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Policy instruments for environmental public goods: Interdependencies and hybridity

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ABSTRACT

The mixture of public goods that arise from rural land is shaped by multiple policy instruments, such as regulations and economic incentives. Whilst there is a vast literature focusing on categories of policy instruments, there remains the need for a deeper exploration of the interaction between these instruments and the consequences for managing public goods in agricultural and/or forested landscapes. Therefore, we explore how policy instruments influence the mix of public goods provided by Scottish agricultural and forested areas, drawing on desk based and empirical research. Our data suggest that whilst environmental policy instruments in Scotland are designed to coordinate – i.e. not to conflict – with each other, the design and implementation of instruments often go beyond this. We find that many instruments are hybrid and/or rely on interactions with other instrument types (interdependency) to achieve their objectives. This seems well understood by those involved in the implementation of policy instruments. In light of these results, we argue that the literature about types of policy instruments must evolve to explicitly acknowledge interdependency and hybridity: these concepts can become starting points for understanding how public goods can be governed in a more systemic way. Our work also draws attention to the need to study policy instruments 'on the ground' in order to understand their role and use in the wider debates about new environmental governance. Finally, while the idea of interdependency and hybridity brings challenges and even resistance by some who design policy, it may also help to overcome the existing policy implementation deficit between the aims and achievements of environmental policies.

1. Introduction

At both global and European scales there are concerns about the impacts of agriculture and forestry on the environment, especially in the face of changing land uses and climate change (Kuhmonen, 2018). Safeguarding and improving the provision of public goods provided by the environment has therefore been at the centre of recent environmental and agricultural policy developments - for example the proposal for the European Union's post-2020 Common Agricultural Policy (CAP) has 9 strategic objectives including climate change action, environmental care and conserving landscapes and biodiversity (European Commission, 2018). However, such policies are often critiqued for failing to protect, let alone improve, environmental public good provision. For example, Gamero et al. (2017) conclude that the combination of European Union (EU) policies to date has merely attenuated rather than reversed a decline in farmland birds.

From a classical economics perspective, environmental public goods are characterized by their inherent non-rivalry and non-excludability[3] (Samuelson, 1954; Buchanan, 1965; Ostrom and Ostrom, 1977, 1997; Cornes and Sandler, 1996). However, definitions are not clear cut and in practice 'publicness' may be contingent on institutional arrangements and not necessarily fixed over time (Novo et al., 2017), whilst public goods of a particular type (e.g. agrobiodiversity) can co-exist with other common-pool, private or club goods. A social and political perspective creates a slightly different perspective on public goods, as outcomes associated with the delivery of socially and/or politically desired goals (e.g. Cooper et al., 2009). In our study, we do not arbi-

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trate between these definitions of public goods but focus on those natural assets that have traditionally been the target of environmental and agricultural policies, namely soils, water and biodiversity, and which underpin the provision of a wide array of public goods and/or bads (e.g. water regulation, water quality, soil erosion, etc.) and which may create trade-offs with private ones.

Thus, improving the delivery of public goods (or minimising the occurrence of public bads) is often an objective of public policy. Public policy is a complex set of interrelated constituent parts spanning the overall policy objective, the design of policy instruments, the implementation of such instruments and the monitoring and evaluation processes that allow policy adjustments if objective(s) are not met (Nilsson et al., 2012). As such, delivering public goods from rural land requires the implementation of multiple policy instruments in a coordinated fashion, across multiple policy domains affecting multiple natural assets (e.g. biodiversity, soil and water). This aspect of the policy process (i.e. the implementation and interaction of multiple policy instruments) is the subject of this paper.

The policy implementation literature shows instruments may evolve from their original design once implemented by specific actors in specific contexts, through what some call institutional crafting (Thiel et al., 2015), so we focus on empirical evidence of policy instruments in use, and the dynamic nature of institutional processes, rather than evaluating their intended effects. We combine insights from Jordan et al. (2012) who argue that it is important to focus on policy instruments as both the outcome of past, and generator for new, political struggles; and the insights from hybridity scholars (e.g. Lockie, 2013) who also argue that hybridity is the result of past, and catalyst for new, innovations in governance approaches. This implies consideration of the multi-level nestedness of policy cycle dynamics; as implementation is influenced by policy design; and policies can be redesigned when implementation fails (Howlett, 2009).

In turn, drawing on empirical examples of policy instruments to deliver public goods from forested or agricultural land in Scotland, we appraise: (i) the extent to which instruments are hybrid (i.e. neither purely legal, economic or informational but designed to be a combination); and/or (ii) interdependent (i.e. rely on interactions with other instrument types to achieve their stated objectives). We focus on how hybridity and interdependencies are designed or emerge, and the implications for conserving or restoring environmental public goods. This exploratory research provides a starting place for further conceptual contribution to policy studies and environmental governance, as discussed in section 4.

1.1. Categories of policy instruments

Policy instruments designed to manage the environment are often categorised as legal, economic or informational (Vatn, 2005, p. 392). Legal (also denoted in the literature as command-and-control or regulatory) instruments establish some form of standards that must be complied with. Failure to do so often entails punitive actions (Jordan et al., 2012, p. 115). Economic instruments include a myriad of instruments (e.g. taxes, subsidies, markets) which are expected to change payoff structures and incentivize agents to make the 'right' decisions (Vatn, 2015, p.331). In turn, economic instruments are often associated with market-based instruments or incentive-based instruments, which Pirard (2012) highlights encompasses a wide variety of instruments, which vary in their intrinsic economic characteristics and their relations to markets. Finally, informational instruments are usually based on the notion of an 'information deficit', whereby the provision of information is expected to result in a change in actors' behaviours, usually towards what is seen as right or best to do (Vatn, 2005, p. 393; Jordan et al., 2012, p. 115; Vatn, 2015, p.337). In addition to these three categories, a last set of instruments often considered in the literature are voluntary or persuasive actions taken by different actors leading to a change in outcomes (Jordan et al., 2012, p. 115).

This classification of legal, economic, informational and voluntary instruments is not universally agreed. Hahn et al. (2015) propose an alternative way of looking at policy instruments for biodiversity and ecosystem services, based on their degree of commodification. The classification ranges from zero-degree, which includes instruments such as moral suasion and regulations justified by the intrinsic value of nature, to six-degree which includes financial instruments such as bonds and derivatives, which are entirely justified by the extrinsic (monetary) value of nature. Jordan et al. (2012) suggest that efforts should focus on how instruments improve policy processes, rather than on debating and refining idealized categories. This paper is based on this advice, and therefore aims to better understand the role of policy instruments in use.

Jordan et al. (2012) also point to the link between governance modes and preferences for particular types of policy instruments. Policy instruments can be seen as a reflection of different governance styles or modes: their design is intended to produce specific effects and through this they reveal expectations about how those governing expect those governed to respond, implicitly conveying expectations about how governance should work (Lascoumes and Le Gales, 2007). Evans (2012) discusses modes of governance in terms of 'hierarchies', 'networks' and 'markets', emphasising the difference in motives for action. As such, governance modes and, in consequence, the design of policy instruments, are also linked through the different stages of the policy process (Howlett, 2009) and to more fundamental world views and assumptions about nature, people and the relationship between them (Muradian and Pascual, 2018), although these assumptions are often implicit.

