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ETHICAL CONSIDERATIONS IN ON-GROUND APPLICATIONS OF THE ECOSYSTEM SERVICES CONCEPT

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Abstract:	The ecosystem services (ES) concept is one of the main avenues for conveying society's dependence on natural ecosystems. On-ground applications of the concept are now widespread and diverse, and include its use as a communication tool, for policy guidance and priority setting, and for designing economic instruments for conservation. Each application raises ethical considerations beyond traditional controversies related to the monetary valuation of nature. We review ethical considerations across major on-ground applications and group them into the following categories: anthropocentric framing; economic metaphor; monetary valuation; commodification; socio-cultural impact; changes in motivations; and equity implications. Different applications of the ES concept raise different suites of ethical issues, and we propose avenues to address the issues most relevant to each application. We conclude that the ES concept should be considered as only one among various alternative approaches to valuing nature, and reliance on economic metaphors can exclude other motivations for protecting ecosystems.

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1 ETHICAL CONSIDERATIONS IN ON-GROUND APPLICATIONS OF THE 2 ECOSYSTEM SERVICES CONCEPT

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1
2 36 **Abstract**

3 37 The ecosystem services (ES) concept is one of the main avenues for conveying society's
4
5 38 dependence on natural ecosystems. On-ground applications of the concept are now widespread and
6
7 39 diverse, and include its use as a communication tool, for policy guidance and priority setting, and
8
9 40 for designing economic instruments for conservation. Each application raises ethical considerations
10
11 41 beyond traditional controversies related to the monetary valuation of nature. We review ethical
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13 42 considerations across major on-ground applications and group them into the following categories:
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15 43 anthropocentric framing; economic metaphor; monetary valuation; commodification; socio-cultural
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17 44 impact; changes in motivations; and equity implications. Different applications of the ES concept
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19 45 raise different suites of ethical issues, and we propose avenues to address the issues most relevant to
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21 46 each application. We conclude that the ES concept should be considered as only one among various
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23 47 alternative approaches to valuing nature, and reliance on economic metaphors can exclude other
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25 48 motivations for protecting ecosystems.
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34 51 **Keywords: commodification, conservation policy, ecosystem management, environmental**
35 52 **ethics, equity**
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63 Introduction

64 The concept of ecosystem services (ES) has gained global attention in recent years as a framework
65 for promoting the societal benefits of ecosystem conservation. This has been influenced largely by
66 widely-read scientific publications and international initiatives such as the Millennium Ecosystem
67 Assessment (MA 2005) and The Economics of Ecosystems and Biodiversity (TEEB 2010), and
68 increasing on-ground application of ES-related policy instruments (e.g. [Tallis et al. 2008](#)).

69 Governments are increasingly integrating goals targeted at the protection of ES into their policy
70 directives. For example, the Governments of China, Costa Rica, Mexico and Ecuador all have
71 schemes to pay landholders who engage in management (e.g. protection of forest or improved
72 agricultural practices) that secures the supply of hydrological services (e.g. clean water provision;
73 Sanchez-Azofeifa et al. 2007, Liu et al. 2008, Muñoz-Piña et al. 2008). Global non-Government
74 organisations such as The Nature Conservancy, Conservation International, and World Wildlife
75 Fund have projects around the world that invest in market-based instruments that aim to protect ES
76 and biodiversity. The increasing attention paid to ES can be attributed largely to the concept's
77 potential to promote a broader appreciation of the contribution of ecosystems to human well-being.

78 Practical applications of the ES concept are now becoming widespread (e.g. Goldman et al.
79 [2008, Tallis et al. 2008](#)) and include payments for ES (PES) schemes (e.g. [Turpie et al. 2008](#)),
80 spatial planning (e.g. [Lubchenco and Sutley 2010](#)), greening of national accounting (e.g. Boyd
81 2007), and directing strategic arguments in high-level policy and law making (e.g. Reducing
82 Emissions from Deforestation and Forest Degradation (REDD); Miles and Kapos 2008). The rapid
83 growth in practical applications of the ES concept has illuminated ethical considerations related to
84 the use of the concept. For example, concerns have been raised that an emphasis on financial
85 valuation of nature may undermine other forms of valuation based on, for example, moral or
86 cultural values (e.g. [Chee 2004, Bowles 2008](#)).

87 As the ES concept becomes increasingly integrated into environmental science and policy,
88 the time is ripe for a comprehensive and reflective consideration of the range of ethical questions

1
2 89 associated with the concept's application. Some critiques of ES have focused only on a subset of the
3
4 90 diverse, multi-faceted applications of the concept. For example, there has been particularly strong
5
6 91 criticism against valuing nature in monetary terms (e.g. Child 2009, Sagoff 2010). Yet, many
7
8 92 practical applications of the ES concept do not require such monetary valuations (e.g. education,
9
10 93 land-use planning, strategic policy making, and, in some cases, even PES schemes). It is important
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12 94 to identify which ethical issues are relevant to particular ES applications so that the most pertinent
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14 95 issues may be addressed in a given management context.

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17 96 A comprehensive consideration of the range of ethical issues associated with different ES
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19 97 applications is timely also because many applications are relatively new and so some ethical facets
20
21 98 are only just becoming apparent. Moreover, the debate on the ethics of ES that has been most
22
23 99 accessible to ES researchers and practitioners has focused mostly on the theoretical underpinnings
24
25 100 of the approach, leaving the diverse range of practical applications largely unaddressed. Here, we
26
27 101 focus attention on the most common on-ground applications of the ES concept and identify the
28
29 102 main ethical issues associated with each application. We begin with a brief description of the range
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31 103 of practical applications. This is followed by a categorization of the major kinds of ethical issues
32
33 104 and their relevance to applications of the concept. We then identify ways for addressing these issues
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35 105 to improve on-ground application of the ES concept. We finish with advice on how to integrate
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37 106 consideration of the ethics of ES into a broader ecosystem management framework.

