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Discussion

Should biodiversity offsets help finance underfunded Protected Areas?

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ABSTRACT

Since the Convention on Biological Diversity was agreed upon at the Rio Earth Summit, global Protected Area (PA) coverage has increased whereas commensurable financial commitments to manage PAs have not. Here, we question whether biodiversity offsets should act as a complementary funding mechanism where funding for PAs is inadequate. Based on the additionality concept that underpins offsetting, biodiversity offsets set in PAs could be considered as not additional since PAs are already protected by legal or other means, and in theory should be adequately financed and managed. In practice however, many PAs are under increasing threat due to a lack of sufficient funding for staffing, infrastructure and other basic operational necessities, which renders their management ineffective, resulting in further loss of biodiversity. In such cases, we argue that additionality from a financial perspective can be demonstrated, opening up the opportunity for offset financing to provide enhanced protection of PAs. Even so, the use of offsets for PA financing is not straightforward due to the introduction of new risks to existing challenges that offsets face in general. We address four key challenges and highlight three advantages of using offset finance for improving PA management. We end by questioning whether the use of offset finance can deliver high quality biodiversity offsets through existing PAs, and what this might mean for biodiversity conservation more broadly. We infer that this mechanism has the potential to boost financing for conservation and help governments meet some of their national and international biodiversity conservation commitments, including realisation of Aichi Target 11.

1. Introduction

At the 1992 Earth Summit in Rio de Janeiro, world leaders agreed on a comprehensive strategy for global biodiversity conservation by adopting the Convention on Biological Diversity (CBD), among other agreements (UNCED, 1992). Following this, Protected Areas (PAs) – defined as geographical spaces, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values (Chape et al., 2003) – increased by 58% in number and 48% in coverage between 1990 and 2010 (Bertzky et al., 2012), but without a concomitant increase in public funding for their operations (Emerton et al., 2006). In 2003 recommendations on protected area finance emanated from the Durban World Parks Congress and were incorporated into the Program of Work on Protected Areas (PoW) that was adopted by the CBD in February 2004. One of the goals of the PoW is to "*ensure the financial sustainability of protected areas and national and regional system of protected areas*". It further specifies that by 2008 sufficient resources to meet the costs to effectively implement and manage protected areas should be secured (Emerton et al., 2006). Yet, countries have fallen short of realising this financing goal, and funding for PAs remains perilous despite marginal improvements. As governments and conservation organisations seek ways to fill this financing gap in the management of PAs (e.g., WCPA, 2000), there has been a growing interest in biodiversity offsets as a potential mechanism to finance PA management and/or expansion of PA systems (e.g., Pilgrim and Bennun, 2014).

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Biodiversity offsets are measurable conservation outcomes resulting from actions designed to compensate for residual adverse impacts on biodiversity arising from project development, in accordance with the mitigation hierarchy (BBOP, Business and Biodiversity Offsets Programme, 2012). The mitigation hierarchy lays out a series of steps that should be undertaken to reduce the negative impacts development projects have on the environment and society before biodiversity offsetting is contemplated. This is in recognition that avoiding and minimising negative impacts of any development project should be favoured above offsetting. However, for many development projects, even the most rigorous attempts will not eliminate impacts on biodiversity entirely. In these cases, offsets can be designed to provide a means for developers to compensate residual impacts (Doswald et al., 2012).

The offset principle is not without its challenges and risks; it remains an extremely controversial approach, attracting equally committed advocates and opponents. While some have made a strong case for offsetting biodiversity (e.g., ten Kate et al., 2004), others have called into question not only the effectiveness of the tool in achieving long term conservation benefits (e.g., Kormos et al., 2014), but also the moral and ethical implications of attempting to do so (e.g., McAfee and Shapiro, 2010; McAfee, 2012). Critics contend that the treatment of biodiversity as a commodity that can be traded or measured against other commodities, is specific to a world view which sets aside cultural, spiritual and inherent values of nature and ecosystems (Sullivan and Hannis, 2015; FoEE, 2014; Evans et al., 2015). They further argue that offsets and other market-based conservation mechanisms must be seen in the context of broader 'neoliberal' economic policies, with implications on environmental policy, including the undermining of the role of the state in conservation (Leach and Scoones, 2015).