Therefore, whilst this paper focuses on policy instruments, it is cognizant of the fact that policy instruments are applied in a wider governance context that shapes all aspects of the policy cycle. Researching the implementation of multiple instruments to support delivery of public goods from agriculture and forestry may also provide a lens to consider wider governance modes. Literature on 'new' environmental governance emphasises the blend of state, market and civic actors and different governance modes involved in delivering environmental objectives (Holley et al., 2012). This 'new' literature calls for empirical research to focus on whether fixed and discrete modes of governance exist in practice or whether there is a blend of governance modes - either moving between modes over time or across levels; or between different modes implemented by the different actors involved in the governance processes (Pahl-Wostl, 2019). Furthermore, it also emphasises the role of the non-state actors in governance processes, who may have differing expectations and world views e.g. about land management (Nigmann et al., 2018). This emerging focus on blends and mixes of governance modes resonates with the concept of hybridity and interdependence in policy instruments. As boundaries between governance styles become more fluid and fuzzy, so too might the categories of policy instruments.

1.2. Hybridity and Interdependence of policy instruments

Traditionally, policy design processes ensure that the types of policy instruments are coordinated in space and time to ensure policy coherence and reduce policy conflicts (Jordan, 2012). Here, we consider efforts that go beyond coordination. The term hybridity was popular-

[3] Non-rivalry implies that one person's consumption of the good does not preclude another person from consuming it. Non-excludability means that no-one can be excluded from consuming the good (or that it would be too expensive to prevent the consumption from other agents).

ized by geographer Sarah Whatmore (2002) who illustrated the need to cross the 'fault lines' between, in her case, nature and society; and since then, the concept has been used to draw attention to the interdependencies and co-constitution of concepts that were previously presented as separate or even in opposition. There have been many references to the idea of hybrid governance - in the context of water (e.g. Eberhard et al., 2017; Kellogg and Samanta, 2018; Pahl-Wostl, 2019); and biodiversity conservation (e.g. Armitage et al., 2012). These papers, following Whatmore, illustrate both tensions and opportunities that arise from the interaction of previously distinct (or thought to be distinct) categories (see also Birkenholtz, 2008; Lane et al., 2011 on hybrid knowledge). However, most of this literature focuses on steering governance arrangements – what Lockie and Higgins (2007) call the 'hybrid assemblages of governing' (see also Lockwood and Davidson, 2010) – not the policy instruments themselves.

Turning to the literature on policy instruments, there is increasing recognition that some 'categories' such as 'market-based instruments' do not operate alone but require a 'hybrid governance' approach (i.e. requiring multiple policy actors with previously distinct institutional configurations) (Boisvert et al., 2013; Muradian and Gomez-Baggethun, 2013; Lambin et al., 2014). The literature also notes that policy approaches to managing ecosystem services are often hybrids, as legal and economic instruments combine to achieve a common objective. Such combinations often occur to overcome implementation issues affecting single policy instruments, because of perceived distributional issues associated with who bears costs and benefits (Villamayor-Tomas et al., 2019). These authors note that there is always a mix of public-private influences within policy approaches given that demand-led instruments must comply with existing legal frameworks. The papers cited above call for more attention to the hybridity of instruments and also provide several useful analytical insights, such as attention to different facets of the policy cycle. However, existing analyses still tend to assume that the instruments themselves are distinct categories, implying that it is the governance approaches that are hybrid. Furthermore, the focus on legal and economic instruments minimizes or excludes the role of voluntary persuasive instruments which are often seen as essential to the uptake of policy measures by land managers (Mills et al., 2017). Therefore, there remains the need for a deeper exploration of 'hybrid' instruments and the ways in which these might advance the management of public goods in agricultural or forested landscapes.

The need to focus on hybridity in relation to policy instruments is also justified by literatures variously referring to interaction, interdependency or even integration between policy instruments. For example, within policy studies there are references to policy integration (Candel and Biesbroek, 2016), policy coherence (Nilsson et al., 2012) or policy mixes (Barton et al., 2017). The main differences between the use of such terms are the levels of analysis and whether the focus is between or within policy domains. These literatures draw attention to the need to understand the synergies and conflicts between policy instruments as implemented, as well as between the overall policy objectives. Barton et al. (2017) and Fedrigo et al. (2014) use the language of policy mixes to draw attention to the bundles of interacting instruments used to achieve objectives. Barton et al. (2017) in particular call for more attention to be paid to the 'rules-in-use' in relation to how specific policy instruments are used in practice, advocating empirically rather than theoretically based discussion. Muñoz-Rojas et al. (2015) highlight that attention to interaction and interdependency is particularly important when adopting a spatial lens, as multiple instruments may simultaneously apply to one patch of land. Given the variety of terminology, we adopt the concept of interdependency to describe how instruments need to work synergistically to deliver a common objective. Note that we use interdependence solely to describe the interaction of policy instruments, rather than the interdependence between actors as in the institutional economics literature (Hagedorn, 2013 building on Vatn, 2005).

In summary, the concepts of integration and hybridity, when taken literally, mean the emergence of a new entity from the combination of previously separate entities, but their use in the environmental governance literatures cited above implies something less deterministic. We understand that hybridity and integration draw attention to the connections between entities, i.e. policy instruments, highlighting their mutual constitution rather than necessarily generating new distinct categories. We define hybrid instruments to be those that span or defy categorisation, in that they seem to be neither purely legal, economic, informational or voluntary. A hybrid instrument can be a single instrument. The blurring of traditional categories (legal, economic, information and/or voluntary) does not necessarily require the interaction of multiple instruments. By contrast, interdependent instruments may or may not be hybrid, but require an interaction with at least one other instrument type in order to achieve their stated objective. We emphasise the creative potential of blurring categories and working across divides, specifically in the implementation of policy instruments acting on public goods. We focus specifically on biodiversity, soils and water as they constitute key topics for environmental policy. This is not only of academic interest but also of practical importance, given ongoing concerns over the quality and quantity of public goods associated with agricultural and forested land uses, and concerns over policy implementation in this area.

2. Methodology

This paper has emerged from two complementary, but separately designed, strands of research funded by the Scottish Government looking at the management of natural assets, including biodiversity and ecosystem services. The emergent ideas within the paper draw on empirical research projects conducted from 2016 to 2019.

