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Deliberative-analytic approaches to Ecosystem Services as a way forward for the land sparing/sharing debate

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Deliberative-analytic approaches to Ecosystem Services as a way forward for the land sparing/sharing debate

Abstract

Growing concerns about the impacts of food systems have led to fierce debate over the pros and cons of different modes of production. In parallel, conservationists have debated “land-sparing” versus “land-sharing” as competing rationales for a land use policy that aims to halt biodiversity loss. As a contribution to these debates, we share research conducted in the South-East of England where contrasting practices for managing land and livestock coexist in close proximity and approximate a land -sparing versus -sharing gradient. The research used an Ecosystem Services (ES) framework to explore the social, ecological and health outcomes of these practices, as understood from different perspectives. In this paper we analyse and interpret both qualitative and quantitative data generated through a participatory deliberative appraisal exercise that formed part of the research. Despite demonstrating the relevance of ES for appraising land use and management practices, we uncover a lack of sensitivity of conventional ES frameworks to the specific concerns, priorities and ambiguities of agroecological practices; an inability to encompass multiple scales and localities; limitations to incorporating site-specific considerations; and a polarising effect on the perspectives of conservationists and farmers. We conclude by offering an approach that may help to bridge between divergent perspectives and engage both on their own terms.

Keywords

Agroecology; Rewilding; Conservation Grazing; Environmental Land Management Scheme (ELMS); Millennium Ecosystem Assessment (MEA); Multi-Criteria Mapping (MCM)

1 Introduction

Concerns about the environmental impacts of animal sourced foods have been steadily growing over several decades, especially in relation to greenhouse gas emissions (Steinfeld, Gerber et al. 2006, Garnett 2008, Garnett 2009, MacMillan and Durrant 2009, Committee on Climate Change 2019), but also in relation to (among others) biodiversity loss, soil loss and water availability (Garnett 2015). In combination with increasing public health concerns about the role of meat consumption in relation to dietary diseases (Lang and Rayner 2012, Willett, Rockström et al. 2019), this has led to both an intense focus on red meat (ruminants) as a key culprit, but also fierce debate over the pros and cons of different production systems (Garnett, Godde et al. 2017). Comparisons have focused on (*inter alia*) ruminant versus non-ruminant, intensive versus extensive, grain-fed versus pasture-fed, indoor versus outdoor, organic versus conventional, and specialised livestock systems versus mixed crop and livestock systems. In parallel, ecologists and conservationists have recently debated “land-sparing” versus “land-sharing” as competing rationales for underpinning a land use policy that aims to halt biodiversity loss (Green et al. 2005, Fischer et al. 2008, Loos and von Wehrden 2018). At one end of this spectrum lies the idea that food production is intensified on a small land footprint to make room for biodiversity, for example creating large tracts of land on which trophic ‘rewilding’ can be attempted (Lorimer, Sandom et al. 2015, Svenning, Pedersen et al. 2016). At the other lie ‘agroecological’ and ‘wildlife friendly’ mixed crop and livestock farming practices that combine – rather than separate – conservation and agricultural production by enhancing biodiversity on farmed land. Both fundamentally rely on large herbivores (wild or domestic) to regulate vegetation structure and provide fertility.

Land use policy frameworks that adopt or attempt to reconcile these varying positions take various forms. At the international level, the ‘universal’ post-2015 development agenda (United Nations 2015) includes relevant targets under Sustainable Development Goals (SDGs) 2 (End Hunger), 3 (Health) and 15 (Life on Land), among others – with various interactions, co-dependencies and conflicts (Alcamo et al. 2020). Different national priorities, let alone social, cultural and agri-environmental contexts, have led to a diversity of policy approaches. Path-dependency in ministerial responsibilities and institutional frameworks has also shaped responses in different EU member states and regions (Bonnieux et al. 2006), as well as in the EU as a whole (Baylis et al. 2008, Heyl et al. 2021). As such, it is sensible to target policy-relevant research at national – or even sub-national – levels, taking into account the policy and political dynamics at play.

In the South-East of England (see **Figure 1**) these contrasting practices currently coexist, alongside more conventional livestock production systems and areas of conservation grazing. The South-East is a region of intense competition over land where national and sub-national policy-makers are attempting to address and balance multiple objectives (Defra 2018, Defra 2018, Defra 2018), making it a valuable case study with increasing relevance as pressures on land and resources continue to intensify globally. Extensive livestock production is one of the dominant land uses in this area (Defra 2013). However, other land uses also coincide which utilise large herbivores for conservation grazing, ranging from peri-urban nature reserves to a substantial rewilding¹ project.

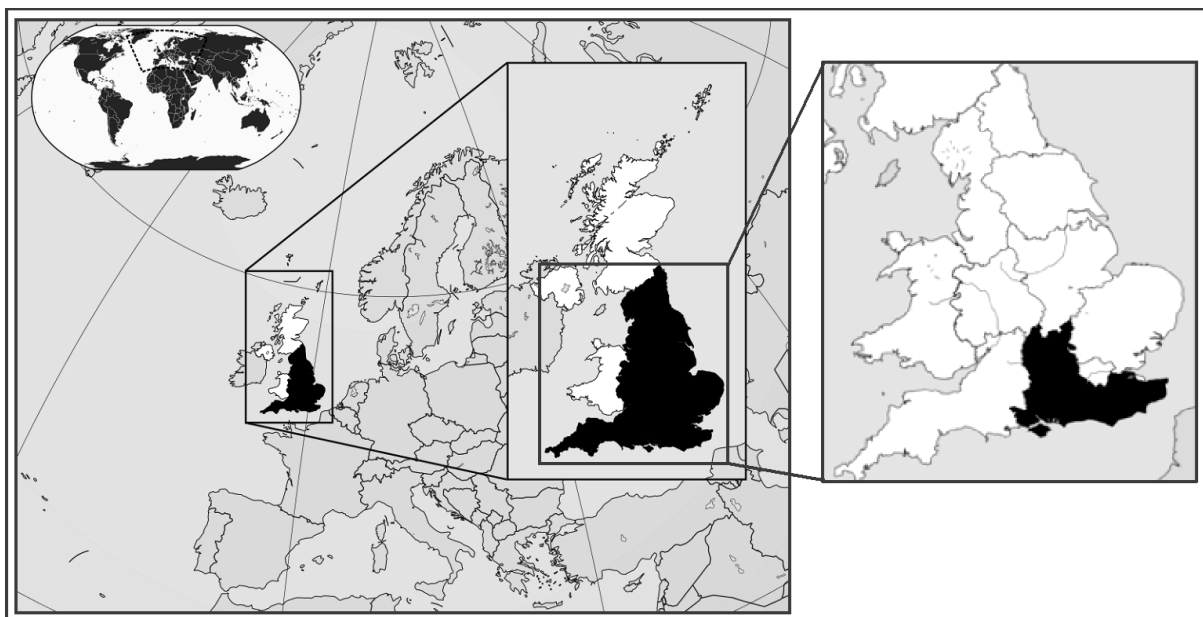


Figure 1. Nested maps locating the South East of England within England, Europe and the World. (Built on original images shared under Creative Commons license, by Wikimedia Commons).

