

Indigenous perspective to inform rights-based conservation in a protected area of Panama



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ABSTRACT

We investigate ways to improve social and conservation outcomes in a protected area inhabited by indigenous residents. We used a consultative approach to look at how the perceptions of residents of the protected area and other stakeholders can inform the implementation of rights-based approach to conservation. We focus on the case study of a protected area in Panama that has a diverse indigenous cultural landscape and high deforestation rates. Using field data we acquired with household survey, focus groups, in-depth interviews and forest cover assessment, we examine the distribution of rights and responsibilities, the state of forest conservation and the residents' needs, views and aspirations for livelihoods and conservation. We found heterogeneous regulations and restrictive policy in recognized and claimed indigenous territories, with constraints put on subsistence use by residents. Despite this challenge, most residents surveyed are content with living in the protected area and contribute to conservation on an individual basis. Residents' perceived food security directly links to forest conservation. Residents support stronger enforcement by the management authority and oppose recent hydro-dams development in the forest reserve. We argue that using residents' priorities for rights recognition and collaboration can accelerate the transformation needed to balance human needs with the long-term sustainability of forest conservation.

1. Introduction

At the World Parks Congress held in Durban, South Africa in 2003, a 'new paradigm' for protected areas (PAs) governance and management was adopted which calls for respecting the rights of indigenous peoples and local communities and embracing a more pluralistic approach to governance of protected areas (The Durban Accord, 2003; Colchester et al., 2008; Stevens, 2014). These new conservation standards came about in recognition of the negative impacts of protected areas and exclusionary conservation models on human rights and well-being (Adams et al., 2004; Pullin et al., 2013; Cernea and Schmidt-Soltau, 2006; Brockington et al., 2006; Colchester, 2004; Vedeld et al., 2012). Indigenous peoples and local communities often bear the highest cost of the establishment and management of protected areas (Amin and Koné, 2015), while the greatest benefits are at the national or global levels (Balmford and Whitten, 2003; Ferraro, 2002). While positive impacts of PAs on human well-being have also been quantified (Leverington et al.,

2010; Andam et al., 2010; Ferraro and Hanauer, 2014), these are unevenly distributed (Brockington and Wilkie, 2015).

Negative social impacts on indigenous peoples and local communities are often at the roots of conflicts over conservation objectives (De Pourcq et al., 2017). The failure to respect, ensure, and fulfill a minimum sets of standards on rights in protected areas can trigger conflicts, resistance and a lack of cooperation (Vedeld et al., 2012), which can generate negative feedback on conservation outcomes (Pascual et al., 2014; Dawson et al., 2017). There are several examples across the globe of PAs where substantial conflicts with local communities are threatening the long-term sustainability of conservation programs (Ostrom and Nagendra, 2006).

A recent review on progress made since the adoption of the Durban Accord shows that from 2003 to 2014 only 8 out of 21 countries had enacted or reformed their protected-area legislation to recognize resource rights and participation of communities (Rights and Resources Initiative, 2015). This slow advancement in adoption of right-based and

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inclusive approaches can undermine the sustainability of conservation programs and their expansion to other areas.

The adoption of rights standards and legal reforms in protected areas is an important high-level policy process. Helping to convey the views and aspirations of indigenous people and local communities is also an important avenue to inform the implementation of rights-based standards to conservation (Bauer, 2003; Durand and Lazos, 2008; Karanth and Nepal, 2012). It can feed novel solutions on how to implement successful conservation efforts, by tying it to the on-the-ground reality.

The goal of this paper is to help identify ways to reduce social costs and improve forest conservation in inhabited protected areas. Inhabited protected areas are common in developing countries, and the residents depend on natural resources for their livelihoods (De Pourcq et al., 2017). For example, in Central and South America, a significant portion of PAs and other forested areas spatially overlap with indigenous land (IUCN, 2016). With this paper, we seek to inform the pursuit of conservation strategies that are more just and that integrate local priorities (Biedenweg and Gross-Camp, 2018).

We focus on the perceptions of indigenous residents living inside a protected area and those of other stakeholders. We address the following question: *How do indigenous residents of a protected area in Panama experience and perceive their rights, interactions with authorities, and livelihood opportunities under the current governance and management arrangement?* Perceptions are important because they define the support that local constituents have for conservation and can inform the course of action to improve governance at different scales (Bennett, 2016). We are interested to see if integrating the perspectives of residents and other stakeholders can inform the advancement of rights-based standards by bridging the gap between those principles and people's priorities over conservation, rights, and livelihoods. Our underlying assumptions are that respecting people's rights in protected areas can both reduce social costs and create a cooperative climate that fosters conservation.

This study brings on a consultative approach to the discussion of the rights-based approach to conservation by conveying the views, the experiences and priorities of Indigenous people who reside in a protected area of Panama, located in a diverse indigenous bio-cultural landscape characterized by higher deforestation rate than any other PA in Panama, and also a key piece of the Mesoamerican biological corridor. It illustrates that there is room for improvements over human rights and well-being in protected areas, and that these conditions limit effective forest conservation.

Using mixed methods, we evaluate the socio-ecological context at the scale of the PA and at the community-level. First, we analyze the stakeholders' perspective on the implementation of rights and responsibilities over resources and management and how it is experienced in practice by residents. Second, we assess the extent of forest cover loss, its drivers as well as the perceptions of residents and other stakeholders in order to see if there is consistency between biophysical information and the view people have of the conservation context. Third, we evaluate the residents' views, needs, and aspirations in terms of livelihoods, conservation and development.

In the next section, we provide some background on the paradigm shift that has taken place in conservation. In Section 2, we describe the research process, field data collection methods and analysis. In the results section, we present the legal and management framework, the forest conservation status, and the residents' needs and priorities. Lastly, in the discussion section, we explore what the implementation of rights-based approach to conservation may mean to this protected area and its potential for strengthening the long-term sustainability of forest conservation.

1.1. Background

Stevens (2014) recognizes four forms of exclusion in PAs: (1)

spatial/physical, through forced or induced relocation, lack of recognition of customary territories or imposed restrictions on settlement; (2) *economic*, through imposed restrictions on land use practices, loss of livelihood and food security, and lack of access to PA benefits; (3) *political* through the loss of control and self-governance over lands, territories and resources as well as the lack of recognition for customary governance and institutions; and (4) *cultural* through loss of access and authority over cultural sites and resources.

Embracing a paradigm shift toward a conservation sensitive to human rights and well-being, the International Union for Conservation of Nature (IUCN) and the Convention of Biological Diversity (CBD) have made rights-based conservation a key guiding principle of their policies and programs for all PAs. The rights-based approach (RBA) involves integrating human rights in policy, planning, implementation, and evaluation to help ensure that conservation practices help affirm and realize rights, rather than violate them (Campese et al., 2009; Sikor and Stahl, 2011). These organizations have requested that their member States reform national laws, policies, and practices to adopt a series of standards relevant to PAs and indigenous people and local communities, based on the Durban Accord and Action Plan and the more recent United Nations Declaration on Rights of Indigenous Peoples (UNDRIP). These standards include the full and effective participation of indigenous people and local communities in protected-area governance and management, the right to livelihood and management of natural resources, and the right for indigenous people to retain ownership of territory within protected areas. Through the promotion of these policies and standards, rights concerns should shape PA governance and management.

