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# 1 Navigating pluralism: understanding perceptions of the 2 ecosystem services concept

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28

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30 policy interface

31

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34

35     **Abstract**

36     Being open to multiple interpretations allows the ecosystem services concept to operate as  
37     a boundary object, facilitating communication and cooperation between different user  
38     groups. Yet there is a risk the resultant pluralism limits the capacity of ecosystem services  
39     assessments to directly inform decision and policy making, and that the concept could be  
40     used to support environmentally or socially harmful activities. Here, we report results from  
41     a large mixed methods survey conducted among academics, policymakers and practitioners  
42     working in the field of ecosystem services across Europe. We use these results to explore  
43     the trade-off that exists between the role of ecosystem services as a boundary object and  
44     the needs of policy and decision makers of more standardisation. We conclude this can be  
45     done by working towards the standardisation of ecosystem service assessments within  
46     specific jurisdictions, whilst maintaining forums for debate, collaboration, and critical  
47     reflection within the broader ecosystem services community. We also aim to deduce guiding  
48     principles to ensure the ecosystem services concept is not used to support detrimental  
49     activities. The consideration of shared and cultural values, the expansion of inter- and  
50     transdisciplinary work and the integration of the concept of sustainability are identified as  
51     valuable guiding principles to this end.

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## 59 **1. Introduction**

### 60 **1.1. A broadly operational concept despite a lack of unity**

61 A number of wide scale assessments have taken place to assess the status and trends of the  
62 world's ecosystem services – including the Millennium Ecosystem Assessment (MA, 2005),  
63 The Economics of Ecosystems and Biodiversity (TEEB, 2010), and the assessments of the  
64 Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES,  
65 2018a, 2018b, 2018c, 2018d). Advances have been made towards operationalizing the  
66 concept in practice (Beaumont et al., 2017; Dick et al., 2018; Jax et al., 2018), and the  
67 concept is starting to be integrated into both national and international policy (Bezák et al.,  
68 2017; Bouwma et al., 2018; Matzdorf and Meyer, 2014). Dick et al. (2018, p. 563) declared  
69 that the ecosystem services concept is 'broadly operational', despite on-going debates  
70 within the ecosystem services community regarding conceptual frameworks, assessment  
71 and valuation methodologies, and even core terminology (Braat, 2018; Costanza et al.,  
72 2017; Díaz et al., 2018; Fanny et al., 2014). This lack of conceptual and methodological unity  
73 has previously been identified as a concern (Nahlik et al., 2012), although Dick et al. (2018)  
74 suggest the concept appears to be compatible in practice with a range of approaches  
75 founded in different philosophical traditions.

76

### 77 **1.2. The acceptance of plurality within the field of ecosystem services**

78 Accepting that the ecosystem services concept is open to multiple interpretations is seen by  
79 some as a strength, as it allows it to operate as a boundary object (Abson et al., 2014;  
80 Schröter et al., 2014; Schröter and van Oudenhoven, 2016). Boundary objects are concepts  
81 that are amorphous enough to be adapted to different contexts and worldviews, but are

82 robust enough to act as a channel of communication between these different positions (Star  
83 and Griesemer, 1989).

84

85 The idea of ecosystem services as a boundary object is well developed in the literature  
86 (Abson et al., 2014; Galler et al., 2016; Hermelingmeier and Nicholas, 2017; Jadhav et al.,  
87 2017; Kull et al., 2015; Schröter et al., 2014; Steger et al., 2018). Saarikoski et al. (2017)  
88 found the concept operated as a useful boundary object in some of the 22 European and  
89 Latin American case studies they assessed. From their case study in German environmental  
90 planning, Galler et al. (2016) conclude that ecosystem services can act as an effective  
91 boundary object in the early stages of collaboration, but that its usefulness decreases over  
92 time. This decrease in usefulness was largely due to conflicting interpretations of how the  
93 concept should be used in specific management or policy decisions. Saarela and Rinne  
94 (2016) develop the idea that artefacts (scenarios, simulation models, indicators etc.)  
95 produced using the ecosystem services concept, rather than the concept itself, may act as  
96 boundary objects. These artefacts are still open to multiple interpretations but are not  
97 neutral objects, as they are tied to the social and institutional context, with their embedded  
98 power relations, in which they are made (Saarela and Rinne, 2016). This can limit their  
99 capacity to operate as boundary objects, as they are only able to connect actors with pre-  
100 existing shared cultural values and preferences (Turnhout, 2009).

101

102 These discussions reveal a tension in the role of ecosystem services as a boundary object.  
103 On the one hand, it is most effective as a broad concept that can accommodate a large  
104 range of perspectives and worldviews. However, this function decreases in the context of  
105 specific policy and decision-making. Undertaking ecosystem services assessments for policy

106 requires the development of standardised classification systems, conceptual frameworks  
107 and related methodologies. This process may lead to certain worldviews being crowded out,  
108 and others foregrounded. If ecosystem service assessments are to become a mainstream  
109 approach for evidencing environmental policy and decisions, then such standardised  
110 practices will become institutionalised, potentially curtailing debate over the value laden  
111 choices taken to create them. This dynamic is referred to by Steger et al. (2018) as the  
112 creation of 'infrastructure'. Infrastructure are 'the tools, work practices, terms, and  
113 technologies that become embedded in and support a community of practice' (Steger et al.,  
114 2018, p. 144). The tension between ecosystem services as a broad, open boundary object  
115 and as an institutionalised concept with precise terminology and associated practices is a  
116 key theme of this paper.

117

118 There is evidence that the concept of ecosystem services is beginning to enter into national  
119 policy and legislation, but not yet in a manner that includes the explicit use of ecosystem  
120 services assessments and valuations (Bezák et al., 2017; Bouwma et al., 2018; Kistenkas and  
121 Bouwma, 2018; Leone et al., 2016; McKinley et al., 2018). Within the research community,  
122 continued disunity can be seen in ongoing debates over core frameworks and terminology  
123 since the introduction of the concept of 'Natures Contribution to People' (Braat, 2018; Díaz  
124 et al., 2018; Kenter, 2018; Maes et al., 2018; Pascual et al., 2017). Peterson et al. (2018)  
125 make the case here for an acceptance of pluralism to avoid a potentially harmful  
126 polarisation within the ecosystem services community. Hermelingmeier and Nicholas (2017)  
127 similarly embrace the range of perspectives that still exist around the ecosystem services  
128 concept, making the case for 'guided pluralism'.

129

130 The continued heterogeneity of interpretations and understandings of the ecosystem  
131 services concept requires an exploration of how far such a pluralistic outlook should be  
132 extended. Accepting pluralism does not mean that any work carried out either in research  
133 or policymaking using the language of ecosystem services is accepted as part of the overall  
134 canon, regardless of the theoretical basis, methodological approach or normative framing.  
135 The term 'guided pluralism' used by Hermelingmeier and Nicholas (2017) captures this idea.  
136 This term originates from the attempt of Baumgärtner et al. (2008) to develop a framework  
137 for coping with the heterogeneous practices within the field of ecological economics.  
138 However the idea has not been explicitly developed in the ecosystem services literature.  
139 Hermelingmeier and Nicholas (2017) only suggest the need for open dialogue over values  
140 and assumptions to establish common ground for research.  
141  
142 Baumgärtner et al. (2008) seek to harmonise the epistemological and methodological  
143 diversity of their field that interweaves descriptive and positive science with values and  
144 normative judgement. In applying the concept of guided pluralism to the field of ecosystem  
145 services, we carry forward this differentiation of epistemological and methodological  
146 diversity, and the view that this naturally arises from different philosophical and normative  
147 positions. We add the consideration of theoretical diversity, with theory being an  
148 intermediate stage, informed by particular epistemologies and informing methodologies.  
149 The second theme of this paper is an attempt to identify guiding principles with which to  
150 navigate this diversity, as to achieve a 'guided' pluralism within ecosystem services research  
151 and practice.  
152



153 The two notions of boundary object and guided pluralism are complementary. Boundary  
154 objects accept pluralism, while the notion of guided pluralism allows space to discuss  
155 principles with which applications of the ecosystem services concept can be directed.

156

### 157 **1.3. Aims**

158 To analyse the work on ecosystem services as a boundary object, and the applicability of the  
159 notion of guided pluralism, it is important to understand different views within the  
160 ecosystem service community. This study hence aims to understand the way the ecosystem  
161 services concept is viewed by researchers, policymakers and practitioners. Firstly, we are  
162 interested in perceptions of strengths and weaknesses in the concept, and the different  
163 ways that people see the concept being used to inform decision-making. From here we ask  
164 if the ecosystem services concept can be seen as a boundary object, and what the  
165 limitations are to this in the context of policy and decision-making. Secondly, we seek to  
166 identify guiding principles for the ecosystem services concept, by synthesizing views from  
167 different user groups. Finally, this paper is also intended to underpin the Antwerp  
168 Declaration, which was developed during the conference hosted by the Ecosystem Services  
169 Partnership (ESP) in Antwerp in 2016. The declaration is an attempt to account for the  
170 critiques and concerns viewed by participants and reflect a need and desire to further  
171 develop the ecosystem services concept.

172

## 173 **2. Methods**

### 174 **2.1. Survey design**

175 We distributed a digital mixed methods survey among 350 early registrants to the European  
176 Ecosystem Services Conference 2016<sup>1</sup> (EESC), which presented a good sampling pool for all  
177 three target groups: academics, including junior researchers, who seek to gain knowledge  
178 and understanding; policymakers, who develop and implement governance strategies and  
179 instruments; and practitioners, who broadly spoken support policy development and/or  
180 make environmental management decisions. The conference – which attracted 700  
181 delegates – was organised by three large research projects (OPERAs<sup>2</sup>, OpenNESS<sup>3</sup>,  
182 ECOPLAN<sup>4</sup>), the University of Antwerp, and the Ecosystem Services Partnership<sup>5</sup>, one of the  
183 largest international networks focused on ecosystem services, and so brought together a  
184 wide range of people from across the field. We engaged with early registrants to be able to  
185 present and discuss the outcomes at the conference. The survey was distributed through  
186 the conference organisers' official e-mail list.

187

188 The survey was divided into four categories to capture different aspects of people's views of  
189 the ecosystem services concept: its underlying purpose (P); visions (V) for its future  
190 evolution (named goals in the survey); perceived myths (M) that misrepresent the concept;  
191 and frustrations (F, named grumbles in the survey) to capture any irritations with the  
192 ecosystem services concept not captured in the other categories.

