

# 1 Good enough for governance? Audit and 2 marine biodiversity offsetting in Australia

3

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5 *Geoforum*

6

## 7 Abstract

8 Biodiversity offsetting is often presented as a way to manage competing demands of environmental  
9 protection and economic development. It is premised on the transparent demonstration of how aims of no  
10 net loss of biodiversity (NNL) or similar are met in practice. This is complicated in marine systems where  
11 ecological predictions are commonly highly uncertain, knowledge of ecological restoration is low and  
12 administrative governance is complex. Drawing on a case study of marine biodiversity offsetting in Australia,  
13 this paper shows how these uncertainties pose practical challenges for both producers and consumers of  
14 marine biodiversity offsets, needing to progress with decision-making while meeting increasing societal  
15 pressure for demonstrable NNL. These competing needs are met through the centrality of an auditable  
16 decision-making process that contributes to establishing an organisation's social licence to operate. The need  
17 for auditability drives the use of an imprecise measure of NNL through financial equivalency and the use of  
18 strategic offsetting projects. The coarse-grained interpretation of biodiversity offsetting best practice  
19 reduces the risks posed by explicit acknowledgement of biodiversity loss, offset failure or prohibitively large  
20 offset liabilities. Strategic relationship management across government, industry, academia and non-  
21 governmental organisations has raised the profile of biodiversity and its importance, but whether the  
22 auditing process has delivered on environmental protection is an open question. What is 'good enough' to  
23 meet governance standards may have become the over-riding goal. We conclude by acknowledging that the  
24 seemingly unattainable yet expected aim of NNL for marine systems prioritises auditability above discussions  
25 of 'acceptable' risk.

## 26 Keywords

27 Audit culture; biodiversity offsetting; no net loss; environmental governance; social licence to operate

28

## 29 Introduction

30 Offsets and net zero targets have proved to be a lively topic of enquiry for geographers. Since their  
31 emergence as part of what have been called neoliberal environmental regulatory regimes from the 1980s  
32 (Robertson, 2000), they have become a central focus in environmental policy from climate change to  
33 biodiversity and ecosystem services. As more corporations, governments and individuals pledge to reduce  
34 their environmental impacts, biodiversity offsets are increasingly becoming both a central tool to manage  
35 'unavoidable' impacts of economic development and as a way to promote a 'net gain' or 'net positive'  
36 outcome for the environment. Doubts have, however, been raised about the technical feasibility and  
37 reliability of biodiversity offsets, as well as criticism of their complicity within a neoliberal system where profit  
38 comes before environmental goals (Apostolopoulou et al., 2018). While acknowledging the importance of  
39 these claims, this paper focuses instead on the more pragmatic ways in which biodiversity offsets are  
40 engaged within practice in the context of marine offsetting in Australia. Rather than simply re-enforcing  
41 arguments for an unfolding system of neoliberal environmental governance or an abject failure to measure  
42 what matters, we argue that as offsets are integrated into decision-making, they are increasingly governed  
43 through and with a concern for auditability. This paper, therefore, offers an exploration of the way that  
44 offsets function as part of an environmental 'audit society' (following Power, 1997) where trust in the  
45 auditing process creates a more pragmatic sense of what is 'good enough' for meeting regulatory rules  
46 through offsets.

47 The paper unfolds by first reviewing existing literatures on biodiversity offsetting before going on to set out  
48 the importance of understanding the primacy of audit as a means of accounting for offsetting processes. The  
49 paper then moves on to briefly contextualise the marine biodiversity offsetting environment in the case study  
50 of Australia as well as setting out the methodology. In discussing the empirical findings, the paper first  
51 establishes the centrality of audit in offsetting, before critically exploring the implications this has for the  
52 definition of targets, the establishing of trust and acceptability in the process, and the consequences of a  
53 focus on what can be measured and audited for biodiversity outcomes. In conclusion, we argue that the trust  
54 in the system of accounting is what will enable biodiversity offsets to work, but that this comes with  
55 significant risks.

56

## 57 A critical review of biodiversity offsetting

58 Biodiversity offsetting, net gain and no net loss (NNL) are policy tools and concepts that emerged with the  
59 decentralisation of environmental governance from the 1980s (Hardin, 1978; Lemos and Agrawal, 2006).  
60 Through competition, increased participation, and accountability they intend to instil efficiency in natural

61 resource use (Lemos and Agrawal, 2006) and to improve social, economic and environmental conditions -  
62 the triple bottom lines of sustainability. In theory, biodiversity offsetting presents a 'win-win' situation where  
63 the environmental damages commonly associated with economic development are controlled through  
64 actions to avoid, minimise, compensate or offset (Bull et al., 2013). Using the mitigation hierarchy,  
65 biodiversity replacement is the last resort only pursued after avoidance and minimisation of damage. The  
66 hierarchy signals where biodiversity offsetting is required, and assists in the quantified measurement of  
67 ecological equivalence which determines the 'amount' and 'type' of biodiversity to be created. Central to  
68 their use is the clear and quantifiable demonstration of ecological equivalence between the biodiversity (and  
69 associated benefits) lost and gained (Bull et al., 2016). Accordingly, biodiversity offsets need to meet the  
70 criterion of additionality, where benefits need to exceed those that may occur in the absence of any offsetting  
71 project. Conceptually, the step-wise implementation of the mitigation hierarchy should bring transparency  
72 and logic to development consent processes implicating biodiversity damage, and enable auditing of  
73 outcomes. Biodiversity offsets are described as a way for business and governments to demonstrate their  
74 commitment to sustainable development and environmental protection (ten Kate et al., 2004).

