vulnerable but the services from the system may not necessarily be. But conservation is often based on species. Assessment of species components of an ecosystem might not be the best measure of how vulnerable a system might be but there is no clear alternative. Species and components of systems are easier to measure than services.

How might 'resilience' be applied practically?
Current priority habitats are a good place to start (*focusing*) on resilience, but we should not lose sight of species.

The IUCN Red List categories include the criteria of 'vulnerable'. Species classified as vulnerable could be mapped within Scotland. This map could be overlaid with maps of habitats/protected areas or delivery of ecosystem services to assess if there is a link with either (i) which habitats are most vulnerable or (ii) which areas are delivering most/least ecosystem services.

Management for resilience of whole systems needs to be undertaken at a large scale such as across habitats at a whole catchment level. Actions to encourage this should probably not therefore focus on single land holdings, although that may depend on how big they are.

Caveats/comments
Resilience ideas are more likely to find application where systems are currently functioning well, but is probably less appropriate in systems that are considered to be vulnerable.

A large scale action to enhance resilience would need to find mechanisms through which people might be brought together (e.g. ECAF within SRDP). Different scales are likely to work for different stakeholders with different priorities, and so appropriate inducements/incentives are needed for implementation

The SBS/Route maps would be good starting points to constructively use resilience to identify pressures on species and habitats and their likely responses

There are different pressures for different systems, the list could be endless!

As a concept it is 'too woolly'; it is good to think about it but difficult to use it. There is much variation in what it might mean so better to avoid (in general) using the word.

3. Can we identify specific Scottish ecosystems, communities or species?

Some systems considered to be suitable targets for resilience action would be:

- Peatlands (we know where degraded peatlands are, and about associated mechanisms and incentives; for other systems we have less information)
- Native woodlands in upland areas
- Mountain scrub
- Artic alpine communities
- Coastal systems

In general, the more natural systems are more resilient and less vulnerable. For example, there is evidence about this from restoration work done in river systems.

Morning Workshop 2: RD 1.3.2 - Assessing changes in ecosystem service flows from woodlands - development of an integrated framework

Anke Fischer

Participants: Ian Bell, Allan Watt, Andrew Heald, Anne Gray, Bill Slee, Bob Frost, Darren Moseley, David Hetherington, Derek Robeson, Eric Baird, Jesse Daniel, Sarah Govan, Jan Dick

Facilitators: Anke Fischer, Robin Pakeman, Justin Irvine, Katrin Prager

The **aim of the workshop** was to get feedback and comments on a draft framework for the assessment of changes in ecosystem services (ES) across a gradient of woodland sites, from the peri-urban to the remote. Key aspects for discussion include the selection of relevant ecosystem services and the management interventions whose impacts are to be evaluated.

After the presentation (see slides), an initial discussion brought up a several points:

- The need to look at ongoing large-scale changes in woodland management (and the consequences that these might have for ES provision). It was argued that two of those large-scale changes were not considered in our selection of study sites, namely changes related to (a) farm woodland and (b) commercial forestry. Woodland expansion and farm woodlands are covered in other RDs (e.g. 1.4.3, 1.4.2) so the need to include these here might be less pressing. However, there is an increasing emphasis on developing woodland for commercial objectives but also on restructuring these woodlands to provide multifunctionality. How this affects the production of ecosystem services and benefits is an important question and the selection of study sites should reflect this. There should be 20-30 years of data from for example EIAs as new woodland sites need to carry these out. For example, East Loch Lomond was a conventional commercial woodland but is now being 'restored' to native woodland: do tourists have preferences for woodland type in a landscape character context? Different groups may have differing views on how woodland restructuring affect them. This would potentially also mean including forestry scientists as part of the research team. Data on yields etc. should be available for all commercial forest plantations and these types of indicators could be used in the analysis, and to identify potential trade-offs with other benefits. The Ecosystem Service Cascade diagram provides a useful framework but there needs to be recognition that the link between the environment and the benefits people derive from it is not a neat as portrayed in the cascade diagram.

- The value of natural-cultural heritage as such, and how this might change over time. The argument here was that e.g., historical natural features will have meaning that is related to their history, and that this needs to be recognised. This could be the focus of an in-depth study (on one or two sites) accompanying the cross-site assessment.
- The question how uses such as mountain biking could be considered. For example, to what extent do mountain bikers derive benefits from woodland that is multifunctional or do they mainly derive the benefit from the prepared track and it is not important what type of woodland the track goes through? Also, how could the wellbeing from mountain biking be compared to that by e.g. capercaillie conservation if we use the number of people benefiting as a multiplier? A travel-cost estimate for the health benefits of different activities undertaken in woodlands may be informative.
- The problems associated with focusing on only a selection of ES. It was suggested that on each site, a wide-ranging assessment of the whole area with a diverse range of participants should be carried out first, before selected focus ES. Also disservices should be included. The landscape needs to be bounded. An alternative/additional approach could entail the use of existing lists of ES to assess people's activities in a landscape; as a second step this would involve asking "how much/how often" these activities are carried out. A heatmap could be an attractive output, where people point at what they like/ what they don't like.
- Study needs to be sensitive to different users

We then moved on to the 'prioritisation' of ecosystem services for our cross-site assessment. Several new ecosystem services were added. Overall, the different areas were scored (using sticky dots) as follows:

- Timber: 11
- Carbon sequestration: 9
- Conservation of target species: 8
- Biodiversity connectivity: 1
- Wider biodiversity: 3
- Natural flood management: 8
- Water quality and quantity: 6
- Income/employment: 3
- Mental restoration: 4
- Mental and physical restoration and wellbeing: 6
- Landscape character and quality: 7
- All other CES (place attachment, traditional knowledge and skills, inspiration, spirituality): 0

It was argued that landscape character and quality was important as this was what mattered to most people. It included scenery and views but also more a holistic and implicit appreciation of a place.

In the last part of the workshop, we broke up into four smaller groups, discussing potential indicators for selected ecosystem services:

- **Timber and Carbon sequestration:**
    - Structures: tree growth, soil carbon (including peat) (stopping grazing and burning to allow regeneration)
    - Flows: Woodland carbon code could be a data source; modelled soil carbon changes
    - Benefits: Timber for construction or woodchips (depends on market) – there are no pulp mills anymore. Carbon sequestration in soil.
- **Conservation of target species**
    - Who chooses them?

- Benefits: needs other measure less focused on visitors

- **Restoration and wellbeing**
  - Participants suggested being more comprehensive and including not only mental, but also physical restoration
  - Part of mental restoration could also be the feeling of being welcome (e.g. on an estate), being able to sit down and have a rest somewhere etc.…
  - There is a close link with landscape features – what are the landscape features that support restorativeness?
  - Can we capture what people do in the woodlands, where and for how long? Do encounters with wildlife etc. matter for restorativeness?
  - How do we deal with questions of visitor numbers? If wellbeing generated by woodland recreation is multiplied by number of visitors, some woodlands will score very highly – possibly higher than some other woodlands of high conservation value.
- **Landscape quality and quality**
  - Structures: suitable data would include land cover (e.g. lochshore woodland), land use, mountains. (This could be compared over time e.g., have areas of woodland increased or decreased, have areas become more or less species diverse, what impact would changes have had on openness, colours?)
  - Flows: What do you do in this place? Access actively being encouraged by some land managers ('selling the place') which can increase flows.
  - Benefits/disbenefits: e.g., heartrate and fitness level improved, but also higher number of injuries from mountain biking which would increase NHS costs (a disbenefit), some users may get their enjoyment from views while others get enjoyment from biodiversity (e.g. midges have been shown to be a disservice to tourists, however locals had different views because they saw midges as necessary part of the ecosystem and knew they were only around for a limited time)
  - Other points – aspects to consider in the assessment: dependent on time; people don't like change, diverging views about what is a benefit or a disbenefit: but should the majority count?
- **Natural flood management** (NFM) – 'slow the flow'
  - Structures: riparian woodlands, log jams/leaky dams, slope woodland, woodland types. Management influences were discussed in the sense that they are drivers of the structures that are put in place. Those with different aims will influence what structures are preferred
  - Flows: linking (upper) catchment with communities in order to recognise that upstream management influences impact on downstream communities. Managing flow rate (indicators such as measuring flow rate in key water bodies ms^{-1}), sediment export, nutrient export indicators (modelled from land use configuration or measured at catchment pore)
  - Benefits (note that these are not necessarily indicators but generally benefits arising from NFM):
    Direct - Reduced costs of water treatment (£), increased biodiversity connectivity and enhancement (connectivity or isolation indices), reduced direct costs of flooding (£) and cost for insurance sector (£), increased engagement in decision making and level of understanding (people attending or responding to consultations).
    Indirect – increased recreation opportunities (length of riparian paths), new business opportunities for hunting or ecotourism would be measured by number of new businesses or bed nights in local hospitality sector).
  - Other points: level of private investment by for example businesses depending on natural resources (whisky sector) or through payments for ecosystem services by a community or insurance sector for upstream management
  - Link management of structures for multiple benefits (integrated catchment management): start with the benefits and work backwards.

Morning Workshop3: RD 1.4.1 – Natural Asset Register and Ecosystem Service flows; which questions need answers?

Alistair McVittie, David Donnelly & Kit McLeod

Participants: Andy Wells, Bruce Howard, Bruce Wilson, Chris Ellis, Chris Spray, David O'Brien, Gus Jones, James Hutchison, Kerry Waylen, Lorna Dawson, Maria Nijnik, Mary Christie, Nikki Dodd, Patricia Rice, Peter Phillips, Stephen Hughes, Andrew Midgely and Chris Dodds

Facilitators: Alistair McVittie, David Donnelly & Kit McLeod

Aims of the workshop: "To present an overview of our work so far on the Natural Asset Register, and how this relates to developing our understanding of ecosystem service flows and natural capital accounts. The discussion will consider how stakeholders might use the Natural Asset Register to guide future refinements. We would also like to identify priority natural assets and ecosystem services to guide the development of natural capital accounts in terms of sectors, scales and locations."

This session was split into two parts, the first focussed on the Natural Asset Register, and the second part on natural capital accounting.

Aims of the part on the RESAS Natural Asset Register were to: 1) share what we have done so far i.e. our review; 2) engage stakeholders to gain their views on a thematic focus, better understand their needs; and 3) to set a clear path forwards for the remainder of this year and the next research year.

What we did

We presented a summary of the findings from our review of initiatives relevant to the Natural Asset Register. Then we posed two questions to structure a discussion: do you have any comments on the findings of our review? What are your needs in relation to a "**comprehensive, national, spatially-explicit natural asset register, which will allow the identification of assets 'at risk' and include an inventory of ecosystem service flows from the assets"** bearing in mind the existing initiatives? We then presented key messages from the Main Research Provider workshop we held in October, including candidate issues for the initial focus of the Natural Asset Register. This was followed by another discussion around asking for views: is it mainly a resource for technical users, and what is its initial thematic focus?

Summary of the points made by the participants

There is interest in the Natural Asset Register from a range of representatives from organisations: Natural England, Scottish Natural Heritage, Scottish Land and Estates, Scottish Wildlife Trust and Ecosystem Knowledge Network.

Organisations like Natural England would find our review useful, as they are looking to review of natural capital tools.

We need to set out more clearly who the non-research users are of the Natural Asset Register. Which groups may find this information useful now, and in the future? For example, land managers may need more information on their natural assets, and define more clearly how their management is adding value to justify public expenditure.

Who is going to use the Natural Asset Register? There is a need for greater engagement with potential user groups (maybe as part of the accessibility review). Trying to design a tool/resource for multiple audiences may not meet their individual needs.

We may need to start from what decisions are people making (or outcomes they want to achieve), and what they need to make those decisions on natural capital assets, when designing the Natural Asset Register. For example, local authorities require greater access to information on natural assets for land use planning.

The Ecosystem Knowledge Network members may provide a grouping of relevant end users. They have groups of users e.g. rural surveyors or local authority planners, who the Natural Asset Register may need to be designed for.

There is benefit in the Natural Asset Register being located on SEWeb where other related datasets and tools are to be found.

Are we trying to provide a single authoritative view on the (natural capital assets) environment? Need to consider a range of knowledges on the natural capital assets.

Are we looking at changes over time in natural capital assets?

There is interest from Scottish Government in where natural capital assets are being added to or reduced. In the future this may help guide publically funded measures/interventions.

Need to be aware of related national/international initiatives e.g. Natural Capital Protocol that key Scottish Stakeholders are involved with e.g. Scottish Wildlife Trust, and involve natural capital assets out with Scotland.

Participants involved in the Scottish/Defra natural capital accounting pilots were critical of the quality of the work carried out.

Aims of the part on natural capital accounting were to: 1) share understanding of what is natural capital accounting, and 2) discuss what research is planned on natural capital accounting.

What we did

An overview of natural capital accounting was provided including existing approaches e.g. Eftec model and Office of National Statistics, along with an outline of planned work. A discussion was structured around how to produce natural capital accounts, at what scales, what habitats, and what ecosystem services.

Summary of the points made by the participants

Conceptual question for a woodland, is it just the sum of the various ecosystem services? Consider a wider consultation to explain the concept, and how it may be of interest to them. You may get some specific asks from respondents.

Members (of Scottish Land and Estates) are aware of payments for ecosystem services, and are waiting for when the money/market arrives: until then, just talk. Different aspects for Scottish Government, if you were able to show natural capital assets increasing on your land then maybe able to link a market. Ultimately, the natural capital accounts must be linked to their scale (of management), and to a market.

