New Directions: A Public Goods Approach to Agricultural Policy Post-Brexit

Dr Adam P Hejnowicz and Prof Sue E Hartley

University of York
YESI York Environmental Sustainability Institute
cecan Centre for the Evaluation of Complexity Across the Nexus

CONTENTS

SUMMARY

Brexit presents both risks and opportunities. The European Union's (EU) Common Agricultural Policy (CAP) has been subject to piecemeal reforms, but Brexit offers an altogether more far reaching opportunity to redesign the UK's agricultural policy landscape. Indeed, whilst the finer details were lacking, the UK Government's 25-year Environment Plan did propose that bolder approaches were being considered and, on the cards, – these have been recently outlined in the Government's command paper 'Health and harmony: the future for food, farming and the environment in a Green Brexit'. An increasingly used phrase within the context of those reforming discussions is the "public monies for public goods" agenda. This phrase can however mean many things to many people, and whilst there's a growing momentum to move future agricultural policy in this direction there has been little exploration of what the term "public goods" actually means, and by extension, what a public goods approach may mean for the development of future agricultural policy. This report seeks to address that deficit. We critically engage with the "economic public goods paradigm" but, noting its deficiencies, develop a broader and more holistic "social-ecological public goods paradigm" based on a wider appreciation of human-nature relations. Our expanded view of public goods, whilst exempting "food production", leads to a reimagining of agricultural policy that emphasizes an agro-ecological approach to landscape multi-functionality, supported by a pluralist value foundation delivered through a payment for ecosystem services approach. Only by utilizing the social-ecological interpretation of public goods outlined here can a sustainable agri-environmental future, as envisioned by the 25-year Environmental Plan, be delivered.

About The Authors

Dr Adam P Hejnowicz is an inter-disciplinary scientist and a Postdoctoral Research Associate in Environmental Policy Evaluation, working as part of the ESRC funded Centre for Evaluation of Complexity Across the Nexus (CECAN), and is based at the University of York. In this current role Adam works closely with DEFRA advising them on how to apply complexity thinking to current and future policy evaluation and design in relation to the Rural Development Programme for England. Adam has received degrees from Keele University (BSc (Hons) in Biochemistry and Biology, 2002), Oxford University (MSc in Integrative Bioscience, 2003), and the University of York (MRes in Ecology and Environmental Management 2010, PhD in Environmental Economics and Environmental Management 2015). His main interests span environmental land management, agriculture and sustainability, viewed particularly through the lenses of ecosystem services, social-ecological systems and nexus and complexity science.

Email: adam.hejnowicz@york.ac.uk

Prof Sue E Hartley is a Professor of Ecology at the University of York and Director of the York Environmental Sustainability Institute, an innovative research partnership bringing together leading researchers from a broad range of disciplines to tackle key global challenges, such as climate change, biodiversity loss and threats to food security. Sue's research focusses on using natural plant defences as a sustainable means of crop protection. Sue is a co-investigator on CECAN, a 3-year £3M ESRC-funded Centre looking at how nexus-related policies and policy evaluation can be improved through the application of complexity approaches and methodologies. She is also a member of the BBSRC Strategic Advisory Panel on Agriculture and Food Security, Chair of the BBSRC/NERC/ESRC Sustainable Agriculture Research Innovation Club and Acting Director of the £16M Hefche-funded N8 AgriFood Resilience Programme. In addition, Sue is a fellow of the Royal Entomological Society, a trustee of the Royal Botanic Gardens, Kew, and Past-President of the British Ecological Society.

Email: sue.hartley@york.ac.uk

1. All is for the Best in the Best of All Possible Worlds

It is abundantly clear that the UK's decision to the leave the European Union (EU) on June 23rd 2016 will have considerable implications for the future outlook of our agri-environment and food system, as well as the broader environment (HoL, EU Committee Report, 2017). Balancing competing needs and agendas in a policy space where there are clear opportunities for redesign, whilst avoiding the dangers of path dependency, is not an easy circle to square. Not least because beyond the uncertainties, these issues are about reconciling two often separate and competing visions: how we feed ourselves and how we view and value nature. Fundamentally then, these matters are as much about livelihoods, identity culture, politics and economics, as they are about credible scientific evidence pointing towards the need for more radical approaches to environmental sustainability. Those calling for environmental sustainability to underpin future agri-environment, food, and rural policy need to be at the forefront of these debates (e.g. Garrod et al., 2017; Gawith and Hodge, 2017; Gravey et al., 2017; Lang et al., 2017; Lightfoot et al., 2017; Stewart and O'Leary, 2017; Wildlife and Countryside Link, 2017).

With the publication of the UK Government's long awaited 25-year Environment Plan (HM Government, 2018)[1] and the launch of a consultation on the future of UK farming policy[2] there are clear signs that the Government is interested in the way sustainability can inform future agricultural policy. If that is the case, then there is hope that opportunities presented by leaving the EU will create possibilities that new thinking across these areas will be warmly welcomed. Especially because UK political parties of all hues have never, historically speaking, been enthusiasts of the EU's Common Agriculutural Policy (CAP), notwithstanding recent greening reforms. Such skepticism is more than warranted. For example, as Gawith and Hodge (2017:2) note, the CAP's funding mechanism has not been kind to Britain:

> *"The CAP is particularly unfavourable to Britain because the common financing rules mean that British taxpayers pay more to subsidize farmers in other EU states than the country receives in return."*

Taking this a stage further, in relation to the structural spending of the CAP, it has been frequently argued (e.g. Gravey et al., 2017:6) that Pillar I monies that provide direct financial support to farmers merely:

> *"…distort agricultural activities, creating inequalities within the system and failing to support the neediest farmers whilst maintaining a cycle of dependency."*[3]

[1] The Government's 25-year Environment Plan can be accessed here: https://www.gov.uk/government/publications/25-year-environment-plan

[2] The consultation documents can be accessed here: https://www.gov.uk/government/consultations/the-future-for-food-farming-and-the-environment

[3] A point similarly made in the Wildlife and Countryside Link's discussion paper 'A Future Sustainable Farming and Land Management Policy for England' (2017:3): "…assessing the many failures of CAP, specifically Pillar I direct payments, which are summarised as ineffective, inefficient and inequitable". And shared also by Lightfoot et al., (2017) in their report 'Farming Tomorrow: British agriculture after Brexit' (2017:10): "Unfortunately, the

Doubtless, to some extent, the same could also be argued for the Common Fisheries Policy (CFP) (e.g. Stewart and O'Leary, 2017).

A House of Lords report (HoL EU Committee Report, 2017) [4] recently acknowledged that:

> *"Brexit represents an opportunity to review and redesign the UK's policy for food and farming."* (pg. 11)

A view similarly shared by Berkley Hill (2017:22) in an article for *EuroChoices*:

> *"Brexit provides an unexpected opportunity to re-establish the framework of the UK's domestic agricultural policy on sound economic principles."*

Significantly, in his first substantial speech[5] since taking-up his new post as Secretary of State for the Environment (and rearticulated in the 25-year Environment Plan), Michael Gove called for a 'green Brexit', emphasizing that:

> *"We now have an historic opportunity to review our policies on agriculture, on land use, on biodiversity, on woodlands, marine conservation, fisheries, pesticide licensing, chemical regulation, animal welfare, habitat management, waste, water purity, air quality and so much more."*

Clarifying his position still further, Gove went on to argue that the public value for money argument – essentially the allocation of public monies for the provision of environmental benefits – will be a central pillar of future policymaking, stating:

> *"We need to take the opportunity that being outside the Common Agricultural Policy will give us to use public money to reward environmentally-responsible land use […] But that support can only be argued for against other competing public goods if the environmental benefits of that spending are clear."*

This sentiment echoes recommendation number 6 of the Environmental Audit Committee's report 'The Future of the Natural Environment after the EU Referendum' (2017)[6] which urges that land management activities:

> *"…should be clearly linked to the public goods that are to be achieved through funding rather than simply providing income support to farmers: these public goods should be supported by strong evidence of the benefits*

objectives of the CAP have been inconsistent, and powerful vested interests have often resulted in policy makers creating distorted artificial markets"

[4] Available at: https://publications.parliament.uk/pa/ld201617/ldselect/ldeucom/169/169.pdf

[5] Available at: https://www.gov.uk/government/speeches/the-unfrozen-moment-delivering-a-green-brexit

[6] Available at: https://publications.parliament.uk/pa/cm201617/cmselect/cmenvaud/599/599.pdf

they provide and the market failure they correct."

Lightfoot et al., (2017:7) make a similar point:

> *"Reforming and replacing the CAP offers a once in a generation chance to reform Britain's environmental policy. This should include recognition that the primary goal of government intervention in agriculture should be to support public goods…"*

Indeed, in his most recent speeches to the farming industry[7] Michael Gove, whilst providing security to farmers that their income-support payments would be protected and maintained until 2022-2024, has also made clear that Brexit is an opportunity to leave behind the "unjust, inefficient and […] perverse outcomes" of the CAP. Specifically, because the CAP primarily rewards those "who have the most private wealth". Instead, he has argued that he wants to put in place a new system geared towards public monies for public goods, indicating that:

> *"After a transition, we will replace BPS with a system of public money for public goods. The principal public good we will invest in is environmental enhancement."*

This perspective is supported by some of the loftier aspirations outlined in the 25-year Environment Plan (HM Government, 2018), such as goals 3 (Thriving plants and wildlife), 5 (Using resources from nature more sustainably and efficiently) and 6 (Enhanced beauty, heritage and engagement with the natural environment). Notably, in his preface to the document Michael Gove states:

> *"We will support farmers to turn over fields to meadows rich in herbs and wildflowers, plant more trees, restore habitats for endangered species, recover soil fertility and attract wildlife back. We will ensure broader landscapes are transformed by connecting habitats into larger corridors for wildlife, as recommended by Sir John Lawton in his official review."* (HM Government, 2018, pg. 7)

Ensuring these outcomes are delivered will require legal substantiation and real money of course, otherwise such sentiments will simply ring hollow. The promising rhetoric, together with the aspirational language of the 25-year Environment Plan, needs to be met by cognate actions on the ground, which perhaps explains the cautious though welcomed reception from a range of environmental organizations.[8]

The movement towards an agricultural policy, at least in part, conceived around the

[7] Farming for the next generation (Oxford Farming Conference, 2018) available at: https://www.gov.uk/government/speeches/farming-for-the-next-generation
and
A Brighter Future for Farming (NFU Annual Conference, 2018) available at: https://www.gov.uk/government/speeches/a-brighter-future-for-farming

[8] See: https://greenallianceblog.org.uk/2017/07/21/a-green-brexit/ and https://www.politicshome.com/news/uk/environment/environmental-protection/press-release/woodland-trust/91989/welcome-25-year-plan

provision of public goods is an important and positive step. How radical that direction of travel will be is not yet fully clear. Nonetheless, some of the tectonic plates are shifting and that will no doubt produce both winners and losers, as Gawith and Hodge (2017:8) point put:

> *"There would also be losers. At this stage it is hard to judge the full net impact of a withdrawal of direct payments on farm incomes […] Some farmers would be encouraged to leave the sector…"*

We should of course be both aware and sensitive to this and as Gawith and Hodge (2017:8) go on to say:

> *"…support the process of agricultural adjustment"*

Yet, at the same time as Berkeley Hill (2017:21) explains:

> *"Poor people who happen to be farmers should be the subject of social welfare policy targeted at families in poverty, not by agricultural policy.*

Overall, re-positioning the agricultural economy to be more sustainably and environmentally-focused as well as based on more sensible and secure economic foundations is essential (Gravey et al., 2017; Wildlife and Countryside Link, 2017). The report by the Wildlife and Countryside Link (2017)[9] argues, for example, that sustainable farming policy should be based around three high-level areas: (i) natural capital restoration; (ii) resilience and risk management, and (iii) sustainable and welfare-sensitive production underpinned by three objectives: (i) effective regulation; (ii) environmental land management contracts – targeted and comprehensive, and (iii) measures to promote resilient, sustainable, innovative and humane production

Embarking on a public goods transformation of agricultural policy raises four important and interlinked issues which lie at the heart of this report. First, what exactly do we mean by the term public goods, especially within an environmental and agricultural setting? Second, what does the provision of public goods mean for how we conceive future land management? Third, how do we appraise the value of public goods? Fourth, what mechanisms are available to deliver public goods? This report addresses each of these questions in turn below.

A caveat: It's important to note that whilst seeking to address these questions this report does not provide a systematic coverage of all relevant literature and is therefore not exhaustive in the sources it draws upon. Nor is its purpose to offer a single coherent vision of a possible post-Brexit future for the UK agricultural policy space. Rather, it highlights the core issues pertinent to a view of future UK agricultural policy cohered around a public goods narrative.

[9] Available at: https://www.wcl.org.uk/docs/Link%20farming%20and%20land%20use%20policy%20paper%20FINAL%20Sep%202017.pdf

2. The Economic Public Goods Paradigm

2.1 Show Me the Goods!

The language and use of 'goods' derives from economics, and essential refers to physical or intangible phenomena that people wish to consume more of, hence the appeal to a moral sentiment in referring to something of that nature as being a 'good' (Oxford Dictionary of Economics, 5th Edition, 2017). Economic goods can be classified, relatively straightforwardly, in several different ways. For instance, they can be categorized according to the degree to which their consumption alters based on price (e.g. Ordinary[10] and Giffen[11] goods) or varies with income (e.g. Normal [12], Inferior [13] and Luxury [14] goods). Alternatively, economic goods can be characterized by their degree of exclusivity (i.e. excludability) and competitiveness (i.e. rivalry) – this is the spectrum of classification in which public goods are located (Table 1).