These conservation standards can also accommodate diverse types of governance for protected areas, including shared governance with government (including co-management and joint management arrangements) as well as indigenous and community conserved areas (ICCAs) (Borrini-Feyerabend et al., 2013; Berkes, 2009a). The participation in governance is crucial for fulfilling the rights of indigenous and local communities as participation in governance defines “how power and responsibilities are exercised and how decisions are taken” (Borrini-Feyerabend et al., 2013). Participation in management, on the other hand, has to do with the means and actions, and thus the implementation of policies, regulations and plans.

2. Materials and methods

We conducted this study in *Bosque Protector de Palo Seco* (BPPS), located in Western Panama. This area was suggested to us for this research by government civil servants at the Ministry of Environment (MiAmbiente) because of the important forest conservation challenge it poses. BPPS is a multiple-use protected area of > 254,445 ha (Appendix), Table S3 Main characteristics of BPPS) that serves as buffer zone for La Amistad Biosphere Reserve (Fig. 1). More than 5000 people from three main ethnic groups reside in the PA (namely 82% Ngäbe, 14% Naso Tjërdi and 4% *latinos* or Hispanic), and they are dispersed in 73 communities.

We used a mix of quantitative and qualitative methods for this study, based on field data acquired mostly from 2009 to 2011. We collected data at the scale of the PA to understand the context and appraise stakeholders' perception and at the scale of two case-study villages to assess residents' viewpoint and experience (Appendix 1, Table S1).

2.1. Authorization, positionality and research approach

MiAmbiente (previously known as Autoridad Nacional del Ambiente, or ANAM) provided a research permit for working in the PA, but the permit was restricted to the area of overlap with the Ngäbe-Bugle indigenous reserve (*Comarca Ngäbe-Buglé*). For the two case-study villages, we obtained permits from *Indigenous Affairs* (*Política*

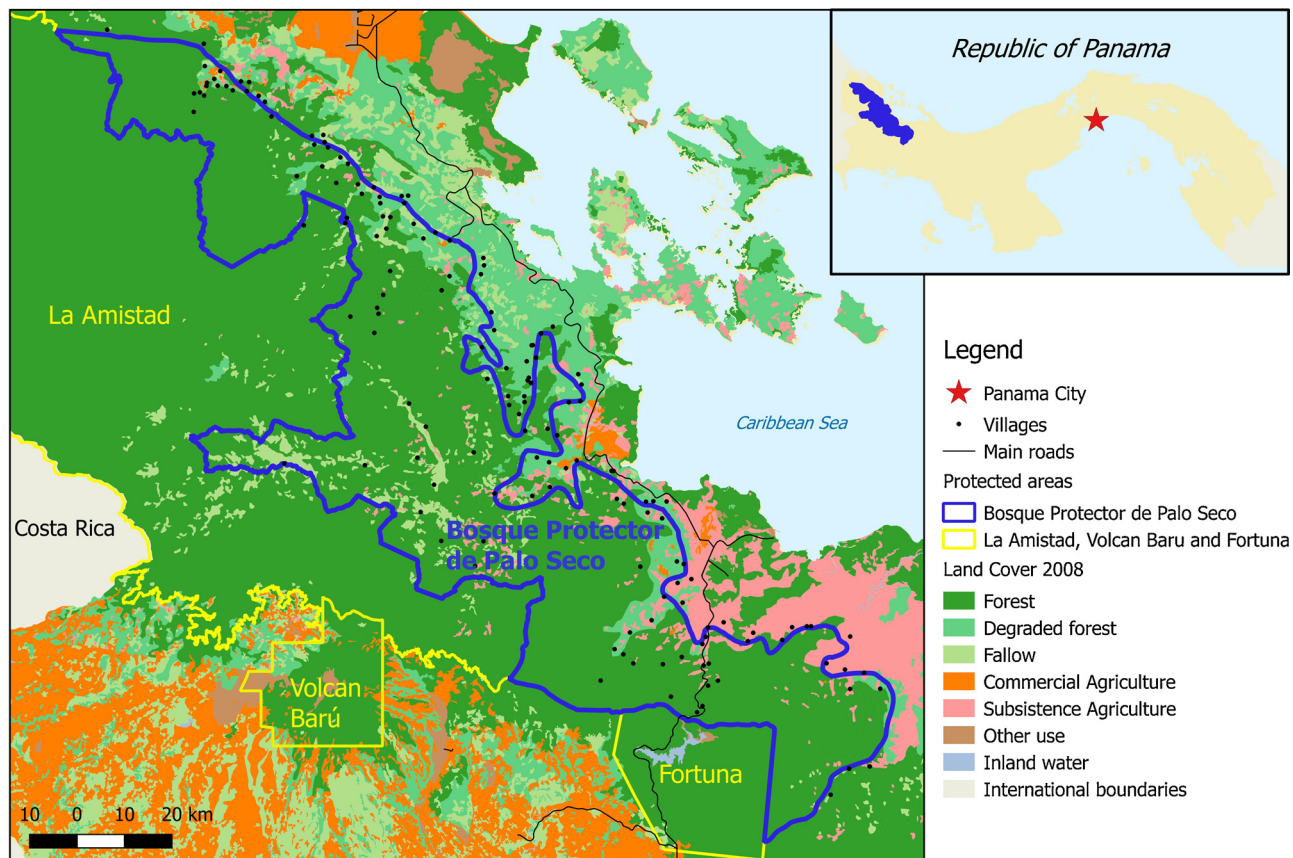


Fig. 1. Palo Seco Forest Reserve – *Bosque Protector de Palo Seco* (in blue contour), located in Western Panama, near the border with Costa Rica. It serves as a buffer zone for La Amistad Biosphere Reserve and is part of the Mesoamerican Biological Corridor. The area is covered by broad-leaved humid tropical evergreen low-land, sub-montane and montane forests. The map displays the land covers in 2008, with main roads in black and village centroids as black dots (Map by the author; data source: MiAmbiente).

Indigenista) and the traditional authority of the *Comarca*. We first offered four information workshops in Spanish and Ngäberé (local indigenous language) in the selected villages to provide study context and ensure informed participation. We obtained a written authorization by the village leaders (*voceros*). We developed the study collaboratively, guided by a protocol for research in indigenous communities (McGill University, access on 29 May 2018).

2.2. PA legal and management framework

We examined the legal framework, the governance and management contexts and capabilities, and the rights and responsibilities for forest conservation. To do so, we used key stakeholder discussions and in-depth interviews relevant to the PA and we reviewed relevant legal and institutional documents. We conducted five in-depth interviews with key stakeholders from MiAmbiente and the *Comarca Ngäbe-Buglé* traditional and governmental authorities, hereafter called ‘institutional participants’. We chose these participants because they served in positions of authority for the management and administration of the area. We held key stakeholder discussions with representatives of organizations involved in the PA to validate information on ongoing activities in the areas. In Appendix 1, we provide the full citations for geographic datasets, reports and the legal documents consulted.

