A systematic review of motivational values and conservation success in and around protected areas

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Abstract

Conservation projects in and around protected areas (PAs) use a suite of policy instruments to motivate conservation behaviour in local people. At present, few studies have related the psychological research on motivational values to conservation in PAs. Here we conducted a systematic literature review of 120 peer-reviewed articles to assess the relative frequencies of intrinsic (coming from within) versus extrinsic (external to the self) motivators that were used to shape behaviour. We also tested to see whether projects with characteristics that support an intrinsic motivation to conserve had greater success in achieving ecological, economic, or social goals than projects that used more extrinsic motivators. Our results suggested that although the majority of projects used extrinsic motivators, projects with a greater proportion of policy instruments fostering intrinsic motivations tended to have greater ecological and social success. Furthermore, although policy instruments such as payments or fines tended to use extrinsic motivators more often than education or community tenure programs, several successfully implemented projects involving payments or fines still fostered intrinsic motivation in the local community. People are driven to conserve for a wide range of reasons. Conservation practitioners should aim to create policy instruments that promote not only material benefits but also more intrinsic values such as relatedness or autonomy. Our study suggests that rather than debating the relative merits of specific policies, conservationists may have more success by focusing on the way different policies, suited to their specific context, can better empower local communities towards self-identification with conservation.

Introduction

Local communities living in and around protected areas (PAs) can have adverse affects on species within protected areas, often through poaching or encroachment of habitat (Redford 1992; Robinson 1993a; Redford & Sanderson 2000). Around the world, there are two broad strategies that are used to change the behaviour of local communities in order to protect ecological integrity. First, in areas with enforcement capacity (Struhsaker et al. 2005), protected areas can be conserved from threats by creating disincentives for local communities to break the rules of the protected area. These disincentives may include fines or other punishments as well as forced relocation (West et al. 2006). Although this first "protectionist" or "fortress-style" strategy appears to be effective in terms of meeting ecological goals (Bruner et al. 2001; Struhsaker et al. 2005), in the past 30 years, the social impacts of this conservation intervention on local people have been questioned both ethically and economically (Ferraro & Kiss 2002; Wilshusen et al. 2002). These critiques have lead to an extensive debate in the conservation literature (Holdgate & Munro 1993; Robinson 1993a, 1993b; Redford & Richter 1999; Wilshusen et al. 2002) as well as a predominant move away from fortress style interventions to community-based conservation (CBC) projects.

Community-based conservation projects aim to garner support and legitimacy from local communities (Lockwood 2010) by providing incentives such as material benefits (eg. payments, economic development opportunities, guaranteed rights of harvest) as well as non-material benefits such as training, social capital or autonomy (Brosius et al. 2005; Brandon & Wells 1992; Western & Wright 1994; Berkes et al. 2000). Particularly in areas with limited enforcement capacity and little compliance, CBCs can help to reduce poaching or local exploitation of resources and thereby help to meet ecological goals (Samoilys et al. 2007; Hazzah et al. 2014a).

In both protectionist and CBC interventions, reducing environmental impact is dependent upon policies that shape human behaviour (Salafsky & Margoluis 2004). Given the challenges of making reliable predictions about how complex social-ecological systems will respond to interventions, such as a new livelihood strategies, many of these conservation projects have had unintended consequences and have failed to effectively conserve biodiversity (Matzke & Nabane 1996; Hackel 1999; Kellert et al. 2000; Adams et al. 2004; Davies et al. 2014).

In recent years, numerous researchers have called for greater social science research into CBCs and protected areas in order to better understand the human dimension of conservation (Mascia 2002; Adams 2007). Although anthropologists, geographers, sociologist and economists have responded, few papers have

examined CBCs through a psychological lens. Psychological studies on attitudes, values, social norms and motivations can help conservationists better predict the effects of different policy instruments on local people and thereby help to design fair and sustainable conservation interventions (Cialdini et al. 1990; Saunders et al. 2006; Martin et al. 2008; St John et al. 2011). Research on motivational values is particularly important for conservation because of the universality of human motivation across different cultures (Grouzet et al. 2005; Schwartz, 2006). Motivational research can thus help in designing successful conservation interventions in a wide range of countries and socio-political contexts by focusing on the underlying commonalities of different projects.

Here we conducted a systematic literature review to investigate how conservation policies motivate conservation behaviour for people living in and around protected areas. Self-Determination Theory (SDT) (Scott Rigby et al. 1992; Ryan & Deci 2000) posits that there are two different types of innate human motivation. Intrinsic motivation is autonomous and arises from within because of spontaneous enjoyment and interest in a particular activity (e.g. planting trees for the sense of fulfillment). In contrast, extrinsic motivation is motivation arising outside the individual, such as rewards or punishments (e.g. planting trees because you are paid for each tree that you plant, or planting a tree because if you don't plant the tree you will have your property rights removed). Although such extrinsic motivators are extremely effective at shaping short-term behavioural change (Skinner 1974), intrinsic motivation is more related to long-term environmental beliefs (Sheldon et al. 2011). Furthermore, extrinsic motivators can also "crowd-out", "over-justify" and undermine more long-term, intrinsic motivators such as moral obligation (Festré & Garrouste 2014; Gneezy & Rustichini 2000; Bowles 2008).

Social environments may alter extrinsic motivation to be more or less intrinsic by affecting feelings of autonomy, competence and relatedness (Deci et al. 1999a). Autonomy is the feeling that one has the ability to make decisions and determine one's future (Ryan & Deci 2000). In conservation, this could be the local community having control over how payments will be distributed or which alternative livelihoods they will adopt. Competence is the feeling that one has the ability to act on a motivation (Ryan & Deci 2000), which, in conservation, could come from clear and explicit regulations or learning new farming practices. Relatedness is the feeling of connection to familiar people or places (Ryan & Deci 2000). Relatedness in conservation could be a program that works through existing communal institutions and social channels.