75 Despite the increasing uptake of biodiversity offsetting and associated aims of NNL and net gain, there are  
76 concerns that the approach may be ill-equipped to halt or even reduce biodiversity losses attributed to  
77 development and land use change. It is technically challenging to quantify and then create fully functioning  
78 biodiversity that matches the complexity and 'value' of that lost. Reviews of compensatory habitat creation  
79 and restoration have consistently identified that offsetting projects do not deliver the full suite of ecological  
80 functions and benefits attributed to natural systems (Ambrose, 2000; Burgin, 2009; Kentula, 2000; Moreno-  
81 Mateos et al., 2012; Quigley and Harper, 2006). This poor performance is attributed to limited understanding  
82 of ecological restoration and inability to both measure and recreate the complex and specific biological,  
83 chemical and physical relationships that support the existence of biodiversity (Calvet et al., 2015; Dauguet,  
84 2015; Hobbs and Norton, 1996). Given this, it is difficult to demonstrate equivalency and define offsetting  
85 requirements (Walker et al., 2009). While metrics have been developed to support standardised, transparent  
86 calculations of equivalency and to establish the units by which biodiversity should be exchanged (Maron et  
87 al., 2012; Robertson, 2006, 2000) they have been criticised for over-simplifying complex ecological systems  
88 (Bekessy et al., 2010; Burgin, 2009, 2008; Van Dover et al., 2017). Ferreira (2017), for example, identifies the  
89 lack of ecosystem accounting standards as a particular weakness in the UK's biodiversity offset trials between  
90 2012 and 2014. Sullivan and Hannis (2017) likewise point to the ways that biodiversity units become  
91 exchangeable such that in aggregate, biodiversity is unchanged, but the composition of the units could be  
92 significantly different. Numbers, for them, enable the function of "*the truth regime of the market*" (ibid:

93 1471), a point echoed by other critical scholars of biodiversity offsetting (e.g. Apostolopoulou and Adams,  
94 2015; Robertson, 2000).

95 Conceptually, offsets or NNL offer a quick and easily understood 'fix' for the unacceptable damages  
96 associated with economic development. This is achieved through obscuring the definition of success by  
97 masking the complexity of biodiversity, the true costs of economic development, and eroding the societal  
98 boundary associated with the approval of environmental damages by reframing and legitimising them as a  
99 transaction (Apostolopoulou and Adams, 2015; Büscher, 2012). Critics fear that the overestimated and  
100 overstated confidence in abilities to create biodiversity through restoration activity is central to this  
101 legitimisation of offsets and may reduce the impetus to explore options to avoid losses (Gordon et al., 2015;  
102 Ives and Bekessy, 2015; Maron et al., 2015; Spash, 2015)

103

#### 104 [The politics of audit](#)

105 Given the concerns about whether ecological equivalence is being met, the demonstration of positive  
106 outcomes through technical measurement and review processes has been pivotal to decision-making about  
107 offsetting (e.g. Department of Environment Water and Natural Resources, 2019). The high degrees of  
108 uncertainty in how to scientifically meet or assess aims of NNL, and the highly contested arena of natural  
109 resource management have led to a favouring of audit as a mechanism of control (Power, 2003). To  
110 demonstrate the effectiveness and legitimacy of offsets, there is a focus on measurement and subsequently  
111 management systems (audits) that monitor performance in relation to those measurements (Power, 2003,  
112 1994). This translates to a simplified and abstracted audit process, through the development of guidelines  
113 and certification schemes that enable a "*cost effective and economically possible*" (Power, 2003) way to  
114 monitor or control the complexities of biodiversity offsetting.

115 The history of audit has been well established in Power's classic account of the audit society, which drew  
116 attention to the increasingly visible work of auditing as a means to provide transparent and efficient  
117 governance, in public services as well as private corporations (Power, 1997). The idea of a financial audit  
118 arose through a proliferation of paperwork that focused on risks and their mitigation that would ensure all  
119 aspects of an organization would become auditable. Often castigated as 'box-ticking', audit trails provide a  
120 vital mechanism through which organizations encourage compliance with rules (Power, 2009). Auditing  
121 almost invariably simplifies issues, but this simplicity enables internal interventions and controls. While  
122 quantification may be important, it is the power of the systemic processes of audit that enables these  
123 simplified assessments to become symbols of regulatory good governance (Power, 2007). Proof of this is that

124 while numbers can be gamed, this does not seem to undermine trust in the overall process of auditing (Bevan  
125 and Hood, 2006). It is thus not so much the numbers as the system of auditing that enables its authority.

126

127 This point is crucial when it comes to a subject like biodiversity offsets. There has been a significant literature  
128 within geography and cognate disciplines exploring the failure of offsets to accurately or reliably measure  
129 ecological equivalence. Scholars have criticised weak simplifications in terms of wetland or stream credit  
130 design (Lave et al., 2010a; Robertson, 2012, 2004) and the way carbon offset forestry writes out other  
131 important communities and ecologies (Lohmann, 2009). Despite the weakness of numbers, the desire for  
132 auditability of 'environment performance' remains strong. These nascent markets have been widely critiqued  
133 and in dissecting the calculation of biodiversity offset quantification in their trial in the UK Carver and Sullivan  
134 (2017) argue that they emerged through an iterative process in which developers and local planning  
135 authorities negotiated the final numbers of units of biodiversity that would be mitigated. The process was  
136 shown to potentially sacrifice conservation values for marketable values i.e. those that could be translated  
137 into an ideal of exchangeable, fungible units.

