



## Review

# How do community-based conservation programs in developing countries change human behaviour? A realist synthesis



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## ABSTRACT

Community-based conservation programs often target local communities with the aim of altering their behaviours to achieve conservation outcomes. However, these programs can underestimate the complexities of human behaviour, and hence jeopardize their effectiveness. We applied a realist synthesis to 17 community-based conservation programs in developing countries that quantitatively measured behavioural changes linked to conservation outcomes. A realist synthesis identifies the critical mechanisms operating within a program and the outcome(s) caused by these mechanisms, and also identifies how the context affects these mechanisms. Our synthesis identified three main mechanisms that best explain the reasoning of individuals to engage in conservation behaviours: i) conservation livelihood provides economic value; ii) conservation provides benefits that outweigh losses of curtailing previous behaviour, and iii) giving local authority over resources creates empowerment. The success of each mechanism was affected by various context factors, including the proportion of income generated for the family, capacity to engage in livelihood, cultural acceptability of livelihood and the livelihood being logistically achievable to partake in. Despite conservation education being a common strategy, there was very little evidence provided of the reasoning of individuals and subsequent behaviour changes from education programs. This is the first application of a realist synthesis to community-based conservation programs. The results advance our understanding of the decision-making processes of communities subject to such programs, and highlight how different contexts influence changes in conservation behaviour. Future reporting of behavioural outcomes and the associated reasoning of individuals and communities to engage, as well as the relevant contextual data, is required for more informed and effective design of community-based conservation programs.

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## 1. Introduction

Community-based conservation (CBC) aims to simultaneously achieve development and conservation goals, therefore meeting the objectives of both local communities and conservationists (Berkes, 2004). CBC programs utilize various strategies to engage with local communities and encourage participation, in order to achieve desired conservation goals. Examples include linking conservation and human development goals, creating socio-economic incentives for conservation and giving communities control over local natural resources (Brooks et al., 2012). Incentives to change behaviour can be created when the benefits of conservation outweigh the costs (e.g., Butler and Marshall, 1996; Campbell et al., 1996; Butler, 2000; Salafsky and Wollenberg, 2000; Wood et al., 2013). However, while some programs have succeeded in favourably changing individual and community behaviour towards conservation (Bajracharya et al., 2005; Cranford and Mourato, 2011), many others have failed (Lewis and Phiri, 1998; Waylen et al., 2009; Sommerville et al., 2010). Programs often underestimate the complex nature of human behaviour and the social and

cultural contexts which often determine outcomes (Knight et al., 2010; Rands et al., 2010; Waylen et al., 2010).

Whether explicit or implicit, the premise behind community-based conservation programs is that changing human behaviour is often a prerequisite to achieving desired conservation outcomes. However, informed strategies to change behaviour are often overlooked in the program design, implementation and management. Evaluating how past programs have successfully or unsuccessfully influenced human behaviour in varying contexts could improve these strategies, but behavioural outcomes are not often measured both explicitly and quantitatively in program evaluations (Brooks et al., 2013), which makes large-scale reviews difficult.

Despite the long history of community-based conservation programs, there have been few reviews of the determinants of success or failure (Kothari et al., 2013). A review of incentive-based conservation programs (Spiteri and Nepal, 2006) found problems in identifying target beneficiaries and program sustainability. Roe (2008), in a conservation-poverty review, concluded that climate change could be a catalyst for bringing together conservation and development communities due

to mutual, time-sensitive goals. Community-based environmental monitoring programs have also been reviewed, revealing that more research is needed to compare and contrast successes, and further case study data are necessary to better understand the benefits of citizen science (Conrad and Hilchey, 2011). Tole (2010) reviewed community-based forest management programs and identified key incentives and institutions affecting their success. However, there continues to be a call to understand whether community-based conservation programs as a whole are an effective conservation tool, and which factors are associated with success and failure (Brooks et al., 2013). In particular, Brooks et al. (2013) concluded that detailed qualitative research is still required to illuminate the key features of social dynamics, which was not possible using their quantitative correlative approach. Furthermore, other reviews of the conservation literature to complement traditional systematic reviews are necessary to account for data that require subjective interpretation and to elicit complex patterns of causality (Waylen et al., 2010).

