

## **'Sustainable' upland estates in Scotland: using Delphi to operationalise sustainability within a collaborative learning environment**

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### ABSTRACT

Although sustainability is an accepted theoretical concept, and there is consensus surrounding the principles of sustainable rural development, conceptual difficulties still arise when translating these principles into operational practice. It has been suggested that such conceptual difficulties associated with sustainability may be overcome by "learning from doing" and attempting to translate the principles of sustainability into practical management strategies with corresponding indicators to measure progress. This paper explores how a collaborative learning approach can be applied in the context of rural, upland estate management in Scotland in order to develop such strategies and indicators.

Drawing on social learning and collaborative management literature, the research employs an adapted policy Delphi in order to develop a sustainability assessment framework for Scotland's upland estates. Through the deliberative engagement of 19 panellists with wide knowledge and experience of sustainability and/or rural estate management, sustainability is made operational by establishing a practical context and developing a coherent set of 'sustainability strategies' for upland estate management. This will allow the development of robust sustainability indicators during a later stage of the research.

### INTRODUCTION

Scotland's uplands have a unique pattern of landownership with much of the land divided into 'estates' owned by private individuals and organisations, public bodies, and non-governmental and community organizations (Cramb 1996; Wightman 2000; Warren 2002; Kerr 2004). 'Sustainability' is an accepted theoretical concept (Counsell 1999) that is commonly listed as a core objective in UK, EU and international policies and projects related to upland management (for example, Chapter 13 of Agenda 21 focuses on sustainable mountain development), and there is consensus surrounding the principles of sustainable rural development in the literature (see Bruckmeier 2004 for an overview). However, difficulties still arise when translating these principles into operational practice and there is a significant research and policy deficit regarding practical meanings of 'sustainability' at the estate scale.

A close look reveals that the issue may lie with the observation made by Jordan (2008) that there are conflicts between the agreed principles. For example, Selman (2002) points out that one of the challenges of operationalising sustainable development is to implement often conflicting plans for

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stable economic growth, inclusive social progress, effective protection of the environment, and prudent use of natural resources. Several authors propose that it is now important to move away from economic debates and sustainability values towards the issues surrounding operationalisation and more practical action (e.g. Ioris *et al.* 2008; Bruckmeier 2004; Glass 2002). It has been suggested that such conceptual difficulties associated with sustainability may be overcome by “learning from doing” and attempting to translate the goals of sustainability into practical management approaches (e.g. O’Riordan 2002; Ioris *et al.* 2008).

This paper alerts the reader to the value of employing a collaborative learning approach in order to overcome these difficulties, and suggests a suitable methodological approach: an adapted policy Delphi. In the first instance, the collaborative learning approach is explained in detail, drawing on key findings from social learning and collaborative management literature. This is followed by an overview of the Delphi approach and examples of its application in natural resource management and sustainability research. The paper then moves on to discuss the design of an adapted policy Delphi that is tailored to allow the implementation of the collaborative learning approach. Outputs of the initial stages of the research are then shared in order to reflect on the operationalisation of sustainability in this context.

