

1 Accounting for natural capital has cross-cutting relevance for UK
2 public sector decision-making

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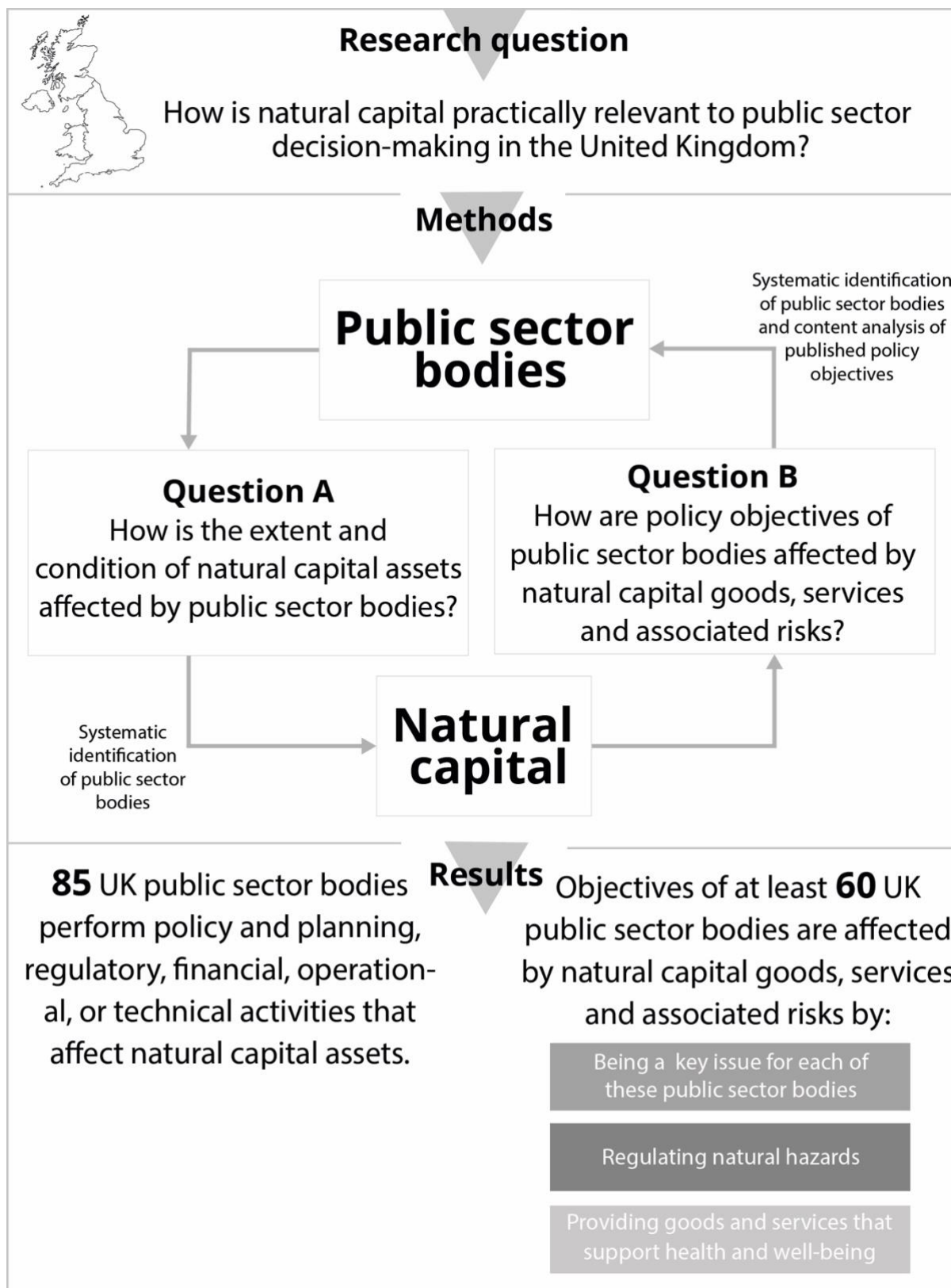
20 ABSTRACT

21 Countries have made a range of international commitments to compile and use natural capital
22 accounts. While processes and methods for compiling natural capital accounts are now well
23 defined, mainstreaming natural capital accounting (NCA) across public sector decision-
24 making remains a practical challenge. This raises the question: which domains of public
25 sector decision-making are important for a phased introduction of NCA? Here, we address a
26 subset of this evidence gap through systematic analysis of the policy-relevance of natural
27 capital accounts in the United Kingdom (UK). We identify 85 UK public sector bodies whose
28 activities can affect the extent or condition of natural capital assets, and 60 bodies whose
29 policy objectives are qualitatively contingent on natural capital stocks or services. For each of
30 these 60 public sector bodies natural capital management (1) is a core policy priority, (2)
31 impacts on policy objectives by regulating natural hazards, or (3) provides ecosystem goods
32 and services that support policy objectives concerning health and well-being. Our findings
33 highlight the considerable cross-cutting relevance of natural capital for public sector
34 decision-making, and the need to account for natural capital in policy domains beyond those
35 focused narrowly on environmental policy and management, e.g through coordination
36 structures that feature cross-departmental representation.