2.3. Household survey and focus group discussions

We selected the two case-study villages after various visits to the BPPS (in 2007 and 2009). Major factors in our selection of these two villages were accessibility and the willingness of village residents to

participate. Willingness to participate may be associated with an overall positive relationship with the PA authorities – this could conceivably bias our results. We note however, that participants were not afraid to express their critical viewpoint.

We wanted to understand how the rights and responsibilities are implemented in practice and to capture the residents’ views, livelihood needs, and aspirations in the two case-study villages. We conducted household surveys, and using primarily open-ended questions, we collected information on: (1) household characteristics, (2) land-use practices and customary forest management, (3) perceptions of the protected area, conservation, and forest cover change, and (4) ways to maintain forest and improve livelihood. We first performed a population census in each village and then we used a random selection of households to interview. The villages selected three research assistants to receive training and assist the lead author with the surveys, including with the translation from Spanish to Ngäberé. We conducted 45 household interviews (67% of the total households), with 15 women and 30 men. We obtained oral consent in all cases.

We held three main focus-group discussions in the case-study villages in Spanish with Ngäberé translations. These focus-group discussions focused on: (1) the history of the village since its inception (1 group with elders), (2) a trend analysis of resources (two groups of women and two groups of men groups), and (3) development priorities (one group of women and one group of men) (see Appendix 1 for details).

The lead author spent two years living in the area, which provided other opportunities to collect information from key informants and participant observation during visits to other sectors of the PA to validate the information collected.

2.4. Data analysis

We used qualitative data analysis to identify common themes, compare perceptions in a consistent manner, and establish cross-relations between perceptions, household characteristics and land-use practices. We coded verbatim interviews and transcripts from focus groups and field notes using NVivo software. We used a grounded theory approach for this analysis; we explored perceptions of conservation status, governance and management, needs and aspirations without preconceived theories but allowing a framework to emerge from the data, following previous guidelines from Glaser (1998).

We used parametric statistical analyses to test for significant relationships in case of divergent positions or to try to explain perceptions based on household or livelihood characteristics, including Chi-square tests, Pearson correlation, univariate regression and one-way analysis of variance (ANOVA) (see Appendix 1 for details). We executed all statistical analysis in R.

2.5. Forest cover change assessment

We compared stakeholders' views of deforestation to remote sensing-based forest cover change analysis using different data sources at two scales: the whole PA and the two case-study village area. For the PA, we evaluated forest cover loss using governmental maps for 1992, 2000 (ANAM/ITTO, 2003) and 2008 (CATHALAC, 2009) that we compared with global forest loss data from 2000 to 2014 from Hansen et al. (2013). We performed this analysis by overlaying Landsat-based land-cover maps with the boundaries of the different sectors of the PA in ArcGIS. For the case-study area, we conducted a participatory mapping workshop to identify the main landscape features, village limits and land-uses, and then geo-referenced these features. We used results from a time series analysis of Landsat and ASTER satellite images from 1999 to 2011 for the area (Pelletier et al., 2012), that we then compared to the national land-cover change maps and the global forest cover loss data.

3. Results

3.1. Legal, governance and management framework of BPPS

3.1.1. Legal framework and enforcement

BPPS was established in 1983 by Presidential Decree, without prior consultation with the residents in order to counteract “a strong wave of colonization, occurring in a chaotic and spontaneous manner, and threatening to destroy forests in the area” (Gaceta Oficial, 1983). Three large infrastructure projects preceded BPPS's creation, the Fortuna hydroelectric-dam, the Puerto Armuelles-Chiriqui Grande pipeline and the trans-isthmus highway connecting Bocas del Toro province to the rest of the country, facilitating access to large forests extent.

One can divide BPPS into four main sectors based on ethnic occupancy and territorial rights. In 1997, the government legally recognized the *Comarca Ngäbe-Buglé*, as an indigenous reserve, encompassing about half of BPPS. Land inside the *Comarca* is inalienable and cannot be segregated, but only the usufruct of natural resources is granted. Another sector occupied by Ngäbe people called Annex territories (*territorios anexos*), is located outside the *Comarca*, administratively in Bocas del Toro Province. In this sector, no land title or user rights exist as BPPS legislation prohibits it. A third sector was created after Decree 127 in 2010, when four Ngäbe communities, previously in Annex territories, obtained their collective land rights in compensation for the damages caused by Chan I hydro-dam construction in the PA (Table 1). A fourth sector, located in the western part of Bocas del Toro Province, includes the ancestral lands of the Naso Tjërdi people whose territory is not yet legally recognized.

BPPS regulations prohibit cutting trees, burning for agriculture, hunting, and all agriculture or plantation activities that are not

explicitly authorized by MiAmbiente. The law specifies that: “families cooperating with the protection of the BPPS will be able to apply for permits to develop activities for subsistence purposes” (Gaceta Oficial, 2006). Institutional participants recognize the constraints for local residents, “in order to work on their land they have to go to MiAmbiente; the environmental agency tells them what they have to do to be able to do their work (which colloquially means clearing forest or fallow for agriculture). If they don't, because there is a conservation law, the institution comes right away to stop it.” Four out of five institutional participants said that no penalty or fine is applied to indigenous residents but only to outsiders.

Based on the survey responses in the two villages, there were 13 cases of law enforcement by park rangers. Twelve cases out of 13 were for clearing for subsistence agriculture and one for game hunting but none were for commercial purposes. One respondent indicates: “I received a visit from a park ranger when I was clearing old fallow to plant bananas. He came to forbid me [...], he told me to stop if I did not want to go to jail, so I stopped”.

Definitely, for the residents in the case-study area, negative impacts of living in the PA relate to restrictions and control over the use of natural resources by MiAmbiente, especially on clearing forest for agriculture (Fig. 2a). Based on the law, clearing for subsistence agriculture should be allowed with a permit but residents were not aware of their rights or when they were aware, respondents indicated that the process is too cumbersome.

3.1.2. Management capability and resources

BPPS is identified as having a weak institutional capacity, with a limited budget and personnel (Oestreicher et al., 2009) (Appendix 1, Table S3). With this lack of capability and resources, a governmental participant confirmed, “MiAmbiente identifies cases of forest clearing almost entirely on the basis of complaints by residents”.

The Mesoamerican biological corridor project contributed to environmental investments in community-enterprise projects, equipment and a management plan, which the environmental agency never implemented due to the lack of funds.

In case-study villages, 58% of the survey participants viewed the relationship with MiAmbiente as ‘average’, less than a third as ‘good’ and the rest (15%) as ‘poor’. Half of the participants believe the relationship has improved, while one third saw it as unchanged (“they apply the same law”). Respondents explained improvements by saying that MiAmbiente “lets us work [clear forest or fallow for cultivation] more than they used to”, “permits cutting wood for personal use and for selling outside¹”, “has given us opportunities including community projects” or “does not yell too much”.