Implementing an offset fully and properly also remains a major challenge (ICF and IEEP, 2014), with only a few studies providing empirical evidence that the mechanism actually works (e.g., Pickett et al., 2013). Besides the technical problem of not being able to effectively measure precisely what is lost and gained, other risks include the difficulty of predicting whether the offset will deliver the expected environmental benefits, ensuring enforcement of the mitigation hierarchy, and establishment of social–cultural and environmental thresholds to offsetting (e.g., Middle and Middle, 2010). Despite the challenges, the concept of offsetting or compensating for unavoidable loss from development projects persists as a tool and source of revenue for biodiversity conservation (Hrabanski, 2015; Lapeyre et al., 2015). Indeed, a rapidly growing number of governments have established or are planning to introduce biodiversity offset laws and policies (TBC, The Biodiversity Consultancy, 2013). Even where laws are absent, companies increasingly undertake voluntary offsetting based on best practice guidance (e.g., Bidaud et al., 2015), to fulfil funding requirements (e.g., IFC, 2012), to avert business risk, or for corporate social responsibility (ten Kate et al., 2004).

Combining regulated and voluntary sectors, the global annual market for biodiversity offsets grew from about USD 1.8–2.9 billion to USD 2.4–4 billion from 2009 to 2010 (Madsen et al., 2011); it is projected that it could generate up to USD 5.2–9.8 billion in 2020 (Parker et al., 2012). Since these values are primarily driven by regulation, the current legislative trends show that governments have begun to recognise the need to regulate practices to protect biodiversity, and at the same time generate new financial mechanisms that can support their conservation objectives (eftec, IEEP et al., 2010). With the growing prominence of biodiversity offsetting comes an increased need for vigilance to avert the risk of poor quality offset projects having negative impacts on ecosystems and human societies over time. Indeed, the extent to which governments are able to monitor offset proponents' adherence to the mitigation hierarchy should remain a focus for researchers and civil society.

While we recognise the challenges with compliance with the mitigation hierarchy, this paper does not attempt to contend with compliance-related challenges of reducing development impacts prior to offsetting. Equally, while we do address risks to social equity, we do not delve into the ideological issues of offsetting or market-based conservation mechanisms in general. Instead, we focus solely on the potential use of offset financing to fund established PAs in cases where all best practice guidelines have been properly adhered to. Our arguments thus only speak to offsets that have been properly developed through the application of the mitigation hierarchy process. We interrogate whether such offsets could be used to finance under-funded PAs, in addition to other unprotected sites within a landscape. We begin by presenting a case for financial additionality as it pertains to inadequately funded PAs, then discuss four challenges and three advantages of using offsets as a finance mechanism for PAs. We conclude that, when appropriately applied, and in specific contexts, using offsets to finance improved management of existing PAs is feasible and additional, and could play a key role in securing sites already recognised as vital for global biodiversity conservation.

2. Biodiversity offsets and Protected Area financing

2.1. A case for financial additionality

The offsetting principle of additional conservation outcomes stipulates that a biodiversity offset should achieve conservation outcomes above and beyond results that would have occurred if the offset had not taken place (BBOP, Business and Biodiversity Offsets Programme, 2012). Since PAs are dedicated to the protection and maintenance of biological diversity through legal or other means, the claim that offset finance for PAs can meet the additionality requirement is not immediately intuitive. However, the 'paper parks' reality, where PAs are designated but do not receive adequate funding to function (Pearce, 2005), legitimises the use of offset finance to help deliver conservation goals that would not have otherwise been achieved for the foreseeable future (Bennet, 2010). In other words, lack of adequate financing limits PA's management effectiveness, thereby diminishing the ability to safeguard the very biodiversity and ecosystem services they were set aside to protect (Bruner et al., 2004; Pearce, 2005).

Effective biodiversity conservation through PA establishment and management is costly, and current levels of PA funding are insufficient globally, especially in developing countries (Bishop et al., 2006; CBD, Convention on Biological Diversity, 2014). Only a few developing countries have complete assessments of their PA financial needs, or have undertaken sustainable financing plans for them (e.g., Turpie et al., 2010). Although, domestic government budget allocations remain the single largest source of PA financing in many countries, they normally represent a small share of total government spending, typically less that 1% of GDP (Emerton et al., 2006). The growing global gap in PA financing suggests that public sector funds are not closing the financing gap (Ervin et al., 2010). Available data show that nations are only investing around 30% of what would be needed to achieve CBD objectives (Gutman and Davidson, 2007). It has been estimated that at least an extra USD 2.3 billion would be needed every year globally to ensure effective management of existing PAs (James et al., 2001; Balmford et al., 2002), before factoring in any calls for expansion of PA systems (e.g., Rodrigues et al., 2004; Lee and Jetz, 2008; Butchart et al., 2015).