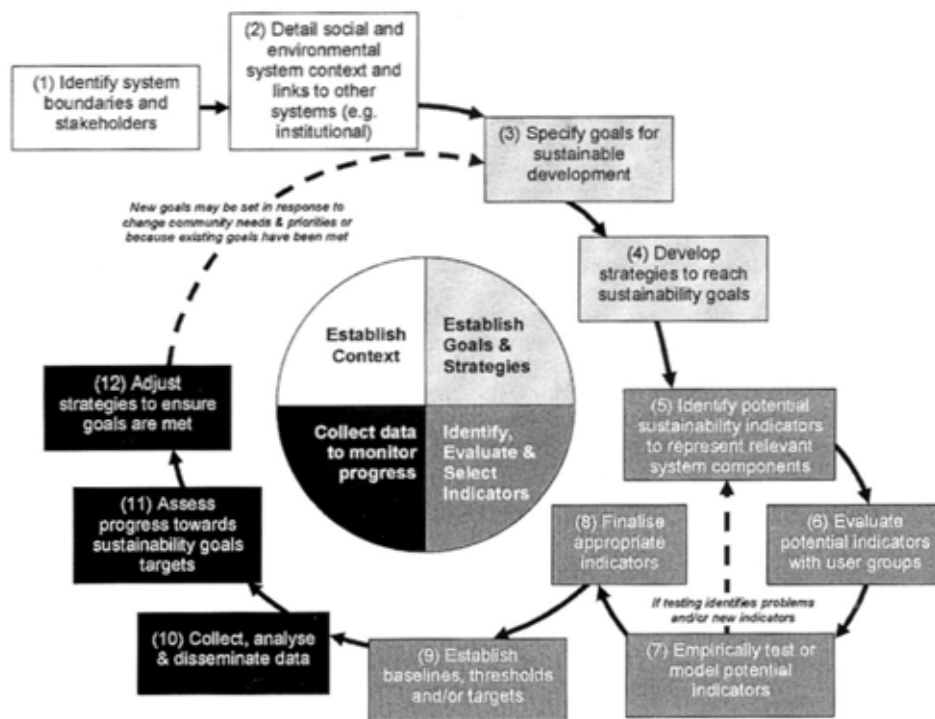
#### OPERATIONALISING SUSTAINABILITY: A COLLABORATIVE LEARNING APPROACH

Sustainability indicators are increasingly seen as providing a means to operationalise the concept of sustainability because they allow the development of a concrete set of issues that can be monitored and responded to over time (Blackstock *et al.* 2008). While indicators can provide essential information on the viability of a system, its rate of change, and on how these contribute to the sustainability of the overall system (Bossel 1999), there is considerable subjectivity in determining which phenomena to measure (Gallopín 1997), with some authors warning of the dangers of the “ad-hoc selection of individual indicators to ensure they provide a clear picture of progress” (Blackstock *et al.* 2006: 4). Sustainability indicator frameworks are commonly classified as ‘top-down’ or ‘bottom-up’ in nature and strengths and weaknesses of both approaches have been identified. For example, indicators developed using bottom-up, participatory approaches have been shown to be equally or more accurate as those developed by experts (e.g. Dougill *et al.* 2006), and ‘top-down’ frameworks have been shown to antagonise stakeholders and hinder their effective implementation (e.g. Bell and Morse 2003). As a result, there has been increasing awareness and academic debate about the need to develop approaches that can capture the positive elements of both (e.g. Reed *et al.* 2006). Social learning and collaborative management theories can help the development of these approaches by including stakeholders and specialists in the process of developing robust sustainability indicators.

The governance of many kinds of land use is complex and therefore requires the joint action of multiple parties (Berkes 2009). Increasing public participation in decision-making and problem-solving processes has become a major theme in the governance literature (Pahl-Wostl 2002; Mostert 2002) and sustainability science has also responded to this, requiring “the integration of multiple perspectives to solve place-based problems” (Blackstock and Carter 2007: 343). Similar perspectives have also filtered into public policy (the Aarhus Convention is a good example) and, as a result, there has been a recent trend in both public and private policy to involve multiple actors in collaboration processes (Bouwen and Taillieu 2004). Collaborative research has made it more important to consider social dimensions (Hurni and Wiesmann 2004) and there have been calls for more research that uses communicative action to allow the re-definition of norms, rules and power relations that impede a more sustainable use of natural resources (e.g. Rist *et al.* 2007). As such, collaborative management (the sharing of power between the government and local resource users) is increasingly being combined with learning-based approaches (Berkes 2009) in order to enable professional and interest groups to work and learn together in a collaborative, transdisciplinary manner (Keen *et al.* 2005).

