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# Environmental Valuation and Benefit-Cost Analysis in UK Policy

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## Abstract

This paper presents an evaluation of the use of environmental valuation – techniques to assign monetary values to environmental impacts of policies and projects, especially non-market impacts – in UK policy. In doing so, we seek to contribute to the debate, more generally, of the use and influence of benefit cost analysis (BCA) in national policy processes such as Impact Assessment. Specifically, our contribution in this paper is two-fold. First, we identify a number of trends that have characterised UK policy use of environmental valuation over the past two or so decades. While this has notably involved development of ‘sharable values’ allowing more widespread uptake, it also seems that different branches of government have developed different traditions of use adding nuance to what, on the face of it, is otherwise a shared endeavour. Second, we evaluate the extent to which the use of environmental valuation can be said to have influenced policy decisions and the degree to which this is embedded by evolving policy processes. As such, we discuss two areas of environmental policy – water quality improvements and natural capital – which have entailed either substantial use of environmental valuation either in determining specific policy and investment project options or where this has helped shape the broader policy agenda. Our evaluation is not exhaustive; nor do our findings suggest that environmental valuation and BCA are necessarily the dominant driver of decisions, as we discuss. However, in recognising this, we argue it is also important to consider a number of established or evolving cultural and legal institutional processes which broadly appear to support our assessment of such cases.

## Acknowledgements

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## 1. Introduction

Substantial progress has been made in developing and refining methods of environmental valuation (see, for example, Champ *et al.* 2017, Atkinson *et al.* 2018). By environmental valuation, we refer to a variety of techniques to assign monetary values to environmental impacts, especially non-market impacts. The promise of such techniques is long recognised, given that it addresses the fact that most goods and services provided by the environment have no obvious markets and, as a result, are all-too-often ignored or downplayed in policy appraisals.

The United Kingdom (UK) has been in the vanguard of those countries actively using environmental valuation in its official policy processes. Policy formulation and especially benefit-cost analysis (BCA) has been the most obvious use, although some prominent examples can be found at other stages of the policy cycle (such as ‘problem definition’). On the face of it then, the dissemination of these analytical techniques in UK policy appears to have been extraordinarily successful. Of course, this begs the question about how success is defined, as well as supplementary questions about how embedded this process is.

In this paper, we address such questions in a number of ways. Our discussion relates to a body of work which has sought to take stock of, as well as understand, the way in which economic evidence, or evidence more generally, is used in policy-making (see, for example, Jordan and Turnpenny, 2015; Cairney, 2016). In particular, our discussion is relevant to those strands of this literature which have sought to understand the role of monetary assessment in impact assessment (Adelle *et al.* 2012), as well as of use of BCA and its influence on policy decisions (e.g. Hahn and Dudley, 2007; Hahn and Tetlock, 2008; Ellig and Fike, 2016), or the evolution in use of key parameters such as the discount rate (e.g. Groom and Hepburn, 2017).

Our contribution in this paper then is to add to this body of knowledge, for the specific case of how environmental valuation has been used in the context of UK policy processes. In doing so, we rely on a mixture of documentary review and a number of interviews with relevant stakeholders either currently or previously in governmental departments or related public bodies, as well as external consultants. A core set of questions sought to gather information about uses of environmental valuation and to clarify its influence (and the basis on which that judgement was made). These interviews were semi-structured allowing adaptation to the expertise and knowledge of specific interviewees as well as investigate further issues as they arose. While we would argue that this generated valuable information and insights, we do not claim that this approach is exhaustive or that interview responses present a purely objective account (see, for example, Cresswell and Cresswell, 2018).

The rest of our paper is organised as follows. In Section 2, we assess use of environmental valuation and identify trends which entail evolving use of ‘bespoke’ commissioned studies for specific policy concerns, the development of sharable values for use ‘off the peg’ and experimentation with novel techniques including combining valuation with physical modelling of environmental change. In Section 3, we examine the use of environmental valuation in UK policy decisions in the context of the water sector as well as natural capital. While the former makes clear established use of environmental valuation in choosing options at the formulation stage of policy-making, the latter suggests additional pathways of influence in terms of problem definition as well as in budgetary review processes. In Section 4, we evaluate the extent to which institutional developments (including European Union withdrawal) might embed, or otherwise, this use of environmental valuation. Finally, Section 5 concludes.

## **2. Trends in the Use of Environmental Valuation in UK Policy**

While environmental valuation is a convenient umbrella term, it covers a range of approaches to assigning monetary values to (in particular) non-market impacts arising from environmental changes (e.g. Freeman *et al.* 2013). These approaches, in turn, can be distinguished in a number of ways. For example, some focus on how these impacts are valued by producers,<sup>1</sup> while others focus on how these impacts are valued by individuals or households. In general, it is the latter approaches that have dominated in UK policy use. The genesis of this arose in the 1980s as a result of growing awareness of the earliest US applications (e.g. as reported in Brookshire *et al.* 1976). For example, the first published UK valuation study was by Ken Willis, and concerned the value of protecting undeveloped land such as greenspace surrounding urban areas (Willis and Whitby, 1985), a policy debate which continues (unresolved) to this day. Also around this time, the value of the impacts of agricultural land-use and potential changes to landscapes were examined in Hanley (1988) and Willis and Garrod, (1991) and studies of river water improvements and the prevention of coastal erosion were starting to appear (e.g. Hanley, 1990; Turner *et al.* 1992; Bateman *et al.* 1992).

