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Nature commodification: 'a necessary evil'? An analysis of the views of environmental professionals on ecosystem services-based approaches

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1 **Nature commodification: ‘a necessary evil’?**
2 **An analysis of the views of environmental professionals on ecosystem**
3 **services-based approaches**
4

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12
13 **Abstract**

14 Ecosystem services (ES) has established itself as the predominant paradigm for framing
15 environmental research and policy-making. Its rapid popularization is raising concerns about the
16 possibility that it might lead to nature commodification. These concerns have been associated with
17 a broader agenda for the neoliberalization of conservation, but research on this area remains
18 mostly theoretical. This paper advances the debate with an empirical study on the views of
19 environmental professionals. The views of those who shape interpretation, uptake and
20 implementation environmental practice are of critical importance since they give the real mark on
21 whether any fundamental change in the current direction of environmental governance is to be
22 expected. Using Mexico as an exemplar case of a country in which ES have clearly entered the
23 environmental discourse, provides a forewarning of what might happen more broadly. Results
24 indicate that, while acknowledging risks of commodification, environmental professionals
25 consider a greater risk ‘missing out’ on opportunities to internalize ES monetary values in an
26 economic growth-oriented context. They see negative side-effects as ‘necessary evils’ to achieve
27 conservation targets. Any substantial change in environmental governance is more likely to occur
28 due to the disenchantment produced by the lack of impact in practice than of fears of
29 commodification.

30
31 **Keywords:** conservation, market-based environmentalism, Mexico, neoliberalism, payments for
32 ecosystem services, valuation
33

34 1. Introduction

35 Human-nature relationships have been of interest since ancient times and different
36 conceptualisations of such relationships have emerged over time (Gómez-Baggethun et al., 2010;
37 Raymond et al., 2013; Saarikoski et al., 2018). The term ecosystem services is one such
38 conceptualisation coined in the 1960s primarily to raise awareness among policy-makers for
39 biodiversity losses by emphasising the benefits that nature freely provides to society (Gómez-
40 Baggethun et al., 2010). Literature on ecosystem services grew from the late 1990s (Costanza et
41 al., 1997; Daily, 1997; De Groot et al., 2002), until it firmly entered the policy arena when the UN
42 Secretary-General Kofi Annan called for a global assessment of the world's ecosystem services
43 (Millennium Ecosystem Assessment report, (MEA, 2005)). Ecosystem services were then formally
44 defined as the benefits that people obtain from ecosystems and were categorized into supporting,
45 provisioning, regulating, or cultural services, which all directly or indirectly contribute to human
46 wellbeing. From the common base of the MEA, a multitude of academic contributions and refined
47 definitions and classifications have emerged (Martin-Ortega et al., 2015; Ojea et al., 2012), making
48 it gain prominence as the paradigm for framing environmental research and policy-making (Martin-
49 Ortega et al., 2015; Raymond et al., 2013).

50 Strongly linked to the overall conceptualization of ecosystem services is the issue of their valuation
51 (Gómez-Baggethun et al., 2010). Mainstream environmental economics assumes that values and
52 benefits derived from nature can ultimately be expressed as “change[s] in human wellbeing arising
53 from the provision of [an environmental] good or service” (Bateman et al, 2002: 1), with rational
54 human beings seeking to maximise their wellbeing according to their substitutable preferences
55 (Pearce and Turner, 1990). Under this paradigm, rooted in neoclassical economics, values are
56 expressed as welfare changes. These can be determined through formal valuation exercises that
57 estimate relative values and people's willingness to exchange scarce means (usually money) to
58 achieve an environmental change. Values of ecosystem services calculated in this way can then be
59 internalized in environmental decision-making (Costanza et al., 2017, 1997).

60 The ecosystem services concept has arguably inspired novel avenues for environmental research,
61 it has enhanced communication, debates, and cooperation between scientists from a diverse
62 range of disciplines, as well as policy-makers, conservationists, and practitioners (Costanza et al.,
63 2017; Martin-Ortega et al., 2015). Beyond the MEA, the global TEEB initiative (The Economics of
64 Ecosystem Services and Biodiversity (Kumar, 2010)), and related national ecosystem assessments
65 such as the UK NEA (Bateman et al., 2011), as well as its adoption by the Convention on Biological
66 Conservation (Prip, 2018), are testimony of the concept's wide-ranging appeal. Another example
67 is the worldwide popularisation of payments for ecosystem services (PES) schemes (Porras et al.,
68 2008; Schomers and Matzdorf, 2013; Waylen and Martin-Ortega, 2018). PES, which have been
69 defined and conceptualized in various ways (Martin-Ortega and Waylen, 2018; Wunder, 2015),
70 provide economic incentives for land management practices that are supposed to enhance or
71 secure the provision of ecosystem services. They are based on the Coasean postulate by which the
72 social optimum may be attained via bargaining between those producing the service and those
73 benefiting from it (Engel et al., 2008; Wunder, 2005).

74 Inevitably, this popularisation has also led to the emergence of new debates and criticisms. Even
75 those who do not necessarily question this notion see large gaps between the conceptual
76 architecture of ecosystem services-based approaches and its translation into policy practice
77 (Nahlik et al., 2012). Others question the added value of the ecosystem services concept beyond
78 cosmetic efforts such as re-labelling pre-existing environmental management approaches (Martin-
79 Ortega et al., 2015; Waylen and Martin-Ortega, 2018). More critically, others point out at the risk of
80 oversimplifying ecological, economic and political processes through the use of the ecosystem
81 services notion (Norgaard, 2010). Ecological economists are critical of the neoclassical
82 conceptualisation of environmental values and argue that some values are incommensurate and
83 cannot be measured with a single measurement unit such as money (Martinez-Alier et al., 1998;

84 Schulz et al., 2017). Concerns have also been raised about ecosystem services reasoning converting
85 nature into a tradable commodity (Brockington, 2011; Gómez-Baggethun and Ruiz-Pérez, 2011;
86 Kosoy and Corbera, 2010), marginalizing and crowding-out non-anthropocentric (often non-
87 Western/utilitarian) frameworks for nature conservation (Raymond et al., 2013).

88 The present paper is concerned with this later issue: the risk of nature commodification. So far,
89 these debates have been vastly dominated by theoretical contributions. Of the few existing
90 empirical studies, some have experimentally explored behavioural changes associated with the use
91 of the notion of ecosystem services (Novo et al., 2018); others have applied document analysis to
92 investigate commodification effects in environmental public policies (Mesa-Jurado et al., 2018) and
93 others have used in-depth case study examination to explore institutional aspects of
94 commodification (Osborne and Shapiro-Garza, 2018). In this paper we focus on the views of those
95 involved in informing, designing and implementing environmental public policy, aiming to
96 understand the extent to which they consider there is a risk of commodifying nature in the
97 adoption of ecosystem services-based approaches. The views of environmental professionals are
98 of critical interest since they shape interpretation, uptake and implementation of ecosystem
99 services-based approaches in practice. This critically affects if and how these approaches are
100 consolidated in the long-rung and the consequences that this might have for environmental
101 management practice. The present study also goes beyond previous research on the views of
102 environmental professionals in this area by expanding the focus beyond market-based instruments
103 only (Martin-Ortega and Waylen, 2018; Sandbrook et al., 2013) and covering ecosystem services-
104 based approaches more broadly.

105 We apply semi-structured interviews to a purposive sample of influential national level Mexican
106 environmental professionals, academics and practitioners. Using Hahn et al. 's (2015) framework
107 for the identification of degrees of commodification, we discuss the views of these professionals
108 in the context of the academic debates. Mexico is used here as an exemplar case of a country in
109 which the ecosystem services discourse has clearly permeated environmental public policy (Mesa-
110 Jurado et al., 2018; Shapiro-Garza, 2013). Discussions of results are, though, of global relevance due
111 to the widespread interest on and application of ecosystem services-based approaches, and the
112 potentially radical way in which these may environmental management and conservation
113 (Sandbrook et al., 2013).

114 The remainder of this paper is organized as follows. Section 2 summarizes the debates on
115 ecosystem services-based approaches and the risk of commodification. Section 3 presents a brief
116 overview of the historical and current use of ecosystem services-based approaches in Mexico's
117 environmental public policy, highlighting its interest as a case study. Methods are described in
118 section 4, followed by a results and discussion section (5). Conclusions are drawn in section 6.

119

120 **2. Ecosystem services-based approaches and nature commodification**

121 We refer to ecosystem services-based approaches as a purposively broader concept than just the
122 notion of benefits that humans obtain from nature. As in Martin-Ortega et al. (2015), we refer to a
123 particular way of understanding the relationships between humans and the environment, which
124 relies on the notion of ecosystem services but that can take different forms and have different
125 purposes. Ecosystem services-based approaches therefore encompass conceptual frameworks
126 such as the ecosystem services cascade (Haines-Young and Postchin, 2010), frameworks of actions
127 (e.g. the Ecosystem Approach (Waylen et al. 2014)), ecosystems assessments (e.g. the UK NEA or
128 TEEB (Bateman et al., 2011; Kumar, 2010)) and individual valuation exercises, as well as instruments
129 for environmental governance such as PES. The underlying core element that underpins any of
130 these is an anthropocentric and instrumental conceptualization of human-nature relationships,
131 based indeed on the central idea that nature produces services that are beneficial to humans, with
132 the purpose of guiding environmental decision-making (Martin-Ortega et al., 2015).

133 While initially the notion of ecosystem services was introduced to ensure that the value of nature
134 was not ignored in environmental decisions (Costanza et al., 1997; Gómez-Baggethun et al., 2010;
135 Peterson et al., 2010), there is growing concern that its mainstreaming might undermine this very
136 purpose (Gómez-Baggethun et al., 2010; Gómez-Baggethun and Ruiz-Pérez, 2011). As explained by
137 Schulz et al. (2017), criticism around the notion of ecosystem services can be understood in the
138 light of the philosophical debate on the nature of values, i.e. whether something (in this case
139 nature or the environment) has a value for its own sake (i.e. an intrinsic value), autonomously and
140 independently of any other entity (Lockwood, 1999) or whether all values are inherently relational,
141 and ultimately, decided by humans (Morito, 2003). This further leads into the question on whether
142 these values can and should be expressed as exchange values¹ through monetization and whether
143 this leads to commodification (Gómez-Baggethun and Ruiz-Pérez, 2011).