If you take away current Common Agricultural Payments, what would we like to pay for (Wales have run through this exercise following Brexit)? How would the government influence the land manager to target an area for a particular benefit e.g. Natural Flood Management?

Do you have a mechanism for how to set (natural capital) accounts in wider context of what people want?

Could you use information in these (natural capital) accounts for cost benefit analysis e.g. in a national park for a wider range of benefits, and not just the cost based ones?

A couple of comments about scales of habitats and services, including at what scales e.g. national parks are a good opportunity to prioritise biodiversity in (specific) locations is more information.

Afternoon Workshop1: RD 1.3.1 & 1.3.4 - Agri-Environment and Climate Scheme (AECS) – what are the gaps for habitat and species action?

Robin Pakeman & Ruth Mitchell

Participants: David Michie, Emma Wright, Ruth Mitchell, Jesse Daniel, Susie Turpie, Allan Watt, Eric Baird, Katrin Prager, Robin Pakeman

Facilitators: Robin Pakeman, Ruth Mitchell

Aims of the workshop: The Rural Development Programme is still evolving since its precursor the ESA's began in the 80s. As part of the Strategic Research Programme we are identifying what gaps there are in current AECS; not what could be done differently/better. There is the option in the Strategic Research Programme to focus on these gaps if the science to underpin new options is absent.

Three methods are being followed to do this:

1. A desk review comparing options in Scotland with other AECS from around Europe.

2. A desk review to identify which Scottish Biodiversity List species and habitats are poorly served by current options.

3. A workshop with stakeholders to seek their views on where gaps lie (today's workshop)

Workshop structure

A brief introduction explaining the rational was presented. The question "What species and habitats are not covered by the current scheme?" was posed to the workshop participants. The participants were split into two groups and each spent approximately one hour discussing the question for each of three sub-topics (20 minutes each):

1. Annual and perennial crops

2. Grass farms

3. Uplands and semi-natural habitats

Results

There were a number of themes that emerged across the three landscape types:

- We could focus on ecosystem services as well as biodiversity;
- There ought to be a long-term approach and consistent funding, as the objectives of the scheme may only be achieved through long-term efforts;
- We need to redesign schemes that consider winter requirements, not just summer feeding and breeding. This applies specifically to waders;
- There ought to be better links between WGS (Woodland Grant Scheme) and AECS;

- There is the opportunity to integrate goose management and raptor schemes with AECS.

1. Annual and perennial crops

There was a good degree of consistency between the two groups. Gaps identified included:

- More efforts to support pollinators, especially in areas of soft fruit production;
- The potential to achieve productivity gains through supporting options that support Integrated Pest Management (IPM);
- Support for silvo-arable systems (agroforestry);
- Support improvements of biofuels production systems to benefit biodiversity;
- Geographically targeted support for the genetic conservation of crop varieties.

As mentioned above there was agreement that support ought to be given to improving ecosystem services, then a number of other options to do this could be considered:

- Soil management aimed at improving quality, increasing soil organic matter (e.g. green manures) reducing erosion and compaction, and supporting nutrient management planning;
- Use of legumes to improve soil quality and support pollinators.

2. Grass farms

Similarly, there was good agreement across the two groups:

- Better support for agro-forestry;
- Support for managing habitat mosaics, including scrub and areas around buildings;
- Support for appropriate management of coastal grasslands, especially with the view of preventing erosion
- There are a number of possibilities that could benefit pollinators, such as widening the range of flowering species by diversification of swards, management for nectar production, and incorporation of legumes into grassland;
- Options that allow for conservation headlands to be used in grazed areas could be developed;
- Break crops are essential in areas where grasslands are often reseeded – the choice of crops could be influenced to benefit other parts of the system, e.g. pollinators;
- There could be more options for wetland creation;

As for cropped systems, support could be used to build up ecosystem services;

- Grasslands could be managed to build up soil function, improve soil structure and resilience;
- Liming could be supported to increase invertebrate population sizes to benefit waders;

Whilst the focus of the workshop was not on improving current options, the following relevant points were made;

- There ought to be a re-examination of the wader options to see where they need extra management included;
- Greater emphasis should be given to the creation and management of lowland species-rich grassland.

3. Uplands and semi-natural habitats

There was more diversity between the two groups for this subject area, potentially as the possibilities for species and habitats options were greater:

- The focus of upland options is currently on moorlands, more could be done to improve the management of montane habitats and upland scrub. This could also include specific options for Juniper management;
- Support for rewilding could be developed under AECS;
- Payments should be made to prevent both under-and over-grazing;
- The options available under AECS are too restricted for peatland habitats. Possible to revert to the wider set of options funded under SNH's Peatland Plan;
- Habitat management to benefit raptors could be supported so that management can move beyond diversionary feeding;
- Options could be developed that provide for species that use the uplands only at certain times – e.g. waders;
- Positive management options for mountain hares could be included.

Managing to improve ecosystem services could be focussed on

- Support for upland wetland conservation to benefit water quality;
- Prevention or repair of erosion;
- Developing options that boost carbon storage outside of peatlands.

Conclusions

The workshop participants were posed a broad question and responded with a range of ideas about how AECS could be developed to address broader issues in relation to protecting and enhancing ecosystem services and narrower focussed efforts at enhancing biodiversity.

These will be integrated into a report on gaps in AECS to provide a third strand of evidence concerning how AECS could be improved on in future. The report will also be used by a second workshop to identify potential options where adoption would be dependent on future research and to prioritise these.

Afternoon Workshop 2: RD 1.3.4 Governance for biodiversity–what has been done and what could be done?

Paula Novo

Participants: Alan Bell, Andy Wells, Bruce Wilson, Chris Ellis, Colin Edwards, David O'Brien, Kerry Waylen, Magdalena Bertilsson, Nikki Dodd, Philip Canavan, Sally Thomas, Sandra Marks, Jenny Johnson

The **aims of this workshop** were to:

- Present an overview of the work done so far
- Identify existing gaps in the database
- Identify which mechanisms may be interesting and relevant for RD 1.3.4 to focus on and discuss the reasons why

The workshop was structured around two main activities that followed the introduction and overview of the work. The first activity consisted in identifying existing gaps in the database. For this purpose, participants were asked to write on post-it notes the name of those mechanisms which were currently missing and then place the post-its on the flipchart under the appropriate category. The mechanisms added during the workshop are the ones highlighted in

light grey in Table 1. After this, participants were asked to identify the top 5 biodiversity governance mechanisms in which RD 1.3.4 should focus on. For this activity, each participant had five sticky dots that could be allocated to any of the mechanisms in the table, including the new ones added in the previous exercise (see Table 1).

The main points from the discussion after the two activities were:

- There is a need for an integrated policy framework linking food, health and education agendas and integrating land uses
- New approaches to subsidy - 'getting more from less'
    - There is a lack of clear prioritization and targeting effectively
    - Collaborative approaches to produce outcomes
    - Co-produce schemes to meet local conditions, the schemes should set objectives/outcomes instead of rules
- Peatland restoration as an example where land managers have engaged due to relationship building and motivated project officers
- In some cases using the 'stick' could be appropriate (e.g. rhododendron). SEPA's approach to diffuse pollution could be applicable to other cases
- Biodiversity offsetting is not high on the political agenda. We need to understand better the limitations and how it is being used locally and for planning; although it is linked to planning it is broader than that.

Table 1. Biodiversity governance mechanisms – results from the workshop

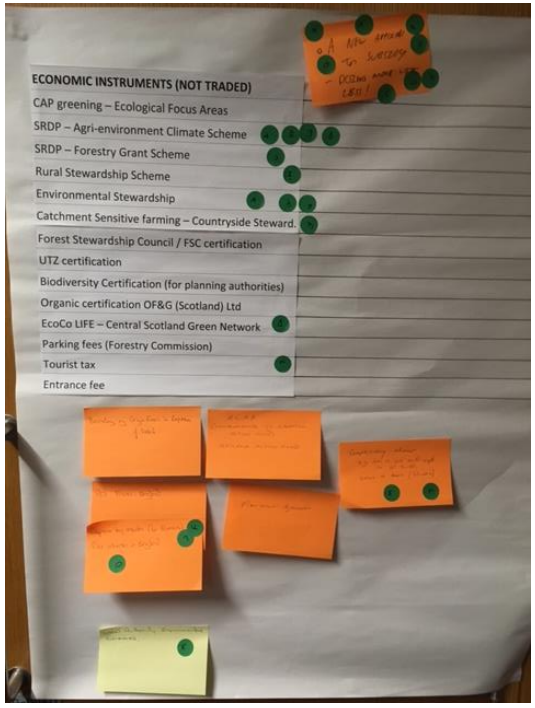
Governance mechanisms	'Sticky dots'
Regulations	
National Designations e.g. SSSIs, National Parks	
European/International designations e.g. Natura sites	
Impact Mitigation Regulations	
Codes of practice (e.g. muirburn)	●
Environmental Impact Assessments	
Water Framework Directive / Natural Flood Management (Flood Act Scotland)	
Licensing for shooting/fishing / field sports	
Birds & habitats directives	
Compliance / Inspection regimes	
Policy frameworks (forestry policy & planning policy)	●
SEPA – Better regulation agenda	●
Plans: River Basin Management, Flood Management, Local Development	●●

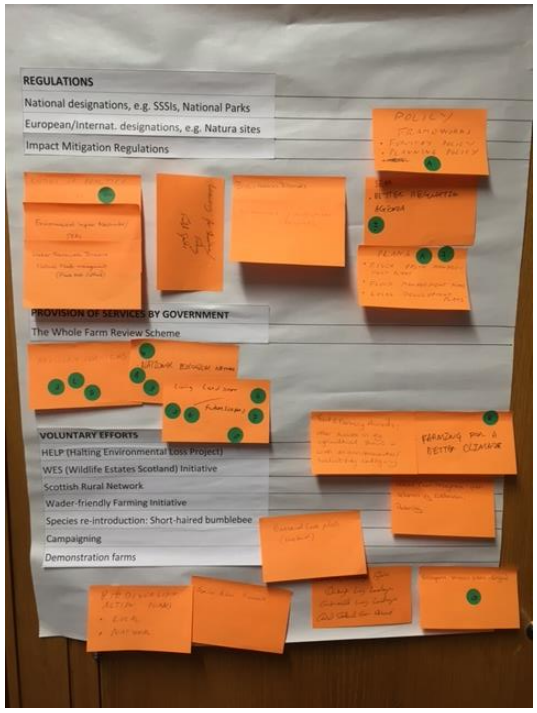
Provision of services by government	
The Whole Farm Review Scheme	
Advisory services	●●●
National Ecological Network	●●●
Living Landscapes/ Futurescapes	●●●●●
Voluntary efforts	
HELP (Halting Environmental Loss Project)	
WES (Wildlife Estates Scotland) Initiative	
Scottish Rural Network	
Wader-friendly Farming Initiative	
Species re-introduction: Short-haired bumblebee reintroduction	
Campaigning	
Demonstration farms	
Food & farming awards (other awards in e.g. agricultural shows with an environmental/biodiversity category)	
Farming for a better climate	●
Natural Flood Management – pilot schemes e.g. Eddleston, Pickering	
Peatland Code pilots (England)	
Ecosystem Services pilots (England)	●
Consortium/Partnership Projects (Edinburgh Living Landscape, Cumberland Living Landscape, Central Scotland Green Network)	
Biodiversity Action Plans (local, national)	
Species Action Framework	
Economic instruments (not traded)	
CAP greening – Ecological Focus Areas	
SRDP – Agri-environment Climate Scheme	●●●●

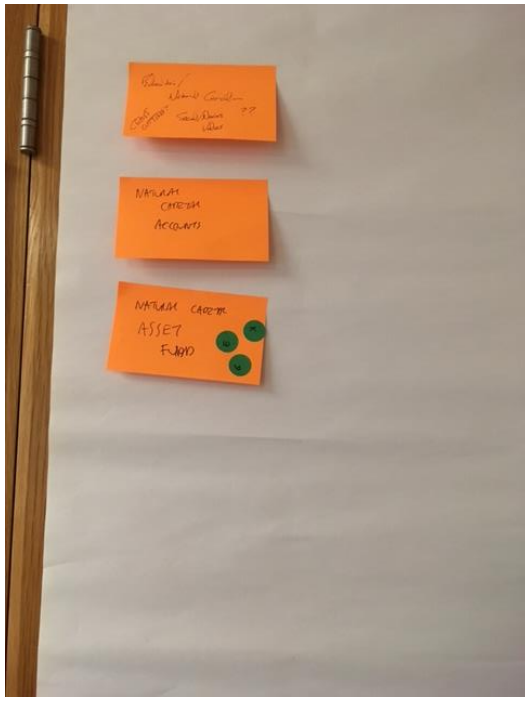
SRDP – Forestry Grant Scheme	●
Rural Stewardship Scheme	●
Environmental Stewardship	●●●
Catchment Sensitive farming – linked to Countryside Stewardship	●
Forest Stewardship Council / FSC certification	
UTZ certification	
Biodiversity Certification (for planning authorities)	
Organic certification OF&G (Scotland) Ltd	
EcoCo LIFE – Central Scotland Green Network	●
Parking fees (Forestry Commission)	
Tourist tax	●
Entrance fee	
New approach to subsidy – doing more with less	●●●●●●●●
Branding, e.g. Origin Green in Republic of Ireland	
ECAF	
Peatland Action Fund	
Payments by results (for farmers) Pilot schemes in England	●●●
Management agreements	
Compensatory schemes	●●
Local Authority Environmental schemes	●