All of these early forays into environmental valuation utilised a particular group of techniques. These were survey-based methods that asked individuals or households directly what economic value they attach to, for example, specified environmental changes. These stated preference methods have general applicability but are especially useful to measure values when there are no observable markets

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<sup>1</sup> Economic production-based approaches look at the way in which the environment is an input to economic production. Examples include insect pollination services as inputs to agricultural production.

through which preferences otherwise can be uncovered. If such markets do exist then revealed preference methods offer the possibility of uncovering environmental values which are revealed (i.e. implicit) in actual expenditures on related market goods. Those approaches however have been much less common in the UK, at least until relatively recently. There were early exceptions to this; notably, Garrod and Willis (1992) which analyzed the way in which the value of changes in woodland cover could be traced in UK house prices. This hedonic pricing approach has also been applied in relation to transport investments and planning (e.g. in quantifying the monetary costs of noise nuisance in Birmingham – Brainard *et al.* 2004). Travel cost models – studies of the time costs and monetary outlays associated with e.g. recreational visits to natural areas – were initially applied in the UK due to a policy need to quantify the non-market value of forest recreation, in order to ‘defend’ forestry as having a high enough rate of return to justify further public investment (Willis, 1991).<sup>2</sup>

This latter point illustrates a general feature of this work. It frequently developed hand-in-hand with policy processes and, in many cases, was commissioned and funded by UK public bodies to provide the evidence base for proposals, as they arose, in particular areas of environmental policy. A key such body is the Department for Environment, Food and Rural Affairs (Defra)<sup>3</sup> as the government department with responsibilities for environmental policy. But given that environmental impacts result from decisions made in other policy areas, the Department for Transport and the Department for Business, Energy and Industrial Strategy (which has responsibility for energy and climate change policy) are also relevant, as is the HM Treasury as the department responsible for the public finances. So-called arms-length bodies are also important given that these organisations are often responsible for *implementing* environmental policy.<sup>4</sup> This notably includes the Environment Agency, with responsibilities for protection and enhancement of the environment in England (and Wales until 2013<sup>5</sup>), including terrestrial and aquatic habitats, as well as the Forestry Commission with responsibilities for managing public woods and forests. Bodies responsible for the regulation of public utilities (such as the Office of Water Regulation) are also relevant actors as well as the private sector

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<sup>2</sup> Mixed approaches combining revealed and stated preference methods (e.g. Hanley, 1989; Hanley and Ruffell, 1993; Christie *et al.* 2007) have also been a feature of this work.

<sup>3</sup> For a discussion of various organisational (and name) changes over the past few decades see Russel and Jordan (2010)

<sup>4</sup> NAO (2016) define arms-length bodies as: “... covering a wide range of public bodies such as including non-ministerial departments, non-departmental public bodies, executive agencies and other bodies ...” (p5).

<sup>5</sup> Environmental policy and related areas such as agriculture, forestry and fisheries are “devolved matters” in the United Kingdom meaning that these are the responsibility of devolved legislative bodies such as the Scottish Parliament (and national assemblies in Wales and Northern Ireland) and also involves arms-length bodies such as, in the case of Scotland, the Environment and Forestry Directorate and the Scottish Environment Protection Agency.

companies that they regulate (see Section 3). Many of these actors interact with external consultants, either in the private sector or in academia as well as, more recently, independent official bodies which act in an advisory capacity to Government, such as the Natural Capital Committee.

Substantial resources have been invested, by all these bodies, in gathering evidence on environmental valuation. For example, over the past two decades or so, Defra has commissioned and used environmental valuation evidence to inform policies related to the marine environment (in relation to Marine Protected Areas, the Marine Strategy Framework Directive), flooding, air quality, biodiversity and conservation, and more recently natural capital, to name but a few. And possibly the single most expensive stated preference study ever performed in the UK arose out of a proposal within Defra in 1997 to impose an environmental tax on the quarrying industry.

More recently, a large stated preference study was commissioned for the UK Department for Transport, to elicit the non-market benefits of building a tunnel for the A303 road as it passes the Stonehenge World Heritage Site (Fujiwara et al., 2017). The benefits under investigation related exclusively to the cultural heritage impacts of removing the A303 road from its current location within the heritage site in terms of noise reduction, increased tranquility, visual amenity and reduced landscape severance. Notably, a very similar major stated preference study on the A303 tunnel had been commissioned almost 20 years earlier in 1998 (Maddison and Mourato, 2001) when the tunnel project was first proposed. Reassuringly, the results between the two studies are broadly similar, taking into account the time elapsed. Less reassuringly perhaps, the fact of a second valuation is suggestive of the political difficulty of making a decision despite what is evidently a strong benefit-cost case.