The funding gap is most apparent and ubiquitous in developing countries (Fig. 1), where it is estimated to be in the range of USD 1.1–1.8 billion per year (Bruner et al., 2004; Vreugdenhil, 2004). This has elicited calls for greater financial transfers from developed to developing countries (Feger and Pirard, 2011). Due to concurrent growth in the number of PAs and to the intensity of the threats PAs face (Rodrigues et al., 2004), we believe that the cumulative financial liability will escalate the need for new PA financing mechanisms to meet these needs for the foreseeable future.

Therefore, despite efforts to use available resources more efficiently and effectively (e.g., Plumptre et al., 2014), and notwithstanding government obligations towards financing PA management (CBD,

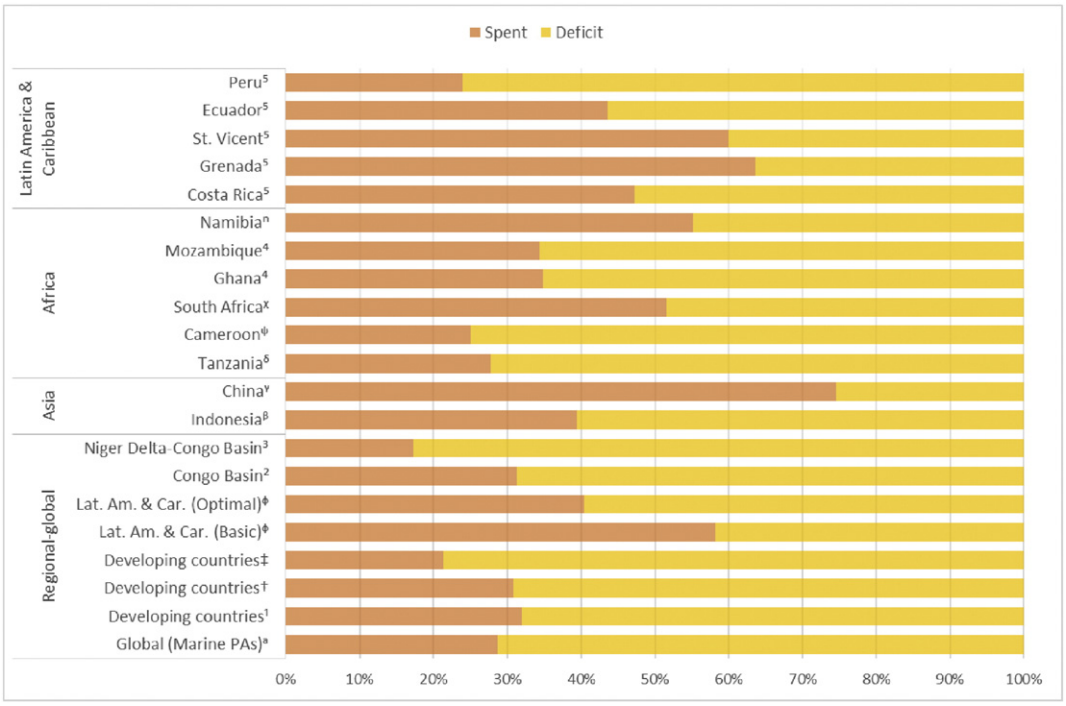

Fig. 1. Financial deficits of protected area systems, showing the total amount of money spent on PA protection and management (from Government and non-government sources) compared to the total budgetary requirements estimated as either cost per unit area (ha or km^2) or cost per PA or multiple PAs at the national, regional or global levels.
(Sources: [a]Balmford et al., 2004; [1]James et al., 2001; †Bruner et al., 2004; ‡Vreugdenhil, 2003; [φ]Bovarnick et al., 2010; [2]Wilkie et al., 2001; [3]Blom, 2004; [β]NISP, 2004; [γ]Li et al., 2013; [δ]Green et al., 2012; [ψ]Culverwell, 1997; [χ]Frazee et al., 2003; [4]Hanks and Attwell, 2003; [n]Turpie et al., 2010; [5]Flores et al., 2008).

Convention on Biological Diversity, 2014), it is beyond question that there are insufficient funds to finance essential activities for many PAs. PA financing cannot rely entirely on traditional methods of financing; novel biodiversity financing instruments are needed to mobilise private investment in PA management (Bishop et al., 2006). This makes the use of offset financing for existing PAs a prospective option. The challenge is to define when and where such financing is appropriate, and how best to make sure that it is managed to achieve positive conservation results over the long-term.