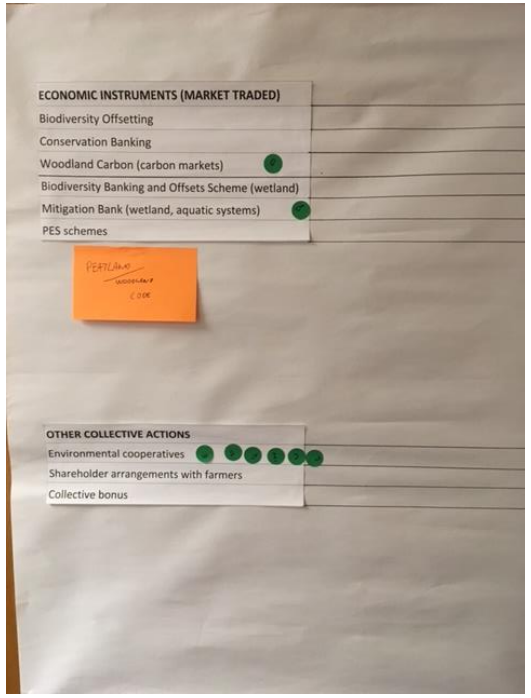
Economic instruments (market traded)	
Biodiversity Offsetting Pilots	
Conservation Banking	
Woodland Carbon (carbon markets)	●
Biodiversity Banking and Offsets Scheme (wetland)	
Mitigation Bank (wetland, aquatic systems)	●

PES schemes	
Peatland/woodland code	
Other collective actions	
Environmental cooperatives	●●●●●●
Shareholder arrangements with farmers	
Collective bonus	
Others	
CROSS-CUTTING: Education/National curricula, social norms, values??	
Natural capital accounts	
Natural capital asset fund	●●●


ECONOMIC INSTRUMENTS (NOT TRADED)
CAP greening – Ecological Focus Areas
SRDP – Agri-environment Climate Scheme
SRDP – Forestry Grant Scheme
Rural Stewardship Scheme
Environmental Stewardship
Catchment Sensitive farming – Countryside Steward.
Forest Stewardship Council / FSC certification
UTZ certification
Biodiversity Certification (for planning authorities)
Organic certification OF&G (Scotland) Ltd
EcoCo LIFE – Central Scotland Green Network
Parking fees (Forestry Commission)
Tourist tax
Entrance fee


REGULATIONS
National designations, e.g. SSSIs, National Parks
European/Internat. designations, e.g. Natura sites
Impact Mitigation Regulations
PROVISION OF SERVICES BY GOVERNMENT
The Whole Farm Review Scheme
VOLUNTARY EFFORTS
HELP (Halting Environmental Loss Project)
WES (Wildlife Estates Scotland) Initiative
Scottish Rural Network
Wader-friendly Farming Initiative
Species re-introduction: Short-haired bumblebee
Campaigning
Demonstration farms




ECONOMIC INSTRUMENTS (MARKET TRADED)
Biodiversity Offsetting
Conservation Banking
Woodland Carbon (carbon markets)
Biodiversity Banking and Offsets Scheme (wetland)
Mitigation Bank (wetland, aquatic systems)
PES schemes
OTHER COLLECTIVE ACTIONS
Environmental cooperatives
Shareholder arrangements with farmers
Collective bonus

Afternoon Workshop 3: RD 1.4.2 - Further development of criteria to assess opportunities for woodland expansion and their consequences

Alessandro Gimona

Participants: Bob Frost; Darren Moseley; David Hetherington; Sarah Govan; Debbie Bassett; Tim Hall; Peter Phillips; Stephen Hughes

Rationale

The rationale for woodland expansion has been explained in several policy documents, including the Scottish Forestry Strategy, the Scottish Biodiversity Strategy and the Scottish Land Use Strategy.

http://www.gov.scot/Resource/0042/00425276.pdf

http://www.gov.scot/Resource/0049/00497086.pdf

http://scotland.forestry.gov.uk/images/corporate/pdf/ForestExpansion.pdf

Woodlands provide multiple ecosystem services which translates into multiple benefits. Although many of these benefits are mentioned by policy documents, rarely priorities and spatial trade-offs are addressed comprehensively. This is the remit of part of the research funded by the Scottish Government (1.4.2c) and this workshop contributed to this end.

Workshop Aims

This stakeholder workshop aimed to:

- Identifying criteria to be used in planning for woodland expansions
- Ranking such criteria by importance

Workshop structure

The workshop used participatory multi-criteria analysis to assess opportunities for woodland expansion. After a brief introduction outlining the aims the participants were divided into 2 groups. Each group performed the same tasks and results were pooled at the end. The first task consisted of agreeing on a list of criteria through discussion. The second task in ranking them in order of importance and attributing to each a score from 0 to 7, where 7 meant very important and 0 meant negligible.

Results

The ranked list of criteria for expansion is provided below. The total score was obtained by adding the score from all participants. The criteria chosen are often not ecosystem services in the narrow academic sense, but are related to benefits that woodland provides and can often be linked to Ecosystem Services. The criteria in blue make up 95% of the cumulative score.

Benefit	***Total score***
Health , wellbeing and recreation	77
Biodiversity	70
Timber	62
C sequestration (soil and trees)	62
Nutrient retention	62
Sediment retention	56
Employment	43
Wood (fuel)	38
Flood management	31
Noise and air quality regulation	28
Environmental history	24
Non timber products	21
landscape	7
shelter belts	5
riparian(shade)	5
sense of place	2

Caveats/comments

The sample size was relatively small, and therefore care should be taken in generalising this result to the population. However, the participants were senior experts in the forest and land use sector and therefore, as a whole, provided an authoritative view of criteria to take into account and their importance.

Afternoon Workshop 4: RD 1.4.3 - What is adaptive management and how is it used in Scottish land and environmental management?

Justin Irvine, Kit Macleod

Participants: Andy Ford, Bill Slee, Bob Frost, Bruce Howard, Chris Spray, Davy McCracken, Derek Robeson, Heather McCabe, Kit Macleod, Mary Christie, Anne Gray, Andrew Midgley, Chris Dodds, Susan Davies, Richard Allan, Jeremy Wilson, Lorna Dawson

Facilitators: Justin Irvine, Kit Macleod, Anke Fischer

Workshop aims "We will present an overview of adaptive management and the main insights from our review of international good practice, before asking participants about their views and experiences of adaptive management (including for those who don't use it, why not?). By the end of the session, we will have established the main issues to consider based on Scottish applications of Adaptive Management in practice. We will use these to improve our framework that will help us evaluate and learn as we take our agricultural, woodland and water management case studies forward".

The specific aim for this session was to raise awareness of the 'adaptive management' work we have done and plan to do in this project; encourage sharing of previous/current/planned uses of adaptive management (and relevant initiatives); and hear about stakeholder understanding of adaptive management, so that it may shape our approach.

What we did

We invited the participants to engage in a series of linked activities:

Activity 1. Our first activity (see activity one) was to ask them to take a couple of minutes to quickly write an answer to the following question: "What do you understand by adaptive management?" We then asked for a show of hands on how many of the participants had used adaptive management (AM) in their work over the past five years (eight out of 17). An overview of our report on adaptive management was given. A discussion raised the following points:

- The AM concept is a fairly universal and generic approach and many sectors use it intuitively without formalising it into a prescription. It is difficult to tease out the added value of AM: it needs a counterfactual to show how it works better than a "learning by doing" approach. One area where it may add value is in the area of reducing uncertainty: i.e. the evidence gathered in monitoring a change in management or governance can help to inform arguments about what is likely to work and what is not.
- The promotion and potential uptake of AM in more explicit ways may be helped if it is compared against examples of poor decision making or management. An example of where AM has not been followed are agri-environment schemes where there is often poor evidence of whether objectives have been achieved due to lack of monitoring.

- AM has the potential to address conflict situations. For example, protected species or designated areas management can limit adaptability of managers to put in place alternative management that may achieve required outcomes or other equally beneficial outcomes.
- There is a need to understand whether AM approach can include economics as part of monitoring the impact of a change on desired outcomes.
- However, what it doesn't usually address are the power relations and how power imbalance is mediated at different stages of the AM cycle, and this links to the need for transparency in order to help the learning process. AM implies a pulling together of knowledge but it needs to be careful not to on exclude different knowledges by focusing only on scientific evidence.
- The research on AM can usefully look at the collective approach to AM and adaptive governance: How do different actors that have to collaborate do this? If you assume that people need to respond to (policy and environmental) drivers then we can look at this process and how AM framework is appropriate or helps us analyse these situations to learn practical lessons and identify current constraints. An important outcome would be actual practical guidance on implementing AM in a range of management and institutional contexts as well as studying the process.

Activity 2: We then split the participants into three smaller groups to discuss the following questions:

Q1-How and when have you used adaptive management?

Q2-What are your thoughts on each of the steps of adaptive management? Go around the cycle and ask their thoughts on each step, using the figure as a prompt.

Q3-Are there other challenges and barriers to using adaptive management?

Q4-Do you see opportunities for using adaptive management in your work

We then briefly reported back from the three groups.

Activity 3. Towards the end of the session, we asked the participants to revisit what they had written in relation to Activity 1 and based on our session had their views or understanding of adaptive management changed, and how?

Here we report on the discussions in relation to the question in Activity 2. This is followed by a table showing the matched responses to Activity 1 and 3.

Key points from Activity 2:

In two of the groups the discussion focussed principally on the concept of Adaptive Management and its value in practical situations. The participants were provided with a generic diagram outlining the stages of the AM cycle.

- Some people felt that this was just another project management cycle diagram and did not advance practical applications. The steps were often what people already did and so this was not useful. Whilst others agreed that the stages were common sense, there was a fair amount of agreement that in many cases, some of these stages were not well implemented. For example, devising a relevant monitoring strategy to collect data in relation to the implementation of a management action or option is often not well implemented, often because of constraints on resources including time and money. There was some discussion about the need to allow flexibility to manage different issues in different ways. The adoption of a rigid AM framework may not be helpful in many situations. However, there may be some merit in using the AM stages as a sort of checklist to prompt stakeholders involved in deciding on management options to consider the different AM stages and whether they are relevant in their context.
- The above two points relate to project evaluation: planning the monitoring of the change that is being implemented is often lacking and therefore debates can arise over the effectiveness of particular actions.

- Not waiting for perfect knowledge but putting in place a system to reduce uncertainty by monitoring the progress of a change in the way things are managed towards achieving objectives.

Activities one and three (no number 3)

No	**List of comments on post-its at the start of the session (what is your understanding of adaptive management)**	**List of comments on post-its at the end of the session (what is your understanding of adaptive management)**
1	Virtuous circle in which conservation interventions are scientifically? informed, evaluated and improved.	Don't underestimate the ability of people to disagree about the problem that adaptive management approaches are proposed to solve. Institutional and governance frameworks can seriously limit space for adaptive management approaches to operate.
2	Recognising a stress in a system and responding. Responding to a crisis/extreme event in ways that reduces the chance of adverse effects.	Legal, economic, social, political and cultural drivers/barriers to smooth adaptive management.
4	Changing management (of a population) to reflect changes in its status.	I worry that you are creating concepts that divert you from some of the causes of system weakness and failure, rather than solve/improve the situation. Adaptive management = iron grip of rationalisations. Removal of trust. What of the politics of knowledge, prioritise scientific knowledges.
5	An iterative process based on science, to help manage natural processes to achieve agreed outcomes for society.	Is it major uncertainties that ultimately drive the need for adaptive management?
6	Monitoring habitats and species, them changing guidance or policy or incentives to reflect needs etc.	Greater awareness of range of factors influencing adaptive management e.g. social structures/barriers/motivations.
7	Evaluation (from the start) –formal (arrow from evaluation to outcomes). Outcomes make a difference to what we do. Learning	My understanding is the same but awareness of confusion around adaptive management has

	from doing.	increased. Also, more aware that partnerships/ governance structures [are] fundamental and important to be part of adaptive management. Need to allow process to identify barriers that require organisational/institutional change.
8	Adaptive management means responding to new information, identifying a course of action, maintaining the consequences and context, and changing the action where needed to meet your objectives, or even changing your objectives.	Adaptive management means making a conscious attempt to design your management structure, processes and tools so that you are able receive, analyse and respond to all types of new knowledge and information, because we live in an uncertain world.
9	Accepting the reality of unexpected change- socially and environmentally, and allowing for it in project design.	Adaptive management – it is about social structures and governance.
10	Flexibility in what management is doing to achieve a fixed end point.	Adaptive management is done by everyone, every day. Easy when committee of one. Difficult when it involves more parties with differing views.
11	Flexible targets, re-iteratively reviewed with stakeholders, so that management can react to new and emerging drivers. Features include no-regret actions, learning by doing etc.	Policy need not be an obstruction. Ash woodland had a recent policy change to allow Sycamore to remain rather than the previous policy of always remove. In conjunction with presence of ash dieback H. fraxineus?
12	Look at current systems. Are they delivering? What do we want them to deliver? How do we encourage change?	
13	Process of learning from interventions and adjusting these to achieve desired outcomes.	Importance of defining the issue at the system/landscape scale- not just a single 'species' issue.
14	To manage adaptation to gain the most benefit from how it can be informed.	