The first project (Project A) focused on policy instruments for improving biodiversity in Scotland (see Table 1). This work reviewed different instruments of governance with relevance to biodiversity, and focused on documenting their strengths and weaknesses. The review was followed by interviews with key stakeholders involved in biodiversity governance in Scotland to explore what was working, what the problems and issues were, how the causes of biodiversity loss were described and understood and what were seen as the barriers to improving biodiversity. The second project (Project B) focused on policy instruments for the integrated management of natural assets (biodiversity, soil and water). Initially, the project focused on Scottish Government policy instruments and then considered instruments initiated by the private sector and other non-state actors (see Table 1). Both projects considered research questions focused on the extent to which these instruments were aligned or integrated and the opportunities available for further alignment or integration to deliver multiple environmental policy objectives. Both pieces of research were designed to inform the delivery of Scottish Agri-environmental policies, which are a transposition of EU policies (e.g. Natura 2000, Water Framework Directive (WFD), Common Agricultural Policy (CAP)) and the Scottish contribution to supra-national strategies (e.g. Aichi Targets, EU Biodiversity Strategy).

Both research projects began from similar methodological positions and adopted similar data collection and analysis techniques. We carried out a desktop analysis of both academic literature and, in the case of Project B, the policy documents themselves. The analysis was structured using criteria based on an Ostromian approach (Ostrom and Cox, 2010) to understanding policy instruments as part of the rules-in-use governing biodiversity, soils and water. Project A took an inclusive approach and covered a broad range of instruments in use in Scotland and beyond. This project covered a total of 66 existing policy instru-

Table 1
Instruments reviewed for Project A and Project B.

Initial category of Instrument		Domain
Legal		
International & National designations	A	Biodiversity
Planning Instruments	A&B	Biodiversity
Regulations	A&B	Biodiversity, Water
Cross compliance	B	Biodiversity
Conservation Covenants	B	Soil, Water
Economic		
Tax & fees	A	
Grants and incentive schemes	A & B	Biodiversity
Sustainable Land Management Schemes	A	Biodiversity, Soil, Water
Stewardship Schemes	A	Biodiversity
Management agreements	A	Biodiversity
Payments for Ecosystem Services	A & B	Biodiversity
Biodiversity Certification	A	Biodiversity, Soil, Water
Eco-accounts	A	Biodiversity, Soil, Water
Labelling & branding & product premiums	A & B	Biodiversity
Offsets	A	Biodiversity
Biodiversity & mitigation banking	A	Biodiversity
Biodiversity derivatives	A	Biodiversity
Green Finance & Lending Policies	B	Biodiversity, Soil, Water
Impact Bonds	B	Biodiversity, Soil, Water
Information		
Advisory services	A & B	Biodiversity
Demonstration farms	A & B	Biodiversity, Soil, Water
Best Practice Guidance	A & B	Biodiversity, Soil, Water
Sustainability or True Cost Accounting	B	Biodiversity, Soil, Water
Ecological Foot printing	B	Soil, Water
Voluntary		
Awards & competitions	A	Biodiversity
Campaigning	A	Biodiversity
Volunteering	A	Biodiversity
Pilot schemes	A	Biodiversity
Partnerships and networks	A & B	Biodiversity, Soil, Water
Corporate Social Responsibility	B	Biodiversity, Soil, Water
Sustainable Procurement	B	Biodiversity, Soil, Water
Non-State Standards	B	Biodiversity, Soil, Water
Sustainable Supply Chain Management	B	Biodiversity, Soil, Water

Note: the examples of instruments are listed in their original categories, although many of them do not fit neatly into these columns, leading to the concepts at the heart of this paper. The totals will not add up to the same totals listed in methodology section 2 due having instruments in common between projects A&B; and listing generic examples here and specific examples in the text (e.g. incentives or agri-environment climate scheme).

ments classified into 23 types of instruments under the four broad categories discussed earlier, namely: i) legal, ii) economic, iii) information and iv) voluntary (see Byg and Novo., 2017 and Table 1). Project B took a more in-depth approach, focusing on ten Scottish Government-led policy instruments, which also covered the categories mentioned above (Blackstock et al., 2018a). The complementary review of private sector-initiated instruments covered a total of 19 types of economic, information and voluntary instruments, (Blackstock et al., 2018b). The review material was organised in QSR International's NVivo 11 and NVivo 12 software databases, including nodes based on the standard instrument categories stated above, to allow thematic analysis and facilitate comparison between instrument types. The results of both projects were shared with relevant stakeholders for peer-checking and review before completion.

In both projects, the findings from the desktop analysis were complemented by interviews and workshops with selected stakeholders involved in either designing or implementing these policy instruments. An initial workshop was held to discuss both projects, to confirm both the research foci and the instruments to be discussed (Blackstock et al., 2017). Project A then conducted further interviews (Byg et al., 2018) as described earlier and held two workshop sessions to confirm the list of instruments being analysed, and elicit further suggestions (Novo et al., 2018a, 2018b). These workshops mainly involved government participants but also included some policy advisors from NGOs. Project B followed up the desk-based analysis by interviewing 17 participants who had been involved in the instrument design or were involved in its implementation (see Blackstock et al., 2018a for details). The initial findings from the private sector-initiated instruments were discussed with governmental and NGO stakeholders during a meeting in January 2019 (see Stockan, 2019) and field notes were added to the dataset. In both cases, the participants were mainly employees of the Scottish government or its agencies, with some participation by NGO personnel involved in policy development and implementation. Note that the 'subjects' of policy instruments (e.g. land managers) were not involved in the data collection.

These data collection and interpretation processes were particularly important to understand how the instruments worked in practice and to expose any challenges faced rather than rely solely on the official descriptions available online. In both cases the data from stakeholders comes from a purposive sample from which individuals self-selected whether to participate in the interviews or workshop discussions and does not include views on the implementation of instruments from individual land managers or members of the public. These data were again analysed thematically using the NVivo software to enrich and extend the insights from the desktop analysis. The views of the stakeholders are complementary data for this paper, which builds primarily on the desktop analysis.

As mentioned above this paper is based on inductive and exploratory analysis of qualitative data from two complementary projects assessing similar topics in the same geographic and socio-political context. There are important differences. Project A was focused on biodiversity instruments and has a wider coverage of different examples, compared to Project B which explores three policy domains through a smaller set of examples. These differences may have framed the responses by stakeholders and may limit direct comparability of cases but does not preclude the observation that hybridity and interdependence occurred in both projects. Confining our analysis to one country allowed us to compare between instruments implemented in the same context by the same policy actors; and the differences between the two projects allow us to see if our emergent ideas hold across a diversity of approaches. We do not claim to represent all environmental policy implementation processes or even a comprehensive audit of environmental policy instruments in Scotland. However, even a partial understanding of the situation based on a single country is useful for exploring the themes arising around instruments 'in use' and their mismatch with the 'standard' instrument types often presented in the literature. We argue that such understandings are also an important guide for supporting better management of public goods provided through agricultural and forestry land uses.

3. Results

3.1. Overview

Although both projects originally adopted standard categories (legal, economic, information and voluntary) to characterize instruments, we found that these categories were often misleading or unhelpful as they obscured how the instruments we studied function when implemented in the field. We felt these tensions were reminiscent of debates within the new environmental governance literature. As defined in section 1 (Introduction), for this paper we consider a hybrid instrument to be one that spans or defies categorisation in that one instrument seems to be neither purely legal, economic, informational or voluntary. Interdependent instruments may or may not be hybrid, but involve an interaction with at least one other instrument type in order to achieve their stated objective. Hybridity and interdependencies can be further distinguished as designed (explicitly planned, intentional, arising as part of a policy design process) or emergent (arising through implementa-

tion, may not be intentional); a distinction that became apparent during analysis.