138

139 In doing so, Carver and Sullivan (2017) make a critical intervention as they demonstrate that biodiversity  
140 calculations are not a neutral expert process, but rather a negotiated process through which there is no  
141 possible precisely accurate answer. As Wilshusen (2019) notes, the reassembling of networks of biodiversity  
142 governance through economic techniques "*encourages the development of new social technologies and*  
143 *devices in ways that enable economic governance techniques to guide business practices*" as well as the  
144 work of other actors such as non-governmental organizations (NGOs). In other words, while accounting for  
145 the accuracy of biodiversity offsets has been of central interest to ecologists and geographers, it is equally  
146 important to recognise that quantification may not be as powerful as the system of auditing that effects  
147 particular forms of governance. That biodiversity should be audited through techniques and processes  
148 derived from economic auditing is critical here. What is interesting, however, is that this auditing needs to  
149 be trusted to be *good enough* to validate a particular goal or outcome. Biodiversity losses must not become  
150 excessive. As Power (2007) reminds us, auditing is risk-based rather than a striving for completeness of  
151 quantification or full accuracy. A criticism of the exact numbers is maintained parallel to an enduring belief  
152 in the qualitative value of the auditing processes as is the case with university managements that project the  
153 value of university rankings for their public relations while decrying the incomplete equations behind such  
154 rankings (Shore and Wright, 2015). There can be an acceptance of biodiversity offsets and their audit trails,  
155 even as the actual numbers or units are considered to be insufficient. This is the argument we develop in this  
156 paper.

157

## 158 Marine biodiversity offsetting – accuracy vs. audit

159 Before turning to the case study and analysis, it is important to contextualise the distinctive situation with  
160 marine offsets. In marine contexts, biodiversity offsetting commonly follows a direct and unadjusted  
161 translation of policy and guidance developed for terrestrial environments (Bas et al., 2016; Jacob et al., 2017;  
162 Author, 2017a, 2017b). The application of terrestrially developed offsetting principles in marine contexts is  
163 complicated due to the high uncertainty in current levels of ecological knowledge, relating to both impact  
164 assessment and restoration (Bas et al., 2016; Jacob et al., 2017; Vaissière et al., 2014; Van Dover et al., 2014).  
165 The ability to audit the process of offset implementation becomes vital as it is simply harder to verify offsets  
166 to ensure their compliance and success. Whilst demonstrating compliance is particularly challenged in marine  
167 contexts, it has also been identified as an issue in the use of biodiversity offsetting in terrestrial settings  
168 where low levels of compliance assessment is attributed to a lack of resources (Brown et al., 2013), political  
169 disincentives where increased scrutiny could be financially or reputationally damaging (Keene and Pullin,  
170 2011) and poorly designed planning conditions (Lindenmayer et al., 2017). In a review of offset effectiveness  
171 in Western Australia May et al. (2017) illustrate that offset effectiveness (or success) is often not a requisite  
172 for compliance success. Auditing and accuracy are not the same thing.

173

174 Within a marine context, it is much harder to establish ecological equivalence due to the inability to  
175 accurately measure losses and gains of marine biodiversity or link predicted and observed ecological changes  
176 to specific activities. The diffuse nature of impact pathways coupled with complex administrative  
177 arrangements such as overlapping temporal and spatial claims to an area or target resource pose difficulties  
178 for management of marine biodiversity. This situation is very different to terrestrial contexts where clearly  
179 defined ownership supports the use of physical (e.g. fences) and enforceable legal measures to isolate an  
180 area for restoration (Kearney et al., 2013). In addition to the practical limitations to creating 'new' marine  
181 biodiversity, these factors have complicated the use of metrics commonly used in the terrestrial application  
182 of biodiversity offsetting. Metrics to establish the type and quantity of biodiversity to be offset commonly  
183 rely on a calculation relating to the spatial area affected and the vulnerability or significance of the type of  
184 biodiversity to be damaged (Bas et al., 2016). The diffuse nature of impact pathways in marine environments  
185 and the lack of knowledge of the environmental dependencies inherent to a healthy marine environment  
186 challenge the ecological relevance of such simplified algorithms. The specificities of what aspects of  
187 biodiversity are lost are not captured by current approaches and so broad-brush assessments are used to  
188 provide an estimate of what an equivalent 'amount' of new biodiversity might be. Assessments are also

189 challenged in establishing the specific impacts arising from a specific action against a backdrop of a host of  
190 other diffuse pressures that are known to cumulatively be affecting marine biodiversity (Halpern et al., 2015).  
191 Available knowledge and science is not readily or sufficiently available to easily (or affordably) inform a metric  
192 refined enough to calculate the specific type and quantity of biodiversity lost through a specific activity.

193

194 In summary, the “*knowledge basis*” (Power, 2003) for the application of biodiversity offsetting in marine  
195 environments can be described as weaker than that observed in terrestrial systems. Accordingly, the use of  
196 audit systems to control the risks of controlling environmental harm, present different modes of feedback to  
197 those apparent in terrestrial environments where understanding, ownership and consequently oversight of  
198 biodiversity are perceived to be greater. High degrees of uncertainty and societal disconnection leaves the  
199 marine application of biodiversity offsetting vulnerable to misuse (Maron et al., 2015). Auditing therefore  
200 plays an even more critical role in the marine context, an argument that we explore using the case of  
201 Australia.