15	Manage the decision maker-how can someone make a green decision when in the red.	Obstacles to development/progress. -Need to think longer term. Need clear steer from Government. Need 'mechanisms' to allow businesses to 'deliver' for society.
16	Adaptive management allows for a flexible, evidence based approach to dealing with uncertainties of managing for environmental change.	
17	Learning by doing- feedback loops.	

Activity 2 data: Anke's group

Q1) *Examples of projects using adaptive management approaches*:

- "Understanding predation"
- Natural flood management in the Borders (multiple knowledges)
- Responses to new legislation: Flood Risk Management
- Goose management (goose counts, i.e. monitoring, lead to payments etc.)
- Catchment (-based) management

Other points:

- Difficult to define adaptive management: understandings of adaptive management seem to range from learning by doing to something very specific and structured. Ecosystem approach incorporates learning by doing to some extent, here understood as just starting to do something, not waiting until perfect knowledge is available (which might never happen) Project evaluation is often missing (especially for social capital and other social aspects, which might be very important) Rollout of a given/predefined approach as an example of non-adaptive management versus experimenting and learning (which then has the potential to be adaptive) Protected areas are another example of non-adaptive management: it might be possible to alter the actual management interventions to some extent, but the objectives can't be modified. Adaptive management approaches might work well for short cycles of adaptation and change, i.e. situations where impacts can be observed soon after an intervention, but they might work less well for long-term cycles, e.g. in woodland management, where outcomes can only be seen after decades (a strategy for such long cycles might be to not put all your eggs in one basket, i.e. to reduce risk but having multiple objectives, interventions etc.)
- Uncertainty - is that what makes this approach different from other management approaches?

Q2) *Comments on the adaptive management cycle*

Not all steps might be possible (e.g. barriers to implementation)- need arrows that "jump" to the next step.

The key question for us might be: What is it that we want people to do differently?

How would adaptive management applied to conservation (which is often rather non-adaptive) look? (e.g. pinkfoot geese management on Orkney).

To which degree is objective setting and negotiation included in the adaptive management cycle? Questions around who sets the objectives (and how) might be key.

A related key question might be: are the social structures fit for adaptation? Who is involved? Who is represented? Are the right mechanisms in place to use emerging knowledge for adaptation?

Should the cycle start from recognition of a lack of knowledge?

National Parks could be an interesting case as they are very experienced in working towards collaboration between a diverse range of actors.

Kit's group

Q1) Goose review group (NGMRG) SNH

Land management all about adaptive management

SWT: raptor management e.g. Langholm, peatland work on restoring hydrological units, river restoration, various species/habitat issues-beavers.

Scottish Government adapt when new government and in the agencies work on adaptive management.

Plant/ animal health e.g. trees.

Q2) General points

Steps are clear, people often stuck at 3 i.e. do not do 4 and 5.

Goose example, focus on part of system, too much focus on a particular part of the system e.g. grassland.

Need a baseline for monitoring/actions

Communication is key: learning to others, locations, resources are tight, not reinvent (wheel)

Policy: short term focus, but responses have longer time scales; ministers (timescale) come in and set focus.

Barriers to engagement-fear that outcomes different to theirs.

2.1, step 1) Adaptive management is always required (i.e. question/step not needed).

Range of stakeholder views: national and local.

Controls to compare interventions. Benchmark/confidence.

2.2/3)Keep stakeholders engaged to implementation.

Tools for monitoring –appropriate

Facilitation/communication is key

Monitoring: not only natural science, social values/feeling e.g. SNH conflict review

Timescales

Prioritising actions

2.4) Conflict resolution skills are needed (important). Important at all stages to keep [stakeholders] on board.

2.5) Very important, need practical knowledge exchange areas with signposting.

Right language/communication

Listening. KE not KT.

Q3) Cultural and social values affect management.

Rights to do it [historical]

Skills/comfort to do. Influence of peers.

Age/willingness to change.

Landscape [;eve;] who facilitates/ honest brokers

Trust [is important]

Lack of capacity: people, pump priming, leadership, LUS (how to make it happen).

Q4) Not just peatland, wider upland environment (maybe a gap in SRP)

Soil sealing, effects of buildings on floods and food production.

What to do with protected species if improved. IUCN lists to get reviewed.

Justin's group

Q1) Eddleston-flooding downstream, land management to reduce flooding

- Issue- who buys in? working with them

- natural capital from people who buy in.

- Impacts- the perception is that management is working but is the evidence being collected

Logical frameworks: together with AM these can help to identify what the goals are, what needs to be put in place to achieve these and how success will be measured.

Birds – species decline results in interventions leading to monitoring e.g. geese on Islay. Whilst there is evidence for recovery of geese, there is less good evidence for the impact of goose management on farm businesses. Is the data being collected? How to define adaptive management? – narrow focus or wider governance. One of the major barriers to adaptive management is the current institutional architecture which can mean different policy areas have conflicting objectives and there is a lack of scope to test alternative governance arrangements that may be more effective in delivering public and private interests.

-Adaptive management should be seen as an opportunity to help not stifle innovation

Q2) Defining problem conceptually/scale=difficult, narrow (species) v wide (governance)

Expertise? Who is the expert?

Conclusion:

Although AM is a "learning by doing" approach and many people would argue that this is already being used, there was also recognition that asking questions structured along the lines of AM principles could help ensure more effective decision making could take place. These particular refer to monitoring and reducing uncertainty so that the iterative learning can take place. However, AM related activities need to address power relations, transparency and integrate the range of knowledges that actors can bring to the table. A crucial area for AM is in relation to testing alternative governance arrangements which requires institutional architecture barriers to be addressed. An area the research will focus on is the process for how actors can collaborate to deal with drivers of change as well as providing practical guidance on how to go about an AM approach and under what contexts it is most relevant.

Afternoon Plenary:

The Work Package Coordinators gave a brief outline of the results from the seven workshops (covered more comprehensively above) before asking for questions from the floor.

- **Q**. What is the wider plan for the group? **A**. Annual meeting for whole group but still have other additional stakeholder engagement within projects - by us inviting stakeholders or perhaps more usefully, stakeholders inviting us to their meetings on specific issues.
- **Q**. Is there a need to meet again sooner rather than later. There are likely to be big changes in the world over the next 6 months. Does the discourse today take that into account? Politicians want a narrow remit but there are likely to be big changes ahead. To what extent are people asking the big questions? What money is available? Are we sleepwalking in a constrained world of opportunity? Brexit changes everything [with regard to rural payments.] We don't know what the financial costs will be. What will happen to rural businesses? There could potentially be significant changes. We need tools available to inform e.g. the move from agri environment-> different land management. Regardless of BREXIT, we can learn from Wales about the vision of what we want from our land. **A**. The underlying ideas in the research will be useful to analyse new policy directions as well as existing policies and we need to focus on getting our methods (e.g. models and scenarios in WP1.4) in place to do these analyses. Furthermore, the Centre for Knowledge Exchange and Innovation (CKEI) may have an event on this topic in 2017. **A** from CKEI: CKEI role and remit is to improve the flow of research. There is a possibility of BREXIT as a cross –cutting theme as there are similar discussions across other parts of SRP. That might be a space in which discussions could take place.
- **Q.** How does research feed into Scottish government e.g. forest planning for eco-system services etc.? What do we do with the knowledge and how will that be fed back to policy? **A**. We try to provide timely evidence but we're not the only influence on policy making. We've learnt that just putting information on websites is not that useful. 1-1 contact is much better. We aren't policy makers but do want to help support policy making. We have regular meetings with Scottish Government Policy makers. If you have a question or issue, please do get in touch.

The meeting ended with a vote of thanks to the speakers, facilitators and participants. A feedback form was distributed (see appendix three). The next meeting is scheduled for autumn 2017.

Appendix One: Evaluation Feedback

Carol Kyle

In general people found the meeting useful, thought it was well facilitated and liked the format of the workshops.

Participants generally agreed that the meeting was well structured and offered a useful opportunity to develop an understanding of a number of organisations and a chance to discuss real and significant issues. They welcomed the opportunity to have an input and felt they gained a greater understanding of the work being presented. Having two breakout sessions was popular and people thought the length of the sessions and group sizes were good for engagement.

On average participants agreed that they gained clarity and awareness of the structure and direction of the research programme and that it was relevant to their work. There was a feeling that participants and researchers agree about a lot more than they disagree about and that there is a lot of overlap between different bodies objectives for defining and progressing resilience but not a single answer for all to adopt. There were suggestions that policy makers and researchers need to communicate more with each other, that there is a requirement for a long term policy vision underpinned by support and that not all agencies agree on methods of practice.

It was also commented that Brexit will have a huge impact on land use and drivers and that it was amazing how little Brexit was raised during the discussions.

1. Overall, did you find this meeting useful?

On average people found the meeting useful. No-one thought it wasn't useful at all and some found it very useful. One person found it somewhat useful but thought it was 'fragmented.'

People thought that the meeting was well structured and offered a useful opportunity to discuss 'real' and 'significant' issues with colleagues and other organisations. Some wanted more time and/or background on the topics beforehand. Whilst some felt it was suitably non-technical, others felt it was 'too academic' in places.

2. Please rate the following aspects of the meeting:

Facilitation on the day: On average people thought the facilitation was good. Some thought it was very good. No-one thought it was poor or very poor. Strong chairing is required to keep the timing on schedule.

Format of the day: On average people thought the format was good. Some thought it was very good. One person thought it was poor - 'disjointed' and no-one thought it was very poor.

Quality of interaction: On average people thought the quality of interaction was good. Some thought it was very good. One person thought it was 'too short for valued input into key issues'.

3. What, if anything, did you learn from today?

Participants learnt about the structure, content and direction of two major areas of the research programme, with many appreciating the fact we had combined forces. Some also appreciated seeing the overview of how the research related to Scottish policy context although others wanted more detail on this [Editors' note: the policy specific aspects of the research are the focus of the sister ELPEG meetings, and we can send a copy of the latest 'ELPEG Bulletin' on request].

Many people had new insights into aspects of ecosystem services and natural capital as well as adaptive management and governance and appreciate the range of work being undertaken. The opportunity to share different views between researchers and stakeholders was appreciated, recognising both where there is common ground and where there are still differences in understanding, methods and perspectives. These differences could be creative, or problematic if they lead to duplication or conflict. For example, Forestry Commission Scotland is setting up a meeting to ensure that the research is informed by current and future policy drivers.

4. What, if anything, was relevant to your work/business/organisation?

All participants who answered felt that the meeting was relevant to them. There were lots of general answers e.g. "pretty much everything" although a few felt that it would depend on how the research progressed in practice. The points of relevance included:

- Shared interests in knowledge exchange and building a common vocabulary
- Shared interests in places (e.g. Cairngorms National Park, landscape scale conservation projects)
- Shared interests in topics e.g. forestry, agri-environment, adaptive management, umbrella species, resilience
- Shared interest in policy implementation and evaluation

5. Please rate your level of agreement with the following statements:

I have new knowledge about the RESAS strategic research on ecosystems and land use: On average people agreed that they had new knowledge. Some strongly agreed and one person disagreed.

I understand how the research might benefit my work/business/organisation: On average people agreed that they understood how the research might benefit their work. Some people disagreed and one person strongly disagreed.

I believe the information and ideas I provided will be incorporated into the process: On average people agreed that the information provided would be incorporated into the process. Some people strongly agreed and one or two either disagreed or strongly disagreed.

I would like to attend future ELSEG events: All (except one) participants who completed an evaluation form agreed or strongly agreed that they would like to attend further ELSEG events.

6. General Comments

It is early stages but some people were not clear how to engage or contribute and wanted more co-construction of the research. [Editors' note: engagement should be occurring through project specific events and user groups but do get in touch if you have an interest that is not being supported in this way so we can share ideas – we won't know what you want or need without further discussion].

The issues involved are complex and need critical social science perspectives, including those that critique current policy arrangements. There should be more recognition of the change that BREXIT could bring and we needed to discuss how the research is relevant to these challenges.