Table 1 Typology of economic goods according to excludability and rivalry

Classification	*Low rivalry*	*High rivalry*
Low excludability	Public goods	Common pool resources
High excludability	Club goods	Market goods

It was the Nobel Prize winning American economist Paul Samuelson, in his 1954 paper *The Pure Theory of Public Expenditure*, who elaborated the 'classic' interpretation of public goods theory. In Samuelson's sense public goods (or collective consumption goods), as indicated in Table 1, are commodities ('resources' is possibly a better characterization) that are both non-rival (with respect to their consumption) and non-excludable (with regards to access). But what exactly does that mean?

If a good is non-rival in character it means its 'essence' is not diminished via consumption, in other words, one person's consumption of good 'x' does not lead to less of 'x' being available for another individual to consume. Thus, non-rivalry is a phenomenon that is fundamentally the result of the nature of the good itself. On the other hand, the notion of non-excludability is about the feasibility of one individual preventing another from consuming the same good. In this case non-excludability, whilst related to the nature of the good in question, is also associated with the governance architecture regulating access to the good (Dasgupta, 2008). To sum up then, in the classic version of public goods, goods are commodities and/or resources open to everyone to consume, which are not diminished by the act of consumption, and from which no individual can be denied access.

Overall, from an economics perspective, public goods 'exist' because they are 'external' to a market environment, either because a 'market' has yet to be developed or because they are not obviously amenable to being 'commodified'. Public goods are therefore normally framed as being the result (or a property) of 'market failure', and their continued persistence a consequence of

[10] "An ordinary good is defined as a good which creates increased demand when the price for the good drops or conversely decreased demand if the price for the good increases, ceteris paribus" (Wikipedia, 2017)
[11] "A good for which quantity demanded falls when its price falls" (Oxford Dictionary of Economics, 5th Edition, 2017)
[12] "A good whose consumption increases with income" (Oxford Dictionary of Economics, 5th Edition, 2017)
[13] "A good of which less is demanded at any given price as income rises, over some range of incomes" (Oxford Dictionary of Economics, 5th Edition, 2017)
[14] "A good or service whose consumption at any given price rises more than in proportion to an increase in income" (Oxford Dictionary of Economics, 5th Edition, 2017)

failing to 'internalize' these 'externalities' (Perrings, 2014).

3. An Environmental Turn: The Social-Ecological Public Goods Paradigm

3.1 Environmental Concerns Promote a Public Goods Agenda

The inclusion of a public goods perspective in policy and regulatory settings has increased over recent years. Driven in large part by the growing recognition of society's impacts on the environment, and an awareness that many public goods are transboundary and 'global' in nature and therefore require collective action to generate them (Cogliati et al., 2015; Kretsch et al., 2016). In the wake of the UK's Brexit vote, talk about the provision of public goods, from an agri-environment perspective, has gained increasing media coverage [15], wider prominence within environmental charities and organizations [16] and broader political salience (HoL, EU Committee Report, 2017). The National Trust (2017) recently reported that the endpoint for the public financing of the agri-environment should be:

> *"…to develop a new system for sustainable farming and other land-uses which encourages better stewardship of the countryside, secures the future of farming and gives taxpayers better value for their money"* (pg. 1).

In this sense, national dialogues concerning public goods have been augmented by international discussions regarding 'global public goods', a concept frequently adopted by influential international institutions (Cogliati et al., 2015).

3.2 Public Goods and Ecosystem Services: One and the Same?

Archetypal examples of public goods often include reference to national defense and lighthouses, but less physically tangible 'goods' such as knowledge, common languages and national health schemes also count. And, at the global scale, reducing and eradicating poverty and communicable disease, enhancing trade integration and democracy (Cogolati et al., 2015). From an environmental perspective public goods are often identified as qualities and properties of well-functioning ecosystems and landscapes, such as clean air and water, healthy soils, carbon sequestration, pollination, flood control, landscape beauty and the protection of the historic environment (OECD, 2013; Kretsch et al., 2016; National Trust, 2017).

Quite understandably, from this angle, the term 'public goods' is often used inter-changeably with ecosystem services. Ecosystem services have been variously defined in the literature (see, for example, Fisher et al., 2009 and Costanza et al., 2017), but here we use the definition used in the UK National Ecosystem Assessment, namely: "Ecosystem services are the benefits provided by ecosystems that contribute to making human life both possible and worth living" (UK NEA, 2011). Ecosystem services are divided into particular clusters or groupings of similar services according to their generation or function, specifically, provisioning services (e.g. food and fibre), regulating services (e.g. climate,

[15] https://www.theguardian.com/commentisfree/2017/mar/20/take-back-control-england-land-ownership

[16] https://greenallianceblog.org.uk/2017/06/27/the-balance-of-agricultural-subsidy-should-shift-towards-public-benefits/ and https://ntplanning.files.wordpress.com/2017/06/paper-2-national-trust-post-cap-series-public-benefits-june-20171.pdf

pollination, soil and water quality), supporting services (e.g. primary production and nutrient cycling) and cultural services (e.g. landscape beauty, spiritual and religious experience, tourism and recreation) (MA, 2005; UK NEA, 2011). Nonetheless, whilst it is tempting to see public goods and ecosystem services as one and the same they are not synonymous with each other (Kretsch et al., 2016).

Though many ecosystem services (i.e. regulating, supporting and cultural) and biodiversity share certain properties of public goods most do so only partially, with their fidelity of non-rivalry and non-excludability a function of scale and joint production. Provisioning ecosystem services on the other hand, such as food and fibre (i.e. the stereotypical agri-environmental goods), display properties associated with traditional private (market) goods, in other words, they are both rival and excludable (Perrings, 2014).

In consequence, the extent to which ecosystem services are both non-rival and non-excludable they can be either 'pure public goods' or 'impure public goods', with examples of latter including common pool resources and club goods. Elinor Ostrom is widely regarded as pioneering the study and popularization of the theory and management of common pool resources, which she defined as "a natural or man-made resource system that is sufficiently large as to make it costly (but not impossible) to exclude potential beneficiaries from obtaining benefits from its use" (Ostrom, 1990 pg. 30). The theory of club goods was developed by James M Buchanan in a 1965 article entitled '*An Economic Theory of Clubs*'. The theory asserts that goods of this kind are such because they 'belong' to specific groups whose use of a good or goods is authorized on the grounds of membership of that club. In general terms, these goods are excludable but have sharing arrangements intermediate between pure public goods and private goods (OECD, 2013). In these instances, ecosystem services take on a fluidic character displaying varying degrees of non-rivalry and non-excludability (Figure 1, Perrings, 2014).

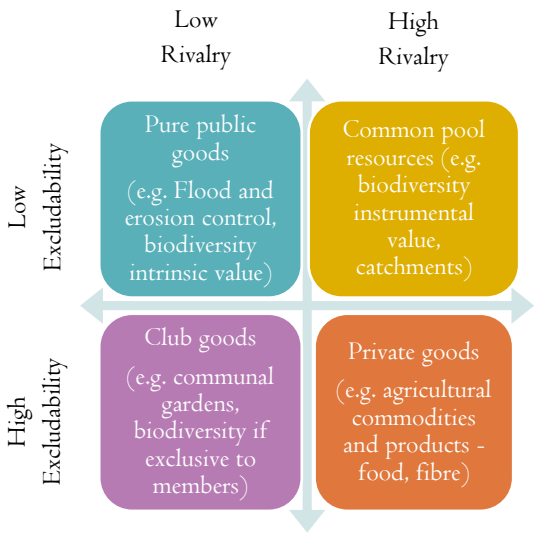

Figure 1 Conventional classification of goods based on rivalry and excludability viewed through an environmental lens (adapted from OECD, 2013).

3.3 Expanding Our View of the Public Goods

The problem with the classification of goods presented in Table 1 and then subsequently applied to the agr-environment, as displayed in Figure 1, is that they suggest these 'goods' can be neatly parceled and compartmentalized into discrete categories which are fixed and never changing. However, categories of public goods are inter-linked and not completely objectively defined – the boundaries between them are fuzzy –because where 'goods' are placed is very much a function of perspective, as rivalry and excludability are frequently scale-dependent, a matter of land ownership and also a political choice, in addition to the fact that ecosystem

services are interconnected and co-produced (Perrings, 2014; Cogolati et al., 2015).

It starts to become increasingly obvious that a public goods approach to future agri-environment policy, if conceived around an ecosystem services narrative – to be effective – needs to break free of the strictures of a 'classical' characterization of public goods to include aspects of 'environmental public goods' naturally associated with common pool resources and club goods (Figure 2a and 2b).

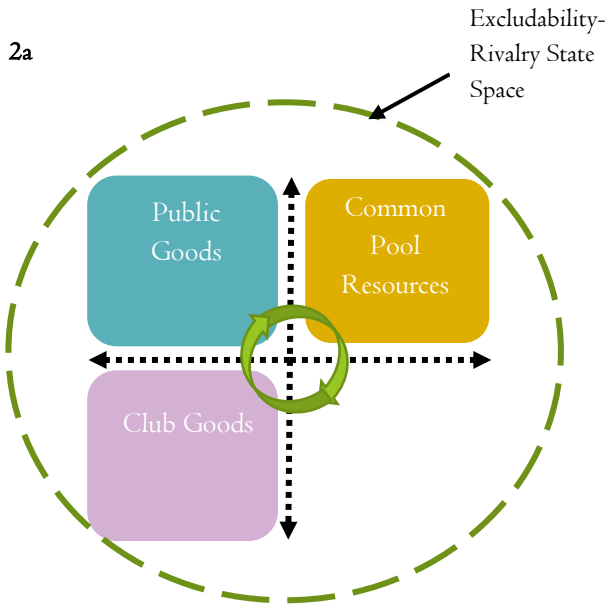

Figure 2a Reclassification of the public goods landscape. Here the arrows indicate that the boundaries between 'traditional' public goods and both common pool resources and club goods are porous (black dotted lines), and also, that it is possible for goods to move between categories and indeed cross all three categories simultaneously (blue arrows). As such, rather than the conditions of excludability and rivalry being tightly fixed, they exist in a manner more akin to a density probability cloud (blue dashed ellipse), which reflects the new dynamic underpinning the reinterpretation of public goods.

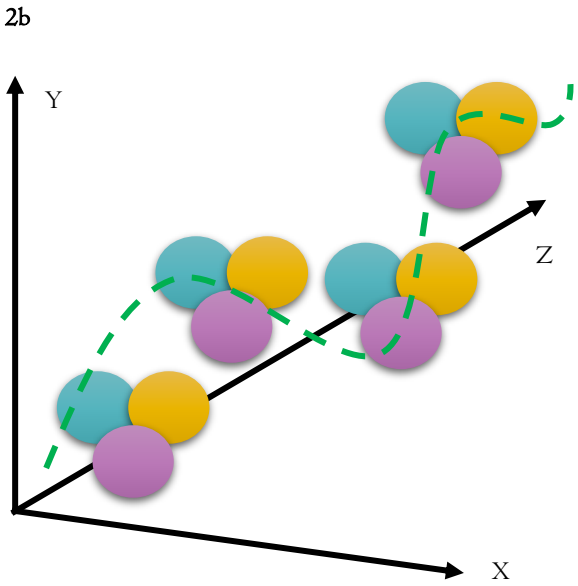

Figure 2b Establishes that public goods are interconnected (venn diagram circles) and that they have a provision trajectory (dashed green line) that is a function of scale (Y-axis), magnitude (X-axis) and time (Z-axis). In this redrawing of the public goods landscape private goods are absent by definition.

Alongside this more realistic and flexible interpretation of public goods[17] it is clear that stereotypical provisioning agri-environmental goods (i.e. food and fibre), which locate themselves in the 'private goods' sphere and therefore do not represent a market failure (though the act of production can produce both positive and negative externalities), cannot be considered a public good however much their provision is linked to a food security narrative[18]. In this latter case, there is a tendency to conflate the notion of public goods with the idea of the

[17] Unless otherwise stated, our use of the term public goods from here on in is inclusive of common pool resources and club goods.
[18]https://www.nfuonline.com/news/latest-news/our-response-to-the-national-trust/; https://www.nfuonline.com/cross-sector/environment/environment-must-read/our-response-to-eac-report-on-post-brexit-environm/; https://www.nfuonline.com/news/latest-news/nfu-response-cpres-new-model-farming-paper/

'Common Good'[19], as well as to argue that subsidization is the only way to deliver food security by counteracting commodity market volatility and ensuring a stable and sufficient income stream for producers.

Firstly, whilst food security is most certainly in the Common Good (or public interest) it is a social and political matter largely about food access not food production *per se*. According to the World Food Summit (1996) food security:

> *"Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life"* (See also Postnote 556 (2017) 'Security of UK Food Security')

Secondly, debates over food security are often actually conversations more concerned with food sovereignty, in other words, who gets to decide what the food system looks like, where the food comes from and who governs and regulates it (Lang et al., 2017). As the Declaration of Nyéléni, (2007) states, food sovereignty refers to:

> *"The right of peoples, communities, and countries to define their own agricultural, labour, fishing, food and land policies which are ecologically, socially, economically and culturally appropriate to their unique circumstances. It includes the true right to food and to produce food, which means that all people have the right to safe, nutritious and culturally appropriate food and to food-producing resources and the ability to sustain themselves and their societies. Food sovereignty means the primacy of people's and community's rights to food and food production, over trade concerns"*

Although food security and food sovereignty are entirely reasonable political arguments for advancing a self-sufficiency agenda for example,[20] they are not credible arguments for forcing 'food production' onto the public goods spectrum because neither of these well-founded concerns represent qualities or properties of 'food' as a 'good'.