Through this psychological framework, our project builds on numerous systematic reviews and meta-analyses that have helped to increase our understanding of what

socio-political, and ecological factors contribute to the success of community conservation projects (Hackel 1999; Kellert et al. 2000; Struhsaker et al. 2005; Brooks et al. 2006; Andrade & Rhodes 2012b). Together these past meta-analyses indicate that management strategies and policies that help to foster the conditions for intrinsic motivation were particularly important predictors of conservation success. For example, conservation projects that included community education (Waylen et al. 2010), capacity-building opportunities (Brooks et al. 2012) with high community participation (Andrade & Rhodes 2012b) and that respect cultural norms (Brooks et al. 2012; Cinner & Huchery 2014) were more successful and also likely enhance feelings of competence or autonomy. Projects that enhance feelings of relatedness through fostering social capital (Ostrom 1990; Gutiérrez et al. 2011) are also more likely to be successful. Clearly incentives that are likely to foster long-term intrinsic motivations are important. However, other meta-analyses have also indicated the value of policy instruments that are usually considered more extrinsic approaches to gaining community support, such as strict enforcement (Bruner et al. 2001; Struhsaker et al. 2005) or direct payment schemes (Hanley et al. 1999; Kleijn & Sutherland 2003).

Although conservation interventions around protected areas rely on successfully altering human behaviour, as far as we know, this is the first systematic review that examines how motivation influences PA outcomes. Researching the role of intrinsic and extrinsic policy instruments is timely because of the recent surge of interest and debate in largely extrinsic policy instruments in conservation, such as a return to protectionist enforcement (Struhsaker et al. 2005; Hilborn et al. 2006; Leeuwis and Gandiwa et al. 2013) and payments for ecosystem services (Thompson et al. 2011; Wunder 2013).

In order to understand how intrinsic and extrinsic incentives influence the success of conservation projects, we first assess the relative prevalence of intrinsic and extrinsic incentives. Second, we employ a meta-analysis to examine whether projects that are designed to foster intrinsic motivations to conserve are more or less likely to succeed than extrinsically motivating projects.

Methods

Search Method:

We performed two keyword searches in the *ScienceDirect* database between 10 May and 10 June 2015. We included case studies from different types of protected areas in both developed and developing countries. Each article included assessments of a conservation intervention aimed at adjusting the behaviour of local communities

and stakeholders living in and around protected areas. Both quantitative and qualitative case studies were included in the systematic literature review. To the best of our knowledge, we followed the established procedures for performing systemic reviews of conservation literature (Pullin & Stewart 2006).

Our initial search algorithm aimed at drawing specifically upon articles that involved protected areas, the incentives or policy instruments of the specific conservation program, and included local communities or stakeholders in their focus. Review papers and other meta-analysis were excluded from the search results. We also excluded papers published before the year 2000. The types of conservation interventions that have been implemented have changed over-time (Minteer & Manning 2003; Sodhi & Ehrlich 2010) and so we wanted to restrict our search to articles that were based on research that was conducted in the past two decades. Our initial search using these key terms resulted in 858 articles:

("protected area" OR MPA OR reserve OR national park) AND (incentive OR IBP OR participation OR perception OR *suasion OR non-monetary benefits) AND ("community-based conservation" OR CBNRM OR CBC OR "participatory management" OR "community conservation" OR "adaptive management")

We read the abstracts and titles of each paper and excluded articles that did not contain at least one case study of a community in or around a protected area, and a description of at least one policy instrument used by park management in order incentivize conservation. We also excluded articles presenting only baseline data of a study region prior to an intervention. Based on these criteria, about 350 articles were retained. Because there are some protected areas that are heavily researched (such as the Great Barrier Reef (Fernandes et al. 2005)), in order to minimize pseudo-replication, we randomly selected only one article per protected area. Following the exclusion of duplicate articles, we haphazardly selected (articles were not selected intentionally, but no random number generator was used) 85 of the remaining articles to code.

We targeted our second search at a slightly broader range of articles by using more terms for protected areas and community involvement. We also removed the terms for incentives or moral suasion, since the language around policy tools is more varied than we could account for in a single search:

("community-based conservation" OR CBNRM OR integrated management OR community conservation OR participatory management OR local community OR indigenous community) AND (marine reserve OR MPA OR protected area* OR park OR "nature reserve" OR "wilderness area" OR "national park" OR "natural

monument" OR "species management area" OR "protected landscape seascape" OR “biosphere reserve”)

Our second search brought 2,775 articles. We read the abstract and title of the first 1000 (sorted by relevance), excluding articles with the same criteria explained above. Out of these 1000 articles, about 240 met the search criteria. Of these articles, we excluded articles coded from the previous search, as well as duplicate protected areas. We selected the first 35 articles (sorted by relevance) and included these articles in the systematic review. Combined, we coded a total of 120 articles from the two searches. Although 13% of the articles contained more than one case study, we randomly selected and coded only one case study per article in order to reduce pseudoreplication from the data.

Coding Process:

For each paper, we recorded local and national socio-political and ecological characteristics of the study areas. We decided which variables to record based on previous meta-analyses and empirical research on the effects of conservation interventions (Hackel 1999; Struhsaker et al. 2005; Waylen et al. 2010; Andrade & Rhodes 2012b; Brooks et al. 2012). All of the variables, other than national socio-political characteristics, were assessed based on details presented in each article. The variables relating to national socio-political context were determined by external sources.

National Socio-political context:

Both the meta-analysis by Jones et al. (2013) and Brooks et al. (2012) incorporate the Human Development Index (HDI) as a national socio-political indicator. Although both studies found HDI a poor predictor of outcome (Brooks et al. 2012; Jones et al. 2013), we included this variable in case our findings differed, or to contribute to the weight of theirs. HDI is a ranking created by the United Nation to give a common measure of a country’s wealth, education, and life expectancy (UNDP 2014). Countries with scores closer to 1 are the most developed in these categories. The HDI for each country was obtained from the United Nations Human Development Report for the year (or closest year) of each article’s publication (UNDP 2014). Because corruption can harm natural resource protection (Laurance 2004; Smith, Muir et al. 2003) we also recorded the Control of Corruption dimension of the World Bank Governance index (The World Bank 2013). We used the Control of Corruption index, rather than other World Bank governance indicators, because the use of park resources for private gain is a key problem for both nationally and locally managed protected areas (Larsen et al. 2011). We

gathered this information from the World Bank based on the year (or closest year) of each article's publication.

