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Current Opinion in Environmental Sustainability

The environmental and social impacts of protected areas and conservation concessions in South America

Judith Schleicher

While the main conservation strategy has been the establishment of government-controlled protected areas (PAs), approaches have diversified over the last decades, including devolving management rights to non-government actors, such as through conservation concessions (CCs). This review assesses the environmental and social impacts of PAs and CCs in South America. Recent studies show positive environmental impacts overall, especially in terms of avoided deforestation. Meanwhile social impacts are more diverse and contested, yet remain less studied. Whilst CCs address some social shortcomings of PAs, they exhibit their own institutional and political challenges. This review highlights a need to broaden the measures of effectiveness and pay more attention to the diverse impacts of PAs and CCs and the factors influencing them, including governance and political aspects.

Address
Department of Geography, University of Cambridge, Cambridge CB2 3EN, UK

Corresponding author: Schleicher, Judith (Judith.Schleicher@geog.cam.ac.uk)

Current Opinion in Environmental Sustainability 2018, **32**:1–8

This review comes from a themed issue on **Environmental change issues**

Edited by **Arun Agrawal, Chuan Liao, Cristy Watkins, Laura Vang Rasmussen** and **Reem Hajjar**

Received: 10 November 2017; Accepted: 10 January 2018

https://doi.org/10.1016/j.cosust.2018.01.001

Introduction

In the face of the continuing loss of forests and associated livelihoods around the world, the global community has responded with an increasing number of interventions to address the environmental, social and economic implications of this loss. From an environmental perspective, government-controlled protected areas (PAs) have long been the main conservation strategy globally [1,2]. Over the last decades, the global PA network has rapidly expanded, with over 200,000 PAs established to date. In addition, governments around the world have agreed to ambitious targets for increasing this number even further [3,4].

Despite the increasing extent of the PA network and the associated conservation efforts, overall forests continue to decline globally [5–7]. Conservationists have therefore sought to diversify their governance approaches, such as through areas protected by indigenous communities, civil society, and private actors [8–10]. In addition, while traditionally the key objective of government PAs has been to safeguard biodiversity, conservation interventions are increasingly also aiming to achieve social and economic goals. This has been primarily in response to criticism about their negative impacts on local communities [11,12]. One novel approach, which has experienced considerable traction, particularly in South America, is conservation concessions (CCs). CCs comprise public land of which the access, management and exclusion rights are granted to non-government actors for conservation purposes, typically for a specific period of time [13]. They have been promoted in numerous countries, including Bolivia, Chile, Guyana, Indonesia, Peru and the USA [13–16], and have been referred to as being part of a 'true revolution in global conservation' [16].

While a sizable body of literature has focused on assessing the effectiveness of government PAs in reaching their objectives, considerable debate still surrounds their environmental and social impacts and how they compare to alternative conservation approaches, including CCs [17•,18]. This is at least in part because of the difficulty of attributing impacts to specific interventions. As a result, there have been mounting calls for rigorously evaluating what works and why [19–21]. Recent methodological advances have helped to address some of these concerns, allowing for more confident attribution of impacts while eliminating alternative explanations [22]. An increasing number of studies have therefore evaluated conservation strategies using counterfactual approaches (*e.g.* [23,24,25,26,27•]).

This paper aims to review the recent literature on the social and environmental impacts of government-controlled PAs and CCs in South America. This is especially timely as no previous review has scrutinized CCs and in light of the recent rapid international spread of initiatives aimed at reducing carbon emissions from deforestation and forest degradation (REDD) [28–30]. Focusing the review on South America is particularly relevant given that the majority of studies on this topic have been conducted in South and Central America [18]. The following sections will therefore focus in turn on the environmental and social impacts of government PAs and

CCs, followed by a discussion of the wider implications and future research needs.

Environmental impacts of government PAs and CCs

There has been a surge in recent research assessing the environmental impacts of networks of government-controlled PAs across South American forest ecosystems (Table 1). Most studies found that government PAs reduced the negative anthropogenic environmental impacts exerted on the forests located within PAs (*e.g.* [31–35]): government PAs have increased carbon storage and have avoided considerable levels of deforestation, fire occurrence, and degradation of forests, including through selective logging, fire and human paths. The majority of these studies have employed quasi-experimental matching approaches. These allow for treatment areas (in this case government PAs) to be compared to control areas that are similar in potential confounding variables, expected to impact the location of the treatment areas and the outcome variable, such as the exposure to human pressures [23,36]. A smaller number of studies have applied regression models to account for observable covariates [33,35,37,38]. Some recent studies also continued to apply more traditional approaches to assessing the impacts of PAs, in particular comparing land inside PAs to the adjacent buffer outside of the area of protection [39–41]. However, as PAs are not randomly distributed across the landscape, but tend to be located in more remote areas with lower human pressure, comparing PAs to their adjacent buffer areas or the wider unprotected landscape has been shown to overestimate their effectiveness [23]. Consequently, the reported effect sizes varied across study locations and methods used, and are therefore not directly comparable. Regardless of the methodological approach taken, the studies agreed in mostly attributing average positive environmental impacts to government PAs.

However, there was considerable variation across the PA network. Whereas some PAs avoided forest loss, fire occurrence, or forest degradation within their boundaries

Table 1

Recent assessments of social and environmental impacts of government-controlled protected areas (PAs) and conservation concessions (CCs) in South America

Types of impact	Country	Methods[a]	Impact[b]	Studies
Environmental impacts				
Government-controlled protected areas				
Deforestation	Brazil	Matching	+	[27•,31,32,76]
		Matching & regression	+ (older PAs); ~ (newer sustainable use PAs)	[77]
		Inside-outside	+ (strict PAs); ~ (sustainable use PAs)	[39,40]
	Colombia	Regression	−	[35]
	Peru	Matching	+	[33,42,48]
		Regression	+	[33,37]
	Ecuador	Matching	+	[34,78]
		Regression	+	[38]
	Paraguay	Inside-outside	+	[41]
	Chile	Matching	+	[75]
Degradation	Peru	Matching	+	[33]
		Matching	~	[42]
		Regression	+	[33]
Fire occurrence	Brazil	Before-after, inside-outside & regression	~	[61]
Carbon storage	Brazil	Matching	+	[79]
Conservation concessions				
Deforestation	Peru	Matching	+	[33,48]
		Regression	+	[33,37]
Degradation	Peru	Matching	+	[33]
Social impacts				
Government-controlled protected areas				
Poverty: asset-based index and unsatisfied basic needs	Bolivia	Matching	~	[53,54•]
Poverty: per capita income and expenditure	Peru	Matching	~	[42]

[a] Matching: matched intervention to similar areas in non-protected landscape; Regression: used a regression model; Inside-outside: compared intervention to nearby areas or wider region; Before-after: comparing time period before and after the establishment of the interventions.
[b] +, intervention has a positive effect, reducing the environmental/social impact; −, negative impact; ~, no significant impact detected.