## 202 Case study & methods

203 Biodiversity offsetting is a requirement of environmental impact policy at a Federal level (Australian  
204 Government, 2012) and five of Australia’s seven states and territories have state level policy that apply to  
205 marine areas (Miller et al., 2015; Niner et al., 2017b). This policy and associated guidance is implemented in  
206 practice with limited consideration of how marine applications may vary from terrestrial experiences (Bell  
207 et al., 2014; Bos et al., 2014; Brodie, 2014; Niner et al., 2017a). At a Federal level, the marine environment is  
208 identified as a ‘challenge’ to the strict adherence to ecological definitions of equivalence; in response the  
209 policy relaxes requirements for ‘like for like’ biodiversity gains (Australian Government, 2012). This Federal  
210 framing for marine offsetting follows through into State legislation in New South Wales (Fairfull, 2013) and  
211 Queensland (Fisheries Queensland, 2012; State of Queensland, 2020, 2015, 2014) including specific policy  
212 for the Great Barrier Reef (GBR) (Australian Government, 2017; Commonwealth of Australia, 2018). At this  
213 level marine biodiversity offsetting policy and guidance sets out the benefits of a strategic approach to  
214 marine restoration as compared to ad hoc offsetting projects. Accordingly, these policies prefer that marine  
215 offsetting requirements are addressed through financial payments to be centrally applied to large scale  
216 efforts to create biodiversity benefit (Niner et al., 2017a). Rather than curating and developing a bank of  
217 biodiversity credits, the aim is to accumulate sufficient funds to address large-scale issues of concern such as  
218 water quality (Bos et al., 2014). Given the limited detailed consideration of marine biodiversity offsetting  
219 globally (Niner et al., 2017b), Australia where marine application has been addressed within policy, provides

220 a useful case study to explore how the approach is addressing uncertainty within decision-making and also  
221 how this same uncertainty is influencing its application.

222

223 To inform this analysis, 31 interviews were conducted between October 2016 and May 2017 to explore the  
224 perspectives of a range of different actors that had professional experience in the development and  
225 application of biodiversity offsetting policy in marine environments in Australia. This included regulators,  
226 industry members, consultants, NGO representatives and academics. In depth thematic analysis of interview  
227 data was combined with extensive reading of related academic and grey literature including policy and  
228 development-consenting documents.

229

230 **Table 1.** The distribution of participants across profession type.

<b>Participant type</b>	<b>Code</b>	<b>Total participants</b>
<b>Practitioner*</b>	Industry	6
	Consultancy	7
<b>Regulator</b>	REG#	7
<b>Non-Governmental Organisation</b>	NGO#	6
<b>Academia</b>	ACA#	5
<b>Total</b>		<b>31</b>

231 \*Industry and consultancy representatives are collectively referred to as practitioners.

## 232 [The importance of audit and defining targets for measurement](#)

233 Making biodiversity offsets auditable might suggest an ability to quantify the ecological benefits of an offset.  
234 NNL is often considered to be a 'specific and quantified' goal wherein the measurement of biodiversity gains  
235 and losses informs the approach to mitigation (Bull et al 2013; Rainey et al, 2014). This appeal to  
236 quantification, however, is challenged in marine offsetting, because the metrics are currently unavailable or  
237 under development in most jurisdictions in Australia (Dutson et al., 2015; Maron et al., 2016). There is  
238 therefore no agreement to how marine biodiversity should be quantitatively represented in decision-making.

239

240 Research participants echoed this conclusion suggesting that a key barrier to the development of marine  
241 offsetting was the lack of a comprehensive understanding of the multiplicity of relationships across time and



242 space that give rise to marine biodiversity. This challenges the development of metrics to quantify  
243 biodiversity losses and gains, and consequently it becomes administratively difficult to implement marine  
244 offset projects where accuracy is the primary goal (Freestone et al., 2014; Van Dover et al., 2017). Participants  
245 described their frustration suggesting that the practice is unfeasible and has “...*always been one of those*  
246 *things that people have stayed away from*” (ACA1), leading, for example, “*to a position that we don’t provide*  
247 *for physical offsetting of seagrass. It’s just too difficult ... it just has failed...*” (REG5). There was common  
248 agreement across participants that the measurable gains and losses stipulated as a requirement to meet NNL  
249 in terrestrial systems are not appropriate for marine systems. Given such challenges of creating trustworthy  
250 numbers, it might be assumed that marine biodiversity offsetting would simply fail.

251

252 Yet this apparent failure of quantification has not diminished an ideal of auditability through numbers. The  
253 majority of actors acknowledged the failures of quantification, but perceived offsets as an accepted  
254 “*cornerstone ... [or a] ... key regulatory tool ... [for] ... compensation*” (REG3) and development consent more  
255 widely. Indeed actors involved in developing and applying this policy approach argued that offsetting is  
256 necessary as an audit trail for environmental regulation and decision-making. This likely stems from the  
257 ubiquity of the approach in terrestrial settings and an increased demand for the transparency and auditability  
258 of decision-making. A system for marine offsets that could be *good enough* to be operationalised is vital to  
259 support the activity and interest of governments and industry and their respective social licence to operate.