### 1.1. Realist synthesis

To address the global decline of biodiversity, it is imperative to adopt evaluation methods that determine what works and when (Ferraro and Pattanayak, 2006). A realist synthesis lends itself to achieving this, and more, by explaining ‘what works, for whom, in what circumstances, and why’ (Pawson and Manzano-Santaella, 2012). It identifies the critical mechanisms operating within a program and the outcome caused by this mechanism. A mechanism ‘describes how program resources influence the reasoning and ultimately behaviour of people’ (Pawson, 2013, p. 13). This approach aims to understand the contexts that can promote or impede the critical mechanisms influencing behaviour change (McCormack et al., 2007). This is because a program can utilize the same resources to trigger mechanisms within a community, but result in different reasoning, and hence outcomes, depending on varying contexts such as gender, culture, socio-economic status or education. The approach is suitably sensitive to diversity and change within programs (Pawson et al., 2004). Instead of providing a pass/fail verdict on program approaches, it takes an explanatory focus that is compatible with complex social interventions (Pawson et al., 2004). The critical distinction between a realist approach and traditional systematic reviews is this explanatory focus, which is beneficial to CBC practitioners who can know how a program will likely work in their situation and context, and what can be done to improve the likelihood of success (Pawson et al., 2004).

Here, for the first time, a realist synthesis approach (sensu Pawson, 2006) is applied to address the research question: how and under what circumstances do CBC programs in developing countries achieve community adoption of conservation behaviours? We defined CBC programs as any conservation-focused intervention that was implemented in a group of people reported as a community by each program, and which required individuals to change their behaviour in order to reach conservation goals. Conservation behaviours were defined as any behaviour that had been changed, adopted or halted by community members and had a direct influence on conservation outcomes as targeted by the community-based conservation program.

## 2. Methods

### 2.1. Search strategy

To begin, we searched the Web of Science database using key terms: “community based conservation” or “community conservation”; “project” or “intervention” or “program” or “programme” or “case study”; and “behaviour\*” or “behavior\*”. The asterisk (\*) is a wildcard used in the database to represent any group of characters, including no character. We then systematically compared the papers with our inclusion criteria: 1) consistency with our definition of a CBC program (see

previous paragraph), and 2) quantitatively measured behaviour change that had a direct impact on the program goals or quantitatively measured conservation outcomes that were highly likely to be due to changes in behaviour of the community. We focused solely on quantitative behavioural outcomes in order to circumscribe the size and scope of this review. Programs that used measures of behaviour change in hypothetical situations were not included. For example, using an individual-based model to investigate the effect of payments and sanctions in a hypothetical community-based program (Keane et al., 2012).

From this search, we identified Brooks et al. (2013), who conducted a review of the attitudinal, behavioural, ecological and economic outcomes of community-based conservation programs. We conducted a cited reference search from this paper to aid in identifying programs that reported behavioural outcomes. Brooks et al. (2013) included behavioural outcomes that had been measured quantitatively, qualitatively and by ‘author’s judgement’. We searched through only those references that were recorded as quantitative outcomes and included the papers that met our remaining inclusion criteria. Of the 136 programs reviewed by Brooks et al. (2013) we included 9 in our review. The database search by Brooks et al. (2013) of JSTOR and Anthropology Plus ended in August 2009. Therefore, we conducted a further search of these two databases from August 2009 to December 2013 using the same key terms as stated earlier. First we reviewed titles and abstracts for applicability, and the paper was excluded only if it was evident that it was of no relevance. If it was deemed potentially relevant, we reviewed the full paper for applicability. This left us with 16 papers (one of which reviewed two applicable programs). Nine of these papers were from Brooks et al. (2013), with the remaining 7 discovered in our further search. A total of 17 programs were found that matched these criteria: 7 from Africa, 4 from Asia, 2 from Central America, 4 from South America. We contacted the corresponding authors from each paper to ask for any further material relating to the programs. Where needed, we further conducted cited reference searches and Google searches to expand on our understanding of the program under analysis. We were unable to search grey literature to uncover programs that were not identified in the original database search as it was out of the scope of this project.