Ecological context

We first coded the ecosystem of each case study by the regional biome using the categories indicated in (Olson et al., 2001). For the statistical analysis, these categories were later simplified into a binary coding of terrestrial or marine.

Local socio-political context

We used the World Conservation Union ranking system (IUCN) to categorize the type of PA of each case study. The IUCN ranking system is made up of six categories, where categories I-IV represent different types of PAs with primarily conservation goals, and categories V and VI represent areas where sustainable use were primary goals. Only 11% of the articles specified the IUCN ranking, thus for the remaining PAs we obtained the IUCN category of the PA in question from the Protected Areas Database (30%) (IUCN 2015), or from contextual information in each of the articles (59%). We first recorded the IUCN rank, and then aggregated these groupings into two categories "strict protection" (I-IV) and "sustainable use" (V, VI) PAs.

Following Brooks et al (2012), we also recorded the number of years since the establishment of a PA. This information was found either within each article or on the *ProtectedPlanet* database (IUCN, 2015).

We also recorded whether the implementation and management of the protected area was conducted by national government, local community (or local government), external organizations (NGOs or private business), or co-managed by two or more groups.

Participation levels were coded using the Pretty typology of participation for development (Pretty 1995, **Table 1**). For consistency, we did not rely on the author of each article's own statements on levels of participation, because researchers often have very different interpretations of high and low participation (Hockings 2003). Levels were coded based on information about how the conservation project indicated in the article engaged with the local community. For example, a conservation project that had been initiated by a local community leader who had sought support from a local NGO might score higher in participation than a national government implemented PA that had only consulted community members after the project was implemented.

Table 1 – Ladder of participation used in article coding. Adapted from Pretty (1995)

Participation Levels	Characteristics
1. Manipulative participation	Pretense of participation; community representatives on boards are unelected with no power
2. Passive participation	People are informed, but decisions are already made in advance
3. Participation by consultation	People participate by contributing information to management through interviews
4. Participation for material incentives	People contribute resources or labor, receive resources in return
5. Functional participation	Participation as means to achieve goals; local people have some decision-making, major decisions still determined externally
6. Interactive participation	Participation as a right; people actively involved in learning and analysis; people have control over decisions they are affected by
7. Self-mobilization	People have full control and act independently; resources may still be externally sourced

Types of projects

For each article, we identified the different types of policy instruments that were used to incentivize conservation behaviour in local communities. A preliminary search through the conservation literature allowed us to develop eight categories of policy instruments: direct payments, regulations, alternative livelihoods, community monitoring, education, resource access, land ownership, and infrastructure development. Direct payment schemes are simply when communities, or individuals, are paid directly for conserving land or as compensation for the implementation of the PA (Ferraro & Kiss 2002). Regulations are the enforcement of the PA through fines or other disincentives. Because most conservation project use some form of regulation, these were only recorded when the specific regulations aimed to alter the behaviour of the local community. Alternative livelihoods are

projects in which new opportunities for making money are offered to local community to diversify or dissuade resource activities that negatively impact the environment (Hill et al. 2012). Community monitoring projects occur when local people are employed as stewards of the park, and perform regular biodiversity monitoring (Danielsen et al. 2005). Education is any outreach program designed to promote altruistic environmentalism or to teach new sustainable resource-use practices (Brewer 2002). Resource access is when a community is offered access to a PA, typically as a bargaining point for other conservation behaviour (Nakakaawa et al. 2015). Land ownership occurs when a part of the PA is offered in exchange for adopting new livelihoods (Xu et al. 2012). Finally, infrastructure development occurs when PA management oversee the building of social services and infrastructure directly, rather than paying the community to decide themselves (Clifton 2013).

Intrinsic and extrinsic incentives

In addition to categorizing each policy instrument discussed in an article (84% of the articles indicated at least more than one policy instrument), we then coded each of the policy instruments as either extrinsic or intrinsic depending on how they were likely to motivate local people to conserve. We applied Ryan and Deci's (2000) Self-Determination Theory that identified three needs that are necessary for intrinsic motivation—autonomy, competence, and relatedness. As we read each article, we assessed the degree to which each of these policies facilitated these needs in local people. For instance, as we read the article we considered whether, direct payment scheme support feelings of autonomy by allowing local control over distribution of funds (Martin et al. 2014). For an alternative livelihood project, we considered whether new occupations reduced feelings of risk by promoting a diversity of livelihoods (Ellis 2000) and thus support feelings of competence. And finally, we considered whether the policy was implemented through existing local organizations and thus supportive of social capital (Pretty & Smith 2004) and feelings of relatedness. We developed this coding method for motivation through a process of preliminary article reading, coding independently and then comparing codes and clarifying differences.

Project Success

We assessed the project outcome in articles that explicitly stated and measured socio-economic or ecological goals. If the goals of the project were not explicitly stated, we deduced the goals of the project based on the description of the history and socio-economic or ecological challenges that were noted in the study area description.

We only coded the social, economic or ecological outcomes if authors measured these either qualitatively or quantitatively and explicitly demonstrated the project's impacts. In some cases the outcome of the conservation project was indicated in the discussion of the article by referencing another study that demonstrated the outcome of the project. Provided that the article that was referenced in the discussion was published in a peer-reviewed journal, included empirical evidence and referenced the same study area and project at the same time, we also included the outcome of this paper. Within each of the three categories of impacts (i.e. social, economic and ecological), success was coded if the project demonstrated at least one positive outcome that related to the goals of the project. If the project measured but failed to demonstrate an impact, or if the project measured and demonstrated a negative impact (eg. adverse impacts on livelihoods or increased divisions within the community) for a given category, we coded that the project failed to achieve either social, economic or ecological goals. Success scores were measured as a binary (successful, or failed).

