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Investigating the inclusion of ecosystem services in biodiversity offsetting

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ABSTRACT

In response to growing international interest regarding the consideration of ecosystem services (ES) in the framework of biodiversity offsetting (BO) and the current lack of guidelines on the subject, we investigated the potential inclusion of ES in BO, highlighting the risks and opportunities. Our argument is premised on the assumption that a practical link already exists between the two and that most of the tools required to make this approach operational are available. But so far, ES are not explicitly taken into account when calculating and designing offsets (whether regulatory or voluntary). One way to integrate ES in BO is to use the Environmental Impact Assessments' framework, here we propose a logical way to integrate ES at each step of the implementation of the mitigation hierarchy and provide details on the links with existing practice. In our proposal, the inclusion of ES is presented as a way to complement current approaches based on the assessment of habitats/species/ecological functions rather than to replace them. We argue that measures proposed to offset biodiversity losses, in addition to respecting ecological performance standards, should equally be chosen to minimize residual losses of ES. The latter require offsetting by different types of complementary measures. Implementing these recommendations as good practice should strengthen the weight of biodiversity, demonstrate consideration of social equity, and result in better acceptance of development projects and the measures proposed to offset them.

1. Introduction

Biodiversity offsetting (BO) is increasingly used in environmental policy as a way of reconciling economic development and the conservation of biodiversity; its objective is to achieve No Net Loss in biodiversity. The aim of BO is to counterbalance the negative impacts on biodiversity arising from development projects by providing ecological gains through conservation or restoration actions. Offsetting is the last step in the mitigation hierarchy, which aims first at avoiding, then reducing, and finally offsetting residual impacts on biodiversity. While BO requirements are not new (they have appeared in the environmental regulations of many countries over the last four decades), the concept has recently benefited from renewed political interest and has been endorsed in various policies, such as those of the Convention on Biological Diversity (CDB) and in the biodiversity strategies of a number of member states in the European Union (EU).

The concept of ecosystem services (ES), defined as the benefits that humans derive from nature emerged at the end of the 1970s in the scientific arena.[2] ES differ from the concept of function defined as the fundamental ecological structures and processes but also as the potential that ecosystems have to deliver a service (Braat and de Groot, 2012). ES original aim was to raise awareness,

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[2] Ecosystem services are commonly divided into four categories. Provisioning services describe the material or energy outputs from ecosystems (food, water and other resources), regulating ones act as regulators (regulating the quality of air and soil or by providing flood and disease control), supporting ones are necessary for the maintenance of all other ecosystem services (e.g. biomass production, production of atmospheric oxygen, soil formation and retention, nutrient cycling, water cycling, and provisioning of habitat) and cultural ones are nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experience (MEA, 2005).

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particularly of politicians, concerning the value of biodiversity and the costs of its degradation (Norgaard, 2010). But since the Millennium Ecosystem Assessment (MEA) (2005), which "firmly placed the concept of ecosystem services on the policy agenda" (Gómez-Baggethun et al., 2010), ES has been extended to the scientific community and become a significant focus of research dealing with biodiversity issues (Méral, 2012).

Conceptually, the principle of offsetting according to the goal of No Net Loss can be applied differently depending on what is at stake – habitat/species, ecosystem functions or ecosystem services (Calvet et al., 2015a; Levrel et al., 2012a). Currently, most offset practices focus on habitats and species, but are increasingly integrating a functional approach. Indeed, current methodologies to size offsets rely on five key features: the definition of detailed target components of biodiversity and ecosystems, the selection of appropriate indicators often based on an area calculation, the identification of appropriate baselines for calculating losses and gains, time-related issues and uncertainties in both assessment and offset outcomes (Quétier and Lavorel, 2011). Many authors have stressed that current BO relies mainly on a biophysical approach (e.g. Mann, 2015; McKenney and Kiesecker, 2009; Quétier and Lavorel, 2011). Others have highlighted a lack of consideration of social and cultural aspects in BO implementation, which may be a source of injustice and inequality (Apostolopoulou and Adams, 2015; Burylo et al., 2013; de Billy et al., 2015; Gobert, 2015). Indeed, the location where offsets are put in place does not necessarily provide ecosystem services to those who have lost them at the location where the impact occurred (BenDor and Brozovic, 2007; Gobert, 2015; Landsberg et al., 2013; Ruhl and Salzman, 2006). This question is of particular significance when the subsistence of a population relies on the ecosystem services impacted by a project (Sullivan and Hannis, 2015). Acknowledging the importance of this issue, the international community has begun in recent years to call for the consideration of ES in BO programs (Ives and Bekessy, 2015). Yet ES offsetting lacks a framework to facilitate its implementation (Bidaud et al., 2015), which is likely the result of significant knowledge gaps concerning this new approach that has only recently been included in policies (Braat and de Groot, 2012; CBD and UNEP-WCMC, 2012; CSBI, 2015). It is also affected by a great deal of debate between scientists on the use of this concept in conservation strategies (e.g. Schröter et al., 2014).