Finally, the subsidization position fails on its own merits. Prior to decoupling, the EU oversaw widespread environmental degradation resulting from agricultural intensification and serious over production leading to massive food surpluses (Lightfoot et al., 2017). Following the Fischler reforms in 2003, and the subsequent decoupling of production and payments, environmental degradation has continued. And by making subsidies the pre-eminent structural component of the CAP the EU has presided over a hugely unsustainable and perverse subsidy regime, which: favours the wealthiest farmers and landowners at the expense of poorest; is not

[19] The notion of the 'common good' is a moral philosophy and political economy term generally referring to "…either what is shared and beneficial for all or most members of a given community, or alternatively, what is achieved by citizenship, collective action, and active participation in the realm of politics and public service" (Wikipedia, 2017)

[20] https://www.theguardian.com/politics/2017/oct/15/higher-food-prices-could-be-avoided-if-no-brexit-claims-chris-grayling

responsive to market volatility; stifles innovation, and probably maintains a lot of 'dead weight' within the farming industry (Lightfoot et al., 2017)[21]. This is not an argument against zero subsidies, like Lang et al., (2017) we recognize that farming is a special case and that some protection against market volatility may be warranted; however, the 'welfarization' of agricultural policy is neither an efficient nor effective use of public monies (Hill, 2017). A far better approach to promote and adopt in relation to supporting producer livelihoods is the strategy of diversification. In fact, removal of support payments provides a strong case for enhancing income diversification both on and off-farm (Weltin et al., 2017)[22], activities that are also likely to increase farming resilience in the long-term (Willis, 2016).

The key message here is that food security, food sovereignty and subsidization whilst representing legitimate political concerns and debates that can feed into wider discussions on the shape and operation of agricultural policy, are not appropriate ways of deciding what does or does not constitute 'public goods' – that is an economic argument. But is that strictly true?

3.4 What About the Social Content of Public Goods?

It should be acknowledged that agri-environmental public goods are not simply environmental economic resources even when described as assets in the language of natural capital[23]. If viewed from the perspective of ecosystem services then they have social, cultural and human-wellbeing dimensions too, not least because many ecosystem services are realized through human agency and nature is a fundamental aspect of human identity and cultural belief systems (Reyers et al., 2013; Díaz et al., 2015; Fedele et al., 2017; Pascual et al., 2017). Strangely, these considerably important issues remain largely absent in discussions of what constitutes public goods. For instance, Euler (2018) criticizes Elinor Ostrom's definition of common pool resources for not adequately accounting for the social construction of those goods and the social practices that are inherently part of their character and realization. Moreover, returning to an earlier remark, others have raised the question of politics in debates about 'public goods' and the importance of political choice as the means by which public goods are realized (Cogolati et al., 2015).

Clearly, there are important sets of fundamental human-nature and society-nature relations and degrees of co-production that are

[21] As George Monbiot sets out in a Guardian opinion piece in 2016: https://www.theguardian.com/commentisfree/2016/jun/21/waste-cash-leavers-in-out-land-subsidie

[22] A recent article in Farming UK highlighted the many and varying ways farmers could diversify their incomes streams beyond purely productive-based activities: https://www.farminguk.com/News/The-many-options-and-ideas-for-farm-diversification_46565.html Countryfile magazine have also recently run a similar piece: http://www.countryfile.com/news/farming-diversification Furthermore, according to an online NFU article "62% of farms already have some form of diversified activity to provide wider economic opportunity to support farming families and the rural economy" https://www.nfuonline.com/cross-sector/rural-affairs/planning-and-local-authorities/planning-news/how-agriculture-is-changing-the-importance-of-diversification/

[23] "Natural capital can be defined as the world's stocks of natural assets which include geology, soil, air, water and all living things." (Natural Capital Forum, 2017) Natural capital is usually defined in terms of a resource asset having 'stocks' and 'flows' characteristics like financial capital (Postnote 542, 2016)

lost or ignored if we simplify public goods to the level of economic caricatures, and this accords with the assertion that many public goods are 'complex social goods', in other words, the co-products of interrelated social and cultural processes (Stoeckl et al., 2018). In which case, we argue, it is logically consistent to broaden the narrow characterization of food beyond simply a commodity, and appreciate that there are, for example, cultural, heritage and farming tradition dimensions to food and its provision that could be considered public goods (Vivero-Pol, 2017). We therefore need to reassess our understanding of agri-environmental public goods to include these broader social-ecological, socio-cultural and socio-political relationships and connections (Figure 3).

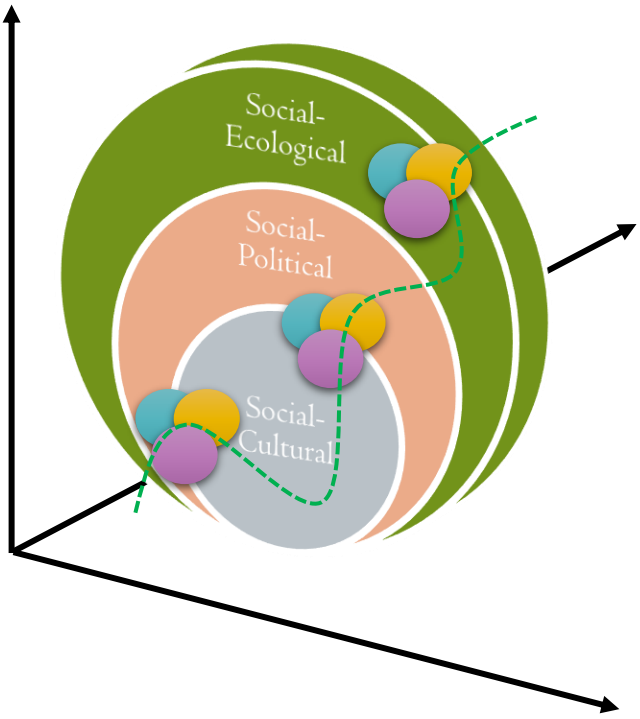

Figure 3 Re-frames public goods to account for the wider ecological, social, cultural and political relationships and connections that co-construct and contribute to the 'nature of public goods' beyond a purely economic characterization. The axes are the same as those identified in Figure 2b.

The implications for this re-framing of the standard public goods model, as applied to the agri-environment, with its broader notion of public goods and emphasis on both their economic underpinnings and social co-production, is three-fold. First, there are implications for how we conceptualize a public goods based agri-environment landscape (Section 4). Second, it has implications for how we value public goods (Section 5). Third, these in turn have implications for how we finance public goods (Section 6).

4. Landscapes of Plentiful Variety

The agri-environment has the potential to supply a broad range of 'environmental public goods'. Emphasizing our broader interpretation of public goods means we are on track to forge a more holistic view of a future agri-environmental policy conceived around a public benefits agenda. In fact, pursuing a public goods agenda moves us closer to a landscape-based approach to agricultural policy, one that advocates for 'landscape multi-functionality'.

4.1 The Multi-functional Approach

The concept of 'multi-functionality' applied to the creation, planning and management of landscapes is not new *per se*. People have always used and managed the land for a variety of purposes and diversity of needs, in ways that reflect socio-cultural beliefs, values, heritages and traditions as well as broader regional and national political and economic circumstances (Wylie, 2007). Recent decades, however, have witnessed the development of the concept of 'multi-functionality'. Multi-functionality has influenced and co-evolved alongside conversations about ecosystem services, environmental stewardship and agricultural sustainability (Marsden and Sonnino, 2008; Selman, 2009; Mastrangelo et al., 2014). As such, multi-functionality has featured in debates around 'land sharing and land sparing' and 'sustainable intensification' (Lescourret et al., 2015; Fischer et al., 2017).

Landscape multi-functionality represents a qualitatively different way of thinking and refers to land that is being managed to foster and sustain joint environmental, social, economic and cultural benefits (Termorshuizen and Opdam, 2009; Reyers et al., 2012). This view moves us away from the 'agro-industrial' and 'post-productivist' perspectives of multi-functionality, where farm and food systems are seen as part of a larger 'industrial bio-science dynamic' and rural areas as merely 'consumption spaces'. Instead, it connects more broadly to the 'rural development' paradigm of multi-functionality, which reframes food production through a more ecologically-oriented lens connecting the socio-environmental dimension of agriculture to thriving rural economies (Marsden and Sonnio, 2008). From a multi-functional stance, landscapes are also seen as comprising a wider interconnected and integrated whole, co-aligning with the 'strongly ecological modernization' turn in agriculture that emphasizes biologically diverse farming, soil health, productivity and resilience (Horlings and Marsden, 2011; Duru et al., 2015). This view meshes neatly with the expanded interpretation of public goods that we have offered above.

4.2 Multi-functionality and Public Goods: Synergies between Complementary Bedfellows

Multi-functionality has strong links to the creation of landscape spaces (Selman, 2009) and 'multi-scale approaches' to the development of diverse land-use patterns (Lovell and Johnston, 2009), meaning that it is capable of delivering a wide range of agri-environmental public goods ("public good bundles")[24], which also provides a route to connect public goods provision with farm

[24] Essentially this is co-opts the notion of ecosystem service bundles, which may be thought of in two ways. From the supply-side Berry et al., (2016:1) define ecosystem service bundles as "a set of associated ecosystem services that are linked to a given ecosystem and that usually appear together repeatedly in time and/or space", whilst from the demand-side ecosystem service bundles are considered to be "A set of associated ecosystem services that are demanded by humans from ecosystem(s)".

diversification and the rural economy (Bartolini et al., 2014; Rovai and Andreoli, 2016). Focusing on public good bundles is also useful for public policymaking because it can identify potential trade-offs and synergies stemming from planned landscape developments (Bolliger et al., 2011). Additionally, it can suggest opportunities for 'cross-sectoral cooperation', 'reductions in management costs' and 'reduced risks of policy failure' (Berry et al., 2016).

Concentrating on, for example, wildlife, water and soil health, resilience to flooding and coastal erosion, climate change and cultural landscapes[25] as principal public goods (National Trust, 2017) across bogs, moorlands, grasslands, heathland and woodland would encourage a broader spread of land-uses and land management activities. More diverse land use and management activities has been argued to enhance ecosystem services (Duru et al., 2015). Thereby promoting more sustainable environments as well as increasing the likelihood of achieving 'sustainable economies' by delivering on Marsden and Sonnino's (2008) three rural development conditions: (i) improving 'income and employment opportunities'; (ii) developing 'a new agricultural sector'; and (iii) radically 'redefining and reconfiguring rural resource'.

Significantly, emphasizing 'landscape multi-functionality' also promotes the role of human agency within landscapes and the social construction of those spaces (Yang et al., 2013). This underlines the importance of the social and cultural practices inherent in the formation of common pool resources (Euler, 2018), as well as demonstrating that many public goods are 'complex social goods' (Stoeckl et al., 2018). Consequently, multi-functionality is closely allied with ideas of 'connectedness of production' and core social-ecological systems notions of 'place, 'resilience' and 'culture' (Lovell and Johnston, 2009; Selman, 2009; O'Farrell and Anderson, 2010; Mastrangelo et al., 2014). Moreover, multi-functionality is regarded as a holistic 'gestalt' concept, relating notions of 'complexity' and 'connectivity' with 'trans-disciplinary approaches' and 'human-value systems' (Fry, 2001; Naveh, 2001). Acknowledging these characteristics increases the likelihood of formulating a more integrated and sustainable land management and agri-food policy post-Brexit (as detailed in Gravey et al., 2017).

Highlighting these dynamic social-ecological relationships further illuminates those processes responsible for shaping landscapes, especially those infused by 'power' and 'politics', which frame the decision-space governing what landscapes are and do, who can access them and who can't, and who are the decision-makers and the decision-takers (O'Farrell and Anderson, 2010; Gailing and Leibenath, 2015; Setten and Brown, 2013; Gailing and Leibenath, 2017). Developing institutional and governance structures and processes to frame and shape the public goods element of future agricultural policy (in the broadest sense) requires thinking through these social and political dimensions (Gravey et al., 2017). This strongly suggests that stakeholders, beneficiaries and the wider 'demos' should be an essential part of the decision-making processes determining which goods and services should be publicly financed (see Cogolati et al. 2015).

[25] For cultural landscapes we would expand to include specific mention of important socio-cultural practices, aesthetic and spiritual dimensions of belief systems and cultural heritage.

4.3 A Reformed Vision for Land Management in the UK

Re-imagining UK environmental land management along these lines brings us much closer to an agro-ecological model of public goods-based landscape multi-functionality. This type of model advances an integrated vision of ecological and social sustainability, but also, acknowledges the importance and influence of broader social, environmental, economic and political factors in shaping governance and farming and community resource management. It therefore moves away from a technocratic and industrial-complex approach and embraces an altogether more holistic, co-dependent and strong sustainability approach to landscape management (Wezel et al., 2009; Gliessman 2011; de Molina, 2013; Gliessman 2013; Vandermeer and Perfecto, 2013; Holt-Giménez and Altieri, 2013; Mendez et al., 2013; Bellamy and Ioris, 2017; Liere et al., 2017).