The Stonehenge Tunnel example is notable as being a specific infrastructure project affecting a unique resource and so perhaps requiring its own ‘bespoke’ study. But within Defra, these sorts of original studies appear to be commissioned less and less frequently now, if at all. One reason is that these are viewed as not responsive enough to the need for timely policy information. And even when a clear gap is identified in the empirical record, it can be difficult to make the case to invest in new valuation data due to budgetary constraints especially in the past decade. This does not mean, however, that environmental valuation has been downgraded as a source of policy evidence. Rather it is the case that its use has evolved: from commissioning new *primary studies* to making greater use of *secondary data* – that is, utilizing the broader, and expanding, empirical record. An early example of this was the “Willis report” (Willis *et al.* 2003) which led to estimates for benefits (e.g. for recreation, biodiversity, landscape quality and water quality) being brought together in per-hectare units which are still used today in appraisal of changes to the public forest estate.

This turns out to have been a forerunner of more recent valuation policy work. Defra created in 2015 the ‘Ecosystem Valuation Lookup’ tool for use in environmental valuation and policy appraisal.<sup>6</sup> At its heart is a menu of ecosystem services related to different ecological zones ranging from wetlands and floodplains, to woodland, to mountains and moorland. The tool uses values for these ecosystem services derived from around 350 valuation studies undertaken in the UK since 2000 (eftec, 2015). The ‘Lookup’ tool also allows users to define the characteristics of the ecosystem under evaluation in terms of visitor rates, visitor activities, ecological characteristics and distance from urban areas. This is important given that it allows users to take account of important spatial differences across ecosystems.

An emphasis on combining valuation with land-use and ecosystem modelling is also illustrated by the Defra supported map-based tool, the Outdoor Recreation Valuation Data Set (ORVal). This is a detailed spatial dataset describing the location, characteristics and economic values attached to accessible greenspace across England (Day and Smith, 2016). It allows users not only to uncover the usage and economic value generated by current greenspaces, but also to predict how these will change if the space itself changes or if new greenspace is created. Users cannot however, add or change the values or figures used in the tool and access is restricted to this interface only rather than to the underlying model. Despite this, an advantage of ORVal is that it allows users to respond to questions in the timely fashion that policy-makers require. Of course, this responsiveness is the product of earlier strategic thinking and planning with regards to analytical needs, given that such tools require substantial investment and time to be developed. As such, it represents a deepening, and embedding, of the use of valuation in the policy analysis undertaken by Defra.

A further trend is towards greater breadth: that is, mainstreaming environmental valuation across UK policy wherever it has an impact on the environment. This is illustrated by a search for sharable values which can be used ‘off the peg’ in any BCA of any project in any department. Examples of this now exist for noise and water quality improvements as well as air pollution and, most recently, the cost of climate change abatement.<sup>7</sup> For the most part these sharable values represent a benefit-side analysis such as in the case of local air quality, which are largely calculated in terms of their effect on mortality and morbidity. One exception is that, in 2009, the way in which the UK government values carbon emissions changed from an approach based on valuation of damages (the social cost of carbon), towards values based on the European Emissions Trading System (ETS) or an abatement cost approach, depending on whether the carbon emissions are classified as traded (under the ETS) or non-

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<sup>6</sup> See: <https://www.eftec.co.uk/index.php/project/%20%09environmental-value-look-evl-tool>.

<sup>7</sup> See: <https://www.gov.uk/government/collections/the-green-book-supplementary-guidance>.

traded (not under the ETS).<sup>8</sup> The Department of Business, Energy and Industrial Strategy therefore relies largely upon the estimates of traded values, due to its focus on energy, which falls under the ETS. Defra on the other hand, uses mainly non-traded values in its analysis. All government projects and regulatory changes that have carbon impacts, which includes those in transport, energy and energy efficiency, are advised to refer to the Government's short-term carbon values. These values are regularly updated with the most recent update taking place in 2016.<sup>9</sup>

As well as adding to, or making use of, the empirical record there remain notable examples of experimentation in using original valuation in policy too. An exemplar here is subjective wellbeing valuation. Subjective wellbeing refers to self-reported measures of personal wellbeing, usually collected via surveys. There are a number of dimensions of subjective wellbeing including *life satisfaction* (or evaluative subjective wellbeing), a self-evaluation of one's life according to some positive criterion (Kahneman et al., 1999).<sup>10</sup> The UK has been collecting data on this, and other dimensions of personal subjective wellbeing, since early 2011 via the Office for National Statistics, alongside other initiatives which have sought to embed these metrics in the policy process (Cabinet Office, 2013).

Most relevant to BCA is that data on people's self-reported wellbeing – combined with data on its determinants across individuals including income – can be used to estimate monetary welfare measures of changes arising from policies and investment projects. This has become known as the subjective wellbeing valuation approach (Ferrer-i-Carbonell and Van Praag, 2002; Frey et al., 2010; Welsch, 2009; Fujiwara and Campbell, 2011). Given a change in the determinant of interest, say environmental quality, the approach works by calculating the change in income that would produce a subjective wellbeing impact of equivalent size. Dolan and Laffan (2016), for example, use the UK Office for National Statistics data to estimate the value that people place on air quality in urban areas.