2.2. Four key challenges

Beyond demonstrating additionality, there are some specific challenges to effective use of offsets as a finance mechanism for PAs. We highlight and discuss the following four that we believe are especially pertinent: (i) avoiding perverse incentives to governments; (ii) non-permanence and transparency risks; (iii) averting social inequity; and (iv) achieving like-for-like or ecological equivalence.

2.2.1. Avoiding perverse incentives to governments

There are concerns that when development that harms biodiversity is rationalised as unavoidable, it legitimises the idea of compensation (Hannis and Sullivan, 2012). Moreover, governments could be inclined to be less strict when evaluating environmental impact assessments (EIAs), so that they can generate more funds for PA management through offsets. This erosion of best mitigation practice is a genuine concern, but we feel that it need not always arise for two reasons. First, it has been shown that offset programmes often require extensive levels of habitat creation and intensive monitoring (e.g., Pickett et al., 2013), both which are costly, thus providing an incentive for companies to avoid and minimise their impacts as far as possible. Consequently, if PA offsets are priced appropriately so that the true costs of conservation are realised, developers should have an incentive to minimise those offset costs in favour of other mitigation measures. Secondly, if offset payment mechanisms are developed to channel money through a third party such as a conservation trust fund, the incentive for government to capture high offset payments may be diminished. Offset disbursements could be tied to government compliance with its PA financing commitments, whereby the third-party acts as a check on government and also ensures that all offset proceeds are channelled directly to meet the established conservation and offset objectives.

Although closing the financing gap for PAs requires a combination of funds from government and the private sector (Darbi et al., 2009), external financing can introduce the risk of shifting government agency responsibility from funding PAs (Darbi, 2010; Pilgrim and Bennun, 2014). Offset financing should not replace existing funding but should complement it by financing activities that were not otherwise being undertaken due to a lack of funds. This is the essence of additionality. The funded activities must be clearly distinct from existing activities that are already, or are projected to be funded. This ensures that offset financing does not provide governments with the leeway to withdraw or reduce existing levels of funding, or fail to increase funds for PAs over time (see e.g., Gordon et al., 2015). For example, funding agreements could be fashioned to be dependent on some level of government funding increase over time, so that offsets do not result in an increasingly larger proportion of financing for PA management. To avert perverse incentives, after an evaluation of the development impact and associated offset requirements (e.g., Minns, 2006; Kiesecker et al., 2009; Moilanen et al., 2009; Miller et al., 2015), we see the following three nested steps as essential (Fig. 2):

i. National level
   a. *Assessment of national PA financing plans*: An analysis of historical and current government spending on PAs should be undertaken and projected over the lifetime of the offset. To avoid leakage, disbursements of offset finance should be pegged to the government maintaining some mutually agreed upon level of funding based on current and projected funding to PAs at this national level.
   b. *Assessment of national biodiversity conservation goals*: This calls for an analysis of national biodiversity conservation objectives,

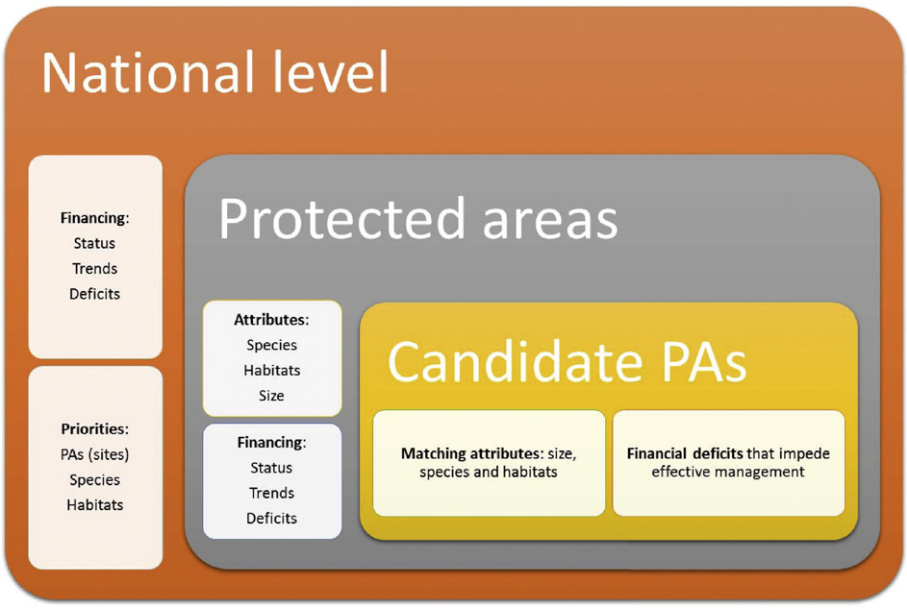

Fig. 2. Nested process for selection of candidate PAs for offset financing, working down from national level prioritisation to matching PA attributes and unmet budgetary needs to the impacts of the proposed development.