37

38 *Keywords:* natural capital, governance, United Kingdom, environmental accounting, public
39 sector, decision-making

40 GRAPHICAL ABSTRACT



42 HIGHLIGHTS

- 43 • 85 public sector bodies perform policy, planning, regulatory, financial, operational,
44 technical or advisory activities affecting the extent or condition of natural capital
45 assets in the UK.
- 46 • 60 public sector bodies are affected by UK natural capital assets through services that
47 include natural hazard regulation, and support for health and well-being.
- 48 • Natural capital is of considerable cross-cutting relevance to UK public sector bodies
49 relevant to themes such as agriculture, health, housing and transport.
- 50 • Accounting for natural capital benefits and impacts is critical in policy domains and
51 institutions beyond those focused on environmental policy and management.
- 52 • UK public sector management of natural capital assets could be enhanced by
53 coordination structures that feature cross-departmental representation.

54 1 INTRODUCTION

55 Conventional measures of economic and social development have largely neglected the
56 natural environment, despite its role as the foundation on which our society and economy are
57 built (GLOBE International, 2014; MEA, 2005). The term “natural capital” is increasingly
58 used to describe those parts of the environment that are capable of contributing to human
59 health and well-being, underpinning all other types of capital (i.e. human, financial,
60 manufacturing and social). The proliferation in recent years of environmental data and
61 statistics provide a window of opportunity to organise this information into natural capital
62 accounts and associated indicators that enable more holistic analysis of wealth and the
63 environmental sustainability of development (Hammond et al., 1995). Since the 1992 Rio
64 Conference on Environment and Development, the relevance and importance of natural
65 capital accounting for public decision-making about sustainable development has been
66 progressively recognised in international political commitments (Chapter 8d in UN, 1992).
67 For example, Sustainable Development Goal (SDG) Target 15.9 calls on all countries, by
68 2020, to “integrate ecosystem and biodiversity values into national and local planning,
69 development processes, poverty reduction strategies and accounts” (UN, 2015). SDG Target
70 17.19 in a similar vein calls on all countries, by 2030, to “build on existing initiatives to
71 develop measurements of progress on sustainable development that complement gross
72 domestic product, and support statistical capacity building in developing countries” (UN,
73 2015).

74 At a technical level, these commitments are now supported by the UN System of
75 Environmental-Economic Accounting (SEEA) (UN, 2014a). The SEEA is a statistical
76 framework that addresses the need to better account for environmental resources in economic
77 and social accounting, containing a set of standardised concepts, definitions and accounting
78 rules that link environmental data and statistics to economic statistics (UN, 2014a). Over 80
79 countries have now compiled or published natural capital accounts following the SEEA
80 Central Framework with 32 countries planning to do so (UNSD, 2019). Although the
81 adoption of the SEEA is a significant achievement in the evolution of international
82 accounting standards, it has not automatically resulted in its direct application across policy
83 domains, and a phased introduction to accounting of natural capital might be better for

84 political and practical reasons (Vardon et al. 2016). This raises the question; which domains
85 of public sector decision-making are important in a phased introduction?

86 Integration of environmental policies has been widely debated, even though evidence of
87 actual application is rather inadequate (Jordan and Lenschow, 2010; Lafferty and Hovden,
88 2003). In particular, mainstreaming accounting of natural capital across governance and other
89 public sector decision-making bodies remains an important practical challenge for decision-
90 makers. Here, we address a subset of this challenge by investigating which domains of public
91 sector decision-making are relevant to natural capital accounting. We use the United
92 Kingdom (UK) as an illustrative country case study because of its existing national
93 commitments concerning natural capital coupled with established environmental and
94 ecosystem accounting programmes, which are explained in section 2. Through qualitative and
95 consultative methods, we assessed how the status (extent and condition) of natural capital
96 assets was affected by decision-making across different public sector bodies by reviewing the
97 functions of existing public sector bodies in the UK. We also examined how accounting and
98 assessment of natural capital could support policy objectives of public sector bodies by
99 identifying cross-cutting themes through a consensus-based content analysis of published
100 policy objectives.