Papers that assessed social outcomes measured the extent to which the project improved food security, fish catch or social capital, or the reduction of illegal activity that negatively impacts the community (Velez et al. 2014). In order to avoid circularity, we only recorded social successes that were a social outcome of a project, rather than a component of the new policy or management instrument. For instance, if a project provides new jobs for poachers as an incentive, we did not code this as a social success because the new jobs were an explicit part of the new policy. However if this project leads to improved health of the children in the community because of this new livelihood option (and the paper examined this impact), then we considered this a success.

Economic successes were typically measured by cost-benefit analysis, and were either the long term economic sustainability, or short-term economic benefits of a project.

Finally, ecological success was measured quantitatively, assessing the stability or recovery of a single species or the overall ecosystem after the conservation intervention, as well as the reduction of an environmentally harmful behaviour (e.g. poaching or cyanide fishing) that obviously reduced ecological integrity.

As numerous authors have noted, "communities" are not a static, homogenous group and projects can impact different members of the group differently depending on factors such as proximity to protected area, gender, access to capital or occupation (Agrawal & Gibson 2001; Agrawal 2009; Karki 2013; Majanen 2007). Thus, when projects indicated social or economic success for an identified group

and a negative impact on another identified group, we did not code the outcome. The social outcomes of 5 articles were excluded for this reason. Similarly, if the study demonstrated both positive and negative impacts for a given category (i.e. social, economic or ecological) we did not code the result as a success or failure. The social outcomes of 6 articles were omitted due to these conflicting results. If however there was a success in one category (e.g. ecological) and a failure in another category (e.g. social), this data was coded.

Intercoder reliability

After coding the first 80 articles through the process of discussion and independent coding described above, we tested the intercoder reliability of 23 haphazardly selected articles between an author (E.R.C) and a trained research assistant. The average Krippendorff's alpha ratio for all variables was 0.90, with a standard deviation of 0.09. The lowest ratio was PA IUCN rank category ("strict protection" or "sustainable use"), with a ratio of 0.73.

Statistical Analysis

First we identified the binary logistic model that best predicted the likelihood that at least one of the social, economic or ecological goals of the project were met.

The independent variables that we included in the model to predict project success were: National HDI, governance score (Corruption Perception Index), years since the establishment of the PA, ecosystem category (marine vs. terrestrial), IUCN PA category (strict protection vs. sustainable use), community participation levels and the proportion of incentives used in a project that fostered intrinsic motivation. In addition, we included two-way interaction terms between each of the variables and ecosystem category, national HDI and PA category. Although it would have been optimal to include more interaction terms, we were unable to do so because the model became saturated. We opted to include these interaction terms because preliminary visual inspection suggested that these variables could have interactive effects.

We followed standard model simplification procedures to identify the minimum adequate model that best describes the data. We began with the model with all fixed effects and then sequentially eliminated variables that do not improve the fit of the model. We used likelihood ratios tests ($\alpha < 0.05$) to assess whether there was a significant increase in deviance when each variable was removed from the model while retaining other variables (Crawley 2007; Zuur et al 2009).

Because there were 25 countries in which we had more than one case study per country and there was the potential for correlated error terms due to country or continent as well as country nested within continent. Thus we compared the AIC values of different generalized linear mixed effects models (glmer in R, library LME4 (R Core Team 2013)) incorporating the random effects of country, continent or country nested within continent. However because the AIC values of the generalized linear mixed-effects models incorporating random effects structures did not have lower AIC values than the model without random effects, we used generalized linear models (glm in R) with only fixed effects to predict the most significant predictors of the success of a conservation project.

Furthermore, in order to examine multi-collinearity in the data, we also ran Pearson's correlations between the independent variables and also examined the variable inflation factor. Although there was correlation between participation and the proportion of intrinsic incentives (Pearson's correlation coefficient r = -0.55) as well as national HDI and governance (r = -.62), the VIFs were all less than 2.5 and therefore below the threshold (5) for moderate multicollinearity (Hair et al. 1998).

If there were significant interaction terms in the models, we examined the interaction term by dividing the data set into two groups according to one of the interacting variables in order to assess how the model fit differed between the different groups.

Different factors are likely to influence the ecological, social or economic success of a conservation project. Thus to gain finer resolution we also ran three separate models for the ecological, social or economic success of the project. For these latter analyses we were unable to include all interaction terms between national HDI, ecosystem type and the proportion of intrinsic instruments and other fixed effects. Thus, for these latter analyses the "full" model only included interaction terms between these three variables and participation and the proportion of intrinsic instruments. This is because the proportion of intrinsic instruments is the main variable of interest in this study and participation has been shown to be the only important variable in a previous meta-analysis (Andrade & Rhodes 2012) and also because these two variables were of greatest interest in this study. For the economic model, due to the small number of projects that attained economic goals (n = 10), we were only able to include the interaction term between PA category and intrinsic instruments as well as PA category and participation.

Results

Location Characteristics

Case studies were found from all continents except Antarctica, most frequently in Asia (n=36), Africa (n=31), and North America (n=20). There were cases from both very low development countries (minHDI=0.34 (Mozambique), max HDI = 0.93 (Australia), mean + SD = 0.67 + 0.14). Using the United Nations four category HDI ranking system (UNDP 2014), there were 30 case studies from Low HDI countries (<0.55), 36 from Mid-Low HDI (0.55-0.70), 33 from Mid-High (0.70-0.80) and 21 from High HDI countries (0.80). There were 58 cases from marine PAs, and 62 from terrestrial.

Project Characteristics

55 of the total cases were from PAs of IUCN ranks I-IV (hereafter referred to as "protective") and 65 were from PAs of IUCN ranks V and VI (hereafter referred to as "sustainable"). The average PA age was 27 years.