Commenting on BPPS management, a governmental informant indicates: “The environmental agency does not come in with a policy of recognition that [the local inhabitants] have rights to access and use natural resources. It comes in with a more restrictive policy; the type of management that has failed, but that persists”.

3.2. Challenges to forest conservation

In this section, we evaluate the forest conservation status based on a remote sensing assessment that we compare with the perception of residents and other stakeholders of the ongoing deforestation and its drivers.

3.2.1. Forest cover loss

Using governmental maps, we quantified 5318 ha in deforestation and forest degradation for the period 1992–2000 and 15,938 ha for the period 2000–2008 (Fig. 3). The sectors populated by Ngäbes displayed higher and increasing deforestation rates (Fig. 4a). Using the products

¹ This information could not be confirmed by BPPS management authorities.

Table 1

Timeline of the recent modifications to the protected area legislation and the Chan-75 hydroelectric development inside Palo Seco Forest Reserve.

Date	Rule number	Event	Source
2005	N° AG-0366-2005	A new era begins with a resolution allowing for private administration concessions in Panama's protected areas	(Gaceta Oficial, 2005)
2006	Decree N° 71	The Ministry of Economy and Finance modifies the legislation of BPPS (Decree N° 25) to allow activities of "social interest or benefit for the rest of the country"	(Gaceta Oficial, 2006)
2007		The Chan-75 hydroelectric project is declared of social and public interest and granted a concession.	(AES, 2012)
2008		The construction the hydroelectric dam starts in January. The area impacted by the reservoir is 1394 ha implying the clearing of approximately 850 ha of forest and the relocation of various Ngäbe communities. Initiated without a full social impact assessment, communities affected by Chan-75, located in BPPS but outside the indigenous reserve, bring the case to the Inter-American Commission on Human Rights with the Petition 286/08.	(Fundación Del Consejo General de la Abogacía Española, 2011)
2009		A report by Special Rapporteur James Anaya done after an on-site visit to Panama finds significant flaws in the government's authorization for the dam and the ongoing construction project. He calls for a new process of dialogue with the affected communities to obtain their agreement on the terms of the project and for measures to ensure respect for their land and other human rights	(Anaya, 2009)
2009		On June 18, 2009, the Inter-American Commission on Human Rights (IACHR) grants precautionary measures in favor of the Ngäbe communities for the purpose of preventing irreparable damage to the communities' right to property and to their security. The IACHR requests that the State of Panama suspend construction and other activities related to the concession until the bodies of the inter-American human rights system can adopt a final decision on the matter.	(IACHR, 2009)
2010		The Inter-American Court on Human rights rejects the request for provisional measures filed by the Inter-American Commission on Human Rights because of the lack of proof supporting the immediate extreme gravity, urgency and irreparable damages to the people affected. However, Inter-American Court in its concluding statement reminds the State of Panama of its obligations to protect the rights of its citizens and to secure appropriate consultation processes.	(I/A Court H.R., May 28, 2010)
2010	Decree N° 127	An executive bill recognizes the collective lands for those directly affected by the transfers and relocations known as the settlements of Changuinola Arriba, Charco la Pava, Guayabal and Valle del Rey, as a result of the activities related to the hydroelectric concessions. Relocations are done inside the protected area.	(Gaceta Oficial, 2010)

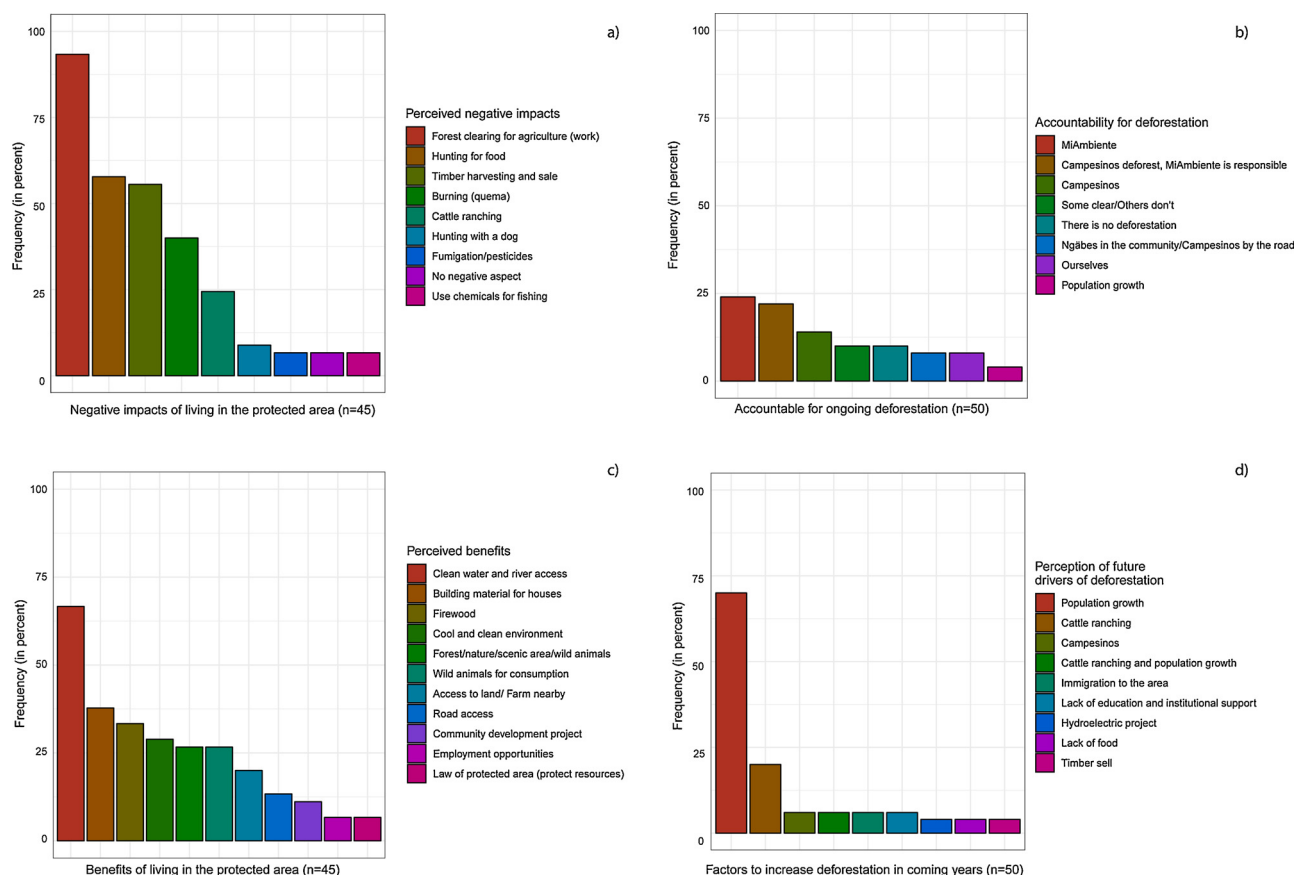


Fig. 2. Bar plots based on results from household survey (a and c), and household survey and in-depth interviews (b and d). (a) Perceived negative impacts of living in the protected area, associated with activities that are prohibited by law. The main negative impact is being prohibited from clearing forest for subsistence agriculture (93.3% of participants) (b) Accountability for deforestation; most residents attribute deforestation to MiAmbiente and local *latino* farmers (*campeños*). (c) Perceived benefits of living in the protected area; access to clean water and river and to building materials for houses are viewed as the most important benefits. (d) Perception of future drivers of deforestation, or factors that will increase deforestation in the coming years; population growth is identified as the main factor.