Defined as “the collective action and reflection that occurs among different individuals and groups as they work to improve the management of human and environmental interrelations” (Keen et al.: 4), social learning offers the means to increase the capacity of collaborators to learn together and respond to changing circumstances, and is increasingly being seen as central to decision-making in environmental management. Arguably an important and under-investigated feature of planning and policy processes, learning together may offer a means of reaching compromise when individuals and communities have diverse, partial and sometimes irreconcilable views (Holden 2008). Pahl-Wostl and Hare (2004) also argue that management should not seek to find the optimal solution to one problem, but should instead be an “ongoing learning and negotiation process where a high priority is given to questions of communication, perspective sharing, and the development of adaptive group strategies for problem solving” (p.193-4). In this sense, learning and reflection in an environmental management context is important for social change as it challenges those involved to consider new knowledge and insights, and to rethink assumptions (Keen et al. 2005).

In the context of transforming sustainability into an operational concept, Reed et al (2006) apply a learning approach when developing and applying sustainability indicators at the local scale. They argue that indicators can go beyond simple measurement of progress and stimulate a learning process that enhances the overall understanding of environmental and social problems. In their work, Reed et al (2006) propose the use of an ‘adaptive learning framework’ (see figure 1) that allows the integration of ‘top-down’ and ‘bottom-up’ frameworks. By first of all establishing a context for sustainability in the local setting, it is then possible to establish goals, strategies and, ultimately, indicators, that have been developed in a robust, accountable and collaborative manner.



**Figure 1:** Adaptive learning process for sustainability indicator development and application (Reed et al. 2006: 414)

Reed et al (2006), in their adaptive learning framework, do not prescribe methodological tools for implementing the framework. Instead, they emphasize the need for methodological flexibility, triangulation, and “adapting a diverse sustainability toolkit to dynamic and heterogeneous local

conditions" (p.415). The Delphi approach offers a flexible, deliberative and iterative method that can be used to facilitate an effective collaborative learning environment.

#### IMPLEMENTING THE COLLABORATIVE LEARNING APPROACH: INTRODUCING DELPHI

The Delphi approach engages a panel of participants (normally experts) in an anonymous, multi-round survey in order to generate opinion and/or consensus about a particular topic/policy issue (Hung et al. 2008; Miller 2001). Participants are usually required to complete a structured series of written questionnaires and the opinions of the group are gathered, collated, disseminated and gathered again in the light of the previous round (Hasson et al. 2000 in Kenyon et al. 2008). By "structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem" (Linstone and Turoff 2002: 3), the Delphi approach is an excellent tool for considering the complexity of making sustainability a practical concept and the reflective nature of the process allows participants to widen their knowledge and stimulate ideas (Powell 2003). The collaborative nature of the Delphi approach can provide a catalyst for reflection, and challenges the panel to consider new insights and knowledge, as well as potentially rethinking assumptions (as deemed important by Keen et al. 2005).

It is common that a Delphi approach is conducted anonymously (Hasson et al. 2000). In contrast to committee meetings and other face-to-face group exercises, this avoids any negative influence (i.e., interpersonal static, individual bias) that could be exercised by factors in individual answers as a result of: domination by powerful individuals; biasing effects of personality traits; and the fact that only one person can speak at a time (Kenyon 2008; Briedenhann and Butts 2006; Powell 2003; Landeta 2006; Still et al. 1999; de Loë 1995). The selection of panel members affects the reliability and quality of results (Shiftan et al. 2003; Tolley et al. 2001) and is key to the success of the Delphi approach (Kenyon et al. 2008; Powell 2003). Most Delphi users employ a purposive sampling approach (Hasson et al. 2000) and recommend that panellists are chosen for their work in the appropriate area and their credibility with the target audience (Powell 2003; Skulmoski et al. 2007). Bringing together a group of people in this way creates an arena for co-producing knowledge. This type of arena can be likened to the 'bridging organization' described by Berkes (2009) as it provides the means to facilitate linkages where they do not already exist, in order to generate new knowledge or "make sense of knowledge from different sources" (p.1695).

Generally, two types of Delphi approach are identified in the literature (Kenyon et al. 2008): conventional and policy. Both have been carried out in several areas of natural resource management and sustainability research. Examples of these are summarised in Table 1.