Participation

Our case studies had generally low participation levels with the majority categorized as "token" or "passive participation" on the Pretty scale. The proportion of participation levels differed amongst continent (**Figure 1**). For example the case studies that were in Central America or Oceania appeared to have more instances of "self-motivation" and "interactive participants" than in Asia and Africa

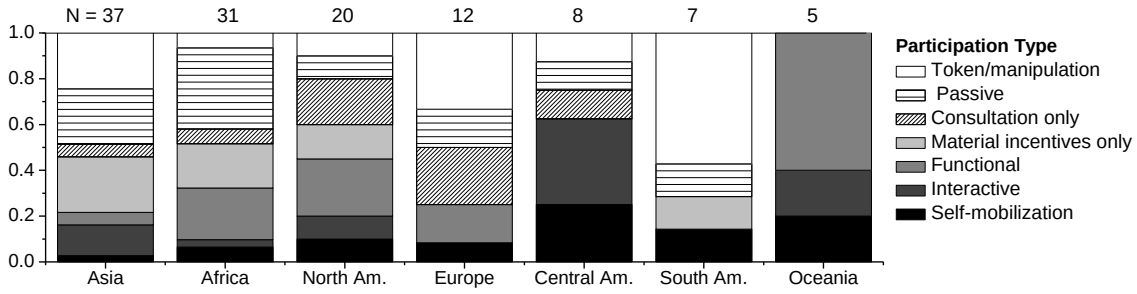

Figure 1. The proportion of participation levels (Pretty 1995) by continent. All 120 case studies included. Darker shades represent greater community power and involvement in the PA.

Policy Tools and Motivation

We found that the most common policy tools that were cited in the case studies were regulations and alternative livelihoods (**Figure 2**). These were also predominantly extrinsically motivating. Conservation education was slightly more common than payments for environmental services, which was documented in only 31 of the 120 PAs. Of these direct payment schemes, 64% indicated payments were made to a community fund, 29% to individuals or families, and 7% did not specify.

The percentages of the total number of policy instruments that were intrinsic motivators were close to the same in marine and terrestrial habitats (45%, 38%). The proportion of intrinsic policies was similar in low HDI (33%), mid-low HDI (39%), and mid-high (41%) HDI countries while high HDI countries had more intrinsic policies (60%).

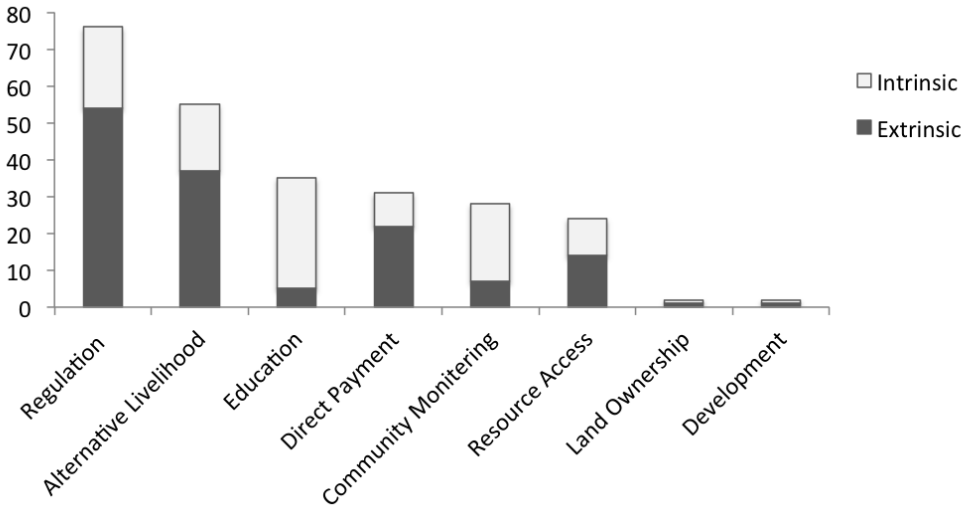

Figure 2. Frequency of different policy instruments and the frequency which they appeared to motivate intrinsically or extrinsically. Total = 253.

Predicting Outcome

Of the 120 case studies 97 were included in the outcome analysis. All case studies were used for descriptive results.

The proportion of intrinsically motivating policy instruments influenced the likelihood of success in all analyses (**Table 2, Figure 3**). In addition to the proportion of intrinsically motivating policy instruments, the number of years since a PA had been established was inversely correlated to social success (**Figure 4a**). Finally, case studies with greater participation levels were also more likely to succeed economically (**Figure 4b**).

Our interaction terms had no significant effect, though visually the proportion of intrinsic instruments appeared to have more effect in sustainable use PAs than in strict protection conservation areas.

Table 2. Parameter estimates for minimum adequate binary logistic model predicting the success of community conservation projects in and around PAs.

	Logit ± SE	**Z value**	**P value**
social, economic or ecological success			
Intercept	-0.9 ± 0.3	-3.0	0.002
Intrinsic instruments	2.9 ± 0.6	4.5	<0.0001
N = 97, Nagelkerke's R^2 = 0.32			
Social success			
Intercept	-0.37 ± 0.5	-0.75	0.45
Intrinsic instruments	3.4 ± 0.8	4.2	<0.0001
Years since PA establishment	-0.03 ± 0.01	-2.3	0.02
N = 71, Nagelkerke's R^2 = 0.45			
Economic success			
Intercept	-5.7 ± 2.0	-2.9	0.004
Participation	1.0 ± 0.5	2.1	0.03
Intrinsic instruments	3.1 ± 1.8	1.9	0.06
N = 37, Nagelkerke's R^2 = 0.61			
Ecological success			
Intercept	-1.0 ± 0.6	-1.9	0.07
Intrinsic instruments	3.6 ± 1.2	3.1	0.002
N = 38, Nagelkerke's R^2 = 0.35			