Appendix Two: List of Participants

Name	Affiliation
Alan Bell	Loch Lomond & The Trossachs National Park
Alessandro Gimona	James Hutton Institute
Alistair McVittie	Scotland's Rural College
Allan Watt	Centre for Ecology and Hydrology
Andrew Heald	Confederation of Forest Industries
Andrew Midgley	Scottish Land & Estates
Andy Ford	Cairngorms National Park Authority
Andy Wells	The Crown Estate
Anne Gray	Scottish Land & Estates
Bill Slee	James Hutton Institute (Honorary Research Fellow)
Bob Frost	Forestry Commission Scotland
Bruce Howard	Ecosystems Knowledge Network
Bruce Wilson	Scottish Wildlife Trust
Carol Kyle	James Hutton Institute
Chris Dodds	Scottish Government
Chris Ellis,	Royal Botanic Garden Edinburgh
Chris Spray	University of Dundee
Colin Edwards	Forestry Commission Scotland
Darren Moseley	Forest Research
David Donnelly,	James Hutton Institute
David Hetherington	Cairngorms National Park Authority
David Michie	Soil Association
David O'Brien	Scottish Natural Heritage
Debbie Bassett	Scottish Natural Heritage

Derek Robeson	Tweed Forum
Emma Wright	Joint Nature Conservation Committee
Eric Baird	Glen Taner Estate
Glenn Iason	James Hutton Institute
Gus Jones	Badenoch & Strathspey Conservation Group
Heather McCabe	Scottish Government
James Hutchison	Joint Nature Conservation Committee
Jenny Johnson	Scottish Natural Heritage
Jeremy Wilson	Royal Society for the Protection of Birds
Jesse Daniel	Scottish Government
Joanna Drewitt	Scottish Government
Justin Irvine	James Hutton Institute
Katrin Prager	James Hutton Institute
Ken Loades	James Hutton Institute
Kirsty Blackstock	James Hutton Institute
Kit Macleod.	James Hutton Institute
Lorna Dawson,	James Hutton Institute
Magdalena Bertilsson	Scottish Government
Maria Nijnik	James Hutton Institute (SIMRA)
Mary Christie	Scottish Natural Heritage
Matthew Smedley	Scottish Natural Heritage
Nikki Dodd	James Hutton Institute (CREW)
Patricia Rice	Natural England
Paul Walton	Royal Society for the Protection of Birds
Paula Novo	James Hutton Institute
Peter Phillips	Collingwood Environmental Planning
Rob Brooker	James Hutton Institute
Robin Matthews	James Hutton Institute
Ruth Mitchell	James Hutton Institute
Sally Thomas	Scottish Government
Sandra Marks,	Scottish Government
Sarah Govan	Centre of Expertise on Climate Change
Susan Davies	Scottish Wildlife Trust
Susie Turpie	Scottish Government

Appendix Three: Slides from Morning Plenary

The following pages show the slides from the morning's plenary session.

Welcome to the Ecosystems and Land Use Stakeholder Engagement Meeting

14th November 2016

BioSS

The James Hutton Institute
Science connecting land and people

Moredun Research Institute

Rowett Institute of Nutrition and Health
University of Aberdeen

Royal Botanic Garden Edinburgh

SRUC

Housekeeping

- Fire exits
- Toilets
- Agenda timings
- Catering

Purpose of Meeting

- Complements ELPEG (Ecosystems and Land Use Policy Engagement Group)
- Ensures voices from wider stakeholder interests can be informed about, and inform, our strategic research direction
  - Complements more focussed KE within a project
  - Workshops give a flavour of some specific projects
- Annual event to help us adaptively manage

Overview of Strategic Research Programme

Robin Matthews
Natural Assets Theme Coordinator (T1)

BioSS
The James Hutton Institute
Science connecting land and people
Moredun Research Institute
Rowett Institute of Nutrition and Health
University of Aberdeen
Royal Botanic Garden Edinburgh
SRUC

Strategic Research Programme 2016-2021

Theme 1 – **Natural Assets**

Theme 2 – **Sustainable Land Management and Rural Economies**

- Crop and grassland production and disease control
- Livestock production, health, welfare and disease control
- Agricultural systems
- Rural industries

Theme 3 – **Food, Health and Wellbeing**

- Improved food and drink production
- Healthy diets and dietary choices
- Food security
- Communities and wellbeing

Not mutually exclusive – strong linkages, co-working etc.

Theme 1 – Natural Assets

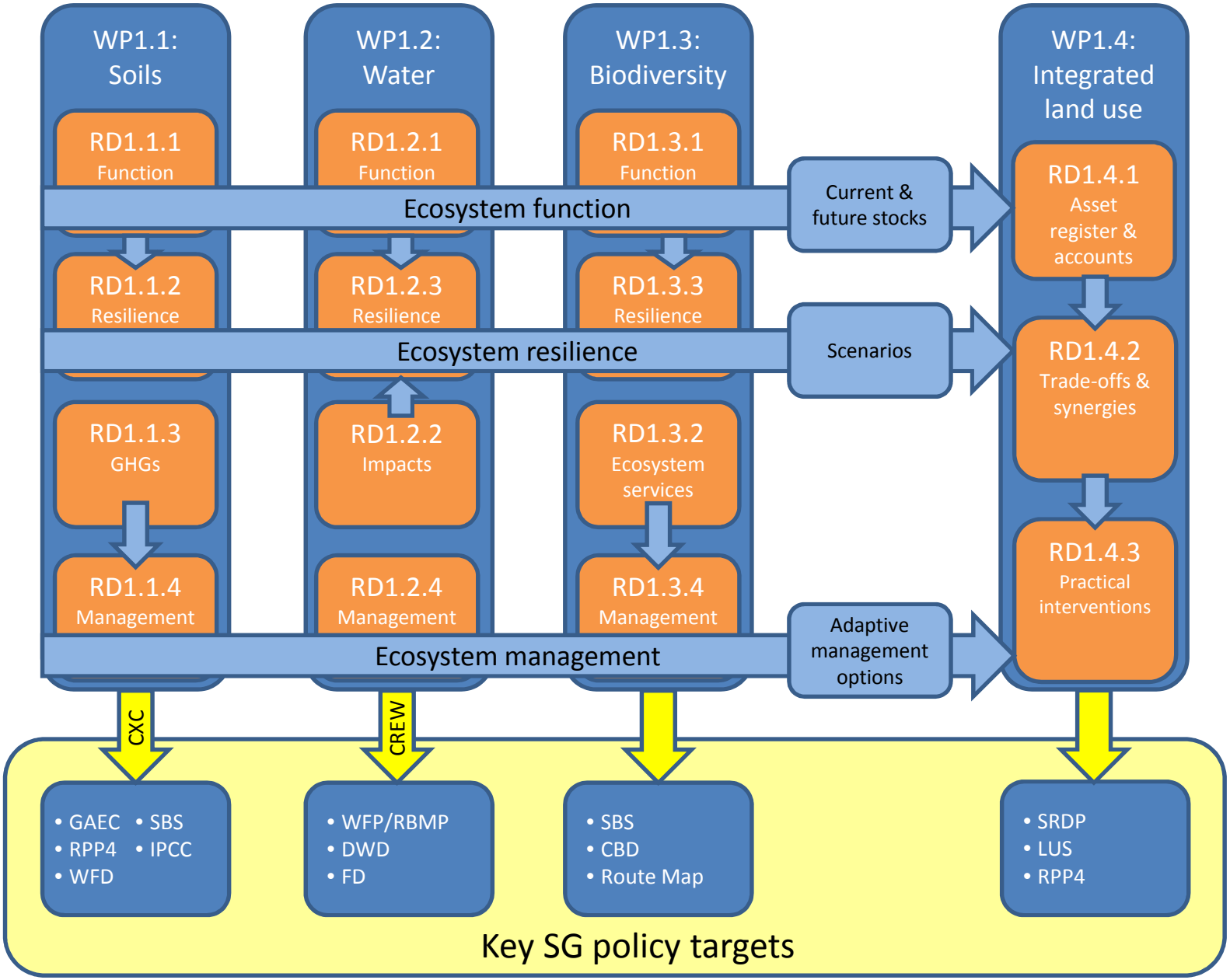
1.1 Soils - Quantify ecosystem services provided through soil systems in Scotland (Allan Lilly, JHI)

1.2 Water resources and flood risk management – Improve and integrate evidence base on water quantity and quality (Marc Stutter, JHI)

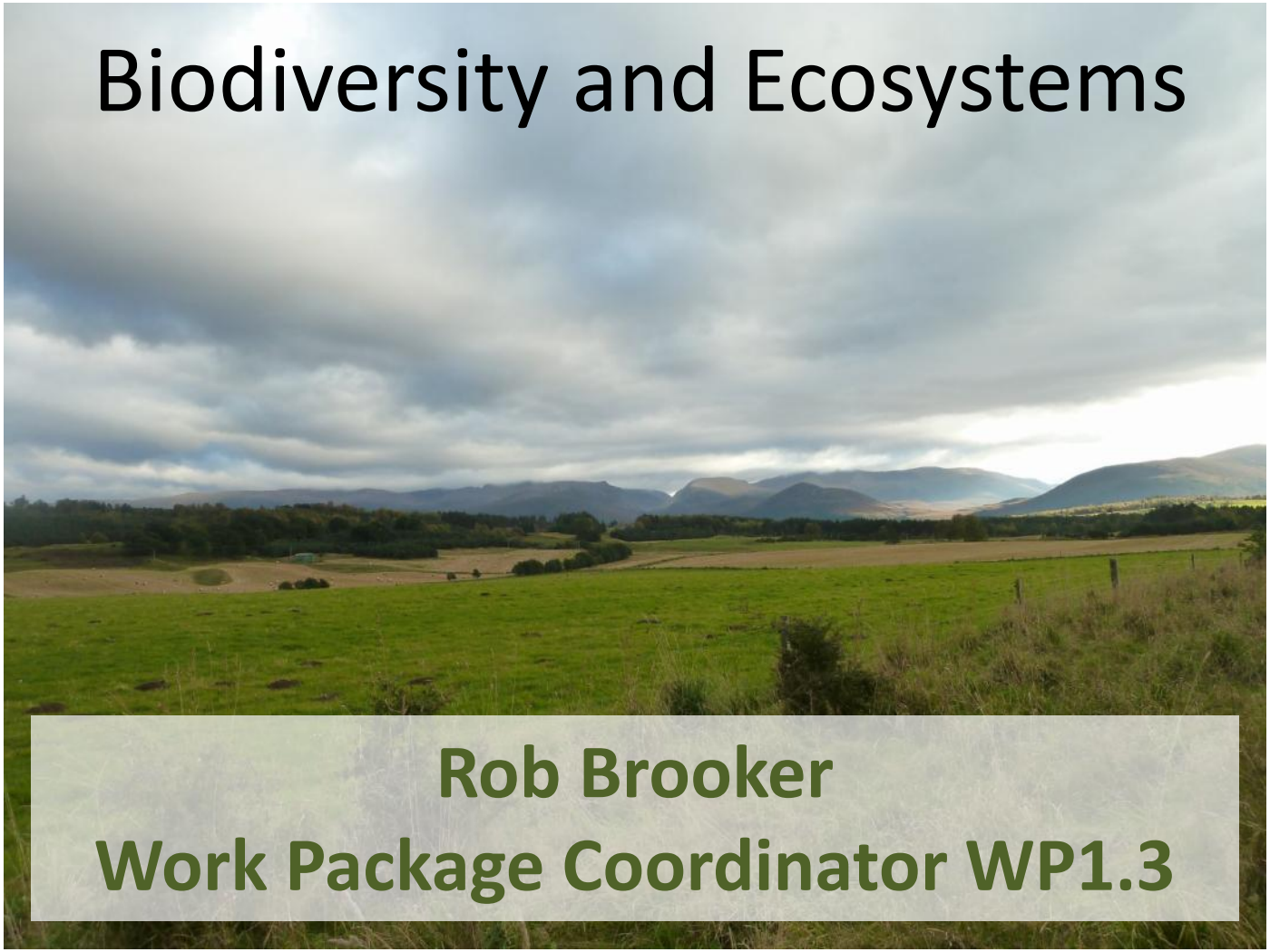
1.3 Biodiversity and ecosystems - Link improved understanding with development of practical management options for maintaining provision of ecosystem services and functions (Rob Brooker, JHI)

1.4 Integrated and Sustainable Management of Natural Assets - Develop innovative solutions for managing natural assets for multiple benefits (Kirsty Blackstock, JHI)

Connecting themes…


WP1.1: Soils
WP1.2: Water
WP1.3: Biodiversity
WP1.4: Integrated land use
RD1.1.1 Function
RD1.2.1 Function
RD1.3.1 Function
Ecosystem function
Current & future stocks
RD1.4.1 Asset register & accounts
RD1.1.2 Resilience
RD1.2.3 Resilience
RD1.3.3 Resilience
Ecosystem resilience
Scenarios
RD1.4.2 Trade-offs & synergies
RD1.1.3 GHGs
RD1.2.2 Impacts
RD1.3.2 Ecosystem services
RD1.1.4 Management
RD1.2.4 Management
RD1.3.4 Management
Ecosystem management
Adaptive management options
RD1.4.3 Practical interventions
CXC
CREW
• GAEC • SBS
• RPP4 • IPCC
• WFD
• WFP/RBMP
• DWD
• FD
• SBS
• CBD
• Route Map
• SRDP
• LUS
• RPP4
Key SG policy targets

Biodiversity and Ecosystems



Rob Brooker
Work Package Coordinator WP1.3

BioSS
The James Hutton Institute
Science connecting land and people
Moredun Research Institute
Rowett Institute of Nutrition and Health
University of Aberdeen
Royal Botanic Garden Edinburgh
SRUC