### 2.2. Review and analysis

The process we took in reviewing and analyzing the relevant publications was guided by realist synthesis principles as outlined in Table 1. We first developed a program theory, which is an abstracted description of how an intervention or a family of interventions (in this case, CBC) is expected to work. It guides the review by providing a framework to align evidence that refutes, refines or supports the initial theory. This provides a deeper understanding of how the program operates, and for whom and in what circumstances it was successful or otherwise (Wong et al., 2013). The program theory was identified from the 17 programs under analysis by assessing ‘how the program was expected to work’. This was based on information provided in the relevant paper and associated information provided by the corresponding authors, cited reference searches and Google searches where available. This started with identifying the main strategy the program employed, and identifying a hierarchy of outcomes from this, including the decision-making process that led to the decision to engage or otherwise in conservation behaviours. We identified four initial program theories (Fig. 1).

Next we searched the selected papers using a standardized data-extraction template that included: details on intervention; evidence to support, refute or refine elements of program theory; a table for context, mechanisms and outcomes relationships; proposed amendments to program theory; comments on rigour/methodology, and other notes. Specifically, the template was used to further identify and refine mechanisms that contributed to the outcome of interest, which in this case was adoption of conservation behaviours or lack thereof. We analyzed

**Table 1**

Steps taken to review and analyze data set (modified from Pawson et al., 2004).

Review and analysis process
1. Develop program theories - review the 17 case studies and assess the theory behind how the program was designed to bring about a change in conservation behaviour
2. Synthesize program theories
3. Extract evidence from data using standardized extraction template including: evidence to support, refute or refine elements of program theory, a table for context, mechanisms and outcomes relationships, proposed amendments to program theory, comments on rigour/methodology
4. Synthesize homogenous context, mechanism and outcome patterns to represent a single relationship pattern
5. Synthesize remaining evidence into initial program theories and adjust where required; including adding additional mechanisms, and adding contexts which influence each mechanism.
6. Report findings in terms of refined program theories that identify how such programs operate by highlighting the key mechanisms that lead to the outcome of behaviour change, followed by the contexts that trigger such mechanisms

both quantitative and qualitative information regarding details of the program and community to provide evidence of mechanisms and contexts. A mechanism was identified by reviewing evidence of the decision-making process and reasoning to engage in the outcome of interest (i.e. changes in behaviours). When program mechanisms were identified, we also searched for evidence pertaining to any specific contexts that were necessary to trigger those mechanisms. For instance, cultural influences, socio-economics, or individual differences between people such as gender or occupation. We recorded the evidence found for each context, mechanism and outcome, and the relationship among them. Homogenous context, mechanism and outcome patterns were synthesized to represent a single relationship pattern.

### 3. Results

We refer to each program reviewed throughout the results as a case study. (See supporting information for greater detail of corresponding case studies, including program and study details, conservation behaviour outcomes and other relevant outcomes.) A brief description of the synthesized context, mechanism, and outcome relationship patterns we identified based on the evidence we uncovered can be viewed in Table 2. This includes the mechanisms initially identified within the program theory (Fig. 1), subsequently refined based on evidence, and any additional mechanisms we discovered, as well as the contexts that triggered these mechanisms. There were several instances in which direct evidence for the relationship between context, mechanism and outcomes was weak, but suspected based on the author's judgement or ambiguous reporting. These are discussed in the results section under headings: additional mechanism identified within program theory 1, program theory 4 – conservation education, and additional mechanisms within program(s).

Next we discuss our findings in order of program theories. We outline each main mechanism, including the reasoning to engage in

conservation behaviours, and the evidence for this within each program. We then present evidence that demonstrates which contexts are relevant to the effectiveness of this mechanism. Finally, we present additional mechanisms, which required further investigation.

### 4. Program theory 1 - integrate conservation and livelihood goals

#### 4.1. MECHANISM: Economic value

This mechanism refers to an individual's decision to engage in a new livelihood due to it providing greater economic value than the original livelihood. By integrating livelihoods with conservation goals, community members whose income is dependent on this livelihood have an economic reason to participate in and act out conservation behaviours. There was strong evidence in 6 programs reviewed of this link between livelihoods and conservation and the positive influence this has on engaging in conservation behaviours. In many instances, the conservation livelihoods provided economic value to the community. However, there was less evidence to demonstrate that the reasoning for engaging in this new livelihood was because it generated greater economic value than the alternative livelihoods. Specific examples of behavioural change motivated by conservation livelihoods and economic value are outlined below.