260

261 Whilst this framing does not meet the rigour that the scientific (academic) community might expect for  
262 biodiversity offsetting, it indicates that it is performing as a quantifiable (and auditable) risk-based tool to  
263 demonstrate how the risks of an activity are considered. The social licence to operate is particularly important  
264 here whereby broad acceptance of an activity is fostered through trust-based relationships between actors  
265 (e.g. industry or government) and society (Bice et al., 2017; Moffat et al., 2016). The majority of participants  
266 described marine biodiversity offsetting positively as an “*an opportunity to demonstrate industry’s social*  
267 *licence to operate*” (IND4). This is further suggested by participants who argued that biodiversity offsetting  
268 influenced an organisations’ perceived image and thereby a preference for offsetting activities that are  
269 “*highly visible*” (NGO1) that “*target the right things*” (IND3) and “*get the right messaging out there*” (IND5).  
270 This suggests that quantifying the metrics for marine offsetting performs a stronger role in managing the  
271 social licence to operate (i.e. secondary business risk) than the ecological risks posed by the loss of  
272 biodiversity. It becomes an issue of institutional risk management (Power, 2007; Rothstein et al., 2006).  
273 Auditability performs a vital role for an organization’s ability to establish that they undertook biodiversity

274 offsetting through due processes, even if formal quantification is incomplete and considered ecologically  
275 insufficient.

## 276 Auditing for financial equivalence

277 For this reason, offsetting is about managing institutional risks as much as achieving a goal of ecological  
278 equivalency (e.g. NNL). Rather than strictly focussing on ecological equivalence, therefore, the ambition for  
279 an auditable system leads to a focus on financial equivalency. Ecological equivalence seeks rigorous  
280 quantification of losses to set specific ecological offsetting targets, such as an area of habitat or species  
281 population, to ensure that this target does not diminish against counterfactual scenarios in the absence of  
282 the impact or offsetting activity (Maron et al., 2012). Financial equivalence is often described as an ‘out of  
283 kind’ offsetting measure whereby losses are attributed a monetary value which is paid to another party in  
284 exchange for a defined quantum of biodiversity benefit. Ecologists describe this as an incorrect use of the  
285 term offset, as activity falling under this term frequently falls short of demonstrating how the biodiversity  
286 gains to be achieved with this finance will be measurable and commensurate with the losses triggering the  
287 offsetting requirement (Bull et al., 2016; Niner et al., 2017a). Conservation funds seek to achieve more certain  
288 benefits of a ‘higher value’ than ad hoc but ecologically equivalent offsets (an approach deemed appropriate  
289 in some circumstances (Habib et al., 2013)), but the use of such funds further challenges the demonstration  
290 of ecological equivalence as the units of exchange are often very different (Bull et al., 2016) and often lead  
291 to a focus on units of finance.

292

293 Financial equivalency allows offsetting requirements to be successfully and demonstrably met at the point  
294 of funds transfer, with “*better bang for buck*” (IND5). The consequent liability for biodiversity creation or  
295 offset success is diluted or passed on to the party delivering the biodiversity benefit, which in Australia is  
296 most frequently the Government. Financial equivalency and the payment of offsetting liabilities into strategic  
297 funds is advised by some as a way to address the demands of marine biodiversity creation (Bos et al., 2014).  
298 Large projects can address the sources of impact at a cumulative level i.e. tackling the sources of trends of  
299 decline, as opposed to seeking to restore and protect an individual specific quantum of marine biodiversity  
300 loss (e.g. an area of seagrass) under these trends. For example, a commonly proposed option for marine  
301 biodiversity offsetting is the improvement of water quality, which would require a large-scale project to  
302 manage the use of coastal and catchment land use (Bos et al., 2014; Dutson et al., 2015). The challenges of  
303 applying ecological equivalence and the promise of greater gains and efficiency, have led to the dominance  
304 of financial equivalence with sums defined arbitrarily as “*a proxy*” (IND3), often based on “*precedent*” (REG7)  
305 and limited transparency over how funds will be used.

306

307 Recognising the benefits of tackling marine conservation projects at scale in Australia, there has been a push  
308 to instil academic interpretations of biodiversity offsetting with a stipulation for ecological equivalence. This  
309 has led to the calculation of ecologically equivalent financial offsets that were found by practitioners to be  
310 so large as to be “*absolutely frightening for industry*” (CON8). A reason for these large numbers when basing  
311 assessments of financial equivalence on ecological science could be explained by the use of offsetting ratios  
312 to address uncertainties in marine biodiversity. Conceptually, offset ratios are applied to account for  
313 uncertainty in creating ‘new’ biodiversity and can be applied to reduce the risk of offset failure by increasing  
314 the effort, scale or significance of an offsetting activity (Moilanen et al., 2009; Quétier and Lavorel, 2011).  
315 These ratios can also be applied to calculate offset liabilities seen to be large enough to meet expectations  
316 that big urban developers, “*the baddies*” (CON1), are suitably punished and to ensure sufficient support for  
317 the activity required to meet strategic conservation aims. The process of auditing offsets generates responses  
318 that go beyond ecological equivalence to ensure the development of trust and legitimacy in the system.  
319 However, the strategic pooling of offset finance to overcome the challenges of marine biodiversity offsetting  
320 may still fall short of the large sums required to meet conservation targets identified (Brodie, 2014). Financial  
321 equivalence is calculated based on the impacts identified through legislative frameworks and limited in scope  
322 to certain ecological aspects such as ‘fish habitat’ (Fairfull, 2013) or ‘native vegetation’ (Government of South  
323 Australia, 2015). Accordingly, it is not clear that assessment against these limited ecological receptors will  
324 support the totals necessary to enact these strategic efforts. Offsetting losses might simply not be sufficient  
325 in marine environments. Regardless, the high costs of an ecologically relevant financial equivalence represent  
326 a distinct change in budget allocations for environmental aspects of development consent where historically  
327 biodiversity depletion has not been internalised.