In light of both the renewed interest in this subject and the lack of guidelines regarding it, we conducted an investigation of the potential use of ES in BO, highlighting the risks and opportunities. We propose a conceptual framework of ES inclusion in BO that emphasizes the consequences on current practices. Our work was based on the premise that practical links between BO and ES already exist and that most of the tools required to make this approach operational are currently available. As observed by Duke (2014), "because biodiversity is a key element of natural capital, many of the conventional instruments by which we seek in practice to conserve it […] also serve, even if they were not explicitly designed to do so, to safeguard natural capital and ecosystem services". In our study, offsets are discussed within the regulatory and voluntary contexts of anticipated and accidental impacts, although the scope for accidental situations is quite limited. It deals solely with BO – not with carbon offsets, which can be considered as compensation focused on only one ES. It should be kept in mind that any discussion of BO is necessarily embedded within the broader context of the mitigation hierarchy.

The paper is organized into three parts. Section 2 investigates the current inclusion of ES in biodiversity offsetting both in regulatory and voluntary contexts, in academic literature, and in other unexpected contexts. Section 3 highlights the potential benefits and limitations of including an ES approach in biodiversity offsetting, and Section 4 proposes a framework for defining authorized impacts in which consideration of ES complements the mitigation hierarchy as it is currently implemented and offers a more thorough way to ensure the achievement of biodiversity conservation goals.

2. Existing links between ES and offsetting: where things stand

2.1. Regulatory contexts

The Convention on Biological Diversity's (CBD) 2011–2020 strategic plan on biodiversity, including the Aïchi objectives signed at the 10th Conference of the Parties in Nagoya, Japan, gives guidelines on how to support largescale actions for biodiversity conservation. These guidelines do not provide any details regarding the mitigation hierarchy or the implementation of BO, nor do they mention a potential link between BO and ES. Nevertheless, the plan commits the 168 signatory parties to developing national strategies for biodiversity, in which one tool is mitigation.

Action 7, Target 2 of the EU Biodiversity Strategy to 2020 (European Commission, 2011) aims to achieve 'No Net Loss' of ecosystems and ecosystem services through measures that include the development of offsetting schemes. Concerning regulatory frameworks, historic regulations related to the implementation of the mitigation hierarchy (e.g. the Environmental Impact Assessment (EIA) Directive [85/337/EEC] and its amendments, the Habitats Directive [92/43/EEC] and the Water Framework Directive [2000/60/EC]) do not mention ES. However, regarding accidental impacts, the Environmental Liability Directive (2004/35/EC) recommends service–service and resource–resource approaches for sizing offsets. The REMEDE working group[3] recommends using two specific ecological-equivalence scaling methods: Habitat Equivalency Analysis (HEA) for the service–service approach and Resource Equivalency Analysis (REA) for the resource–resource approach. HEA is commonly used in the United States. However, it should be noted that the term 'service' is related to 'functions' in these methods.

At national level, we decided to detail the French case study as France is the only European country with Germany to fully mandatory require offsetting for certain biodiversity impacts (Conway et al., 2013; Tucker et al., 2014). France's Biodiversity Strategy does not mention the concept of ES in relation to BO. French policy related to the mitigation hierarchy (dating to 2012) considers the need to take ES into account, but remains vague. Guidelines on the implementation of the mitigation hierarchy (MEDDE, 2013) list the different areas that must be considered to ensure equivalence between losses and gains, and suggest that ES could be considered under the ecological aspects, which are regarded as a priority area. In addition, two other areas, geographical/functional and societal, call upon similar concepts to those of ES, without mentioning it explicitly. In 2014, a new French law to protect biodiversity was drafted, however, it is still being reviewed and amended in parliament and is not expected to pass before the end of 2016. Whether or not to include the concept of ES within the mitigation hierarchy is still under debate. While a previous version of the legal text called for the avoidance and reduction of impacts on both biodiversity and ecosystem services, but required offsetting only for biodiversity, the last available version of the legal text (January 2016) more generally calls for avoidance, reduction and offsetting of impacts on environment (without mentioning ES).

In the United States, the implementation of BO has a longer

[3] Resource equivalency methods for assessing environmental damage in the EU (REMEDE).