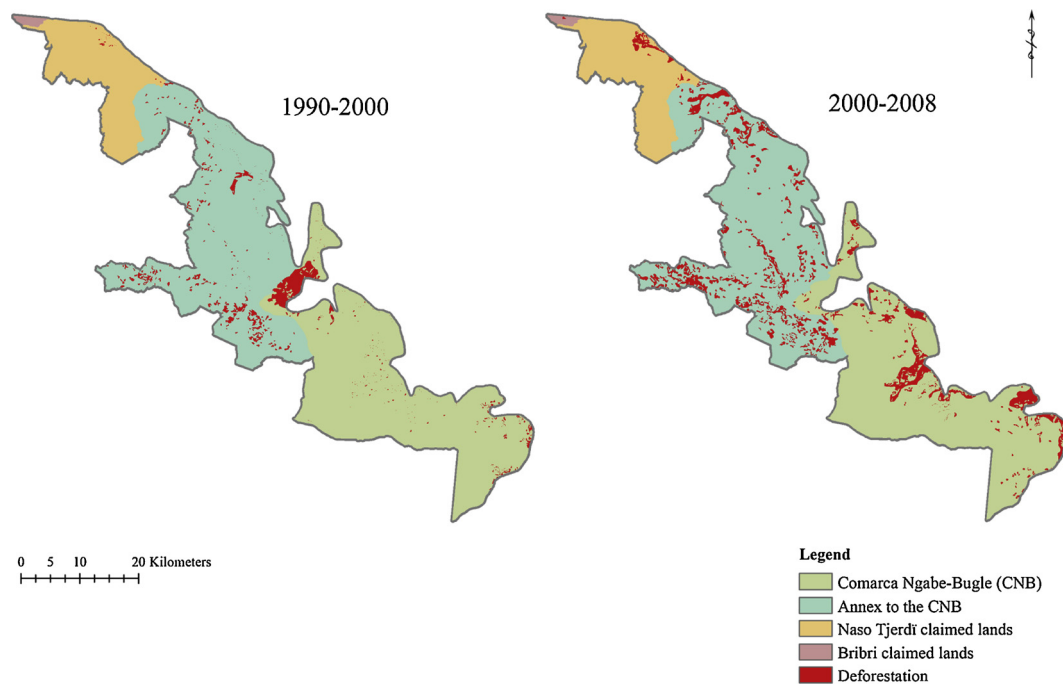


Fig. 3. Forest cover loss for the period 1990–2000 and 2000–2008 by sector under different occupancy, including parts of recognized indigenous territory (the Comarca Ngäbe-Buglé), land occupied by Ngäbes (Annex territories to the Comarca), parts of land claimed by Naso-Tjërdi and by Bribri indigenous people. Bribri indigenous people are not discussed since most of their land falls outside the BPPS. The area covered by the four re-settled villages following the Chan I hydro-electric project is not displayed since we were unable to access the geographic layer of the territory.

generated by Hansen et al. (2013), we estimated a total deforested land of 4193 ha for 2000–2014 in BPPS (Fig. 4b). The national assessments showed more deforestation with a difference equivalent to 9295 ha for the overlapping period (2000–2008). The small-scale of human activities and definitional differences most likely explain this difference. Hansen et al. (2013) considered forest loss as the complete removal of tree cover at the 30-m Landsat pixel scale, while national assessments consider deforestation as a decline in canopy cover from > 80% to less than 60% (CATHALAC, 2009). With these different definitions, it is not surprising that the estimates are different. Clearly, there are still large uncertainties on the impacts of human activities on forests in BPPS.

For the case-study area covering 1500 ha, a decline in forest area and an increase in non-forest area were found from 1999 to 2004, though cloud cover in 2010 and 2011 satellite images prevented an estimate of the trend in more recent years (Pelletier et al., 2012). From 2000 to 2008, the national land-cover maps detected 30.6 ha of deforestation while Hansen et al. (2013) detected 18.4 ha. Field vegetation surveys also validated that both forest and fallow were cleared for shifting cultivation (Pelletier et al., 2012).

3.2.2. Perceptions of deforestation and its drivers

Institutional participants do not share the same perception of deforestation in BPPS. Participants from MiAmbiente, who have access to land-cover maps, considered deforestation to be the main problem in the PA. In contrast, two out of three Comarca institutional participants consider that “there is not a lot of deforestation, they only utilize the patches for eating; they clear to survive”.

Focus group participants generally perceived a forest decline and an increase in fallow areas (Appendix S1, Figure S1). In surveys, 48.9% of participants perceived a decrease in forest cover, 37.8% perceived no change, and 13.3% perceived an increase.

According to the management plan document (ANAM/CBMAP, 2006), the main proximate drivers of deforestation are: (i) agricultural expansion by *Latinos* (non-indigenous farmers) from Chiriqui Province and Ngäbes; (ii) selective extraction of resources; and (iii) hydroelectric and electric transmission projects. Five hydro-dam projects are

currently in different stages of completion (ANAM/CBMAP, 2006) and have triggered tensions between the government and indigenous people affected. For example, the Chan I hydroelectric dam established in Ngäbe Annex territories and completed in 2011, resulted in > 850 ha of forest clearing and the re-settlement of four Ngäbe villages inside BPPS. This hydro-dam project prompted conflicts with the residents affected (Table 1).

Half of the survey participants identified the environmental agency as the main underlying driver of deforestation; that is, MiAmbiente is seen as being accountable for the ongoing deforestation by failing to prevent deforestation created by other actors (Fig. 2b). They expressed the viewpoint that MiAmbiente does not monitor and enforce the law as it should to halt deforestation. They perceive that the *Latinos* who deforest receive no punishment: “They clear, they do not obey the law and [MiAmbiente] doesn’t do anything”.

Cattle ranching is also an important proximate driver. It claims a lot of cleared land for pasture, is common in certain sectors of the protected area, and is supported by loans from the Agricultural Development Bank (Appendix 1, Table S3).