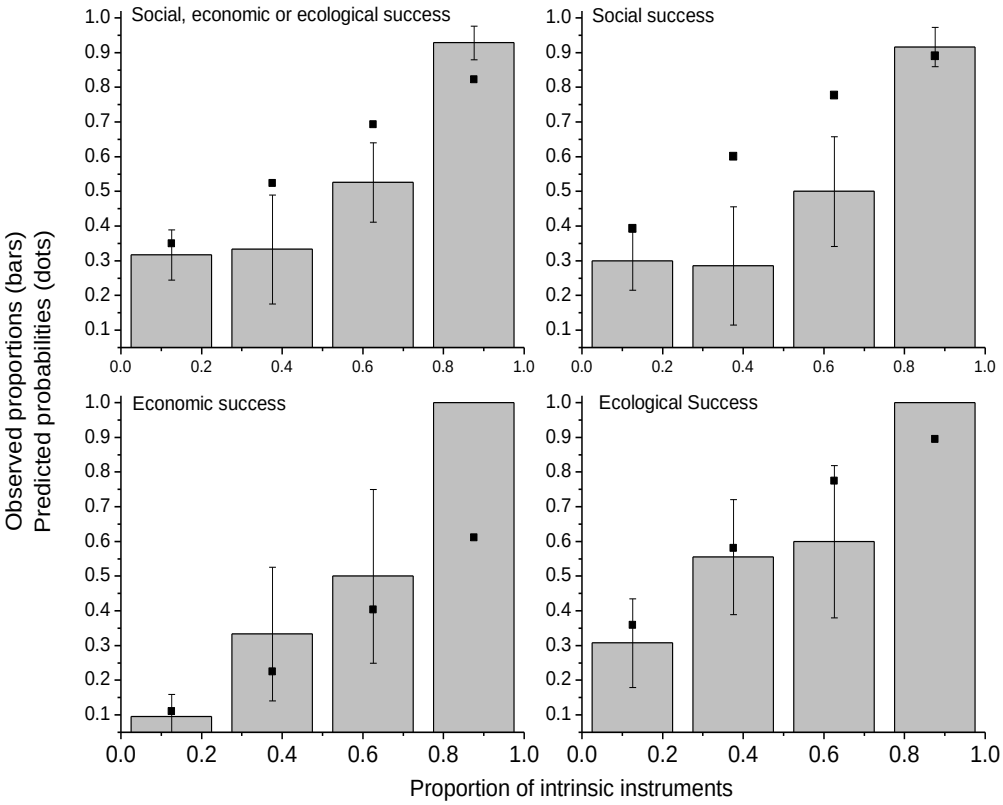

Figure 3. Grey bars indicate the effect of the proportion of intrinsic instruments on the proportion of successful conservation projects in and around PAs. Binomial error bars are shown. Black squares represent a fitted logistic regression curve showing the predicted probabilities from the model. For the curve, the other significant independent variables were set to mean values. The bar graph and the logistic curve are plotted on the same scale. The bar graph and the logistic curve are plotted on the same scale.