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<sup>8</sup> The traded sector includes grid electricity in all sectors, direct fuel use in manufacturing and direct fuel use in aviation. Non-traded sectors include direct fuel use by households and non-aviation transport, emissions from land use, land use change and forestry, and emissions from agriculture. For a comprehensive guide on how the UK government values carbon, see:

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/615374/1\\_Valuation\\_of\\_energy\\_use\\_and\\_greenhouse\\_gas\\_emissions\\_for\\_appraisal\\_2016.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/615374/1_Valuation_of_energy_use_and_greenhouse_gas_emissions_for_appraisal_2016.pdf)

<sup>9</sup> For a list see: <https://www.gov.uk/government/collections/carbon-valuation--2>

<sup>10</sup> In addition there is: *eudaimonic* wellbeing, the process of achieving a flourishing and worthwhile life where one's true potential is realised (Waterman, 1993; Ryan & Deci, 2001); and, *momentary wellbeing* (or affect/experienced wellbeing), measuring feelings, affect or mood at a particular point in time (MacKerron and Mourato, 2013).

Some interest in subjective wellbeing valuation in a number of government departments has developed, most notably in using it to compare the impact of participation in different sport and cultural activities (Fujiwara et al, 2014), as well as on the value of museums (Fujiwara 2013, Bakhshi et al. 2015). While not the only examples, these illustrations do indicate that application can best be described as influential in some areas of government only, notably those public bodies with a less prominent track record in using non-market valuation techniques generally.<sup>11</sup> If so, then perhaps the lack of subjective wellbeing valuation in the environmental policy domain in part is explained by the extensive use of established approaches as well as value toolkits and so leaves less space or appetite to explore further methods. This, in turn, possibly highlights discussions about whether subjective wellbeing evidence can do more than just provide extra support for policies already seen as beneficial using existing approaches, perhaps by highlighting entirely new directions for policy (EAC, 2013).

### **3. Environmental Valuation and Decision-making**

#### ***The Water Environment***

Water quality management is an exemplar of the use of environmental valuation in policy decisions in the UK as a result of regulatory developments, both domestically and in the European Union. A key actor is the Environment Agency as the public body responsible for implementing policies to achieve, for example, improvements in water quality in rivers, lakes, estuaries and coastal waters. One way it does this is through a system of ‘consents’ which specify the allowable pollution inputs that polluters can release into waterbodies. The relevance to our discussion in this paper is that the Agency is required to consider the benefits and costs of its proposals on these consents. This was not always so; towards the end of the 1990s this assessment was based on a multi-criteria approach. However, in the face of pressure to show more explicitly which schemes would generate benefits in excess of costs (Fisher, 2008), the Agency developed guidance for the assessment of benefits, based on relatively simple techniques based on utilising values in the empirical record (or value transfer as it is often known). As a result of this initial analysis, the Agency recommended that a large number of options for water quality improvements should go ahead, although budgetary constraints meant that in the end many of these were not implemented.

Nevertheless, a significant legacy was that this set a template, in essence, for how the Environment Agency would subsequently tackle the valuation challenge in multiple further schemes resulting from

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<sup>11</sup> This does not work perfectly as an explanation given that the cultural applications have often been implemented alongside stated preference studies such as in Fujiwara (2013) and Bakhshi et al. (2015).

its regulatory responsibilities. For example, the new directive on bathing water (2006/7/EC) requires that minimum quality standards be achieved by 2015 for all bathing waters across the EU. However, local authorities responsible for bathing water in a particular area could de-list beaches where it can be shown that costs exceeded benefits. This led to a programme of valuation work using stated preference methods which is described in, for example, Czajkowski *et al.* (2015).

The case of the Water Framework Directive (EC 2000/60/EC) provides a further example of how the Agency has used environmental valuation in this way. While the directive itself is very much a European Union ‘top-down’, target-driven statutory instrument for achieving minimum standards for all lakes and reservoirs, rivers and canals, transitional and coastal waters, as well as groundwater bodies across its Member States, environmental valuation has played its part, in the UK, in shaping implementation in at least two ways. One was by assessing the *national* costs and benefits of implementation using stated preference methods to value the benefits of water quality improvements, as described in Metcalfe *et al.* (2012). Subsequent work translated these economic values into a form that was usable for local water management areas, known as ‘water catchments’ (EA, 2013). The other role of environmental valuation led on from this and entailed conducting a further benefit-cost assessment of water quality improvements at the catchment level. This second endeavour was no small matter given that it appraised the costs and benefits of specific plans for reaching minimum water quality standards in several hundred of these localities across England.

In terms of decisions about the implementation of the Water Framework Directive, the findings of those local studies were used to assess the degree to which implementation at particular catchments might entail ‘disproportionate costs’. The significance is that – in such instances, under the terms of the directive – this triggers the possibility of a Member State obtaining a reprieve from achieving minimum water quality standards at these locations using so-called ‘derogations’ (EA, 2013). For the Environment Agency, disproportionate costs were equated with an exceptionally weak benefit-cost case. And, in practical terms, this was interpreted as a benefit-cost ratio of less than 0.5; although this was accompanied by extensive use of sensitivity analysis to ascertain how robust was the conclusion of a weak case.

The Environment Agency estimates that around £9.3 billion of resource savings resulted from the derogations based on this BCA.<sup>12</sup> Of course, these cost savings entail a sacrificed social benefit, given that minimum water quality standards are not met in these instances. This was estimated to be in the region of £500 million, which on the face of it indicates that the BCA appears to have been used

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<sup>12</sup> Steve Arnold, pers. comm. These are savings to those actors who would incur costs as a result of having to comply with the directive in these local areas.

effectively to filter the most (net) costly options. It is important to note that granting derogations was not automatic. The process required signing off by relevant senior officials – and by implication the BCA too – as well as requiring ministerial support. Moreover, these decisions are potentially subject to legal challenge, an issue to which we return in the Section 4.