#### 4.1.1. Case study 1: Tanzanian integrated conservation and development program involving butterfly farming (Morgan-Brown et al., 2010)

This program relied on forest conservation to operate effectively and generate income. Butterfly farmers reported significantly more participation in conservation behaviours compared to other community members who were not butterfly farmers. For example, butterfly farmers were more likely to report being an environmental committee member (+31%), attend environment committee meetings (+18%), plant trees on own land (+18%), participate in village tree-planting activities

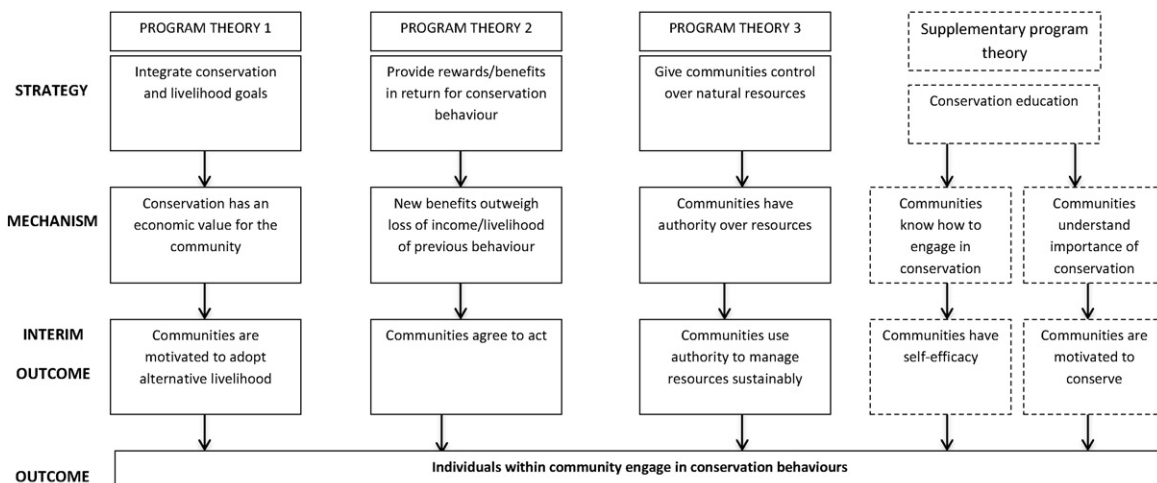


Fig. 1. Initial program theories identified of how the community-based conservation programs under review are 'expected' to work.

**Table 2**

Summary of predominant context, mechanism and outcome patterns identified from the review of 17 case studies.

Program theory/strategy	Context	Mechanism	Outcome
1. Integrate conservation and livelihood goals	Alternative livelihood is of <i>significant</i> monetary value or income Members have an <i>understanding</i> of the link between conservation and livelihood Communities have ability to engage	Economic value - new conservation-focused livelihood offers economic value	Engage in conservation-focused livelihood and associated conservation behaviours to receive economic benefit.
2. Provide economic and development benefits in return for conservation behaviours	Communities have logistical ability to engage in conservation behaviour Capacity to engage in behaviour Culturally acceptable behaviours Equal distribution	Benefits > losses - the economic/social benefits for conservation behaviour outweigh losses from halting old behaviour	Engage in new behaviour and stop old behaviour
3. Provide communities control over natural resources	Reliance on natural resources Livelihood needs met Provision of alternatives	Authority over resources - communities control their resources sustainably out of self interest	Manage resources in a sustainable fashion that benefits conservation outcomes

(+23%), preserve household land as forest (+14%), and discourage illegal cutting (+26%). The economic value of the program was supported and sustained by generating an increase in annual income of >25% through butterfly farming over previous livelihood strategies.

#### 4.1.2. Case study 2: Ecotourism in Costa Rica (Stem et al., 2003)

Communities who had economically viable tourism programs linked to the local natural environment and wildlife were reported to have largely stopped environmentally destructive behaviours. Those employed in tourism or who had a family member employed in tourism reflected a greater likelihood of engaging in conservation behaviours such as maintaining forest cover on private land. To a lesser but still significant extent, this was also the case for those living in a community where environmental tourism exists, compared to those in communities not exposed to tourism, or who were not employed or no family employed in tourism. However, interviews identified an unclear relationship between individuals' perspectives on conservation and tourism employment status. This could demonstrate that the behaviour change is not due to an enhanced conservation ethic but rather a desire to be involved in tourism due to other reasons, such as the economic value it provides.