144 Commodification is defined in this context as “the symbolic and institutional changes through
145 which a good or service that was not previously meant for sale enters the sphere of money and
146 market exchange” (Gómez-Baggethun, 2014; p.67). Gómez-Baggethun and Ruiz-Pérez (2011)
147 explain the way through which the economic framing and conceptualization of nature’s value as
148 monetized exchange value can lead to the formalization of property rights on specific ecosystem
149 services or the land producing such services. This appropriation can in turn lead to the creation of
150 institutional structures of sale and exchange in the form of markets; a process of
151 commercialization that is argued to often involve privatization (Boelens et al., 2014; Gómez-
152 Baggethun and Ruiz-Pérez, 2011). Some alert about the spreading of this phenomenon through the
153 growing trade of previously un-marketed ecosystem functions (e.g. carbon sequestration,
154 watershed regulation, habitat provision) in PES schemes, carbon markets and biodiversity off-
155 setting (Luck et al., 2012).

156 Reasons why commodification is considered problematic include ethical concerns related to the
157 attributed moral superiority of some aspects of nature, i.e. the consideration that some aspects of
158 nature ought to not to be for sale (McCauley, 2006). The debate is partly about expanding the
159 frontier of commodification to previously non-traded ecosystem services, since some other have
160 been commodified for centuries (e.g. food, energy) (Gómez-Baggethun and Ruiz-Pérez, 2011).
161 Commodification has also been argued to act as complexity blinder that obscures the importance
162 of biodiversity to perform ecosystem functions (Norgaard, 2010; Peterson et al., 2010). Equity
163 concerns regarding changes over property rights and access to resources have also been raised,
164 following evidence that the implementation of markets for ecosystem services have led to
165 increased inequalities (Corbera et al., 2007). From a conservationist perspective, there are
166 misgivings that shifting to an economic framing may lead to motivation crowding out in the long
167 term (Luck et al., 2012; Rode et al., 2015) and result in changes in mind-sets relating to
168 environmental protection (Vatn, 2000). It is argued that this risks changing conservation logic
169 “from moral obligation or community norms towards conservation for profit” (Rode et al., 2015,
170 p. 273), undermining ethical and moral arguments for conservation (McCauley, 2006).

171 This frame shifting has been related to a broader economic process of neoliberalization of nature
172 conservation (Fletcher and Büscher, 2017; McAfee, 2012; Sandbrook et al., 2013). Valuing ecosystem
173 services and related market environmentalism have been advocated as ways to reconcile
174 economic growth, allocation efficiency and environmental conservation, that some associate with
175 the expansion of neoliberal ideology (Gómez-Baggethun and Ruiz-Pérez, 2011). While its

¹ A note is necessary on the issue of intrinsic values with respect to the concept of existence values. Conventional environmental economics includes existence values as part of the recognized taxonomy of exchange environmental values composing the so-called total economic value (TEV); i.e. individuals’ appreciation of a given environmental good or attribute for its mere existence, even if they do not use it or enjoy it directly. Human motivations which may underlie the position that nature should be conserved *in its own right* have been subject to much debate. In practice, what is at issue here is whether it is meaningful to say that individuals can assign a quantified value to nature or its component parts, reflecting what they consider to be intrinsic value (Turner et al., 2003).

176 increasingly recognized that most PES schemes do not operate in practice as actual markets
177 (Martin-Ortega et al., 2013; Muradian and Gómez-Baggethun, 2013; Vatn, 2000; Wunder, 2015), the
178 argument is been made that they still reflect a *market logic* or *rhetoric* (Fletcher and Büscher, 2017),
179 with some scholars explicitly arguing that the promotion of PES responds to an agenda of global
180 corporate interests (Büscher, 2012).

181 Some contend these views. Fletcher and Büscher (2017) provide a good overview of the arguments
182 that have been made to refute or at least nuance commodification in this context. These all share
183 the overarching core idea that payments for ecosystem services do not *have to* require
184 commodification (Hahn et al., 2015). For example, for some authors ‘propertization’ of ecosystem
185 services does not have to mean privatization, since property rights may still be held collectively
186 (Farely and Costanza, 2010); or that nature valuation does not necessarily need to be orientated to
187 profitability (Muniz and Cruz, 2015). These nuances have led to proposals of ‘hybrid’ (i.e. not strictly
188 Coasean) formulations of PES that place stronger focus on the integration of equity, justice and
189 ecological sustainability concerns into PES design (Van Hecken et al., 2015). But some have argued
190 that PES are neoliberal *in nature* and that this make them inherently contradictory with these
191 purposes (Fletcher and Büscher, 2017). Others, while acknowledging that valuation of ecosystem
192 services and market-based conservation instruments do no equate to commodification, claim that
193 the institutional context in which they are currently deployed leads them to it (Gómez-Baggethun
194 and Ruiz-Pérez, 2011).

195 What is clear is that the debate is not closed. Nor is commodification necessarily unidirectional or
196 irreversible (Gómez-Baggethun and Ruiz-Pérez, 2011). In this study, we explore the views of those
197 involved in informing, designing and implementing environmental public policy on the extent to
198 which the adoption of ecosystem services-based approaches can lead to the commodification of
199 nature and what are the associated implications. We would argue that understanding the views of
200 environmental professionals is as least as important as understanding the theoretically-driven
201 viewpoints that so far dominate this debate, since that would give the real mark to whether this is
202 likely, in the long-run, to trigger any fundamental reaction and changes to environmental
203 governance.

204

205 **3. The application of ecosystem services-based approaches in Mexico: a brief overview**

206 Mexico is one of the main mega-diverse countries of the planet, hosting more than ten percent of
207 global biological diversity (Sarukhan et al., 2015). Almost eighty percent of its forest are managed
208 under community-based tenure (Klooster, 2003). As in other emergent economies, economic
209 growth has rapidly evolved in the last century based on a strong dependency on natural resources,
210 urbanization process, cattle ranching development and agricultural frontier expansion. This has
211 resulted in a severe degradation of ecosystems evidenced in high rates of deforestation, land
212 degradation, loss of biodiversity, aquifers overuse and water and air pollution, all linked to high
213 marginalization and poverty rates that represent a great challenge for policy-making (Figueroa et
214 al., 2016; Muñoz-Piña et al., 2008).

215

216 The notion of ecosystem services has gained increasing prominence in Mexican environmental
217 governance discourse and it is now clearly embedded in its environment political discourse (Mesa-
218 Jurado et al., 2018). The notion of ecosystem services has been progressively linked to economic
219 development policies, predominantly on the forest sector (Lara-Pulido et al., 2018; Perez-Verdin et
220 al., 2016). The National Programme of Payments for Environmental Services, launched in 2003 by
221 the National Forest Commission (CONAFOR), is particularly prominent. The programme has been
222 qualified as one of the most complex and largest PES programmes worldwide, combining poverty
223 alleviation and forest conservation goals (Mcafee et al., 2010; Muñoz-Piña et al., 2008).

224 Mexico's national PES programme has been discussed in the context of the broader
225 neoliberalization agenda. Shapiro-Garza (2013, p. 12) noted that, having received more structural
226 and sectoral adjustment loans from the World Bank than any other country and being subject to
227 the effects of North American Free Trade Agreement, Mexico's embracing of PES would seem
228 coherent with its "truly neoliberalized open market" agenda. Interestingly, the author finds that
229 the original market-based vocation of the programme had not - at the time of her analysis- led to
230 the introduction of market-like mechanisms into policy design or to devolve administration away
231 from the federal state.

232 Altogether, this draws a suitable complex context in which to explore the extent to which
233 environmental professionals perceive a risk of nature commodification and potential expected
234 implications, providing also a forewarning of what might happen in other countries.

235

236 3.1 Sample

237 We conducted a total of 20 key informant interviews in November 2017. Participants were recruited
238 from and interviewed at the V International Congress of Ecosystem Services in the Neotropics²
239 held in the city of Oaxaca, Mexico. Potential interviewees were pre-selected from the delegates
240 list and an email was sent prior to the congress to schedule interviews. Those who did not answer
241 to the email request, were directly approached at the congress. None of the potential participants
242 approached at the congress refused to take part in the survey. Recruiting participants at this forum
243 allowed us direct access to a varied range of environmental professionals at the national level,
244 including policy-makers, practitioners and academics involved in either designing, applying or
245 informing the application of ecosystem services-based approaches.

246 Table 1 shows the number and type of organization to which the interviewees are affiliated and a
247 brief description of their remit. Like with any other purposive sampling process (Babbie, 2007),
248 there is always a risk that those more strongly opposed to the topic at hand might not have been
249 present at this event, and it is possible that attendees hold a generally positive attitude towards
250 the topic of ecosystem services. Although it should be noted that the interview disclosed from the
251 start that it had a focus on understanding the risks associated with the application of ecosystem
252 services-based approaches. Therefore, those opposed to the approach or those with negative
253 views of it, would not have necessarily felt excluded or inclined to hide their critical views. It would
254 be fair to say, in any case, that our participants are part of Mexican's environmental policy
255 'establishment' and that minority voices might not have been captured in our study. Being of a
256 qualitative nature, this study is not aimed at providing a representative generalizable description
257 of the views of all environmental professionals, but rather to understand the meaning and
258 reasoning behind the views of those concerned (Babbie, 2007). Moreover, the sampling process
259 purposely tried to recruit influential professionals, since their views are particularly relevant to
260 understand the direction that environmental governance might take into the future. Although
261 academics account for half of the sample, several of them are also environmental policy advisors
262 or hold/have held key political positions in the environmental sector.

263

² www.pecsii.org.