Although these different land uses are currently underpinned financially by area-based payments and Higher Level Stewardship (HLS) payments through the European Union’s Common Agricultural Policy (CAP), the UK Government is developing a new Environmental Land Management Scheme (ELMS) to replace CAP measures following the UK’s departure from the EU. Both HLS and the new ELMS are policy instruments used with a view to assessing, rewarding and ultimately incentivising environmentally sustainable forms of land use and management, which is a complicated goal, not

¹ ‘Rewilding’ implies the return of land to a wilder and more natural state and is used especially with reference to the reintroduction of (large) mammals of (or similar to) species that were exterminated locally at some earlier period (Oxford English Dictionary).

least because the science behind such assessments is continuously evolving (Linstead, Barker et al. 2008). Nonetheless, policy approaches such as these, which are based on scientific understandings of 'Ecosystem Services', represent the most widely recognised of such frameworks.

The extent to which Ecosystem Service (ES) delivery is optimised by either separating agricultural production and nature conservation (land-sparing), on the one hand, or through agroecological and wildlife friendly farming practices (land-sharing), on the other hand, is now an important frontier for land use policy and research. Though initially framed as an "either/or" dilemma in relation to optimising trade-offs between biodiversity conservation and productivity, criticism of this has led to more nuanced views that recognise the value of "both/and" framings (Kremen 2015). Recent studies, for instance, have explored the use of spatially-differentiated approaches to optimising ES delivery through sparing land in some places and sharing in others (Maskell et al. 2013). However, given the historical and continued emphasis on production efficiency in agriculture and minimal harm in conservation (Wittman et al. 2017), as well as a failure to integrate agricultural and environmental policymaking (Candel and Pereira 2017), land-sparing has dominated policy and practice in the Global North by default. Despite gaining substantial attention from social-political scholarship (Glamann, 2017), land-sharing approaches such as agroecology, mixed farming and smallholder agriculture have suffered from a lack of effective support (Batary et al. 2015). Therefore, our aim within this paper is to explore connections between the management of large herbivores in the South East of England, through both land-sharing and land-sparing practices, and ES, as they are understood from a broad range of relevant perspectives. To do this we will present evidence from a participatory deliberative appraisal exercise in which expert stakeholders from across the policy-practice and farming-conservation spectra were asked to assess different land use and management options with respect to their capacity to enhance biodiversity, food security and broader sustainability.

By doing so we will produce insights into how both land-sharing and land-sparing practices are understood from different perspectives, thereby contributing towards a shift in the balance of stakeholder representation within scholarly debates about the trade-offs between food production and biodiversity conservation. We will also draw out some challenges concerning the usefulness of ES frameworks for assessing land use and management options and make suggestions about how they might be overcome through the development of participatory social appraisal tools and other deliberative-analytic approaches. We hope that this intervention is of particular use to individuals and organisations working at the research-policy and research-practice interfaces, including those seeking to both leverage evidence and encourage the adoption of improved methods with a view to influencing the direction of policy development in rural and peri-urban land use and management.

2 Materials and methods

The research presented in this paper is based on a Multi-Criteria Mapping (MCM) exercise that was undertaken between January 2018 and March 2019. MCM is a participatory social appraisal tool developed by Stirling et al. (see particularly Stirling and Mayer 1999, Stirling and Mayer 2001) as a way to intervene in complex policy debates by opening them up to include a broad range of perspectives, instead of intervening in order to "close down" debate around a narrow set of perspectives. Indeed, our choice to use MCM as a tool for policy appraisal, over alternatives, stems from the fact many other such tools "restrict the technical assessment of particular options under specific criteria to selected (even individual) specialists" (Stirling 2006: 103), whereas MCM provides a more open procedure within which participants can (re)define the terms of their appraisal iteratively and at multiple points during the exercise. An additional advantage of this is that it

generates qualitative data which is more amenable and appropriate for exploratory analysis through open coding than would have been generated through a more prescriptive procedure.

The MCM exercise included (1) a research design phase in which desk research, scoping interviews and a focus group meeting were conducted, (2) a formal structured interviewing phase through which the data presented in this paper was gathered (Stirling and Coburn 2014), and (3) a workshop. As part of this, a range of experts from across the South East of England were engaged, who represented different perspectives on the issues – both in policy and practice – surrounding the management of large herbivores on both agricultural and conservation-oriented sites. The remainder of this section will be focused on first outlining some key concepts and then describing the data collection and analysis techniques used in phases 1 and 2.

2.1 Concepts

2.1.1 Ecosystem Services

Developed in the 1970s and 1980s, the Ecosystem Services (ES) approach to sustainable land use and environmental management – which is most comprehensively exemplified within the Millennium Ecosystem Assessment (Millennium Ecosystem Assessment 2005) – hinges on the notion that by clearly articulating the benefits that ecosystems provide to people, science and policy can positively influence global ecosystem change (Haines-Young and Potschin 2010). This approach has been applied widely in an attempt to appraise options on the basis of their ecological implications. In particular, land use changes and their impacts on ecosystem services have been widely studied (Crossman et al. 2012, Maes et al. 2013; Fu et al. 2015; Hasan et al. 2020) and applied in various ways to decision-making (Reyers et al. 2009; TEEB 2018; Ribeiro and Šmid Hribar 2019). However, much less attention has been paid to the application of ES frameworks on the ground and the implications of translating the theory into policies and practices that can support transitions towards sustainability (though see Dendoncker et al. 2018 where this has been attempted through the development of more integrated procedures for valuing ES in relation to agroecology).

The ES approach has also been criticised for the potential of ES valuation to socially and historically decontextualize environmental degradation and thereby occlude more socially transformative pathways (Melathopoulos and Stoner 2015). In a process akin to the disembedding of “fictitious commodities” from their social and natural roots (Polanyi 1944), scholars have raised further questions about the disempowerment associated with applying ES approaches to “green grabs” linked to “biodiversity conservation, biocarbon sequestration, biofuels, ecosystem services, ecotourism or offsets” (Fairhead et al. 2012). But despite these criticisms, ES frameworks have become perhaps the dominant approach to valuing (in monetary or other terms) land use options beyond agricultural market values and have been taken up explicitly in UK policy (Bateman, Harwood et al. 2013).

Therefore, with a view towards the application of the framework in a cautious, critical manner, we will use a blended ES framework which combines the categories of ES used within the Millennium Ecosystem Assessment and the UK-relevant ES categories used by Haines-Young and Potschin in their report for Defra (Haines-Young and Potschin 2008, following Linstead and Barker et al. 2008) as a heuristic device to aid our interpretation, thus enabling us to identify correspondences and divergences of our data from the ES categories and explore alternative meanings and their implications (see section 2.3 below). In line with the Millennium Ecosystem Assessment (2005), we will include ‘supporting’ services, but we will combine them in the same category as ‘regulating’ services (see section 2.3 below), as empirical instances of these two types can be particularly hard to disentangle from each other in practice (Haines-Young and Potschin 2010, Fu, Su et al. 2011).