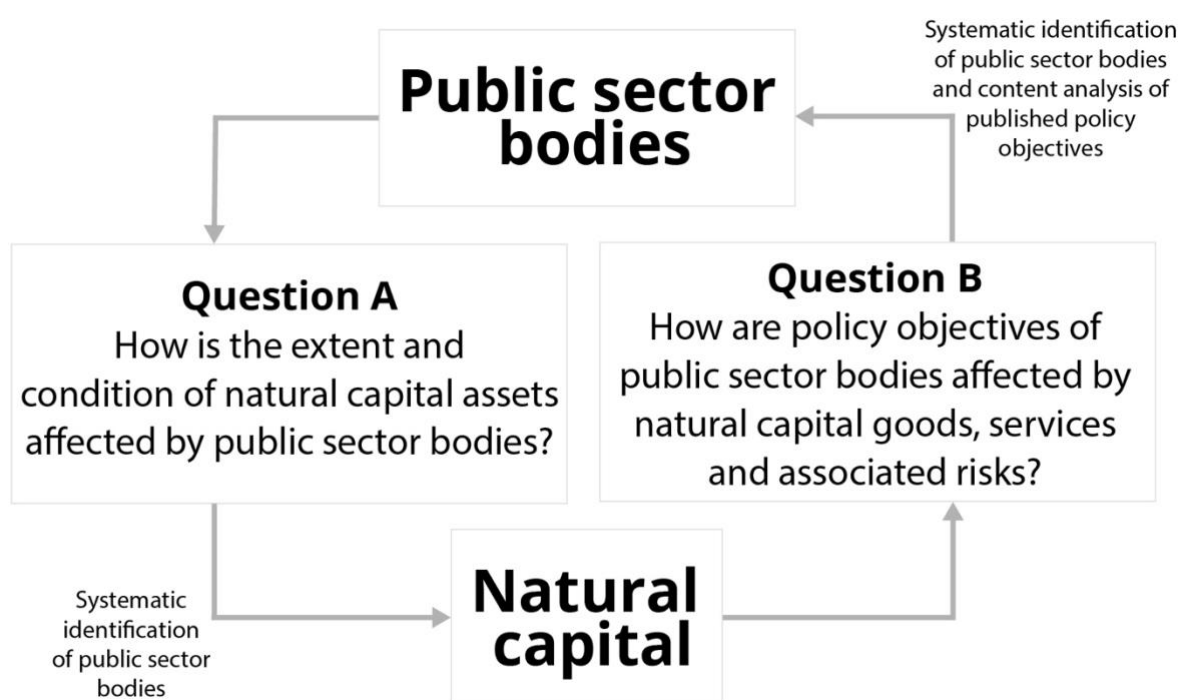
101 2 UK CONTEXT

102 The UK makes an interesting case study because certain progress on natural capital
103 accounting has been made. There is also an interest to understand how to mainstream
104 accounting for natural capital assets across governance and other public sector decision-
105 making bodies. The UK has made several national commitments aimed at highlighting the
106 importance of UK's natural assets and make progress on accounting for natural capital. The
107 current Government's 2019 manifesto pledged to '*protect and restore our natural*
108 *environment*' (Conservative Party, 2019). More concrete commitments were made in the
109 UK's Government's 25 Year Environment Plan which seeks to '*improve and expand the*
110 *range of tools and guidance that support biodiversity net gain approaches, including through*
111 *the future incorporation of natural capital measures*' and to '*better incorporate the full*
112 *spectrum of natural capital and the value of the benefits it provides into analysis and*
113 *appraisal across government*' (Defra, 2018). Since 2013, annual environmental and
114 ecosystem accounts informed by the SEEA Central Framework (SEEA-CF) and the SEEA

115 Experimental Ecosystem Accounting (SEEA-EEA) have been developed and published by
116 the Office for National Statistics (ONS) and Defra (ONS, 2018; UN, 2014a, 2014b) in
117 partnership with the Natural Capital Committee (NCC). The NCC was initially established in
118 2012 to advise the UK Government on management of natural capital (NCC, 2017a) and is
119 developing annual reports on the state of the UK’s natural capital (NCC, 2019, 2017b).
120 Lastly, the new Green Book, published by Her Majesty’s (HM) Treasury in 2018, includes a
121 guidance on the use of non-market values of natural capital in appraisal and evaluation (HM
122 Treasury, 2018).