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41 107 Throughout the paper, we note where a misunderstanding of the major principles of the
42
43 108 concept may lead to ethical concerns, or where modifying the application of the concept is
44
45 109 necessary to address these concerns. Contrasting the core metaphor of nature as a service provider
46
47 110 with alternative metaphors describing the value of nature becomes more crucial as the ES concept
48
49 111 gains prominence. Reliance on economic metaphors in discussions about the value of nature may
50
51 112 erode non-economic motivations for conservation and lead policy-makers to falsely conclude that
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53 113 there are possible equivalents (or substitutes) between economic and ecological values. We show
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55 114 that exclusive focus on monetary valuations raise particular ethical issues, but demonstrate also that
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1
2 115 different applications of the ES concept raise different types of ethical issues, and these issues can
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4 116 be addressed using a range of management approaches.
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8 118 **Applications of the ES concept**

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10 119 There are many and varied applications of the ES concept. We have grouped these into three broad
11
12 120 themes to demonstrate the general association among the different applications (Table 1).
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14 121

17 122 *Communication tool*

18
19 123 The ES concept may be used as a tool to help communicate the importance of ecosystems and
20
21 124 biodiversity to human well-being in a language that reflects dominant political and economic views.
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23 125

24 125 Communication may be focused purely on *awareness raising and education*, and prominent
25
26 126 examples of this include the MA (2005), which raised awareness of the impacts of ecosystem
27
28 127 change on human well-being, and TEEB (2010), which raised awareness of the costs of policy
29
30 128 inaction to halt biodiversity loss. The ES concept may also support *strategic arguments* designed to
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32 129 influence conservation decisions or direct policy (e.g. the EU biodiversity strategy to 2020:
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34 130

35 130 [http://ec.europa.eu/environment/nature/biodiversity/comm2006/pdf/2020/1_EN_ACT_part1_v7\[1\].](http://ec.europa.eu/environment/nature/biodiversity/comm2006/pdf/2020/1_EN_ACT_part1_v7[1].pdf)

36
37 131 [pdf](#) viewed 20th June 2012). Finally, the ES concept can provide a framework to guide and
38
39 132 sometimes improve *interdisciplinary communication* among academic disciplines concerned with
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41 133 sustainability (e.g. ecology, economics and political science) and among academics, policymakers
42
43 134 and various stakeholders and interest groups (e.g. farmers, developers and conservationists).
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45 135

48 136 *Policy guidance and priority setting*

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50 137 Another important application of the ES concept is priority setting for policy guidance and decision-
51
52 138 making support. The ES concept and related valuation tools are often used to quantify ecological
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54 139 impacts and socio-economic costs and benefits, and to document the distributional impacts involved
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56 140 in different options for land-use planning. This serves to improve understanding of the broader
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1
2 141 effects of decisions (e.g. their impact on ecosystems and, indirectly, on socio-economic systems)
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4 142 and better inform approaches to balancing trade-offs. This application theme is arguably the best
5
6 143 known and most controversial because it generally involves the valuation of benefits obtained by
7
8 144 people from ES in monetary terms. Yet, benefits are valued by different people in different ways,
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10 145 and application of the ES concept allows these benefits to be more concretely conceptualized and,
11
12 146 in some cases, paid for. Practical applications related to monetary valuation include *cost-benefit*
13
14 147 *analyses* and *green accounting* (Table 1). However, valuation – in the sense of scoring based on
15
16 148 importance – need not involve placing a monetary value on these benefits (e.g. Chan et al. 2012).
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23 150 *Strategic objective and design of policy instruments*

24 151 The ES concept may be referenced in various on-ground practices or policies where ecosystem
25
26 152 protection is one of the strategic objectives. In this way, the application of the concept can shape the
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28 153 approach taken to the design of policy instruments and project execution including how projects are
29
30 154 managed and how stakeholders are identified and involved. This type of application moves beyond
31
32 155 simply trying to raise public awareness (as with communication) and influence decision making (as
33
34 156 in priority setting), and emphasizes attaining particular benefits delivered through policies or
35
36 157 practices that protect ES. Practical examples include ES embedded in large-scale *spatial planning*
37
38 158 (e.g. Integrated Coastal Zone Management; see for example <http://www.pegasoproject.eu/> viewed
39
40 159 20th June 2012), modifying *land or resource management* to promote service delivery (e.g.
41
42 160 managing agricultural landscapes to support native pollinating species; Kremen et al. 2004), high-
43
44 161 level *policymaking and law writing* (e.g. Kyoto protocol, REDD, and Convention on Biological
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46 162 Diversity), *PES* (Kinzig et al. 2011), and *multi-objective programs*, especially those linked to a
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48 163 development agenda (e.g. Ecosystem Services for Poverty Alleviation; <http://www.espa.ac.uk/>
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50 164 viewed 20th June 2012).
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166 **Ethical considerations in applying the ES concept**

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2 167 In this section, we classify ethical issues related to the practical applications of the ES concept into
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4 168 seven main categories.