2.1.2 Environmental impacts and participatory social appraisal

Debates about the environmental impacts of animal sourced foods and the land-sparing versus land-sharing debate are characterised by different forms of incomplete knowledge (including examples of uncertainty and ambivalence (Stirling 2010)). For instance, in attempts to compare the environmental impacts of different livestock production systems, scientists have struggled with uncertainty over how to most robustly quantify relevant factors, from the relatively discrete (e.g. GHG emissions from rumination) to the open-ended (e.g. changes in global food demand). However, they have also struggled with ambiguity over which factors are relevant to assessment in the first place. Given the degree of division between proponents of competing visions of the future for a more environmentally sustainable global food and farming system, i.e. implied by the Life Sciences versus Agroecological/Ecological paradigms (Lang and Heasman 2004, Levidow 2015), ambiguity – that is “a state of knowledge in which there are acknowledged to exist divergent, equally valid ways to frame different possible outcomes” (Leach, Stirling et al. 2010) – is a defining characteristic of these debates.

Participatory social appraisal is a particularly relevant analytical approach to inform decision making in policy and practice in situations characterised by ambiguity (Leach, Stirling et al. 2010). Combining participation and research, participatory social appraisal is a way to incorporate “more diverse, extensive and context-specific bodies of knowledge and to take more careful and explicit account of divergent values and interests” (Stirling 2006: 96), whilst also addressing a normative imperative to increase democratic participation in decision making. Moreover, from the perspective of ES proponents, policy appraisal procedures are seen as important sites for embedding ES frameworks within public policy (Turnpenny, Russel et al. 2014), making our decision to combine ES and policy appraisal all the more relevant. In the next section, we will describe how we have used Multi-Criteria Mapping (MCM) to do this.

2.2 Data collection

The interviewees (participants) that were recruited for the exercise included 13 individuals, covering 14 different ‘perspectives’ (in the MCM lexicon, a perspective is “a grouping of viewpoints that may be seen on the basis of MCM analysis to display certain features in common” (Stirling and Coburn 2014). These perspectives relate to: (1) the dominant land use type of any relevant site that the individual is connected to; (2) the participant’s relationship to land/property; (3) the remit of their professional roles; and (4) the sector that they are most closely associated with. Individual participants were assigned to multiple perspectives, though not all perspective groups were found to be relevant to all participants (**figure 2**). Taken overall, the 14 perspectives encompass the most prevalent stakeholder positions with respect to the farming and conservation landscape in the South East, representing large landowners (including agricultural and conservation-focussed estates), tenant farmers, farm-workers, conservation charities, land agents, legal advisers specialising in environmental and property law, utility companies, trade unions, local authorities and national government departments.

This list of target perspectives was arrived at through a period of background research and reflection that involved accessing secondary sources and mapping key actor positions operating within regional conservation and agricultural systems. In order to identify relevant individuals and assign them to the different perspectives, a database was built up through a combination of desk research focussed on accessing relevant websites and online archives, and informal scoping interviews conducted by telephone. This database was then used to sequentially select and recruit individuals into the research, so that in combination, all perspectives were covered. Full details of which participants were assigned to which perspectives can be found in the **appendix** (Appendix A).

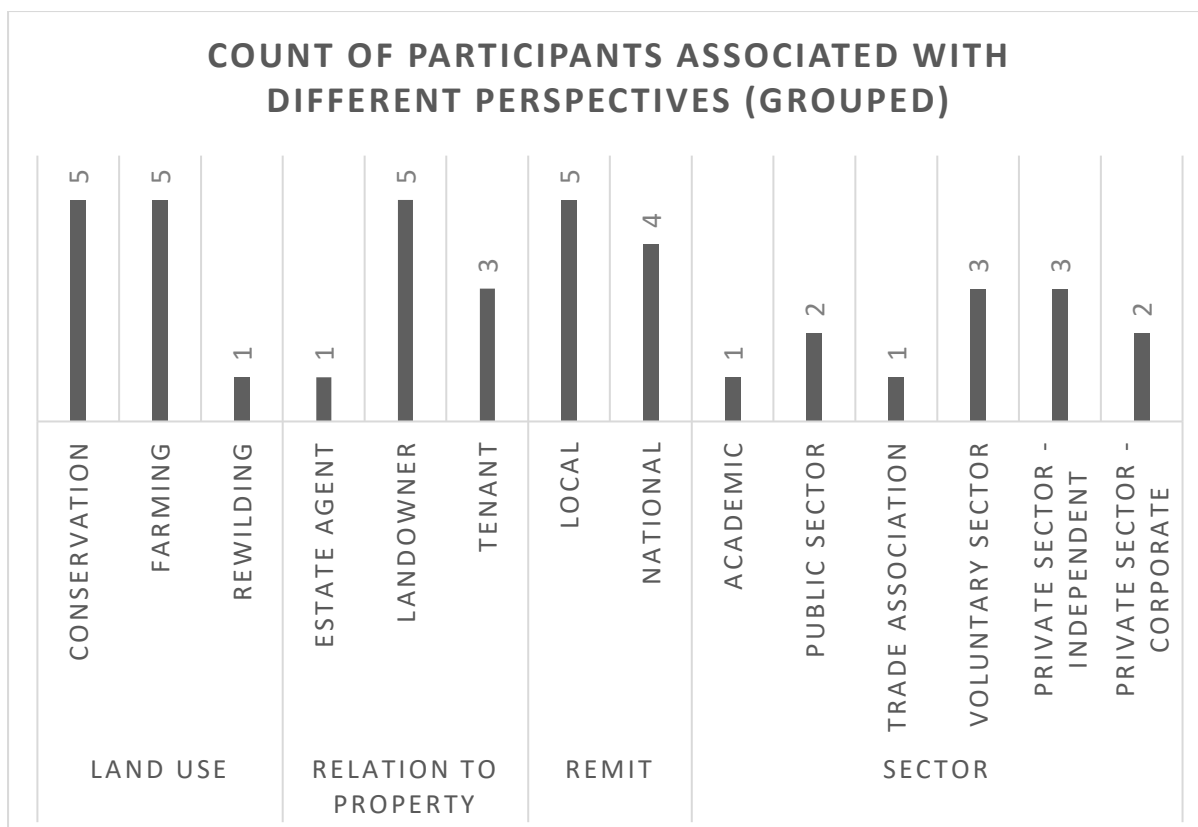


Figure 2. Bar chart showing the numbers of participants representing each of the 14 perspectives.