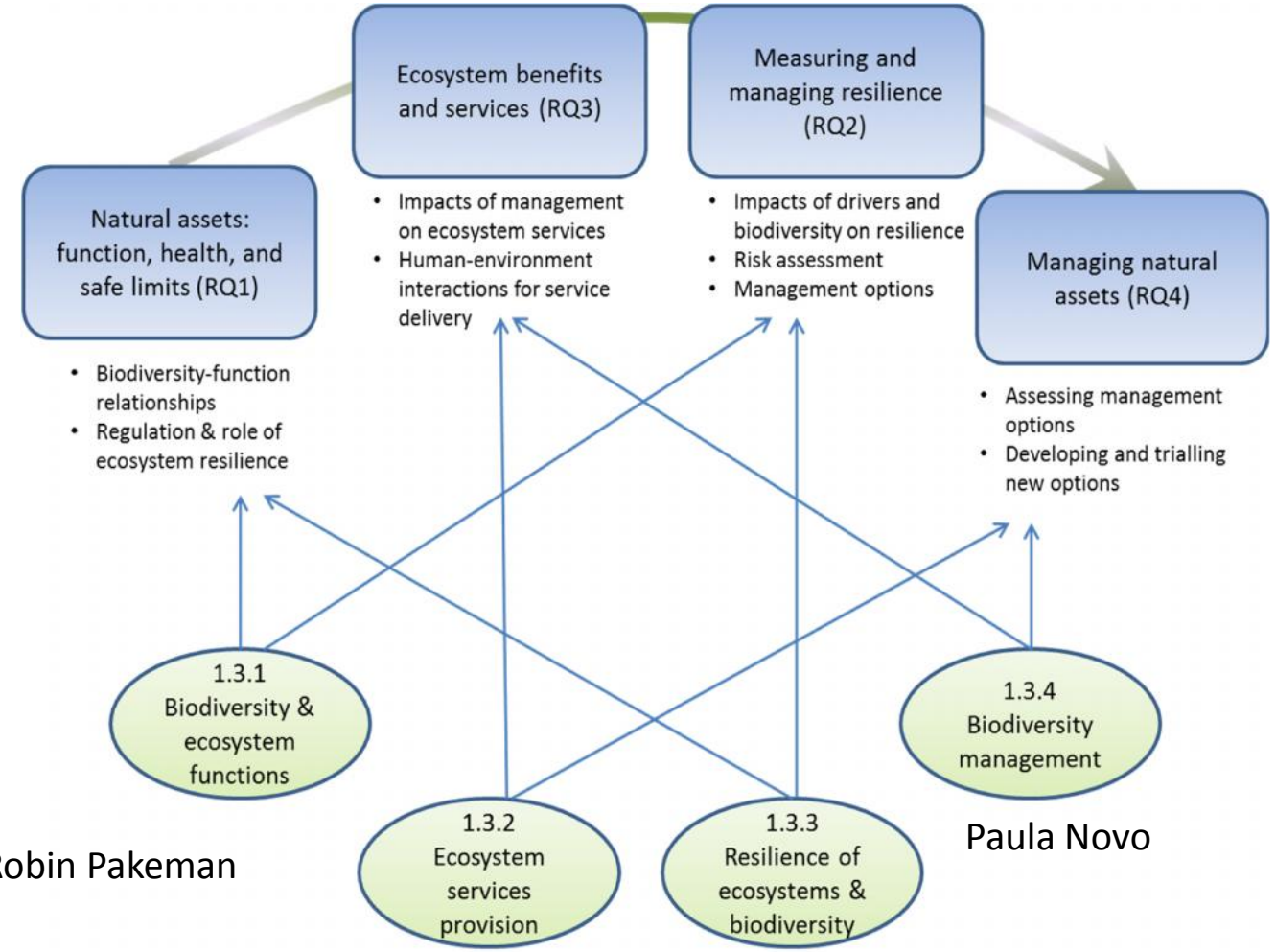
WP1.3 aims to improve our understanding of the **functioning and resilience** of our **natural assets**, particularly biodiversity, providing **new approaches and metrics** for sustainable land management, leading to a **healthier and more resilient environment**.

(a) Understand what underpins a healthy ecosystem;

(b) Understand how systems provide services, and if we can rebuild “lost” services through good management;

(c) Understand what makes a system resilient, and how can we manage for resilience;

(d) Provide a knowledge base for key biodiversity-management actions.



Robin Pakeman

Anke Fischer

Glenn Iason

Paula Novo

RD1.3.1 Biodiversity and ecosystem function

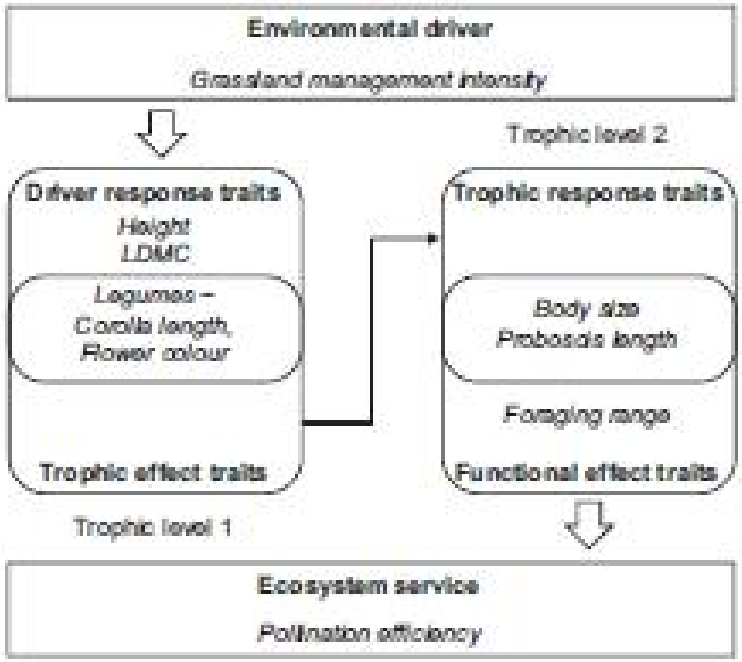
Ecosystem services are underpinned by how the ecosystem functions.

RD1.3.1 Biodiversity and ecosystem function

Ecosystem services are underpinned by how the ecosystem functions.

This RD covers three aspects of ecosystem functioning:

- How ecosystem functions are regulated by species present through their traits
  - Interactions between genotypes, phenotype and species in controlling function
  - Cross trophic linkages and ecosystem cascades



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- Refine indicators of ecosystem health (function)
  - Development of assemblage level indicators to supplement existing indicators

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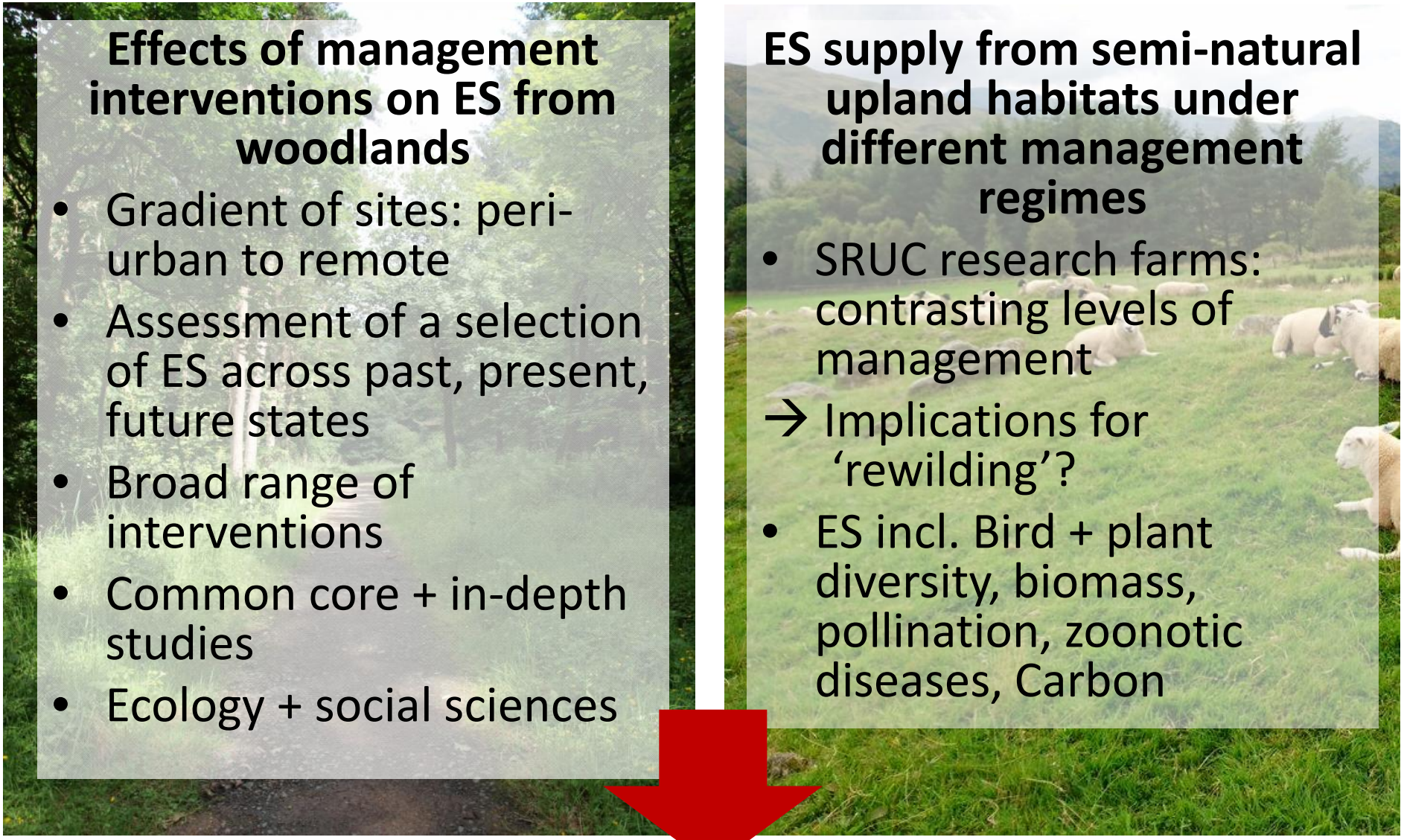
  - Cross trophic linkages and ecosystem cascades
- Refine indicators of ecosystem health (function)
  - Development of assemblage level indicators to supplement existing indicators
- How connectivity controls ecosystem function
  - Developing new connectivity measures
  - Assessing biodiversity changes in light of changing connectivity

RD 1.3.2: Ecosystem services (ES) supply



Effects of management interventions on ES from woodlands

- Gradient of sites: peri-urban to remote
- Assessment of a selection of ES across past, present, future states
- Broad range of interventions
- Common core + in-depth studies
- Ecology + social sciences

ES supply from semi-natural upland habitats under different management regimes

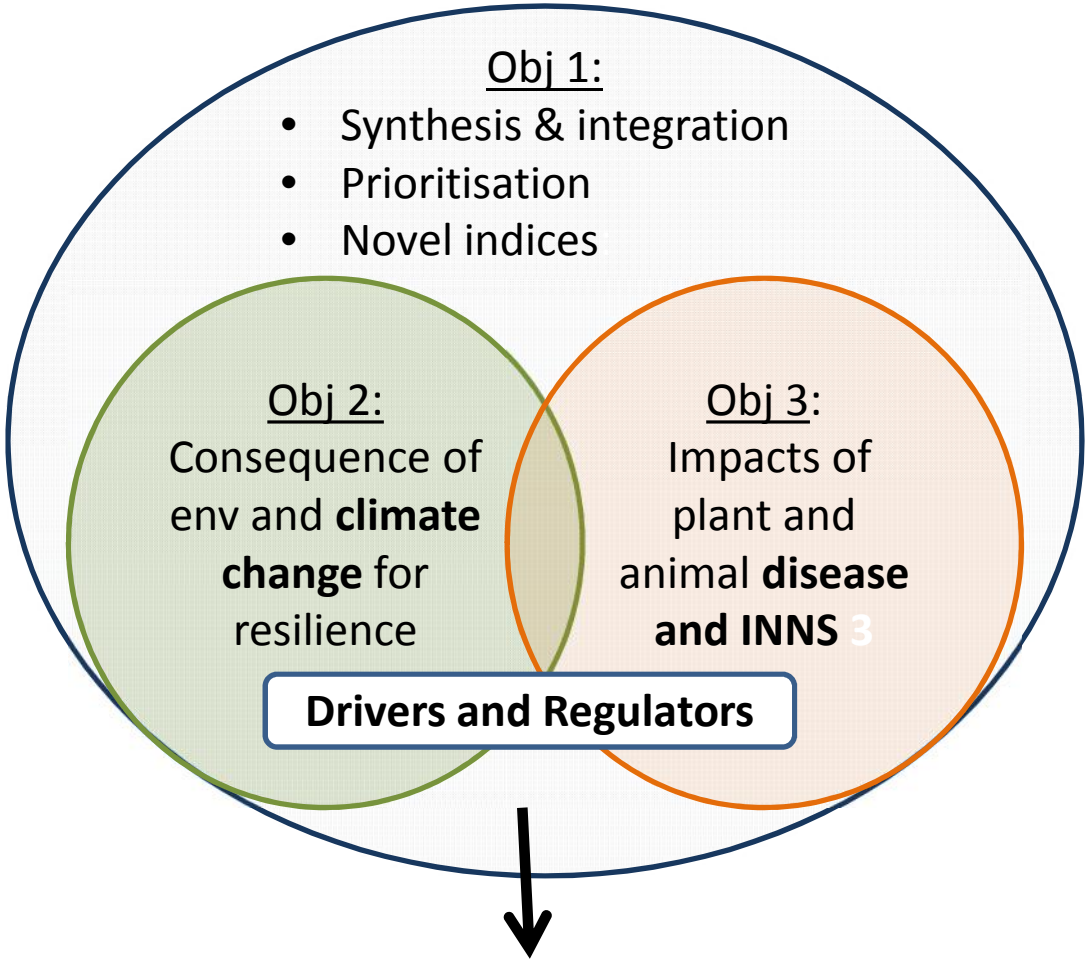
- SRUC research farms: contrasting levels of management

→ Implications for 'rewilding'?