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7
8 170 *Anthropocentric framing*

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10 171 Application of the ES concept raises ethical considerations largely because the concept endorses an
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12 172 anthropocentric perspective that in principle is solely concerned with the attributes of nature that
13
14 173 contribute to human well-being (MA 2005). The term ‘service’ emphasizes the value natural entities
15
16 174 have for human purposes (i.e. their ‘instrumental’ values) at the expense of an emphasis on their
17
18 175 intrinsic values (Ludwig 2000). An anthropocentric bias in valuation is problematic because, as
19
20 176 some environmental ethicists have argued, non-human organisms merit consideration in and of
21
22 177 themselves, and not only in reference to what they can do for people (e.g. Callicott 1984, Naess
23
24 178 1989). Underlying the values that humans assign to nature are key metaphors that organize human
25
26 179 thinking in favor of specific types of values at the expense of others (Larson 2011).

27
28 180 Conservationists have always used various metaphors to characterize nature and its values. For
29
30 181 example, John Muir (cited in Nash 1982, p. 168) referred to forests as “cathedrals of the people”
31
32 182 while others see nature as an organism (e.g. Lovelock 2000). To regard nature as a provider of
33
34 183 ‘services’ is one particular metaphor that carries different kinds of value connotations (Norgaard
35
36 184 2010). For example, it promotes valuing nature primarily through the benefits that humans derive
37
38 185 from ecosystems and places these benefits in the same context as those delivered via human
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40 186 activities.

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43
44 188 *Economic metaphor*

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46 189 The metaphor that describes ecosystems as (natural) capital and ecosystem functions as (ecosystem)
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48 190 services adopts an economic framing, potentially favoring the expansion of the rationality of profit
49
50 191 calculus to the environmental domain (Gómez-Baggethun and Ruiz-Pérez 2011). Some authors
51
52 192 have been highly critical of this conceptualisation (e.g. Callicott 1984, Naess 1989) because there

1
2 193 are ethical concerns that refer to broader human interests than just the instrumental ones (Norton
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4 194 2005). Adopting an economic language and metaphor to frame human–nature relationships implies
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6 195 the idea of possible equivalents (i.e. certain components of nature can be replaced completely by
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8 196 other components or human-derived alternatives). For example, an implication of possible
9
10 197 equivalents is that the loss of a species and its various contributions to ecosystem function is
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12 198 compensated for completely by other species in the system or through human alternatives (e.g. the
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14 199 loss of biological control agents compensated for in all contexts through the use of pesticides).
15
16 200 While substitution and compensation for the loss of species and habitats might in some cases be
17
18 201 ‘economically rational’, there are other rationalities that do not accept substitution. Also, from the
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20 202 perspective of environmental ethics, one could argue for the importance of recognizing nature’s
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22 203 intrinsic moral value, and that this value is inappropriately reduced when nature is subjected to
23
24 204 simple economic measures based on, for example, willingness-to-pay (Sagoff 2010). As the ES
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26 205 concept increases in prominence, it becomes arguably even more important to contrast its core
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28 206 metaphor of nature as a supplier of services with alternative metaphors and ways of valuing nature
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30 207 (e.g. nature as kin; see ‘Addressing ethical considerations’).
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208

209 *Monetary valuation*

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39 210 Monetary valuation of ES is a specific instance of economic framing and so it includes all of the
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41 211 concerns listed in the section above, and is a major source of ethical controversy (Spash 2008, Child
42
43 212 2009). For example, monetary valuation of species raises the ethical issue of the anthropocentric
44
45 213 bias in how value is assigned across species. Martín-López et al. (2008) demonstrated that visible
46
47 214 and well-known species (e.g. giant panda *Ailuropoda melanoleuca* or mountain gorilla *Gorilla*
48
49 215 *beringei beringei*) attract greater attention and hence higher willingness-to-pay than less visible and
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51 216 more poorly known species (e.g. microorganisms). This has important ethical implications in terms
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53 217 of, for example, how priorities are set and public funds are allocated for conservation.
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2 218 Contingent valuation is a frequently used tool for the monetary valuation of ES because
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4 219 many services are not private goods so they are generally not directly associated with existing
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6 220 markets. Yet, there is evidence showing that respondents to contingent valuation surveys often
7
8 221 refuse to value nature in monetary terms (O'Neill and Spash 2000, García-Llorente et al. 2011). So-
9
10 222 called 'protest' responses (high individual bids, zero bids or refusal to bid) have been interpreted by
11
12 223 some researchers as respondents being unwilling to assign a monetary value to ecosystem
13
14 224 components because they feel that this is an act of betrayal of a moral commitment (Svedsäter
15
16 225 2003). Moreover, proponents concerned with the distributional justice of the benefits and burdens
17
18 226 from nature conservation have noted that 'the poor sell cheap'; that is, people in need are willing (or
19
20 227 forced) to accept lower sums of money for ES loss (Martínez-Alier 2002). Finally, some authors
21
22 228 have objected to valuing ES in monetary terms on the grounds that it promotes the commodification
23
24 229 of nature (e.g. Gómez-Baggethun and Ruiz-Pérez 2011).