The thirteen expert interviewees were individually led through an appraisal process in which they were invited to assess contrasting land use and management *options* (phrased in terms of “*strategies* for enhancing biodiversity, food security and broader sustainability through the management of large herbivores within peri-urban and rural landscapes in the South East of England”). At no point did the brief mention ecosystem services or any service categories or sub-categories. Participants were provided with four core options to appraise and were asked to volunteer any additional options that they thought warranted appraisal in parallel. They were then asked to volunteer their own criteria for conducting the appraisal (typically 4-8 criteria). This involved coming up with criteria titles, key features and more detailed descriptions. Some of the participants had come to the interview with a list of criteria that they had pre-prepared, whereas others took time to think about and discuss their criteria with the interviewer. Next, they were led through a scoring process that enabled them to attribute pessimistic (‘at best’) and optimistic (‘at worst’) scores for each of the options against each of the criteria. The use of scoring ranges instead of discrete scoring allows for the articulation and exploration of uncertainty and ambiguity in relation to the performance of options under different conditions (see Stirling and Coburn 2014). Finally, they were asked to weight the criteria that they had used, before being presented with a ‘final ranking picture’ that showed the average scoring ranges for each of their options – combining the scores for all criteria, weighted accordingly – so that they might be able to reflect on their overall assessment of the options. Throughout the interviews, participants were seated at a computer terminal next to the researcher, who typed their definitions and comments into the screen using the MCM tool (Stirling and Coburn 2014). Participants were asked to review each entry as they progressed through the appraisal and were invited to type their own entries, though none opted for the latter.

The four options that the interviewees were presented with were carefully constituted through a multi-staged process during the spring and summer of 2018. The aim of this was to produce a set of discrete options that collectively encompass a broad range of relevant practices on the sparing-sharing spectrum, are divergent enough to allow comparison, and are indicative of the sorts of practices currently in use in the region. The first stage involved reviewing official statistics and literature on contemporary conservation and agricultural practices used within the South East of England (including Greater London, East and West Sussex, Kent, Surrey and Hampshire) and empirically mapping the different sorts of practices currently in use in the area (which ruled out the inclusion of intensive indoor livestock production as an option; for more information see the Compassion In World Farming report (2019)). Data concerning the types of livestock kept as well as legal, managerial, social and ecological characteristics of the sites, was gathered through desk research on a total of 46 sites on which large herbivores were being kept. Two draft versions of the options were produced from this stage. The second stage involved conducting scoping interviews with expert informants who indicated their preference between the two draft versions and helped to improve the favoured version. The final stage involved piloting the MCM interview process with members of the research team and two additional expert informants, in order to further improve the options. A final version of the four options was produced from this stage (**figure 3**). This was incorporated into a briefing booklet that outlined the MCM interview process and was distributed to interviewees prior to their interviews; a digital copy is provided as a supporting document to this paper.



Figure 3. The four MCM options used within the appraisal interviews, as rendered within the participant briefing pack.

2.3 Analysis

For the purposes of this paper, *quantitative* 'ranks' charts of the core options were produced, which show the rankings of the options as assessed by: (1) all of the participants using all the criteria (overall ranks), (2) subsets of the participants using all of the criteria (overall ranks, by perspective),

(3) all of the participants using subsets of the criteria (sub-ranks, by ‘issue’²), and (4) subsets of the participants using subsets of the criteria (sub-ranks, by issue and perspective). Sub-ranks represent scores (extrema and mean; pessimistic and optimistic), multiplied by normalised weights, that calculate the ratio of each criterion weight to the sum of all criteria weights, rather than using only those weights pertaining to criteria within the selected issue groupings (Stirling and Coburn 2014). These ranks charts were then used to identify particular *options* and *issues* that polarised opinion and to explore which, if any, of the *perspectives* might be associated with these divisions. They were also used to highlight areas of common ground between perspectives on particular options or issues. These preliminary findings were then taken as lines of inquiry to be further explored in the qualitative data deriving from the MCM interviews.

The validity and relevance of the perspective groups was tested by reviewing the ranks charts for each individual participant and clustering them inductively through an iterative process (i.e. visually comparing the patterns of ranks and then using logical queries to carefully check their coherence). The result of this process was to show that the Conservation perspective (n=5) has a high level of coherence, whereas the Farming perspective (n=5) might be better broken down into three sub-groups comprised broadly of ‘Farmers’ (n=2), ‘Agroecologists’ (n=2) and ‘Estate Managers’ (n=1), if the research were to be repeated. It was not possible to test the coherence of the other perspective groups as the numbers of individuals assigned to them were too small.

The *qualitative data* produced from the exercise include definitions of 67 appraisal criteria volunteered by the 13 participants (each including a title, key features and a description). These data were subjected to a detailed thematic analysis (Boyatzis 1998), which involved several stages of iteration, to both test the validity and consistency of the predefined ES categories and to generate a set of more grounded empirical categories and emergent (interpretive) themes, linked by branches within a tree of codes. Initially, the three top-level ES categories were used for clustering the criteria, alongside a residual category for criteria that fall outside of them and a cross-cutting category for criteria that cut across them. These categories include ‘supporting and regulating’ or SRES; ‘provisioning’ or PES; ‘cultural’ or CES; ‘cross-cutting’ or CCES; and ‘residual’ or RES. Then a set of empirical categories were developed through an analysis of the terms most frequently used to define the criteria within each ES category. Finally, a subset of interpretive categories was arrived at through a process of deducing common meanings amongst criteria relating to each of the empirical categories. This process was revisited, and empirical and interpretive categories were compared and, in some cases, combined.

A graphical representation of the methodological design illustrating the use of MCM analysis (based on Coburn and Stirling 2019) within the wider participatory social appraisal exercise is provided as an **appendix** (Appendix B) to the paper.

3 Findings

In this section an account will be provided of the 67 appraisal criteria volunteered by the 13 MCM participants, in order to demonstrate the relationships between the criteria and the three predefined ES categories (section 3.1). Attention will then be paid to criteria that do not fit with the ES categories (section 3.2). Subsequently, an account will be provided of how the performance –

² The option to (dis)aggregate criteria under different ‘issues’ is an in-built function of the MCM tool, which allows the researcher to define a set of issues and allocate criteria among them. These issue groupings can then be used to produce sub-ranks charts. In this exercise, the ‘issues’ used to cluster criteria were the same as those used in the qualitative analysis (i.e. SRES, PES, CES, CCES and RES – see below).

against these criteria – of the four land use and management options, varies under different perspectives (section 3.3). To aid readability, both empirical and interpretive categories will be referred to simply as ‘themes’. The first letters of criteria titles will be capitalised and, as per usual conventions, any terms or phrases quoted verbatim will be inserted within speech marks and reference will be made to the participant being quoted. Participants are referred to within the text using either their organisational affiliation, or, if they opted to make their data responses non-attributable, either their job role or a descriptive title will be used. We urge the reader to view the graphical abstract for this paper – within which the research findings are presented visually – in parallel to reading this section.

3.1 Criteria relating to conventional ES frameworks

From amongst the 67 criteria, close to 70% (n=49) were found to relate to the predefined ES categories SRES, PES, CES). Of these 49 ES-related criteria, two were framed in ways that cut across the SRES, CES and PES categories, offering wide-ranging and generic accounts of goods and services provided to society (n=2 for CCES). The other 47 were found to relate principally to either the SRES (n=21), PES (n=13) or CES (n=13) categories. It is worth noting, however, that only two participants actually used the term ‘Ecosystem Services’ at any point in the interviews, and only one out of these two participants used this term substantively. In defining a criterion with the title ‘Ecosystem Services’, this participant listed a range of properties which relate to both SRES and CES categories. However, in applying the criterion through the allocation of scores, the participant was only concerned with the SRES aspects, so this criterion was coded to the SRES category. This approach – of checking consistency between the criteria definitions and the way that they were applied by participants in practice – was applied throughout the process of allocating all 67 criteria to the five top-level codes, therefore ensuring high level of validity of the analysis.