5. The Plural Values of Public Goods

This report has suggested a wider than typical definition of public goods and, in so doing, it has also significantly widened the value dimensions of those public goods. Valuation is central to understanding public goods and their delivery, particularly when conceived through an ecosystem services lens (Bateman et al., 2013; Bateman et al., 2014; Guerry et al., 2015). Valuation is not simply a form of assessment, but it is also a means of articulating views and engaging with stakeholders and beneficiaries. It provides a mechanism to feed into the processes of decision-making underlining different management options. And as part of that process, but more fundamental in some ways, it enables the values that are expressed and considered to act as mediators for those decision-making processes, and thus provides a means to connect beliefs to behaviours and motivations to actions (O'Brien and Wolf, 2010; Costanza et al., 2014).

5.1 Values: What do we Mean?

The values attributed to our expanded view of public goods will almost certainly range from those that relate to the innate moral constituents of a good (so-called Ideal values), the observable and verifiable attributes of a good (so-called Objective values) to the perceptual attributions of a good (so-called Subjective values), and therefore encompass a 'value continuum' running from the spiritual to the monetary (Dendoncker et al., 2014; Kenter et al., 2016a; Spangenberg and Settele, 2016; Hejnowicz and Rudd, 2017). However, the main descriptions of the public goods value of UK agriculture are primarily monetary and for a limited range of goods. For example, the latest natural capital account estimates for UK farmland[26] indicate asset values of £160.9 million for water abstraction, £6560.5 million for recreation, £54.3 million for education, $38,157.2 million for biomass provisioning and £5690.5 million for pollution removal (ONS, 2017). Other value estimates for UK farmland include its carbon sink capacity (£514 million/yr) and (£672 million/yr) for environmental protection (Development Economics, 2017).[27] Values are also typically framed in terms of 'returns on investment' and again, from this perspective, public goods are characterized monetarily.

5.2 Valuation Debates: Goods and Bads

It is important to realize that valuation is not neutral or value-free; framings and language articulating the processes of valuation matter considerably (Jacobs et al., 2016). Valuations of 'nature' have – quite correctly on many occasions – been heavily criticized, and these criticisms are well documented (e.g. Hejnowicz and Rudd, 2017). Typically, such criticisms suggest that 'valuing nature' enterprises are misjudged, inconsistently applied, and biased towards economic valuation approaches that result in the monetarization or pricing of nature (Spangenberg and Settele, 2010; Salles, 2011; Parks and Gowdy, 2012). The basis of these arguments is that the values nature holds for people are incommensurable[28], a view which is frequently

[26] According to the Office of National Statistics (ONS) from which these values are drawn, the definition of farmland covers arable and horticultural land (inc. uncropped arable land), improved grassland and rough grazing. Altogether this totals 17.6 million hectares.

[27] It it important to note that with this study the definition and coverage of UK farmland may well differ than that considered by the ONS.

[28] Incommensurable refers to the idea that there is no single common value to which a set of different values can be reduced to (e.g. equality and price are two values that have

linked to a broader neo-liberalization of nature discourse (Büscher et al., 2012).

Perhaps equally, however, these criticisms have a propensity to misrepresent the purpose of valuation, and also tend to eschew the significant progress that has been made towards more non-monetary and pluralistic forms of valuation approaches in recent years (de Groot et al., 2012; Costanza et al., 2014; Hejnowicz and Rudd, 2017). For example, there have been important developments in the theory of deliberative valuation processes and practice (Kenter et al., 2016b),[29] and the application of these ideas to elicit a broad spectrum of value forms through arts-led dialogues (Edwards et al., 2016), story-telling (Kenter et al., 2016c), ethnography (Ranger et al., 2016) and participatory approaches (Kenter, 2016a). Indeed, there has been a growing recognition and emphasis on ways to elicit and capture shared and social values (Kenter et al., 2015; Kenter, 2016b) and articulate these and other wider value languages in more holistic frameworks of human value-systems (Díaz et al., 2015; Gunton et al., 2017; Pascual et al., 2017).

5.3 A Pragmatic View of Values for Future Policy

A future agricultural policy devised around the provision of public goods will require a pluralistic foundation to environmental valuation. One means of achieving that is to adopt a pragmatist stance with respect to the full understanding of value and valuation processes (Peltola and Arpin, 2017). Here the acknowledgement and understanding of the social complexity and practices that underlie value formation, which returns us to our characterization of public goods as 'complex social goods' is what matters (Peltola and Arpin, 2017).

Adopting a pragmatist stance captures the dynamism of value processes; reflects the fact that people value the particularities rather than the generalities of nature; acknowledges the politics and performative aspects of valuation and, emphasizes the importance of considering the interactional relationships between humans and nature in influencing value formation and valuation processes (Peltola and Arpin, 2017). Embedding a pragmatist ethos in valuation processes not only provides for greater reflection on the instrumental dimensions of 'how we value', but also gives expression to the normative decision-making aspects of 'what it is we choose to value' and presses us also to consider the philosophical basis of 'why we are considering a process of valuation' in the first place.

In the case of the public goods derived from the UK agri-environment, taking a pragmatist stance provides a much more robust basis for both eliciting and substantiating the broadest possible set of values across all interested parties, and is therefore both in accordance with, and reinforced by, an agro-ecological approach to environmental land management (e.g. Gliesmann, 2011; 2013). This is especially important given the emphasis in the 25-year Environment Plan on adopting a natural capital approach – which without the presence of a strongly pluralist value foundation may result in a highly economic-framed view of the agri-environment and human-nature relations.

no common reducible measure). For more information about specific forms of value incommensurability see the Stanford Encyclopaedia of Philosophy (https://plato.stanford.edu/entries/value-incommensurable/)

[29] For a comprehensive definition of deliberation and deliberative approaches see Kenter et al., (2016b)

6. Delivering Public Goods

6.1 The Costs of Delivering Public Goods

Recent analysis supported by the RSPB, the National Trust and The Wildlife Trusts (Rayment, 2017) suggests (somewhat conservatively) that delivering the UK's environmental land management priorities will cost at least £2.3 billion/yr, of which England takes the lions share (62%, £1.3 billion), followed by Scotland (21%, £594 million), Wales (9%, £210 million) and Northern Ireland (8%, £177 million). Most of these monies (40%, £1.03 billion) is required for the management of priority habitats[30], with other principal areas of spend including arable land (21%, £436 million), boundary features (18%, £375 million) and grassland (15%, £358 million) (Rayment, 2017).

Post-Brexit, following a period of transition, public funds to pay for these land management activities could be most conveniently obtained from monies that would have otherwise been allocated to Pillar 1 of the CAP (Lightfoot et al., 2017). For instance, as Rayment (2017:5) suggests, Brexit:

> *"…provides an opportunity to enhance funding for environmental land management in the UK, potentially by diverting financial resources from the 1st Pillar of the CAP, which currently provides £2.6 billion in direct payments to farmers…"*

This would underline the Government's stated ambition, as set out in the 25-year Environmental Plan to:

> *"…introduce a new environmental land management system to deliver this. It will incentivise and reward land managers to restore and improve our natural capital and rural heritage. It will also provide support for farmers and land managers as we move towards a more effective application of the 'polluter pays' principle (whereby for costs of pollution lie with those responsible for it)."* (HM Government, 2018, pg. 37)

6.2 Wider Considerations for Delivering Public Goods

Of course, how this policy aspiration is achieved and instituted in practice is not solely a decision for the UK Government. Trade will have a big influence on the workings of the final policy. In particular, and collectively speaking, via: i) the constraints imposed by the trading rules relating to agriculture as set out by the World Trade Organization (WTO, see Box 1), ii) the future nature of post-Brexit trading relationships the UK manages to negotiate with the EU and non-EU countries, and iii) the degree of continued regulatory alignment the UK seeks to maintain with the EU going forwards[31] (Gravey et al., 2017; Lightfoot et al., 2017; Postnote 557, 2017; Wildlife and Countryside Link, 2017).

[30] Priority habitats equate to approximately 5.43 million hectares, principal among those being: blanket bog (2.23 million hectares); native broadleaved, mixed and yew woodland (1.1 million hectares); upland heathland (0.95 million hectares); coastal floodplain and grazing marsh (0.26 million hectares) and native pinewood (0.18 million hectares).

[31] See article by David Allen Green in the Financial Times: https://www.ft.com/content/4fddeb2e-7e92-3d81-b0a7-9dfeb6055510

Box 1. WTO Trade Options

Under WTO rulings there are four categories under which domestic agricultural support programmes can be considered, each of which has implications for how the policies operate and how the Government chooses to fund them, these are the so-called Blue, Amber and Green Box payments. Blue Box payments act to reduce production, whilst payments classified in the Amber Box are those regarded as affecting trade and production. These also include *De Minimis* payments that support specific products that will have trade distorting impacts – these can be up to 5% of total agricultural output and a further 5% for non-product specific support. Payments categorised as Green Box payments are required to have a minimal trade distorting influence. So long as these payments are decoupled from production then the payments themselves can be limitless. However, in the case of agri-environment schemes, payments are limited to either the costs incurred, or the income foregone.

See the WTO cite for further details: https://www.wto.org/english/tratop_e/agric_e/agboxes_e.htm

6.3 A PES Proposition

Nevertheless, if the Government is serious in its commitment to create a new land management policy, then using those Pillar I monies is likely the most effective means of achieving that systemic change – particularly if such changes are going to go beyond simply reproducing a CAP avatar. Based on our characterization of public goods, landscape multi-functionality and value plurality, we believe that payment for ecosystem service (PES) schemes represent the most suitable means to achieve those future policy ambitions.

A common 'model' for a PES scheme will often involve a scenario in which, as Hejnowicz et al., (2015:10) describe:

> *"ES providers (e.g., landholders, farmers or communities) voluntarily participate in a program whereby they receive payments from ES buyers (e.g., a government, a utility or private organization). Transactions are facilitated by a single or multiple set of intermediary actors (e.g., a semi- autonomous body or non-governmental organization). In return for payments, providers adopt alternative land-use practices and management strategies that can secure and deliver a set of important ES to a wider beneficiary population."*

A more general and principled description is provided by Ishihara et al., (2017:45), who (following Muradian et al., 2010) frame PES as:

> *"…a transfer of resources between actors, which aims to create incentives, subject to clear conditions, to align individual and/or collective resource use decisions with the social interest in the management of natural resources"*

Conceived in this way, public monies could be directed towards financing both a national-level PES programme, and through priming or 'seed' funds, the development of innovative and multi-sector local and regional PES schemes between farmers, businesses and NGOs. Harnessing a diversity of PES schemes addresses the multiple, and often quite different, local, regional and national scale land management challenges and priorities (Gawith and Hodge, 2017; Wildlife and Countryside Link, 2017).

This approach could be linked to the concept of an "Environmental Impact Fund", financed through a range of different capital sources, proposed in the 25-year Environment Plan (HM Government, 2018).

6.4 Why Adopt A PES Approach to Environmental Land Management?

PES schemes have had rapid and widespread uptake over the last 20 years (primarily, though not exclusively, in low and middle-income countries), resulting in an equally rapid growth of evidence critiquing the development of these types of policy interventions, helping to highlight what does and does not work (e.g. Landell-Mills and Porras, 2002; Engel et al., 2008; Bond and Mayers, 2010; Schomers and Matzdorf, 2013; Hejnowicz et al., 2014; Ezzine-de-Blas et al., 2016). Overall, the evidence suggests that PES schemes have been moderately successful in tackling a varied range of environmental management and associated socio-economic challenges (Hejnowicz et al., 2014; Ezzine-de-Blas et al., 2016).

PES schemes have been designed and implemented in a wide range of environmental, social and economic contexts, focusing frequently on the provision of ecosystem services such as water quality and quantity, soil erosion, carbon storage and sequestration, reforestation and afforestation, and biodiversity conservation, combined in many instances with activities designed to promote sustainable livelihood strategies (Hejnowicz et al., 2014). Significantly, PES schemes are particularly well disposed to deal with common-pool resource management issues (Fisher et al., 2010).

Furthermore, PES offer a flexible approach to governance and management as they do not conform to a single operational standard, instead, they represent a suite of policy mixes often initiated by the State but also, in many cases, involving (and indeed led by) private and voluntary sector partners (Schomers and Matzdorf, 2013; Hejnowicz et al., 2014; Ezzine-de-Blas et al., 2016). Thus, despite being frequently Government-financed, they are regarded as a more consensual and 'bottom-up' model of land and natural resource management (Hejnowicz et al., 2014).

6.5 Evidence to Support PES Practice in the UK

Translating best practice lessons for PES design and implementation into a UK setting is more straightforward now than ever before. Many developed countries have adopted policies with similar governance arrangements to deliver a broad array of agri-environmental public goods such as Australia's Landcare Programme, Canada's Beaver Hills Initiative, Germany's Landcare Association scheme and New Zealand's Aorere Catchment Project to name but a few (OECD, 2013).