193

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<sup>1</sup> [www.esconference2016.eu](http://www.esconference2016.eu)

<sup>2</sup> [www.operas-project.eu](http://www.operas-project.eu)

<sup>3</sup> [www.openness-project.eu](http://www.openness-project.eu)

<sup>4</sup> [www.uantwerpen.be/en/research-groups/ecoplan/](http://www.uantwerpen.be/en/research-groups/ecoplan/)

<sup>5</sup> [www.es-partnership.org](http://www.es-partnership.org)

194 Each category featured one closed question, and two or more open-ended questions,  
 195 allowing participants to enter as little or as much text as they needed to express their ideas  
 196 and opinions. Participants were asked to complete at least one category, and at the end of  
 197 their first round of questions were given the opportunity to complete additional ones. Table  
 198 1 summarises the questions, which were phrased in generic terms to allow respondents the  
 199 opportunity to give unrestricted open answers. The full questionnaire is included as  
 200 Supplementary Material 1.

201

202 Table 1. Summary of the survey questions for the four survey categories: Purpose (P),  
 203 Visions (V), Myths (M), Frustrations (F). One question on supposed differences of opinion  
 204 (A1) was asked to all respondents at the end of the survey. The questions were either on a  
 205 5-point Likert scale (Likert), multiple-choice multiple answers (MCMA) or open-ended  
 206 (open). MCMA statements are included in Figure 2. The full survey is available as  
 207 Supplementary Material 1.

208

ID	Question	Type
P1	The ecosystem services concept provides a utilitarian framing of ecosystem functions as services to increase public interest in conservation.	Likert
P2	The concept of ecosystem services denotes a generic idea or metaphor to increase awareness of how human well-being in many ways depends on natural systems.	Likert
P3	Using an economic approach to environmental issues can help decision-makers to determine the best use of scarce ecological resources at all levels.	Likert
P4	Can you put down in your own words what you think is at the heart of the ecosystem services framework?	Open
P5	What would be the worst misuse of the ecosystem services framework?	Open
P6	Beyond basic research ethics and good practice, what values and principles or ideas should guide the practical applications of the ecosystem services framework?	Open
V1	In 20 years' time, what role should the ecosystem services framework have in society?	MCMA
V2	What are the main challenges for the widespread use of the ecosystem services framework?	Open
V3	What do you think are key steps to undertake in the future development of the ecosystem services framework?	Open
M1	Can you describe a common myth or misunderstanding you frequently encounter in your work?	Open
M2	Who holds these erroneous views?	Open
M3	What to your mind is the source of confusion that gave rise to these myths?	Open
M4	How would you debunk the myth?	Open
M5	Have you ever encountered one of the following claims regarding ecosystem services in your work?	MCMA
F1	What do you find most frustrating about working with the ecosystem services	Open

	framework?	
F2	What would be the best way to resolve your frustration?	Open
F3	What to your mind is the biggest theoretical, moral or practical shortcoming of the ecosystem services framework?	Open
F4	How could that shortcoming be remedied?	Open
F5	Have you ever encountered one of the following frustrations?	MCMA
A1	In the field of ecosystem services, where do you think the biggest differences of opinion lie?	Open

209

210

211

## 2.2. Quantitative analysis

212

Attributes, i.e. characteristics of participants or cases (Bazeley and Jackson, 2013), were

213

included in the survey design as open questions to prevent restricting participants in their

214

answers. Based on the qualitative entries we constructed attribute labels for gender,

215

discipline, and years of experience (Table 2). For 'Field of Study' we captured unclear

216

answers with the 'Other discipline' category. Participants were also asked whether they

217

were an academic researcher, junior researcher or student, practitioner, policymaker or

218

'other'.

219

220

Each category of the survey (Purpose, Visions, Myths, and Frustrations) had one multiple-

221

choice section for which we compiled separate bar charts to help identify themes and

222

support for the qualitative analysis of the open questions.

223

224

Table 2. Retrofitted attribute labels describing survey participants

Open-ended	Retrofitted Attribute labels
Gender	Female, Male
Years of experience	<5; 5-9; 10-19; >20
Discipline	Natural/Physical Sciences, Social Sciences, Economics, Science Policy Nexus, Inter/Transdisciplinary, Other discipline

225

226

## 2.3. Qualitative analysis

227 A general inductive approach (Thomas, 2006) to thematic content analysis was used to  
228 examine patterns in the responses to the open survey questions (Table 2) in a replicable and  
229 systematic manner (Bryman, 2016). The general inductive approach provides an easily used  
230 and systematic set of procedures for analysing qualitative data that can produce reliable  
231 and valid analysis of underlying structure in the raw data (Thomas, 2006). Rather than  
232 making prior assumptions about the survey responses in a predefined coding frame, an  
233 inductive approach was followed because we had no comprehensive predetermined  
234 expectations of the patterns, similar to Asah et al. (2014) and Maraja et al. (2016). The  
235 intended outcome of the inductive coding process was to create a small number of  
236 summary categories that in the evaluator's view capture key aspects of the themes  
237 identified in the raw data and are assessed to be the most important themes given the  
238 study's objectives (Thomas, 2006).

239

240 We followed the five stages of analysis described by Thomas (2006) using the Nvivo  
241 qualitative data analysis software (QSR International, 2016). The full set of responses was  
242 read carefully (1) and specific text segments were identified that related to the topic of the  
243 survey category (2). These segments were labelled to create a set of initial themes (3),  
244 which were refined to reduce overlap and redundancy (4) in an iterative process both within  
245 the categories and across the whole survey, allowing responses to be coded for multiple  
246 themes. Themes that were rarely mentioned were grouped as 'other'. The final stage  
247 consisted of creating a model that incorporates the most important themes into a limited  
248 set (5). Thomas (2006) explains that inductive coding that results in too many major themes  
249 – he suggests more than eight – can be viewed as incomplete and encourages the evaluator  
250 to make hard decisions about which themes are most important.

251

252 Given likely overlap in responses between the different survey categories we anticipated  
253 that the final step would identify a number of cross-cutting themes. The choice of these  
254 cross-cutting themes was supported by the results of the quantitative analysis and looked  
255 for both consensus and divergence in views among the respondent categories. The cross-  
256 cutting themes are illustrated with quotes and cross-references were made to the survey  
257 questions that provided answers in support of the cross-cutting theme.

258

#### 259 **2.4. Corroborating our findings and building towards a unified message**

260 Key findings from the analysis were presented at EESC 2016 to corroborate our findings  
261 through discussions with conference attendees, and to collaboratively shape a charter  
262 (named the Antwerp Declaration) that could capture and communicate a set of  
263 recommendations based on our findings and discussions. An early findings document was  
264 compiled and distributed among conference participants in the delegate packs. This formed  
265 the basis for informed discussions and events during the conference where participants  
266 could engage with the Antwerp Declaration process: a parallel session on the second day of  
267 the conference presenting and discussing many of the themes relevant to the Declaration; a  
268 Quote of the Day booth where participants could vote and share their opinion on proposed  
269 bits of text for the Declaration; and a workshop held on the third day specifically addressing  
270 different aspects of the Declaration. Input gathered through these events was then taken  
271 forward by a writing team. At the end of the conference the final Declaration was presented  
272 in plenary and a website was opened for signing the Declaration.

273

### 274 **3. Results**

275 **3.1. Survey response and respondent attributes**

276 The response rate was 34%, n=121, comprising academic researchers (50%); junior  
277 researchers (24%); practitioners (15%); policymakers (7%), and 4% who did not fit these  
278 categories. The gender balance was 41% male, 51% female, and 8% not stated, and most  
279 people reported their experience in the field of ecosystem services to be under or around  
280 10 years.

281

282 Table 3. Definitions of each participant category.

Category	Definition
Academic researcher	Research staff at a University or research institute
Junior researcher	Researcher at an academic institution, either at PhD or post-doc stage
Practitioner	Individuals responsible for implementation or making environmental management decisions “on the ground”. This can include support of the creation of public policy (civil service) or overseeing its implementation (government agencies or third sector)
Policymaker	Individuals working for national or supranational government with statutory responsibility for creating public policy
Other	Those that did not identify as any of these categories

283

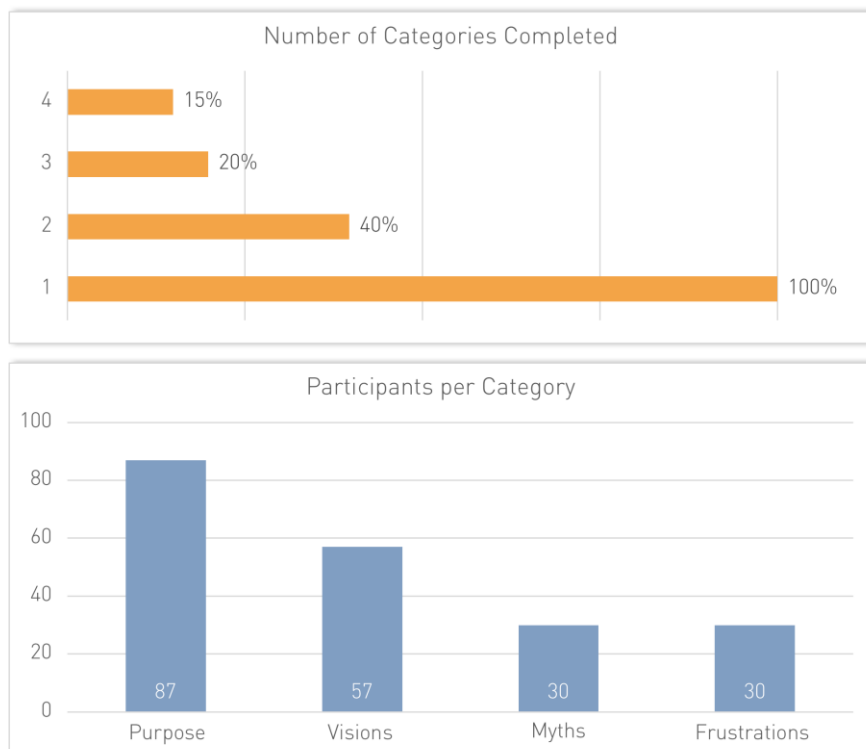
284

285 Table 3 contains our interpretation of the participant categories. However, these definitions  
286 were not included in the original survey and we recognize that some individuals could fit in  
287 more than one category (e.g. a researcher in an NGO). This is especially true given the  
288 contemporary shift from ‘government’ to ‘governance’ and towards a post-normal science  
289 approach to research for policy making. We took responses to mean that respondents  
290 identified most with this group and saw this as their primary role. The category of  
291 ‘practitioner’ is also open to interpretation and this role may change depending on the way  
292 in which the ecosystem services concept is used. From the data collected we were not able  
293 to determine the precise role of individuals who identified as practitioners.

294

295 All participants were obliged to complete the questions for at least one category, and many  
296 chose to complete multiple (Figure 1). Participants were free to choose which category they  
297 completed, but the distribution among themes suggests most people followed the  
298 categories in order of listing (Figure 1), although this may also reflect their interests.