Supporting and Regulating Ecosystem Services (SRES): The most prominent themes that came from analysing the 21 SRES-related criteria included ‘biodiversity’ and ‘soil’. In total five separate criteria were volunteered with the title ‘Biodiversity’, a further five having the word biodiversity or diversity in their titles (including ‘Capacity for Diversity’, ‘Impact on Biodiversity’, ‘Species and Biodiversity’, ‘Stopping Biodiversity Loss’ and ‘System Diversity’) and a further four being about aspects of biodiversity (titled ‘Habitat connectivity’, ‘Connectivity’, ‘Plants and Animals’ and ‘Space for Nature’). Hence, the majority of the 21 criteria relating to SRES are specifically about (aspects of) biodiversity. Amongst these criteria, both diversity of habitats and diversity of species were frequently discussed and generally distinguished from each other, though both aspects were assumed to be a positive feature by all. One participant focussed on species diversity in the definition that they gave for a criterion titled ‘Biodiversity’, as follows: “abundance of wildlife in terms of biomass and species diversity, across the site, over a range of habitats, focussing on both short term gains, or ‘quick wins’, and longer term sustainability of the species and habitats” (05). Others, however, focussed more on diversity of habitats. Though this is described in subtly different ways, the meaning seems fairly consistent across most perspectives and is concisely summarised by one participant in terms of a “mix of target habitats” (07).

A further four SRES-related criteria were primarily concerned with soil, expressed variously in terms of “soil health” (08, 13), “soil fertility” (09), and “sustainability” and “regeneration” of the soil (11), within their titles or key features. Soil was also mentioned by several participants in connection to biodiversity (03, 08, 12), as well as other SRES and PES-related themes. Participant 13, for instance, summed up soil health in terms of “capacity to support nutritious food production and contribute to climate change mitigation”. Other aspects of soil highlighted within participants’ criteria included “balance of nutrients within the soil, mycorrhizal activity and carbon sequestration” (08) “absorptive

capacity" (09) and "processes of regeneration" (11). Finally, whereas one out of the remaining three SRES-related criteria describes a nature-based approach towards land management titled 'Working with Nature' (09), the other two list bundles of services. For instance, one participant listed various types of SRES under the title of 'Environment', including air quality, water quality, flood water management, carbon sequestration, climate change objectives and soil health (03).

Provisioning Ecosystem Services (PES): With 11 separate criteria relating to it, the provision of food emerged as the most prominent PES-related theme and second most prominent theme from across all the criteria. In fact, only two other environmental 'goods' were mentioned, by only two participants: energy and water. Framed predominantly as an output, food was considered in terms of both its intrinsic values (relating to quality, quantity and variety), as well as its contribution towards extrinsic or relational values (such as affordability, security and sustainability). In terms of quantitative appraisals of food output, this was generally construed in terms of the amount of food produced by unit area, with calories per hectare given as a likely metric. Issues relating to quality that were mentioned by participants include taste (12), nutrition – i.e. "nutrients, balance of fatty acids, health-giving properties" (11) or "fat content [and] carcass quality" (08), and safety (03). Variety, which was the other intrinsic value mentioned, was expressed by one participant as a measure of the "diversity of products" produced from the different options (04).

In terms of more extrinsic or relational values, one participant (03) mentioned the importance of "affordability and availability of food to the majority of people" as a consideration. This concern for the way that food outputs from the different options might be accessed and consumed by people was a common theme. Hence, another participant asked: "Is sufficient food produced to meet societies' needs?" (12). Other participants made links between food security, healthy eating and sustainability, touching on aspects that relate to the CES category. One in particular was concerned with the "capacity of the model to contribute to local and national food security, linking food security to dietetic advice and health agendas" (13); for another, the different options hold variable potential to contribute towards the "wider societal benefits of behaviour change around meat eating" (07). For two other participants it is the "environmental impacts of production" (11) which underpin food provision and provide a link to food security, as "very high input methods may be unsustainable therefore not 'secure'" (10).

Another characteristic of the PES-related criteria is the prominence of statements about priorities and trade-offs between the various different themes. For instance, participant 04 defined their criterion (titled 'Food Security') as "a trade-off between quantity, quality and diversity" (04), without specifying a generic order of prioritisation. For participant 02, quality is clearly prioritised over quantity, "because of the impact of food production on the environment" (assuming an inverse correlation between food quality and environmental impact). Referring to yet another trade-off, participant 03 commented that "in terms of food safety, food security is not about cheap food" (03), meaning that affordability is important, but not at the cost of safety. In a similar vein, participant 07 talked about the "prioritisation of land use for meat production" (07) as revolving around a choice between "cheap meat or high quality more expensive meat". All these comments were provided within definitions of PES-related criteria.

Cultural Ecosystem Services (CES): Education (and knowledge) was the most prominent theme from amongst the CES-related criteria (contained within four criterion titles and included within the key features of a further three criteria) and was generally understood as pertaining to individuals rather than organised groups or collectives. The sort of individuals envisaged by participants included the public as well as farmers, and both young people and old. For the public, this means learning about food production and land use – i.e. to help them understand "why the estate is being

managed in that way” (02), to give them “an understanding of human relationships with the land historically” (08), and to educate them about “food production and what good food is, so that they understand the compromises involved in producing food in different ways” (10). For farmers, it’s about providing opportunities for them to learn techniques and approaches “for future sustainable food production” (13) and “getting them to open their eyes to new ideas that are not totally based on high inputs – ideas that work for small farms and help them survive” (10). This participant also emphasised the importance of providing “opportunities for multiple family members to be employed on the land or farm business” (10), as a way to retain “the value of tacit and traditional knowledge of farmers”.

Another CES-related theme is health and care (in two criterion titles and the key features of another) – or the “capacity [of the option] to promote human health and social care”, such as could be provided through “social or care farming” (13). Four participants linked positive outcomes for mental and physical health with access to land for recreation, whether “virtual or real” and relating to both “local communities and general publics” (05). The health of land managers and workers was also considered by two participants, with one asking whether “those involved in the option have good mental health” (12) and the other being concerned about the ‘Lifestyle’ of those working the land “in terms of happiness, busy-ness and flexibility” (08). Two additional themes that emerged from analysing the CES-related criteria are engagement and development. The term engagement was commonly used by participants in relation to a number of other concepts that feature in the criteria, some already mentioned, including access, involvement, consultation, education, advocacy, participation, connection and community. Attempting to generalise over much of this, one participant asked, “Does the option integrate the community in its operations and objectives?” (12). The term development was used more specifically in connection to rural, particularly agricultural, communities and their reliance on a range of business services, as “every farm needs a vet, haulier, merchant and so on – the vital supporting services – and when in place they also provide employment” (03).