priorities and gaps at national level, and the role of PAs in meeting these objectives (see also Kormos et al., 2014). Special consideration for key species of concern such as endangered and migratory species will be considered here, including identification of areas that could be added to the national PA system to improve its effectiveness and representativeness.

ii. Protected Area level
   a. *Assessment of funding status of PAs*: An analysis of historical and current funding for specific PAs including deficits. Most government agencies in charge of PAs will have undertaken some form of financial planning for their PAs, identifying how much money would be needed for various activities, and the current and potential funding sources (e.g., WCPA, 2000).
   b. *Assessment of selected PA attributes*: An analysis of the key attributes of the PAs related to the biodiversity footprint of the proposed development, e.g., size, major habitats and species within PAs, as well as geographical location. This evaluation will focus on the metrics selected as the currency of exchange. From this, a pre-selection of candidate PAs will be done, which will be those that can potentially match the development impact (based on size, species, habitats, ecosystems etc.) and are underfunded, but with additional benefits such as being critical to national conservation plans and/or being located in close proximity to the planned developments.

iii. Candidate PAs level
   a. *Evaluation of previous, current and projected funding levels*: This will concentrate on identification of unmet budgetary needs in the candidate PAs that could be targets for offset finance. For this, it is imperative that candidate PAs have a budgeted PA management plan outlining goals and activities of the PA, their current status and sources of financing. This will enable a proper assessment of the impact of insufficient funds, and an analysis of how extra funding could achieve unmet PA objectives and conservation outcomes. While it is likely that many underfunded PAs may not have comprehensive management plans, most do have some type of budgeted planning document that they use to lobby for government financing. This level of planning and budgeting must be set as the minimum necessary for a PA to be considered for offset financing. This will compel government agencies to perform this critical function for all their PAs, and minimise risk of exaggerating deficiencies or exacerbating baseline biodiversity declines (e.g., Gordon et al., 2015).
   b. *Matching and selection of best fit and implementation*: Finally, the unmet financial needs for the candidate PAs are matched economically and ecologically to the development impacts to determine which best fulfils the desired biodiversity outcomes cost effectively. The best-fit PA can then be selected, followed by an agreement on the means of accounting for the offset finance, identifying the specific conservation activities and establishing the required monitoring activities. This could involve working through a third party such as a conservation trust fund or local foundation with the requisite mandate to monitor the government agency in charge of implementing the actions. To effect this, a Biodiversity Offset Management Plan that is integrated within the PA planning document should be jointly-developed by the project proponent, public agency and third party under the offset finance. The proposed activities in the offset management plan will based on a matching analysis that demonstrates how they compensate for the residual negative impacts of the associated development project. Alternatively, after the identification of candidate PAs, biodiversity offset *credits* could be established through internationally accepted standards and certification schemes. This would have the advantage of establishing the habitats that could be included as part of project mitigation beforehand, as project proponents purchase credits prior to beginning their project (Johnson, 2015).

2.2.2. Non-permanence and transparency risks

It is essential that the financing for the offset and its impacts be guaranteed to last at least as long as the development project impact persists. Though some developers may undertake the offsets themselves, most contract third parties to undertake offsets on their behalf (eftec, IEEP et al., 2010). Since funding PAs often implies giving money to public authorities to spend, this could dissuade companies from using PAs as offsets because private companies generally do not have

the legal mandate to oversee or command government bodies. Here, reliable third parties such as conservation trust funds (e.g., Pielemeier, 2001; Bladon et al., 2014) can play the important role of managing relationships between public entities and the private sector. Analogous to this, US conservation banking regulations require establishment of non-wasting endowments to ensure that financial permanence can be guaranteed by a third party mitigation bank (McKenney and Kiesecker, 2010).

Often such agents can enter into agreements with public authorities to ensure that funds are appropriately applied within a country for a specific goal, thereby furnishing assurance to companies that their funds will not be diverted to other uses. Thus, while it is the government agency that does the actual implementation, money is only released by the third party upon successful completion of predetermined activities. Similar arrangements exist in several countries like Mexico, Brazil and Madagascar, and could be adapted to include private companies' funding through biodiversity offsets programmes. In Madagascar for example, a Biodiversity Trust Fund (http://www.madagascarbiodiversityfund.org/) has a working agreement with the PA authority to help finance about a third of the country's PAs. Thus, the framework into which offset financing can be adopted for already exists.