Table 1. Description of interview participants

Interview code	Sector	Name and type of organization	Interviewee role
Acad1	Academic institution	[anonymized]. Public High Education and Research	Senior academic; research specialization in environmental public policy
Acad2	Academic institution	[anonymized]. Public High Education and Research center	Senior academic; research specialization in participatory natural resources management
Acad3	Academic institution	[anonymized]. Private High Education and Research	Senior academic; research specialization in environmental economics
Acad4	Academic institution	INECOL. Research and knowledge transfer centre	Senior academic; research specialization in public policy
Acad5	Academic institution	CORNELL. High Education and Research (abroad)	Senior academic; research specialization in economic instruments for environmental management
Acad6	Academic institution	UAM. Public High Education and Research	Senior academic; research specialization in impact of environmental public policies
Acad7	Academic institution	COLMEX. Public High Education and Research	Senior academic; research specialization in behavioral economics
Acad8	Academic institution	[anonymized]. Public High Education and Research	Senior academic; research specialization in socio-economic effects of environmental governance
Acad9	Academic institution	[anonymized]. Public High Education and Research	Senior academic; consultant and policy advisor. Member of the team designing and implementing the national PES programme
Acad10	Academic institution	[anonymized]. Private High Education and Research	Senior academic; consultant and policy advisor of federal government and international organizations. Member of the team designing and implementing the national PES programme
CSO1	Civil Society Organization	[anonymized]. Management of resources for conservation and sustainable use of biodiversity	Designer of the Matching Funds programme (local PES scheme)

CSO2	Civil Society Organization	FMCN. Private institution focused on financing and promoting projects for the conservation of Mexico's natural heritage	Coordinator of the integrated watershed movement programme "Watersheds and Cities"
CSO3	Civil Society Organization	FMCN. Private institution focused on financing and promoting projects for the conservation of Mexico's natural heritage	Coordination, design and development of conservation projects nationwide
CSO4	Civil Society Organization	NATURA MEXICANA. Non-profit organization for conservation, environmental management and restoration	Implementation of nature conservation public policies; consultant for policy-making
CSO5	Civil Society Organization	[anonymized]. Non-governmental international organization for the protection of nature	Sector Deputy Lead
Gov1	Government sector	CONAFOR. National Forestry Commission	Coordination of financing mechanisms of the national PES programme
Gov2	Government sector	[anonymized]. Ministry of Environment	Division coordinator
Gov3	Intergovernmental organization	IPBES. Intergovernmental body for the assessment of the state of biodiversity and ecosystem services to inform decision-making	Co-Chair
Gov4	Government sector	INECC. Government institute for Ecology and Climate Change (knowledge provision for policy decision-making)	Design of economic instruments for green growth
Gov5	International government sector	GIZ. German federal government agency for the promotion of sustainable development	Principal advisor for financing mechanism EcoValor project.

266 Names of organizations are anonymized upon requests by the interviewees as per conditions of consent.

267

268 3.2 Interview description

269 We used semi-structure interviews with a set of pre-determined questions but allowing the
 270 interviewer to explore particular themes or responses further (Babbie, 2007). The interviewer first
 271 introduced herself and informed the interviewee that the research was aimed at understanding
 272 how ecosystem services-based approaches are being implemented in Mexico and to study the risks
 273 associated with their implementation. A set of preliminary questions were aimed at capturing the

274 respondent's general understanding of the notion of ecosystem services and related governance
275 instruments.

276 The next set of questions prompted discussion on opportunities and risks associated with the use
277 of ecosystem services-based approaches. This was aimed at detecting whether the risk of
278 commodification came up spontaneously in respondents' answers. Next, the issue of
279 commodification was explicitly introduced in the conversation. Hahn et al.'s (2015) framework of
280 degrees of commodification was presented and briefly explained. Hahn et al. refer to degrees of
281 commodification as 'the extent to which the value of biodiversity or an ecosystem services has
282 become a tradable commodity' (ibid, p. 76) and propose a framework of six degrees that they use
283 to analyse commodification in terms of policy integration. These degrees range from "no
284 commodification" (degree zero), which includes intrinsic appreciation of ecosystems, in which the
285 rationale for protecting nature is nature itself, including 'indigenous cosmologies' (p.76); followed
286 by varying degrees in which commodification arises under the instrumental framing of nature
287 without valuation but with "new property rights and liabilities which involve measurement"
288 (degree 1), and with valuation (degree 2) (p.76). The third degree involves "deliberate efforts to
289 express or 'demonstrate' the value of nature in monetary terms" (p.76). Degree 4 refers to
290 Pigouvian monetary incentives (e.g. taxes and subsidies) in which the prices signal is used to
291 "internalize externalities and evoke behavioural change but do not create markets" (p.78). Degree
292 5 refers to market-traded biodiversity offsets and other markets resembling cap-and-trade
293 systems, such as conservation banking (McKenney and Kiesecker, 2010) and user-financed PES
294 (Vatn, 2000; Wunder, 2015). Degree 6 covers financial instruments and what Hahn et al. (Hahn et al.
295 et al., 2015) refer to as "complete commodification". It refers to how the traded commodity is "re-
296 packaged and re-sold as financial instruments (e.g. bonds or derivatives)" (p. 79), i.e. the process
297 by which financial actors invest in units of conserved nature and turn these into financial products
298 which are traded on financial markets. Respondents were asked, in the light of their experience,
299 their opinion on this framework and whether they would relate Mexico's current environmental
300 public policy to any or several of these degrees of commodification.

301 Respondents were prompted to reflect specifically on whether the notion of ecosystem services
302 has generated changes in the relationship between humans and nature. Respondents were further
303 requested to reflect on the institutional changes that ecosystem services-based approaches might
304 bring to environmental management and conservation.

305 A final set of questions specifically asked about participants' views on the monetization of the
306 value of ecosystem services. At the end, respondents were encouraged to provide any further
307 comment about the topic of this research and environmental management more broadly.

308 Interviews lasted from 30 to 90 minutes.

309 3.3 Analysis

310 Interview responses were analysed using a structural code system (DeCuir-Gunby et al., 2011) on
311 the following themes: Understandings of nature's value and ecosystem services-based
312 approaches, Problems and risks, Changes in human-nature relationships and Degrees of
313 commodification and policy integration. As new themes emerged during the reading of the
314 responses, new codes were identified and included in the analysis. Once the code system was
315 stable, sub-codes that showed central ideas, patterns, differences or similarities in the data were
316 established. Finally, each code and sub-code was analysed and described in depth. The software
317 package ATLAS.ti version 7.5.4 was used to store, manage, search, and code these data. Interview
318 responses were analysed directly in Spanish by the authors, who are all native speakers. Quotes
319 have been translated into English for the purpose of writing this manuscript.

320 We checked responses across the three different sectors represented: academic, civil society
321 organizations and government to explore whether convergence and divergence in views could be

322 attributed to particular sectors. In general, we did not find remarkable differences or clear
323 clustering of the positions within types of organizations, therefore results are not presented by
324 sector.

325

326 4. Results and discussion

327 Our respondents generally adopt an instrumental interpretation of nature's value, emphasizing
328 (either implicitly or explicitly) nature as the support of human well-being and advocating this as a
329 core argument to protect it. This is not to be interpreted as a dismissal of nature's intrinsic values
330 but, in line with its original purpose (Costanza et al., 1997; Gómez-Baggethun et al., 2010; Peterson
331 et al., 2010), our respondents view the notion of ecosystem services as a means to give visibility to
332 the dependency of humans on nature and to consider its intangible aspects. Ecosystem services-
333 based approaches are seen as way of "promoting the sustainable use of ecosystems" (CSO2),
334 demystifying the idea that that conservation and development are not compatible and providing
335 arguments to act in favour of conservation. This reflects the advocacy of ecosystem services as a
336 notion that can help reconciling economic development and environmental conservation where
337 purely conservationist arguments have failed (Gómez-Baggethun and Ruiz-Pérez, 2011; Sandbrook
338 et al., 2013), as illustrated by quotes such as:

339 *"Economic development is this monster that is destroying the environment... If you*
340 *speak to a decision maker and say that the forest needs to be preserved for*
341 *grandchildren or because biodiversity has its own right to exist, that doesn't resonate*
342 *much, but if you say 'if you cut down the forest, you're increasing by 50% the risk of*
343 *paying 10 Million Pesos to compensate for flood damages', then they start listening"*
344 *(Acad4).*

345 Our respondents see ecosystem services as an integrative concept, appealing to a range of
346 disciplines and sectors (e.g. political, academic, communities, decision-makers, etc.), providing a
347 'common language' to connect science and policy and one that can help environmental policy.
348 This is in line with some of the academic arguments (Martin-Ortega et al., 2015) and is illustrated
349 by quotes such as::

350 *"In the environmental policy arena we have been very ingenuous, very naïve, to believe*
351 *that we would convince decision-makers with all the data we have on the biological and*
352 *ecological importance of ecosystems, species, etc. But we don't see big changes with*
353 *respect to the advancement of the agricultural frontier... if you look around, threats*
354 *keep being the same, pressures keep being the same and, as long as other sectors don't*
355 *start speaking the same language as us, or we don't start speaking the same language*
356 *as those sectors, those pressures won't diminish"* (Gov5).

357 With this (seemingly positive) starting premise, next we discuss respondents' views on the
358 problems and risks that they perceive from the usage of ecosystem services-based approaches.

359

360 4.1 Problems and risks of ecosystem services-based approaches

361 When prompted to discuss problems and risks of ecosystem services-based approaches,
362 respondents predominantly focused on the impediments and challenges that their
363 implementation is having 'on the ground', rather than on the negative consequences that they
364 might bring (as it was intended in the interview question).

365 Our respondents acknowledge that the ecosystem services conceptualization has clearly made its
366 way into environmental public policy in Mexico (notably, in the forest sector), as also evidenced by
367 the analysis of Mexico's public policies (Mesa-Jurado et al., 2018). However, they pointed at the
368 fact that while academia, civil society organizations and governmental institutions have been

369 considering ecosystem services-based approaches for a number of years now, there has been so
370 far little successful translation on the ground. This has also been noted by the literature more
371 generally (Martin-Ortega et al., 2015; Nahlik et al., 2012) and in Mexico specifically (Lara-Pulido et
372 al., 2018; Perez-Verdin et al., 2016). Some respondents wondered if the value of the approach itself
373 might have been overestimated: *“I have the feeling that it is fashionable and it could be overvalued.
374 Can you tell me any successful examples? How many years [of experience] do we have on ecosystem
375 services with national programmes, academics fully engaged, civil organisations [tatatatata³] and
376 examples are still like this. So, it hasn’t come to make a revolution in terms of impacts”* (CSO1). This
377 resonates with Silvertown’s (Silvertown, 2015) arguments that ecosystem services-based
378 approaches have been ‘oversold’.