3.3. Residents’ livelihood needs, views and aspirations

3.3.1. Livelihoods and land-use practices

In the case-study area, all of the respondents’ household economies rely on subsistence agriculture (Fig. 5a). The majority of households surveyed clear forest or fallow before planting for subsistence agriculture, adding up to > 17 ha for 2010 based on reported value from respondents. Fallow is preferred for planting over forest. Sixty-four percent of participants observed decreasing yields and 86% shared the view that “you need to clear forest to maintain food production”. Younger households have the smallest farm size ($F = 4.63$, $p = 0.0069$). Land rightholders with small farms (< 10 ha) do not have cattle ($X^2 = 6.18$; $p = 0.0196$), they work significantly more often on other people’s farms as laborers ($X^2 = 13.85$; $p = 0.0015$), and replant significantly more often on the same plots ($X^2 = 7.1529$; $p = 0.0226$) or leave the land fallow for shorter time ($R^2 = 0.19$; $p = 0.0030$). Fallow

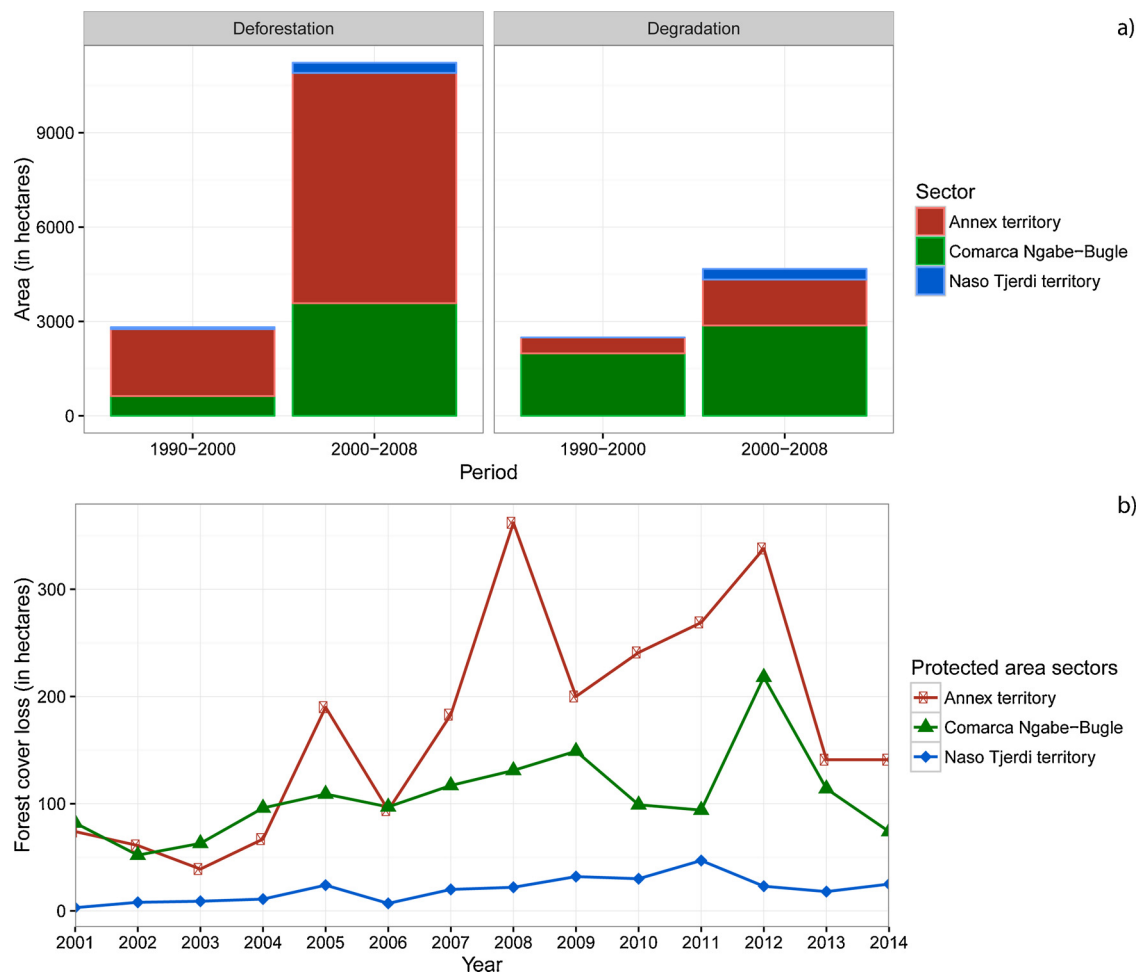


Fig. 4. Forest cover loss in Bosque Protector de Palo Seco. (a) Upper panel shows the area affected by deforestation and forest degradation based on governmental assessment for the 1990–2000 period (ANAM/TITO, 2003) and the 2000–2008 period. We observed higher and increasing rates from 1990–2000 and 2000–2008, with 3.8–9.3% for the Comarca and 3.7–12.2% for the Annex territories. (b) The bottom panel is the annual forest cover loss assessed by Hansen et al., 2013. Only the 2000–2008 period overlap between the two different assessments, with very large discrepancies between the deforested area estimated with the governmental maps (11,224 ha) and Hansen et al. (2013) global product (1929 ha), reflecting difference in definitions of forest loss or deforestation. Overall, the Annex territories which are territories inhabited by Ngäbes that were not included in the Comarca law of 1997 and where the Chan 75 hydroelectric project took place, experienced higher deforestation.

period duration varied between farmers, with a 10-year maximum fallow period (Appendix 1, Table S2). Some households favor permanent cultivation to conserve their forests (50%) or because their plots are distant.

3.3.2. Customary land rights

Land distribution is skewed, ranging from 0 to 210 ha (Fig. 5b), with the village founders and their descendants having the largest land-holdings. Forests are not managed as a common-pool resources, namely “each person is responsible for their own land”. Only 24.4% of the participants believe the community should have a say if someone cleared forest or sold timber from their own land. Some respondents would perceive it as unfair, “why does he have this opportunity and not me”. Many participants indicated that they would personally make a complaint about these actions to MiAmbiente. Some mentioned their preoccupation: “[those who deforest] will end up without trees, there will be no hope for the family (the children); there will be no more forest. One can only try to talk to the person”. We found a significant correlation between the landholding size and the forest area owned ($r = 0.95$; $p = 2.2e-16$), indicating that customary land rightholders with more land have more impact on the fate of forest.

3.3.3. “Keeping forest for the future”

Most participants (73.3%) think it is fine to live in BPPS and few (6.6%) see it negatively. Gender does not influence these perceptions. The most important benefits are related to forest resources and eco-system services (Fig. 2c).

Most right-holders surveyed maintain forest on their land. The majority conserved forests for the future, as an inheritance for their children. Some respondents also conserve forest as a supply of building materials, “because I have enough fallow to work on”, to protect hunting grounds, to teach their children about forest and animals, to cultivate later on, and “because of the [PA] law”.

Most participants expressed their support for forest protection, emphasizing that the forest protection granted by the protected area legislation made their village a better place to live in comparison to villages outside the PA where forest resources have been destroyed. Those who did not support the idea of reducing deforestation indicated that “there are already enough restrictions on us” or declared “I already conserve, I could not do more”. We found no significant difference between the land holding size of participants who do or do not support the idea of reducing deforestation.