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30 231 *Commodification*

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32 232 The commodification of ecosystem functions and biodiversity (i.e. the expansion of market trade to
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34 233 previously non-marketed areas of the environment) is an important ethical consideration related to
35
36 234 the application of the ES concept. Ethical concerns associated with commodification of nature are
37
38 235 not new. For example, under the rubric of 'commodity fiction', Polanyi (1957) scrutinized critically
39
40 236 the commodification of land, arguing that such commodification involved subsuming to market
41
42 237 forces the very essence of human societies. As quoted in Gómez-Baggethun and colleagues (2010),
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44 238 Polanyi (1957, p. 178) wrote "The economic function is but one of many vital functions of land. It
45
46 239 invests man's life with stability; it is the site of his habitation; it is a condition of his physical safety;
47
48 240 it is the landscape". Ethical controversies related to commodification have grown with the
49
50 241 expansion of new market-based mechanisms for the management of ES (Spash 2008, Kosoy and
51
52 242 Corbera 2010, Gómez-Baggethun and Ruiz-Pérez 2011). Commodification of nature is now a
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54 243 widespread phenomenon associated with a growing number of ecosystem functions (e.g. carbon
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2 244 sequestration, watershed regulation and habitat provision) that can be increasingly traded in markets
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4 245 through mechanisms like PES, carbon markets, and biodiversity offsets.

5
6 246 Protest responses recorded in contingent valuation surveys, as discussed above, have been
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8 247 interpreted also as a resistance by respondents to represent ecosystem components in a commodity-
9
10 248 like fashion (Vatn 2000). According to some authors, this may reflect recognition by people that
11
12 249 there are ethical limits to commodification (e.g. Douai 2009). A further concern with
13
14 250 commodification is the notion of the relational value of natural entities (Muraca 2011), which
15
16 251 argues that human well-being rests on relationships with the human and non-human environment
17
18 252 and that these relationships cannot adequately be commodified because their very essence is
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20 253 uniqueness not transferability. In fact, adopting the commodity metaphor that is often implicit in the
21
22 254 ES concept implies the idea of possible equivalents, and of the capacity to substitute and
23
24 255 compensate for the loss of species and habitats (e.g. tradable development permits in habitat and
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26 256 wetland banking; Spash 2008).

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33 258 *Socio-cultural impact*

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35 259 The use of market instruments in the application of the ES concept raises ethical questions about the
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37 260 socio-cultural impacts of these instruments, especially when applied in rural or indigenous
38
39 261 communities where external markets may be a relatively new phenomenon. Socio-cultural impacts
40
41 262 (which may be either positive or negative) can include long-term changes in quality of life,
42
43 263 independence, attitudes or belief systems, culture, security, empowerment of women, community
44
45 264 identity or other changes in behavior and motivations for conserving nature (Gómez-Baggethun et
46
47 265 al. 2010). Assessments of socio-cultural impacts related to the application of the ES concept must
48
49 266 focus on both short- and long-term effects because these can vary. For example, while short-term
50
51 267 assessments of PES schemes record increased income to payee communities, there may be longer
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53 268 term social impacts of these schemes and anthropological evidence from integrated conservation
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55 269 and development programs suggests that the likelihood of long-term impacts are real (e.g. West
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1
2 270 2006) and can include loss of tenure rights, change in social institutions (such as marriage) and a
3
4 271 reduction in cultural diversity. The lack of reliable data to address long-term effects of PES and
5
6 272 other economic instruments that build on the ES concept is partly a consequence of the lack of
7
8 273 adequate monitoring, and partly because socio-cultural impacts are often indirect and difficult to
9
10 274 measure, and therefore tend to go unobserved or unrecorded (Caplow et al. 2010).

11
12
13 275 Although the empirical basis to address this issue is still weak, there is emerging evidence of
14
15 276 cultural impacts from the application of PES schemes (Grieg-Gran et al. 2005). For example,
16
17 277 research on PES programs in Central America and Uganda have documented loss of customary
18
19 278 tenure rights or access to the commons (Corbera et al. 2007, Carter 2009), while similar research in
20
21 279 Mexico has reported reductions in dietary diversity and loss of cultural practices (Ibarra et al. 2011).
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23
24 280 Moreover, eligibility criteria to participate in PES programs have made it difficult for the poor to
25
26 281 participate, usually due to the requirement of land title in order to establish the contract (Corbera et
27
28 282 al. 2007). Because cultural changes are often slow, addressing the ethical question of the full range
29
30 283 of socio-cultural impacts of PES programs and other ES applications will require robust
31
32 284 assessments of baseline conditions and medium- to long-term monitoring. We believe that co-
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34 285 management schemes where Government agencies work in collaboration with local communities
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36 286 would be well positioned to conduct this monitoring to ensure year-to-year consistency in
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38 287 assessment procedures and longevity of funding support.
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43 289 *Changes in motivations*

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46 290 An important ethical question raised in relation to the establishment of economic incentives to
47
48 291 secure ES supply relates to potential changes in motivations for protecting the environment. It has
49
50 292 been argued that the very conceptualization of ecosystem functions in economic terms can affect
51
52 293 motivations for conservation and favor utilitarian logics in human–nature relationships (Vatn 2000).
53
54 294 Furthermore, empirical data from behavioral experiments suggest that environmental policies based
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56 295 on economic incentives such as PES involve a risk of eroding non-economic incentives for
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1
2 296 environmental stewardship, a phenomenon often referred to as motivational crowding out (Bowles
3
4 297 2008, Vatn 2010). For example, Vatn (2010) argues that while PES may strengthen community
5
6 298 relations and simplify action for environmental care, these schemes may also introduce instrumental
7
8 299 logics and in some cases worsen the status of the environment by crowding out other environmental
9
10 300 virtues. This issue can be particularly problematic, because further empirical evidence from
11
12 301 experimental economics suggests that once the motivational change has taken place (i.e. an
13
14 302 economic incentive replaces a moral incentive) it may be difficult to return to the original
15
16 303 motivation even if the economic incentive disappears (Gneezy and Rustichini 2000). Moreover, if
17
18 304 monetary payments are not large enough to compensate for the opportunity cost of conservation
19
20 305 (e.g. restrictions on obtaining an income from the conserved land), instruments like PES might be
21
22 306 counter-productive (i.e. result in weaker conservation outcomes).
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307