379 Several explanations were given to this lack of practical translation. In general, these explanations
380 are in line with what has been proposed already by the literature. The lack of a unified
381 understanding of the concept makes its operationalization difficult (Nahlik et al., 2012). Difficulties
382 and costs of quantifying and monitoring of ecosystem services were also mentioned (Costanza et
383 al., 2017). This relates to the fact that service provision is rather difficult to establish due to the
384 complex non-linear relationships characterising ecosystems functioning (McVittie et al., 2015). This
385 is associated by our respondents to two important risks. Firstly, with the fact that conservation
386 actions might not end up leading to an actual preservation of ecosystem services, in line with
387 concerns expressed by the literature on the lack of consolidated evidence on the environmental
388 effectiveness of PES (Aguar et al., 2017; Börner et al., 2017; Pattanayak et al., 2010), or as nicely put
389 by one of our interviewees: *“In watersheds we say that the larger the forested land, the lower the
390 water cleaning process because the water runs with better quality, there are less sediments and also
391 better infiltration. But the reality is that this is not always true, reforestation doesn’t necessarily lead
392 to more water... and that’s where deceptions come, those we were just talking about, they think that
393 by planting trees all will be sorted out but it isn’t necessarily like that. But there is no other way, more
394 research is needed, that is what we would need to do”* (CSO2). Secondly, this might lead to un-
395 fulfilled expectations, disappointment and, ultimately, to disengagement from conservation
396 initiatives, as identified by Massarella et al. (2018) and as powerfully expressed by one of our
397 respondents: *“This is not a problem of surface runoff, it is about groundwater and aquifer
398 overexploitation, then it doesn’t matter how much you have upstream if you’re pumping
399 groundwater. They are deceiving a bit people in that way, and it is like a time bomb because sooner
400 or later people will complain, ‘we have been ten years paying this and we have less water available”*
401 (Acad4).

402 Respondents also mentioned other impediments for the effective development of environmental
403 policies based on ecosystem services approaches. These included: lack of political will, conflicting
404 objectives between policies, corruption, political bias towards corporate interests and lack of trust
405 and legitimacy of public policies. These are common challenges traditionally attributed to
406 environmental governance more generally (Hempel, 1996). Discrepancy between budgets
407 allocated to subsidizing agricultural development and conservation was a prominent theme in the
408 interviews, highlighted in statements such as *“While SAGARPA or CONAPESCA [respectively the
409 federal agencies for Agriculture and Livestock and Fishing] continue to implement these subsidies,
410 which are monumental!, 120 times bigger than the ones in the environmental sector, while we don’t
411 achieve that, change will be difficult”* (Gov5). Indeed, an eyeballed analysis of SAGARPA’s budget
412 and the joint budget of the national and local PES schemes indicates that the latter hardly amounts
413 to 10% of the former⁴.

³ Onomatopoeic emphasis.

⁴ Based on own calculations using published budgets by SAGARPA’s and CONAFOR’s (Mexico’s national forestry commission, in charge of running the national and various regional PES schemes): <http://subsidiocalcampo.org.mx/analiza/presupuesto-sagarpa/>, and <http://www.conafor.gob.mx/web/apoyos/>, respectively. Ratios are: 6.28% in 2011; 9.05% in 2012; (2013 missing); 8.94% in 2014; 14.20% in 2015 and 3.61% in 2016.

414 Interaction and cooperation between users and providers of ecosystem services is seen as one of
415 the advantages of ecosystem services-based approaches. However, our respondents also consider
416 that the responsibility over nature conservation is still been mostly deferred to local rural
417 communities. This directly relates to ethical considerations regarding distribution of
418 responsibilities, but not as often argued in the literature. The argument has often been framed in
419 the literature around the idea that upstream landowners have pre-existing moral obligations not
420 to compromise the capacity of those downstream to enjoy the ecosystem services (Luck et al.,
421 2012), questioning that they get paid to cease to pollute (Pirard et al., 2010; Waylen and Martin-
422 Ortega, 2018). Here, however, ecosystem services-based compensation mechanisms are seen as
423 aiming to change the behaviour and livelihoods systems of those that are less to blame for the
424 environmental degradation *in general*, as illustrated by this quote: *“Programmes ask a lot from*
425 *communities and we have received complaints from people that say ‘but what do we win with taking*
426 *care of the forest, with ensuring clean water, with not using pesticides, with not cleaning the coffee*
427 *beans in the rivers, with [..], if when we go to Oaxaca everything is dirty, full of litter?; So why are we*
428 *asked so much for the very little we get when they [in cities] have more money and are not asking*
429 *people to take care of the water, to keep the river clean? Because when it leaves our community, water*
430 *goes clean”* (Acad2).

431 Other equity considerations such as distribution of costs and benefits (Corbera et al., 2007) and
432 franchise equity (Farrell, 2014)) did not come up in our interviewees responses. This is, to a certain
433 extent, surprising considering the emphasis that has been given to targeting marginalized
434 communities and reduction of rural poverty in e.g. the national level PES programme in Mexico
435 (Shapiro-Garza, 2013) and the more general questioning of market-based instruments’ ability to
436 improve social equity based on empirical evidence in Latin America (Aguar et al., 2017). These
437 equity considerations have been mentioned though in a related regional level analysis in the State
438 of Chiapas (Pineda-Vazquez et al., 2018).

439

440 4.2 Monetary valuation of ecosystem services and the risk of nature commodification

441 As explained, when asked about the risks and problems of using ecosystem services-based
442 approaches, respondents focused on the impediments that the applications are having on the
443 ground. Still, eight respondents spontaneously referred to commodification. Out of those eight,
444 two stated to be aware of criticisms but did not share their concerns (Acad1, Acad3). Three clearly
445 expressed explicit concerns about it (GOV3, Acad2, Acad7) and two others mentioned the debate
446 around nature commodification but did not express a position within it (Acad5, CSO5, CSO1).

447 Those questioning the argument of commodification of nature dismissed it as an ideological
448 position. While they accept that this might be a legitimate position to have, they felt that this
449 debate hampers the generation of ‘real’ instruments that would allow reducing pressure over
450 ecosystems and biodiversity. In a way, their position is not so much that commodification is not
451 taking place, but that what is important is to develop operational instruments, arguments and
452 regulations in the current (market) setting , embracing (monetary) valuation as one way of doing
453 so: *“[commodification] is more a discussion of a metaphysical nature... Because at the end of the day,*
454 *the only way that governments have found to establish these types of policies has been grounded on*
455 *this view of ‘pesos’ and cents or monetarily. There may be other ways based on the views of the*
456 *communities, which is entirely different. But the communities’ views find many bumps along the*
457 *road... The question is how much, or for how long, can such a vision prevail in a market context that*
458 *alienates most of it”* (Acad1). This is in line with what was found by Sandbrook et al. (2013) in their
459 interviews to conservationist internationally with respect to market-based instruments.

460 In general, monetary valuation is seen by our respondents as a useful means to establish reference
461 values. Several of our respondents find it useful to establish a common language and as an
462 argument for “negotiation” with other sectors which operate under the “capital logic”. It is

463 considered to be useful as a way to capture the attention of decision-makers. Respondents
464 showed a pragmatic view on it, considering that development decisions are taken in monetary
465 terms and that if ecosystem services are not monetized, they will be ignored. Not in all
466 circumstances, respondents thought, the intrinsic value alone is a sufficient argument:

467 *“Decision makers already do valuation, each time they allow a shopping mall where there
468 was a forest, they are doing a cost-benefit analysis, they indicate how many jobs it can
469 generate, how much taxes; and with the forest there are no numbers to compare to, so
470 how can we resolve this situation without providing a value or some sort of value?
471 Acknowledging beforehand that this is always an underestimation of the value” (Acad4).*

472 *“[...] if we’re in this [global] logic we need to play like they [policy makers], like a pack of
473 wolves, we shall howl like them” (Acad7).*

474 Furthermore, these respondents see a greater risk in not incorporating the value of ecosystem
475 services in existing markets. Respondents argued that those markets shape development
476 decisions and natural resources use. Traditionally, those decisions have ignored the value of
477 ecosystem services, and, in a way, they see commodification as an opportunity to recognize such
478 values: *“It is interesting, first to ask yourself why it is a risk to assign a value to ecosystem services, I
479 see it differently, I see what has happened in the past and that is that ecosystem services were not
480 incorporated in markets and being markets how money and decisions are usually managed, by not
481 incorporating these values it means that wrong decisions are taking against conservation... ..”*
482 (Acad10). This would relate to the argument made by some scholars that commodification does
483 not necessarily mean nullifying the intrinsic value of natural resources, but making it visible
484 (Costanza et al., 2017) and incorporating it in policy making (TEEB, 2010)⁵. Some of our respondents
485 further argue that commodification can benefit those that are taking conservation action, when a
486 ‘sense of co-responsibility’ is established between those paying for the service and those receiving
487 the payments.

488 Nevertheless, respondents warned that monetary valuation is not the panacea and that it should
489 not be the only argument for decision-making. This resonates with what the conservationists
490 interviewed by Sandbrook et al.’s (2013) expressed. Our respondents argue it should be used in
491 combination with other instruments and its limitations should be acknowledged. Respondents
492 were actually critical with the way monetary valuation is being done and the way it is being
493 communicated. They consider that often valuation exercises are incomplete, oversimplified and
494 tend to underestimate the value of ecosystem services. Moreover, some respondents see a risk on
495 the underestimation of values, particularly when used for making the case for conservation
496 initiatives face to large development projects or for the establishment of compensating
497 mechanisms. This to some extent relates to Silvertown’s (2015) arguments that valuation can
498 actually ‘expose’ biodiversity and ecosystem services to “the vagaries of the market” (p.645). But,
499 contrary to Silvertown (2015) who rejects valuation, our respondents urged for establishing rules
500 for the implementation of valuation techniques and the communication of results and, while
501 acknowledging its risks, argue that it can still be useful in certain contexts.

516 Those respondents who expressed concerns about the risk of commodification made reference to
517 its perverse effects for communities: *“it is a very perverse way of using the economic language with
518 the communities. It isn’t appropriate and not used in an appropriate way” (Acad2).* One of our

⁵Two examples were mentioned to illustrate the usefulness of monetary valuation for increasing the visibility of the importance of natural protected areas to other sectors: CONANP’s ECOVALOR MX project, an initiative that promotes the valuation of ecosystem services in federal protected natural areas in Mexico in the context of preservation of biodiversity and climate change mitigation (www.ecovalor.mx/index.html); and the valuation of the Cruces Nayarit Dam, in the San Pedro-Mezquitlan basin (https://fmcn.org/wp-content/uploads/2017/11/ImpactValuation_LasCrucesEN_27-11-25.compressed.pdf). According to one of our respondents, the valuation done in this case highlighted that the impact on the ecosystem services would be much larger than the income expected to generate by the dam (CSO3).