Therefore the results are structured around four themes: (1) the existence of 'hybrid instruments'; (2) the importance of interdependencies; (3) when hybridity and interdependencies of instruments are designed or emergent and (4) 'new' governance approaches for public goods.

3.2. Existence of hybrid instruments 'by design'

Firstly, as illustrated in Table 2, some of the instruments could not be classified as purely legal, economic or informational. For example, several of the policy instruments under the Scottish Rural Development Programme (SRDP) (2014–20) (under pillar two of the CAP) were originally classified as incentives but are neither purely legal, economic or informational in nature. For example, all of the agri-environment and climate measures (optional incentive-based payments) require that recipients cross-comply with a number of environmental and animal health standards and achieve Good Agricultural and Environmental Conditions (GAEC) on their holdings (Table 2). Therefore, these are designed hybrid instruments that combine economic incentives with legal approaches. Another example is the Knowledge Transfer and Innovation Fund (KTIF), which is another SRDP measure. This again may seem like an economic incentive-based instrument where groups of land managers receive funds to implement innovative agri-environmental projects; however, to access the fund, groups of land managers must voluntarily come together and undertake peer-to-peer knowledge transfer as part of the condition of the grant. This, we argue, can be usefully seen as a designed hybrid between economic, voluntary and informational types of instruments.

Similarly, in the context of water policy and management, Scotland's Environment Protection Agency (SEPA) has established a Diffuse Pollution Management Advisory Group (DPMAG) as part of the Diffuse Pollution Management Strategy (DPMS) to help implement the Water Environment and Water Services (Scotland) Act 2003. DPMAG uses a two-tier approach to reduce diffuse pollution by combining a legal instrument, the Controlled Activities Regulations (CAR) and information dissemination. As such, this hybrid approach combines a national campaign to promote awareness and ensure compliance with diffuse pollution General Binding Rules (GBRs) (a part of the Controlled Activities Regulations) and the establishment of Priority Catchments where different instruments are used to provide information to land managers on the required steps they need to take to comply with GBRs (SEPA, 2017). Whilst the CAR was not designed initially as a hybrid instrument and can be used as a purely legal instrument, the current implementation of the DPMS has intentionally designed the implementation of the GBRs as a combination of legal and informational approaches.

Turning to land use planning instruments, another hybridity is exemplified in the use of biodiversity offsetting (e.g. Scottish Borders Biodiversity Offsets scheme) as part of the statutory planning processes. While biodiversity offsets are typically regarded as economic instruments, evidence from the Scottish Borders (Tharme, 2017) and elsewhere (e.g. Germany and England) highlight that these are intentionally inserted into existing legal instruments (planning policies and site specific legal agreements between public (council) and private (developers) actors). The Central Scotland Green Network (CSGN) is an instrument of the Scottish National Planning Framework that aims to deliver multiple objectives including green infrastructure and woodland expansion. The network was designed to be simultaneously an umbrella to steer voluntary activities by land managers and other stakeholders within the area, a source of information via their officers and a funder of environmental restoration activities (among others) - thus the network is a hybrid instrument combining voluntary support, information provision and economic incentives.

Within these examples, hybridity is explicitly designed to combine different types of instruments in one. Crucially, the hybrid policy instruments were designed by a single actor (e.g. Scottish Government Agriculture and Rural Development policy unit, or the Scottish Government Planning policy unit or the Scottish Water Environment Unit) and implemented within a single policy regime such as Scottish Rural Development Programme, Scottish Planning Framework or Controlled Activities Regulations. This differs from interdependencies (that we describe below) where achieving the goal of protecting public goods requires the synergy of more than one instrument from different policy regimes, with different policy design teams. Therefore, these interdependencies are more emergent and not necessarily designed from the start. In summary, our data suggest that hybrid policy instruments exist that can not be categorised as solely legal, economic, informational or voluntary, but are entities that combine the properties of at least two types of instruments in order to better achieve their policy goals. This mutual constitution illustrates opportunities to combine the benefits of different governance styles (e.g. hierarchical and market) to be more responsive to the needs of those managing public goods on agricultural or forested land.

3.3. The importance of interdependencies

Hybrid instruments deserve attention but may not be common or typical of most instruments that are used to help govern the provision of public goods from agricultural or forested lands. Our research also draws attention to the issue of interdependency between policy instruments. Often, in the Scottish context, these interdependencies were implicit in the formal presentation of individual policy instruments and only became explicit when discussing with practitioners how the instruments work in practice.

By interdependency, we mean that the instrument cannot achieve its stated objective without the application of another type of instrument(s) to support it, a finding arising from our data. This is slightly different to the formal statements within policy documents that often note how instruments must 'have regard' to other policies and Governmental guidance. Take, for example, CAR, the legal instrument generated to support the transposition of the Water Framework Directive (WFD), and thereby influence activities on land as well as within water bodies (as described above). This instrument, which already sub-

Table 2
Examples of Scottish Government hybrid instruments 'by design'.

Policy Instruments	Regulation/legal	Economic	Informational	Voluntary?
Agri-environment Climate Scheme	Cross-compliance with Good Agricultural and Environmental Conditions (GAEC)	Payments		Yes
Diffuse Pollution Management Strategy	Controlled Activities Regulations (CAR), Storing silage, slurry and agricultural fuel oil regulations, Nitrate Vulnerable Zones		Information / advice provision	No
Scottish Borders Biodiversity Offsets scheme	Planning policy and legal agreements	Compensation		Yes
Central Scotland Green Network		Grants	Information provision	Yes

sumed or incorporated eight earlier pieces of legislation, still has to be aware ('have regard') of other permitting regimes such as Pollution Prevention and Control, Waste Management Licensing and Radioactive Substances. However, this is still 'simply' one legal instrument working with other legal instruments (Table 3).

Instead, interdependency means working with another type of policy instrument to achieve policy objectives, without which, our participants suggested there may be limited ability to deliver. Consequently, instruments become interdependent when used with another policy instrument from a different policy regime. CAR instruments are reliant on interdependencies - for example, to improve compliance with the CAR, SEPA conducted advisory on-farm inspections in certain Priority Catchments (see above). In this case, interviewees felt that the promotion of the need to comply with General Binding Rules under CAR had minimal consequences by itself on the uptake of diffuse pollution mitigation measures. However, when used as part of cross compliance with GAEC, this was a more powerful incentive to encourage land managers to comply, to ensure access to their single farm payment under CAP. Furthermore, advice given by SEPA to land managers on how to leverage agri-environmental payments also helped improve compliance. Therefore, these deliberate interdependencies between informational, legal and economic-based instruments within both the CAP, through cross compliance and GAEC, and the CAR regimes, stemming from different parts of Scottish Government, were associated with improvements in environmental good practice and a better delivery of policy objectives. This also exemplifies how a hybrid instrument (e.g. CAR) may also rely on interdependencies.