Conversely, public agencies and affected stakeholders will require assurance from the companies that funding will be available over time to meet these PA conservation needs and satisfy offset goals. This is not very straightforward especially in the absence of a budgeted management plan, and insufficient compensation may be offered. Similarly, developers may prepare offset payment schedules without any guarantees, thereby jeopardising the permanence of the offset (Bull et al., 2013). As a result, in addition to the Biodiversity Offset management plan and third party agents to ensure compliance, for permanence purposes, offsets in PAs will also require financial mechanisms that guarantee the conservation financing over the life of the project. This could include creation of a permanent endowment, development of insurance, bonds or other financial guarantees (e.g., Parker et al., 2012).

2.2.3. Averting social inequity

Alongside the perverse incentives discussed above, governments could be driven to justify development projects on the basis that any harm to biodiversity would be compensated, while underestimating the destructive social impact of the proposed project (Lovera, 2014). While strict adherence to best practice guidelines ought to safeguard social well-being and prevent this, social equity cannot be assured if the destruction of an ecosystem on which a community depends were to be compensated through restoration or protection of a different ecosystem, or one that the affected community cannot equally access, such as a PA. Moreover, establishing offsets in a PA away from the community reinforces the notion that humans and other species live in separate places and cannot coexist (Hannis and Sullivan, 2012). This could be seen as retrogressing to fortress-type conservation that is considered an unreliable long term strategy (e.g., Beymer-Farris and Bassett, 2012; Butchart et al., 2015).

In such cases, additional measures to compensate and support local communities would be required. These measures must be agreed upon in a consultative and participatory manner (see e.g., Suiseeya and Caplow, 2013). One possibility is that communities be given or retain access to resources in PAs as part of the offset design, and that access is included as part of the PA management plan. Another possibility involves designing a composite offset where the PA financing represents one part of the offset, while a totally separate offset is located at a different site and preferably closer to the development area to specifically address community losses of any biodiversity or ecosystem benefits (BBOP, Business and Biodiversity Offsets Programme, 2009). This mitigation setup could include a combination of both in-kind (access to natural resources lost) and financial compensation (e.g., Bidaud et al., 2015). The approach to employ depends on how the development impacts the community and its access to resources, and the availability of sites that can compensate for community losses, recognising that some social impacts may be too difficult or even impossible to offset (Gardner et al., 2013). It is necessary to emphasise here that there will be some limits to offsetting social and economic impacts, just as there are limits to biodiversity offsetting (e.g., where the development leads to species extinction). Development projects must also be contingent on the Free, Prior and Informed Consent of communities (UN-REDD Programme, 2013) accepting the trade-offs offered, ensuring that they are not worse off as a result of the impacts and subsequent offsets.

2.2.4. Realising like for like or ecological equivalence of impacts

Since no universal metric exists that objectively captures the full extent of biodiversity in any given place, demonstrating like for like or ecological equivalence of impacts is complicated (Bull et al., 2013). Any system needs to be designed based on the habitats and species existing in a specific geographic area. Consequently, designing and developing appropriate baselines, metrics and guidelines to be used in showing that the loss–gain exchange is at least the same or equivalent to the area impacted is critical (e.g., Minns, 2006; Quétier and Lavorel, 2011; ICF and IEEP, 2014), as is demonstrating that the offset truly counterbalances impacts (e.g., Pickett et al., 2013). Whereas like for like is most easily satisfied when the target site for offset financing is in situ (Morandeau and Vilaysack, 2012), or relatively close by, this might not always be feasible or optimal when using offset finance to fund exclusively existing PAs since ideal PAs could be located further away. However any offsets in those PAs located further away would need to demonstrate that priority biodiversity is being protected, and that the exchange between that which was lost and the gain achieved is beneficial to biodiversity.

On the one hand, depending on the species or ecosystem qualities involved, PAs may represent a trading up. Many countries do allow for trading up (e.g., Morandeau and Vilaysack, 2012; DEFRA, Department for Environment, Food and Rural Affairs, 2013) as long as there is guidance on equivalency methods and trading ratios applied (eftec, IEEP et al., 2010). On the other hand, since the global PAs network is not always prioritised for biodiversity conservation (Eken et al., 2004), use of PAs can also present a trading down risk when a highly threatened habitat is the target for development. In such cases, it would be inappropriate to use existing PAs as offsets if no match can be found; it will be extremely difficult to offset such impacts anyway (e.g., Gardner et al., 2013). Two final caveats need discussion here: first, in practice it is complex to ascribe changes in biodiversity outcomes in PAs to individual sources of funds; having a predetermined theory of change built into the biodiversity offset management plan will help defend any later claims. Secondly, it is necessary to build into the offset framework an environmental risk, which represents the uncertainty of the offset actually delivering the predicted biodiversity benefits (e.g., Maron et al., 2010; Bull et al., 2013). Applying avoided loss and placing the offset in a PA does minimise this risk but does not necessarily eliminate it; the third party must remain vigilant that the activities are fully undertaken and desired impacts achieved.