519 respondents explicitly linked this to changes in indigenous cosmovisions of nature but referred to
520 the fact that this can lead to changes in attitudes and behaviour “for the good or for the bad”
521 (CSO5), opening up possibility that those changes might be positive. Indeed, ecosystem services-
522 based approaches are seen by our respondents to be aimed at, and desired to, change human nature
523 relationships in a way that would lead to further conservation in recognition of the benefits that
524 nature generates.

525 Furthermore, respondents also argued that communities do not necessarily operate anymore
526 under a paradigm of valuing nature for its spiritual and ethical values. They observed that
527 communities have been operating under “some kind of ‘neoliberalization’ of the environment”
528 already for long time (Acad1). This would resonate with the idea that ecosystem services-based
529 approaches are just one more element of a broader process of neoliberalization started before the
530 term was popularized (Gómez-Baggethun and Ruiz-Pérez, 2011). Interestingly though, our
531 respondents seem to think of ecosystem services as the one element of that process that can
532 actually act as a counter-balancing force that can help protect nature: “The concept of market for
533 ecosystem services or payments for ecosystem services is not what is destroying nature nor what is
534 going to destroy it. On the contrary, it should be the element that counterbalances or seeks the
535 acknowledgement of what has not been paid for, that is the benefits nature provides. The risk is
536 already there, in the economy. Therefore the risk is that [nature] is not sufficiently acknowledged in
537 the economy” (Gov1).

538 Furthermore, even those most critical seem to consider that despite the risks, applying ecosystem
539 services-based approaches is necessary, as if it was a “necessary evil” (“un mal necesario” as
540 expressed in Spanish). This is well illustrated by this quote: “Of course, in economic terms everything
541 can be monetised, it is a big risk, [...] but if you don’t reach a politician saying this is the number, this
542 is how much it will cost if you don’t take preventive measures, [...] you have to give them the number
543 and not only the amount of service, even though this sounds bad, but also how much it will cost... and
544 how much it will cost to not maintain [the service].” (Acad7). This would reflect the pragmatic stand
545 of environmental professionals also identified by Sandbrook et al. (2013) and Waylen and Martin-
546 Ortega (2018) by which environmental professionals consider that the world’s economy already
547 runs like this and there is actually more to lose than to gain from not recognizing ecosystem
548 services.

549 Respondents do worry about the emergence of a ‘payment dependency’, i.e. that rural
550 communities might become dependent on the payments and that payments become the only
551 motivation for conservation, as suggested by some scholars (Luck et al., 2012; Rode et al., 2015).
552 Other worries concern the fragmentation of communities based on their different approach to the
553 management of the resources.

554 Finally, Gov3 argued that the risk of commodification is only to be associated with a ‘narrow’ vision
555 on ecosystem services that of ecosystem services instrumental values. She advocated for the new
556 conceptualization proposed by Intergovernmental Science-Policy Platform on Biodiversity and
557 Ecosystem Services (IPBES), that is argued to integrate different knowledge systems regarding
558 human-nature interactions, including indigenous and local perspectives (Pascual et al., 2017). It
559 revolves around the notion of “nature’s benefits to people” as a broad category that encompasses
560 ecosystem services which ultimately contribute to “leading a good life”, which in turn is
561 understood in a broad sense and that may widely differ across cultures (e.g. living in harmony with
562 Mother Earth) (Pascual et al., 2017). While shifting the focus from exchange values towards
563 relational values, understood as ethical and moral principles that guide ‘good’ human-nature
564 relationships (Chan et al., 2016), the IPBES framework maintains the original anthropocentric
565 perspective, but emphasizes a less utilitarian philosophy and pluralistic values (Schulz and Martin-
566 ortega, 2018). According to this one respondent, IPBES’ framework overcomes the problems of
567 ecosystem services-based approaches by removing the term ‘services’ and by acknowledging
568 alternative and more holistic views of understanding human-nature relationships. Without

569 necessarily questioning the concept of ecosystem services itself, other respondents also made
570 suggestions for alternative terms, with possibly less ‘ideological weight’ in their view. Terms like
571 ‘services from nature’, ‘services from biodiversity’, ‘nature’s rights’ or ‘right to a health
572 environment’ or ‘agreements for our water’ (instead of PES), were suggested. This is explicitly
573 contradictory with recent criticism made to IPBES, which argues that “by replacing ecosystem
574 services with a near-synonymous term, IPBES ditches the baby (the successful term ecosystem
575 services), whilst keeping the dirty bathwater (the problems with the term)” (Kenter, 2018, p. 40).

576 Next, we discuss views on the current level of commodification currently perceived to be taking
577 place in Mexican’s environmental policy.

578 4.3 Degrees of commodification and policy integration

579 When presented with Hahn et al. ’s (Hahn et al., 2015) framework of degrees of commodification,
580 three respondents showed clear opposition to it on the basis of its departing premise, i.e. the fact
581 that it assumes that ecosystem services-based approaches *do* lead to commodification, in line with
582 the questioning to the notion of commodification that they had previously expressed (see section
583 5.2). The rest partially agreed with the framework but suggested modifications to its gradation and
584 alternative categorizations. Moreover, respondents argued that commodification is not
585 something that can be defined a priori but that depends on the context, decisions and views of
586 those involved. Despite these criticisms, the framework was still used by all participants as a
587 boundary object for the discussion on how insofar is commodification present in Mexico’s
588 environmental public policy. Table 2 shows examples of instruments and policy arrangements
589 mentioned by the respondents across the various degrees, that we explain next.

590 There is a generalized sentiment that intrinsic values (degree zero in the framework, e.g. in the
591 form of protected areas) do not drive Mexico’s current environmental policy, i.e. they are seen as
592 a theoretical idea but with no practical resonance on the ground. In degree 3, economic valuation
593 is mostly seen to be confined to the academic realm only. Respondents only mentioned a few
594 concrete examples in which it has been translated into policy, although efforts on this area were
595 acknowledged. This is confirmed by the lack of evidence that Pulido-Lara et al. (2018) and Perez-
596 Verdin et al. (2016), who compiled and reviewed ecosystem services valuation studies in Mexico,
597 detected with regard to the impact or influence of these exercises in decision making processes.
598 Similarly, respondents see land planning as largely failing, i.e. it is present “on paper” but it is not
599 being complied with. It has been suggested that valuation of ecosystem services within the
600 context of integrated ecosystem accounts, such as the ones that are being promoted by the
601 project Natural Capital Accounting and Valuation of Ecosystem Services in Mexico, could overcome
602 some of the limitations of PES implementation (Sanchez-Colon, 2017).

603 Our respondents unequivocally associate most of Mexico’s existing PES schemes with degree 4,
604 i.e. Pigouvian type of PES mostly funded by the government (Schomers and Matzdorf, 2013; Vatn,
605 2000; Wunder, 2015). This includes the aforementioned national PES programme (Programa
606 Nacional de Pago por Servicios Ambientales) developed by CONAFOR. While this programme was
607 originally established in 2003 to introduce market-efficiency into environmental protection, it has
608 essentially become a federal subsidy for poverty alleviation as explained in detail by Shapiro-Garza
609 (2013). This author attributes this lack of further market transition of the national PES programme
610 to a clash with the norms, laws and institutions of the Mexican federal state as well as with the
611 effect that key actors had in shaping its implementation. On the contrary, our respondents seem
612 to associate it with practical impediments, such as the need for a better understanding and
613 monitoring of the ecosystem services provided and their monetary value as well as the need for
614 clarification over property rights and ‘rights to sell’.

615 Other PES schemes were also mentioned. The Local Payments for Environmental Service
616 Mechanisms through Matching Funds (Fondos Concurrentes), implemented since 2008, are a local
617 form of PES, which ‘matches’ local funds with national funds to transition from nationally to locally

618 financed programmes (Nava-López et al., 2018). These matching funds are considered to be a
619 'wise' arrangement by our respondents because they establish a link between users and providers
620 and have enabled communication between different government sectors and investors about the
621 management of the land. This has led, according to our respondents, to a certain relief on
622 CONAFOR's budget. Similar benefits with respect to communication were mentioned about
623 another CONAFOR operated PES scheme, the Biodiversity Heritage Fund (Fondo Patrimonial para
624 la Biodiversidad), which allowed different municipalities to communicate and take decisions based
625 on a 'catchment vision' rather than according to political-administrative boundaries (CSO3). This
626 'catchment vision' has also been mentioned as one of the values of applying ecosystem services-
627 based approaches more generally (e.g. Martin-Ortega (2012)).

628 Respondents associate some existing initiatives with degree 5 (e.g. voluntary carbon markets), but
629 signalled that these are isolated experiences and that there is not yet sufficient demand and offer
630 for them. The few local PES schemes that exist are considered to be PES-like/subsidy types (i.e.
631 corresponding to degree 4). In general, it was considered that for this kind of instruments to
632 become more widespread, further changes in the public policy would have to occur. One
633 respondent (CSO3) argued that while some companies have shown interest in adopting
634 international standards for off-setting (such as the ones promoted by the private non-for-profit
635 Mexican Fund for Nature Conservation), these are not being followed with "rigour and
636 professionalism", entailing a risk of miss-use. This respondents argues that, while off-set is meant
637 to be used only when other actions are not possible according to a pre-established mitigation
638 hierarchy (as also described by the literature (Arlidge et al., 2018)), there is a risk that it gets applied
639 directly, before anything else is tried (i.e. not respecting the hierarchy).

640 A few other initiatives were associated with degree six (complete commodification). These include
641 the Green Bonds promoted by NAFIN (Nacional Financiera-Banca de desarrollo), which has
642 launched bonds to fund wind and hydropower projects and the Forest Carbon Bonds launched by
643 Mexican Stock Exchange to finance climate change. Scole'te⁶ and prospective REDD and REDD+
644 projects. Again, our respondents consider that these initiatives are, at this stage, anecdotal,
645 isolated experiences or still at the planning stage, not yet spread or consolidated in environmental
646 policy. Interestingly, one respondent (Acad5) commented that CONAFOR had initially attempted
647 to progress towards the generation of financial instruments but its "now turning back to a subsidy
648 approach, rather than a market creation approach".