# CATEGORIES



299

300 Figure 1. Number of survey categories completed by participants and number of  
301 respondents per category.

302

### 303 3.2. Multiple choice responses

304 Figure 2 presents an overview of the Likert scale and multiple-choice responses for  
305 questions P1, P2, P3, V1, M5 and F5. There was strong agreement that the ecosystem  
306 services concept could increase societal interest in conservation (P1) and raise awareness of  
307 human reliance on natural systems (P2), but opinion was divided as to whether an economic  
308 approach could support better decision-making (P3). There was a shared vision that the

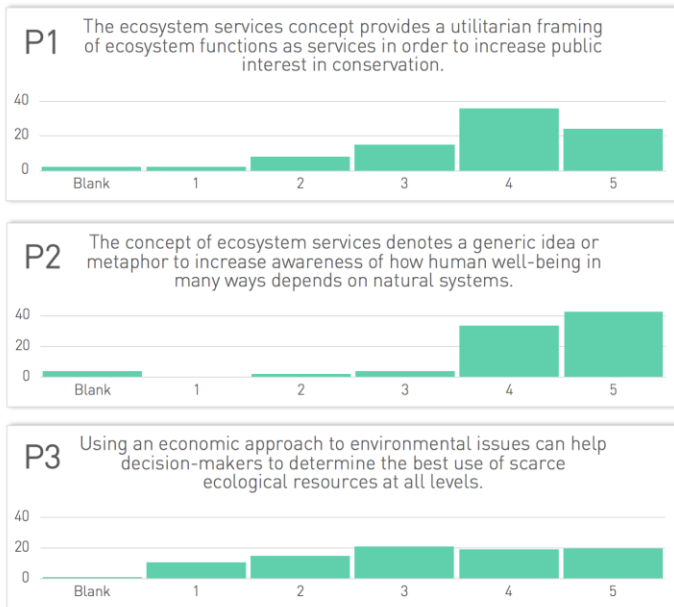


309 ecosystem services concept would achieve a paradigm shift in environmental protection  
310 (V1C). Three myths frequently encountered were that the ecosystem services concept: does  
311 not consider the intrinsic values of nature (M5B); is a capitalist paradigm about making  
312 money (M5A); and implicitly accepts that human benefits are the only things that should be  
313 protected (M5D). The most dominant frustrations with ecosystem services were: challenges  
314 to communicating non-economic research due to misconceptions that economic valuation is  
315 at the core of the concept (F5C); that it has become such a buzzword that the concept  
316 becomes increasingly vague (F5E); and that the terminology is too complicated and  
317 academic to use with non-expert audiences (F5A).

318

# PURPOSE

N = 87



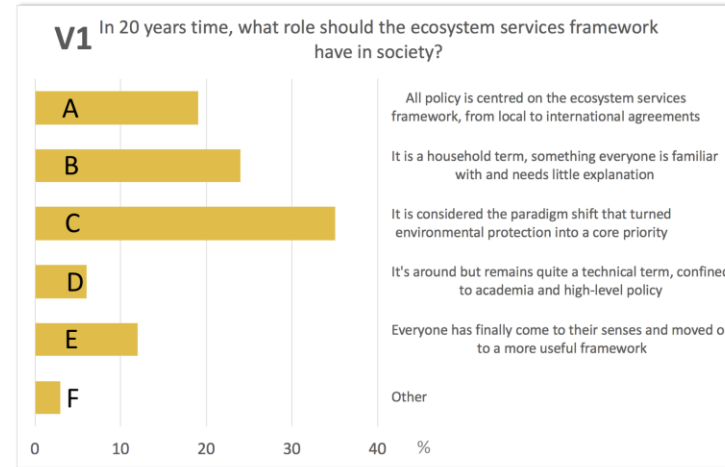
# MYTHS

N = 30



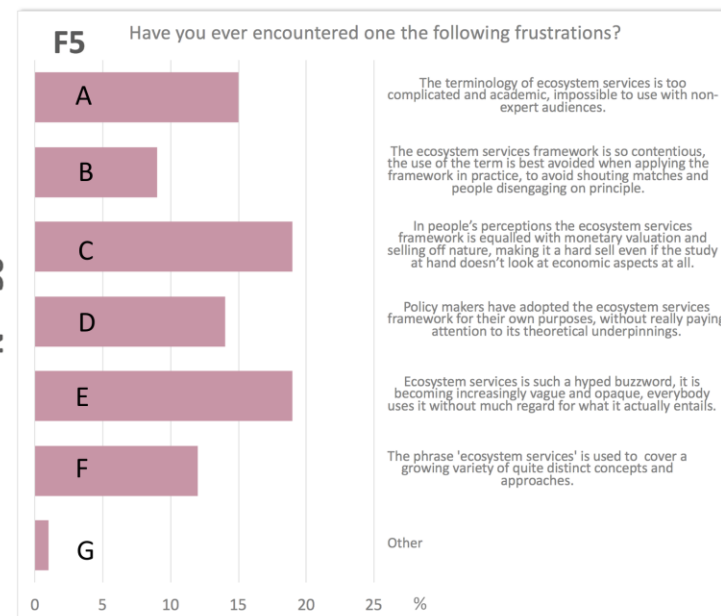
# VISIONS

N = 57



# FRUSTRATIONS

N = 30



319

320 Figure 2. Responses to the closed questions in the survey.

### 321 3.3. Cross-cutting themes

322 Thematic content analysis helped structure the richness of the open question responses.  
323 Supplementary Material 2 provides an overview of the identified themes per question.  
324 Identical or highly related themes emerged for different questions and different survey  
325 categories. Results were therefore further synthesised to five cross-cutting themes, which  
326 are described below. The descriptions are based on the open-ended survey responses and  
327 identified themes, which are referenced, and illustrated by direct quotes.

328

#### 329 3.3.1. Cross-cutting theme 1: Purpose of the concept

330 The core purpose of the ecosystem services concept was viewed by most respondents as an  
331 ‘awareness raising’ metaphor of the many ways human well-being depends on natural  
332 systems. This was evident in responses to P1 and P2 (Figure 2) and confirmed by the open-  
333 ended answers to P4. This can be exemplified by the below quote:

334 *“The ecosystem service framework is useful to quantify the multifunctionality of ecosystems*  
335 *and to demonstrate how human health and wellbeing depend on the multiple functions and*  
336 *services of ecosystems. It is a concept that can be used to increase awareness among*  
337 *ecosystem users and to support conservation.”* – Academic Researcher response to P4.

338

339 Three primary themes emerged from responses to P4 regarding what respondents felt to be  
340 at the heart of the ecosystem services concept, ‘awareness raising’, ‘scientific approach’,  
341 and ‘decision-making aid’. ‘Awareness raising’ was the most common theme, particularly  
342 amongst academics (see Table. 4). The ‘decision-making aid’ code captured answers that  
343 emphasised how the ecosystem services concept supports natural resource management  
344 and allocation, or explicitly referred to decision-making. Entries coded as ‘scientific  
345 approach’ highlighted the ecosystem services concept as a cognitive exercise, aimed at  
346 better understanding of socio-ecological systems. ‘Decision-making aid’ and ‘scientific

347 approach' appeared a similar number of times. Four more codes for P4 were derived for  
 348 responses that combined elements of the three main codes (see Table 4.).

349

350 Table 4. Summary of the responses under the 'Purpose' theme of the survey.

Theme	Summary of responses coded under theme	Academic Researcher	Student/Junior Researcher	Practitioner	Policy maker	Other	Total
<b>Purpose (Values)</b>							
P4 - Can you put down in your own words what you think is at the heart of the ecosystem services framework?							
Decision-making aid	<i>ES as tool/support for decisionmaking &amp; resource management</i>	7	1	2	1	1	12
Scientific approach	<i>ES as a scientific endeavour, expanding knowledge</i>	4	2	3	1	0	10
Awareness raising	<i>ES to demonstrate value of nature</i>	22	11	4	0	1	38
Holistic approach	<i>ES as an encompassing approach to complexity</i>	3	3	0	1	1	8
Advocacy x Science	<i>Responses combining science and awareness raising, focus on general public</i>	8	4	1	2	0	15
Decision x Activism	<i>Responses combining awareness raising and decision support, focus on policy</i>	4	4	0	2	1	11
Science x Decision	<i>Responses combining science and decision support, technocratic focus</i>	2	0	4	1	0	7
Other		4	1	1	0	0	6

351

352

353 **3.3.2. Cross-cutting theme 2: Concerns with the use of economic valuation**

354 Although frequently mentioned and occasionally criticised (V2, V3), economic valuation was  
 355 – overall – not perceived to be inherently problematic, but its potential misuse was a  
 356 concern for many. Respondents disagreed whether an economic approach would help  
 357 decision-making (Figure 2; P3). Participants were concerned that misuse of the ecosystem  
 358 services concept could lead to poor decision-making, rushed and under-resourced  
 359 assessments used to further a political agenda, and a bias towards industry interests (P5,  
 360 V2). Several respondents warned against considering the ecosystem services concept as a  
 361 panacea or cure-all for any environmental or resource management challenge regardless of  
 362 the appropriate scale, methods and application of the framework (V2). There were also  
 363 concerns about the framework potentially backfiring by providing a rationale for

364 environmental degradation rather than conservation (P5) as illustrated by the following  
365 quote:

366 *“The misconception that it is all about utilitarian and monetary values. This is untrue, even*  
367 *to the contrary. However, this has been repeated so often, and some instances in fact do*  
368 *misuse the concept that way still. Kind of a self-fulfilled myth almost.”* – Academic  
369 Researcher response to M1.  
370

371 Thematic content analysis revealed that these frustrations stem from a polarised academic  
372 debate, and to a lesser extent from opposition with conservationists. This polarisation and  
373 confusion is potentially stirred up by media and high-profile publications that are feeding  
374 the debate on which dominant worldviews and ideologies are being served by the  
375 ecosystem services concept. Meanwhile, new ecosystem services terminology and  
376 underlying conceptual frameworks are continuously developed, with different ideas about  
377 the role of economic valuation (M3). There was considerable frustration about false  
378 perceptions that economic valuation is central to the ecosystem services concept, which  
379 was expressed exhaustively as a common misunderstanding (M1), but also as a frustration  
380 (F1) as illustrated by the following quote:

381 *“That ecosystem services is all about 'valuing nature' - it's an approach that should be used*  
382 *very intelligently to frame environmental management challenges through a more socially*  
383 *relevant and integrated lens. Valuation is just one tool in the ecosystem services basket.”* –  
384 Policymaker response to M1.  
385

### 386 *3.3.3. Cross-cutting theme 3: The importance of understanding social and cultural* 387 *values in policy and decision-making*