123 3 METHODS

124 We assessed UK public sector bodies operating inside and outside the environmental domain
125 In terms of the interlinkages of their priorities with natural capital goods, services and
126 associated risks by asking two main questions: How is the status (extent and condition) of
127 natural capital assets affected by each public sector body (Figure 1, Question A)? How are
128 policy objectives of each public sector body affected by natural capital goods, services and
129 associated risks (Figure 1, Question B)?



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131 **Figure 1.** Assessing interlinkages between public sector decision-making and delivery bodies and natural
132 capital.

133 3.1 PUBLIC SECTOR BODIES THAT AFFECT THE CONDITION OF NATURAL
134 CAPITAL

135 To understand how the status (extent and condition) of natural capital assets is affected by the
136 objectives of UK public sector bodies (Figure 1, Question A), we reviewed the data directory
137 of public bodies 2015 (Cabinet Office, 2015) and the UK Government website and other
138 direct web links from this site (HM Government, 2018). We further refined the identification
139 of UK public sector bodies through facilitated discussions with experts until a consensus was
140 reached. The experts consisted of the authors of this paper and public servants from Defra
141 with diverse disciplines spanning environmental sciences, economics and public policy. The
142 experts did not exclude the possibility that other unidentified public sector bodies might have
143 an association with natural capital assets and emphasised that this method does not explain a
144 causal relationship between natural capital assets and the objectives of UK public sector
145 decision-making. The identified public sector bodies were classified in terms of their
146 geographical jurisdiction and functional remit:

- 147 • What geographical jurisdiction does each identified public sector body act in? The
148 following geographical jurisdictions were considered: UK, England, Scotland, Wales,
149 Northern Ireland and local jurisdictions.
- 150 • What function does each identified public sector body exercise? All public sector
151 bodies exercised a functional subset of activities. Our typology of functions was based
152 on a consultation with experts, collaboration with public servants and was generally
153 consistent with the policy framework used in Milligan (2014). It was not based on a
154 review of relevant legal frameworks. The following functional activities were
155 considered: policy and planning, regulatory, financial, operational, and technical and
156 advisory function (see **Table 1**). We identified only those functions within a public
157 sector body which were explicitly deductible during review of publicly available
158 information on this public sector body. Every public sector body was considered to
159 potentially exercise multiple functions as functions sometimes overlap. The experts
160 did not exclude the possibility that functions of a public sector body might change
161 over time (MacCarthaigh and Roness, 2012).

162 **Table 1.** Description of the different functions that public sector bodies exercise considered in this paper.

Function	Description	Example
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Policy and planning function	The public sector body thinks about and organises activities required to achieve a particular objective, involving the creation and maintenance of a plan.	The Planning Inspectorate deals with planning appeals, planning applications and other planning-related work for various types of infrastructure.
Regulatory function	The public sector body monitors, guides and controls particular public and/or private actors, which can include enforcing government controls and restricting a particular sector.	The Civil Aviation Authority regulates UK airline and airport safety standards, and security arrangements at UK airports.
Financial function	The public sector body manages money in such a manner to support and accomplish the objectives of other public sector bodies.	HM Treasury controls funding of UK farmers and rural communities by allocating financial resources to Defra, the Scottish Government, the Welsh Government and the Northern Ireland administration.
Operational function	The public sector body brings together material and/or immaterial assets to produce a particular product or service.	Network Rail operates and develops Britain’s railway, which includes tracks, bridges, crossings and stations to deliver well-functioning railway infrastructure to all its users.
Technical and advisory function	The public sector body provides a technical and/or advisory role, which can include the responsibility to manage and share data and statistics.	The UK Expert Committee on Pesticides provides technical advice to the government on the science relating to pesticides.

163 3.2 POLICY OBJECTIVES THAT ARE AFFECTED BY NATURAL CAPITAL

164 We assessed UK public sector bodies inside and outside the environmental domain and
 165 associated policy objectives for interlinkages with natural capital goods, services and
 166 associated risks. We reviewed institutional objectives using the same list of public sector
 167 bodies gathered in section 3.1 (Cabinet Office, 2015; HM Government, 2018) through the
 168 following question: Can this public sector body be affected by natural capital (Figure 1,
 169 Question B)? We used the Common International Classification of Ecosystem Services
 170 (CICES) as a general reference typology for these natural capital benefits and risks (Haines-
 171 Young and Potschin, 2018). CICES was developed by the European Environment Agency to
 172 standardise the way in which ecosystem services are described if international environmental
 173 accounting methods were to be further developed and is shaped in part by discussions with
 174 the United Nations Statistical Division (Haines-Young and Potschin, 2018).