649 In line with the previous discussion on the risk of commodification (section 5.2), some respondents
650 did acknowledge that risks increase with increased degrees of commodification, but again insisted
651 that there is a greater risk in Mexico not entering higher degrees of commodification because it
652 might lose opportunities for development. "Yes, there is that criticism, and I think that with
653 increasing degrees of commodification, obviously risks increase, but there is also the risk of not doing
654 it. To not reach a degree of commodification 6 has its own consequences and these can be really
655 serious" (CSO3).

656
657

⁶Interestingly, Scole'te is a voluntary carbon market (which respondents had place generically in degree 4 of commodification). It has been implemented since 1997 in Chiapas supported by Plan Vivo Foundation and managed by the local civil association "Ambio"; it is considered the first voluntary forest-based carbon offset in the world (Hendrickson and Corbera, 2015; Osborne and Shapiro-Garza, 2018).

658
659

Table 2. Examples of instruments and policy arrangements in Mexico associated with degrees of commodification as determined by survey respondents

Degree	Definition (Hahn et al. 2015)	Number of times mentioned by survey respondents	Examples and observations made by survey respondents
0	Moral suasion and regulations justified by intrinsic value	4	Examples: Natural Protected Areas (CONANP), Biosphere Reserves, Wild Life General Law Observations: not complied with / does not drive environmental public policy
1	Non-monetary regulations based on instrumental arguments	5	Examples: Management Plans, Wildlife Management Units (UMAs), Natural Protected Areas (CONANP), Endangered species List Observations: not complied with / generates information does translate into environmental public policy
2	Non-monetary regulations based on physical metrics (units of nature)	3	Not present
3	Non-Monetary regulations designed to maximize economic efficiency	4	Example: land planning and economic valuation Observations: land planning not complied with/ no impact; effort is being put into developing valuation studies but with little translation into policy-making (mostly academic)
4	Economic instruments (not traded)	6	Examples: national PES programme, subsidies and taxes Observations: PES has limited presence (mostly in the forest sector)
5	Economic instruments (voluntary marked trade)	4	Example: voluntary carbon markets; Adopt a hectare (Coatepec, Veracruz), voluntary local PES schemes, (planned) Habitat Banks, land purchase for conservation, Mexican Fund for Nature Conservation's carbon off-setting plan Observations: these are anecdotal, isolated experiences or still at the planning stage, not yet spread or consolidated in environmental policy
6	Financial instruments	3	Examples: Green Bonds (NAFIN), (prospective) REDD and REDD+, Scole'te, Forest Carbon Bonds in Mexican stock market Observations: these are anecdotal, isolated experiences or still at the planning stage, not yet spread or consolidated in environmental policy

660

661

662 **5. Conclusions**

663 Ecosystem services has established itself as the predominant paradigm for framing environmental
 664 research and policy-making. Originally advocated as a means of raising awareness for biodiversity
 665 losses by emphasising the benefits that nature provides to society, ecosystem services-based
 666 approaches represent an anthropocentric and instrumental conceptualization of human-nature
 667 relationships. The ever more rapid popularization of this concept is raising increasing concern
 668 about the possibility that it might translate into a fundamental change of those relationships, one
 669 that risks converting nature into a tradable commodity, crowding-out non utilitarian motivations
 670 for nature conservation. These concerns have been associated with a broader agenda for the
 671 neoliberalization of conservation. The present study has placed the focus on understanding the
 672 views of environmental professional in this debate. Their views are of critical interest, since they

673 shape interpretation, uptake and implementation of ecosystem services-based approaches in
674 practice. This is at least as important as understanding the theoretically-driven viewpoints that
675 have so far dominated this debate, since it gives the real mark to whether this is likely, in the long-
676 run, to trigger any fundamental change in environmental governance. This study is goes beyond
677 previous studies expanding the focus beyond market-based instruments, covering ecosystem
678 services-based approaches more broadly. It is also one of the very few empirical studies on
679 ecosystem services and commodification. Using Mexico as an exemplar case of a mega-biodiverse
680 regional leader where the ecosystem services discourse has clearly permeated the environmental
681 discourse, provides insights that are of relevance worldwide.

682 In-depth interviews to a range of influential national level professionals across government, civil
683 society and academic institutions from the Mexican environmental governance arena has provided
684 with a nuanced but unequivocal picture of the current interpretation of ecosystem services-based
685 approaches. Environmental professionals' views are in line with the original arguments by which
686 ecosystem services and their valuation serve to recognize the value of nature and can be a mean
687 of reconciling economic development with nature conservation. Impediments and limitations of
688 the approach are in line with those having been identified by the literature more broadly and in
689 general there is a sentiment that, while they have clearly entered the discourse, ecosystem
690 services-based approaches have yet not translated into much change in practice.

691 While their support for ecosystem services-based approaches cannot be qualified as enthusiastic,
692 our results clearly show that mainstream environmental professionals in Mexico support
693 furthering the implementation of this way of conceptualizing human-nature relationships. Results
694 indicate that, while acknowledging risks of nature commodification and changes to local
695 worldviews, environmental professionals consider that there is greater risk is 'missing out' on
696 opportunities to internalize monetary value of ecosystem services in the context of economic
697 growth-oriented development. Negative side-effects are seen as 'necessary evils' to achieve
698 conservation targets. Environmental professionals acknowledge academic discourses most critical
699 to ecosystem services-based approaches but weigh them against other political demands. Results
700 uncover political dilemmas that go beyond practical operational challenges of ecosystem services-
701 based approaches and which might be rooted at a deeper level. Environmental governance and
702 how it plays out in practice (at a particular time and place) is fundamentally determined by the
703 value judgements of all those involved. While our respondents do not represent the full spectrum
704 of views, they do encapsulate the environmental governance 'establishment'. It could be argued
705 that some of them, who currently apply ES-based approaches themselves, form part of what
706 Büscher (2014, p. 79) refers to as the "epistemic circulation" around ecosystem services, i.e. an
707 interpretation of the value of the ES approach that helps legitimate interventions on which they
708 are involved and dependent on.

709 Whether the new (but not fundamentally different) conceptualization put forward by IPBES ends
710 up having a substantial impact on the global environmental discourse, or whether more critical
711 minority views become mainstream is yet to be seen. In the meanwhile, our results would indicate
712 that any substantial change in the current direction of environmental governance in the short run
713 is more likely to occur due to the disenchantment produced by the lack of impact in practice than
714 of fears of commodification.

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728 **References**

- 729 Aguiar, S., Camba Sans, G., Paruelo, J.M., 2017. Instrumentos económicos basados en mercados
730 para la conservación de la biodiversidad y los servicios ecosistémicos en Latinoamérica:
731 ¿panacea o rueda cuadrada? *Ecol. austral* 27, 146–161.
- 732 Arlidge, W.N.S., Bull, J.W., Addison, P.F.E., Burgass, M.J., Gianuca, D., Gorham, T.M., Jacob, C.D.S.,
733 Shumway, N., Sinclair, S.P., Watson, J.E.M., Wilcox, C., Milner-Gulland, E.J., 2018. A Global
734 Mitigation Hierarchy for Nature Conservation. *Bioscience* 68, 336–347.
735 <https://doi.org/10.1093/biosci/biy029>
- 736 Babbie, E., 2007. *The basics of social research*. Wadsworth Publishing.
- 737 Bateman, I.J., Mace, G.M., Fezzi, C., Atkinson, G., Turner, K., 2011. Economic analysis for ecosystem
738 service assessments. *Environ. Resour. Econ.* 48, 177–218. [https://doi.org/10.1007/s10640-010-](https://doi.org/10.1007/s10640-010-9418-x)
739 [9418-x](https://doi.org/10.1007/s10640-010-9418-x)
- 740 Boelens, R., Hoogesteger, J., Rodriguez De Francisco, J.C., 2014. Commoditizing water territories:
741 The clash between Andean water rights cultures and payment for environmental services
742 policies. *Capital. Nature, Social.* <https://doi.org/10.1080/10455752.2013.876867>
- 743 Börner, J., Baylis, K., Corbera, E., Ezzine-de-Blas, D., Honey-Rosés, J., Persson, U.M., Wunder, S.,
744 2017. The Effectiveness of Payments for Environmental Services. *World Dev.* 96, 359–374.
745 <https://doi.org/10.1016/j.worlddev.2017.03.020>
- 746 Brockington, D., 2011. Ecosystem services and fictitious commodities. *Environ. Conserv.* 38, 367–
747 369. <https://doi.org/10.1017/S0376892911000531>
- 748 Büscher, B., 2014. Selling Success: Constructing Value in Conservation and Development. *World*
749 *Dev.* 57, 79–90. <https://doi.org/10.1016/j.worlddev.2013.11.014>
- 750 Büscher, B., 2012. Payments for ecosystem services as neoliberal conservation: (Reinterpreting)
751 evidence from the Maloti-Drakensberg, South Africa. *Conserv. Soc.* 10, 29.
752 <https://doi.org/10.4103/0972-4923.92190>
- 753 Chan, K.M.A., Balvanera, P., Benessaiah, K., Chapman, M., Díaz, S., Gómez-Baggethun, E., Gould,
754 R., Hannahs, N., Jax, K., Klain, S., Luck, G.W., Martín-López, B., Muraca, B., Norton, B., Ott, K.,
755 Pascual, U., Satterfield, T., Tadaki, M., Taggart, J., Turner, N., 2016. Opinion: Why protect
756 nature? Rethinking values and the environment. *Proc. Natl. Acad. Sci.* 113, 1462–1465.
757 <https://doi.org/10.1073/pnas.1525002113>
- 758 Corbera, E., Kosoy, N., Martínez Tuna, M., 2007. Equity implications of marketing ecosystem
759 services in protected areas and rural communities: Case studies from Meso-America. *Glob.*
760 *Environ. Chang.* 17, 365–380. <https://doi.org/10.1016/j.gloenvcha.2006.12.005>
- 761 Costanza, R., D'arge, R., De Groot, R., Farber, S., Monica, G., Hannon, B., Limburg, K., Naeem, S.,
762 O'Neel, R. V., Paruelo, J., Raskin, R.G., Sutton, P., Van Den Belt, M., 1997. The value of the
763 world's ecosystem services and natal capital. *Nature* 387, 253–260.
764 <https://doi.org/doi:10.1038/387253a0>
- 765 Costanza, R., de Groot, R., Braat, L., Kubiszewski, I., Fioramonti, L., Sutton, P., Farber, S., Grasso,
766 M., 2017. Twenty years of ecosystem services: How far have we come and how far do we still
767 need to go? *Ecosyst. Serv.* 28, 1–16. <https://doi.org/10.1016/j.ecoser.2017.09.008>
- 768 Daily, G., 1997. Introduction: What are ecosystem services?, in: *Nature's Services: Societal*
769 *Dependence on Natural Ecosystems*. Island Press, Washington DC, pp. 1–10.
770 <https://doi.org/10.1023/a:1023307309124>
- 771 De Groot, R.S., Wilson, M.A., Boumans, R.M.J., 2002. A typology for the classification, description
772 and valuation of ecosystem functions, goods and services. *Ecol. Econ.* 41, 393–408.