Furthermore, the Department for Environment, Food and Rural Affairs (DEFRA) has a strong track record in promoting PES pilot initiatives in England, from the Southwest (i.e. Fowey river) to the Northeast (i.e. Hull flood risk): commissioning 16 pilots between 2012 and 2015 ranging from peat restoration (i.e. Peatland Code), sewage treatment (i.e. Tortworth Brook) and cultural and recreational services (i.e. Visitor giving scheme) to bio-energy (i.e. Energy for Nature) and water quality and flood mitigation (i.e. Winford Brook) (DEFRA, 2016). These were largely feasibility studies, but most were broadly successful, and provided a platform for further innovation, for example: supporting new avenues of investment; promoting further PES activities amongst many engaged partner

organizations; providing new metrics for natural accounting systems; mainstreaming ecosystem services thinking; and promoting integrated management and restoration (DEFRA, 2016). In addition, DEFRA also produced its own guide reviewing PES best practice (DEFRA, 2013).

Finally, in a more formal sense, the UK (like other EU countries) has been engaged in a process of PES-style management for several years, as the recent iterations of agri-environment schemes have been increasingly PES-oriented in their operations (e.g. Burton and Schwarz, 2013; Wynne-Jones, 2013; Russi et al., 2016).

6.6 Challenges to Implementing PES

We are not suggesting that PES schemes are a universal panacea or 'silver bullet' (Landell-Mills and Porras, 2002), rather any PES-based policy needs to be developed and implemented according to stakeholder needs and larger societal and political conditions and priorities (Hejnowicz et al., 2014). In executing PES schemes successfully, several issues need to be negotiated, namely:

- managing the trade-offs and inter-dependencies between aspects of programme efficiency, effectiveness and equity (e.g. Pascual et al., 2010);
- creating and embedding the appropriate institutional structures, processes and capacities to deliver transparent and accountable schemes (e.g. Muradian et al., 2010; Legrand et al., 2013);
- developing adequate rights of ownership and secure forms of contract (e.g. Lockie, 2013; Hejnowicz et al., 2014);
- effectively managing transaction costs (e.g. Marshall, 2013; McCann, 2013; Scheufele and Bennett, 2017);
- identifying the linkages between specific management interventions and the provision of ecosystem services (e.g. Yin et al., 2013);
- optimizing the spatial targeting of schemes and ensuring adequate levels of monitoring and compliance (e.g. Wendland et al., 2010; Sommerville et al., 2011; Wünscher and Engel, 2012);
- maintaining existing motivations, rights and responsibilities (e.g. Chan et al., 2017); and
- delivering sufficient social and wellbeing results (e.g. Daw et al., 2011; Mahanty et al., 2013).

Many of these issues arise because initiatives designed to deliver a wide range of public goods must grapple with the problem of fostering and promoting collective action,[32] where the potential for 'free riding'[33] is particularly problematic (OECD, 2013).

6.7 PES and Collective Action: The Benefits

However, there are a range of benefits that result from collective action (OECD, 2013; Prager, 2015; Westerink et al., 2017), namely:

- practices and policies can be coordinated at the right scale;
- the supply of public goods delivery is more effective;
- it is easier to deal with transboundary issues, especially externalities like pollution;

[32] Defined here as: "a set of actions taken by a group of farmers, often in conjunction with other people and organizations, acting together in order to tackle local agri-environmental issues." (OECD, 2013:58)

[33] Defined here as: "A person or organization who benefits from a public good but neither provides it nor contributes to the cost of collective provision. They thus free ride on the efforts of others" (Oxford Dictionary of Economics, 2017, 5th Edition).

- landscape-scale management is made possible making it easier to encourage the development of ecological networks;
- coordination of policy objectives and outcomes can be harmonized;
- knowledge exchange and sharing are encouraged;
- social and ecological resilience is improved;
- it builds capacity within the farming community for farmer-led management;
- transaction costs are reduced;
- decision-making is made more credible and is legitimized by a broader stakeholder sector; and
- it is easier to deal with local and regional issues and priorities

6.8 What is the Likelihood of Collective Action?

There are many instances of collaborative agri-environment arrangements operating across the EU. Westerink et al., (2017) cite examples from Belgium, England, France, Germany and The Netherlands showing that farmers involved in collaborative arrangements take on more "governance tasks", alongside demonstrating innovative solutions to negotiate the complex organizational and institutional challenges related to coordinating such widespread management activities. Similarly, Jarrett et al., (2015) identified, very broadly, that farmers were sympathetic towards the idea of engaging in collaborative management approaches. Experience from the DEFRA PES pilots (DEFRA, 2013) and other collaborative management schemes across OECD countries (OECD, 2013) generally supports that view.

However, Riley (2018) sounds a note of caution, suggesting that in many cases collective action in an agri-environment context has been viewed through the 'structural elements of schemes', with a tendency to ignore or overlook 'the deeper sets of farming relations which underpin farmers' collective dispositions' and, referencing watershed management as an example, suggests that there has been a shift from community-level management to individualized land management.

Overall, however, collaboration between farmers (and other groups) for the provision of multiple agri-environmental services is both possible, plausible and workable given the right circumstances and conditions (Jarrett et al, 2015; Westerlink et al., 2017).

6.9 Implementing PES: A Question of Institutions

Developing effective PES policy interventions requires a proper understanding and acknowledgement of the governance and institutional context and dynamics within which these programmes are framed, operationalized and implemented (Hejnowicz et al., 2014). For instance, Hausknost et al., (2017) strongly argue that PES need to be understood as 'political projects', embedded in a matrix of ideological, institutional and power relationships, especially because the supply of particular services is socially and politically constructed. Similarly, Ishihara et al., (2017) introduce the notion of 'institutional bricolage,' or the way actors remake or reform existing institutions, to explain the complex dynamics at play shaping PES implementation. They suggest that providers of environmental services are not simply passive actors, but active agents engaged in a process of recreating these interventions to suit their own context – actions

that are underpinned by power relationships and dynamics. Accounting for these dynamics is central for PES interventions to be considered 'just', and critical for them to be able to deliver social equity: fair and equitable processes of stakeholder participation in decision-making processes (McGrath et al., 2017).

6.10 Implementing PES: The Importance of Enabling Conditions

Delivering a full range of public benefits requires PES programmes to have certain 'social-ecological enabling conditions' in place across all salient dimensions i.e. 'governance', 'socio-cultural', 'biophysical' and 'economic' (Huber-Stearns et al., 2017). Establishing a new form of environmental land management then, as previously alluded to, rests on the development of effective institutions at the level of both the 'wider system' and the specific policy intervention. The existence and interactions between these enabling conditions is essential for developing effective PES programmes and negotiating the problems of collective action. What we outline below are the necessary enabling factors and conditions that need to be both considered and present in the development of a PES-based future agricultural policy model.

6.10.1 Governance and Socio-Cultural Conditions

Flexibility: Creating institutions with a high degree of flexibility through encouraging learning, promoting communication (between farmers, stakeholders and delivery agencies) and fostering leadership is key to programmes being able to respond and adapt to changing circumstances and retain a high degree of efficacy (Murdiyarso et al., 2012; Giest and Howlett, 2014; Somorin et al., 2014; Prager, 2015).

Engagement and Accountability: Institutional processes, programmes need to be inclusive and support an ethos of accountability and transparency (Larsen et al., 2011; Ingram et al., 2014).

Stakeholders and Decision-Making: Accountability builds 'trust and transparency among actors', whilst increasing stakeholder engagement and widening participation can counter barriers such as 'a lack of awareness'. Where trust is lacking, as the DEFRA review of its PES pilot programme noted, 'it can hamper the progress of PES schemes' (DEFRA, 2013). Trust is also fundamental to collaboration (Prager, 2015), whilst the related concept of social capital can be crucial in influencing farmer participation (de Krom, 2017). Moreover, a lack of awareness of the benefits arising from PES or even changes in management practices can act as stumbling blocks to prevent full stakeholder engagement (DEFRA, 2013).

These elements are central to ensure programme interventions are fully supported and legitimised by the local community, increasing the likelihood that they are aligned with local value systems. Trust building and awareness raising is also necessary for understanding participant motivation and preferences, promoting individual and collective agency, encouraging stakeholder participation and using local knowledge (Brooks et al., 2012; Davenport and Seekamp, 2013; DEFRA, 2013; Andersson et al., 2014; Chan et al., 2017; Huber-Stearns et al., 2017). Increased stakeholder engagement also ensures that PES represents a process of co-production between all involved parties (Reed et al., 2017).

Leadership and Power: Collectively, these processes consolidate the responsibilities of involved stakeholders, whilst also furthering the

development of local leadership or 'influential champions' (Chhatre et al., 2012; Huber-Stearns et al., 2017). At the same time, it is important to recognise that how these processes are 'framed' matters, as they can be easily undermined by pre-existing and emergent power relationships (Dewulf et al., 2011).

6.10.2 Governance, Economics and Biophysical Conditions

Ownership: Establishing a form of ownership 'secure land tenure and property type' is a central feature of PES policy interventions (Lockie, 2013; Huber-Stearns et al., 2017). Defining these arrangements is necessary for conditional payments, where provider/supplier and purchaser/beneficiary relations need to operate, and where oversight and accountability for delivering project outcomes is important (Hejnowicz et al., 2014; 2015). These arrangements are also necessary for securing contracts and providing a framework and mechanism to enforce rights (Naughton-Treves and Wendland, 2014).

Demand-side Payment Models: A crucial issue for PES is how to encourage beneficiaries who have the option to free-ride to contribute payments through a scheme. Whilst this is normally achieved through government or private initiatives there are alternative arrangements, such as creating programmes based on a multiple-purchaser model, which has the potential added advantages of increased cost-effectiveness, widening funding streams and enhanced service flows (Smith and Day, 2018). In fact, experimental multiple-purchaser PES models indicate that under conditions of 'multi-lateral negotiation' and 'binding pre-commitments to payments', which enable risk sharing, the collective action problem can be resolved (Smith and Day 2018).

Supply-side Payment Models: The mechanism(s) by which environmental service suppliers are remunerated for their management practices is a core element of a functioning land management scheme. The form and shape of a payment mechanism has serious consequences for farmer income, scheme uptake, farmer engagement with more prescriptive management practices, agreement length and compliance (Hejnowicz et al., 2014; 2016). 'Classic' PES and agri-environment schemes operate on a management-based model, but there are increasingly two other schools of thought regarding payment models for so-called 'service providers' that might afford a more effective mode of land management. *Both of these models could be part of a new PES-oriented land management strategy.*

The first model is a payment-by-results (PBR) design, whereby payments are made based on outcomes rather than specific management practices. Much of the work on PBR programmes is based on insights from results-based agri-environment schemes (e.g. Burton and Schwarz, 2013; Russi et al., 2016; Herzon et al., 2018). The main benefits of a PBR model are (Russi et al., 2016; Birge et al., 2017; Herzon et al., 2018):

- higher conditionality through improved environmental impacts;
- processes of verification are streamlined;
- biodiversity provision becomes part of the farming system;
- lower risk aversion on the part of farmers;
- flexible management implementation;
- hands responsibility to the farmer;
- farmer upskilling; and
- improved social capital

However, PBR-based schemes are not appropriate in all circumstance (Herzon et al., 2018).[34] There are also several technical issues to negotiate, specifically (Herzon et al., 2018):

- Being able to clearly define biodiversity objectives;
- developing a reliable set of biodiversity and ecosystem indicator measures;
- installing a straightforward system of results verification;
- ensuring that there is sufficient capacity and expertise available to provide the necessary support services;
- acknowledging and accommodating socio-economic factors that affect stakeholder values and behaviours;
- ensuring a functioning dispute resolution mechanism is in place (in cases where there is conflict over whether results have been achieved); and
- setting appropriate payment levels.

Regarding the issue of payment levels, these can be partially dealt with either by adopting a reverse auction process or through introducing of a system of differentiated payments (Russi et al., 2016; Herzon et al., 2018). Overall, for Herzon et al., (2018), the principal hurdle for PBR-based agri-environment schemes to negotiate is bringing farmers together.

The second model has most recently been championed by Chan et al., (2017). Drawing on PES experiences from Latin America, they propose a model based on rewarding 'good stewardship'. In this approach, 'service providers' are rewarded for their stewardship rather than "pre-defined actions or outputs", which it is argued negates the problem of a "fixed metric for payment" and can lead to both "short-term and long-term stewardship". The rationale is that this increases both scheme flexibility and attractiveness to farmers because the means of achieving outcomes is not determined (Chan et al., 2017). Moreover, this model advocates that payments should be shared across the supply chain (i.e. across all potential involved actors), alongside rewarding farmers for being "stewards rather than polluters", thereby promoting a situation in which schemes "distribute rights and responsibilities in a manner more conducive to sustainability". Payment arrangements act to reinforce 'stewardship values' and 'trusting relationships'. Ultimately, this approach is built on 'crowding in' intrinsic motivations, building stakeholder capacity through 'cultivating agency', and 'embodying trust' by rewarding stewardship (Chan et al., 2017).

Long-term Financing: The long-term financing of PES is inherently linked to the types of payment models proposed as part of that broader land management strategy. Mechanisms that ensure PES approaches are generative, in other words, that they will be able to self-sustain their ongoing operations are especially important, particularly if they are going to realise a sustainable flow of public benefits over a long period of time (Pirard et al., 2010). Models that involve multiple parties and sectors, like the 'stewardship model' described by Chan et al., (2017), may be particularly helpful in this respect because there is the possibility of leveraging a wider array of funding sources as well as encouraging the diversification of livelihoods for participants

[34] Specifically, when: i) indicators cannot be reliably developed; ii) the costs of measuring indicators are too expensive; iii) measuring outcomes takes too long and affects farmers receiving their payments; iv) the expertise to set-up a PBR scheme is lacking; and v) there is no acceptance amongst the farming community (Herzon et al., 2018).