A more general characteristic of the CES-related criteria is their application at different times, by different participants, to either people as individuals or as collectives. For instance, as demonstrated above, the education, health and care-related benefits of different options were frequently framed in relation to individuals. However, the themes of engagement and development both explicitly concern people as collectives, related to each other within communities, in addition to having relevance to people as individuals.

3.2 Criteria outside conventional ES Frameworks

The thematic analysis of the 18 residual criteria (RES) volunteered by participants produced two top level themes and five further sub-themes: Viability (including financial, political and practical) and Desirability (including ethics and efficiency/effectiveness). Only four out of the 18 criteria reflect matters of desirability – the rest all reflecting issues of viability.

Desirability: “Land Use Intensity” emerged as a particularly important consideration for one participant, who used this criterion to enable comparison of the options in terms of how efficiently and effectively they use land, albeit that they are using it in different ways, for different purposes. For this participant, it is paramount that land is used in an efficient and effective way in order to mitigate the pressure from agricultural expansion, which is fuelling biodiversity loss; thus, whereas inefficient use of land could be a *viable* option, it is not a *desirable* one. Another matter of desirability emerged as a consideration for several of the participants (08, 10, 11 and 13). According to these four, Animal welfare, i.e. “capacity of the model to promote high level welfare of farmed

animals through the whole system, birth to death” (13), must be maintained above a certain level for an option to be considered desirable.

Viability: As a term, “viability” was resonant for a number of participants. Of the four who used it in their criteria titles (and one other who used it as part of their criterion description), all were citing economic or financial matters. For instance, several participants felt that it was important to consider the options from a business perspective, either in terms of “value of outputs” against “value of inputs” (02); “productivity”, “market size” and “costs” (01); or whether there is a “basic profit-making model” underlying the individual enterprise (13). One participant was specifically concerned with the behaviour of consumers (“it is often only ABC1 groups that are able to buy direct from the producer or local butchers”), which they claimed is what “drives markets” and therefore determines viability (06). Another, whose ‘market’ is an internal one, focused on reputational benefits, or the capacity of the different options “to justify the cost of environmental services from internal budgets” by “producing good stories for customer sales purposes” and “showcasing” the company’s “interest and concern for the environment” (07). Participants were also concerned with the extent to which the options represent a “long term financially stable method of land use” (13) – or in other words, the “sustainability of the underpinning finances” in terms of a “50+ years’ consideration of where the money comes from” (03).

Several other aspects of broader ‘viability’ (i.e. ability of the options to survive or work successfully) were also volunteered as appraisal criteria. Political support was raised by a participant who indicated various levels of policy and politics as being relevant, including “national, international (by which I mean agro-environmental schemes), local councillor support at the ward level, planning permission, the SDNPA [South Downs National Park Authority], and other relevant statutory bodies” (Local Government). More ‘practical’ aspects of viability concern the availability of expertise – in terms of “land manager knowledge and experience” (06), or the “skills, education, staffing required” (01) – and the suitability of the options’ locations in relation to their surroundings, with respect to access and connectivity, as well as their “size, fertility and history of management” (02). In connection to the issue of expertise and linking this with the changing political landscape, one participant highlighted that “if new opportunities or different techniques or goals are to be incorporated into the system then that knowledge and learning has to come from somewhere” (06).

3.3 Exploring different viewpoints

Figure 4 below shows the ‘ranks chart’ for all participants (and therefore all perspectives). It displays the ‘ranks’ (overall performance scores) for each of the core options under the complete range of criteria that were developed by all of the individual participants through their appraisal interviews. Each bar in the ranks chart below is an aggregation of the individual ranks assigned by each participant, which in turn are calculated as the sum of the scores under individual criteria, each multiplied by the normalized weighting for that criterion (Stirling and Coburn 2014). The ‘rank extrema’ (thin lines) give an impression of the full variability in the ranks assigned by different participants, whereas the ‘rank means’ (thick bars) give an impression of the distribution of participants’ ranks within the full ranges.

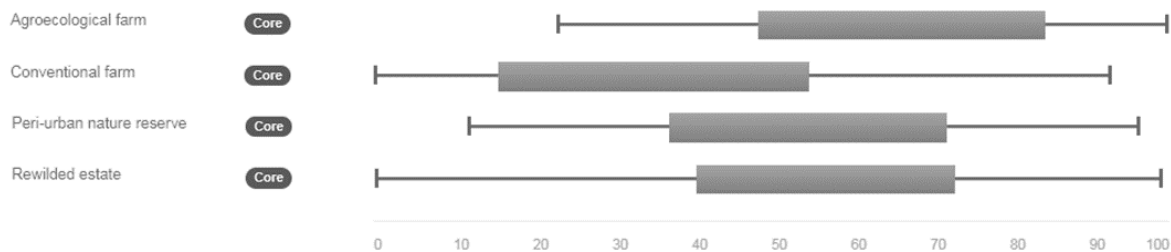


Figure 4. Ranks chart showing the aggregate ranks for the core options, calculated using pessimistic and optimistic scores assigned by all perspectives using all criteria.

On the surface, this chart suggests that there is an overall ‘winner’ and an overall ‘loser’ of the MCM exercise (the Agroecological Farm and the Conventional Farm respectively) and the other two options are relatively close ‘runners-up’. It also shows that there is a high degree of variability between the ranks assigned by different participants, for all four options, which indicates – as anticipated – considerable ambiguity and/or uncertainty in relation to the options. However, it is important not to misinterpret or overemphasise the final ranking outcomes – in particular, the picture of ranks does not represent statistically significant preferences about land use. Rather, it provides an indication of how the options defined within this exercise have been appraised by a group of appraisers who were selected for their capacity to view the issues from a range of relevant perspectives. The data therefore become more interesting when they are cut according to the different perspectives and issues, revealing how performance of the options is understood from those perspectives and in relation to those issues.

For instance, patterns of performance according to the Conservation perspective, on the one hand, and the Farming perspective, on the other, are particularly contrasting. Under the Conservation perspective, the Conventional Farm is universally disfavoured (there is a common ‘foe’) but there is disagreement over which of the other options is *most* favourable, whereas under the Farming perspective the Agroecological Farm is most favoured (a common ‘friend’), but there is disagreement over which of the other options is *least* favourable. The contrast between perspectives concerning remit (Local versus National) and sector (Private versus Public) is less pronounced in both cases. A striking difference, however, between the ranks for the Local and National perspectives is the difference of attitude towards the Conventional Farm option. The Local scores for this option are strongly skewed to the pessimistic end of the scoring range, whereas the National scores are skewed slightly to the optimistic end, suggesting that there may be more sympathy towards conventional farming from the National perspective.