2.3. Three key advantages

Despite these challenges, using offset finance to fund PA management and conservation confers several advantages both to the development proponents, communities and government. Here, we highlight the following three that we deem most pertinent: (i) reduced restoration need; ii) the ability to deliver the conservation benefit immediately; and (iii) mainstreaming offsets into broader ecological and institutional frameworks.

2.3.1. Reduced need for restoration

Habitat is a species-specific concept; when habitat restoration is not targeting a specific species (e.g., Suronen and Newingham, 2013) determining desired end-states can be difficult (Vera, 2010). Whereas restoration often seeks to recreate ecosystems with properties that were characteristic of the system at some time in the past, this can be problematic because ecosystems are naturally dynamic entities (Hobbs and Harris, 2001). Many ecosystems exist in a number of different states with restoration thresholds due to either biotic interactions or abiotic limitations preventing the system from returning to a less-degraded state without active management (Hobbs and Harris, 2001). Overall, there are few real-world examples that restoration delivers the goal of no net loss of biodiversity (Hilderbrand et al., 2005; Maron et al., 2012; but see Pickett et al., 2013). Using PAs as offsets may reduce the need for total restoration for two reasons.

First, in terms of biodiversity conservation, preserving existing habitat is the best option (Hobbs and Harris, 2001); management activities for averted habitat loss are more likely to be in PAs (Coetzee et al., 2014). Although PAs may have undergone some changes in the past through active management or natural fluxes, they are in many ways the last depositories for life's diversity — genetic, species and ecosystems (CBD, Secretariat of the Convention on Biological Diversity, 2008). They are considered the foundation for conservation strategies by being areas where ecological and evolutionary processes can continue, by and large, with least human interference (Carey et al., 2000). Secondly, though PA underfunding may have resulted in some ecosystem degradation, rarely will it have crossed the biotic barrier (sensu Hobbs and Harris, 2001), meaning that restoration efforts would not be as extensive as restoring or re-vegetating a complete ecosystem (Keenleyside et al., 2012). The fact that such restoration sites are set within a PA adjacent to more intact habitats also means end-state targets are easier to set and achieve, e.g., due to existing seed banks or proximity of colonisers. This helps to address key problems associated with restoration, by lowering uncertainty about the conservation outcome and the time to achieve desired end-states (Moilanen et al., 2009; Maron et al., 2012).

2.3.2. Avoidance of temporal loss of biodiversity

The use of existing PA's for offsets also has an advantage similar to a mitigation bank, by making it possible to have the offset in place prior to the expected development. This helps address an important element related to the timing and uncertainty of when the gains from offsets can be achieved given that biodiversity losses are guaranteed, while the future gains may be realised late or not at all (Bull et al., 2013). Temporal losses of biodiversity represent one of the concerns about whether offsets can deliver no net loss of biodiversity, and are also especially critical for social equity due to the compensation needed before the ecosystem can be restored. Using PAs largely reflects avoided loss (e.g., through biodiversity offset credits), and might therefore enable benefits for conservation to be assured immediately.

2.3.3. Mainstreaming into broader ecological and institutional frameworks

Incorporating the offset into an existing PA's national framework creates several economic and ecological synergies. The offset enters into a system of critical ecological and institutional networks, ensuring that compensatory measures are implemented where they are likely to be most useful (Darbi, 2010). It also allows for aggregated offsets at suitable scales, thereby maximising the potential benefits for conservation and avoiding shortcomings of project-specific offset schemes, such as high transaction costs and sub-optimal selection of offset areas (Kiesecker et al., 2009; Kormos et al., 2014). While we recognise that many PAs, especially in developing countries, lack sufficient institutional capacity, it is easier to build this into existing architectures rather than creating new ones for new sites. Indeed, mainstreaming offsets into existing frameworks can help clarify who should maintain the designated activities beyond the life of offset financing, and identify the policy and financial support mechanisms essential for achieving lasting no net loss of biodiversity (Quétier et al., 2014).