	Topic	Aim	Scale	No. of rounds	Panel size	Panel composition	Author(s)
<b>Conventional Delphi approach</b>	<i>Tourism</i>	To identify issues considered important for an <b>index of evaluation criteria</b> for rural tourism projects	UK and South Africa	4	60	Academics Public sector Consultants Operational sector	Briedenhann and Butts (2006)
		To <b>develop indicators</b> to measure movement of a tourism product to a position of greater/ lesser sustainability	Global (company/ resort level)	2	74	Academics/consultants who had published on the subject of sustainability in any of 4 major tourism journals	Miller (2001)
	<i>Pollution</i>	To <b>determine best available techniques</b> to reduce nitrogen emissions from the poultry industry	UK (used case study farm)	3	10	Noted in field of work on Nitrogen emissions and impacts Even-spread of interests: Regulatory organizations Research bodies	Angus et al (2003)
	<i>Sustainable cities</i>	To <b>predict trends</b> of walking in Europe by 2010	Europe	2	300 (112 responded in first round)	Selected from professional groupings: Research, practice, policy, advocacy, planning, other	Tolley et al (2001)
<b>Policy Delphi approach</b>	<i>Tourism</i>	To <b>investigate constraints and imperatives</b> relating to the long-term management of built heritage attractions	UK	3 (preceded by postal questionnaire to more respondents)	17	Heritage tourism specialists: Consultants, local authority officers, heritage organization administrators, tourism academics museum officers	Garrod and Fyall (2000)
	<i>Climate change</i>	To <b>explore the complex policy question</b> of climate change and water management responses	Ontario, Canada (Grand River basin)	2	189 (48 responded in first round)	Municipal/provincial politicians and staff Consultants Environmental and user groups	de Loë (1995)
	<i>Flood management</i>	To <b>investigate the potential role</b> of agriculture in sustainable flood management	Scotland	3	25 (14 responded in first round)	Planners, industry consultants, agricultural consultants, flood management and land use academics, farmers, environmentalists, insurance consultants.	Kenyon et al (2008)

**Table 1:** Examples of conventional and policy Delphi approaches used in natural resource management and sustainability research

## AN ADAPTED POLICY DELPHI

The conventional Delphi approach (see Table 1) has been criticised for focussing on achieving consensus rather than allowing for detailed discussion of the issue in question (Briedenhann and Butts 2006; Hasson et al. 2000) and it has been argued that the aim should not be to achieve a definitive answer but to aid the development of possible solutions based on the results (Kaynak and Macauley 1984). Miller (2001), for example, employed a conventional Delphi approach to develop sustainable tourism indicators on the assumption that indicators that catch the attention of, and are plausible to, policy makers/decision-makers are more likely to be implemented and have meaning as they are perceived to be monitoring something that is important. By involving these people in the process of indicator selection, it was seen as more likely that the resulting indicators would be put to practical use. While Miller's work produced a comprehensive list of possible indicators for use in the context of sustainable tourism, the panel were presented with a pre-determined list of indicators (and invited to comment on, rate, and rank them) rather than being involved in the process of determining sustainable tourism goals and objectives in the first instance.

The policy Delphi approach allows the exploration of consensus and disagreement surrounding complex and uncertain policy issues rather than focussing on reaching a consensus. This is done within an informed group that presents options and supporting evidence for mutual consideration (Briedenhann and Butts 2006; Turoff 2002), raises issues for debate (Hasson et al. 2000) and attempts to produce potential resolutions (Kenyon et al. 2008). The objective is to generate opinions and ideas about a particular policy issue among a diverse group of people with different stakes in the solution/outcomes. For example, Kenyon et al. (2008) use a policy Delphi approach to investigate the potential role of agriculture in sustainable flood management in Scotland (see Table 1 for more detail).