328 Combined, these challenges lead to actors resisting a scientifically robust interpretation of offsetting given  
329 the prohibitive financial costs and the risk of failure involved. Financial equivalence comes to shape the audit  
330 process instead. The ad hoc and ambiguous determination of financial equivalence accepted by actors was  
331 widely recognised as falling short of encompassing the full value of biodiversity loss. Rather than this  
332 becoming a stumbling block to offset development, it is this lack of definition that enables actors to reach  
333 agreement, to make decisions and to progress with development. Current opaque processes to offset  
334 biodiversity through financial equivalence appear sufficient enough demonstration that due process has  
335 been followed and crucially that agreement on offsetting liabilities has been met.

336 The numbers then are mobilised in support of an audit trail. It is unlikely that the numbers could be too far  
337 removed from instinctive reactions about biodiversity (i.e. losses are acknowledged), as this would present

338 an unacceptable threat to an organisations social licence. But neither do the numbers need to be excessively  
339 precise or accurate to make offsetting legible in auditing terms. To re-iterate our argument, while the design  
340 and quantification of offsets matters, as mechanisms for efficient governance it is their ability to enable an  
341 auditing of organizational performance in relation to biodiversity risks that matters more. Counting marine  
342 offsets in one form or another enables a proximate, good enough account and response, at least for achieving  
343 financial equivalence if not ecological equivalence. A key question is whether this would be sufficient to allay  
344 scientific concerns that what is measured is not really what matters in terms of biodiversity loss.

345

### 346 Auditing to convince stakeholders

347 For an audit trail to convince and for the governance framework to become legitimate and established, the  
348 varying stakeholders involved in the process need to agree that this system is the best possible or good  
349 enough to achieve the stated aims of biodiversity offsetting such as NNL. This system relies on governmental  
350 support, third party organisations such as large environmental NGOs and, public and academic goodwill.  
351 Accordingly, Biodiversity offsetting has become a threat for users, where threats are perceived to arise  
352 through the expectations of society for environmental responsibility and protection. The approach poses a  
353 threat to an organisations' social licence by increasing societal expectations for NNL. Participants describe  
354 how expectations exist that *"industry will fix the problem"* (IND1) that they acknowledge is *"both naturally  
355 occurring and influenced by human interaction"* (IND1) and very unlikely to be addressed through offsets for  
356 a specific planned impact. Falling short of this expectation is described as a risk to an organisation's social  
357 licence to operate and highlights the challenges of communicating significance and cumulative impacts,  
358 which are complex and often poorly defined scientific concepts as opposed to an easily understood measure  
359 of biodiversity loss.

360

361 As a management tool for these perceived threats, the control of messaging around the use of biodiversity  
362 offsetting and environmental impact is important for users. The loss of control associated with the use of  
363 coarse grain measures of financial equivalence and strategic offset funds was described as a point of concern  
364 for industry. Control is lost through the reliance on third parties or governments to decide on the final form  
365 and project design of the offset project and its delivery, and how targets are defined, monitored and then  
366 reported against. Similarly, the risk of offset failure was described as entirely unpalatable to government  
367 representatives, yet the conceptually simple message of NNL was described as creating an overarching  
368 institutional expectation that refusal of a potentially damaging activity was unwarranted and unacceptable.

369 Whereby “everyone thinks they’re an environmental expert” (REG1) and this perceived understanding of  
370 biodiversity offsetting process assumed by ecologically unqualified government officials (e.g. ministers of  
371 planning or infrastructure) seeking to further their own interests, undermines abilities to refuse development  
372 on the grounds of unacceptable environmental impact through the misinformed identification of “a fantastic  
373 offset” (REG1).

374

375 The threats to the legitimacy of the offsetting system were further outlined in relation to the likelihood of  
376 failure:

377 *“...the biggest barrier and it's, there's two there's a legal, a legal fear and a... human fear of failure,*  
378 *we're too scared of failure, we aren't prepared to fail. So we spend all our time trying to make sure*  
379 *that it's fool proof and holds water and then we don't go and measure it because we don't actually*  
380 *want to know that it's failed. So, we're too scared of the nasty answer, Minister doesn't want to*  
381 *stand up in parliament and go well my department has issued four hundred approvals requiring this*  
382 *many offsets and none of them have worked, it doesn't work, he's not going to do it...” (CON8)*

383

384 Auditing a process of offsetting that has been agreed among many stakeholders provides collective  
385 reassurance that institutional and societal risks have been managed, however overt ecological failure remains  
386 unacceptable and an acknowledged source of risk. There is a security through the process as long as the audit  
387 does not too carefully examine the details.