A separate development has given rise to a mini-industry of environmental valuation commissioned and used by the regulated water utilities in England and Wales. These private sector companies have responsibilities for water supply and sewage treatment as well as statutory obligations in providing these services to households and economic producers. Indeed, some of those obligations are the result of the Environment Agency's imposing pollution control responsibilities on the water companies as part of its process for granting consents, as described earlier. Of course, any such obligation is likely to necessitate costly investment. Ultimately such costs are financed by water customers (households and businesses within a water company's area of operations); but only after close scrutiny of the BCA case by the regulatory body for the sector – the Office for Water Regulation (Ofwat).

This process is known as the 'Periodic Review' (or Price Review), and occurs every 5 or so years. The outcome is an agreement between the regulator and the water companies concerning the water supply service package that customers will receive, the investments required to deliver that package and the price changes in customers' bills that are permitted to result. To reach this agreement, Ofwat requires that water companies demonstrate that the impacts on customers and the environment associated with proposed investments are worthwhile and represent value for money, when appraised in a BCA framework. As a result, these businesses now routinely fund substantial primary valuation work in order to participate in this dialogue with the regulator. In particular, this has led to an explosion of use of stated preference methods by e.g. Thames Water, Bristol Water, Yorkshire Water, Anglian Water, United Utilities Water, etc.

Given all of this, it is tempting to overplay the degree to which BCA is the 'only game in town' (Pearce, 1998) in the water sector in the UK. Perhaps unsurprisingly the reality is more complex. For example, in the case of Thames Water's 'Thames Tideway project' – a 25km sewer tunnel that will reduce or eliminate combined sewer overflows into the River Thames – a report by NAO (2017) is explicit that BCA was not a driving force behind the approval of the scheme. Rather it seems that the BCA was done to fulfil mandatory assessment requirements or, more generously, to frame cost-benefit thinking in the context of broader strategic objectives driving the policy narrative.

More generally, the role that environmental valuation plays in the Periodic Review process appears to be evolving. A report by NAO (2015) highlights the apparent frustration of water companies following the last such review in 2014 that their evidence on the benefit-cost case of investment –

based on its surveys of customer willingness to pay – was in some cases downplayed by Ofwat. Notwithstanding the BCA adage that this is just one input to decisions, a specific challenge for the regulator appears to be that individual water companies tend to each commission their own studies. In doing so, differences in results across companies have arisen from differences in methodology as much as due to differences in customer preferences. The current Periodic Review (concluding in 2019) has asked the industry to look into new ways to demonstrate customer engagement including using customer experiences among other considerations. Consequently, some water companies are already starting to use subjective wellbeing valuation to look at the impacts of events such as flood incidents, burst water mains, and odour from sewage treatments, in the way described in Section 2.

### *Natural Capital*

The above examples for water illustrate instances where BCA has been used in the UK at the formulation stage of policy: that is, when options to implement policy objectives are being decided. Policy concerning ecosystems and biodiversity as well as habitats and land-use – which increasingly appears to be coalescing under the policy heading of ‘natural capital’ in the UK – suggest additional pathways whereby BCA and environmental valuation has influenced decisions including in the ‘Spending Review’, the process whereby HM Treasury allocates funding across government policy priorities, notably providing departments such as Defra with the financial resources required to implement policies (NAO, 2015). This is important as potentially this is an institutional venue in which departments might make the case for new and additional money. One (modest)<sup>13</sup> example is the additional capital spending granted to Defra for its policy for peatland restoration. A substantial part of this investment case was the demonstrable value of ecosystem services such as carbon storage. The general point here is that department officials in Defra (past and present) regard the role of environmental valuation in the Spending Review to be of growing importance.

Even in the relatively politicised space of agricultural policy, BCA and evidence on value of ecosystem services has been used by the UK in making the case to shift more of the European Union’s Common Agricultural Policy spending from Pillar 1 (subsidies to agricultural land in production) to Pillar 2 (subsidies for the provision of public goods). It is worth noting as well that this evidence is based on a rich empirical record, starting with Willis and Garrod (1993) as well as Hanley et al, (1998) and Hanley et al. (2007). Indeed, agri-environmental policy design has been a driving force behind the use, and development, of valuation in the UK.

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<sup>13</sup> This extra spending amount to some £12 million.

Nevertheless, policy officials in Defra for example are keen to acknowledge a twist in such tales of apparent success. It may be that environmental valuation and BCA are *one-sided* in their direction of influence. What this means is that deliberations on policy are less contentious when valuation evidence is used to make a positive case for a policy action. The peatland case, and its finding of significant net benefits of restoration, is one example of this. But the suspicion is that the same sort of evidence might not be so influential when used to argue that a policy action, with significant environmental costs, should not go ahead especially when that action decreases otherwise regulatory burdens on business. In other words, the argument that nature provides services which are valuable public goods needing protection and enhancement is easier to make than a policy narrative in which economic activity is said to threaten these services and should be (or remain) regulated or circumscribed in some way.