(Hejnowicz et al., 2014). Reducing fiscal constraints and accounting for the full assemblage of transaction costs [35] is also a fundamental consideration for the long-term financial viability of PES (McCann et al., 2005; Hein et al., 2013; Marshall, 2013; McCann, 2013; Scheufele and Bennett, 2017).

Capturing Actions and Outcomes: In a stewardship model, less emphasis is placed on capturing, in a quantifiable sense, input-output connections (i.e. management practices and resultant public benefit flows). However, in 'conventional' and 'PBR-based' PES models capturing the link between a prescribed set of specified management interventions and particular service provisions or, being able to demonstrate in some tangible manner that particular management interventions have been undertaken, or that certain specified goods or service provisions have been supplied is absolutely essential (Porras et al., 2013; Hejnowicz et al., 2014; Russi et al., 2016; Herzon et al., 2018). The capacity to verify interventions validates schemes and lends them credibility, whilst also ensuring that a distorted picture of service provision does not emerge (Hejnowicz et al., 2014; Herzon et al., 2018).

Where PES policy seeks to deliver multiple defined goods, being able to clarify and capture the relationships between the provision of those goods is important, both for reducing possible trade-offs in their supply and crystallizing the connections between those social-ecological benefits and the values they hold for different social groups (Reed et al., 2017). Layering[36] or bundling[37] service provisions is one way to deal with these issues but, doing so, also needs to account for the various inter-dependencies between the "ecological and social systems that may be affected by PES schemes"; particularly because layering and bundling predominantly focus on a narrow subset of tangible goods and generally ignore intangible 'cultural' goods, despite these being in many instances frequently more highly valued by stakeholders (Reed et al., 2017)[38].

Associated with the issue of verification is additionality, or the ability to demonstrate that programmes have had "added value" (Ghazoul et al., 2010), which is also connected to how schemes are targeted to ensure they maximise service flows (Wünscher and Engel, 2012; Lau, 2013). For a PBR-based model the notion of additionality is fundamental to participants receiving payment, as the so-called 'added value' is, in effect, the 'result' (Herxon et al., 2018). However, under a stewardship model, individual level additionality, like that observed in PBR, is not something that is sought. Indeed, providing rewards to pay farmers for actions and outcomes that they would have undertaken anyway is regarded as a perfectly reasonable state-of-affairs. What matters in this context is additionality derived at the programme level (Chan et al., 2017). A further complicating factor that needs to be borne in mind when assessing additionality is the concept of 'leakage', in other words, identifying possible 'spill-over' effects resulting from the policy intervention that

[35] See references McCann et al., (2005) and Scheufele and Bennett (2017) for further discussion of what transaction costs comprise and their implications for PES.

[36] Layering is defined by Reed et al., (2017:93) as a form of scheme arrangement in which: "…payments are made for different ecosystem services separately from the same system."

[37] Bundling is defined by Reed et al., (2017:93) as a form of scheme arrangement in which: "…multiple ecosystem services [are grouped] together in a single package to be purchased by individual or multiple buyers"

[38] This underscores the need for value plurality to be an essential feature of a public goods driven land management policy agenda, which we advocated in Section 5.

may offset any potential gains (Engel et al., 2008; Porras et al., 2013).

Contracts: In PES approaches contracts can be informal (implicit) or formal (explicit), though generally the latter, but whichever form they take they are necessary to ensure agreements are valid, and that the duties and responsibilities of the individual parties involved are transparently set-out (Ferraro, 2008; Wunder et al., 2008). Contracts that are clear over their requirements promote long-term security and provide a regular and reliable income that supports livelihoods, consequently they also tend to have greater uptake and more promising longer-term beneficial environmental outcomes (Ferraro, 2008; Hejnowicz et al., 2014).

Another important role that contracts play – alongside an appropriate regulatory framework – is providing oversight and accountability (critical where public monies are concerned) by helping to tackle issues such as moral hazard, adverse selection and signalling. As such, and especially in PBR-based models, monitoring and compliance represent fundamental contractual conditions to help support a scheme deliver on its primary objectives (Danielsen et al., 2013). Contract enforcement only works in circumstances in which there is a credible monitoring regime in place (where it is known who is undertaking the monitoring and how frequently), in conjunction with a proportionate system of penalties and sanctions to deal with issues of non-compliance (Ferraro, 2008; Sommerville et al., 2011; Wunder et al., 2008). It is widely understood that a lack of enforcement can reduce scheme performance (Defra and Natural England, 2008; Mountford et al., 2013; Radley, 2013; Schomers and Matzdorf, 2013).

In taking forward a UK national-level PES programme, differential contracts with broader as well as targeted objectives – based on the magnitude and diversity of expected agri-environmental public goods – and which allow flexibility in design and implementation whilst aligning with local and national priorities will likely yield the best results (Wildlife and Countryside Link, 2017).

Intermediaries: The important roles played by intermediary bodies and advisors (both public and private) in PES (e.g. Pham et al., 2010; Huber-Stearns et al., 2013) and agri-environment schemes (e.g. Vesterager and Lindegaard, 2012; Lastra-Bravo et al., 2015; Hejnowicz et al., 2016) is increasingly widely recognised. Frequently, intermediary actors are required to play key roles in knowledge exchange, negotiation and brokering, capacity building and coordination (Hejnowicz et al., 2016). Furthermore, having effective intermediary actors in place has been shown to increase scheme uptake as well as enhance programme effectiveness (Lastra-Bravo et al., 2015; Radley, 2013). Consequently, having sufficiently skilled, resourced and accessible extension services is central to effective PES-based approaches (Huber-Stearns et al., 2013 Lastra-Bravo et al., 2015), and will be crucial to the future success of a new environmental land management strategy in the UK founded on a similar basis.

Sharing of Benefits: Fairness and equity, both in participation and outcomes, need to be central features in the design and implementation of any publicly-funded PES-based approaches (Rodríguez de Francisco et al., 2013). Research from Latin America has shown that, even though these issues can be negotiated, there is often a trade-off between efficiency and equity, with economic efficiency frequently overriding equity concerns (Narloch et al., 2011; 2013). However,

Leimona et al., (2015) have shown that such trade-offs are not inevitable if tackled together and, can be managed by adopting a pragmatic approach and adhering to a mantra of "fairly efficient and efficiently fair". Moreover, adopting a place-based approach in the design and implementation of PES, as demonstrated in the example of the UK's Peatland Code, can enable social justice and equity concerns to be addressed head-on (Reed et al., 2017). Taken together, improving benefit sharing requires the broadest level of stakeholder engagement and participation, an understanding of the socio-economic implications of programmes on non-participants as well as beneficiary populations, legitimate decision-making processes and the possibility of adjusting payments/rewards to accommodate the changing circumstances of farmers and land managers (Hejnowicz et al., 2014).

RECOMMENDATIONS: UK AGRICULTURAL POLICY 3.0

1. Future agricultural policy should be based on a "social-ecological public goods paradigm" not an "economic public goods paradigm". The definition of agri-environmental public goods should be extended to include common pool resources (e.g. forests, pastures, irrigation systems) and club goods (e.g. biodiversity in private parks), and set within a wider social, ecological, economic and political context. This reinterpretation of public goods emphasizes, beyond purely economic properties, the social-cultural co-production of these goods. A broader conception of public goods also has the advantage of better aligning with currently employed environmental management frameworks and concepts such as ecosystem services and natural capital.

2. A shared understanding of public goods requires a genuinely open discussion with all interested stakeholders. This discourse should be based on the views and values of all involved stakeholders (see Recommendation 5).

3. Using the "public monies for public goods" argument, we argue that it is not appropriate for public monies to fund food production where regular markets exist and operate through which those goods are bought and sold. Even in our expanded view of public goods 'food production' is excluded because of its marketable character. However, the social-cultural and farming practices associated with food production would constitute part of our redefined view of public goods.

4. Future agri-environment policy should focus on landscape multifunctionality delivered through an agro-ecological approach, ensuring we have landscapes of plentiful variety that can supply a broad and consistent range of environmental public goods. Framing future agri-environment policy in this way means the land is managed for joint environmental, social, economic and cultural benefits. This also recognizes the important role of human agency, power, and institutions in the social construction of landscapes. Furthermore, it presents a much more robust platform to deliver a sustainable agri-environmental future across the UK.

5. Value pluralism combined with a pragmatic approach should be adopted as pre-requisites for understanding how 'nature' (i.e. environmental public goods) is viewed and valued to ensure future management decisions and actions are co-produced, well informed and legitimate. This means ensuring the widest possible stakeholder involvement and engagement in policymaking processes. Value judgements informing policy should be democratically arrived at and representative of all involved stakeholders.

6. A PES-based approach should form the core funding mechanism for a future agricultural policy. Such an approach could adopt a payment-by-results or stewardship model, or a combination of both, and operate at a national-level to achieve national and regional-level priorities. The programme could be financed through re-directing public monies from funds allocated to Pillar I income-support payments. In conjunction, this national-level programme could provide seed-funds to stimulate locally organized schemes, comprising multi-stakeholder and cross-sector partnerships formed to deliver local-level priorities.

REFERENCES

Andersson, K., Benavides, J. P., León, R. (2014) Institutional diversity and local forest governance. Environmental Science & Policy 36, 61–72

Bartolini, F., Andreoli, M., Brunori, G. (2014) Explaining determinants of the on-farm diversification: empirical evidence from Tuscany region. Bio-based and Applied Economics 3, 137-157

Bateman IJ, Harwood AR, Abson DJ, Andrews B, Crowe A, Dugdale S, Fezzi C, Foden J, Hadley D, Haines-Young R, et al. (2014) Economic Analysis for the UK National Ecosystem Assessment: Synthesis and Scenario Valuation of Changes in Ecosystem Services. Environmental and Resource Economics 57, 273-297

Bateman IJ, Harwood AR, Mace GM, Watson RT, Abson DJ, Andrews B, Binner A, Crowe A, Day BH, Dugdale S, et al. (2013) Bringing ecosystem services into economic decision-making: land use in the United Kingdom. Science 341, 45-50

Bellamy, A.S., Ioris, A.A.R. (2017) Addressing the knowledge gaps in agroecology and identifying guiding principles for transforming conventional agri-food systems. Sustainability 9, 330.

Berry, P., Turkelboom, F., Verheyden, W. and Martín-López, B. (2016) Ecosystem Services Bundles. In: OpenNESS Ecosystem Services Reference Book. Potschin, M. and K. Jax (Eds.). EC FP7 Grant Agreement no. 308428

Birge, T., Toivonen, M., Kaljonen, M., Herzon, I. (2017) Probing the grounds: developing a payment-by-results agri-environment scheme in Finland. Land Use Policy 61, 302-315

Bolliger, J., Bättig, M., Gallati, J., Kläy, A., Stauffacher, M., Kienast, F. (2011) Landscape multifunctionality: a powerful concept to identify effects of environmental change. Regional Environmental Change 11, 203–206

Bond, I., Mayers, J., 2010. Fair Deals for Watershed Services. Natural Resource Issues No. 13. International Institute for Environment and Development, London, UK.

Brooks, J. S., Waylen, K., Borgerhoff Mulder, M. (2012. How national context, project design, and local community characteristics influence success in community-based conservation projects. Proceedings of the National Academy of Sciences USA 109, 21265–21270

Burton, R.J.F., Schwarz, G. (2013) Result-oriented agri-environmental schemes in Europe and their potential for promoting behavioural change. Land Use Policy 30, 628–641

Büscher, B., Sullivan, S., Neves, K., Igoe, J., Brockington, D. (2012) Towards a synthesized critique of neoliberal biodiversity conservation. Capitalism Nature Socialism 23, 2.

Chan, K.M.A., Anderson, E., Chapman, M., Jespersen, K., Olmsted, P. (2017) Payments for ecosystem services: rife with problems and potential – for transformation towards sustainability. Ecological Economics 140, 110-122

Chhatre, A., Lakhanpal, S., Larson, A. M., Nelson, F., Ojha, H., Rao, J. (2012) Social safeguards and co-benefits in REDD+: a review of the adjacent possible. Current Opinion in Environmental Sustainability 4, 654–660

Cogolati, S., Hamid, L., Vanstappen, N. (2015) Global public goods and democracy: what role for

international law? Working Paper No. 159. Ku Leuven Centre for Global Governance Studies (pp. 22)

Costanza, R., de Groot, R., Braat, L., Kubiszewski, I., Fioramonti, L., Sutton, P., Farber, S., Grasso, M. (2017) Twenty years of ecosystem services: how are have we cone and how far do we still need to go? Ecosystem Services 28, 1-16

Costanza, R., de Groot, R., Sutton, P., van der Ploeg, S., Anderson, S.J., Kubiszewski, I., Farber, S., Turner, R.K. (2014) Changes in the global value of ecosystem services. Global Environmental Change 26, 152-158

Danielsen, F., Adrian, T., Brofeldt, S. (2013) Community monitoring for REDD+: international promises and field realities. Ecology & Society 18, 41.