In future years, respondents identified that the factor posing the greatest threat to forest cover is population growth (Fig. 2d). As a governmental participant explained: “definitely population growth is

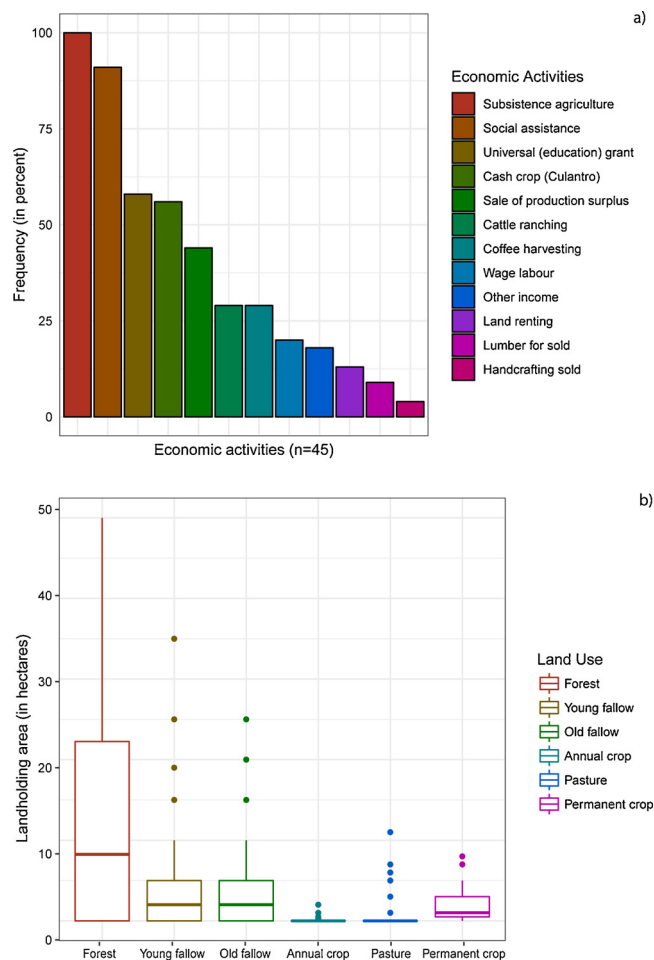


Fig. 5. Main economic activities showed on barplot (a) and landholdings boxplot (b) in the case-study area. For (a), the main economic activities are subsistence agriculture, followed by governmental assistance (*Red de oportunidad* and Universal grant) and production of cash crop (*culantro*). For (b), the landholding area in hectares under different land uses is presented, as reported by survey participants (3 outliers were removed from the forest land for display; but they include landholders having the largest area of forest land (with max. of 200 ha). Most of the land is occupied by forest, young and old fallow and permanent crop. Forests are still the main land use in terms of area, and only a relatively small area is used for annual crops and pasture. The variation in the area reported under different land uses which reflects different preferences in the use of the land between respondents as well as an uneven land distribution.

an issue that is like putting your finger on the wound that no one wants to cure; nobody wants to face it, no institution really.” The expansion of cattle ranching is also viewed as a future threat to forest cover.

3.3.4. Improving forest conservation and development aspirations

Food security is the main preoccupation and respondents perceive a direct link between food security and the capability to maintain forests (Table S4). Alternatives proposed to maintain forests were closely tied to the land, for family consumption and some for cash crop production (Table 2). The incentive projects and payment programs conducted to date in the sector were not directed at maintaining forest, but rather focused on poverty and malnutrition (Fig. 5b). Education ranked as the top priority for community development in focus group activities followed by establishment of a health center. Institutional participants recognized the need to provide the local communities with incentives to conserve forests.

4. Discussion

Rights-based conservation is the new international standards for protected areas, and this has important implications for conservation objectives, governance and management. These high-level policy standards can nonetheless be far removed from PA residents’ reality. At the heart of this effort for a more just conservation are considerations for human well-being, a concept which can be defined differently and is also a matter of perceptions and social norms (Biedenweg and Gross-Camp, 2018). This paper contributes to this effort by using a consultative approach to show how taking account of residents’ views and priorities can inform an effective response. We examined how indigenous residents experience and perceive their rights, interactions with authorities and livelihood opportunities. We used our observations on people’s perceptions to identify patterns and commonalities. We assume that respecting people’s rights in protected areas can both reduce social costs and favor cooperation. Bridging the gap between rights-based standards and the people’s priorities can help to speed up the transformation toward more equitable outcomes in conservation.

We found that most residents share a positive view of living in the PA, which allows them to enjoy key ecosystem system goods and services still available because of the protection law. These findings are similar to results from other protected areas where residents recognize benefits associated with conservation (Amin and Koné, 2015). We also found that the residents’ views aligned with the conservation managers for the most part, and that residents’ concerns could be ameliorated with specific targeted changes. To advance rights-based conservation, we highlight those changes that could best deliver on the priorities of residents for addressing their concerns and recognizing their rights.

4.1. Landing rights-based conservation for protected area residents

Our results show that food security is clearly at the center of the residents’ preoccupations and is a basic criterion for their involvement in conservation activities. Similar to the recommendation by Kashwan (2013), we propose that establishing a minimal set of inalienable rights to subsistence for residents can address this food security concern.

To recognize subsistence needs by residents, we found that it would be effective to establish shared rules on what activities should be accepted, restricted or prohibited, and what sanctions to apply for infractions so that the rules are perceived as fair and legitimate. According to Ostrom (2014), establishing shared rules that are clear and easy to implement can lead to new social norms supporting sustainable use and conservation. Clear and socially legitimate rules on resource access and land use are at the basis of good management and will shape social and conservation outcomes (Sayer et al., 2013). Previous work emphasizes that increasing fairness and legitimacy can increase cooperation toward conservation objectives (Jodoin, 2014; Tyler, 2011; Bouma et al., 2014; Bouma and Ansink, 2013).

We found that the interaction with park rangers who apply those rules and restrictions also affects residents’ views, as they are the face of conservation, and that it could be improved. In accordance with previous studies, we consider that empowering park rangers in conflict resolution (De Pourcq et al., 2017), in caring about the relationship with communities (Mutanga et al., 2015), and in developing the legitimacy and trustworthiness as park rangers, can stimulate voluntary compliance in conservation (Stern, 2008a, Stern, 2008b).

Residents also requested more enforcement by the environmental agency toward outsiders who deforest. When recognizing land and user rights, it is important to define who should have access and who should be excluded from using those resources for their protection (Ostrom, 1999). A clear and careful process for formalizing land and user right is needed to avoid the risk of race to resources and land grabbing.

Residents expressed apprehension toward hydro-dam development inside the PA. This development alienates the population, creating conflicts with authorities, between residents and with conservation

Table 2Alternatives proposed to maintain forest in the area and risks associated identified in interviews ($n = 50$).