A further example to illustrate interdependencies is the voluntary and informational initiative 'Farming for a Better Climate' (FFBC) scheme that was initiated under the Climate Change (Scotland) Act 2009 to help comply with ambitious climate change mitigation targets. The official documentation does not make any formal links to other policy instruments beyond other voluntary codes of good practice and decision support tools developed by Non-Governmental actors and the private sector. However, during the interviews it became clear that the scheme relies heavily on another voluntary and informational instrument - the State funded 'farm advisory scheme', in which advisors help farmers select climate-friendly practices whilst remaining compliant with a range of regulatory instruments including CAR, GAEC, and Natural Heritage regulations. These advisors were also aware of KTIF activities (see above) and sought to ensure that the FFBC scheme amplified the combination of incentives and peer-to-peer learning within this complementary hybrid policy instrument. Thus, these actions are ensuring that the FFBC voluntary instrument has a regulatory 'backstop' to ensure additional delivery of public goods. This emergent interdependence is an illustration of the fact that the scheme is reliant on a combination of further voluntary instruments and the signals from the legal standards for agricultural production in order to achieve the climate change mitigation objective.

A final example, the biodiversity offsets scheme from the Scottish Borders mentioned in the previous section also benefits from interdependency. In this case, support from SRDP funds for specific habitat enhancement helped to meet broader biodiversity objectives as outlined in the Scottish Biodiversity Strategy associated with the Scottish planning process (Tharme, 2017). This emergent interdependency between biodiversity offsets and planning process has also been highlighted in the evaluation of the Biodiversity Offsetting Pilot Programme in England (Baker et al., 2014) .

In summary, these results suggest that in addition to hybridity, policy instruments also interact through interdependencies with a varying degree of intentionality. Interdependency can take many forms, combining different or the same instrument types (e.g. Biodiversity offsetting and SRDP both have elements that are economic instruments), and occurring across environmental domains to meet multiple objectives (e.g. climate, water and soil for FFBC) or within one domain (e.g. biodiversity offsetting and SRDP funding for habitat creation). While some instruments were deliberately designed to be interdependent, in other cases this interdependency emerges through implementation and as a result of the suite of instruments which already exist on the ground. Like hybridity, the combination of instruments can build on the strengths of different governance styles to achieve objectives across more than one type of public good.

Table 3
Examples of Scottish Government interdependent instruments.

Policy Instrument	Type	Works with Policy Instrument	Type
Controlled Activities Regulations (CAR). General Binding Rules (GBR)	Legal Information	Cross-compliance with Good Agricultural and Environmental Conditions (GAEC)	Legal Information
		Single Farm Payment	Economic
Farming For a Better Climate (FFBC)	Information Voluntary	Farm Advisory Scheme	Information
		Knowledge Transfer and Innovation Fund (KTIF)	Voluntary Information
		Cross-compliance with GAEC	EconomicVoluntaryLegal
Biodiversity Offsets Scheme	EconomicLegal	Scotland's Rural Development Programme (SRDP)	Economic Voluntary

It is important that we do not convey that these hybridities and interdependencies, whether designed or emergent, are without problems. Our data illustrates that there are still gaps in management of public goods, particularly soil quality, that are not well addressed in Scotland, and there are opportunities where further work is needed to make interdependencies function better. These include: the need to improve the 'crossover' between FFBC and GAEC, between GAEC and existing good practice e.g. Prevention of Environmental Pollution from Agricultural Activity code, between CSGN and the Scottish climate plan and to improve the understanding of how environmental and development planning permitting processes overlap and intertwine.

3.4. Deliberate design or emergence through implementation

In our data, our examples of hybridity were all intentional, i.e. explicitly designed as hybrids. Our examples of hybrid instruments always act on more than one environmental asset (soil and water for the DPMS, water and biodiversity for biodiversity offsetting or CSGN). They tend to be voluntary instruments, but not always (notably, the RDPP in Table 1). However, all our hybrid instruments were designed by a single institutional lead. This purposeful design might be necessary in order for the instrument to be a coherent entity unless multiple policy makers coordinate to design hybrids. Similarly, while our results point at intentionality in the design of hybrid policy instruments, we do not know if it is possible for hybridity to emerge, even if the original instrument was designed as a pure 'type', although it is possible that 'pure' instruments could become hybridised as part of the implementation process.

By contrast, in our data, interdependency did not feature within the original design of instruments. Whilst all our interdependent instru-

ments had legal elements, the interdependency was through voluntary choices by implementing agencies to combine existing and independent instruments. In our cases it was not formally designed from the outset, as it involves different institutional actors controlling different instruments with different statutory or funding cycles. In our data, interdependency was pursued as opportunities emerged during the implementation process. It is possible to imagine that interdependency could be designed into policy instruments, even if this is not the case with our examples, although this would require considerable institutional coordination.

Our data are based on practitioners' perceptions of how instruments are implemented, and references to deliberate design of instruments that bridge more than one type of instrument were an emergent theme on that data. As such, we cannot ascertain what options for selecting and connecting instruments were originally considered by the designers of policy instruments, only that once implemented many instruments cannot be neatly categorised. As, in our examples, the hybridity was visible from the very start of the implementation process, this might suggest this is design rather than emergence.

In summary, we found that hybridity seems to be designed by a single institutional actor but that interdependency emerged during the implementation process of instruments led by multiple actors. Both hybridity and interdependence can operate across multiple policy domains even if the original instrument was designed for a single focus (e.g. biodiversity).

3.5. New governance approaches for public goods

Locating our policy instrument research within wider governance context drew our attention to the need to consider multiple modes and motivations for different governance styles; and to include all social actors including those from the non-State and private sectors when governing public goods. Our data suggests that the complexity of individual instrument interdependence, or hybrids between categories of instruments, seem well understood by those involved in the implementation of these policy instruments. Indeed, in many cases, interview and workshop participants felt that it was traditional 'siloed' approaches to policy instruments that prevented practitioners taking a more holistic approach to managing public goods. In general, practitioners at workshops also recognized that standard categories used in the academic literature are not intuitive. For them, it was less important to understand the category an instrument belongs to, and more important to focus on how effective it was in changing practices and improving the delivery of public goods. These findings should be put in context of feedback from the preliminary workshop in 2017 whilst scoping the two projects (Blackstock et al., 2017). Participants illustrated that they felt more could be done to improve the implementation of biodiversity instruments in Scotland, and more integration between instruments was needed. In both cases, the debate was about how to engage multiple actors and work across silos in order to use existing instruments together more effectively.