388

389 To navigate the perceived impossibility of meeting a quantifiable NNL in marine systems, organisations  
390 coalesce around biodiversity offsetting as a system of auditing which allows for decisions to be made and  
391 economic activity to proceed. This is not to say that there is an explicit intention to damage biodiversity but  
392 rather that NNL in marine contexts presents too many risks for users to be practicable and a more rigorous  
393 application of NNL is not sought. Indeed tacit approval of this mode of practice is garnered from the increased  
394 attention on the technicalities of biodiversity offsetting by independent academics and large environmental  
395 NGOs. This attention takes the form of ‘best practice guidance’ for marine biodiversity offsetting (e.g. Fauna  
396 & Flora International, 2017), and despite acknowledging the limitations of the approach, perpetuate the  
397 narrative that NNL is an achievable and politically supported target. Conversely, much formal academic  
398 attention describes the scientific challenges of meeting a meaningful NNL but promotes the accepted norm  
399 that NNL is a desirable and achievable outcome. Academic representatives among others were critical of the  
400 misuse offsets “they’re [financial offsets] not offsetting anything they’re just a payment to go and do

401 *something that's not actually an equal and opposite effect. It's not a benefit that's equivalent to a loss. So*  
402 *that to me is not an offset it's a form of compensation"* (ACA3). However, voices that explicitly challenge  
403 whether or not NNL is appropriate in marine contexts at all remain absent and the technical focus on  
404 'improving practice' remains dominant. Improvements that were commonly sought include the definition of  
405 the offset 'problem' "So the question, no net loss of what, compared to what, get clear on that (ACA3) and  
406 improving the information basis for decisions "you don't have the baseline data ... and thus like what the  
407 counterfactual looks like into the future" (ACA4). Counterintuitively this critique does not support  
408 transparency in the use of NNL but leads to a dependence on audit to navigate the risks posed by expectations  
409 of biodiversity offsetting. The engagement of perceived independent academic 'experts' and societal actors  
410 (e.g. large environmental NGOs) – either as a form of resistance through critique of effectiveness or  
411 acceptance – serves to amplify the use of the approach within the management of risk (Power, 2007). These  
412 relationships serve to manage the 'threatening agents' (Power, 2007) of alternative narratives that could  
413 damage an organisation's social licence to operate. It is why bringing stakeholders together to unite around  
414 an ideal of offsetting is an effective institutional and societal risk management strategy.

415

416 In turn, a reliance on these relationships as opposed to formalised process is a point of conflict where users  
417 of offsets (practitioners) perceived that regulators do not have the capacity to pragmatically assess scientific  
418 advice. Indeed regulators admitted a lack of expertise:

419 *"...we don't have anyone with any marine expertise whatsoever ...I just don't know, I don't know the*  
420 *marine environment and we don't have anyone here that does..." (REG1)*

421 The struggle for regulators to assert any kind of scientific authority was not, however, embraced as an  
422 opportunity to take advantage of the process. Practitioners were concerned about the ability of regulators  
423 to use information and scientific advice appropriately to "*put a good filter on what comes to them*" (CON1)  
424 rather than take advice at face value in the absence of a perceived lack of "*real world perspective*" or  
425 "*experience*" (CON1) of both academics and regulators involved. The lack of expertise, therefore, was equally  
426 concerning in both the risk of overly cautious regulators under pressure from conservationists and in risks to  
427 trust in their ability to establish the authority of the audit process in enabling 'good enough' offsetting to  
428 proceed. Governing through audit needs to convince the relevant stakeholders, not least to ward off possible  
429 criticisms about gaming or insufficiency.

430

## 431 Consequences of a focus on audit

432 Conceptually attractive and operationally challenging targets such as NNL have the potential, as described  
433 here, to focus attention on measurement of what is possible as opposed to ‘what matters’ with respect to  
434 biodiversity (Bevan and Hood, 2006; Radnor, 2008). A common critique of offsets is that they erode moral  
435 boundaries to environmental damage (Apostolopoulou and Adams, 2015; Ives and Bekessy, 2015) and we  
436 present some evidence here that supports these concerns. Conservationists also fear that overarching trust  
437 in the system whilst closed to ecological challenge, is open to gaming, where targets are defined for purposes  
438 of auditability more than environmental protection.

439 Gaming, however, implies systems where a focus on audit distorts behaviour such that offsetting targets are  
440 defined to meet the benefit of users over that of biodiversity creation. One avenue of system gaming was  
441 described as the use of biodiversity offsetting to facilitate development consent decision-making as a  
442 ‘sweetener’ (NGO4) where, despite a lack of evidence of equivalent impact, commitments to offsets were  
443 made with a view to denial of these commitments at a later date. Evidence of this was provided by several  
444 participants where an extensive suite of offsets were agreed to that were not tied to a specific impact but  
445 rather as an acknowledgement of working in an ecologically important area with the likelihood of some  
446 unquantified impact occurring. An NGO representative described how these commitments were then  
447 “*progressively weakened*” (NGO4) and systematically reneged after approval had been achieved and  
448 development initiated. A key reason for this was perceived as the absence of ministerial support for  
449 implementation of biodiversity offsetting policy.