The UK National Ecosystem Assessment (NEA) represents a case where the influence of environmental valuation on policy is a ‘slow burn’. The NEA itself was a major scientific assessment of the state of, and trends in, ecosystems in the UK (UK NEA, 2011). One of several of its innovations was its extensive use of ecosystem service values (Bateman *et al.* 2011; Gibbons *et al.* 2014). It is perhaps important not to overstate this role: for example, the economic content of the final report amounts to relatively few chapters and does not appear until over 1,000 pages in. Yet despite the fact that the NEA rested on a multidisciplinary mix of approaches, the economic evidence arguably punched above its weight when it came to helping to shape the narrative of policy summaries of the final report to UK Government.

More importantly, the economic evidence also seems to have played a role in the arguments about the future direction of nature policy in England in the 2010 Natural Environment White Paper (Defra, 2011).<sup>14</sup> Although the White Paper did not evolve into actual legislation (as yet), it did lead to two important developments. One was the establishment of the Natural Capital Committee, an independent body launched in May 2012 with its remit including a strong focus on the economic case for natural capital investment in England. For example, the Third (*State of Nature Capital*) Report produced by the Committee asserts that: “... In line with our Terms of Reference, we have developed advice on how to prioritise investments in natural capital, looking in particular at the economic valuation evidence underpinning each investment opportunity.” (NCC, 2015, p36).<sup>15</sup> In turn, that report elaborated all this in terms of an overarching need for a 25-Year Environmental Plan for

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<sup>14</sup> Other non-economic contributions have shaped this policy agenda, perhaps most notably the Lawton Report (see Lawton *et al.* 2010).

<sup>15</sup> It should be noted that the NCC work has also been careful to acknowledge limits to the rolling out of valuation across natural capital, given complexities and uncertainties.

investing in natural capital. This plan has since been developed further by Defra as well as the Natural Capital Committee (now in its second phase), and was launched early in 2018 (Defra, 2018).

#### **4. Embedding Environmental Valuation**

Whether environmental valuation is embedded and sustained in policy requires understanding not only patterns and trends in use in organisations which are the branches of government but also the institutions that are part of the policy process. These are the *rules of the game* for how environmental valuation is used and the quality standards that this evidence must need. ‘Impact Assessment’ is perhaps the most focal of these institutions in this context. Regulatory proposals are subject to these assessments in the UK (as in other countries) and BCA is at the heart of this, including evidence on the value of environmental impacts (see Russel and Jordan, 2010, for a discussion of this for the UK).

Formal organisations play their part in shaping and imposing rules about this process too. Notably, in the UK there is the role of HM Treasury in establishing the ground-rules for BCA through its published guidance (HM Treasury, 2018). This guidance – the so-called *Green Book*, recently updated in 2018 – provides the broad framework for BCA and its use across UK government, as well as placing this in the context of the general policy background and the wider set of options available to the government to achieve their objectives. While there is no law that states that the *Green Book* has to be used by, for example, policy departments, the accepted ‘culture’ is to treat it as if it were a ‘mandatory’ requirement and one means of satisfying sound management of the public finances that is required constitutionally. A strength of this is that it allows comparability between projects and proposals across central government and over time. Moreover, this culture appears to extend beyond this to, for example, arms-length bodies as well as non-governmental organisations and occasionally business in their own analyses of projects with public benefits, especially where compatibility with governmental guidelines is considered a benchmark of good practice.

In this way, the *Green Book* is a tangible manifestation of shared values that are woven into the fabric of the government (and related) decision-making. It is not surprising then that officials in HM Treasury regard the *Green Book* as being ‘strongly embedded’.<sup>16</sup> What the guidance says about environmental valuation clearly matters for its uptake and use in policy decisions. The principle supporting guidance on this is well-established given that the *Green Book* emphasises that policy is not solely about minimizing expenditures and reducing costs, but also to take into account, amongst other things, the benefits side of the BCA ‘ledger’. What this means more precisely is reflected in

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<sup>16</sup> Evidence of this can be found in the origins and history of the *Green Book*. In the 1970s, BCA guidance was put in place to guide investment in the nationalized industries of that time. Despite the many privatizations of the 1980s and early 1990s, the *core* guidance has remained the same. Extensive training of government practitioners on its use is another means of ensuring that its influence persists.

wide-ranging supplementary guidance that is an adjunct to the core of the *Green Book*. Currently, in relation to environmental valuation, this covers air quality, greenhouse gas emissions, ecosystems and stated preference techniques.

Of course, in practice, the influence of environmental valuation across government varies in its nature and extent and depends on specific organisational remits and the prevalence of non-market values in the typical projects and policies that they deal with. Nonetheless, presumably it is the case that relevant public bodies with responsibilities for environmental policy are keen to encourage this process of expanding and updating guidance in this way. Put another way, it becomes more straightforward to make the case for beneficial but costly policy, if it can be demonstrated that those benefits are not only substantial but consistent with *Green Book* guidance. But such updates represent an evolutionary process. Supplementary *Green Book* guidance (Fujiwara and Campbell, 2011 and in its 2011 update: pp57-58) on using subjective wellbeing valuation (see Section 2) is an example of this. In the relevant supporting guidance, this is described as ‘an evolving methodology’, useful to support other evidence and ensure a full range of impacts is considered but, at that time, not yet robust enough for direct use in BCA; while in the 2018 version of the *Green Book* (HM Treasury, 2018), the status of subjective wellbeing valuation is elevated with the recognition that it may be robust enough to be used in social BCA, particularly in certain policy areas.