In order to establish a context for sustainability in upland estate management and develop sustainability strategies prior to selecting indicators, the policy Delphi approach was adapted for the purposes of this research. Focussing on the exploration of consensus and disagreement was not deemed highly important in this case (as in a typical policy Delphi) as the process was explicitly designed in order to maximise the potential for collaborative learning over a series of rounds. The process of 'dialogue' is deemed important in social learning theory and this does not typically seek consensus. Instead, it provides an environment for learning and thinking together in order to build richer pictures and act jointly (Ison 2005). In this regard, the adapted Delphi approach was designed so that there was scope for panellists to explore and debate their conceptual underpinnings of a context for sustainability because how a participant perceives the situation in question is deemed crucial (*ibid*). Engaging the panel in deliberation on their perceptions of sustainability and ideas about possible sustainability strategies ensured that indicators were not selected in an 'ad-hoc' manner. Instead, a clear rationale for indicator selection was provided through the findings of these initial steps of the research. The structure of the survey process was not over-specified in order to allow for the contribution of different perspectives related to the questions and to give enough consideration to areas of disagreement and debate.

A significant limitation of the Delphi approach is found in high rates of attrition (drop-out) during the process. Factors contributing to this include the time commitment required from panellists, and the difficulty in maintaining high panellist motivation due to the lack of face-to-face contact (Briedenhann and Butts 2006). Kenyon et al. (2008), for example, found attrition to be a problem. In the first round of their study of the role of agriculture in sustainable flood management, 25 participants had agreed to take part but only 14 responded, and in the second round this number dropped to 11. Hung et al. (2008) highlight the importance of selecting panellists who are interested in the topic in question and the need to stay in touch with panellists in order to maintain enthusiasm and engagement. They also suggest that following-up with non-respondents can enhance response rates. Interestingly, Hung et

al. (2008) emphasise the importance of their professional connections in maintaining participation in their education-focussed Delphi, observing that those respondents with which they had a “personal rapport” (p. 195) dropped out at a lesser rate than those recruited from an internet search.

Time was invested in developing a more personal relationship with panel members in order to reduce levels of drop-out, as suggested by Hung et al. (2008). The first scoping round of the Delphi approach was carried out in the form of a semi-structured interview rather than a written questionnaire. This allowed face-to-face contact between the researcher and the panellists and the development of personal rapport. The interviews also gave the researcher the opportunity to explain the project in more detail, clarify the time commitment required, and help the participants to see that their involvement was important and valued.

It is common practice for the first round of a Delphi to be unstructured, seeking an open response: this gives panellists free scope to elaborate, and reduces their exposure to researcher bias (Hasson et al. 2000; Powell 2003). Conducting this round in interview format allowed the panel members to ‘brainstorm’ their understanding of the issues surrounding sustainability and estate management, in particular exploring their perceptions of the situation (as recommended by Ison 2005). They were encouraged to consider their initial views on the topic (based on their knowledge and experience), as well as to suggest ideas for goals/objectives for sustainability in the context of estate management. The panellists were encouraged to elaborate freely in order to reduce any bias that might have been exerted by the researcher due to the format of the questions/prompts.

Brief explanatory material was sent to the interviewees ahead of each meeting in order to provide some background information about the research and a diagram of the proposed survey process. The discussion allowed any concerns/queries/points requiring clarification to be raised and addressed immediately in a receptive environment. The first round interview also gave the researcher the chance to make sure that panellists were aware of the length of the survey (maximum of five rounds) and the commitment required, offering them the opportunity to decline to take part at that stage. It was also made clear that there was scope for the process to evolve in a slightly different way, based on the responses given and the ability of the researcher to develop indicators based on the content of the initial rounds. This emphasised that the participants have a degree of ownership over the survey process.