773 [https://doi.org/10.1016/S0921-8009\(02\)00089-7](https://doi.org/10.1016/S0921-8009(02)00089-7)

774 DeCuir-Gunby, J.T., Marshall, P.L., McCulloch, A.W., 2011. Developing and using a codebook for the
775 analysis of interview data: An example from a professional development research project.
776 *Field methods* 23, 136–155. <https://doi.org/10.1177/1525822X10388468>

777 Engel, S., Pagiola, S., Wunder, S., 2008. Designing payments for environmental services in theory
778 and practice: An overview of the issues. *Ecol. Econ.* 65, 663–674.
779 <https://doi.org/10.1016/J.ECOLECON.2008.03.011>

780 Farelly, J., Costanza, R., 2010. Payments for ecosystem services: From local to global. *Ecol. Econ.* 69,
781 2060–2068. <https://doi.org/10.1016/J.ECOLECON.2010.06.010>

782 Farrell, K.N., 2014. Intellectual mercantilism and franchise equity: A critical study of the ecological
783 political economy of international payments for ecosystem services. *Ecol. Econ.* 102, 137–146.
784 <https://doi.org/10.1016/j.ecolecon.2014.03.014>

785 Figueroa, F., Caro-Borrero, Á., Revollo-Fernández, D., Merino, L., Almeida-Leñero, L., Paré, L.,
786 Espinosa, D., Mazari-Hiriart, M., 2016. “I like to conserve the forest, but I also like the cash”.
787 Socioeconomic factors influencing the motivation to be engaged in the Mexican Payment for
788 Environmental Services Programme. *J. For. Econ.* 22, 36–51.
789 <https://doi.org/10.1016/j.jfe.2015.11.002>

790 Fletcher, R., Büscher, B., 2017. The PES Conceit: Revisiting the Relationship between Payments for
791 Environmental Services and Neoliberal Conservation. *Ecol. Econ.* 132, 224–231.
792 <https://doi.org/10.1016/j.ecolecon.2016.11.002>

793 Gómez-Baggethun, E., de Groot, R., Lomas, P.L., Montes, C., 2010. The history of ecosystem
794 services in economic theory and practice: From early notions to markets and payment
795 schemes. *Ecol. Econ.* <https://doi.org/10.1016/j.ecolecon.2009.11.007>

796 Gómez-Baggethun, E., Ruiz-Pérez, M., 2011. Economic valuation and the commodification of
797 ecosystem services. *Prog. Phys. Geogr.* 35, 613–628. <https://doi.org/10.1177/0309133311421708>

798 Hahn, T., McDermott, C., Ituarte-Lima, C., Schultz, M., Green, T., Tuvendal, M., 2015. Purposes and
799 degrees of commodification: Economic instruments for biodiversity and ecosystem services
800 need not rely on markets or monetary valuation. *Ecosyst. Serv.*
801 <https://doi.org/10.1016/j.ecoser.2015.10.012>

802 Haines-Young, R., Postchin, M., 2010. The links between biodiversity, ecosystem services and
803 human well-being, in: Raffaelli, D., Frid, C. (Eds.), *Ecosystem Ecology: A New Synthesis*.
804 Cambridge University Press, Cambridge.

805 Hempel, L.C., 1996. *Environmental Governance: the global challenge*. Island Press, Washington DC.

806 Kenter, J.O., 2018. IPBES: Don’t throw out the baby whilst keeping the bathwater; Put people’s
807 values central, not nature’s contributions. *Ecosyst. Serv.* 33, 40–43.
808 <https://doi.org/10.1016/J.ECOSER.2018.08.002>

809 Klooster, D., 2003. *Campesinos and Mexican Forest Policy during the Twentieth Century*, Latin
810 American Research Review.

811 Kosoy, N., Corbera, E., 2010. Payments for ecosystem services as commodity fetishism. *Ecol. Econ.*
812 69, 1228–1236. <https://doi.org/10.1016/j.ecolecon.2009.11.002>

813 Kumar, P. (editor), 2010. *The Economics of Ecosystems and Biodiversity: The Ecological and*
814 *Economic Foundations*. Earthscan, London and Washington.
815 <https://doi.org/10.1017/s1355770x11000088>

816 Lara-Pulido, J.A., Guevara-Sanginés, A., Arias Martelo, C., 2018. A meta-analysis of economic

- 817 valuation of ecosystem services in Mexico. *Ecosyst. Serv.* 31, 126–141.
818 <https://doi.org/10.1016/j.ecoser.2018.02.018>
- 819 Luck, G.W., Chan, K.M.A., Eser, U., Gómez-baggethun, E., Matzdorf, B., Norton, B., Potschin, M.B.,
820 Luck, G.W., Chan, K.A.I.M.A., Eser, U.T.A., Gómez-baggethun, E., Matzdorf, B., Norton, B.,
821 2012. Ethical Considerations in On-Ground Applications of the Ecosystem Services Concept.
822 *Bioscience* 62, 1020–1029. <https://doi.org/10.1525/bio.2012.62.12.4>
- 823 Martin-Ortega, J., 2012. Economic prescriptions and policy applications in the implementation of
824 the European Water Framework Directive. *Environ. Sci. Policy* 24, 83–91.
825 <https://doi.org/10.1016/j.envsci.2012.06.002>
- 826 Martin-Ortega, J., Jorda-Capdevila, D., Glenk, K., Holstead, K.L., 2015. What defines ecosystem
827 services-based approaches?, in: Martin-Ortega, J., Ferrier, R.C., Gordon, I., Khan, S. (Eds.),
828 *Water Ecosystem Services: A Global Perspective (International Hydrology Series)*. Cambridge
829 University Press, Cambridge, pp. 3–9. <https://doi.org/10.1017/CBO9781316178904.003>
- 830 Martin-Ortega, J., Ojea, E., Roux, C., 2013. Payments for water ecosystem services in Latin America:
831 A literature review and conceptual model. *Ecosyst. Serv.* 6, 122–132.
832 <https://doi.org/10.1016/j.ecoser.2013.09.008>
- 833 Martin-Ortega, J., Waylen, K.A., 2018. PES What a Mess? An Analysis of the Position of
834 Environmental Professionals in the Conceptual Debate on Payments for Ecosystem Services.
835 *Ecol. Econ.* 154, 218–237. <https://doi.org/10.1016/j.ecolecon.2018.08.001>
- 836 Martinez-Alier, J., Munda, G., O'Neill, J., 1998. Weak comparability of values as a foundation for
837 ecological economics. *Ecol. Econ.* 26, 277–286. [https://doi.org/10.1016/S0921-8009\(97\)00120-1](https://doi.org/10.1016/S0921-8009(97)00120-1)
- 838 Massarella, K., Sallu, S.M., Ensor, J.E., Marchant, R., 2018. REDD+, hype, hope and disappointment:
839 The dynamics of expectations in conservation and development pilot projects. *World Dev.*
840 109, 375–385. <https://doi.org/10.1016/j.worlddev.2018.05.006>
- 841 McAfee, K., 2012. The Contradictory Logic of Global Ecosystem Services Markets. *Dev. Change* 43,
842 105–131. <https://doi.org/10.1111/j.1467-7660.2011.01745.x>
- 843 McAfee, K., Shapiro, E.N., McAfee, K., Shapiro, E.N., 2010. Payments for Ecosystem Services in
844 Mexico : Nature , Neoliberalism , Social Movements , and the State Payments for Ecosystem
845 Services in Mexico : Nature , Neoliberalism , Social Movements , and the State. *Source Ann.*
846 *Assoc. Am. Geogr.* 5608, 37–41.
- 847 McCauley, D.J., 2006. Selling out on. *Nature* 443, 27–28. <https://doi.org/10.1038/443027a>
- 848 McKenney, B.A., Kiesecker, J.M., 2010. Policy Development for Biodiversity Offsets: A Review of
849 Offset Frameworks. *Environ. Manage.* 45, 165–176.
- 850 McVittie, A., Norton, L., Martin-Ortega, J., Siameti, I., Glenk, K., Aalders, I., 2015. Operationalizing
851 an ecosystem services-based approach using Bayesian Belief Networks: An application to
852 riparian buffer strips. *Ecol. Econ.* 110, 15–27. <https://doi.org/10.1016/j.ecolecon.2014.12.004>
- 853 MEA, 2005. *Millennium Ecosystem Assessment*. Island Press, Washington, DC.
- 854 Mesa-Jurado, M.A., Pineda, M., Novo, P., Martin-Ortega, J., 2018. ¿Cómo se adopta la noción de
855 servicios ecosistémicos en la política pública en México?, in: *Foro de Discusión: Una Mirada*
856 *Crítica a Los Servicios Ecosistémicos ¿Mercantilización o Conservación de La Naturaleza?*
857 Mexico City, Mexico.
- 858 Morito, B., 2003. Intrinsic value: a modern albatross for the ecological approach. *Environ. Values*
859 12, 317–336.
- 860 Muniz, R., Cruz, M.J., 2015. Making nature valuable, not profitable: Are payments for ecosystem

861 services suitable for degrowth? *Sustain.* 7, 10895–10921. <https://doi.org/10.3390/su70810895>

862 Muñoz-Piña, C., Guevara, A., Torres, J.M., Braña, J., 2008. Paying for the hydrological services of
863 Mexico's forests: Analysis, negotiations and results. *Ecol. Econ.* 65, 725–736.
864 <https://doi.org/10.1016/J.ECOLECON.2007.07.031>

865 Muradian, R., Gómez-Baggethun, E., 2013. The Institutional Dimension of “Market-Based
866 Instruments” for Governing Ecosystem Services: Introduction to the Special Issue. *Soc. Nat.*
867 *Resour.* 26, 1113–1121. <https://doi.org/10.1080/08941920.2013.829380>