This specific contrast is echoed in qualitative accounts of ‘food security’ provided by participants, wherein different geographical scales emerge as drivers of the different perspectives. For instance, for one participant in the Local perspective (12), considering food security means asking whether the option supplies “the local community”, whereas for participants in the National perspective (03), food security means “self-sufficiency of the UK” and “global societal systems” (01). Likewise, contradictory accounts of biodiversity highlight another polarising issue. Whereas, for participant 04 (Conservation perspective), “genetic diversity is not a level of detail that is relevant here”, for participant 13, biodiversity is framed in terms of the “extent to which the model has the capacity for diversity of herbivores and other land uses to support biodiversity, including agro-biodiversity, in terms of genetic diversity and traditional practices, for enhanced resilience”. In contrast to the previous account, this framing is particularly sympathetic to agroecological practices, which enhance

biodiversity on farmed land and consider the whole farm system, including different breeds of domestic species, as relevant to biodiversity conservation.

4 Discussion

Our research shows that selected stakeholders – surrounding the management of large herbivores on sites in the South East of England that span the land sparing-sharing spectrum – incorporate elements of SRES, PES and CES in their framings of performance. Taken alone, this finding strengthens arguments advocating for ES approaches to be used in the assessment of agricultural systems (Crossman et al. 2012; Maes et al. 2013; The Economics of Ecosystems and Biodiversity (TEEB) 2018). However, looking in more detail at the most prominent themes to emerge from a thoroughgoing thematic analysis of the empirical data associated with the 49 ES-related criteria (titles, key features and descriptions), the findings reveal a more challenging picture.

As demonstrated in section 3.1 above, within SRES, the most prominent themes relate to biodiversity (in terms of habitats and species) and soils. Given the set-up of the MCM exercise, which included the phrase ‘enhancing biodiversity’ within the overarching goal, it is unsurprising that biodiversity features as a theme. However, the predominance of this theme is worthy of note, as is the prominence of soil as a theme and the fact that other SRES-related themes – for instance relating to air quality, climate regulation, control of pests and diseases, erosion control, pollination, water regulation, nutrient cycling, and so on – did not emerge more clearly (many only featured tangentially, in connection to biodiversity or soil). These findings offer challenges to conventional ES frameworks, as neither biodiversity nor soil (as construed by the participants) are clearly defined within them. Instead, soil cuts across conventional SRES subcategories, whereas biodiversity seems to sit semi-invisibly behind them, concealing a raft of complex, non-linear relationships (Haines-Young and Potschin 2010). Therefore, conventional ES frameworks may fall short of assessing SRES-related aspects of land use and management options that incorporate agroecological practices, within which both biodiversity and soil take on particular significance and specific meanings that are not well aligned with subcategories of SRES.

Turning now to PES, the most prominent themes relate to food provision – in terms of both the intrinsic values relating to the quality, quantity and variety of food provided and the extrinsic or relational values of that food, such as its affordability, the security and sustainability of its supply, and the contexts of its consumption – almost to the exclusion of any other outputs (e.g. fuel, fibre, freshwater, medicines and so on). This in itself is unsurprising as the set-up of the MCM exercise included the phrase ‘enhancing [...] food security’ within the overarching goal. Nonetheless, a striking characteristic of the criteria definitions relating to food, which goes beyond the scope of conventional ES frameworks to account for, is the prominence of statements about priorities and trade-offs between the various different themes. What this clearly reflects is the inextricability – or indeed ‘embeddedness’ (Sonnino and Marsden 2005) – of the values that can be derived from PES and the contexts in which they are produced and consumed – in terms of contextual differences between different options or sites, aspects of the competitive environment and elasticity surrounding them, and varying contexts of food consumption. In light of this, and the fact that all of these considerations about intrinsic and extrinsic values must be prioritised in practice by landowners and managers themselves on a site-by-site basis, conventional ES frameworks – which provide no method of prioritisation – cannot offer a comprehensive solution for assessing land use and management options if agroecological practices are taken into account.

Regarding CES, the most prominent themes relate to education, health and care, with engagement and development also featuring prominently. Within these themes a wide range of other issues are

represented, spanning most of the subcategories of CES used within conventional ES frameworks. Moreover, a striking contrast between and within the various CES-related themes, which is challenging to conventional ES frameworks, concerns their application to either people as individuals or as collectives (see section 3.1). This ambiguity is challenging to conventional ES frameworks because it makes the various subcategories of CES extremely difficult to compare or reconcile with each other, as they relate simultaneously to different scales and locations – including landowners and managers themselves, their family members as individuals, individual members of the public, individual members of local communities, local communities as collectives, consumers and citizens as collectives, and so on. We therefore suggest that applying these categories in the context of agroecological practices demands particular sensitivity – in contrast, for instance, to conventional agricultural options which are not typically community-oriented in the same ways or to the same degree (Whatmore, Stassart et al. 2003, Renting, Schermer et al. 2012). Though some literature has begun to explore this and other issues relating to the assessment of CES (Bryce, Irvine et al. 2016, Fish, Church et al. 2016, Fish, Church et al. 2016, Tratalos, Haines-Young et al. 2016, Chen, de Vries et al. 2019), little work has adopted a structured, participatory approach, allowing stakeholders and participants to identify their own framings of the problem (Stirling 2006, Stirling 2010, Bernues, Tello-Garcia et al. 2016, Schmidt, Walz et al. 2017), nor has attention been directed to addressing this in the context of agroecological practices.

Looking across, within and between SRES, PES and CES, divergent perspectives (in particular between conservation and farming) can be identified, underlining the fact that values and interests differ within and across stakeholder groups and illustrating the utility of MCM in ascertaining those differences. These perspectives revealed divergent framings of certain issues (e.g. food security in relation to multiple geographical scales and biodiversity in relation to multiple ‘biological scales’, including genetic diversity, species diversity and habitat diversity), with varied relevance for the different options (e.g. agroecological practices tend to be oriented towards local communities whereas conventional farming tends to be oriented towards national and global markets; genetic diversity of livestock is highly valued within agroecological practices but less so within conservation, where the focus tends to be on species and habitat diversity). The implication of these findings for the use of ES frameworks in assessing land use and management options is that care must be taken to ensure that assumptions (e.g. whether contribution to food security is sought at the local, national or global level and whether biodiversity is sought at the genetic, species or habitat level) are made explicit.

Our findings also point towards other stakeholder considerations that fall outside of conventional ES-focussed studies, as well as more integrated forms of ES assessment (e.g. Dendoncker et al. 2018). These considerations were found to focus on aspects of viability and desirability of particular options – both of which illustrate the context-specificity of performance within multi-level policy regimes and ecological and socio-cultural contexts. In particular, the three ‘Viability’ sub-themes – financial, political and practical – are all very rooted in the national and local context in which the particular land manager is operating. This relates not only to the biophysical environment but also the socio-cultural and policy environment. For instance, as shown in section 3. 2, participants’ main concerns relating to viability are: How profitable is the option? Is there enough money to support land managers and workers now, and for investing in the future? Where is the money coming from? And, how sustainable are the finances over generations? Hence, broader aspects of viability of concern to participants relate to the landscape of political support for the option, the availability of expertise required for making a success of it, and the suitability of the option in relation to the characteristics of specific sites. This emphasis on context-sensitivity highlights the importance of localised considerations to decision-makers – especially those working at sub-national levels.