- ES incl. Bird + plant diversity, biomass, pollination, zoonotic diseases, Carbon

Trajectories of changes in ES supply

RD 1.3.3 Resilience of ecosystems and biodiversity



Management options, risk and monitoring tools

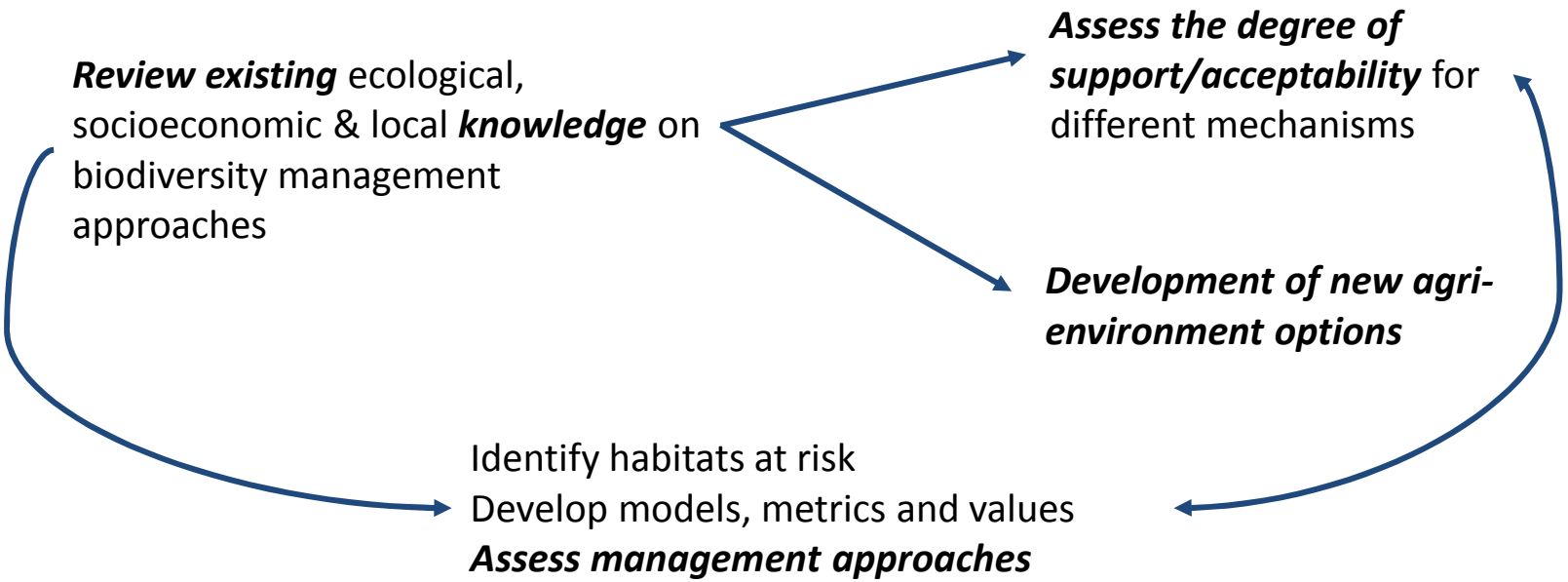
Systems: Obj1
All
Stability of Ecosystem functions
Disease (Camplyobacter) in top predators (Seals)

Systems: Obj 2
Foundation species (Trees)
Umbrella species (Capercaillie)
High impact species (Red deer)
Ticks
Peatland flora and fauna

Systems: Obj 3
Disease risk to biodiversity – trees
Scottish rare plant species
Spread of INNS and pathogens
Squirrelpox, trees and shrubs, phytophthora
Natterjack toad – liver fluke - grazing

RD 1.3.4: Biodiversity management

Understanding the applicability of existing biodiversity management measures and novel approaches:



We will

- Use participatory approaches
- Make use of experimental farms (as demonstration farms) & specific test cases (upland birchwoods)
- Consider habitats at risk from different types of development & 'new' habitats – potential of offsetting

Sustainable and Integrated Management of Natural Assets

Kirsty Blackstock
Work Package Coordinator WP1.4

BioSS
The James Hutton Institute
Science connecting land and people
Moredun Research Institute
Rowett Institute of Nutrition and Health
University of Aberdeen
Royal Botanic Garden Edinburgh
SRUC

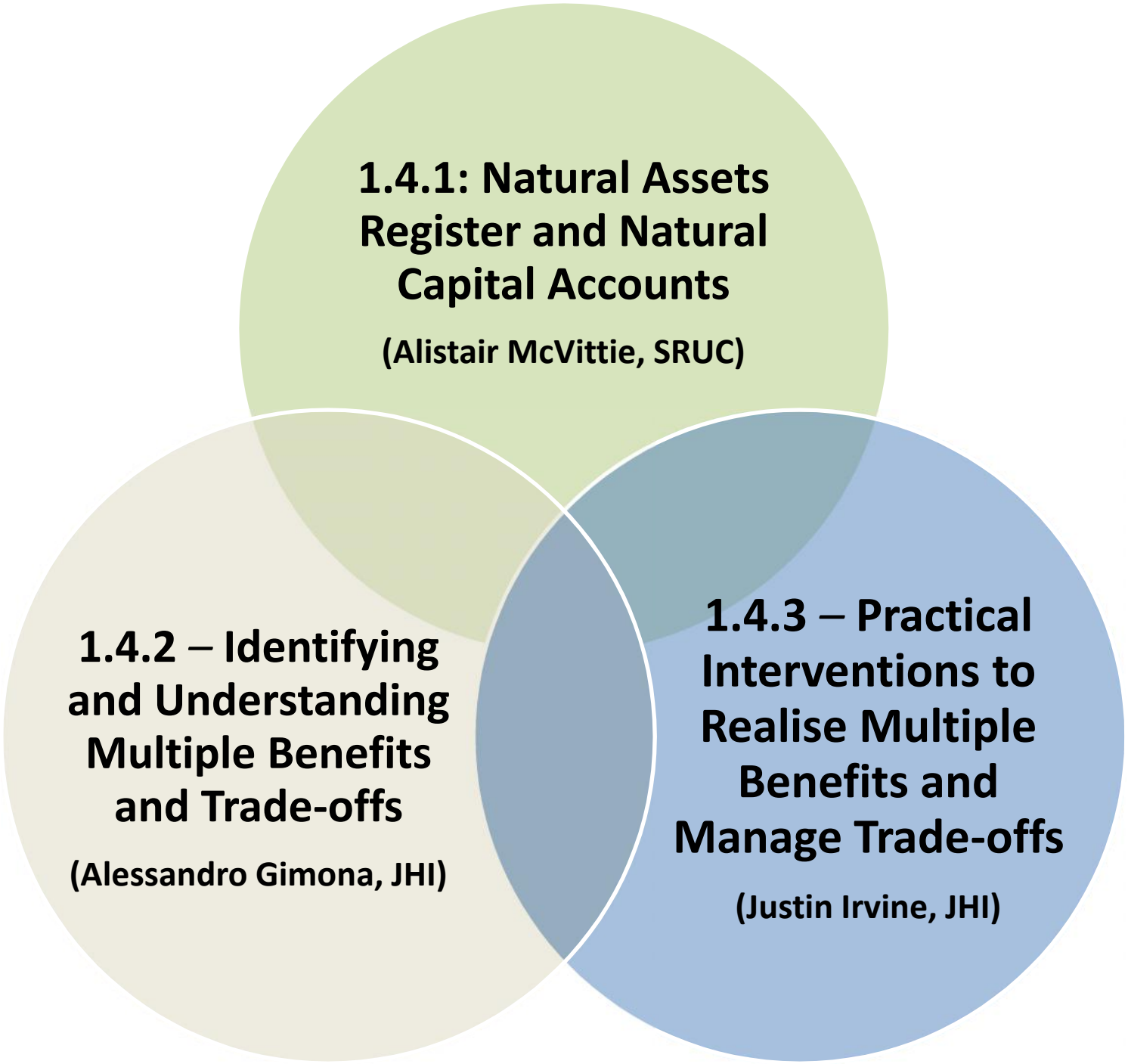
WP1.4 aims to illustrate the **multiple benefits** that **natural assets** provide to **Scottish society** and to use this understanding to **support decision making** on trade-offs and management at **multiple scales**

(a) use a dynamic natural assets register (NAR) and natural capital accounts (NCA) to illustrate how assets contribute to Scotland's green growth aspiration;

(b) identify and quantity trade-offs and impacts on multiple assets and ecosystem services (ESS) to illustrate where we are living beyond planetary limits;

(c) support integrated decision-making and adaptive management to protect multiple natural assets and maximise benefits in socially acceptable ways; and

(d) illustrate how existing and novel measures can deliver integrated delivery of benefits.

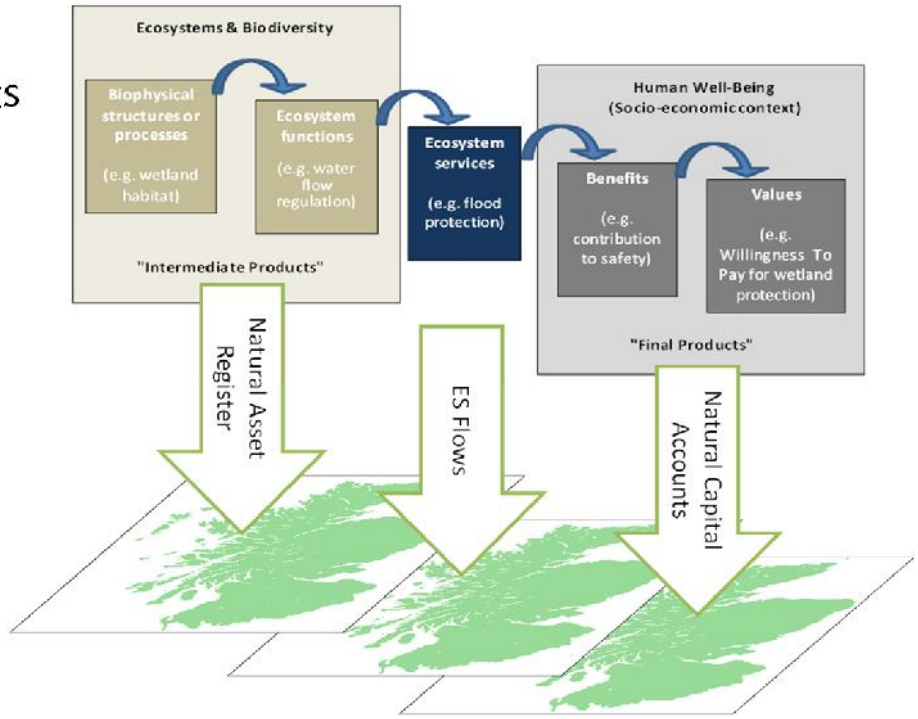

1.4.1: Natural Assets Register and Natural Capital Accounts
(Alistair McVittie, SRUC)
1.4.2 – Identifying and Understanding Multiple Benefits and Trade-offs
(Alessandro Gimona, JHI)
1.4.3 – Practical Interventions to Realise Multiple Benefits and Manage Trade-offs
(Justin Irvine, JHI)

RD 1.4.1 Natural Asset Inventory and Natural Capital Accounts

a. Development of a natural asset register
   - Spatially based inventory of assets
   - Identification of assets 'at risk' and include an inventory of ES flows

b. Assessing ecosystem services delivery and interactions
   - Spatial modelling of natural capital assets
   - Natural Capital Asset Index
   - Peat depth and condition modelling
   - SRDP targeting
   - Cultural ecosystem service mapping and indicators

c. Natural Capital Accounts
   - Plurality of values
   - Range of scales: national to local
   - Range of users



RD 1.4.2: Identifying and understanding multiple benefits and trade-offs - How can we identify resilient interventions for multiple benefits

Aims

- Identifying multiple benefits and trade-offs between Ecosystem Services
- Identifying opportunities to increase multiple benefits through policy and industry delivery mechanisms
- Option appraisals to demonstrate the resilience of natural assets under different trajectories

RD 1.4.2: Identifying and understanding multiple benefits and trade-offs - How can we identify resilient interventions for multiple benefits