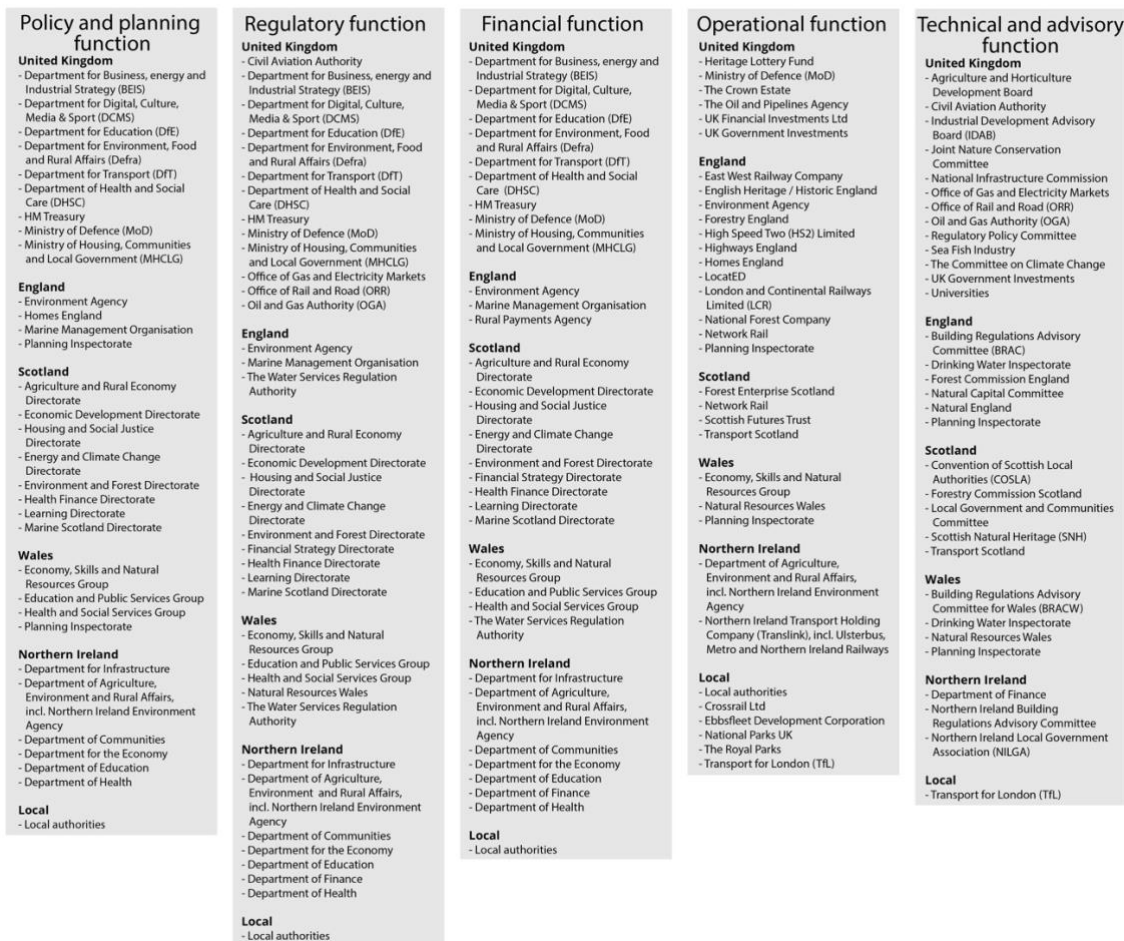
175 We then distilled, into a core set of principles, the objectives of all identified UK public
 176 sector bodies that can be affected by natural capital to identify cross-cutting themes through a
 177 consensus-based qualitative content analysis. This process contained three stages: (1) a short
 178 summary consisting of two or three sentences was made for each identified public sector
 179 body on how it can be affected by natural capital, (2) the summaries of stage one were

180 summarised into a maximum set of three themes which can be either a word or a short
181 sentence and (3) a final set of three key themes were identified for all public sector bodies
182 together based on the themes of stage two. This analysis was informed by Elo and Kyngäs
183 (2008) and enables us to iteratively summarise how UK public sector bodies can be affected
184 by natural capital in a transparent and reproducible way (Harwood and Garry, 2003). This
185 systematic procedure avoids imposing our own value judgement and minimises subjectivity
186 in the analysis of the normative content. We refined these results through facilitated
187 discussions between the two main authors of this paper until a consensus was reached.