Type of proposition	Alternatives/activities proposed	Potential risks
Agricultural production	<ul style="list-style-type: none"> - Access road to the village (send products to market) - Production alternatives for food and market (including coffee, <i>ají</i>, cacao (in agroforestry system)) - Timber, firewood and fruit tree plantations - Chicken, eggs, pork, lamb or/and fish production 	<ul style="list-style-type: none"> - Road: increased migration to the area or/and illegal logging - Adoption of cash crops can stimulate forest conversion
Employment	<ul style="list-style-type: none"> - Tourism project - Self-management of handcrafting by women - Forest rangers 	<ul style="list-style-type: none"> - Financial benefits to a minority of people with possibly small net effect on forest cover change
Payment for Environmental Services	<p>Direct payment:</p> <ul style="list-style-type: none"> - Compensation for conserving forest on their land (payment per ha of forest or equal for all) - Monetary incentive coupled with education and technical assistance <p>Funds:</p> <ul style="list-style-type: none"> - Finance projects of agricultural production and employment (see above) - Strengthening of the environmental institution (EA) - Fortifying local organization (social capital) - Social programs with environmental education 	<p>Direct payment:</p> <ul style="list-style-type: none"> - Investment in activities promoting forest cover change (“If I had money, I would buy cattle”) - Paternalism and dependence toward the State - Difficult process to clarify payments on untitled land (land is often informally transferred and generates intergenerational conflicts) - “Money is easily spent”/“Money might not even reach the community” - Create food insecurity “we will produce less food” - Money given individually may generate conflicts <p>Funds:</p> <ul style="list-style-type: none"> - Overtaken by local elite, limited benefits to the community - “Money is politically managed” and does not reach the community
Capacity-building and Education	<ul style="list-style-type: none"> - Grants for students/Access to education - Technical assistance for production - Capacity-building - Environmental education 	
General measures	<ul style="list-style-type: none"> - Creation of a specialized institution to attend to poverty in rural areas 	

objectives. Including the right to uphold consent to future hydro-dam development for residents would definitely relieve some tension between residents and MiAmbiente.

This case study illustrates the fact that there are opportunities for developing conservation policies that improve both social and conservation outcomes. Even though the context and residents’ perceptions may change between PAs, this work shows that focusing on the perceived local needs and priorities is a useful way to inform conservation strategies. Of course, appropriate funding and political will at the national level are also needed. Geldmann et al. (2015) point out that targeting funding and resources to PA under threat would have the greatest impact for conservation.

4.2. Forest conservation status

The forest cover change analysis highlights the fact that more research is needed to better understand the impacts and potential contributions of traditional agricultural systems to conservation over time and space. Previous research in the case-study PAs has shown that the subsistence agriculture and agroforestry systems used in the area has limited impacts on carbon stocks (Pelletier et al., 2012; Ortiz et al., 2008). Agriculture may reduce tree diversity but it supports bird diversity (Van Bael et al., 2007). In addition, overlapping protected areas and indigenous territories were also found more effective in avoiding deforestation in Panama (Vergara-Asenjo and Potvin, 2014), including in the case-study area. Indigenous territories also play a role in reducing deforestation rates compared to their surroundings in Bolivia, Brazil, and Colombia (Ding et al., 2016). Generating more accurate forest-cover loss information and sharing this information with residents and stakeholders can help develop a shared vision of the forest status and need for conservation.

4.3. Further actions for implementing the rights-based approach

Based on previous research, we propose future actions that would activate this transformation toward inclusive conservation strategies,

which have been shown to be more effective at generating synergies between conservation and socioeconomic outcomes (Oldekop et al., 2016). Recognizing rights involves reconfiguring who makes decisions and how they are made, changing how responsibilities and benefits are shared, and rethinking how governance and management quality are evaluated (Stevens, 2014). Putting rights considerations at the forefront of protected area laws through legal reform is one initial step that can help to re-configure the roles and mandates between governmental agencies and affected residents.

The creation of a culturally appropriate democratic structure and a process for collaborative governance through innovative institutional arrangements is important (Berkes, 2009b), along with recognizing the legitimacy of indigenous governing authorities for co-governance (Premauer and Berkes, 2015). After bringing clarity on rights and by adopting a collaborative governance strategy, the management agency and residents can co-develop a shared vision on conservation objectives and regulations, and define responsibilities and benefits. These negotiations are also useful for acknowledging tradeoffs on both sides (Premauer and Berkes, 2015; McShane et al., 2011). The fairness of the consultation procedure and decision process is crucial to build legitimacy and social acceptability around conservation objectives (Jodoin, 2014; Bennett, 2016).

Most residents in the case-study area contribute on an individual basis to forest conservation, but collaborative development of co-ordinated actions and a long-term vision could also help secure the future of forest conservation in these PAs. Collective actions can help protect ecosystem services than people value. For instance, community monitoring, supported by the management agency, can be an effective method to protect the forests from infractions to agreed rules (Chhatre and Agrawal, 2008; Ostrom and Nagendra, 2007). Already, volunteer reporting to authorities is the primary means by which deforestation is detected by PA staff.

The creation of endogenous development plans by residents, for whom education and health is a priority, can also achieve greater security for conservation and could help to restrain impacts from future challenges due to population growth. Participatory land-use planning,

for example, can support the generation of those plans and help identify tradeoffs based on alternative scenarios and potential outcomes (Dalle et al., 2011; Bourgoïn, 2012; Bourgoïn et al., 2012).

Finally, evaluating the governance quality and adaptive learning in management is crucial for the success of PA and for fostering rights-based approach to conservation (Borrini-Feyerabend et al., 2013). New sets of principles for evaluating good PA governance now account for human well-being and rights (Lockwood, 2010; Woodhouse et al., 2015). These principles are important to normalize desirable practices and to provide a means to assess progress on rights and reduce social costs.

5. Conclusions

Recent global reviews show slow progress in rights recognition in PAs. To implement RBA to PA governance and management, high-level policy changes and adequate funding are required. Here, we bring residents and other stakeholders' perspectives to inform the transformation needed to bring fairer outcomes and balance human needs and conservation. We found that residents share a positive view of living in the protected area because of the ecosystem products and services they enjoy, in part as a result of the environmental protection law. However, we observed that the legal and perceived rights of access and use of natural resources are not clearly or formally recognized, especially when it concerns food security. We saw that residents' participation in the protected-area governance and management is also deficient; they don't have decision power in the PA objectives, nor a voice to influence the rules imposed on them. These elements, combined with tensions related to hydropower development in the protected area, limit co-operation by residents and threaten the long-term sustainability of forest conservation in the PA, in accordance with previous theoretical assertions and empirical work on cooperation (Ostrom, 2014; Jodoin, 2014; Tyler, 2011). This study shows that there are opportunities to improve social and conservation outcomes and synergies between these objectives with specific targeted changes, despite tradeoffs. This consultative approach can help accelerate the process by identifying residents' priorities for rights recognition and collaboration. This is not an end, but a process. In the coming years, it will be relevant to hear more about indigenous peoples' views on the PA objectives, and the governance, management and development plans that they would like to see implemented.

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Appendix 1 Supplementary data

Supplementary data associated with this article can be found, in the online version, at <https://doi.org/10.1016/j.landusepol.2019.01.027>.

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