308 *Equity implications*

309 Independent of the question of how ES are valued is the fact that protecting the supply of services
310 can bestow asymmetric costs and benefits to different sectors of society. This raises the important
311 issue of the ethically appropriate assignment of costs and benefits. Problems such as these are the
312 essence of environmental justice, focused primarily on the fair distribution of environmental costs
313 and benefits and the procedural aspects of attaining this distribution (Schlossberg 2007). This is
314 directly relevant to the management of ES. For example, in China, upstream landowners are
315 required to manage forest cover to ensure the ongoing supply of hydrological services primarily to
316 downstream beneficiaries (Liu et al. 2008). Yet, protection of forest could represent an opportunity
317 cost to upstream landowners who may wish to clear the land to, for example, grow crops. Upstream
318 suppliers may rightfully claim monetary compensation (e.g. PES) for engaging in land management
319 that benefits others (at a potentially personal cost). However, one might argue that upstream
320 landowners have a pre-existing moral obligation not to harm others by said land clearing.

321 Environmental justice concerns are relevant also when, for example, a landholder utilizes ES for his

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2 322 or her personal profit (e.g. harvesting timber), but subsequently compromises the provision of other
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4 323 ES that may benefit the broader community (e.g. carbon storage, water filtration, or recreation). An
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6 324 assessment of the value of the 'lost' ES is fundamental to identifying a fair distribution of costs and
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8 325 benefits.
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10 326 While the discussion above relates primarily to intra-generational equity, *inter-generational*
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12 327 equity is an equally relevant component of environmental justice concerns and the ethics of ES.
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14 328 Ethical considerations arise, for example, when current generations consider giving up current
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16 329 income for the benefit of future generations, or the opposite; gaining benefits now at the expense of
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18 330 future generations (TEEB 2008). Preferences expressed in current markets cannot capture the
19
20 331 preferences of future generations. Discount rates are the solution generally suggested by economists
21
22 332 to address this problem. However, these discount rates are often arbitrarily fixed and tend to
23
24 333 undervalue the interests of future generations by using rates that are too high (Martínez-Alier 2002).
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26 334 For example, TEEB (2008, p. 5) reports that "...a 4% discount rate means that we value a natural
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28 335 service to our own grandchildren (50 years hence) at one-seventh the utility we derive from it". One
29
30 336 way of tackling this issue is to use discount rates that are variable, that is, much higher in the near-
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32 337 future than in the more distant future, to account for the reality of personal discounting and the
33
34 338 ethics of social discounting for future generations (Sumaila and Walters 2005). TEEB (2008)
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36 339 advocated using 'social discount rates', which engage ethical aspects involved in choices such as
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38 340 consumption now versus later, or consumption for society versus consumption for individuals.
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46 342 **Addressing ethical considerations**