Sustainability and estate management are issues that attract a complex range of economic, social and environmental interest groups and stakeholders: the ability of the Delphi to structure communication between these diverse interests made it possible to deal with the problem in a collective manner. In line with the methods used by Kenyon et al. (2008) and de Loë and Wojtanowski (2001), a purposive matrix approach was used to select the panel, in order to ensure that the required skills and knowledge were represented, and that any possible bias was countered. Panellists were from a range of professional backgrounds and were identified from a range of sources, for example: memberships of working groups/committees, conference papers/presentations, academic journals/other publications, referral, and reputation. Panel members represented a balanced selection of academics, consultants, professionals, members of representative bodies (for example, Scottish Environment LINK, Scottish Rural Property and Business Association etc.) and policy-makers, with expertise in: sustainability, rural/upland land use and/or estate management (preferably on a range of estates). It was common that panellists had knowledge of more than one subject area or satisfied two selection criteria (e.g., an estate management professional who was also a member of a representative body).

There is also debate with regard to optimum panel size, and Delphi panel numbers vary greatly (see Table 1). While it has been argued that the larger the panel, the more reliable the judgement (e.g., Murphy et al. 1998 in Powell 2003), a smaller panel can also ensure that the material produced is kept to a manageable level and feedback is more accurate (Kenyon et al. 2008). Briedenhann and Butts

(2006) initially chose a larger panel of 60 in order to allow for drop out, while Still et al. (1999) found that 18 panellists was “typical and sufficient” for ensuring a sufficiently broad range of expertise (p. 86). It is important to note that there is little empirical evidence of the effect of panel numbers on the reliability/validity of the process (Powell 2003), with representativeness ultimately being assessed on the quality of the panel, rather than the size (Powell 2003; Garrod and Fyall 2000). For this research, 20 panel members were deemed to be sufficient in light of the discussion in the literature and the resources available to the researcher. In the first instance, written invitations were sent to 30 potential panellists with the aim of setting up a balanced panel of about 20 participants. Acceptances were received from eight participants. Follow-up e-mails and telephone calls resulted in the recruitment of 11 more panellists, with one person declining the invitation to take part.

#### ROUND ONE: ESTABLISHING A CONTEXT

It has been suggested that the first round of a Delphi can often fail to produce the level of information that would be generated from a thorough literature review (Wheeller et al. 1990). Kenyon et al. (2008) correctly observe that this would be a fair criticism if the role of the scoping rounds were solely fact finding. They argue that questions that can be answered from a literature review are not good candidates for Delphi studies and agree with Gordon (2003) that the strength of a Delphi is in exploring issues that require judgement.

The first round interviews with the panel members produced a wealth of rich qualitative data that could not have been extracted from a literature review. In line with the collaborative learning approach to indicator development, panel members had the chance to express their judgements when establishing a context for sustainability (i.e. how sustainability is defined in the context of upland estate management), as well as to suggest goals and strategies for sustainable upland estates. Further discussion also considered any practical constraints or challenges to implementing the goals on the ground.

When exploring panel members’ understandings of sustainability in the context of upland estate management, it was immediately apparent that there is some negative feeling towards the concept due to the difficulties experienced in defining its practical meaning. Familiar ideas of inter-generational equity, employment of the precautionary principle, and maintenance and enhancement of natural capital were discussed but there was also some feeling of dissatisfaction with the term ‘sustainable’ due to its overuse and ambiguous nature:

“...you’ll notice that I’ve not used the word ‘sustainable’ at all, and I wouldn’t, because I don’t understand what it means. It’s used all over the place by people who also, I think, do not understand it at all...”

*Estate management professional*

Nearly all of the panellists argued that ‘sustainability’ means that estate management should be well-balanced in terms of economic, social and environmental aspects, with the combination of these aspects developed or maintained by an estate being essential. In contrast, one panellist believed that there is, instead, much more of a need to focus on the environment, as it was seen as unacceptable to degrade the environment in order to maintain social and economic sustainability:

“...the number of times I’ve heard ‘it’s not just about the environment, you know. We have to be sustainable – economically sustainable, socially sustainable’, which basically means that it’s an excuse to be environmentally unsustainable.”