To our knowledge, previous ES studies of re-wilding in the UK have not incorporated viability considerations. Likewise, ES-led studies looking at different types of farming have not – to our knowledge – explicitly dealt with financial, political and practical viability issues, even though these may have been taken into account in studies of agro-ecological farming that have not incorporated ES measures (Laughton 2017). This represents a disjuncture in the literature that this study highlights and – to some extent – begins to bridge. However, it is difficult to imagine how ES frameworks might be extended to be generalizable across these issues.

5 Conclusions

Land-sharing and land-sparing practices, such as those surrounding the management of large herbivores in the South East of England, are understood in different ways, from different perspectives. Through exploring how their relationships to the delivery of ES vary under differing views, we have opened up land use policy and research to include a wider set of considerations than previously attended to. This has helped to move the discussion forward by re-emphasising the limitations of conventional – as well as more integrated – ES frameworks and suggesting a direction for future scholarship.

Taken overall, our findings have uncovered a lack of sensitivity of conventional ES frameworks to the specific concerns, priorities and ambiguities of agroecological practices; an inability to encompass multiple scales and localities; and limitations to incorporating localised considerations. Even if they do not allocate a monetary value to ecosystem services (thus falling short of creating Polanyian ‘fictitious commodities’), ES approaches still ‘disembed’ natural processes from their local contexts. Therefore, in order to re-embed the kinds of data gathered by ES-based assessments of land use policy, we suggest more attention is paid to an additional set of stakeholders’ considerations which focus on viability and desirability, lie outside of traditional ES categories, and rest on biophysical, socio-cultural and political-economic (e.g. policy) conditions. This presents opportunities for incorporating such context-specificities into mapping approaches that aim to broaden out perspectives and present open, plural and conditional (Stirling 2008, 2010) advice to policy and practice. Thus, we believe that further development of the MCM tool – as well as other approaches that aim to broaden out perspectives and present open, plural and conditional advice to policy and practice (Stirling 2008, 2010) – could enable a more deeply embedded approach to appraising ES at local levels. , and that there is much scope for experimenting with these kinds of broad and open deliberative-analytic approaches (Ely et al. 2014) as the UK develops its land use policy following the UK’s departure from the EU.

Whilst this paper presents evidence based on a small sample size, with associated limits to the number and diversity of perspectives sought, we believe that it makes an important contribution to scholarly debates about land use policy. We therefore suggest that further work research could be undertaken to broaden the increase the range of perspectives that are included within interviews and scale up sample size, enabling more fine-grained distinctions (e.g. within the “farming” perspective). In particular, an exploration of the perspectives of farmers and other land managers operating at multiple geographic scales would be important. Additionally, broadening core options to include intensive agriculture could also yield important and interesting insights. Given the attention being paid to local decision-making around the implementation of the ELMS and the landscape level at which ES are best understood, and the fact that the MCM tool itself is not currently able to combine different options together in a portfolio approach (e.g. appraising a combination of land use measures used on different parts of a single estate, or a combination of

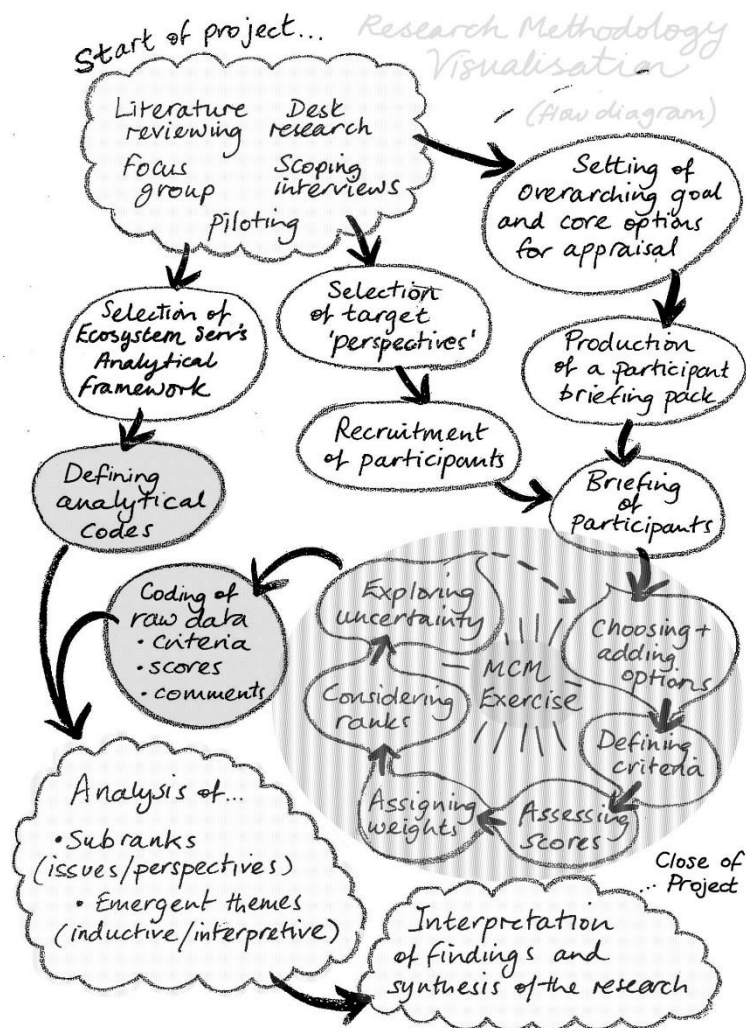
649 land use measures adopted by different land managers, for example in a local farm cluster), this
650 presents one possibility for how the MCM tool could be developed into the future.

Appendix A

I.D.	ORGANISATION TYPE	PROFESSIONAL ROLE TYPE	LAND USE	RELATION TO PROPERTY	REMIT	SECTOR
01	National government body	Agri-Environmental Officer	N/A	N/A	National	Public Sector
02	Local authority	Conservation Manager	Conservation	Landowner	Local	Public Sector
03	Trade union	Regional Adviser	Farming	N/A	National	Trade Association
04	Local AONB	Conservation Manager	Conservation	N/A	Local	Voluntary Sector
05	Charitable trust	Wildlife Advisor	Conservation	Landowner	National	Voluntary Sector
06	Charitable trust	Agriculture and Grazing Specialist	Conservation	Landowner	National	Voluntary Sector
07	Utility company	Environmental Officer	Conservation	Landowner	N/A	Corporate
08	Land agency	Rural Surveyor	Farming	Estate Agent	N/A	Corporate
09	Community farm	Farm Director	Farming	Tenant	Local	Voluntary Sector
10	Family farm (Weald)	Tenant Farmer	Farming	Tenant	Local	Independent
11	Agricultural estate	Estate owner and director	Rewilding	Landowner	N/A	Independent
12	Family farm (Downland)	Tenant Farmer	Farming	Tenant	Local	Independent
13	University	Environmental Lawyer	N/A	N/A	N/A	Academic

Appendix B

Methodological design, illustrating the use of MCM analysis (based on Coburn and Stirling 2019) within the wider participatory social appraisal exercise.



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