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48 343 In this section, we outline the ethical concerns pertinent to each application of the ES concept and
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50 344 describe strategies to address these concerns. In certain cases, it may be appropriate to provide
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52 345 simply a more detailed explanation of the major principles of the ES concept to alleviate ethical
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54 346 concerns. In other circumstances, modifying how the concept is applied on the ground is crucial to
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56 347 addressing ethical issues (Table 2).
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1
2 348 Ethical concerns related to anthropocentric and economic framing pertain to all the
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4 349 applications that explicitly refer to the ES concept (by thinking of nature as a source of ‘services’).
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6 350 In relation to communication tools (i.e. raising awareness, strategic arguments, and interdisciplinary
7
8 351 communication) the use of economic framing alone may be avoided by explicitly employing
9
10 352 multiple metaphors to describe nature; for example, nature as material life support, nature as sacred,
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12 353 nature as kin, or humans as stewards of nature. The economic metaphor does not necessarily need to
13
14 354 be central to any communication regarding how ecosystems contribute to human well-being.
15
16 355 Communication about the multiple ways in which nature not only sustains but enriches human lives
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18 356 moves far beyond narrow human self-interest and includes aspects like emotional attachment,
19
20 357 cultural meaning or aesthetic experience.
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24 358 When deciding on the most appropriate metaphor to use to communicate the value of nature,
25
26 359 it is pertinent to consider the target audience. For example, some policy makers or economic
27
28 360 rationalists may more easily dismiss non-economic arguments for protecting ecosystems, especially
29
30 361 where monetary valuation is central to guiding decisions among competing values. Yet, deeply held
31
32 362 personal values may trump economic rationalism; hence, a detailed understanding of the personal
33
34 363 and professional backgrounds of message recipients is likely crucial to successfully conveying the
35
36 364 value of nature.
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39 365 In providing policy guidance and priority setting, and developing strategic objectives and
40
41 366 designing policy instruments, the ES approach is only one potential strategy for achieving desired
42
43 367 outcomes in nature conservation and improving human livelihoods. Acknowledging the legitimacy
44
45 368 of alternative approaches and valuation languages for conserving nature helps to avoid any one
46
47 369 strategy, including the ES concept, from dominating the conservation discourse. To achieve this
48
49 370 objective in the current context, instead of beginning with the ES concept, one might take a
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51 371 comprehensive, deliberative and inclusive approach to addressing management issues, including
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53 372 appropriate framing of the problem and choice among available management options (see ‘Placing
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55 373 ES in a broader management context’).
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1
2 374 Concerns about monetary valuation of nature relate primarily to priority setting applications
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4 375 and to a lesser extent the design of policy instruments. To address these concerns it may be possible
5
6 376 and appropriate to employ non-monetary measures of valuation either alone or in concert with
7
8 377 monetary measures (Table 2). For example, Chan et al. (2012) described eight dimensions of values
9
10 378 pertinent to appropriate valuation and decision making in the context of protecting ES, including
11
12 379 whether the values at hand are associated with consequences, moral principles or virtues, or best
13
14 380 understood as characteristic of groups vs. individuals. When and if using monetary measures for
15
16 381 valuation is desirable, attention should be given also to the most appropriate design of non-market
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18 382 valuation. For example, it might be desirable to employ choice experiments, where monetary values
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20 383 can be derived from choices among alternatives in which monetary measures are but one variable
21
22 384 among several others (e.g. the choice between different types of vacations to Vancouver Island,
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24 385 Canada, that may involve seeing sea otters, a guided wildlife tour or other organised activities, and
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26 386 various kinds of accommodation, and also an associated cost), rather than traditional contingent
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28 387 valuation in which stated monetary values are requested directly (e.g. 'how much would you be
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30 388 willing to pay...').
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35 389 Ethical questions raised by the commodification of nature relate primarily to policy-
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37 390 instrument applications and more specifically to those implying tradable permits over ES (e.g.
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39 391 carbon markets, wetland banking, and biodiversity offsets). Addressing commodification concerns
40
41 392 may be partly achieved through promoting approaches to manage common-property resources
42
43 393 rather than privatizing resources. For example, PES programs can be seen as a means of privatizing
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45 394 a resource that previously had some qualities of a public good (Kinzig et al. 2011), and is an
46
47 395 attractive option for managing for sustainability if the arguments related to the 'tragedy of the
48
49 396 commons' are accepted. However, Ostrom and colleagues have demonstrated that such 'tragedies'
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51 397 can be avoided through collective action even in the context of common-pool resources (Ostrom et
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53 398 al. 1999). Concerns associated with commodification may also be addressed by restricting
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55 399 commodification to certain types of ES or benefits in contexts where markets are already
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1
2 400 widespread (e.g. food production) and even banning it in specific environmental domains. The latter
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4 401 option would be appropriate for benefits directly linked to vital social values or processes, to ES
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6 402 covering basic conditions for life (conceivable as 'rights'), and to ecological processes and
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8 403 components for which there may not be economic substitutes and for which private property rights
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10 404 can be undesirable (e.g. clean air and potable water).

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12
13 405 Ethical concerns regarding socio-cultural impacts pertain mostly to the priority setting
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15 406 applications of the ES concept and to a lesser degree designing policy instruments. Addressing
16
17 407 socio-cultural ethical concerns effectively generally requires baseline assessments accompanied by
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19 408 long-term studies of the impacts of a particular application across diverse communities, and
20
21 409 adopting the precautionary principle when necessary. What limited evidence exists (see 'Socio-
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23 410 cultural impact'), suggests loss of common access rights and little benefit for poorer people in PES
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25 411 scheme implementations in developing countries. Tackling these concerns may require greater
26
27 412 emphasis on community rather than individual benefits and rights (Table 2).

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30 413 Ethical concerns around changes in motivations are relevant to all ES applications that
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32 414 appeal to self-interest or invoke new incentives for conserving nature. The concerns about
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34 415 motivational crowding out can be addressed largely by adequate design of the motivational
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36 416 incentive(s) in relation to the context(s) in which it is applied (see Bowles 2008). The behavioral
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38 417 outcomes of incentives depend on a variety of factors, including the nature of motivations and the
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40 418 type of incentive, and the likelihood of motivational crowding out is higher when habits have an
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42 419 important pro-social component, intrinsic or moral motivations are salient, and rewards are
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44 420 monetary and relatively low (Lacetera and Macis 2010). In this context, a key challenge is to
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46 421 identify institutional designs for motivational structures in which intrinsic and utilitarian values
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48 422 complement each other, and to identify situations where the use of utility-based rationalities (e.g.
49
50 423 financial incentives) may undermine moral sentiments for conservation (Bowles 2008). Initiatives
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52 424 will more successfully appeal to intrinsic and instrumental motivations if they are explicit about the
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54 425 moral value of an action and also offer either or both technical or financial assistance towards that
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2 426 action. Initiatives must also explicitly acknowledge the various motivations and reasons for
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4 427 protecting and managing nature. The associated communication strategy must convey the message
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6 428 that monetary values of ES are minimum values only, and that intangible values related to, for
7
8 429 example, cultural services are priceless (see TEEB 2008, p.33, Figure 3.2, which places monetary
9
10 430 values of ES in context). Apart from prudential reasons that appeal to self-interests, communication
11
12 431 strategies should also stress moral reasons (which involve arguments of justice) and ethical reasons
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14 432 that pertain to specific ideas about what humans need to lead a 'good' life (Eser 2009).

15
16
17 433 Equity implications and environmental justice concerns relate mostly to priority setting and
18
19 434 policy design applications. These concerns can be alleviated via comprehensive identification of the
20
21 435 sectors of society that experience costs or benefits from the management of a given ES in a given
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23 436 context. Such identification enables management of the service designed to yield a fair distribution
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25 437 of costs and benefits (e.g. through PES schemes or through fair distribution of property rights).