*Policy maker*

Ideas were shared about the opportunities that sustainability brings for innovation and departure from the status quo, as well as the need for adaptation to external pressures and driving forces such as climate change and financial instability. This round also gave panellists the opportunity to reflect on the range of perceptions of sustainability in the context of upland estate management and the broad range of management objectives that may hinder the development of any context-specific definition:

"You know, my view of sustainable development might be different from a neighbouring estate's view of sustainable development. But equally, either of them may be valid – it depends on which context you take it in...of what spin you put on it."

*Estate management professional*

When asked to suggest specific goals and strategies for sustainability, the majority of the panel stressed the need to sustain rural communities, particularly through maintaining and increasing employment opportunities associated with estate activities. The maintenance and enhancement of natural capital was also seen to be a key objective, with several panellists stressing that estates would be more able to generate income from habitats that are in a productive state. Integrated management was commonly mentioned, with much discussion about the importance of developing effective partnerships and the sharing of good practice in order to encourage the spread of good ideas and management practices.

In terms of constraints and challenges to implementing 'sustainable' practices, a commonly cited example was the hindrance of progress by cultural issues and mindsets in the landowning/managing community in Scotland:

"My initial reaction is to say that, for me, the intractable issues here are not the scientific or the intellectual or even the concept of sustainability as much as the clash of cultures. I think that that's the intractable bit."

*Sustainability professional with land managing experience*

The lack of financial reward available to land owners/managers for the good management of public goods was also widely discussed:

"...public goods for public money [...] should be a fundamental principle of any public policy involving spending public money. And if this person over here is doing sustainable work [...] then that person is actually giving public goods to the taxpayer for nothing."

*Policy maker*

Carrying out the first round in interview format allowed the establishment of personal rapport between the researcher and panellists and provided the opportunity to increase levels of motivation and commitment among the participants. For example, one panellist commented:

"I'm really chuffed that you've asked me to be involved in this and I'm very, very happy to help in whatever way I can."

*Rural sustainability consultant*

This discussion also allowed participants to air any thoughts/concerns they had about the process:

"I do like the idea of being informed by what other people have said because we haven't got monopoly of wisdom and if somebody else made a good point we'd say actually, yes, that's right...I do agree. Or if somebody says something that I disagree with, I'll make sure that I say so."

*Rural land use professional*

"So there isn't going to be too much bother finding time to do it – we won't need to find a mutually convenient time."

## ROUND TWO: DEVELOPING PRACTICAL SUSTAINABILITY STRATEGIES

The second round of the Delphi approach allowed panellists to reflect on the findings of round one and refine their ideas, ultimately developing a coherent set of strategies for sustainable upland estates. The deliberative nature of this stage enabled the researcher to understand areas of agreement and disagreement in more detail, highlighting any areas that would require more discussion.

Some main themes emerged from the second round that had not been discussed in great detail in round one: the importance of temporal and spatial scales when discussing what is 'sustainable'; growing doubt about too simplistic a balance between the three pillars of sustainable development; the potentially greater importance of 'adaptability' as opposed to 'sustainability', and the growing relevance and importance of creating a market for ecosystem services in the uplands.

In the first round there was some disagreement about which approach should be taken when managing change, i.e. focussing on the environment or using a more tri-partite model that gives equal weighting to the three pillars (environment, economy and society). Four panellists suggested the need to think about time scales when considering this issue, and one panellist expressed how these views could be reconciled by looking at how time scales play a role in determining the 'sustainability' of a management regime:

"...at any given time the three-legged stool will be 'skewed' one way or another but sustainable management could be seen as maintaining that balance over the long term. It is all about being able to react to change and keep the balance between the three."

*Land use professional*

There was also emerging consensus that aiming for a 'balance' between the three pillars of sustainable development is too simplistic, with several panellists revisiting the idea expressed by a minority in the first round that the sustainability of the environment is of over-riding importance. Interestingly, a couple of panellists reflected that a more sensible way to resolve this dilemma is to accept that the environment 'underpins' the economic and social sustainability of the estate, as the majority of upland estate activities and wider sustainability goals in international and national policy are dependent on rich biodiversity and careful environmental protection:

"Social and economic activity should be conditional on environmental sustainability. This isn't about a veto, but is about exposing the inevitable trade-offs for rational decision-making based on the above distinction, and recognising that although we humans are more interested in the social and the economic, these are both reliant, especially in the long term, on the environment."