In general, our research suggests that most of those involved in developing and implementing policy instruments recognize and often embrace interdependencies between instruments. In many cases they were keen to see more interactions between instruments. Whilst the participants tended to use the language of interaction, coordination or integration rather than interdependence, it is possible to understand much of the data in terms of mutual support between instruments. For example, interaction between instruments is needed to provide clear and unambiguous messages from the government about the need to, and benefits from, the protection of public goods and to draw attention to the roles and responsibilities of land managers. There was a strong theme within the data of policy instruments being implemented together to improve uptake. Instruments are needed to encourage and incentivize the private sector, as well as enforcing legal standards. Taking the example of FFBC described above, which relies on a suite of regulatory 'backstops' as well as the voluntary approach - the relevant participants argued that by making the primary focus about good practice, for the long term viability of land-based businesses, the message was more palatable and the outcomes more likely to be reached. Likewise, whilst participants did not use the language of 'hybridity' themselves, they accepted our presentation of some instruments as 'hybrids'. This may reflect and be reinforced by a wider Scottish context that emphasises public-private partnership and 'better regulation' whereby economic, information and voluntary approaches are prioritised with legal instruments retained as a 'backstop' (e.g. SEPA's One Planet Prosperity Regulatory Approach, n.d.). This can be seen as combining market, network and hierarchical governance styles.

However, whilst resonant with new governance approaches, it was clear that most participants were more supportive of enabling interdependencies than designing further hybridity i.e. new instruments that were the result of combining existing instruments, in order to retain flexibility and allow adaptation. What we understand from this is that for some participants, further hybridization of instruments by design might require a change – either in legislation or in organizational structure – whereas interdependency of instruments could be achieved through voluntary choice within the existing institutional arrangements. One outcome of this difference is that interdependency can be reversed or stopped, whereas hybridity by design was seen as more formal and therefore less flexible. There were also concerns expressed by some (often but not always policy designers) about whether hybrid or even interdependent instruments might become too complicated and unclear. However, this view was countered by other participants (often but not always policy implementers and NGOs) who felt instruments were already interdependent due to sharing common objectives; and this could be designed into future schemes. Many policy designers and policy implementers, in both interviews and workshops, felt more 'complication' was a worthwhile price to pay for better management of public goods.

A similar rationale can be found within cases where some interviewees resisted the potential to hybridize the instruments. These were typically Scottish Government employees responsible for a specific regulatory instrument. They were concerned that hybridization would 'grey the boundaries' of instruments (if taken literally, hybridity would destroy any boundaries) and make it more difficult to implement the instrument effectively in ways that would ensure that those not complying with the requirements could be held to account. This is an example whereby these individuals were resisting a move away from 'pure' instruments and did not want to blend governance styles. Some workshop participants (government agency staff) also felt that under conditions of austerity, it may be easier to implement 'pure' instruments than negotiate institutional processes required to enable interdependencies. These findings, even though a minority view, do temper some of the positivity found in the new environmental governance literature, and illustrate that there may be resistance, often based on sound rationales, to hybridity and interdependency that require collaborative working and blurring of boundaries.

However, other workshop participants (also government agency staff and NGO participants) recognized that as resources get tighter there is an increasing role for larger scale instruments, such as partnerships steering a series of interdependent instruments. Whilst these news approaches might require more coordination, networking and openness to change in governance, they were seen as the solution to the current implementation deficit for these participants. Hybridity and interdependence were seen as a useful way to deliver public goods across policy domains. Furthermore, as illustrated above, many of the instruments' actual implementation illustrate how interdependencies, if not hybridity, appear central to achieving the instruments' objectives.

In summary, our findings on the importance of hybridity and interdependence of policy instruments seemed to be directly recognized by stakeholders, albeit expressed in other terms. This may relate to wider discourses about the need to engage with multiple stakeholder perspectives, and to promote policy instruments that align with market and network governance modes as much as hierarchical modes. For many, though not all of the participants in our research, combining these modes is appropriate and necessary in order to deliver public goods from multiple environmental assets.

4. Discussion

4.1. Overview

From our results it appears that environmental policy instruments for environmental public goods in Scotland actively interact through hybridity (instruments that defy simple categorisation) and interdependency (instruments that require an interaction with other instrument types to achieve their stated objective). This means that public policy implementation practices go beyond the idea of coordination, i.e. the mere avoidance of conflicts.

Hybrid instruments are designed as such, but from the perspective of those designing the instrument, the focus is on achieving their policy objectives and not on the instrument's explicit hybridity (as defined by academic categories). Our data provide examples of de-facto coordination of these and other instruments that are applied at the same time and in the same space by different institutional actors (e.g. policy teams responsible for water regulations, agricultural subsidies, etc.), what is often referred to as ensuring policy coherence (Nilsson et al., 2012). Our research results show that the need for coherence between multiple instruments is well understood by policy actors, and leads to purposeful interactions for implementation.

We suggest that beyond coherence there is interdependency, whereby different instrument types rely on each other to achieve their goals. Interdependency may emerge from the efforts of those implementing the instruments whilst 'in the field and, in principle, could be designed into the instruments, though this was not observed in our cases. We observe that the presence of interdependency is important for the delivery of environmental policy goals in Scotland. Interdependency is therefore valued and those involved in implementation often work hard to deliver it wherever they can (the hidden labour involved in such work is the topic for a paper in development).

This leads us to two main themes around which the remaining discussion is structured. Firstly, these ideas of interdependencies and hybridity are extremely visible when working 'on the ground' looking at how public goods are managed and governed but these ideas seem either under-reported or under-conceptualized in the academic literature defining types of policy instruments. Secondly, we explore how these ideas of interdependence and hybridity contribute to the desire to better manage public goods from agriculture and forestry. There may be more examples of hybridity and interdependence beyond those within our sample and we are unable to judge what proportion of environmental policy instruments exhibit either hybridity or interdependency at present. Therefore, we end with a section on suggestions for further research.

4.2. Contribution to the policy literatures

Our findings make an empirical and conceptual contribution to the policy instrument literature. Our focus is specifically to discuss the need to revisit the practice of categorising policy instruments, rather than more general literature on institutional economics or governance of socio-ecological systems. We are not looking at the process of implementation of single policy instruments and how they are crafted in the implementation process but at the interaction of different types of policy instruments, either through designed hybridity or more informal, often emergent, interdependency.

Whilst those working 'in the field' are very aware of hybridity and interdependence in practice (see section 3.4 above), this awareness is less apparent in the literature. Categories and taxonomies help tame complexity and structure thinking but have also been critiqued for framing research questions in ways that limit or constrain analysis (Kahneman, 2011). We therefore offer our findings to extend the debate about how to study the relationship between different types of instruments and to disrupt categories if they do not help us understand empirical practice. As stated previously in this paper, there is some scholarship questioning the conventional definitions of types of policy instruments. In particular, researchers looking at 'market-based instruments' question the utility and accuracy of the category. For example, Muradian et al. (2013) asks if instruments can be 'market-based' when dealing with common pool or public goods that are subject to market failure; and others (e.g. Lambin, 2014) illustrate that it is not possible to have a market-based instrument without legal frameworks to regulate such market transactions. Thus, many recognize that 'new' environmental policy instruments like Payments for Ecosystem Services are not pure instruments but hybrids (Barton et al., 2017). However, there is little literature focused on policy instruments that recognizes forms of hybridity and interdependence as we have done throughout this paper.