Davenport, M. A., Seekamp, E. (2013) A multilevel community capacity model for sustainable watershed management. Society and Natural Resources 26, 1101–1111

Daw, T., Brown, K., Rosendo, S., Pomeroy, R. (2011) Applying the ecosystem services concept to poverty alleviation: the need to disaggregate human well-being. Environmental Conservation 38,370–379

De Krom, M.P.M.M. (2017) Farmer participation in agri-environmental schemes: regionalization and the role of bridging social capital. Land Use Policy 60, 352-361

de Molina, M.G. (2013) Agroecology and politics. How to get sustainability? About the necessity for a political agroecology. Agroecology and Sustainable Food Systems 37, 45-59

DEFRA (2016) Ecosystem services pilot projects 2012-2015: review of key findings. Department for Food, Environment and Rural Affairs. (pp. 58)

DEFRA and Natural England (2008) Environmental Stewardship Review of Progress. Department for the Environment, Food and Rural Affairs, London. (pp. 167)

Dendoncker, N., Keune, H., Jacobs, S., Gómez-Baggethun. (2014) Inclusive ecosystem services valuation. In Ecosystem Services: Global Issues, Local Practices. Jacobs, S., Dendoncker, N., Keune, H., Eds. Elsevier Publishing Inc: Amsterdam, The Netherlands (pp. 1-12)

Dewulf, A., Mancero, M., Cardenas, G., Sucozhanay, D. (2011) Fragmentation and connection of frames in collaborative water governance: a case study of river catchment management in Southern Ecuador. International Review of Administrative Sciences 77, 50-75

Díaz, S., Demissew, S., Carabias, J., Joly, C., Lonsdale, W.M., Larigauderie, A. (2015) The IPBES conceptual framework – connecting nature and people. Current Opinion in Environmental Sustainability 14, 1-16

Duru, M., Thermond, O., Martin, G., Martin-Clouaire, R., Magne, M-A., Justes, E., Journet, E-P., Aubertot, J-N., Savary, S., Bergez, J-E., Sarthou, J.P. (2015) How to implement biodiversity-based agriculture to enhance ecosystem services: a review. Agronomy for Sustainable Development 35, 1259-1281

Edwards, D.M., Collins, T.M., Goto, R. (2016) An arts dialogue to elicit shared, plural and cultural values of ecosystems. Ecosystem Services 21, 319-328

Engel, S., Pagiola, S., Wunder, S. (2008) Designing payments for environmental services in

theory and practice: an overview of the issues. Ecological Economics 65, 663–674

Euler, J. (2018) Conceptualizing the commons: moving beyond the goods-based definition by introducing the social practices of communing as vital determinant. Ecological Economics 143, 10-16

Ezzine-de-Blas, D., Wunder, S., Ruiz-Pérez, M., Moreno-Sanchex, R.P. (2016) Global patterns in the implementation of payments for ecosystem services. PLoS One 11, e014849

Fedele, G., Locatelli, B., Djoudi, H. (2017) Mechanisms mediating the contribution of ecosystem services to human-wellbeing and resilience. Ecosystem Services 28 Part A, 43-54

Ferraro, P.J. (2008) Asymmetric information and contract design for payments for environmental services. Ecological Economics 65, 810–821

Fischer, J., Meacham, M, Quieroz, C. (2017) Editorial: A plea for multi-functional landscapes. Frontiers in Ecology and the Environment 15, 59.

Fisher, B., Kulindwa, K., Mwanyoka, I., Turner, R.K., Burgess, N.D. (2010) Common pool resource management and PES: lessons and constraints for water PES in Tanzania. Ecological Economics 69, 1253-1261

Fisher, B., Turner, R.K., Moriling, P. (2009) Defining and classifying ecosystem services for decision-making. Ecological Economics 68, 643-653

Fry, G.L.A. (2001) Multi-functional landscapes – towards transdisciplinary research. Landscape and Urban Planning 57, 159-168

Gailing, L., Leibenath, M. (2015) The social construction of landscapes: two theoretical lenses and their empirical applications. Landscape Research 40, 123-138.

Gailing, L., Leibenath, M. (2017) Political landscapes between manifestations and democracy, identities and power. Landscape Research 42, 337-348

Garrod, G., Liddon, A., Phillipson, J., Roew, F., Shortall, S., Shucksmith, M. (2017) After Brexit: 10 key questions for rural policy. Available at: http://www.ncl.ac.uk/media/wwwnclacuk/centreforruraleconomy/files/imported/10%20Policy%20Qs%20about%20Brexit%20final%2016%20Feb%202017.pdf

Gawith, D., Hodge, I. (2017) Envisioning a British ecosystem services policy: Policy Brief for the University of Cambridge Centre for Science and Policy Workshop. (pp. 10)

Ghazoul, J., Butler, R.A., Mateo-Vega, J., Koh, L.P. (2010) REDD: a reckoning of environment and development implications. Trends in Ecology and Evolution 25, 396–402

Giest, S., Howlett, M. (2014) Understanding the pre-conditions of commons governance: the role of network management. Environmental Science & Policy 36, 37–47

Gliessman, S. (2011) Transforming food systems to sustainability with agroecology. Journal of Sustainable Agriculture 35, 823-825

Gliessmann, S. (2013) Agroecology: growing the roots of resistance. Agroecology and Sustainable Food Systems 37, 19-31

Gravey, V., Brown, I., Farstad, F., Hartley, S.E., Hejnowicz, A.P., Hicks, K., Burns, C. (2017) Post-Brexit policy in the UK: a new dawn? Agri-environment. Available at: www.york.ac.uk/yesi/news/newsarchive/brexit

Guerry AD, Polasky S, Lubchenco J, Chaplin-Kramer R, Daily GC, Griffin R, Ruckelshaus M, Bateman IJ, Duraiappah A, Elmqvist T, et al. (2015) Natural capital and ecosystem services informing decisions: from promise to practice. Proceedings of the National Academy of Sciences 112, 7348-7355

Gunton, R.M., van Asperen, E.N., Basden,, A., Bookless, D., Araya, Y., Hanson, D.R., Goddard, M.A., Otieno, G., Jones, G.O. (2017) Beyond ecosystem services: valuing the invaluable. Trend in Ecology and Evolution 32, 249-257

Hausknost, D., Grima, N., Singh, S.J. (2017) The political dimensions of payments for ecosystem services (PES): cascade or stairway? Ecological Economics 131, 109-118

Hein, L., Miller, D.C., De Groot, R. (2013) Payments for ecosystem services and the financing of global biodiversity conservation. Current Opinion in Environment Sustainability 5, 87–93.

Hejnowicz, A.P., Raffaelli, D.G., Rudd, M.A., White, P.C.L. (2014) Evaluating the outcomes of payments for ecosystem services programmes using a capital asset framework. Ecosystem Services 9, 83-97

Hejnowicz, A.P., Kennedy, H., Rudd, M.A., Huxham, M. (2015) Harnessing the climate mitigation, conservation and poverty alleviation potential of seagrasses: prospects for developing blue carbon initiatives and payment for ecosystem service programmes. Frontiers in Marine Science 2, 32.

Hejnowicz, A.P., Rudd, M.A., White, PC.L. (2016) A survey exploring private farm advisor perspectives of agri-environment schemes: the case of England's environmental stewardship programme. Land Use Policy 55, 240-256

Hejnowicz, A.P., Rudd, M.A. (2017) The value landscape in ecosystem services: value, value wherefore art thou value? Sustainability 9, 850.

Herzon, I., Birge, T., Allen, b., Povellato, A., Vanni, F., Hart, K., Radley, G., Tucker, G., Keenleyside, C., Oppoermann, R., Underwood, E., Poux, X., Beaufoy, G., Praan, J. (2018) Time to look for evidence: results-based approach to biodiversity conservation on farmland in Europe. Land Use Policy 71, 347-354

Hill, B. (2017) The United Kingdom's domestic policy for agriculture after Brexit. EuroChoices 16, 18-22

HM Government (2018) A green future: Our 25-year plan to improve the environment. Department for Food, Environment and Rural Affairs.

Holt-Giménez, E., Altieri, M.A. (2013) Agroecology, food sovereignty, and the new green revolution. Agroecology and Sustainable Food Systems 37, 90-102

Horlings, L.G., Marsden, T.K. (2011) Towards he real green revolution? Exploring the conceptual dimensions of a new ecological modernization of agriculture that could 'feed the world'. Global Environmental Change 21, 441-452

House of Commons Environmental Audit Committee (2017) The future of the natural environment after the EU referendum. Sixth Report of the Session 2016-2017 HC599.

House of Lords European Union Committee (2017) Brexit: Agriculture. 20th Report of the Session 2016-2017. House of Lords Paper no. 169.

Huber-Stearns, H.R., Bennett, D.E., Posner, S., Richards, R.C., Hoyle Fair, J., Cousins, S.J.M.,

Romulo, C.L. (2017) Social-ecological enabling conditions for payments for ecosystem services. Ecology and Society 22(1): 18

Huber-Stearns, H.R., Goldstein, J.H., Duke, E.A. (2013) Intermediary roles and payments for ecosystem services: a typology and programs feasibility application in Panama. Ecosystem Services 6, 104–116

Ingram, J. C., Wilkie, D., Clements, T., McNab, R. B., Nelson, F., Baur, E. H. (2014) Evidence of payments for ecosystem services as a mechanism for supporting biodiversity conservation and rural livelihoods. Ecosystem Services 7, 10–21

Ishihara, H., Pascual, U., Hodge, I. (2017) Dancing with storks: the role of power relations in payments for ecosystem services. Ecological Economics 139, 45-54

Jacobs, S., Dendoncker, N., Martín-López, B., Barton, D.N., Gómez-Baggethun, E., Boeraeve, F., McGrath, F.L., Vierikkoh, K., Geneletti, D. (2016) A new valuation school: integrating diverse values of nature in resource and land use decisions. Ecosystem Services 22, 213-220

Jarrett, J., Morris, C., Wheeler, R., Winter, M. (2015) Literature review on farming collaboration. Report for Defra project LM0302 Sustainable Intensification Research Platform Project 2: opportunities and risks for farming and the environment at landscape scales

Kenter, J.O. (2016a) Editorial: shared, plural and cultural values. Ecosystem Services 21, 175-183

Kenter, J.O. (2016b) Integrating deliberative monetary valuation, systems modelling and participatory mapping to assess ahred values of ecosystem services. Ecosystem Services 21, 291-307

Kenter, J.O., Bryce, R., Christie, M., Cooper, N., Hockley, N., Irvine, K.N., Farzey, I., O'Brien L., Orchard-Webb, J., Ravenscroft, N. (2016a) Shared values and deliberative valuation: future directions. Ecosystem Services 21, 358-371

Kenter, J.O., Reed, M.S., Fazey, I. (2016b) The deliberative value formation model. Ecosystem Services 21, 194-207

Kenter, J.O., Jobstvogt., Watson, V., Irvine, K.N., Christies, M., Bryce, R. (2016c) The impact of information, value-deliberation and group-based decision-making on values for ecosystem services: integrating deliberative monetary valuation and story-telling. Ecosystem Services 21, 270-290

Kenter, J.O., O'Brien, L., Hockley, N., Ravenscroft, N., Fazey, I., Irvine, K.N., Reed, M.S., Christie, M., Brady, E., Bryce, R. (2015) What are shared and social values of ecosystems? Ecological Economics 111, 86-99

Kretsch, C., van Dijk, J., Schleyer, C. (2016) Public goods and ecosystem services. In: OpenNESS Ecosystem Services Reference Book. Potschin, M., Jax K. (Eds.). EC FP7 Grant Agreement no. 308428.

Landell-Mills, N., Porras, I.T. (2002) Silver Bullet or Fools' Gold? A Global Review of Markets for Environmental Services and Their Impact on the Poor. International Institute for Environment and Development, London.

Lang, T., Millstone, E., Marsden, T. (2017) A food Brexit: time to get real – a Brexit Briefing. City University of London, University of Sussex and Cardiff University. (pp. 88)

Larsen, R. K., Acebes, J. M., Belen, A. (2011) Examining the assumptions of integrated coastal management: stakeholder agendas and elite co-

option in Babuyan Islands, Philippines. Ocean and Coastal Management 54, 10–18

Lastra-Bravo, X., Hubbard, C., Garrod, G., Tolón-Becerra, A. (2015) What drives famrers' participation in EU agri-environmental schemes? Results from a qualitative meta-analysis. Environmental Science & Policy 54, 1–9

Lau, W. W. Y. (2013) Beyond carbon: conceptualising payments for ecosystem services in blue forests on carbon and other marine and coastal ecosystem services. Ocean and Coastal Management 83, 5–14

Legrand, T., Froger, G., LeCoq, J.F. (2013) Institutional performance of payments for environmental services: an analysis of the Costa Rican program. Forest Policy Economic 37,115–123

Leimona, B., van Noordwijk, M., de Groot, R., Leemans, R. (2015) Fairly efficient, efficiently fair: lessons for developing and testing payment schemes for ecosystem services in Asia. Ecosystem Services 12, 16-28

Lescourret, F., Magda, D., Richard, G., Adam-Blondon, A-F., Bardy, M., Baudry, J., Doussan, I., Dumont, B., Lefèvre, F., Litrico, I., Martin-Clouaire, R., Montuelle, B., Pellerin, S., Plantegenest, M., Tancoigne, E., Alban, T., Guyomard, H., Soussana, J-F. (2015) A social-ecological approach to managing multiple agro-ecosystem services. Current Opinion in Environmental Sustainability 14, 68-75

Liere, H., Jha, S., Philpott, S.M. (2017) Intersection between biodiversity conservation, agroecology and ecosystem services. Agroecology and Sustainable Food Systems 41, 723-760

Lightfoot, W., Burke, J., Craig-Harvey, N., Dupont, J., Howard, R., Lowe, R., Norrie, R., Taylor, M. (2017) Farming Tomorrow: British agriculture after Brexit. Policy Exchange. (pp. 69)

Lockie, S. (2013) Market instruments, ecosystem services, and property rights: assumptions and conditions for sustained social and ecological benefits. Land Use Policy31, 90–98

Lovell, S.T., Johnston, D.M. (2009) Creating multifunctional landscapes: How can the field of ecology inform the design of the landscape? Frontiers in Ecology and Environment 7, 212–220

Mahanty, S., Suich, H., Tacconi, L. (2013) Access and benefits in payments for environmental services and implications for REDD+: lessons from seven PES schemes. Land Use Policy 31,38–47

Marsden, T., Sonnino, R. (2008) Rural development and the regional state: denying multifunctional agriculture in the UK. Journal of Rural Studies 24, 422-431

Marshall, G.R. (2013) Transaction costs, collective action and adaptation in managing complex social–ecological systems. Ecological Economics 88, 185–194

Mastrangelo, M.E., Weyland, F., Villarino, S.H., Barral, M.P., Nahuelhual, L., Laterra, P. (2014) Concepts and methods for landscape multifunctionality and a unifying framework based on ecosystem services. Landscape Ecology 29, 345–358

McCann, L. (2013) Transaction costs and environmental policy design. Ecological Economics 88, 253–262.