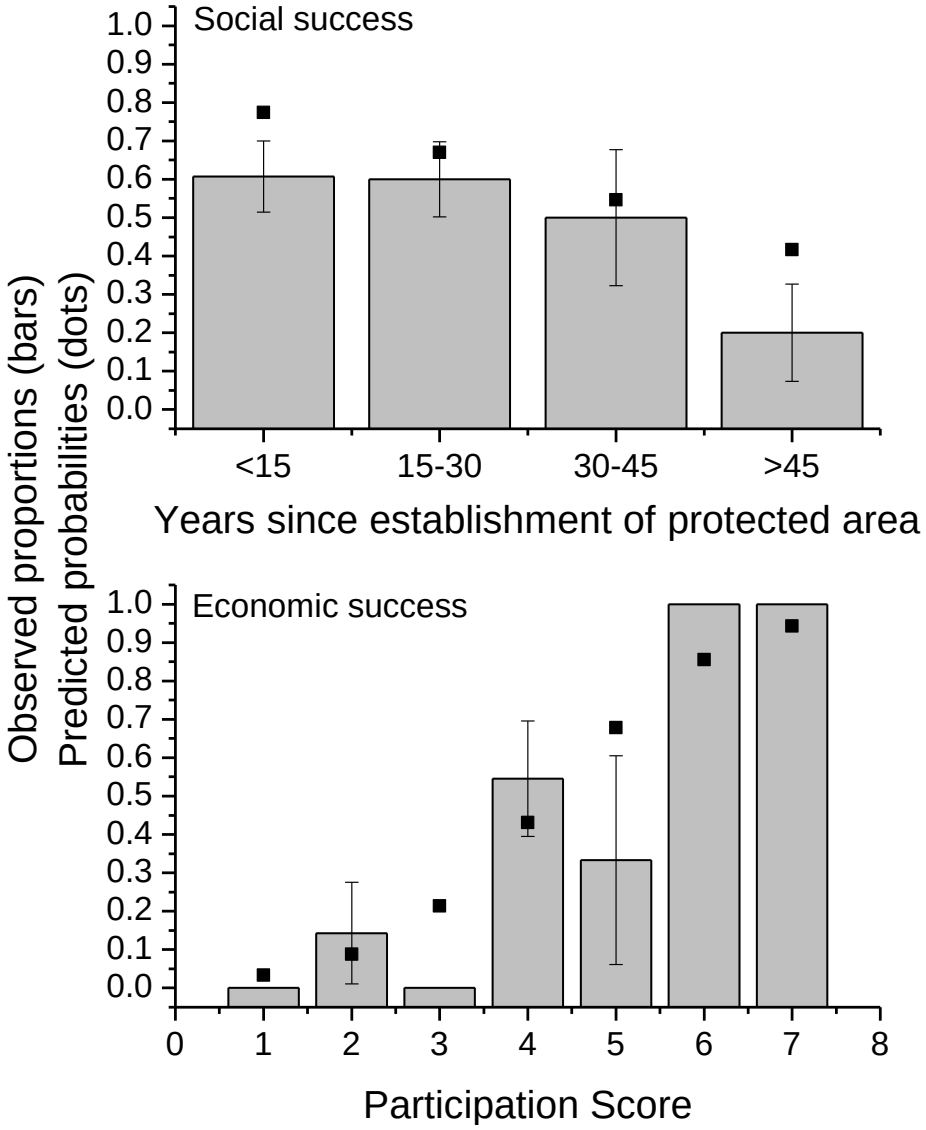

Figure 4. Grey bars indicate the effect of year since the establishment of the PA and participation on the proportion of socially successful conservation projects in and around PAs (top, a) and economically successful conservation projects in and around PAs (bottom, b). Binomial error bars are shown. Black dots represent a fitted logistic regression curve showing the predicted probabilities from the model. For the curve, the other significant independent variable (ie the proportion of intrinsic instruments) was set to mean values. The bar graph and the logistic curve are plotted on the same scale.

Discussion

Our global analysis of conservation projects in and around protected areas suggested that the proportion of intrinsically motivating incentives was the most important variable of the eight variables tested for predicting successful PA outcomes. Our study supports psychological research suggesting that socially sustainable projects need to be designed to provide opportunities for personal choice, personal growth, meaningful feedback and substantive participation (Scott Rigby et al. 1992; Deci et al. 1999b; DeCaro & Stokes 2008). Furthermore, our study support the idea that ecological protection depends on how conservationists are engaging with local people through their cultures (Waylen et al. 2010), institutions (Brooks et al. 2012b), and social webs (Gutiérrez et al. 2011). Broadly, these results suggest that the current emphasis on socially just conservation is a positive step towards the larger goal of sustainably preserving the world's remaining biodiversity.

Intrinsic motivation and types of conservation instruments

Although each of the eight policy instruments differed from each other in terms of the proportion of cases that used intrinsic motivators, it is notable that we found examples of both intrinsically and extrinsically motivating case studies for all eight types of instruments. This finding emphasizes the point that the context of how each of the policy instruments are implemented influence whether a particular instrument fosters intrinsic or extrinsic motivation to conserve (**Table 3**).

It is unsurprising that both regulations and direct payments were frequently categorized as extrinsic motivators for conservation behaviour, however, it was somewhat unexpected that alternative livelihoods projects were also largely extrinsic. Alternative livelihood projects may have been categorized as more extrinsic because of the social difficulty of shifting livelihoods when they are a central part of local identities and social structures (Hill et al. 2012). Another reason for the frequency of extrinsic alternative livelihoods programs may be because private external and well-organised businesses, such as tourism operators, may take a disproportionate share of the benefits from the alternative livelihood project and leave little for the local communities living in and around a PA (Igoe & Brockington 2007). The collaboration of these private businesses with government officials can lead to elite co-option by private businesses (as in Dressler & Roth 2011) and thereby reduce opportunities for local communities to interact with park management, which likely reduces feelings of autonomy from the local community living in and around protected areas.

Community biodiversity monitoring and education policies had the greatest proportion of intrinsically motivating incentives. Perhaps this is because community monitoring and education projects require more sustained contact between stakeholders, conservation organisations and existing local institutions (Brewer 2002; Danielsen et al. 2005). Opportunities to interact between local communities and conservation stakeholders can help to foster greater self-identification with the conservation project and create opportunities to enhance both vertical and horizontal social capital with external agencies (Cardenas et al. 2000) . Educational outreach programs can foster group identity, pride and support for conservation projects (Sommerville et al. 2010). Furthermore, according to cognitive dissonance theory, simply the act of voluntarily showing up to a community monitoring workshop or education session can begin the process of changing beliefs and attitudes about environmental issues (Festinger 1957). Both monitoring and education can directly enhance feelings of autonomy and self-efficacy by providing capacity training, knowledge transfer and also provide a means to address local concerns with the PA (Danielsen et al. 2005).

Direct payment schemes were most often extrinsic. While this is in line with the common critique of PES programs that they do not lead to long-term changes in values or attitudes (Martin et al. 2008; Muradian et al. 2013) our study focused on how policies were implemented and not necessarily whether their rewards were extrinsically motivating. We coded many direct payment case studies as extrinsic because they did not indicate whether communities had decision-making power, or how the payments supported existing social groups, or promoted feelings of competence. Traditional psychological theories on payments have suggested that payments themselves promote feelings of self-sufficiency (Vohs et al. 2006), however, studies in behavioral economics have also suggested that payments can feel controlling by the recipient and thereby reduce feelings of autonomy and "crowd-out" more intrinsic feelings of moral obligation (Bowles 2008). Whether extrinsic incentives adversely affect intrinsic motivation appears to depend largely on the contextual factors of the incentive such as the size or timing of the financial incentive (Gneezy & Rustichini 2000), whether the incentives are contingent on monitoring (Festré & Garrouste 2014; Deci et al. 1999), whether payments are made to a group or an individual (Narloch et al. 2012) as well as well as prevailing cultural beliefs (Bowles 2008). Coding for these factors was beyond the scope of this study, thus more focused research on direct payment projects is necessary to identify the contextual factors that influence the effect of payments on intrinsic motivation (Wunder 2013; Muradian et al. 2013). Our findings indicate that direct payments can be intrinsically motivating provided that direct payments schemes are carefully designed (Souto et al. 2014) to still provide a means for local people to develop an

intrinsic motivation to conserve that the process is self-determined, identified, and long-term. Whether payments are overall positive or negative, conservationists should heed the advice of economist Samuel Bowles: "Good policies and constitutions are those that support socially valued ends not only by harnessing selfish preferences to public ends but also by evoking, cultivating, and empowering public-spirited motives" (2008).

Table 3. Policy instruments and a description of their specific strategies for intrinsic and extrinsic implementation. Articles with characteristic examples included.