We have observed that it is easier to understand hybridity and interdependence through data focused on actual practices of policy implementation. Policy implementation theory helps to give a context to such observations. For example, in addition to the introductory insights on paying attention to implementation deficits, DeLeon and DeLeon (2002) note that there are three approaches to implementing policy: top-down approach; bottom-up where implementation is shaped by the field officer; and hybrid where top-down and bottom-up approaches meet. The latter approach (hybridity of top-down and bottom-up approaches to understanding policy implementation) is most prominent within the EU policy implementation at present (Thomann and Sager, 2017). This approach highlights that successes and failures in implementation can be explained through design intentions or through implementation actions, or a mixture of both (Sabatier and Mazmanian, 1980). It also highlights that different actors can be involved in developing and implementing policy instruments. In the Scottish case we have found that both design intentions (hybridity) and implementation actions (interdependencies), effected through the interaction of multiple actors, create a complex picture of environmental policy implementation that is representative of both a top-down and bottom-up approach present across the EU policy contexts. Thus, our insights add to the literature on institutional crafting (Thiel et al., 2015) that recognize how design and practice do not always align (see section 4.3 below).

Based on the evidence for policy implementation in practice, it is striking that the term hybridity is not commonly used (beyond e.g. Barton et al., 2017) in literature discussing policy instruments, despite already being in use within the governance and policy sciences. Therefore, we believe that institutional or environmental economic approaches would benefit from interacting further with the policy sciences and governance literatures that seem to already accept the concept of hybridity. This would help scholars to consider how categories that comply with stylized theories become fuzzier and more indistinct when confronted with empirical realities. We welcome, and continue to use, the 'ideal' categorization of policy instruments. Such categories help us manage complexity and provide structure for analysis. However, we recommend that the policy instrument literature explicitly acknowledges that pure examples of any one type rarely exist, or are rarely implemented alone without the influence of other instruments.

Conversely, our work draws attention to the need to study policy instruments 'in-use' in order to understand their role in the wider debates about governing environmental public goods. It is clear that we need new integrated approaches to support spatial collective action particularly around large-scale ecological networks or restoration approaches. The call for integration or a more systemic approach to managing land is widespread from the Scottish Land Use Strategy (2016); Defra's Environment Plan (2018), Nature-Based Solutions (European Commission, 2020) and the UN's Sustainable Development Goals (particularly goal 15). However, these steering strategies for governance pay relatively little attention to the role of the policy instruments. This is despite the fact that policy instruments form the 'glue' in the logic chain between a desired objective and achieving this outcome (Jordan et al., 2012). Therefore, whilst the discussion around policy instruments needs to evolve to fit these debates on integration and systemic approaches, environmental governance literature could also be more explicit on the use of policy instruments.

4.3. Contribution to delivery of public goods

The importance of understanding the hybridity and interdependence of policy instruments is not merely an academic issue. We believe it can contribute to understanding, and potentially overcoming, the existing policy implementation deficit between the aims of EU agricultural and forestry policies and what has been achieved to date. Therefore, it matters less whether our insights are truly 'new' or are simply different terms for ongoing debates; the substantive contribution of this analysis is how we seek to shift the focus from individual instruments analysed in isolation to understanding their roles in a wider governance and institutional landscape. Understanding that there are interdependencies between policy instrument categories, and some instruments that are deliberately designed to be hybrids, can become starting points for understanding how public goods can be governed in a systemic way, rather than in policy silos. Therefore, acknowledging hybridity and interdependency is asking people who design and implement policy to approach these tasks differently (see for example Thiel and Moser, 2018). Previous scholarship (see for example Waylen et al., 2015) has illustrated that cognitive, institutional and political changes to allow such shifts in approach are difficult, and explain why it is easier to work within policy instrument silos. However, when considering how best to support the delivery of public goods using policy, such a shift seems important to achieve.

Furthermore, explicitly recognizing how different types of policy instruments interact, whether by design or through creative implementation practices, helps align the State's approach with the way that most land managers plan their operations, making legal instruments more acceptable. The majority of farmers (and probably foresters) focus on a set of integrated objectives from their holdings and use a suite of voluntary instruments whilst navigating the suite of statutory instruments to enable them to achieve such goals (Posthumus and Morris, 2010; Van Herzele et al., 2013). Our findings resonate with those promoting the 'better regulation' agenda in the land-based sector - to use 'persuasive' approaches first with a regulatory backstop (e.g. de Graaf et al., 2013) and those studying behaviour change in land management - to focus on how the State can enable good practice by other actors through a mix of instruments (Vatn, 2018). When the state actors involved in any land based governance processes are able to frame discussions in terms of private benefits, it becomes easier to improve mutual understanding and improve trust (Knickel and Marechal, 2018). This matters when it is increasingly recognized that the State needs to work in partnership working with non-state actors to deliver public goods at the landscape/catchment scale (Knoot and Rickenbach, 20144 for forestry; Westerink et al., 2017a for agriculture).

This is not just a trite observation that delivery of public goods needs multi-stakeholder partnerships. Whilst public goods are under threat, good governance matters. In order to properly understand how complex networks of social interactions between different actors (within the State and with other actors) can deliver environmental protection, it is important to understand the hidden logics associated with different styles of governance, their associated policy instruments and with what good governance means. These logics relate to the way that different governance styles and types of policy instruments utilize different motivations to achieve their objectives (Dedeurwaerdere et al., 2016). Some motivations are extrinsic and require ongoing pressure by the State, for example through regulations, to ensure that the outcomes will be delivered. In other cases, some instruments are designed to tap into intrinsic motivations (e.g. voluntary instruments) that, in theory, reduce the role of the State in achieving objectives. The concept of hybrid and interdependent instruments illustrate that often there is a range of motivations implicitly connected with the instruments in use. Furthermore, given interdependency between voluntary and regulatory instruments, it is rare to have fully intrinsic motivations for actions that remove the need for an active State in delivering public goods. This may also bring about concerns regarding the use of different instruments that are based on different world views and may crowd-out existing motivations.