388 Although economic valuation was not seen as problematic – as explained above – many  
389 respondents were concerned about the lack of non-economic valuation methods (V2), and  
390 the more limited interest and ability to include non-economic valuation in decision-making  
391 (V2). This bias can lead to poor decision-making (P5), and the explicit incorporation of social

392 and cultural values into decision-making was expressed as an important step in the future  
393 development of the ecosystem services concept (V3). This would prevent misuse of the  
394 framework (P5) and help overcome a range of shortcomings currently identified (F3) –  
395 including a lack of social science compared to ecological and environmental sciences and  
396 economics. Embracing social and cultural values was seen as important communication  
397 pathway to both wider society and decision makers (V3, F2, F4), countering potential  
398 misunderstandings and inappropriate use of monetary definitions of value (M4), and a key  
399 requirement to realizing the transformative potential of the framework (V3, F4). The  
400 following quote is one of many emphasising the importance of social and cultural values:

401 *“Incorporate the cultural (and spiritual) value of nature more which brings back the*  
402 *connection to nature and why we care about nature.”* – Junior researcher or student in  
403 response to V3.  
404

405 *3.3.4. Cross-cutting theme 4: The need to further expand inter- and transdisciplinary*  
406 *approaches to ecosystem services assessments*

407 Many respondents hope the ecosystem services concept would be considered a paradigm  
408 shift in environmental protection within the next 20 years (35% of responses; V1C Figure 2).  
409 Despite this apparent enthusiasm, a broad range of challenges impeding the widespread use  
410 of the ecosystem services concept were raised (V2) including: the lack of training and  
411 awareness of the concept among policymakers and practitioners; a lack of demonstrable  
412 policy impact and evidence of halting environmental degradation; institutional barriers and  
413 ‘silos’ in research and governmental bodies; and the technocratic and/or utilitarian  
414 terminology. These challenges were mirrored in frustrations about the bias and limitations  
415 in methods and decision-making processes (F3).

416

417 There was recognition that the ecosystem services concept has been a catalyst for  
418 promoting collaboration across disciplines (P4), but that expanding collaboration further is  
419 essential to stimulate dialogue and generate common understanding that is necessary to  
420 achieve societal impact (V3, F4). Framing the challenges around issue-based research will  
421 encourage transdisciplinary collaboration between disciplinary experts, business  
422 stakeholders and public body representatives (V3, F4). The involvement of knowledge  
423 brokers and the media is critical in supporting collaboration and in communicating  
424 outcomes (F4). The following quote is one of many calling for interdisciplinary research:  
425 *“Ultimately, it is critical for a more interdisciplinary approach to the scientific research*  
426 *agenda to enrich the research and facilitate better policy translation and a reduction in the*  
427 *emergence of perverse policies.”* – Respondent from ‘other’ category in response to V2.  
428

#### 429 *3.3.5. Cross-cutting theme 5: Ecosystem services in policy and decision-making*

430 As identified above the ecosystem services concept can assume different roles in decision or  
431 policy making contexts. It may be used directly as a ‘decision-making aid’ through the  
432 instrumental mode of knowledge use (Mckenzie et al., 2014; Weiss, 1979) or as an  
433 ‘awareness raising’ tool akin to the conceptual mode of knowledge use (Dunlop, 2014;  
434 Weiss, 1979). Although less directly related to policy and decision-making, using the  
435 ecosystem services concept in the context of a purely ‘scientific approach’ may also  
436 influence decisions again through the conceptual mode by contributing to societies wider  
437 understanding of the dependence of humans on natural systems.

438

439 A number of ways to increase the uptake of ecosystem services in policy and decision  
440 making were identified that span both instrumental and conceptual knowledge use. A clear  
441 need for practical learning emerged (V2, F1, F3, F4), and case study research was identified

442 as a way to progress the implementation of the framework to support land management  
443 decision-making (V3, F4). To this end, several steps for further development of the  
444 ecosystem services concept were identified (V3, F4): develop and share targeted  
445 information, packaged and communicated appropriately to selected audiences; engage  
446 stakeholders and the public; and include more socio-cultural values and closer work with  
447 social scientists.

448

449 There were many frustrations related to the user-friendliness of the ecosystem services  
450 concept (F1, F2) as a decision-making aid. Irritations about the academic nature or the  
451 terminology (F5A, Figure 2), has already been mentioned, but the content analysis revealed  
452 frustration around the lack of standardisation (F2), insufficient suitable and accessible  
453 methods (F3), and a lack of data (V2, F3). Those identifying primarily as practitioners also  
454 signalled being overwhelmed by the variety of categorisations and tools available, and the  
455 background information required for their appropriate application (F3); suggesting these  
456 may have been policy practitioners. The following quotes illustrate the frustration with the  
457 user-friendliness of the ecosystem services framework:

458

459 *“The language – and therefore the concept – suffers from its technocratic, utilitarian image.”*  
460 – Academic researcher in response to V2.

461

462 *“It is frustrating how many parties seem obsessed with re-classifying ecosystem services on a*  
463 *continual basis - this is often unnecessary and unhelpful when seeking to implement a*  
464 *joined-up approach across different interest groups.”* – Policymaker response to F1.

465

### 466 **3.4. The Antwerp Declaration**

467 The ‘early findings’ document, included in the EESC delegate pack (see Supplementary  
468 Material 3), formed the basis for the participatory exercises during the conference, which



469 received input from approximately 100 individuals. These participatory events largely  
470 confirmed the cross-cutting themes summarised in section 3.3, although greater emphasis  
471 was placed on the importance to focus the ecosystem services concept on the principles of  
472 sustainability. The discussion also provided guidance about how to translate the findings to  
473 a short Declaration that forms a call for action that was signed (on a voluntary basis) by the  
474 conference delegates. The resulting Declaration (Figure 3) was presented at the closing  
475 plenary and has been signed by 331 people on the website [www.antwerpdeclaration.com](http://www.antwerpdeclaration.com)  
476 following the conference (last count 17 August 2018).  
477

# The Antwerp Declaration



Following a decade of ever more research activity the ecosystem services framework has major political and scientific momentum. We must now deliver societal impact.

In this declaration we – the signatories – call for action to realise the transformative potential of the ecosystem services framework. We need to refocus on principles of sustainability, reclaim the notion of value and expand collaborations.

## **Refocus on principles of sustainability**

Ecosystem services gained prominence as a framework that acknowledges nature's fundamental role in supporting human wellbeing. There has been considerable progress in quantifying, valuing, and mapping ecosystem services. Yet, there is a risk that these methods are applied without consideration of equality and social justice. To ensure the fair distribution of nature's benefits we need to refocus the ecosystem services framework on the principles of sustainability. By explicitly including sustainability principles in ecosystem services assessments we can bring into focus trade-offs between conflicting interests, guide just decisions and avoid misuse of the concept.

## **Reclaim the notion of value**

How we understand our relationship with nature sits at the heart of the ecosystem services framework. To do justice to all the ways nature matters to us as humans we need to include diverse values into our assessments. By embracing a multitude of perspectives, voices and values we can move away from understanding nature's importance in a purely monetary way. Finding innovative approaches that include multiple values is challenging, but enables us to make better decisions. Collaborative projects with many different stakeholders should therefore be the starting point of any ecosystem assessment.

## **Expand collaborations**

The ecosystem services framework has been a catalyst for promoting collaboration across disciplinary boundaries. Expanding collaboration is essential to stimulate dialogue and generate common understanding that is necessary to achieve societal impact. Framing the challenges around issue-based research will encourage collaboration between disciplinary experts, business stakeholders and local government representatives. The involvement of knowledge brokers and the media is critical in supporting collaboration and in communicating outcomes.

## **For impact we need to**

- make the most of the large amount of knowledge and learning that is generated by case study research
- develop and share targeted information, packaged and communicated appropriately to selected audiences
- increase the user-friendliness of frameworks and tools to support their application beyond current users
- bring business and researchers together to encourage innovation and creation of new flexible business models that integrate ecosystem services
- strengthen the integration of ecosystem services into all policy sectors in dialogue with researchers and practitioners

Sign the Declaration today:  
[www.antwerpdeclaration.com](http://www.antwerpdeclaration.com)



478

479 Figure 3. The Antwerp Declaration – [www.antwerpdeclaration.com](http://www.antwerpdeclaration.com)

## 480 **4. Discussion**

481 The EESC represented a rare opportunity to collect the views of a varied group of

482 researchers, practitioners and policymakers engaged with the ecosystem services concept.

483 We recognise our result reflects a primarily Eurocentric perspective. However, the survey  
484 received many responses and the events held at the conference were well attended,  
485 allowing us to collect insights from a diverse group.

486

#### 487 **4.1. The role of the ecosystem services concept in the science-policy interface**

488 Responses to our survey demonstrate the tension between the different roles that the  
489 ecosystem services concept can play at the science-policy interface. Many participants  
490 expressed the view that the concept was a useful awareness raising tool and could be used  
491 to integrate different perspectives and approaches in environmental management (Cross-  
492 cutting theme 1). That is, to function as a boundary object. Many academics in our study did  
493 not identify scientific inquiry as the primary role of the ecosystem services concept, instead  
494 emphasising the awareness raising role that it plays. This could indicate a perception among  
495 academics of ecosystem services as a way to communicate research findings to a broader  
496 audience, rather than as a tool for scientific inquiry (Barnaud and Antona, 2014; Crouzat et  
497 al., 2017).

498

499 There were also concerns around the lack of standardisation and the user-friendliness of the  
500 concept for decision makers (Cross-cutting theme 5). Indeed, many practitioners and  
501 policymakers did not see the core purpose of the ecosystem services concept as  
502 contributing directly to decision-making at present (Table 4). This is consistent with recent  
503 literature suggesting that, despite a number of projects and toolkits aimed at integrating  
504 ecosystem services into decision-making, assessments rarely play an instrumental role in  
505 influencing decisions (Dick et al., 2018; Martinez-Harms et al., 2015; Ruckelshaus et al.,  
506 2013; Saarikoski et al., 2018).

507

508 Standardisation was the most frequently cited remediation for the issue of user-friendliness,  
509 amongst all groups (F2). Efforts are being made to standardise the categorisation of  
510 ecosystem services (primarily through the Common International Classification of Ecosystem  
511 Services (CICES<sup>6</sup>)), and several calls and attempts to standardise conceptual frameworks and  
512 assessment/valuation approaches have appeared in the literature (Boerema et al., 2017;  
513 Boyd and Banzhaf, 2007; Seppelt et al., 2012, 2011). However, standardisation involves the  
514 curtailment of some of the conceptual and methodological diversity that exists within the  
515 ecosystem services community. This could potentially hamper inter- and transdisciplinary  
516 dialogue and communication supported by our respondents (Cross-cutting theme 4).  
517 Standardisation correlates to the creation of 'infrastructure', and we follow Steger et al.  
518 (2018) in suggesting that such a move would limit the capacity of ecosystem services to  
519 function as boundary objects. This supports the conclusion of Galler et al. (2016) that  
520 ecosystem services may function most effectively as a boundary object prior to the point  
521 where it is used to inform specific policy or management decisions.