Policies	***Intrinsic***	***Extrinsic***
Regulations	Explicit regulations created and agreed upon through stakeholder discussions. Effectively enforced based on monitoring. Room for flexible, locally driven initiatives. (Cudney-Bueno et al. 2009)	Imposed/ enforced by small, possibly external group. Little community legitimacy or means for decision-making. No clear delineation of rules. Heavy use of fines. (Hind et al. 2010)
Direct Payments	Ability to opt out, payments made to existing community groups, local input can affect payment program, payments are well spread. (Mbaiwa & Stronza 2011)	Forced into program, payments to individuals, only option for involvement with protected area. Payments are made haphazardly, with little formal dialogue (Glaser et al. 2010)
Alternative Livelihoods	Goals and methods decided by participatory meetings with stakeholders. Works to strengthen existing social organizations. No single occupation, rather offers opportunities for diverse livelihoods. (Mena et al. 2006)	Benefits to one specific group of individuals. Imposed goals and implementation of new technology. Creating new hierarchies/institutions. No clear relationship between livelihood and preserving protected area—emphasis on payments. (Castrejón & Charles 2013)

Resource Access	Decentralized and internally monitored against overexploitation, allowance for sustainable usage of culturally significant resources. (Taylor 2010)	Only concerned with resource use, does not incorporate parallel outreach programs to garner involvement with PA. (Quintana & Morse 2005)
Community Monitoring	Local people trusted to perform scientific monitoring. Monitoring is stakeholder driven, beneficial information to community members. Opportunity for empowerment through education. Incorporates traditional ecological knowledge (TEK) (Danielsen et al. 2005)	Local people not directly a part of data collection, just patrol. No incorporation of TEK. Information is kept separate from village, used only by park staff. Rigid hierarchy for monitoring team; little training beyond necessary skills. (Balint & Mashinya 2006)
Education	Supports an appreciation of nature for its intrinsic value. Locally led, using social networks to appeal broadly (Lu et al. 2005)	Ignores TEK, posits that western beliefs are the only acceptable environmental view. Educates on regulations only. (Wise 2014)

Other Variables

It is striking that participation, indicating community management and power, was only marginally significant in predicting outcomes. Participation was only a predictor of economic success, a result found in another meta-analysis (Waylen et al. 2010). Decentralized management of a protected area has been shown to improve the way conservationists respond to the economic needs of local people (Dupar et al. 2002). Our social and ecological results, however, emphasize the point that although decentralized community participation is important (as other studies have found (Andrade & Rhodes 2012)) it is not as significant as supporting a means for communities to identify with conservation. Here we suggest that

decentralization may not be a panacea but rather can be a means to a more intrinsic motivation.

Our results also indicate that projects are more likely to be socially successful in newly protected areas (younger than 45 years). Older protected areas are more likely to have been established during a time when "fortress style" conservation was the norm. Conservation projects in and around these old protected areas may struggle working with the local community to establish a socially effective conservation project because of mutual negative feelings between local communities and external conservationist that were created as a result of "fortress-style" conservation (Hoole & Berkes 2010). Developing intrinsic motivation, which is predictive of social success, may be difficult with poor conservationist-community relationships. Our study was unable to determine whether intrinsic motivation led to better relationships with conservation, or if communities with strong relationships to conservation made implementing intrinsic policies more possible.

In any case, developing more intrinsic policies may be difficult since engaging with stakeholders is likely a slow process with a high initial payment cost. The point has been made that with few resources, conservationists should focus on the most direct means of preserving biodiversity (Ferraro & Kiss 2002). However, in terms of long-term cost-effectiveness, conservationists may benefit from pro-actively implementing intrinsically motivating conservation projects at the beginning, rather than focusing initially on narrower ecological objectives.

Future research

Part of why we have found intrinsic incentives to be the only consistent variable predicting success may be because we included many different types of conservation projects and regions into this analysis. With such an aggregate sample size broad themes appear that may not hold true for every type of project. It would be informative to focus in on single type of conservation intervention in order to gain a more nuanced understanding of different incentives. For example, as indicated above, examining only conservation projects that involved direct payments could help to better understand questions such as "crowding out" or how payments to groups versus individuals influenced outcomes.

A major gap in this study is our lack of quantitative data around autonomy, competence, and relatedness. This was because few papers addressed these directly, so we instead had to rely on contextual information and the inference of each researcher. More research is needed on how different policies can support people's self-determination, and the different reasons communities are motivated to conserve.

As previous research has indicated, people are motivated by far more than just financial or ecological gain (Langholz et al. 2000; Yasué et al. 2010; Blackmore & Doole 2013). Hope, pride, competition, a sense of community ownership or solidarity might all help to inspire conservation action (Hazzah et al. 2014b; Silva & Mosimane 2014). Furthermore, communities exist within a broader historical, political context that may play a significant role in influencing decisions (Ostrom 1990; Muradian et al. 2010). However, there were relatively few studies that provided a more complete picture of the social benefits and non-economic incentives for communities to participate for conservation. More detailed quantitative and qualitative research (such as Hazzah et al. 2014) is necessary to examine the reasons why people decide to engage in a conservation project and evaluate the costs and benefits of non-monetary and monetary incentives in very specific cultural contexts. These types of detailed case studies may help to answer some of the questions we have been unable to resolve in this study.

Conclusion

With the rapid rate of biodiversity loss (Butchart et al. 2010), extrinsic incentives such as enforcement and payments (Bruner et al. 2001; Struhsaker et al. 2005), seem to be attractive and necessary short-term responses to halt immediate degradation. If, however, conservation is to be self-sustaining, quick solutions should not preclude investment by the conservation community in the long-term process of recognizing and engaging with local people's identities—their institutions, cultures and individual preferences. These slower and sometimes more difficult processes can allow for an intrinsic motivation that can develop into long lasting "cultures of conservation" (DeCaro & Stokes 2008; Child 2009; García-Amado et al. 2013; Souto et al. 2014).

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