Objectives

-Mapping and modelling gaps and trade-offs

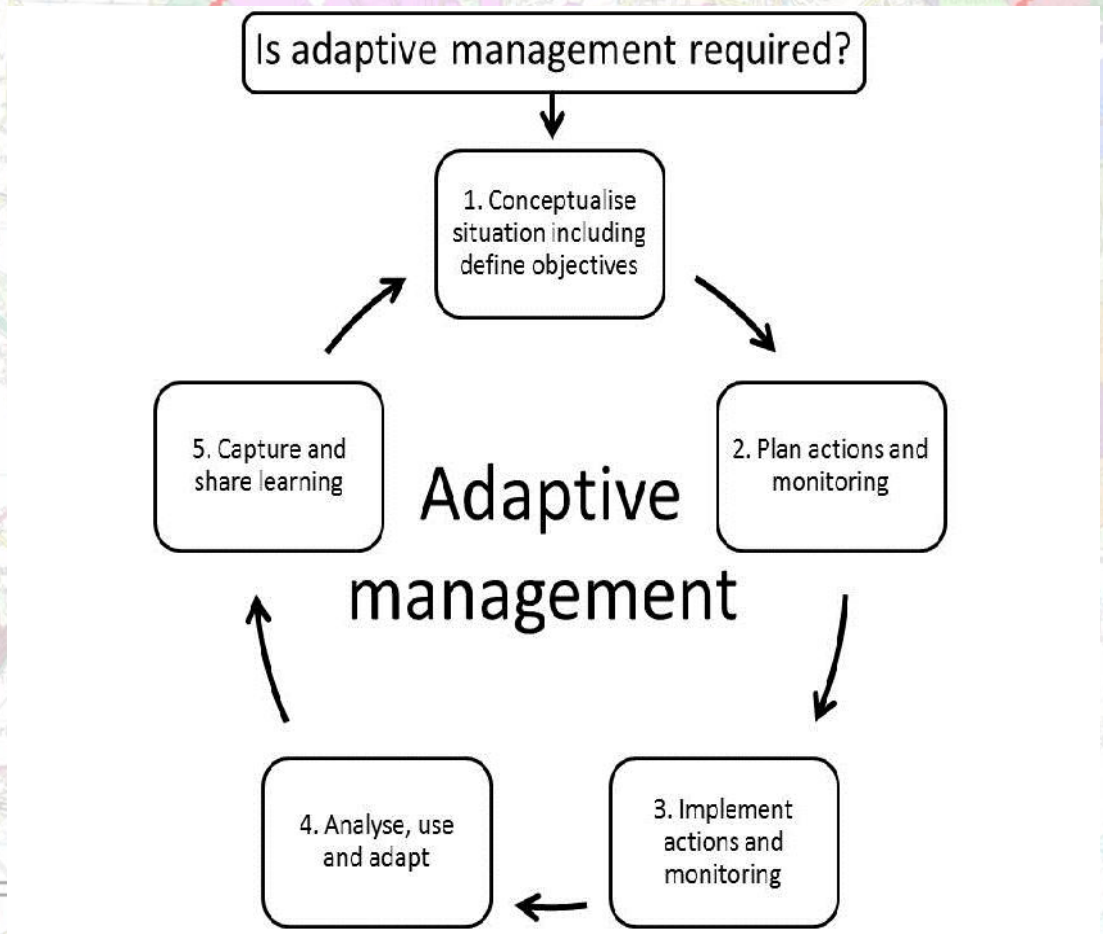
- Improved policy and institutional alignment
-Opportunities to use monitoring and evaluation to deliver multiple benefits
-The role of social innovation
-Sustainable supply chains

-Policy option appraisal for agricultural, woodland and peatland management
-Future distribution of native woodlands under climate change
-Trajectories of ESS delivery and trade-offs in multifunctional landscapes (scenario based)
-Assessing economic impacts of changes in ecosystem services

RD 1.4.3: Practical interventions to realise multiple benefits and manage trade-offs

An evaluation framework based on adaptive management to guide learning from across case studies.

- What is it, where is it being used and what are its limitations?



RD 1.4.3: Practical interventions to realise multiple benefits and manage trade-offs

An evaluation framework based on adaptive management to guide learning from across case studies.

- What is it, where is it being used and what are its limitations?

Landscape scale *case studies* based on *cooperation over*

- implementation of *agri-envrironment* measures among farms within their catchments

- uptake of *woodland expansion* targets in peri-urban and rural areas

We will monitor the process to evaluate:

- *Participation* and inclusiveness
- *Purpose*: challenges, issues and potential actions
- *Knowledge:* learning, use of data and monitoring
- *Process*: governance constraints; facilitation, conditions

We will explore:

a.barriers & opportunities for achieving *collaborative decision making* over land management

b.social & institutional circumstances under which collaborative decision making can be supported

Integrated Sustainable Management (1.4)

1.4.1 - Natural Assets Register and Natural Capital Accounts (Alistair McVittie, SRUC)

- Development of a natural asset register
- Assessing ecosystem services delivery and interactions
- Natural Capital Accounts

1.4.2 – Identifying and understanding multiple benefits and trade-offs (Alessandro Gimona, JHI)

- Identifying multiple benefits and trade-offs between ecosystem services
- Identify opportunities to increase multiple benefits through policy and industry delivery mechanisms
- Option appraisals to demonstrate the resilience of natural assets under different future trajectories

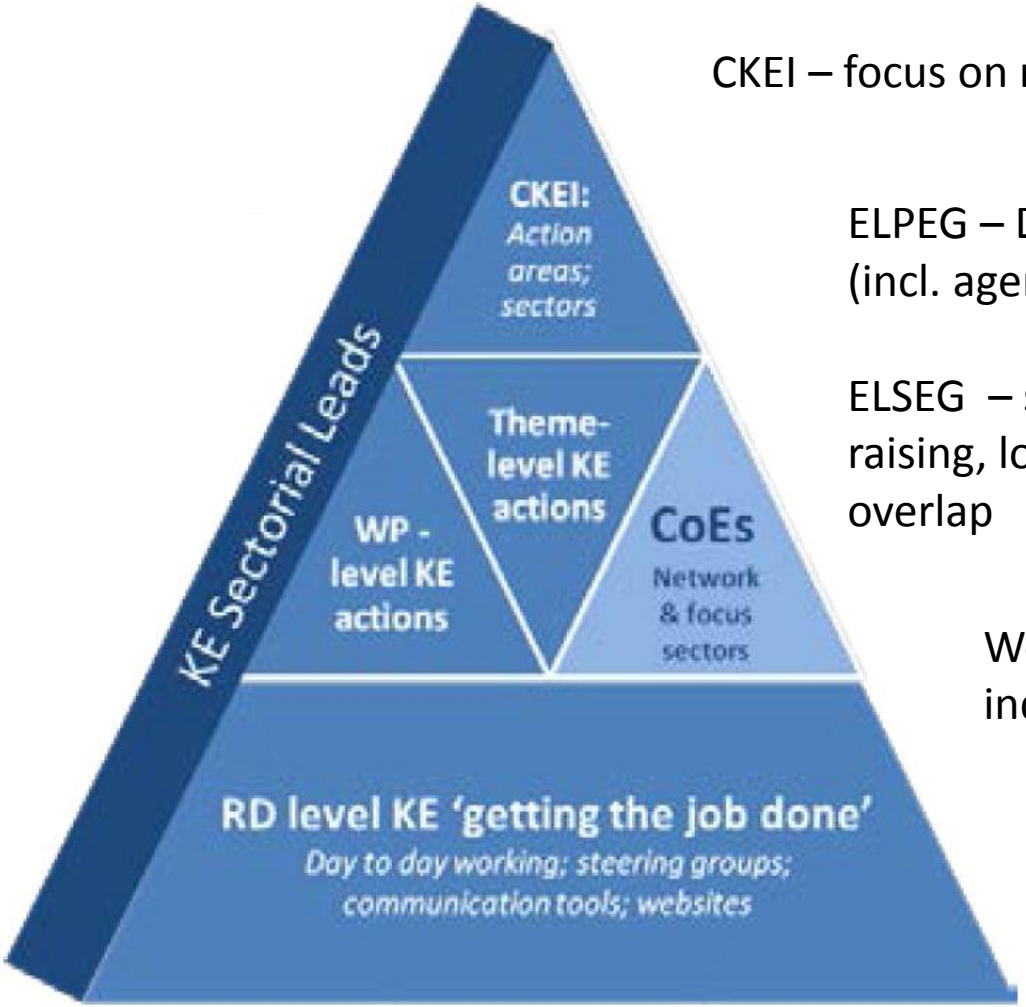
Biodiversity and Ecosystems (WP 1.3)

1.4.3 – Practical interventions to realise multiple benefits and manage trade-offs (Justin Irvine, JHI)

a. Adaptive management framework to help delivery
b. Agri-environment & EFA scheme delivery at a landscape scale
c. Reconcile woodland expansion with other land use priorities
d. Integrate SRDP, flood Management and General Binding Rules

Common Elements for WP1.3 & 1.4

Knowledge Exchange



CKEI – focus on maximising impact from programme

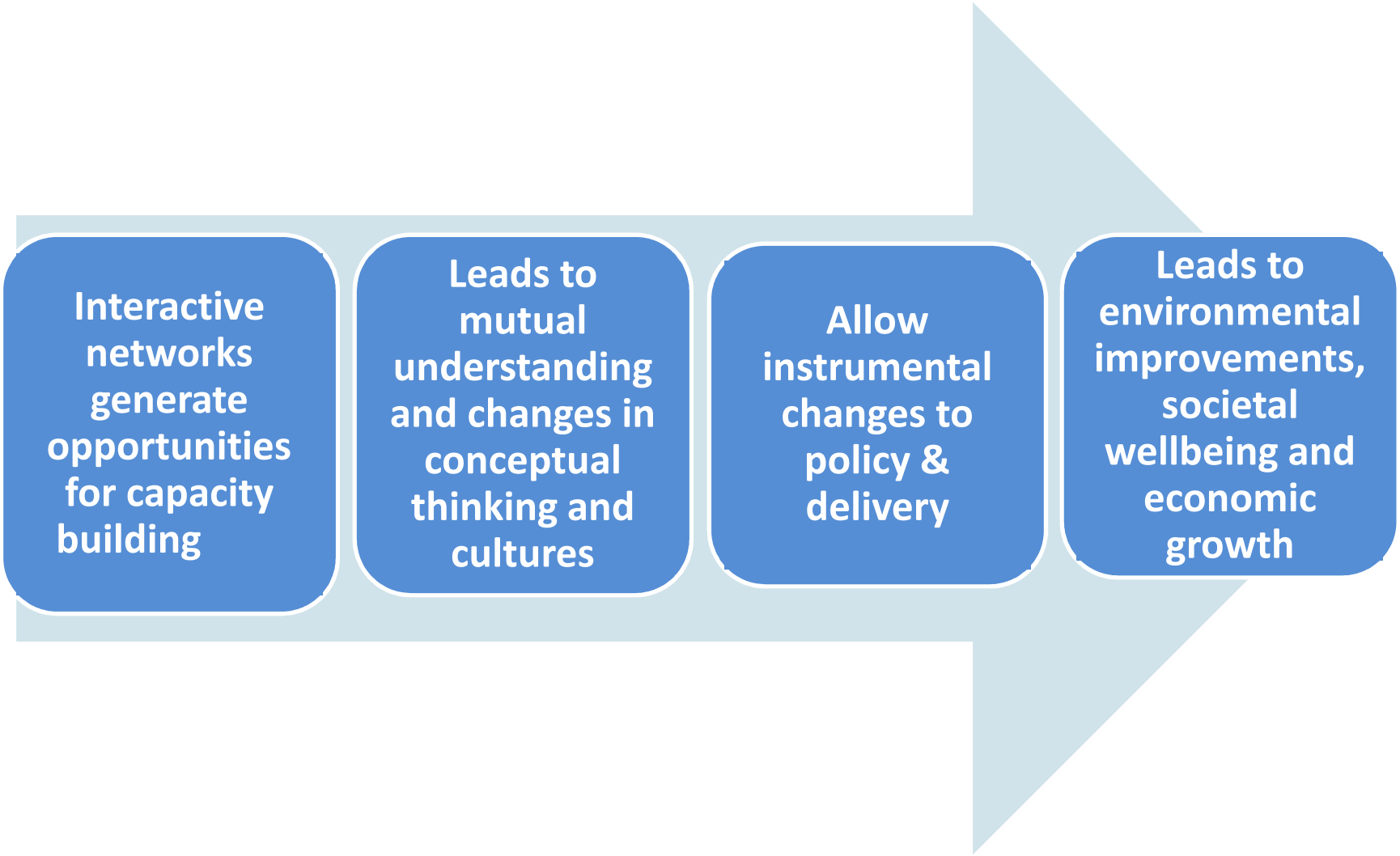
ELPEG – Direct exchange with policy makers (incl. agencies)

ELSEG – strategic guidance, awareness raising, looking for synergies & avoiding overlap

Working Groups within RDs, e.g. indicators in 1.3.1 and 1.4.1

Contribution to networks and advisory groups or boards

Impact: what kind?



Focus for our impacts

- Scottish Biodiversity Strategy
- Land Use Strategy
- Climate Change - Report on Policies and Practices; Climate Change Adaptation Programme
- Common Agricultural Policy; Scottish Rural Development Programme
- Scottish Forestry Strategy
- Natural Capital and associated initiatives (NCAI, EHI)

Workshops

- Provides a in-depth look at *some* of the research within each research deliverable
  - Some information from us but mainly to elicit your views and ideas
  - Pre-assigned to ensure balanced numbers
  - Venues and timing on your agenda
- Meet for lunch at 12:30 in XXX

Morning Workshops 11:15

Title	Room & Facilitator
Resilience of biodiversity and ecosystems	**Rooms 4 & 5 – Glenn Iason**
Assessing changes in ecosystem service flows from woodlands – development of an integrated framework	**Room 6 - Anke Fischer**
Natural Asset Register and Ecosystem Service flows; which questions need answers?	**Room 2 - Alistair McVittie & David Donnelly**
Lunch	**Rotunda at 12:30**

Thank you for your attention

Questions and Comments?

The Main Research Providers are supported by the Scottish Government Rural and Environment Science and Analytical Services

Afternoon Workshops 13:30

Title	Room & Facilitator
Agri-Environment and Climate Scheme – what are the gaps for habitat and species action?	**Room 4 - Robin Pakeman**
Governance for biodiversity – what has been done and what could be done?	**Room 5 - Paula Novo**
Further development of criteria to assess opportunities for woodland expansion and their consequences.	**Room 6 – Alessandro Gimona**
What is adaptive management and how is it used in Scottish land and environmental management?	**Room 2 – Justin Irvine**