522

523 This does not imply that the concept plays no role in policymaking; others have identified  
524 conceptual learning, consistent with the boundary role of ecosystem services, as a  
525 promising impact pathway of ecosystem services assessments and research (Beaumont et  
526 al., 2017; Carmen et al., 2018; Dick et al., 2018; Ruckelshaus et al., 2013).

527

---

<sup>6</sup> [www.cices.eu](http://www.cices.eu)

528 There is then a potential conflict between those who see ecosystem services as a tool for  
529 raising awareness and discussion, and those who wish to see it standardised and used in  
530 decision-making. We argue that this can be reconciled by accepting that the concept is  
531 capable of playing both roles at once. Whilst the creation of standardised infrastructure  
532 should be supported, it is also necessary to maintain a more pluralistic notion of the  
533 concept within academic and policy debates (Figure 4).

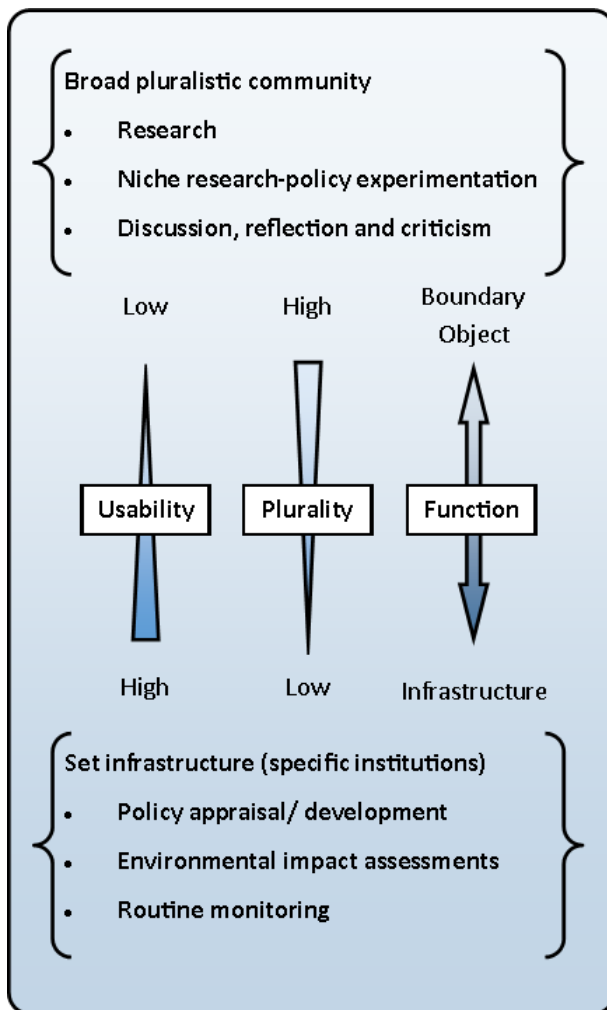
534

535 The creation of infrastructure will reflect and embody the norms of the context in which it is  
536 developed (Saarela and Rinne, 2016; Turnhout, 2009). This can be a necessary trade-off to  
537 improve usability and uptake of the concept directly in decision and policymaking. However,  
538 it can become problematic for two reasons: 1) if the knowledge, views or values of a  
539 particular group or groups within this context are excluded, for instance, the development  
540 of accounting schemes for ecosystem services might focus on instrumental values (Hein et  
541 al., 2015), and could be problematic for the inclusion of relational values that people might  
542 hold with respect to nature (Pascual et al., 2017). Or 2) if such infrastructure is transplanted  
543 to a cultural context that is significantly different from where it was created (as may be the  
544 case in transnational environmental governance settings). This problem was recently  
545 pointed out by Díaz et al. (2018), emphasising the need for context-specific perspectives  
546 when assessing the relations between humans and nature. Polasky et al. (2015) similarly  
547 make the point that ecosystem service assessment standards should be tailored to specific  
548 use contexts.

549

550 Experimentation with the ecosystem services concept in different policy contexts is  
551 increasing, and it is possible that we will see a continued construction of infrastructure

552 within different administrative jurisdictions (at a sub-national, national, and international  
553 scale) (Bezák et al., 2017; Bouwma et al., 2018; Mauerhofer, 2018; Mauerhofer and Laza,  
554 2018; McKinley et al., 2018). As this happens, retaining a highly pluralistic notion of the  
555 concept that exists above any contextually specific infrastructure has two distinct  
556 advantages over full standardisation. Firstly, it maintains space for worldviews that are  
557 excluded through the construction of infrastructure, allowing ecosystem services to still  
558 function as a boundary object that enhance debate and awareness raising over the  
559 relationship between nature and human well-being. Secondly, it allows space for more  
560 critical, dissenting voices and academic disciplines to highlight constantly the way that the  
561 creation of infrastructure can obfuscate and normalise political choices made during its  
562 creation. Critical geographers, for instance, are well positioned to offer such critique, as  
563 their discipline is well versed in exploring the power relations around the social construction  
564 and mobilisation of emerging and 'taken for granted' concepts and practices (Kull et al.,  
565 2015; Turnhout et al., 2016).



567 Figure 4. Trade-offs between the function of ecosystem services as a boundary object and as  
 568 set infrastructure capable of informing policy and decision-making, in terms of usability and  
 569 plurality.  
 570

571 **4.2. Valuation of ecosystem services: integrating cultural and social values as a guiding**  
 572 **principle**

573 Values, and valuation, are useful vehicles to explore the dynamic between ecosystem  
 574 services in the broad, pluralistic sense (where it is most effective as a boundary object), and  
 575 ecosystem services as set infrastructure. Our results show a clear desire for social and  
 576 cultural values to be better captured in ecosystem services assessments (Cross-cutting  
 577 theme 3). This was reaffirmed through input to the Antwerp Declaration, where the need to  
 578 ‘reclaim’ the notion of value was raised. This desire resulted from the dual perception that

579 1) integrating a plurality of values is essential to ensure that ecosystem services  
580 assessments lead to inclusive decision-making, and 2) a perception exists that only a limited  
581 definition of value is captured within the ecosystem services concept.

582

583 The concept of ecosystem services has stimulated much debate about the notion of value,  
584 and how best to measure it; bringing together scholars from a wide range of disciplines  
585 (Chan et al., 2016, 2012; Edwards et al., 2016; Fanny et al., 2014; Fish et al., 2016; Jacobs et  
586 al., 2018, 2016; Jax et al., 2013; Kenter et al., 2016b, 2015; Ranger et al., 2016; Sagoff,  
587 2011). Here we see ecosystem services work as an effective boundary object, and many  
588 methodologies now exist for integrating different types of values into ecosystem service  
589 assessments (Iniesta-Arandia et al., 2014; Jacobs et al., 2016; Kenter, 2016; Kenter et al.,  
590 2016b, 2016a; Ranger et al., 2016). Such methodologies are now established as a part of the  
591 plethora of existing ecosystem services approaches and practices. Operationalizing these  
592 methods in real world decision-making was a core priority that emerged from our survey  
593 (Cross-cutting theme 3).

594

595 However, no method is capable of capturing all types of value (Jacobs et al., 2018), and it is  
596 not necessarily the case that the use of a variety of methods will become standard practice  
597 within policy and decision-making. In the UK for example, the importance of shared and  
598 cultural values was recognised in the UK National Ecosystem Assessment (UK NEA, 2014).  
599 However, the Treasury 'Green Book' which dictates valuation methods for public body  
600 decision-making in the UK relies exclusively on methods derived from neoclassical  
601 economics (Treasury, 2011). The centrality of marginal utility value theory in neoclassical  
602 economics makes it difficult to meaningfully account for shared and cultural values. As the



603 ecosystem services concept becomes embedded in set infrastructure there is a risk that  
604 evaluation methods will foreground incumbent individualist notions of value at the expense  
605 of methods accommodating of social and cultural values.

606

607 Narrow economic valuation of ecosystem services was criticised by some respondents to  
608 our survey but was largely not seen as inherently problematic (Cross-cutting theme 2);  
609 matching findings from previous studies (Fisher and Brown, 2015; Hermelingmeier and  
610 Nicholas, 2017). Concerns were raised however regarding the potential for ecosystem  
611 services studies to be misused to further specific political agendas or support  
612 environmentally destructive activities. This may be the case if infrastructure is created in the  
613 context of highly extraction-driven, capitalistic norms. Maintaining a pluralistic notion of the  
614 ecosystem services concept will ensure that space remains for critical reflection on  
615 assessment and valuation approaches within different institutional settings. Within this  
616 context, the desire to ensure that social and cultural values are captured offers a potential  
617 guiding principle for the ecosystem services community.

618

#### 619 **4.3. Expanding inter- and transdisciplinary approaches**

620 Increased collaboration, both between academic disciplines and between academia and  
621 wider society, was identified as a key area for the development of ecosystem services  
622 research and practice. The expansion of inter- and transdisciplinary work was a clear desire  
623 of the respondents (Cross-cutting theme 4) and matches aspirations in the literature  
624 (Carmen et al., 2018; Jacobs et al., 2015). The inclusion of more social scientists within  
625 ecosystem services assessments was particularly stressed as a necessary step to increase  
626 the integration of social and cultural values (Cross-cutting theme 5).

627

628 The ecosystem services concept arose at the interface of ecological and economic science,  
629 however is now engaged with by, and functions as a boundary object between, a large  
630 range of disciplines (Chaudhary et al., 2015). Yet physical, economic and social geographers  
631 are just a few groups to have been identified as having useful, but underutilised insights  
632 (Barnaud and Antona, 2014; Dempsey and Robertson, 2012; Potschin and Haines-Young,  
633 2011). Even large scale efforts at interdisciplinary working, such as the Intergovernmental  
634 Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), are to some degree  
635 dominated by natural scientists (Timpte et al., 2018) and within IPBES the need for a  
636 stronger engagement of social science and humanities was particularly emphasised (Díaz et  
637 al., 2018).

638

639 Our result suggest the lack of engagement from some disciplines may be due to the way the  
640 concept is perceived. Although respondents to our survey did not see economic valuation as  
641 central to the ecosystem services concept (P4), the perception that the two are closely  
642 interlinked was commonly encountered by participants. This view was encountered  
643 primarily from other scientists and, to a lesser extent, conservationists (Cross-cutting theme  
644 2). One respondent suggested that many groups and scientists simply refuse to engage with  
645 ecosystem services (P2) due to its image as a technocratic and utilitarian approach. This  
646 finding matches others who have noted the tendency to conflate 'ecosystem services' with  
647 'payments for ecosystem services' (PES) schemes, and the potential for such confusion to  
648 deter some from engaging with the concept (Schröter et al., 2014; Schröter and van  
649 Oudenhoven, 2016).

