



**UNIVERSITY OF LEEDS**

This is a repository copy of *Nature commodification: 'a necessary evil'? An analysis of the views of environmental professionals on ecosystem services-based approaches*.

White Rose Research Online URL for this paper:  
<http://eprints.whiterose.ac.uk/144538/>

Version: Accepted Version

---

**Article:**

Martin-Ortega, J [orcid.org/0000-0003-0002-6772](https://orcid.org/0000-0003-0002-6772), Mesa-Jurado, MA, Pineda-Vazquez, M et al. (1 more author) (2019) Nature commodification: 'a necessary evil'? An analysis of the views of environmental professionals on ecosystem services-based approaches. *Ecosystem Services*, 37. 100926. ISSN 2212-0416

<https://doi.org/10.1016/j.ecoser.2019.100926>

---

© 2019, Elsevier. This manuscript version is made available under the CC-BY-NC-ND 4.0 license <http://creativecommons.org/licenses/by-nc-nd/4.0/>.

**Reuse**

This article is distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs (CC BY-NC-ND) licence. This licence only allows you to download this work and share it with others as long as you credit the authors, but you can't change the article in any way or use it commercially. More information and the full terms of the licence here: <https://creativecommons.org/licenses/>

**Takedown**

If you consider content in White Rose Research Online to be in breach of UK law, please notify us by emailing [eprints@whiterose.ac.uk](mailto:eprints@whiterose.ac.uk) including the URL of the record and the reason for the withdrawal request.



[eprints@whiterose.ac.uk](mailto:eprints@whiterose.ac.uk)  
<https://eprints.whiterose.ac.uk/>

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

4  
5                   Julia Martin-Ortega<sup>a</sup>, M. Azahara Mesa-Jurado<sup>b\*</sup>, Mariana Pineda-Vazquez<sup>b</sup>, Paula Novo<sup>c</sup>

6  
7                   <sup>a</sup>Sustainability Research Institute, University of Leeds, Leeds, United Kingdom

8                   <sup>b</sup>El Colegio de la Frontera Sur, Unidad Villahermosa, Tabasco, Mexico

9                   <sup>c</sup>Land Economy, Environment and Society Group, Scotland’s Rural College, Edinburgh, United  
10 Kingdom

11                   \*corresponding author: [azaecosur@gmail.com](mailto:azaecosur@gmail.com)

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 (Porrás 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 values<sup>1</sup> 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 Neotropics<sup>2</sup>  
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

---

<sup>2</sup> [www.pecsii.org](http://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 [tatatatata<sup>3</sup>] 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 (Aguiar 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 former<sup>4</sup>.

---

<sup>3</sup> Onomatopoeic emphasis.

<sup>4</sup> 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)<sup>5</sup>. 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

---

<sup>5</sup>Two 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](http://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](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’te<sup>6</sup> 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

---

<sup>6</sup>Interestingly, 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.

715

716

717 **Acknowledgments:** This research was funded by the Newton Advanced Fellowship Scheme 2015 of the  
718 British Academy and the Newton Fund (project: "Applying ecosystem services-based approaches to water  
719 resource decision making: studying the risk of nature commodification in Mexico's last free-flowing river" –  
720 Usumacinta ROC - Award Reference: AF150190). Authors are grateful to all interviewees and to ECOSUR  
721 colleagues and supporting staff, particularly to the staff of the Laboratorio Transdisciplinario para la

722 Sustentabilidad (LATSU). The authors acknowledge the support of the ‘Shut up and Write’ writing club and  
723 the Women’s Writing initiative of the Faculty of Environment of the University of Leeds. The interviews and  
724 overall research plan was approved by Research Ethics Committee of the University of Leeds.

725

726

727

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., Blanko, 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