868 Nahlik, A.M., Kentula, M.E., Fennessy, M.S., Landers, D.H., 2012. Where is the consensus? A
869 proposed foundation for moving ecosystem service concepts into practice. *Ecol. Econ.* 77, 27–
870 35. <https://doi.org/10.1016/j.ecolecon.2012.01.001>

871 Nava-López, M., Selfa, T.L., Cordoba, D., Pischke, E.C., Torrez, D., Ávila-Foucat, S., Halvorsen, K.E.,
872 Maganda, C., 2018. Decentralizing Payments for Hydrological Services Programs in Veracruz,
873 Mexico: Challenges and Implications for Long-term Sustainability. *Soc. Nat. Resour.* 0, 1–11.
874 <https://doi.org/10.1080/08941920.2018.1463420>

875 Norgaard, R.B., 2010. Ecosystem services: From eye-opening metaphor to complexity blinder. *Ecol.*
876 *Econ.* 69, 1219–1227. <https://doi.org/10.1016/J.ECOLECON.2009.11.009>

877 Novo, P., Martin-Ortega, J., Mesa-Jurado, A., Ferre, M., Pineda-Velazquez, M., 2018. Can we
878 measure nature commodification? A framed field experiment in the Lacandon jungle, Mexico,
879 in: *Research Network on Economic Experiments for the Common Agricultural Policy.*

880 Ojea, E., Martin-Ortega, J., Chiabai, A., 2012. Defining and classifying ecosystem services for
881 economic valuation: The case of forest water services. *Environ. Sci. Policy* 19–20, 1–15.
882 <https://doi.org/10.1016/j.envsci.2012.02.002>

883 Osborne, T., Shapiro-Garza, E., 2018. Embedding Carbon Markets: Complicating Commodification
884 of Ecosystem Services in Mexico's Forests. *Ann. Am. Assoc. Geogr.* 108, 88–105.
885 <https://doi.org/10.1080/24694452.2017.1343657>

886 Pascual, U., Balvanera, P., Díaz, S., Pataki, G., Roth, E., Stenseke, M., Watson, R.T., Başak Dessane,
887 E., Islar, M., Kelemen, E., Maris, V., Quaas, M., Subramanian, S.M., Wittmer, H., Adlan, A., Ahn,
888 S., Al-Hafedh, Y.S., Amankwah, E., Asah, S.T., Berry, P., Bilgin, A., Breslow, S.J., Bullock, C.,
889 Cáceres, D., Daly-Hassen, H., Figueroa, E., Golden, C.D., Gómez-Baggethun, E., González-
890 Jiménez, D., Houdet, J., Keune, H., Kumar, R., Ma, K., May, P.H., Mead, A., O'Farrell, P., Pandit,
891 R., Pengue, W., Pichis-Madruga, R., Popa, F., Preston, S., Pacheco-Balanza, D., Saarikoski, H.,
892 Strassburg, B.B., van den Belt, M., Verma, M., Wickson, F., Yagi, N., 2017. Valuing nature's
893 contributions to people: the IPBES approach. *Curr. Opin. Environ. Sustain.* 26–27, 7–16.
894 <https://doi.org/10.1016/J.COSUST.2016.12.006>

895 Pattanayak, S.K., Wunder, S., Ferraro, P.J., 2010. Show me the money: Do payments supply
896 environmental services in developing countries? *Rev. Environ. Econ. Policy* 4, 254–274.
897 <https://doi.org/10.1093/reep/req006>

898 Perez-Verdin, G., Sanjurjo-Rivera, E., Galicia, L., Ciro Hernandez-Diaz, J., Hernandez-Trejo, V.,
899 Antonio Marquez-Linares, M., 2016. Economic valuation of ecosystem services in Mexico:
900 Current status and trends. *Ecosyst. Serv.* 21, 6–19. <https://doi.org/10.1016/j.ecoser.2016.07.003>

901 Peterson, M.J., Hall, D.M., Feldpausch-Parker, A.M., Peterson, T.R., 2010. Obscuring ecosystem
902 function with application of the ecosystem services concept: Essay. *Conserv. Biol.* 24, 113–119.
903 <https://doi.org/10.1111/j.1523-1739.2009.01305.x>

904 Pineda-Vazquez, M., Mesa-Jurado, M.A., Novo, P., Martin-Ortega, J., 2018. El enfoque basado en
905 servicios ecosistémicos: oportunidades y riesgos percibidos por actores locales, in: *Foro de*
906 *Discusión: Una Mirada Crítica a Los Servicios Ecosistémicos ¿Mercantilización o Conservación*

- 907 de La Naturaleza? Mexico City.
- 908 Pirard, R., Billé, R., Sembrés, T., 2010. Upscaling Payments for Environmental Services (PES): Critical
909 issues. *Trop. Conserv. Sci.* 3, 249–261.
- 910 Porras, I., Grieg-gran, M., Neves, N., 2008. All that glitters: A review of payments for watershed
911 services in developing countries. *Natural Resource Issues* No 11.
- 912 Prip, C., 2018. The Convention on Biological Diversity as a legal framework for safeguarding
913 ecosystem services. <https://doi.org/10.1016/j.ecoser.2017.02.015>
- 914 Raymond, C.M., Singh, G.G., Benessaiah, K., Bernhardt, J.R., Levine, J., Nelson, H., Turner, N.J.,
915 Norton, B., Tam, J., Chan, K.M.A., 2013. Ecosystem Services and Beyond: Using Multiple
916 Metaphors to Understand Human–Environment Relationships. *Bioscience* 63, 536–546.
917 <https://doi.org/10.1525/bio.2013.63.7.7>
- 918 Rode, J., Gómez-Baggethun, E., Krause, T., 2015. Motivation crowding by economic incentives in
919 conservation policy: A review of the empirical evidence. *Ecol. Econ.* 117, 270–282.
920 <https://doi.org/10.1016/j.ecolecon.2014.11.019>
- 921 Saarikoski, H., Primmer, E., Saarela, S.-R., Antunes, P., Aszalós, R., Baró, F., Berry, P., Blanco, G.G.,
922 Gómez-Baggethun, E., Carvalho, L., Dick, J., Dunford, R., Hanzu, M., Harrison, P.A.,
923 Izakovicova, Z., Kertész, M., Kopperoinen, L., Köhler, B., Langemeyer, J., Lapola, D., Liqueste,
924 C., Luque, S., Mederly, P., Niemelä, J., Palomo, I., Pastur, G.M., Peri, P.L., Preda, E., Priess, J.A.,
925 Santos, R., Schleyer, C., Turkelboom, F., Vadineanu, A., Verheyden, W., Vikström, S., Young, J.,
926 2018. Institutional challenges in putting ecosystem service knowledge in practice. *Ecosyst.*
927 *Serv.* 29, 579–598. <https://doi.org/10.1016/j.ecoser.2017.07.019>
- 928 Sanchez-Colon, S., 2017. Contabilidad del Capital Natural y Servicios Ecosystemicos en Mexico 2017-
929 2020, in: 2nd Forum on Natural Capital Accounting for Better Policy.
- 930 Sandbrook, C.G., Fisher, J.A., Vira, B., 2013. What do conservationists think about markets?
931 *Geoforum* 50, 232–240. <https://doi.org/10.1016/j.geoforum.2013.09.009>
- 932 Sarukhan, J., Urquiza-Haas, T., Koleff, P., Carabias, J., Dirzo, R., Ezcurra, E., Cerdeira-Estrada, S.,
933 Soberon, J., 2015. Strategic actions to value, conserve, and restore the natural capital of
934 megadiversity countries: The case of Mexico. *Bioscience* 65, 164–173.
935 <https://doi.org/10.1093/biosci/biu195>
- 936 Schomers, S., Matzdorf, B., 2013. Payments for ecosystem services: A review and comparison of
937 developing and industrialized countries. *Ecosyst. Serv.* 6, 16–30.
938 <https://doi.org/10.1016/j.ecoser.2013.01.002>
- 939 Schulz, C., Martin-Ortega, J., Glenk, K., Ioris, A.A.R., 2017. The Value Base of Water Governance: A
940 Multi-Disciplinary Perspective. *Ecol. Econ.* 131, 241–249.
941 <https://doi.org/10.1016/j.ecolecon.2016.09.009>
- 942 Schulz, Martin-ortega, J., 2018. ScienceDirect Quantifying relational values — why not ? *Curr. Opin.*
943 *Environ. Sustain.* 35, 15–21. <https://doi.org/10.1016/j.cosust.2018.10.015>
- 944 Shapiro-Garza, E., 2013. Contesting the market-based nature of Mexico’s national payments for
945 ecosystem services programs: Four sites of articulation and hybridization. *Geoforum* 46, 5–
946 15. <https://doi.org/10.1016/j.geoforum.2012.11.018>
- 947 Silvertown, J., 2015. Have Ecosystem Services Been Oversold? *Trends Ecol. Evol.*
948 <https://doi.org/10.1016/j.tree.2015.08.007>
- 949 Turner, R.K., Paa, J., Cooper, P., Farber, S., Jessamy, V., 2003. Valuing nature : lessons learned and
950 future research directions 46, 493–510. [https://doi.org/10.1016/S0921-8009\(03\)00189-7](https://doi.org/10.1016/S0921-8009(03)00189-7)

- 951 Van Hecken, G., Bastiaensen, J., Windey, C., 2015. Towards a power-sensitive and socially-informed
952 analysis of payments for ecosystem services (PES): Addressing the gaps in the current debate.
953 *Ecol. Econ.* 120, 117–125. <https://doi.org/10.1016/j.ecolecon.2015.10.012>
- 954 Vatn, A., 2000. The environment as a commodity. *Environ. Values* 9, 493–509.
- 955 Waylen, K.A., Martin-Ortega, J., 2018. Surveying views on Payments for Ecosystem Services:
956 Implications for environmental management and research. *Ecosyst. Serv.* 29, 23–30.
957 <https://doi.org/10.1016/J.ECOSER.2017.11.007>
- 958 Wunder, 2005. Payment for environmental services: Some nuts and bolts, CIFOR Occasional paper,
959 42, p 24.
- 960 Wunder, S., 2015. Revisiting the concept of payments for environmental services. *Ecol. Econ.* 117,
961 234–243. <https://doi.org/10.1016/j.ecolecon.2014.08.016>
- 962