650

651 The perception that the concept of ecosystem services is equivalent to putting a price on  
652 nature limits its capacity to function as a boundary object. Increasing integration of other  
653 disciplines into ecosystem services research may be assisted by improving communication  
654 to overcome myths about the concept (see section 5.1.3: Economic valuation), and by  
655 demonstrating the contributions that different disciplines can make through the expansion  
656 and publication of case study research.

657

658 As infrastructure is created to embed ecosystem services assessments in specific  
659 governance institutions, it will be impossible and potentially unnecessary to maintain the  
660 disciplinary heterogeneity that exists within the wider community. However, ecosystem  
661 service assessments still require skilled interdisciplinary teams, particularly if they are to  
662 capture social and cultural values as well as the biophysical elements of ecosystem services.  
663 Assessment approaches also legitimise some knowledge claims at the expense of others. In  
664 the context of transdisciplinary assessments it is therefore important to co-develop the  
665 design of the research between knowledge holders and to be open about methodological  
666 and data-related choices. This consideration requires the deployment of trained social  
667 scientists to develop suitable processes for knowledge co-production (see, e.g. (Hauck et al.,  
668 2015). Equipping public bodies with the necessary skills requires significant investment as  
669 environmental impact assessments and policy appraisals are currently not necessarily  
670 conducted by teams of researchers with interdisciplinary skills (Rozas-Vásquez et al., 2018;  
671 Turnpenny et al., 2014; Wawrzyczek et al., 2018). It is in this context that it becomes crucial  
672 to retain a diverse, reflexive community of practice outside of any specific attempt to  
673 institutionalise the concept; as discussed above.

674

675 The importance of inter- and transdisciplinary research and assessment approaches  
676 identified in our survey also gains strong support within the ecosystem services literature  
677 (Ainscough et al., 2018; Albert et al., 2017; Carmen et al., 2018; Costanza et al., 2017; Steger  
678 et al., 2018). This acts as a guiding principle in the broad sense that it rejects narrow  
679 disciplinary approaches to ecosystem service assessment and valuation, supporting the  
680 norm of collaborative working and respect for different knowledge types.

681

#### 682 **4.4. Integrating sustainability and ecosystem services**

683 A need to focus on the principles of sustainability was emphasised during events at the  
684 conference and became a core element of the Antwerp Declaration. Sustainability is usually  
685 understood as equitably meeting the needs of current generations without reducing the  
686 capacity of future generations to meet their needs (WCED, 1987). As sustainability is not  
687 necessarily implied by the ecosystem services concept, many authors have sought to  
688 synthesize the two concepts to ensure that the ecosystem services concept is applied in a  
689 manner consistent with the principles of sustainability (e.g. Bennett et al., 2015; Ekins et al.,  
690 2003; Jacobs et al., 2013; Schröter et al., 2017). Key points made in this literature are, first,  
691 that the biophysical processes underpinning ecosystem services (and inherent limits in  
692 their ability to survive under different levels of stressors) should not be lost behind the  
693 'stock' metaphor of ecosystem services. Second, stakeholder preferences and values should  
694 form part of ecosystem service assessments, to ensure people's needs are equitably  
695 accounted for.

696

697 Jacobs et al. (2013) stress the need to refocus ecosystem services research around a 'strong'  
698 notion of sustainability. These authors suggest the majority of ecosystem services research

699 focuses on the efficient use of ecosystem services, but not the inherent limits and  
700 boundaries of the reproductive capacities of underlying natural capital. Jacobs et al. (2013)  
701 also emphasise the centrality of fairness and equity to the sustainability concept and  
702 suggest that distributional effects should be central to any ecosystem services analysis.

703

704 Schröter et al. (2017) discuss ecosystem services as a descriptive and normative scientific  
705 concept, whose application may conflict with the principles of sustainability. They claim that  
706 'if the ecosystem service concept is understood as contributing to sustainability, ecosystem  
707 services need to be conceptualised through sustainability strategies rather than assessing all  
708 forms of natural resource use in aggregated, snap-shot assessments' (Schröter et al., 2017,  
709 p. 41). Cavender-Bares et al. (2015) seek to synthesise economic, ecological and systems  
710 theory to integrate ecosystem services and sustainability. Principally, they suggest  
711 accounting for the ecological mechanisms underpinning services in the way assessments are  
712 carried out, particularly the inherent biophysical limits of these processes. By integrating  
713 preferences and values of different stakeholders, coupled with a systems dynamics  
714 approach, ecosystem services assessments could consider how the whole system might  
715 develop over time (Cavender-Bares et al., 2015). Similarly, Bennett and Chaplin-Kramer  
716 (2016) point to the development of a socio-ecological systems perspective as a step forward  
717 in integrating sustainable use to the ecosystem services research agenda (although it is not  
718 clear that this is an 'advancement' as much as a return to the roots of ecosystem services  
719 science, given its origins in systems ecology (Costanza et al., 2017; Odum, 1971)). Despite all  
720 these calls, sustainability issues of ecological thresholds and fairness are still often ignored  
721 in ecosystem services research and practice (Dendoncker et al., 2018).

722

723 Focusing on principles of sustainability, coupled with consideration of social and cultural  
724 values of ecosystem services, was seen as key to ensuring the concept was not misused or  
725 used to justify environmentally degrading activities (Cross-cutting theme 2). Here we  
726 reiterate, with the support of respondents who contributed to the development of the  
727 Antwerp Declaration, the call to adopt the normative and analytic content of the concept of  
728 sustainability in discussion and application of the ecosystem services concept. We add that  
729 as the ecosystem services concept is embedded as infrastructure in planning and decision-  
730 making in different contexts, the need for this to be coupled with the principles of  
731 sustainability becomes greater.

732

733 In terms of the main types of pluralism we have discussed, the notion of sustainability  
734 provides limits to the epistemological and methodological approaches within ecosystem  
735 services research, whilst also placing it within a broader normative framing. It is therefore a  
736 useful concept to guide the discussion and practice around the ecosystem services concept.  
737 This has ramifications for the types of epistemological, theoretical and methodological  
738 approaches to ecosystem services research and practice compatible with sustainability.

739

740 A heavy focus on human values, or biophysical processes, whilst not precluded by a  
741 commitment to sustainability, should also be treated with caution. Methodologies that seek  
742 purely to understand how humans value their environment will not capture ecological  
743 dynamics and limits. Similarly, approaches focused purely on the biophysical underpinning  
744 of ecosystem services may miss the important distributional impacts of changes between  
745 different user groups. At the broad level of research and policy-science innovations, this is  
746 not problematic as studies may seek to answer certain questions or develop new methods.

747 However, as infrastructure is created, it is important that neither values, nor biophysical  
748 dynamics are neglected. This reinforces the need to ensure that inter- and transdisciplinary  
749 practices are carried forward as the concept is institutionalised.

750

751 The three guiding principles that emerged from this survey are mutually reinforcing; a  
752 consideration of social and cultural values, inter- and transdisciplinary approaches and a  
753 commitment to the principles of sustainability. Such principles can accommodate a broad  
754 range of theoretical, epistemological and methodological approaches, whilst guarding  
755 against an 'anything goes' approach to the application of the ecosystem services framework.

756

#### 757 **4.5. Limitations and future research**

758 User group identifications in our survey broad and not defined during the data collection;  
759 leading to potentially different interpretations between participants. Participants were also  
760 not able to identify as multiple user groups, which may not reflect the way that these roles  
761 can overlap. We also received fewer responses from those identifying as policy makers or  
762 practitioners than those identifying as academics. We were therefore not able to explore in  
763 detail the variety of different roles connected to varying uses of the ecosystem services  
764 concept outlined above. In order to gain a more nuanced understanding of how the  
765 ecosystem services concept is perceived by different user groups, further research will be  
766 needed with a more targeted sampling approach.

767

768 Future work may also build upon the distinction between set infrastructure and a broad,  
769 pluralistic ecosystem services community. These two strands are undoubtedly already in  
770 existence and we do not suggest that critical debate is waning within the ecosystem services

771 community. Yet the ecosystem services concept is likely to become increasingly embedded  
772 in policy and decision-making institutions moving forward. As this happens, there may be a  
773 need for a more substantive elaboration of the necessary structures to ensure that the  
774 critical, pluralistic perspective on ecosystem services is maintained and crucially kept in  
775 dialogue with the construction of contextually specific infrastructure.

776

777 Part of this process may be cross jurisdictions reviews of the way that ecosystem services is  
778 being embedded at sub-national, national, and international level. Studies of individual  
779 jurisdictions and some comparisons are beginning to emerge, but not yet in a systematised  
780 way (Bezák et al., 2017; Leone et al., 2016; Mauerhofer and Laza, 2018; McKinley et al.,  
781 2018). We suggest that such studies would benefit from considering the guiding principles  
782 laid out in this paper. These principles formed the basis of the collaboratively developed  
783 Antwerp Declaration and are supported by other literature as outlined above. We suggest  
784 that these may constitute potentially useful frames to reflexively assess the  
785 institutionalisation of the ecosystem service concept.

786

## 787 **5. Concluding remarks**

788 There are advantages and disadvantages to the ecosystem services concept being a  
789 boundary objects or set infrastructure, and likely these roles represent poles on a spectrum  
790 rather than a binary split. We find these two notions useful lenses for understanding the  
791 role of the ecosystem services concept at the science-policy interface, and for framing the  
792 views of different user groups. As the concept is further institutionalised in governance  
793 institutions, it is important to remain cognizant of the trade-off that exists between these



794 two roles and to not lose sight of the political choices necessary for the creation of set  
795 infrastructure.

796

797 The structured pre-conference survey and the participatory process of developing the  
798 Antwerp declaration have helped to identify different major purposes of the ecosystem  
799 service concept, including its function as awareness raising tool, scientific approach, and  
800 decision-making aid. The integration of the principles of sustainability and the inclusion of  
801 social and cultural values were seen as major research frontiers.

802

803 Although our findings are based on large number of responses of relevant stakeholders (n=  
804 121), they are biased towards the European research community, and the segmentation of  
805 policy and practitioner stakeholders could not be clearly defined. Nevertheless, they  
806 emphasised research needs that have been identified and discussed in the literature for  
807 some time thus affirming and supporting existing arguments, whilst providing and guidance  
808 to support application of the ecosystem services concept. We suggest that surveys of the  
809 wider community to understand the ecosystem services concept provide a valuable  
810 approach to encourage nuanced discussion and reflexivity and prevent polarisation of the  
811 debate.