McCann, L., Colby, B., Easter, K.W., Kasterine, A., Kuperan, K.V. (2005) Transaction cost measurement for evaluating environmental policies. Ecological Economics 52, 527–542.

McGrath, F.L., Carrasco, L.R., Leimona, B. (2017) How auctions to allocate payments for ecosystem services contracts impact social equity. Ecosystem Services 25, 44-55

Millennium Ecosystem Assessment (2005) Ecosystems and Human Well-being: Synthesis. Island Press, Washington, DC.

Mountford, J.O., Cooke, A.I., Radley, G.P. (2013) Higher level stewardship (HLS)—developing a standard method for evaluation of agreements against objectives. In: agri-environment schemes – what have they achieved and where do we go from here? Aspects of Applied Biolgy 100, 27–33

Muradian, R., Corbera, E., Pascual, U., Kosoy, N., May, P.H. (2010) Reconciling theory and practice: an alternative conceptual framework for understanding payments for environmental services. Ecological Economics 69, 1202–1208.

Murdiyarso, D., Brockhaus, M., Sunderlin, W. D., Verchot, L. (2012) Some lessons learned from the first generation of REDD+ activities. Current Opinion in Environmental Sustainability 4, 678–685

Narloch, U., Pascual, U., Drucker, A.G. (2011) Cost-effectiveness targeting under multiple conservation goals and equity considerations in the Andes. Environmental Conservation 38,417–425

Narloch, U., Pascual, U., Drucker, A.G. (2013) How to achieve fairness in payments for ecosystem services? Insights from agrobiodiversity conservation auctions. Land Use Policy 35, 107–118

National Trust (2017) Public money for public benefit: the basis for a post-Brexit farm system. National Trust. Available at: https://ntplanning.files.wordpress.com/2017/06/paper-2-national-trust-post-cap-series-public-benefits-june-20171.pdf

Naughton-Treves, L., and Wendland, K. (2014) Land tenure and tropical forest carbon management. World Development 55, 1–6

Naveh, Z. (2001) Ten major premises for a holistic conception of multi-functional landscapes. Landscape and Urban Planning 57, 269-284

O'Brien, K.L., Wolf, J.A. (2010) A value-based approach to vulnerability and adaptation to climate change. Wiley Interdisciplinary Reviews in Climate Change 1, 232-242

O'Farrell, P.J., Anderson, P.M.L. (2010) Sustainable multifunctional landscapes: A review to implementation. Current Opinion in Environmental Sustainability 2, 59–65

OECD (2013) Providing agri-environmental public goods through collective action. OECD Publishing, Paris.

Ostrom, E. (1990) Governing the commons: the evolution of institutions for collective action. Cambridge University Press.

Parks, S., Gowdy, J. (2013) What have economists earned about valuing nature? A review essay. Ecosystem Services 3, e1-e10

Pascual, U., Balvanera, P., Díaz, S., Pataki, G., Roth, E., Stenseke, M., Watson, R.T., Dessane, E.B., Islar, M., Kelemen, E. et al. (2017) Valuing

nature's contributions to people: the IPBES approach. Current Opinion in Environmental Sustainability 26, 7-16

Pascual, U., Muradian, R., Rodríguez, L.C., Duraiappah, A. (2010) Exploring the links between equity and efficiency in payments for environmental services: a conceptual approach. Ecological Economics 69, 1237–1244

Peltola, T., Arpin, I. (2017) How we can come to value nature? A pragmatist perspective. Ecological Economics 142, 12-20

Perrings, C. (2014) Our Uncommon Heritage: Biodiversity Change, Ecosystem Services, and Human Wellbeing. Cambridge University Press. Cambridge, UK.

Pham, T.T., Campbell, R.M., Garnett, S., Aslin, H., Hoang, M.H. (2010) Importance and impacts of intermediary boundary organizations in facilitating payment for environmental services in Vietnam. Environmental Conservation 37, 64–72

Pirard, R., Billé, R., Sembrés, T. (2010) Questioning the Theory of Payments for Ecosystem Services (PES) in Light of Emerging Experience and Plausible Developments. Institut du Développement Durable et des Relations Internationales, Paris.

Porras, I., Aylward, B., Dengel, J. (2013) Sustainable Markets Monitoring Payments for Watershed Services Schemes in Developing Countries. London: International Institute for Environment and Development.

Postnote 542 (2016) Natural capital: an overview. Houses of Parliament: Parliamentary Office of Science and Technology.

Postnote 556 (2017) Security of UK food supply. Houses of Parliament: Parliamentary Office of Science and Technology.

Postnote 557 (2017) Environmentally sustainable agriculture. Houses of Parliament: Parliamentary Office of Science and Technology.

Prager, K. (2015) Agri-environmental collaboratives for landscape management in Europe. Current Opinion in Environment and Sustainability 12, 59-66

Radley, G.P., 2013. Lessons for the design of future agri-environment schemes. In: agri-environment schemes—what have they achieved and where do we go from here? Aspects of Applied Biology 100, 1–8.

Ranger, S., Kenter, J.O., Bryce, R., Cumming, G., Dapling, T. Lawe, E., Richardson, P.B. (2016) Forming shared values in conservation management: an interpretive-deliberative-democratic approach to identify community voices. Ecosystem Services 21B, 244-257

Rayment, M. (2017) Assessing the costs of environmental land management in the UK. Final Report. A report for the RSPB, the National Trust and The Wildlife Trusts. (pp. 49)

Reed, M.S., Allen, K., Attlee, A., Dougill, A.J., Evans, K.L., Kenter, J.O., Hoy, J., McNab, D., Stead, S.M., Twyman, C., Scott, A.S., Smyth, M.A., Stringer, L.C., Whittingham, M.J. (2017) A place-based approach to payments for ecosystem services. Global Environmental Change 43, 92-106

Reyers, B., Biggs, R., Cumming, G.S., Elmqvist, T., Hejnowicz, A.P., Polasky, S. (2013) Getting the measure of ecosystem services: a social-

ecological approach. Frontiers in Ecology and Environment 11, 268-273

Reyers, B., O'Farrell, P.J., Nel, J.L., Wilson, K., (2012) Expanding the conservation toolbox: Conservation planning of multifunctional landscapes. Landscape Ecology 27, 1121–1134

Riley, M., Sangster, H., Smith, H., Chiverrell, R., Boyle, J. (2018) Will farmers work together for conservation? The potential limits of farmers' cooperation in agri-environment measures. Land Use Policy 70, 635-646

Rodríguez de Francisco, J. C., Budds, J., Boelens, R. (2013) Payment for environmental services and unequal resource control in Pimampiro, Ecuador. Society and Natural Resources26, 1217–1233

Rovai, M., Andreoli, M. (2016) Combining multifunctionality and ecosystem services into a win-win solution: the case of the Serchio River Basin (Tuscany-Italy). Agriculture 6, 49.

Russi, D., Margue, H., Oppermann, R., Keenleyside, C. (2016) Results-based agri-environment measures: Market-based instruments, incentives or rewards? The case of Baden-Württenberg. Land Use Policy 54, 69-77

Salles, J-M. (2011) Valuing biodiversity and ecosystem services: why put economic values on nature? Comptes Rendus Biologies 334, 469-482

Scheufele, G., Bennett, J. (2017) Can payments for ecosystem service schemes mimic markets? Ecosystem Services 23, 30-37

Schomers, S., Matzdorf, B. (2013) Payments for ecosystem services: a review and comparison of developing and industrialized countries. Ecosystem Services 6, 16–30

Selman, P. (2009) Planning for landscape multifunctionality. Sustainability: Science, Practice and Policy 5, 45–52

Setten, G., Brown, K.M. (2013) Landscape and social justice. In: The Routledge Companion to Landscape Studies. (Eds) Howard, P., Thompson, I., Waterton, E. Routledge, Oxford. (pp. 243-251)

Smith, G., Day, B. (2018) Addressing the collective action problem in multiple-purchaser PES: an experimental investigation of negotiated payment contributions. Ecological Economics 144, 36-58

Sommerville, M.M., Milner-Gulland, E.J., Jones, J.P.G. (2011) The challenge of monitoring biodiversity in payment for environmental service interventions. Biological Conservation 144, 2832–2841

Spangenberg, J.H., Settele, J. (2010) Value pluralism and economic valuation – defendable if well done. Ecosystem Services 18, 100-109

Spangenberg, J.H., Settele, J. (2016) Precisely incorrect? Monetising the value of ecosystem services. Ecological Complexity 7, 327-337

Stewart, B.D., O'Leary, B.C. (2017) Post-Brexit policy in the UK: a new dawn? Fisheries, seafood and the marine environment. Available at: www.york.ac.uk/yesi/news/newsarchive/brexit

Stoeckl, N., Hicks, C., Farr, M., Grainger, D., Esparon, M., Thomas, J., Larson, S. (2018) The crowding out of complex social goods. Ecological Economics 144, 65-72

Termorshuizen, J.W., Opdam, P. (2009) Landscape services as a bridge between landscape ecology and sustainable development. Landscape Ecology 24, 1037–1052

UK National Ecosystem Assessment (2011) The UK National Ecosystem Assessment: Synthesis of the Key Findings. UNEP-WCMC, Cambridge

Vandermeer, J., Perfecto, I. (2013) Complex traditions: intersecting theorectical frameworks in agroecological research. Agroecology and Sustainable Food Systems 37, 76-89

Vivero-Pol, J.L. (2017) Food as commons or commodity? Exploring the links between normative valuations and agency in food transition. Sustainability 9, 442.

Weltin, M., Zasada, I., Franke, C., Piorr, A., Raggi, M., Viaggi, D. (2017) Analyzing behaviour differences of farm households: an example of income diversification strategies based on European farm survey data. Land Use Policy 62, 172-184

Wendland, K.J., Honzák, M., Portela, R., Vitale, B., Rubinoff, S., Randrianarisoa, J. (2010) Targeting and implementing payments for ecosystem services: opportunities for bundling biodiversity conservation with carbon and water services in Madagascar. Ecological Economics 69, 2093–2107

Westerink, J., Jongeneel, R., Polman, N., Prager, K., Franks, J., Dupraz, P., Mettepenningen, E. (2017) Collaborative governance arrangements to deliver spatially coordinated agri-environmental management. Land Use Policy 69, 176-192

Wezel A., Vincent, A., Nitsch, H., Schmid, O., Dubbert, M., Tasser, E., Fleury, P., Stöckli, S., Stolze, M., Bogner, D. (2018) Farmers' perceptions, preferences and propositions for result-oritented measures in mountain farming. Land Use Policy 70, 117-127

Wezel, A., Bellon, S., Doré T., Francis, C., Vallod, D., David, C. (2009) Agroecology as a science, a movement and a practice: a review. Agronomy for Sustainable Development 29, 503-515

Wildlife and Countryside Link (2017) A future sustainable farming and land management policy for England. Discussion Paper. (pp. 70)

Willis, G. (2016) New model farming: resilience through diversity. Farming & Foresight Paper 1. Campaign to Protect Rural England. (pp. 32)

Wunder, S., Engel, S., Pagiola, S. (2008) Taking stock: a comparative analysis of payments for environmental services programs in developed and developing countries. Ecological Economics 65, 834–852

Wünscher, T., Engel, S. (2012) International payments for biodiversity services: review and evaluation of conservation targeting approaches. Biological Conservation 152, 222–230

Wylie, J. (2007) Landscape. Routledge. London and New York.

Wynne-Jones, S. (2013) Connecting payments for ecosystem services and agri-environment regulation: an analysis of the Welsh Glastir scheme. Journal of Rural Studies 31, 77-86

Yang, B., Li, M-H., Li, S. (2013) Design-with-Nature for multi-functional landscapes: environmental benefits and social barriers in community development. International Journal of Environmental Research and Public Health 10, 5433-5458

Yin, R., Liu., T., Yao, S., Zhao, M. (2013) Designing and implementing payments for ecosystem services programs: lessons learned from China's crop land restoration scheme. Forest Policy Economics 35, 66–72