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29 30 439 **Placing ES in a broader management context**

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32 440 Addressing ethical concerns related to the ES concept requires also placing the approach within a
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34 441 broader policy and management context. That is, treating it as one possible management strategy
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36 442 alongside the many others that are related to the fields of 'action-orientated research' and 'evidence-
37
38 443 based policy or management'. This then allows the full gamut of ethical questions to be raised and
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40 444 compared across different possible management approaches. Central to these approaches is the
41
42 445 issue of problem framing (or problem recognition), which involves individuals, communities or
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44 446 organisations coming together to agree that there is a problem that ought to be addressed.

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47 447 The ES approach is often accompanied by a 'zero price problem' narrative of ecosystem
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49 448 goods with public good character (Kinzig et al. 2011), which is just one way in which problems can
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51 449 be framed. Contemporary approaches to environmental management, particularly those that have
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53 450 evolved out of the sustainability debate, often take the position that problem framing must be done
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55 451 in an inclusive, participatory way, and be based on interdisciplinary frameworks that involve
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1
2 452 scientific experts, policymakers and stakeholders (Munda et al. 2008). If it is accepted that
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4 453 procedural legitimacy can be strengthened through democratic and participatory approaches, then
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6 454 the ethical issues that follow are related to whether the process of problem framing can identify
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8 455 relevant stakeholders, how powerless stakeholders are given voice, and whether the ES concept is
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10 456 appropriate for the particular context.

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12 457 A key principle of inclusive ecosystem management, in which, it could be argued, the ES
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14 458 approach is embedded, is that decisions about resource use are a matter of social choice (Potschin
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16 459 and Haines-Young 2011). If actions related to ES management are to appropriately address ethical
17
18 460 considerations, the decision-making process must involve a clear articulation of management
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20 461 options to allow informed choices to be made. A criticism of stakeholder engagement is that it is
21
22 462 often misused as a way of legitimising decisions that have already been made, and only pays lip-
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24 463 service to consultation (Shepherd and Bowler 1997). Stakeholders may be more willing to take
25
26 464 ownership of solutions they had a role in developing.

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29 465 Central to the ES approach is evidence-based decision making, which aims to integrate
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31 466 understanding (with available evidence) of the social implications of environmental change across
32
33 467 all stakeholders. However, there is a risk that ES applications may entrench existing inequalities
34
35 468 because some stakeholders have greater access to evidence and its integration into decision making
36
37 469 than do others (Ferraro 2008). In order to mitigate these political-economy kinds of ethical issues,
38
39 470 decision makers should be transparent and inclusive regarding the type and availability of evidence,
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41 471 and how that evidence is scrutinised. This includes establishing at the outset the use of quantitative
42
43 472 and/or qualitative data as evidence, how to treat uncertainty, the roles of different stakeholder
44
45 473 groups in evaluating the evidence, how to ensure equitable access to information, and the tools
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47 474 needed to process and analyse the information. Fair process is likely to facilitate fair outcomes, but
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49 475 since some stakeholder groups may not possess even the capacity to effectively advocate for a
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51 476 desirable process, arrangements to ensure that all parties have effective advocates is essential
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53 477 (Ferraro 2008).
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2 478 Regardless of the evidence base, choices regarding actions will eventually be made and at
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4 479 this point ethical issues become most apparent because the process generally involves using a set of
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6 480 criteria to weigh the consequences of alternative choices. Much of the debate surrounding the major
7
8 481 ethical issues listed above concerns the nature of the criteria used to assess choices. For example,
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10 482 monetary valuation of nature is only one approach, or one possible valuation language, to
11
12 483 demonstrate the importance of the natural environment to humanity (Martínez-Alier 2002; Chan et
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14 484 al. 2012).

15
16
17 485 In many situations, multiple criteria are used to assess choices even when most stakeholders
18
19 486 agree that economic values are a significant element in their decision making (Munda 2008). For
20
21 487 example, it is widely acknowledged that valuation of marginal changes in the economic value of ES
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23 488 can be meaningful only when social-ecological systems are not close to a tipping point or regime
24
25 489 shift (e.g. Limburg et al. 2002, Fisher et al. 2008). In the context of sustainability science, for
26
27 490 example, the criteria used to evaluate policy or management proposals should be based on an
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29 491 inclusive, deliberative and participative process and also be ‘revelatory’ and ‘designed to minimise
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31 492 losers’ (O’Riordan 2001).

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35 493 Once a decision has been made, the management action to be implemented will also likely
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37 494 raise ethical issues. These issues may actually be included in the criteria that are considered during
38
39 495 the choice-making process, but it is worth separating the implementation phase from the earlier
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41 496 phases to emphasise that ends do not necessarily justify means. For example, it may be
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43 497 economically efficient to pay landowners to supply a particular ES (e.g. water filtration), but, as
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45 498 discussed above, from the perspective of environmental justice it may not be morally appropriate to
46
47 499 compensate landowners for not undertaking actions that may be considered damaging to other
48
49 500 sectors of society. The rights and responsibilities associated with the ownership of land or resources
50
51 501 have to be part of the ethical debate surrounding the appropriateness of the ES concept (Corbera et
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53 502 al. 2007, Vatn 2010), along with scrutiny of the balance between private and public goods and
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55 503 benefits.
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2 504 As we have argued above, decisions and actions with regard to ES occur in the face of
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4 505 substantial uncertainty. The outcomes of actions must therefore be monitored, accepting that
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6 506 modifying actions is required if outcomes are not desirable. Monitoring and adaptive management
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8 507 (i.e. learning from mistakes) is vital to demonstrate the appropriate expenditure of funds and to
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10 508 show that the expectations of stakeholders and wider society have been met without significant
11
12 509 unintended consequences. The motivation for adopting this type of adaptive management is
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14 510 technical (owing to uncertainty) and ethical. That is, we argue, it is ethical to reconsider the initial
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16 511 decision if evidence suggests outcomes from that decision are unacceptable.
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21 513 **Conclusion**