In other cases, formal legislation might also play its part, as in the case of the Public Services (Social Value) Act 2012<sup>17</sup>, which requires large-scale public sector commissioning to consider wider social, economic and environmental wellbeing benefits. The legislation does not specify how this might be done, nor does it guarantee that compliance is regarded as more than yet another ‘box to tick’ in the appraisal process. Nevertheless, its existence puts down a formal marker for asking searching questions about how organizations responsible for large infrastructure projects requiring public funding are using environmental valuation. Moreover, there are some signs of companies in the construction sector, for example, anticipating such inquiry and being proactive in the search for this new economic evidence, in a manner analogous perhaps to the experience of the water companies discussed previously in Section 3.

Embedding environmental valuation in official guidance or legislation is necessary but not sufficient to ensure its use. Institutional capacity is one further element, although building this capacity can take a number of forms. Most obviously perhaps this has taken the form of reaching critical mass in core economic teams within relevant organisations such as Defra. In this respect, however, the period’s post-financial crisis has been a challenging time in the UK civil service with cuts in spending

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<sup>17</sup> See: <http://www.legislation.gov.uk/ukpga/2012/3/enacted>

shrinking capacity (through the loss of personnel as well as reduced policy budgets generally) to respond to the needs of evidence-based policy-making. This has accelerated long-standing concerns about the loss of institutional memory arising from the drain on internal expertise that inevitably accompanied these recent developments.

A longer-term trend has been the externalisation of expertise in form of ‘outsourcing’ of basic analytical tasks to external consultants, more often than not in the private sector; although this is not a context that is unique to either the UK or environmental valuation (see, for example, Howlett *et al.* 2015). An interesting contrast to such trends though is the example of the Environment Agency and its use of BCA for implementation of the Water Framework Directive, discussed earlier in Section 3. Economists at the Agency acted as internal experts for this appraisal, but a distinctive feature of this was the inclusion of the local Agency staff – including those with backgrounds in the natural sciences such as ecology and hydrology – as de facto benefit-cost analysts in their own water management catchments. That is, it was these staff who actually undertook the BCA in these localities. This followed a relatively short period of training, with more extensive support subsequently on the appraisal exercise and critical elements. In doing so, this devolution of BCA sought to harness local expert knowledge of local conditions, rather than rely predominately on centrally based (or external) analytical services. Another objective was to promote greater transparency about the role economic thinking can play in policy implementation and enabling potentially greater institutional buy-in within catchments for, erstwhile esoteric tools such as, BCA and environmental valuation.

Use of BCA and environmental valuation in policy inevitably gives rise to questions concerning its quality (see, for example, Hahn and Dudley, 2007 and Georgiou *et al.* 2018, in this volume). In this respect, institutional processes governing scrutiny appear to be increasingly important in the UK, often occurring via formal organisations including the National Audit Office, as the public body which examines public spending on behalf of Parliament. As part of this role it undertakes reviews of public projects as well as government departments where, for example, it can look at the quality of evidence produced by these bodies either generally or in the context of a particular use (such as appraisal of a major infrastructure project).

Various reports by the National Audit Office (see, for example, NAO, 2006, 2010) have been directly concerned with BCA in UK impact assessments judged according to a number of criteria about quality as well as the breadth and depth of use. Echoing findings elsewhere (e.g. Hahn and Dudley, 2007 for the US), these documents indicate that it cannot be taken for granted that use of BCA is always synonymous with ‘good quality’.

What is important, of course, is strengthening incentives for doing better in the future and the growing role of scrutiny of the quality of evidence-based policy appears to be reflected too in developments elsewhere such as in the European Commission's Regulatory Scrutiny Board (see, RSB, 2016). In the UK, an analogous body – Regulatory Policy Committee – focuses on the scrutiny of the business case for policy proposals vis-à-vis business interests (and charitable or voluntary bodies). As such, the Committee is better viewed as a manifestation of the 'better regulation' agenda although its role does involve evaluating (and, in some cases, rejecting) Impact Assessments. The case for extending this remit to the BCA elements of these assessments is suggested in a Parliamentary report on the Regulatory Policy Committee's (PAC, 2016). This notes, for example, that in 2014, only one third of cases examined by the Committee demonstrated a satisfactory assessment of social costs and social benefits. But, given the Committee's remit, it had no power to influence this outcome by rejecting assessments on grounds of 'poor quality' BCA. Put this way, given these weak incentives it is not surprising that policy proposers may provide incomplete or sub-par BCA evidence.

In the case of the Environment Agency, somewhat different scrutiny processes appear to have been prominent. Use of BCA by the Agency, in 'ruling out' water quality improvements in locations where net benefits were judged to be substantially negative, has met with challenge from stakeholder groups involving Judicial Review (the legal process whereby decisions made by a public body can be challenged). Such experiences seem to have shaped the Agency's use of valuation evidence, especially with regards to its subsequent deliberations with stakeholders. Notably its emphasis increasingly has been on transparency and engagement regarding the environmental valuation toolkits that it uses. This has involved the Agency, for example, showing stakeholders how these tools are to be used and inviting stakeholders to express views on this. Of course, the risk is that stakeholders seek to influence analysis in their favour, although the Agency's intention is that changes to toolkits, in the light of such views, will itself be subject to a scrutiny process. Whatever the outcome, this amounts to a strong degree of deliberation where environmental valuation in policy seems to be part of a process of dialogue, rather than solely a 'means to an end' in producing a BCA.