450 This example whilst illustrating the potential for gaming of current weak offsetting systems, did not appear  
451 to be representative of the wider experience of marine biodiversity offsetting in Australia. The majority of  
452 participants described frustration at the limitations of current practice where a lack of trust in others to  
453 respect or understand the needs of their organisation when interpreting biodiversity offsetting forces a focus  
454 on audit. However, the absence of trust between players in the system provide opportunities for those that  
455 are able to play the “*honest broker*” (NGO3) such as NGOs who seek to use offset finance to restore areas of  
456 degraded habitat. By the same token, trusted actors that are able to bridge institutional siloes and work  
457 across disciplines and sectors may be able to leverage biodiversity benefit outside of that currently measured  
458 in relation to biodiversity offsetting. This was observed here where engagement of industry with NGOs and  
459 academic representatives at a strategic level or at stages of project planning whilst primarily sought for the  
460 purposes of legitimacy, may increase the scientific rigour of policy development and implementation.

461

462 Yet the benefits afforded by these opportunities to act as a trusted and honest broker do not appear to be  
463 open to all. Requirements to audit performance could be leading to a decrease in funding for wider activity  
464 associated with a social licence to operate such as contributions to community capacity building, health and,  
465 education programs. Participants felt that the more formalised approach, where targets can be clearly  
466 achieved, favoured those organisations and activities that provide the most effective and valuable outcome  
467 to support their social licensing activity. In practice, this could mean that smaller locally focussed NGOs that  
468 may not have the capacity to engage with biodiversity offsetting at a strategic level are marginalised from  
469 decision making. Further, the need for auditability of environmental performance could also detract from  
470 funding that was previously available to these locally focussed NGOs to develop the capacity to assist in their  
471 engagement.

472 Another consequence of a focus on audit as opposed to biodiversity gain is eroding the organisational value  
473 or “business case” (CON7) of the initial target of NNL and environmental protection. For example, where  
474 commitments for ecological interpretations of NNL set by a company as an “environmental differentiator”  
475 (CON7) can set that company at a disadvantage because the system is not set up to present a ‘*level playing*  
476 *field*’ (CON7) and value biodiversity protection. There appears to be sufficient trust in this system that is  
477 delivering against stated aims regardless of the way in which it is enacted. Consequently, these good  
478 intentions are penalised both through exposure to increased risk of failure of meeting their commitments  
479 and through investment of capital that competitors are not required to do. The system is set up to support  
480 those that adhere to the ‘mediocre’ requirement of audit (Bevan and Hood, 2006).

481 Requirements to meet an audit trail frustrate actors that wish to engage in better conservation practices and  
482 tend toward a focus on doing what is required rather than best practice. Even if there is limited evidence of  
483 actual gaming, the system of auditability is liable to be gamed and at best incentivises a pragmatic, ‘good  
484 enough’ approach to offsetting. This pragmatic interpretation, necessary to manage the high uncertainty and  
485 impracticalities of marine biodiversity offsetting, helps ensure trust in the system for the actors involved, but  
486 is likely to create distrust from concerned conservationists.

487

## 488 Conclusion

489 The case of marine biodiversity offsetting in Australia illustrates the increasing interest in and relevance of  
490 offsetting mechanisms as the way to achieve conservation objectives of NNL. Yet marine ecosystems are  
491 particularly tricky to measure and monitor in terms of ecosystem losses and gains, because of the high  
492 degrees of uncertainty involved arising from the highly interconnected and diffuse relationships that give rise



493 to marine biodiversity. Indeed, there is a general recognition that the goals of marine biodiversity offsetting  
494 are not currently being achieved. Despite this, offsetting retains an enduring power. We have argued that  
495 this is because offsets provide a form of accountability through a process that enables auditability. In light of  
496 Power's (1997) arguments about an audit society, we suggest that marine biodiversity offsets function as  
497 techniques through which good environmental governance can be rendered legible and acceptable. The  
498 limits to quantification and accuracy are less consequential for offsetting than the positive endorsement of  
499 an audit trail that makes deliberations more visible.

500 Offsetting in principle thus becomes a way to share the risks of ad hoc compensatory activity across actors  
501 and projects in providing a process in which trust can be established. The process of offsetting is not about a  
502 full quantification of outcomes, but rather an agreement that this is the way through which organizations  
503 can benchmark their performance against other organizations, and therefore in setting expectations for  
504 standard forms of behaviour. Trust becomes a critical component – trust in the system in terms of delivering  
505 a satisfactory outcome for auditing processes for biodiversity governance and trust in other organizations  
506 believing in the system to unlock avenues for offset finance. It is not a 'trust in numbers' therefore so much  
507 as a trust in the auditing of the process of biodiversity governance. Collective, shared agreements, after all,  
508 may help secure an outcome that could otherwise be scientifically challenged. They might also, of course,  
509 achieve some environmental benefits that would be better than having no system.

510 We concur with a number of critiques of biodiversity offsets from geographers and others (Gordon et al.,  
511 2015; Lave et al., 2010b; Lindenmayer et al., 2017; Maron et al., 2015; Robertson, 2012) about the weak  
512 quantification, monitoring and evaluation schemes for biodiversity offsets. But as we have shown, the  
513 distrust in numbers does not necessarily over-rule a trust in the system. The case of marine biodiversity  
514 offsetting provides a potentially more dramatic example of this compared to terrestrial biodiversity offsetting  
515 because the uncertainties are so significant and, to a great extent, irreconcilable. If marine offsets are to be  
516 made to work, it will most likely not be because of accurate quantification of biodiversity loss and gains. It  
517 will be because organizations trust in a system of apparently transparent governance that is good enough to  
518 enable companies to audit their biodiversity management plans to meet set goals. Whether objectives such  
519 as NNL can maintain their public acceptability in delivering on expectations for good environmental  
520 governance remains an open risk.

521

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