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24 514 The ES concept is applied in many different contexts, which yield different consequences and raise
25
26 515 different suites of ethical issues. While the economic framing of ES in general, and their monetary
27
28 516 valuation in particular, have received special attention, this emphasis does not (and should not)
29
30 517 necessarily lead to a denial of the non-use and intrinsic values of nature. These particular values
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32 518 may not be central to economic conceptualizations of the benefits of nature, but there are means for
33
34 519 effectively integrating intangible and non-economic values into ES practice (Chan et al. 2012).
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36 520 Applications of the ES concept that involve monetization or commodification of nature raise a raft
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38 521 of ethical issues that are not necessarily pertinent to using the concept to raise awareness or develop
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40 522 strategic arguments. Therefore, it is vital to recognise the context-dependence of ethical concerns to
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42 523 ensure that the most relevant concerns are addressed for a given application.
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46 524 The increasing prominence of the ES concept has occurred in parallel with the rise of a
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48 525 globalized economy, increasing privatization of public assets, and greater Government deregulation
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50 526 and economic rationalism. This environment is challenging for promoting non-monetary values of
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52 527 nature, and local communities that elevate intrinsic values above all else may experience economic
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54 528 disadvantage, especially considering the increasing opportunities afforded by global trade. For
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56 529 example, the global trade in timber means that forest resources can be harvested from a number of
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1
2 530 locations and local communities that promote these instrumental values of forests may experience
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4 531 greater financial reward than those that do not, putting increasing pressure on the latter to abandon
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6 532 some of their intrinsic values, especially in times of economic hardship. Some policy instruments
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8 533 (e.g. REDD+) are designed to address this issue by establishing financial incentives for forest
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10 534 protection. Yet, these instruments are very recent, and their capacity for long-term protection is
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12 535 untested. Promoting the intrinsic values of nature will likely become increasingly difficult with
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14 536 growing economic uncertainty.

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17 537 Our approach provides both generalized and specific recommendations. Several
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19 538 commentators have emphasised the importance of place and context in terms of, for example,
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21 539 understanding values and trade-offs related to ES (e.g. Martin-López et al. 2008; Sagoff 2010). We
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23 540 argue that the treatment of ethical issues is no different and that few principles can be applied
24
25 541 universally. A major challenge then is to ensure that the actors in any particular application of the
26
27 542 ES concept are sensitive to the range of possible ethical considerations, and that these
28
29 543 considerations are treated alongside other issues in a reflective and deliberative fashion.
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38
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56 57 555 **References**

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684 Table 1. Applications of the ecosystem-services concept.

Ecosystem service application	Theme(s)	Examples
Awareness raising and education	Communication tool	MA; TEEB; Ecuador national mapping
Strategic arguments	Communication tool	EU biodiversity strategy to 2020; Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
Interdisciplinary communication	Communication tool	Ecological economics; Sustainability science
Cost-benefit analyses	Policy guidance/priority setting	
Green accounting	Policy guidance/priority setting	Integrated System of Environmental and Economic Accounts; Common International Classification of Ecosystem Services
Spatial planning	Strategic objective/policy instruments	Integrated coastal zone management
Land or resource management	Strategic objective/policy instruments	Natural Capital Project
Policymaking and law writing	Strategic objective/policy instruments	Kyoto Protocol; REDD
Multi-objective programs	Strategic objective/policy instruments	Ecosystem Services for Poverty Alleviation
Payments for ecosystem services	Strategic objective/policy instruments	Water fund; REDD+; PES programs in Costa Rica and Mexico

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2 691 Table 2. Addressing ethical considerations for each application of the ecosystem-services concept.

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Ethical considerations	Most relevant practical applications	Addressing ethical considerations
Anthropocentric framing and economic metaphor	All	Employ multiple metaphors to describe nature (e.g. stewardship of nature). Consider the ecosystem-service concept as one of many possible management options.
Monetary valuation and commodification	Policy guidance/priority setting Strategic objective/policy instruments	Employ non-monetary measures of valuation (in addition to, or instead of monetary measures). Consider the most appropriate design of non-market valuation (e.g. choice experiments). Promote approaches to manage common-property resources. Restrict commodification to certain types of ecosystem services (e.g. food production) and ban it for others.
Socio-cultural impact	Policy guidance/priority setting Strategic objective/policy instruments	Emphasize community rather than individual benefits. Develop baseline assessments and long-term studies of impacts of particular applications. Adopt the precautionary principle when impacts are potentially high.
Changes in motivations	All	Consider design of motivational incentives in relation to context. Employ instrumental incentives that enhance or complement intrinsic incentives. Acknowledge upfront the various motivations for protecting nature.
Equity implications	Policy guidance/priority setting Strategic objective/policy instruments	Identify societal sectors that experience costs or benefits from ecosystem-service management.

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2 Employ fair compensation to those experiencing
3 costs (e.g. through PES schemes).
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5 Design PES schemes as re-distributional
6 mechanisms and/or as compensation for
7 ecological debts.
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