188 4 RESULTS

189 4.1 PUBLIC SECTOR BODIES THAT AFFECT THE CONDITION OF NATURAL 190 CAPITAL

191 We identified 85 public sector bodies that perform activities affecting the extent and
192 condition of natural capital assets located in the UK (summarised in Figure 2, raw data in
193 electronic supplementary material [ESM] Table 1 and 2). This includes organisations active
194 in a variety of fields such as protecting the environment (e.g. Defra and the Environment
195 Agency), maintaining and expanding rail and road infrastructure (e.g. Department for
196 Transport, Network Rail and Highways England) and providing housing (Ministry of
197 Housing, Communities and Local Government and Homes England). The 85 public sector
198 bodies that were identified are spread across all geographical jurisdictions and 44 out of 85
199 public sector bodies (52%) were identified to perform uniquely one function. Forestry
200 England, for example, is solely identified to have an operational function by being the largest
201 land manager of public forests in England.



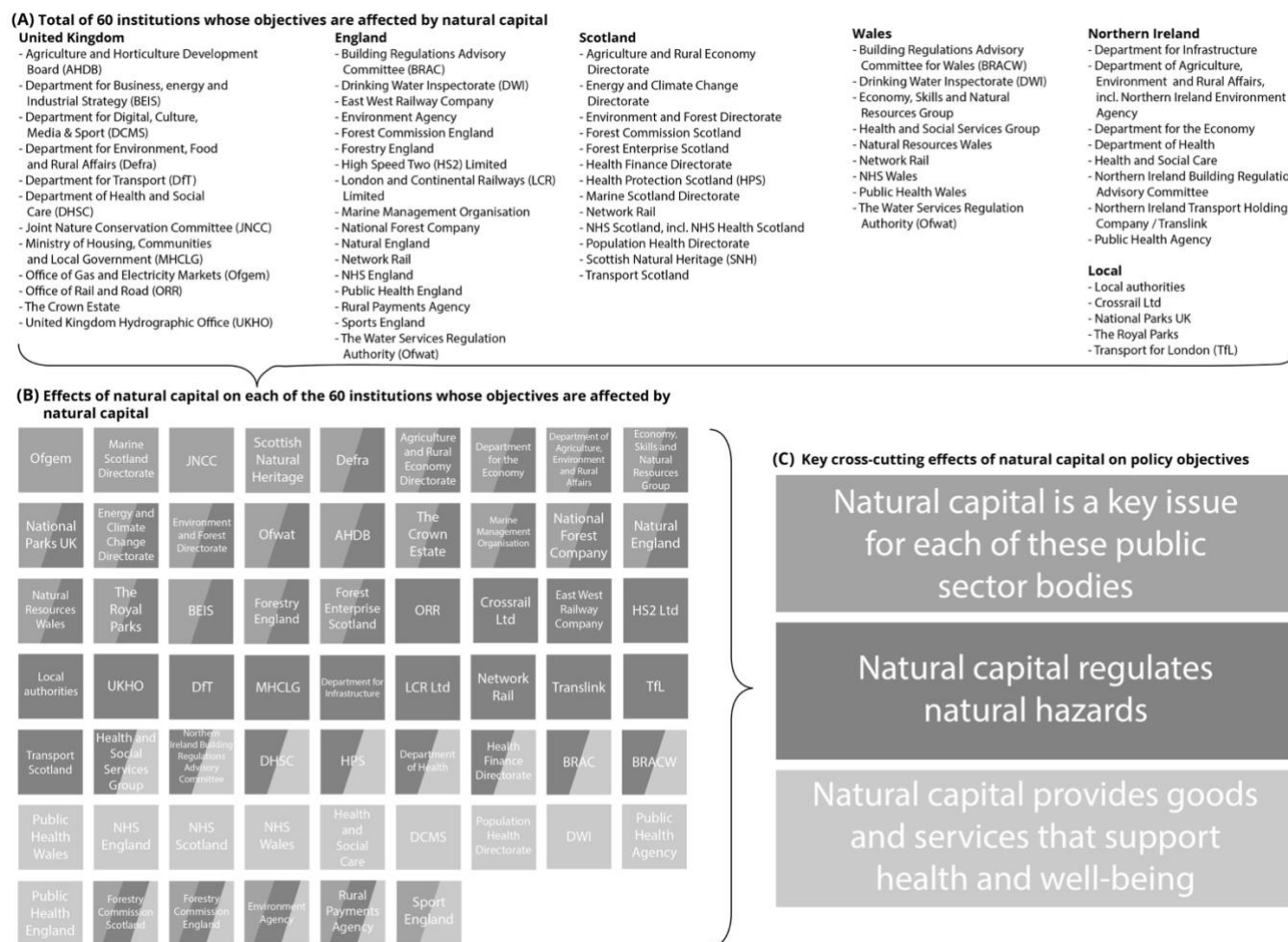
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Figure 2. Overview of UK public sector decision-making and delivery bodies that perform activities affecting the status (extent and condition) of natural capital assets. National Parks UK consists of 15 National Park Authorities (managed locally): Brecon Beacons, Cairngorms, Dartmoor, Exmoor, Lake District, Lock Lomond & The Trossachs, New Forest, Northumberland, North York Moors, Peak District, Pembrokeshire Coast, Snowdonia, South Downs and Yorkshire Dale. The Royal Parks consists of 10 parks: Brompton Cemetery, Bushy Park, Greenwich Park, Hyde Park, Kensington Gardens, Richmond Park, St James’s Park, The Green Park, The Regent’s Park and Primrose Hill, and Victoria Tower Gardens. Local authorities were grouped together for the purpose of this project. Raw data of the analysis for each public sector body can be found in Table 1 and 2 of the electronic supplementary material.