812

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828

#### 829 **Conflicts of interest**

830 None

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1149 **Supplementary Material**

1150 SM1 – Full questionnaire

1151 SM2 – Coding Matrix

1152 SM3 – Early findings documents

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1154 **Supplementary Material 1**

1155 Full survey circulated among 350 early registrants to the European Ecosystem Services  
 1156 Conference 2016.

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<p>Q1. What would you like to talk about? <i>(Multiple-choice, single choice, mandatory)</i></p> <ul style="list-style-type: none"> <li>A) Values</li> <li>B) Goals</li> <li>C) Myths</li> <li>D) Grumbles</li> </ul>
<p><b>Purpose (Values in the original survey)</b></p>
<p>What do you think is at the heart of the Ecosystem services framework? [...] Please indicate how closely each of the following statements resembles your own thinking:</p> <p>P1) The ecosystem services concept provides a utilitarian framing of ecosystem functions as services in order to increase public interest in conservation. <i>(5-point Likert scale)</i></p> <p>P2) The concept of ecosystem services denotes a generic idea or metaphor to increase awareness of how human well-being in many ways depends on natural systems. <i>(5-point Likert scale)</i></p> <p>P3) Using an economic approach to environmental issues can help decision-makers to determine the best use of scarce ecological resources at all levels. <i>(5-point Likert scale)</i></p> <p>P4) Now that you've gone through the literature statements, can you put down in your own words what you think is at the heart of the ecosystem services framework? <i>(Open-ended)</i></p> <p>P5) What, to your mind, would be the worst misuse of the ecosystem services framework? <i>(Open-ended)</i></p> <p>P6) Beyond basic research ethics and good practice, what values and principles or ideas should guide the practical applications of the ecosystem services framework? <i>(Open-ended)</i></p>
<p><b>Visions (Goals in the original survey)</b></p>
<p>V1) In 20 years time, what role should the ecosystem services framework have in society? <i>(Multiple-choice, tick all that apply)</i></p> <ul style="list-style-type: none"> <li>A) All policy is centred on the ecosystem services framework, from local to international agreements</li> <li>B) It is a household term, something everyone is familiar with and needs little explanation</li> <li>C) It is considered the paradigm shift that turned environmental protection into a core priority</li> <li>D) It's around but remains quite a technical term, confined to academia and high-level policy</li> <li>E) Everyone has finally come to their senses and moved on to a more useful framework</li> <li>F) Other (please describe below)</li> </ul> <p>V2) What are the main challenges for the widespread use of the ecosystem services framework <i>(Open-ended)</i></p> <p>V3) What do you think are key steps to undertake in the future development of the ecosystem services framework? <i>(Open-ended)</i></p>
<p><b>Myths</b></p>
<p>M1) Can you describe a common myth or misunderstanding you frequently encounter in your work? <i>(Open-ended)</i></p> <p>M2) Who holds these erroneous views? <i>(Open-ended)</i></p> <p>M3) And what to your mind is the source of confusion that gave rise to these myths? <i>(Open-ended)</i></p> <p>M4) How would you debunk the myth? <i>(Open-ended)</i></p> <p>M5) Have you ever encountered one of the following claims regarding ecosystem services in your work? <i>(Multiple-choice, tick all that apply)</i></p> <ul style="list-style-type: none"> <li>A) The ecosystem services framework is based on economic terminology and therefore a capitalist concept, it's just an extension of the capitalist paradigm and all about making money</li> <li>B) The ecosystem services framework undermines the widely held moral-aesthetic value arguments for environmental protection and does not consider the intrinsic value of nature.</li> <li>C) The ecosystem services framework implicitly accepts that happiness and wellbeing can be quantified.</li> </ul>



<p>D) Ecosystem services are purely human-centric, the framework implicitly accepts that human benefit is the only good and that we should solely protect services if they benefit humans.</p> <p>E) The traditional, ethical arguments for conservation have failed, so the ecosystem services framework embodies an appeal to self-interest instead.</p> <p>F) The ecosystem services framework cannot support decision-making nor can it create a solution that pleases everyone and therefore has no use in informing environmental policy.</p> <p>G) Other (please describe below)</p>
<b>Frustrations (Grumbles in the original survey)</b>
F1) What do you find most frustrating about working with the ecosystem services framework? ( <i>Open-ended</i> )
F2) What would be the best way to resolve your grumble? ( <i>Open-ended</i> ) What to your mind is the biggest theoretical, moral or practical shortcoming of the ecosystem services framework? ( <i>Open-ended</i> )
F3) How could that shortcoming be remedied? ( <i>Open-ended</i> )
F4) Have you ever encountered one of the following frustrations? ( <i>Multiple-choice, tick all that apply</i> ) <ul style="list-style-type: none"> <li>A) The terminology of ecosystem services is too complicated and academic, impossible to use with non-expert audiences.</li> <li>B) The ecosystem services framework is so contentious, the use of the term is best avoided when applying the framework in practice, to avoid shouting matches and people disengaging on principle.</li> <li>C) In people's perceptions the ecosystem services framework is equalled with monetary valuation and selling off nature, making it a hard sell even if the study at hand doesn't look at economic aspects at all.</li> <li>D) Policy makers have adopted the ecosystem services framework for their own purposes, without really paying attention to its theoretical underpinnings.</li> <li>E) Ecosystem services is such a hyped buzzword, it is becoming increasingly vague and opaque, everybody uses it without much regard for what it actually entails.</li> <li>F) The phrase 'ecosystem services' is used to cover a growing variety of quite distinct concepts and approaches.</li> <li>G) Other</li> </ul>
<b>Background</b>
A1) In the field of ecosystem services, where do you think the biggest differences of opinion lie? ( <i>Open-ended</i> )
A2) What do you do? ( <i>Multiple-choice, single option</i> ) <ul style="list-style-type: none"> <li>A) Student/Junior Researcher</li> <li>B) Academic Researcher</li> <li>C) Policy maker</li> <li>D) Practitioner</li> <li>E) Other</li> </ul>
A3) What is your main field of study? ( <i>Open-ended</i> )
A4) How long have you been working with the ecosystem services approach? ( <i>Open-ended</i> )
A5) What gender do you identify with? ( <i>Open-ended</i> )
A6) Schedule permitting, would you be interested in attending a follow-up workshop at the conference, to discuss some of the topics raised here in more detail? ( <i>Yes/No</i> )
That was all, thank you so much for taking part and we're looking forward to meeting you in September. Would you like to do another theme? ( <i>Yes/No</i> ) [If yes, redirects to Q1]

1159 **Supplementary Material 2**

1160 Coding matrix of the inductive thematic content analysis. Counts refer to the number of  
 1161 times each theme was mentioned by each user group. Any empty responses to open  
 1162 questions were removed from the analysis prior to coding.

Theme	Summary of responses coded under theme	Academic Researcher	Student/Junior Researcher	Practitioner	Policy maker	Other	Total
<b>Purpose (Values)</b>							
<b>P4 - Can you put down in your own words what you think is at the heart of the ecosystem services framework?</b>							
Decision-making aid	<i>ES as tool/support for decisionmaking &amp; resource management</i>	7	1	2	1	1	12
Scientific approach	<i>ES as a scientific endeavour, expanding knowledge</i>	4	2	3	1	0	10
Awareness raising	<i>ES to demonstrate value of nature</i>	22	11	4	0	1	38
Holistic approach	<i>ES as an encompassing approach to complexity</i>	3	3	0	1	1	8
Advocacy x Science	<i>Responses combining science and awareness raising, focus on general public</i>	8	4	1	2	0	15
Decision x Activism	<i>Responses combining awareness raising and decision support, focus on policy</i>	4	4	0	2	1	11
Science x Decision	<i>Responses combining science and decision support, technocratic focus</i>	2	0	4	1	0	7
Other		4	1	1	0	0	6
<b>P5 – What would be the worst misuse of the ecosystem services framework?</b>							
Backfiring	<i>ES used to demonstrate that environmental degradation is affordable</i>	3	0	0	0	2	5
Monetary valuation	<i>ES solely used to put a price on nature</i>	28	8	4	2	1	43
Panacea	<i>ES used a cure-all applied without concern for context or applicability</i>	3	0	0	2	0	5
Poor decision making	<i>ES used in flawed decision-making processes</i>	7	2	1	1	1	12
Selling off nature	<i>ES used to commodify nature</i>	8	4	3	1	1	17
Other		6	4	4	0	0	14
<b>Visions (Goals)</b>							
<b>V2 - What are the main challenges for the widespread use of the ecosystem services framework?</b>							
Education & awareness	<i>Addressing lack of knowledge of ES framework and theoretical underpinnings</i>	6	2	2	2	1	13
Impact	<i>Lack of tangible impact (i.e. Halting of environmental degradation)</i>	0	1	0	0	2	3
Institutional barriers	<i>Historic and organisational challenges in academia and governance</i>	3	4	1	0	1	9
Methods, date & tools	<i>Methodological improvements needed and concerns around data gaps/quality</i>	11	4	5	2	1	23
Policy & decision making	<i>Lack of political will and vested interests in decision making</i>	4	2	2	0	2	10
Terminology	<i>Overly technical ES terminology acting as a barrier to widespread use</i>	9	3	0	0	0	12
Un-niching	<i>Need to move ES beyond a scientific margin into policy and public mainstream</i>	3	0	0	0	1	4
Other		1	0	0	1	0	2
<b>V3 - What do you think are key steps to undertake in the future development of the ecosystem services framework?</b>							
Better communication- General	<i>Responses citing better communication</i>	2	2	1	1	0	6
Better communication- Holistic emphasis	<i>Responses citing communication to promote holistic nature of ES framework</i>	0	1	0	1	0	2
Better communication- Stakeholder & public engagement	<i>Responses citing better communication with non-expert audiences</i>	1	1	3	0	0	5
Better decision-making	<i>Improving the decision-making process</i>	1	0	0	0	0	1
Better science- General	<i>Responses citing the need for better science in general (tools, methods, data, theory)</i>	9	2	3	3	0	17
Better science- Accounting	<i>Responses specifically citing need for better accounting for ES</i>	1	0	0	0	0	1
Better science- Include cultural values	<i>Responses focusing on improving inclusion cultural values in ES research/valuations</i>	3	2	0	1	0	6
Better science- Interdisciplinarity	<i>Responses citing need for working more interdisciplinarily in ES</i>	3	0	1	1	0	5
Science-policy	<i>Improvements to the science-policy interface and evidence based decisions</i>	15	5	1	1	0	22