*Sustainability professional*

In the first round, panellists identified constraints to putting sustainability into practice on upland estates. Geographical limitations and external factors such as climate change and financial markets were often mentioned by panellists as constraints to diversifying and adding value to estate activities in the uplands. In response to this, in round two, the importance of an estate's ability to adapt and pursue innovative management strategies was mentioned by several panellists:

"If change is the order of the day, and 'doing things tomorrow the same we as we do them today' is not competitive, then surely sustainability, in this context, must mean 'adaptability' or 'the ability to constantly re-invent and change direction to pre-empt ever-changing external factors...'"

*Estate management professional*

Similar points highlighted the notion that some panellists equate the concept of sustainability with resilience, which may help to narrow the range of interpretations of the complexity of sustainability as there are arguably fewer ways in which to interpret resilience, particularly as an approach towards reducing the vulnerability of systems through an increase in adaptive capacity (see Berkes et al. 2003 for a full discussion).

Discussion about financial rewards for the sound management of public goods also continued in round two, with panellists flagging up concerns about the allocation of funds and the levels of subsidy that would make a difference to management practices.

Table 3 shows an overview of the sustainable estate management strategies identified by the panel over the course of the first two rounds.

	Sustainable upland estate management strategies
Biodiversity	Conserve and enhance biodiversity Restore and enhance ecological functionality Integrate long-term management of other ecosystem services Develop and implement long-term management plans
<i>underpins</i>	
Business	Diversify estate income streams where appropriate Encourage innovative enterprise and alternative business models Add value (and quality) to core rural industries, estate businesses and products Reduce reliance on external funding Assess exposure to internal/external pressure and risk (financial and otherwise)
Communities (local and non-local)	Facilitate localisation and self-sufficiency Maintain and enhance socio-economic vitality of rural communities Maintain and enhance cultural heritage Encourage capacity building and knowledge production (on and off the estate) Provide opportunities to foster spiritual and physical well-being
Governance	Encourage joined up thinking among stakeholders through dialogue within and between estates, government, NGOs and communities Enter into effective partnerships where appropriate (meeting of public and private interests) Share ideas and best practice

**Table 3:** The second round of the Delphi approach allowed the development of strategies for sustainable upland estate management in Scotland

The preliminary rounds allowed the panel to deliberate over the context and goals/strategies required for sustainable upland estates. By exploring the ideas and themes that emerged, it will be possible for the researcher to develop relevant and robust indicators based on the results. The indicators will be developed by the researcher and fed back to the panel in the third round, once again offering experienced deliberation of the relevance and suitability of the assessment criteria before they are implemented on estates in upland Scotland.

## CONCLUSION

This paper has highlighted the potential for using an adapted policy Delphi to implement a collaborative learning approach for operationalising sustainability in the context of upland estate management in Scotland. The method allowed rich qualitative data about the perceptions and understandings of sustainability in this context to be gathered, in a manner that was iterative, deliberative and participatory. The exploration of initial ideas, standpoints, constraints and

judgements, through the first rounds of a Delphi, allowed a novel approach to the establishment of a clear context and rationale for the development of sustainability indicators, and provided an arena for the generation of new knowledge and shared ideas. By feeding back the findings of the first round to the panel, it was possible for panellists to reflect on the ideas and opinions of the other participants and respond accordingly. It was also possible for the researcher to explore areas of disagreement in more detail, as well as confirm the opinions of panel members on the suggested goals and management strategies for sustainability. The wealth of data generated by the initial rounds allowed the researcher and panel to develop a more in-depth understanding of sustainability in the context of upland estate management and provides a sound, accountable rationale for the future development of sustainability indicators.

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