209 4.2 POLICY OBJECTIVES THAT ARE AFFECTED BY NATURAL CAPITAL

210 We identified that the policy objectives of at least 60 public sector bodies are affected by
211 natural capital assets in the UK (summarised in Figure 3A and Figure 3B, raw data in ESM
212 Table 1 and 2). The qualitative content analysis summarises the diverse range of ways by
213 which natural capital assets can affect these policy objectives, i.e. natural capital management
214 (1) is a core policy priority for each of these public sector bodies, (2) impacts institutional
215 objectives by regulating natural hazards (e.g. flooding, air quality, climate change), and (3)
216 provides goods and services that support health and well-being (e.g. space for recreation)
217 (Figure 3C, raw data in ESM Table 2). Regulation of natural hazards was the most prevalent
218 cross-cutting benefit of natural capital, being relevant to the policy objectives of 46 out of 60
219 (76%) identified public sector bodies. Almost half of identified public sector bodies, i.e. 29
220 out of 60 (48%), are connected to the cross-cutting theme of ‘natural capital as a core policy
221 priority of the organisation’, while 24 out of 60 (40%) relevant public sector bodies were
222 classified as affected by natural capital goods and services that support health and well-being.

Mainstreaming natural capital across public sector decision-making – Maes et al. (2020)



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Figure 3. Summary of the cross-cutting effects of natural capital assets on policy objectives. Different panels illustrate the qualitative content analysis undertaken on (A) identified public sector decision-making and delivery bodies affected by natural capital goods, services and associated risks, (B) effects of natural capital on each of the identified public sector bodies and (C) cross-cutting thematic classification of natural capital effects on delivery of institutional policy objectives. See figure 2 for the definition of National Parks UK and The Royal Parks. Local authorities were grouped together for the purpose of this project. Raw data of the analysis for each public sector body can be found in Table 1 and 2 of the electronic supplementary material.

229 5 POLICY IMPLICATIONS

230 Our findings revealed that the objectives of a large number of UK public sector bodies affect
231 or are affected by natural capital assets. These public sector bodies cover many policy
232 domains such as transport, energy, health, economy, education, housing, defence, agriculture
233 and environment. This indicates that effects on and from natural capital cut across many
234 policies and public sector bodies (GLOBE International 2014), which implies that meeting
235 environmental objectives depends on their mainstreaming into non-environmental public
236 sector bodies (Lafferty and Hovden, 2003). The UN SDGs also reflect this cross-cutting
237 relevance because the thematic areas covered by the SDGs are well connected with each
238 other (Le Blanc, 2015; Maes et al., 2019; Scharlemann et al., 2016). This cross-cutting
239 relevance indicates that environmental protection and management could be enhanced by
240 bringing government stakeholders together into coordination structures and processes with
241 broad cross-departmental representation, which has been identified in many domains and
242 sectors before (Keast and Brown, 2010; Klinsrisuk et al., 2013; Korhonen-Kurki et al., 2015;
243 Ruijs et al., 2018).