One final process in the UK that will frame much else, of course, is European Union Exit (so-called 'Brexit'). Notably, in time, one likely outcome of that departure is a greater demand for more domestic decision-making in areas such as environmental policy, depending on the proposed degree of alignment with European policy after withdrawal. Of course, it is speculation as to the narrow question about the role that environmental valuation will play in this new domestic agenda over the longer-term. However, one possible future given credence by policy officials is a continued, and maybe even enhanced, role for valuation given that UK policy-makers will be looking for a way to make 'novel' decisions, previously the domain of the European Commission, and the role of evidence could well be crucial here, especially given the existing national policy culture as indicated, and

discussed earlier in this section, by *The Green Book*. While it would be unlikely that domestic environmental policy would be seen as a technocratic exercise, examples do exist where Defra has previously had discretion over policy, notably the decision to shift farm subsidies towards greater support for providing environmental public goods, and where use of environmental valuation has been prominent in framing these policy decisions.

## **5. Conclusions**

This paper presents an examination and evaluation of the use of environmental valuation in UK policy. On the face of it, this use has been extensive echoing growing use of non-market valuation methods more generally. A principal use in UK environmental (and related) policy has been in benefit-cost analysis (BCA) as part of the Impact Assessment process. For example, in the case of water quality, there is extensive use by the Environment Agency, as the public body responsible for implementing European Union directives, as well as by the water companies in the private sector in their having to routinely demonstrate – to the regulatory body for that sector – the social value of industry investment plans. In the case of nature policy, environmental valuation has also been used at the problem-definition stage of policy, as major official studies such as the UK National Ecosystem Assessment illustrate.

A number of trends can be identified in this policy use over the past two decades and more.

Firstly, initial ‘bespoke’ and original studies were commissioned for particular identified policy questions, arguably reflecting the paucity of the early empirical record which, in effect, placed a premium on gathering primary data in these areas of policy concern. As this empirical record grew, along perhaps with budgetary and time constraints and a wish to boost ease of use, there has been an increased emphasis on sharable values – e.g. valuation toolkits – which can be used ‘off the peg’ in a variety of policy areas where environmental impacts are empirically relevant.

Second, while we have employed ‘environmental valuation’, in this paper, as a convenient umbrella term, the reality is that this refers to a wide variety of techniques of non-market valuation. Early studies for policy use tended to utilise stated preference methods (with some exceptions). This ‘tradition’ has continued in uses by the Environment Agency and water companies. However, the UK National Ecosystem Assessment and the Department for Environment, Food and Rural Affairs reflect other methodological developments and, notably, the use of ecosystem and land-use models in conjunction with environmental valuation.

Third, while the ‘holy grail’ might be to embed established techniques of environmental values, and develop sharable values, there remains scope for a variety of innovations. The aforementioned combination with ecosystem modelling in Defra is one illustration of this. So too is the use of subjective wellbeing valuation, although it is notable that many of those applications, up to now, have been non-environmental and emanate from branches of government with a less strong tradition in using more established non-market valuation methods.

Overall, it is apparent that policy officials, in the UK, now routinely reach for (where relevant) environmental valuation – in some shape or form – to inform policy and investment project decisions. A number of the cases that we have examined, in this paper, do indicate BCA information being used relatively unambiguously for implementation decisions in the case of the Environment Agency. In other cases, environmental valuation appears to be part of how an evidence case is shaped either in Spending Reviews, reforming the character of agricultural subsidy payments or crafting policy narratives as in the recently announced UK Government ‘25-Year Environmental Plan’.

A number of (related) institutional processes appear to reinforce this use, including established ones such as the HM Treasury *Green Book*, setting an early template for how BCA is to be undertaken for UK policy. A growing emphasis on scrutiny, via a number of official bodies and legal processes, may in time not only reinforce use but provide a further impetus driving the quality of this valuation evidence. There remain uncertainties, of course: notably what happens in the environmental policy domain upon the proposed UK withdrawal from the European Union. It is not implausible that the current trends in use of environmental valuation will continue, or even increase, as greater need for domestic decisions on environmental policy are required, along with examples of how environmental valuation has been used in the past where such discretion in policy-making has been permitted.

While ours is a largely positive assessment, the discussion in this paper is not exhaustive either in its coverage of environmental policy areas or cases examined. Indeed, it is clearly the case that environmental valuation and BCA, can only contribute to arbitrating, rather than determining, policy decisions. Illustrations, discussed in this paper, include specific projects such as the Stonehenge Tunnel, Thames Tideway Tunnel and broader areas of application such as in the deliberations between industry and regulator in the water sector. All this is to be expected, of course, given that BCA is only one input to decision-making. But it leaves us less clear about what precisely the influence of environmental valuation has been, despite the fact that it has been ‘done’ and is ‘used’. This suggests a number of avenues for future work to help determine this influence in a more methodical way perhaps by alighting in further detail on particular categories of policy application. The use of environmental valuation in policy decisions and investment projects affecting the quality

of water bodies seems a promising focus for this given the richness of its applications and the apparent nuances, and evolving issues, in this use.

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