3. Discussion

We have argued that using biodiversity offsets for the financing of PA management has value in very specific situations and when adequate safeguards are in place. This should not be construed as a reason to allow development projects in ecosystems considered to be off-limits due to being too ecologically sensitive, such as World Heritage Sites, or sanctioning of projects leading to irreplaceable loss of biodiversity or social–cultural values and services. Neither are we advocating for all biodiversity offsets to be used to finance PAs, nor suggesting that all PAs are good candidates for such financing. Yet, based on current patterns and expected future trends, many PAs are likely to suffer funding shortfalls into the foreseeable future, leading to increased threats. Biodiversity offsets potentially represent a new source of financing, one that should complement and not substitute for existing sources, especially from the government.

In addition, it is very important to ensure that the use of PAs for biodiversity offsetting does not induce the erosion of the mitigation hierarchy or weaken existing legislation including environmental impact assessment processes; offsets must still be rigorously designed and regulated. Compliance mechanisms should be institutionalised, including independent verification and well-defined compliance and oversight roles for third-party players like conservation trust funds. These offset managers must be able to demonstrate a match between the adverse biodiversity impacts from the development and positive biodiversity benefits from funding specified activities in the PA. This means that offsets need to be appropriately priced to ensure that sufficient funding for delivering long-term conservation outcomes, besides having sound monitoring, reporting and verification strategies, based on clear metrics, indicators and baselines. Offset metrics should be rigorous enough to ensure changes are discernable and attributable, and simple enough to be realistic and achievable over time (ICF and IEEP, 2014). Guidance on offsetability of biodiversity impacts, extent to which offsets may improve target species or habitats, how long it might take, and the odds for proper implementation is increasingly available (e.g., Pilgrim et al., 2013; Miller et al., 2015).

In sum, we believe that in the proper context and with proper implementation, using offset financing in PAs can improve PA management. More broadly, assuming governments and humanity shall continue to permit developments that involve loss of natural habitats, offsets might also be a useful policy instrument towards improving environment conservation. Besides avoided loss, reduced need for restoration when using PAs means that chances of attaining the desired biodiversity and social benefits are enhanced. By reducing the risk of not achieving the offset goals, social equity is more attainable since communities can be immediately compensated from these ecosystems.

3.1. Key take-home messages

- *Supplementary financing system*: Biodiversity offset financing should not replace any current or future sources of PA funding — it should be seen as an additional funding source, helping to plug the deficits in PA financing that beget conservation failures.
- *Not for all PAs*: using biodiversity offset financing to fund PA management is dependent on financial and political contexts and therefore cannot be applied as a rule of thumb across all PAs. Besides demonstrated financial shortfalls, there must be political will for government agencies to disclose financial plans and engage in an analysis of projected costs and sources of funds.
- *PA selection is crucial*: ultimately, the utility of this approach for conservation in general will rest upon the ability of the proponents, government and third party to select the most appropriate PAs for financing, based on a combination of ecological prioritisation

(e.g., national conservation priorities) and matching attributes (e.g., like-for-like or trading up).

- *PA Management plans required*: the biodiversity offset management plan and activities must be nested within an already existing PA planning process. This is vital for evaluating whether funding these activities will lead to the desired end goals for compensating for the development impacts.
- *Third party inclusion*: third parties are likely to be a mandatory safeguard for providing checks to both government and developer. For the government, the third party will ensure that existing and projected funding to the PAs are maintained and offset funds are channelled to meet offset obligations. For the developer, they will ensure required transparency and accountability for the funds, providing assurance that the investment is achieving compliance with offset commitments.

4. Conclusion

Most countries face the dual challenge of growing their economies without adversely affecting their natural environment. Biodiversity offsets seek to ensure that unavoidable negative environmental impacts of development are balanced by environmental gains. Offsets as a finance mechanism should be used as a last resort in a process where impacts are avoided and minimised, and when used, appropriate safeguards must be in place to ensure delivery of positive conservation outcomes. A key question for conservation is whether using biodiversity offset financing in PAs is a good thing for conservation as a whole in the long run. We think the answer is that 'it depends'. It depends on alternatives to the planned development, and the context of the PA. Realistically, it is difficult to eliminate development. It is nearly impossible to have development without some residual impact. Therefore offsets, when properly applied, can contribute conservation value. Whether or not to apply them to PAs is context-dependent. We discuss how we think offsets can be used in PAs to the benefit of biodiversity and peoples' access to resources. We also highlight risks that might render the approach damaging to conservation and human society in general. The challenge, which is the basis of our contribution to this topic, is to develop ways and tools for teasing these two situations apart.

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