244 Even though responsibility for natural capital is often spread across many government
245 departments and other public sector bodies, public pressure and final responsibility is often
246 directed towards respective government departments for environment or other environmental
247 organisations. In 2016, for example, the charity ClientEarth sued and won an air pollution
248 case in High Court against the UK government and particularly the Secretary of State for
249 Environment, Food and Rural Affairs (ClientEarth v Secretary of State for the Environment
250 Food and Rural Affairs, 2016). Final responsibility for drafting and publishing air pollutions
251 plans comes from Defra, even when regulation of particular air pollution sources might not
252 fall under the responsibility of Defra. Environmental departments alone (such as Defra)
253 cannot guarantee cross-government action and government departments need to have their
254 own sustainable development strategy without feeling as if it were imposed on them (WWF,
255 2015). Considering the role cross-departmental structures and processes could play for more
256 effective environmental policy and management, identifying key areas for cooperation and
257 capacity-building should be considered a priority for public sector decision-making.

258 Successful or effective cross-government coordination related to natural capital depends on
259 well-structured information. A key aspect of compiling national environmental accounts

260 focused on understanding the state of natural capital. Progress has been made by ONS and
261 Defra, in partnership with the NCC, to develop annual environmental and ecosystem accounts
262 (NCC, 2019, 2017b; ONS, 2018, 2017). However, previous research has highlighted the
263 limited knowledge amongst policy decision-makers of natural capital accounting, or how it
264 might be used to support their decision-making (Vardon et al., 2016). Simply accounting for
265 the state of natural capital has not led to the desired adoption by decision-makers for
266 informing policy domains (Vardon et al., 2016). A next step will be to establish strong
267 connections between accounting efforts and strategic cross-governmental natural capital
268 policies. A phased implementation of environmental accounts as suggested by Vardon et al.
269 (2016) by identifying priority natural capital assets in a country can move accounting of
270 natural capital towards broader adoption in decision-making.

271 The expenditure of each public sector body is an important component of its impact (or lack
272 thereof) on natural capital. For example, UK environmental accounts estimated that £14.4
273 billion was spent on environmental protection in 2018 alone, accounting for 1.8% of UK
274 government expenditure (ONS 2018). A majority of the environmental protection
275 expenditure (77.8%) was spent on waste management followed by smaller expenditures such
276 as waste water management, protection of ambient air and climate, and other abatement costs
277 (ONS 2018). Environmental protection expenditure does not give any indication however of
278 direct spend on natural capital. Much of the expenditure goes to goods and services that
279 protect the environment indirectly such as waste processing and recycling, while other
280 expenditures are more evidently related to natural capital such as tree planting schemes and
281 green space creation. UK Government expenditure on natural capital is not yet
282 comprehensively accounted for across Ministerial Departments and other public sector
283 bodies. In particular, data on direct spending to improve natural capital is not consistently
284 gathered across all departments and sectors (Defra 2018). It is unknown if current
285 expenditure is enough to maintain a healthy environment, nor if the expenditure has been
286 well directed and effectively used (Vardon et al., 2016), suggesting the need to
287 comprehensively account for public spending on natural capital.

288 6 CONCLUSIONS AND FUTURE RESEARCH

289 Our findings highlight (1) the considerable cross-cutting relevance of natural capital for UK
290 public sector decision-making, and (2) the need to account for natural capital benefits and

291 impacts in policy domains and institutions beyond those focused specifically on
292 environmental policy and management. A systematic review of public sector bodies through
293 facilitated discussions and qualitative content analyses as presented in our paper could be
294 used to better understand how to mainstream natural capital to non-environmental objectives
295 across public sector decision-making in other countries. Three key points may be of particular
296 interest to public sector decision-making in the UK and beyond:

- 297 • First, public administration and delivery of Government commitments concerning
298 natural capital could be enhanced by bringing government stakeholders together
299 through coordination structures and processes that feature broad cross-departmental
300 representation. As we highlight, many policy domains and public sector bodies
301 beyond those that traditionally focus on environmental policy and management can
302 affect or can be affected by natural capital assets. Identifying, across public sector
303 bodies, specific priority areas for cooperation and capacity-building concerning
304 natural capital will be necessary for effective protection and enhancement of natural
305 capital.
- 306 • Second, connecting environmental accounting with strategic environmental objectives
307 and policies can help identify, for example, priority natural capital assets in a country
308 and deliver a step-by-step and cost-effective agenda towards improving the state of
309 natural capital. It can also help identify best practices and methods for win-win
310 scenarios for policy delivery and natural capital management.
- 311 • Third, comprehensively accounting for public spending on natural capital could help
312 clarify the role of different policy domains and public sector bodies to environmental
313 policy and management. As indicated by others, it could also help identify if public
314 spending is enough to maintain a healthy environment, or if spending is well directed
315 or effectively used (Vardon et al., 2016).

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400 ELECTRONIC SUPPLEMENTARY MATERIAL

401 Raw data for answering the methods are available in full in the attached pdf document and
402 can be found in the online version of this article.