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Theme		Academic Researcher	Student/Junior Researcher	Practitioner	Policy maker	Other	Total
<b>Myths</b>							
<b>M1 - Describe a common misunderstanding or myth around ecosystem services you frequently encounter in your work?</b>							
All about the money	<i>ES revolves around monetary valuation of nature</i>	10	2	3	1	0	16
Other		5	1	3	0	0	9
<b>M2 - Who holds these erroneous views?</b>							
Conservationist	<i>Responses citing conservationists and/or environmentalists as myth believers</i>	4	1	0	1	0	6
Lay people	<i>Responses citing lay people as myth believers</i>	6	1	0	0	0	7
Scientists	<i>Responses citing other disciplines and scientists as myth believers</i>	8	3	1	0	0	12
Polymakers & practitioners	<i>Responses citing policymaker and/or practitioners as myth believers</i>	2	0	2	1	0	5
Other		2	0	2	0	0	4
<b>M3 - What to your mind is the source of confusion that gave rise to the myth you've just described?</b>							
Media & publications	<i>Responses citing certain ES publications or media in general as source of myths</i>	2	1	2	0	0	5
Terminology & concept	<i>Confusion seen as inherent to the language and concept of ES</i>	3	0	1	0	0	4
Worldview & ideology	<i>Responses citing ideological bias and vested worldviews as source of myths</i>	4	1	2	0	0	7
Other		5	1	1	1	0	8
<b>M4 - How would you debunk the myth?</b>							
Communication	<i>Improving communication around ES</i>	8	3	4	0	0	15
Expanding disciplinary	<i>Working across disciplines and audiences</i>	3	0	1	0	0	4
Refine concept	<i>Improve ES framework conceptually</i>	1	1	0	0	0	2
Other		3	0	1	0	0	4
<b>Frustrations (Grumbles)</b>							
<b>F1 - What do you find most frustrating about working with the ecosystem services framework?</b>							
External skepticism	<i>Responses citing negative attitudes to ES framework</i>	3	0	0	0	1	4
Misuses	<i>ES framework being misapplied</i>	2	0	0	0	0	2
User friendliness	<i>Difficulties with terminology and high expertise needed to use ES &amp; tools</i>	7	2	4	2	0	15
Practical implementation	<i>Difficulties with applying ES framework in practice</i>	4	0	1	2	0	7
Science shortcomings	<i>Scientific issues raised - lack of data, accounting methods, conceptual flaws</i>	5	4	2	1	0	12
Silos-Niche	<i>Lack of mainstreaming and inter/cross disciplinary work within ES</i>	4	1	0	0	0	5
<b>F2 - What would be the best way to resolve your grumble?</b>							
Best practice	<i>Spreading best practice guidance and knowledge sharing</i>	0	0	0	1	0	1
Educate	<i>Improving education around ES framework</i>	2	1	0	0	0	3
Interdisciplinarity	<i>Working across disciplines and audiences</i>	3	0	0	1	0	4
More research	<i>Issues can be addressed by further research into challenges</i>	1	1	0	0	0	2
Pick & roll	<i>Picking one ES framework methodology and sticking with it across all ES research</i>	0	0	1	0	0	1
Standardisation	<i>Standardising existing frameworks and methodologies (plural)</i>	3	2	3	1	0	9
Tailor & complement	<i>Tailoring ES framework to local contexts and use in conjunction with other tools</i>	1	0	0	0	1	2
<b>F3 - What to your mind is the biggest theoretical, moral or practical shortcoming of the ecosystem services framework?</b>							
Bias	<i>Problems relating to perceived ideological biases in ES framework</i>	0	1	0	0	0	1
Concept & method deficit	<i>Problems cited relating to the theory, concept and method of ES framework</i>	5	4	2	1	1	13
Decision-making deficit	<i>Issues with use of ES framework in (flawed) decision-making processes</i>	1	0	0	1	0	2
Practical implementation deficit	<i>Lack of practical applications of ES framework</i>	1	0	1	0	0	2
Social science deficit	<i>Lack of inclusion of social sciences in ES research</i>	4	1	1	0	0	6
<b>F4 - How could that shortcoming be remedied?</b>							
Communication	<i>Improved communication can address challenges</i>	3	0	0	1	0	4
Inter/ transdisciplinarity	<i>Improving and increasing work across disciplines and audiences</i>	5	0	1	0	0	6
More research	<i>Additional studies needed</i>	1	1	1	0	1	4
Public/ stakeholder engagement	<i>Better inclusion and outreach to general public and stakeholders</i>	1	1	0	2	0	4
Standardisation	<i>Standardising existing frameworks and methods</i>	2	3	1	0	0	6

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### Supplementary Material 3

Early findings documents circulated in the delegate pack to the all participants in the European Ecosystem Services Conference 2016.

# The Antwerp Declaration



The Antwerp Declaration will outline a clear message from the conference participants about ecosystem services that is relevant to the wider world. It provides a means of communicating high-level views to a range of potential audiences including decision makers, academics and practitioners. The Declaration embodies a legacy for the conference and a statement of intent from the scientific community.

#### Survey

To inform the discussions on the conference we sent out an online survey in July to 350 early registrants. The questionnaire gathered views from the participants on the Values, Goals, Myths and Grumbles they encounter in their work with ecosystem services. A big Thank You goes out to the **121 participants** who contributed!

#### Values

The Values theme asked what participants considered the core of the ecosystem services framework.

“ *Ecosystems services are a wide window through which we have to realise that our survival is dependent on the planet's ecology and that we have to start to work hand in hand with it.* ”

At its heart, the ecosystem services framework is still viewed by most as a metaphor that **raises awareness** of the many ways human wellbeing depends on natural systems. Although frequently mentioned and occasionally criticised, economic valuation was on the whole not perceived to be inherently problematic. Its potential misuse on the other hand was a concern for many and resonated strongly with responses in the Myths theme as well.

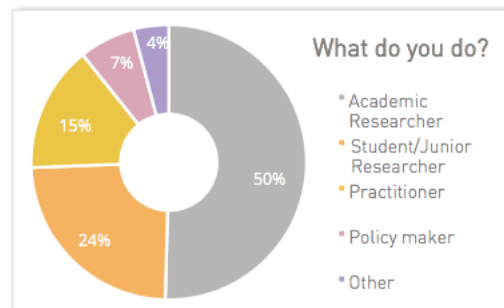
*It's an approach that should be used very intelligently to frame environmental management challenges through a more socially relevant and integrated lens. Valuation is just one tool in the ES basket.* ”

However, most of our respondents come from an academic background, which begs the question from policy makers, applied researchers and practitioners:

**Q** – What are the practical benefits of using the ecosystem services framework on the ground? Does it indeed enable awareness raising and a more socially relevant approach to environmental management?

#### Goals

The ecosystem services community certainly does not lack ambition: in the Goals section the majority of re-



spondents expressed a hope that in 20 years time the ecosystem services framework will have catalysed a **paradigm shift** that turned environmental protection into a core priority. However, despite this widespread enthusiasm and high-held hopes for the concept, a broad range of challenges was raised.

*The language - and therefore the concept - suffers from its technocratic, utilitarian image. It has been used in this way so long that it is impossible to broaden it to embrace real-world problems (and their less tangible but essential values) fully. This is demonstrated by the still awkward and clumsy state of the cultural services debate, and the blunt refusal of many movements - and scientists - to work with it as a central concept. The time has come to face the fact that there are frontiers, and confine this concept to its safe operating space.* ”

We also asked what key steps are necessary for the future development of ecosystem services, and the answers were surprisingly homogenous: better communication, emphasising the holistic nature of the approach, more inclusion of socio-cultural values (and by extension social scientists), improve stakeholder engagement and strengthen the science policy nexus.

**Q** – Is concentrating on incorporating cultural values through transdisciplinary work and participative projects with many different stakeholders the most transformative frontier of the ecosystem services framework

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## Myths

We asked what myths people most frequently encountered in working with ecosystem services, and there was a very clear answer: it's all about the money. Economic valuation and commodification of nature was the most frequently raised point in this section. Interestingly enough, the reported sources of these myths and their audiences (who subscribe to the reported myths) show that it is mostly **a quarrel between scientists**. 'Other scientists' was the most cited audience to misunderstand ecosystem services, followed by conservationists, lay people, and finally policymakers & practitioners.

The remedies offered resonate with those mentioned in other themes: better communication and working more interdisciplinarily. However the direction of communication suggests an engagement gap between scientists and policymakers & practitioners, those who would arguably be one of the most important target audiences to reach. One respondent raised an interesting point in terms of the potential impact of applying the ecosystem services framework and the limits of scientific evidence:

**“** *[It is a myth] that describing a range of (natural) ecosystem services could counterbalance the conflicting interests of industry (and politics).*

Many respondents, especially from the policy and practitioners side called for best practice examples and effective case studies to demonstrate how ecosystem services are used in decision-making processes on the ground and to promote best practice.

**Q** — How can we encourage case study research of successful applications of ecosystem services that are actually being used in the decision making process?

## Grumbles

A lot of the frustrations voiced in the Grumbles section had to do with **user friendliness** in various forms. On the scientific side there were complaints around the lack of standardization in the framework as well as insufficient methods, and a lack of data. Practitioners on the other hand signaled being overwhelmed by the variety of categorisations and tools available, and the background information required for their appropriate application.

**Q** — Instead of further adaption and refinement of ecosystem services frameworks, efforts should be focused on ensuring the existing frameworks and tools are understood by and accessible to practitioners and policymakers.

## Events during the conference

### Monday - Introduction

Opening address by Ben Delbaere.

### Quote of the Day

From Tuesday to Thursday a statement will be up in a central location for you to discuss, leave comments and vote on. Stickers for voting have been provided: a different colour for each day and white for comments.

### Tuesday - G4 Session

**11:00-12:30**

There will be an opportunity to discuss themes related to the Declaration in the G4 session "*Reflections on the last decade of ecosystem services research: Rights, Wrongs and the Way Forward*". This session is organised by Alexander van Oudenhoven, Matthias Schröter and Sander Jacobs, and will take place in room K.201.

### Wednesday – AD16 Workshop

**12:30-16:30 (at the latest)**

The main AD16 discussion event will be an interactive workshop style session, taking place over lunch and into the afternoon on Wednesday. We will ply you with food and drink, and set your brilliant minds to work over some of the puzzles thrown up by the survey results and previous discussions. Location TBC.

NOTE: This event runs parallel to the field excursions, and has limited spaces. If you would like to attend please e-mail: [aster.devrieslentsch@ed.ac.uk](mailto:aster.devrieslentsch@ed.ac.uk).

### Thursday – Drop-In Session

**09:00-12:30**

We will run a drop-in session in the morning. Pop in to discuss the Declaration progress, share your thoughts on the Quotes or take a seat and to be our armchair critic!

### Friday – Official launch

**Social Media** - #AD16 (Twitter)

### CONTACT

If you have any questions about the Antwerp Declaration, please get in touch with Aster via e-mail: [aster.devrieslentsch@ed.ac.uk](mailto:aster.devrieslentsch@ed.ac.uk).

*All quotes used were taken directly from the survey as illustrative examples of points raised.*