The existing scholarship on hybridity as a concept draws attention to the fact that creative tensions from combining previously distinct, or even opposing, ideas can also be of practical use. In short, the idea of hybridity brings challenges but also opportunities. In terms of challenges, our data included the following: fit with existing institutional arrangements, transaction costs and accountability. Firstly, taking hybridity and interdependencies seriously may require institutional change. This is less of an issue for hybridity, given that our examples were planned and controlled by single policy design units, but is more of an issue for interdependency where it involves either planning or responding across organizational and policy boundaries. The fact that institutional change is challenging (Waylen et al., 2015) is exemplified by the resistance to more hybridity shown by some of our participants, particularly those who shape policies, as they had concerns about losing their regulatory authority. However, the fact that we also found that hybridity and interdependence already exist in practice illustrates potential niches for change that can be utilized by bottom-up policy implementation processes. Secondly, it seems that hybrid or interdependent policy instruments may require more resources than coordination through desktop policy design. Our examples tend to require more 'boots on the ground' to explain and advise alongside providing financial incentives or regulatory guidance. Making time to receive such advice, or attend events, can also be seen as a transaction cost for the land manager. However, it is expected that such personal approaches and mutual understanding may increase the uptake of the policy instrument and improve the acceptance of the approach from land managers (Westerink et al., 2017b; Mills et al., 2016). Therefore, whilst finding sufficient resources might be difficult during times of austerity, the investment may be justified in terms of increased (or higher likelihood) of implementation success. Finally, interdependent instruments involving different policy regimes and actors may decrease the transparency of policy implementation and blur the lines of accountability, a common governance problem (Armitage et al., 2012; Lockwood, 2010). Therefore the State has a role to play in ensuring that hybridity and interdependency becomes an issue of responsibility sharing rather than blame shifting if an implementation deficit persists. Thus, each challenge can also be seen as an opportunity for positive change that aligns more closely with calls for new environmental governance.

4.4. Areas for further development

As stated in the methodology section, our research is based on an exploratory and inductive analysis of a sample, rather than a full population, of policy instruments in use in a single place. We are drawing on common themes across two projects with slightly different data sources, and both undertook data collection at a time of potential post-EU policy change, which may have influenced our findings. As such our understanding is necessarily partial. Therefore, a more deductive research project to explore whether these concepts (hybridity and interdependence) are relevant to other geographical or institutional settings would be a logical further development which may also enable the consideration of counterfactuals to the results presented in this study. It would be interesting to consider whether hybridity and interdependency are experienced differently in policy domains beyond the environment.This research would help improve understanding of whether an explicit focus on considering how categories of instruments interact helps make visible issues previously screened out through conventional within-type policy instrument analysis.

Much of this discussion has recognized that we need to understand policy instruments, particularly how they might be hybrid or interdependent, in the context of environmental public goods. However, we have not attempted to link this discussion to the insights from institutional economics regarding nature-related transactions (Hagedorn, 2013) whereby the economic allocation processes (transactions) are conditioned by the physical properties and processes at work within the natural world. Deeper analysis of fewer instruments-in-use might illustrate whether and how designed hybridity or emergent interdependence of policy instruments work in different environmental settings, with different degrees of environmental degradation or ecological complexity. This analysis may wish to use the lens of physical transactions to explore how the attributes of the natural world affect the institutional arrangements, such as policy instruments applied to natural resource management (Hagedorn, 2008) and if these attributes further explain how and when hybridity and interdependent instruments occur. Furthermore, deductive research could explore to what extent hybridity and/or interdependence are perceived by the subjects of these policy instruments; and whether their adoption might change associated transactions costs or how costs and benefits are distributed. Findings around resistance to hybridity (see section 3.3) hint at the fact that distributional issues of accountability and who bears the cost of enforcement or collaboration may underlie the stakeholders' concerns. Such enquiries would help to answer whether hybridity and interdependence could improve uptake or compliance with policy instruments and better deliver policy objectives.

The concept of institutional crafting (Thiel et al., 2015; Bromley, 2015) also draws attention to the purposeful interaction between features of social and ecological systems, but from the focus of to what extent are the notions of policy instrument hybridity and interdependency exogenous to the socio-ecological systems to which they are applied or whether they are endogenous and 'always in the making', making the concept of prior design somewhat more problematic. Our paper has focussed on the mere fact that such issues as hybridity (i.e. breaking down distinctions between policy instrument types within an instrument) and interdependency (i.e. relying on more than one type of instrument working together) exist. Further research could consider more explicitly when and why these come into being and to what extent they are context-dependent, in particular ideas concerning whether hybridity can emerge without prior design; or whether interdependency could be designed and how this may vary across contexts (Acheson, 2006). Building on Lambin et al. (2014), further research could link hybridity and interdependence more explicitly to the policy cycle, exploring the mutual constitution of policy design and implementation processes. The ideas around institutional 'fit' could also be used to consider how hybridity or interdependence fit the ecosystem dynamics as well as human behaviours and actions (Vatn and Vedeld, 2012).

Finally, our research was not primarily about governance styles but types of policy instruments. However, as above, our proposition that hybridity and interdependency could be explored in different settings can be extended to see when and how these are associated with different governance modes or occur when governance modes are blended and blurred. Given that the literature (Evans, 2012; Jordan et al., 2012) suggests that different types of instruments are associated with different types of governance styles, this also turns out to be an academic typology that is more complicated in practice. Likewise it may be useful to see if hybridity and interdependence mainly arise when considering instruments for multiple natural assets in agricultural or forested settings, or also occur when managing for single assets only. More broadly, research on hybrids and interdependencies of policy instruments could be extended to other policy fields for comparative policy analysis.

5. Conclusion

The examples from Scotland presented in this study have reflected on four key themes largely unexplored in the policy instruments literature, namely: (1) hybrid instruments; (2) interdependencies between types of instruments (3) whether these are designed or emergent and (4) resonance with 'new' governance approaches for public goods. Our results suggest that Scottish environmental policy instruments are not only designed to be 'coherent' but can be hybrids of more than one type of instrument; or require interdependency with another instrument to deliver their objectives. While, in general, policy designs ensure that public policy instruments are coordinated and not contradictory, our research points to more purposeful interactions taking place 'on the ground'. These results challenge the academic emphasis on categories of policy instruments. We suggest that explicitly acknowledging that pure examples of any one type rarely exist, or are rarely implemented alone without the influence of others instruments, will enrich policy design and policy implementation studies, even though the 'ideal' categorization of policy instruments can help us manage complexity and structure for analysis. Our research draws attention to the need to study the reality of policy instruments 'on the ground' and engage with the different actors involved in developing and implementing policy instruments. Acknowledging hybridity and interdependency (beyond academic debates) will also require people who design and implement policy to approach these tasks differently. The focus on interdependencies and hybridity taps into wider debates about environmental governance across multiple natural assets. Thus, the shift from individual instruments analysed in isolation to understanding their roles in a wider governance and institutional landscape can contribute to understanding, and potentially overcoming, the existing policy implementation deficit between the aims of EU agricultural and forestry policies and what has been achieved to date.

6. Uncited references

UK Government (2018) and United Nations (2020).

CRediT authorship contribution statement

K.L. Blackstock: Conceptualization, Methodology, Formal analysis, Writing - original draft, Supervision. **P. Novo:** Conceptualization, Methodology, Formal analysis, Writing - original draft, Supervision. **A. Byg:** Conceptualization, Methodology, Formal analysis, Writing - review & editing. **R. Creaney:** Formal analysis, Data curation. **A. Juarez Bourke:** Formal analysis, Data curation, Writing - review & editing. **J.L. Maxwell:** Formal analysis, Writing - review & editing.

S.J. Tindale: Methodology, Formal analysis, Writing - review & editing. **K.A. Waylen:** Conceptualization, Methodology, Formal analysis, Writing - review & editing.

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Appendix A. Supplementary data

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