#### 4.1.3. Case study 3: Community-based ecotourism in Cambodia (Clements et al., 2010)

A community-based ecotourism program was designed to 'directly link revenue to long-term species conservation'. It was enforced by an agreement, between The Wildlife Conservation Society, protected area authorities and the community, which stipulated that the revenue raised from tourism is subject to adherence to the land use plan and not engaging in hunting of agreed wildlife species. The program was further supported by a greater fee being paid if all bird species are seen by tourists compared to a smaller fee if only a subset is seen. This tourism program has placed value on the bird species to the community, and has seen substantial increases in abundance of wildlife and enforcement of land use plans. For example, in 2002 there was one nest and a single pair of the Critically endangered White-shouldered Ibis (*Pseudibis davisoni*) (BirdLife International, 2015) that increased to at least six nests and 23 individuals in 2008.

#### 4.1.4. Case study 4: Agri-environment payment scheme for wildlife-friendly products in Cambodia (Clements et al., 2010)

This program allowed farmers to sell rice through a village committee if they followed a conservation focused land use plan and did not participate in hunting. The rice was sold to a marketing association at preferential prices, which by-passed the middlemen that previously monopolized village trade. Villagers reported they still preferred to sell to the marketing association through the village committee even after the middlemen raised their prices to become competitive. These interviews highlighted additional mechanisms other than that initially outlined in the program theory (Fig. 1) likely contributing to the success

of the program (mentioned in the additional mechanisms at the end of the results). The actual effect of the program in protecting the species is not known at this stage. However, it was reported that less than 8% of families in each of four villages have been recorded breaking the land-use plans. Furthermore, three of the four have refused to accept immigrants (benefiting land-use plans) and the fourth had no immigrants trying to settle due to being remote.

#### 4.1.5. Case study 5: Torra Conservancy Namibia (Scanlon and Kull, 2009)

A community-based scheme in the Torra Conservancy of Namibia gave residents of 'communal lands' rights over wildlife and tourism once they created a community-level resource management institution. These were called conservancies, which managed wildlife through hunting and regulated tourism. Most people involved received benefits in the form of meat, cash, employment or other benefits such as compensation for loss of their stock, funeral assistance funds, and superannuation and community level benefits. The Torra Conservancy received most revenue from a joint venture with a commercial tour company. Commercial poaching is reported by the authors to have ceased, and the majority of residents reported participating in conservation activities.

#### 4.1.6. Case study 6: (also program theory 2) Community conservation program for Cotton-headed Tamarin (*Saguinus oedipus*) in Colombia (Savage et al., 2010)

A main strategy of this program was to develop environmental entrepreneurs who create and sell products made from recycled plastic. The strategy had a significant impact on littering levels observed in the rural communities and in the adjacent forest that provided habitat for threatened wildlife. Nearly two million plastic bags have been recycled through the network of environmental entrepreneurs. Whilst no direct evidence is provided, the authors report that Cotton-headed Tamarins were no longer captured in the area for the illegal pet trade, with this outcome linked to improved economic livelihoods of the communities. The species is Critically Endangered according to the IUCN Red List (Savage and Causado, 2014).

## 4.2. Context

The following is a list of contexts that were identified to trigger the above reasoning of 'conservation livelihoods providing economic value.'

### 4.2.1. Significant income generator

We found evidence to suggest that the proposed livelihood should be a significant income generator to the community. For instance, in case study 1, conservation behaviours were most prevalent for those whose primary and secondary source of income was butterfly farming compared to the control group of community members, but not for those who ranked butterfly farming as a lower source of their income (Morgan-Brown et al., 2010). However, for most households

participating in this program, butterfly farming was not the primary economic source but was still a strong enough incentive to motivate conservation behaviours (Morgan-Brown et al., 2010). In case study 3, the revenue received by individuals employed in the tourism season ( $n = 25$ ) was an average of \$160 per year, which is significant for families who rely on subsistence agriculture and forest products (Clements et al., 2010). A further 65 individuals benefited through temporary employment or local trade (Clements et al., 2010). It is unclear, though, whether level of engagement in conservation behaviours differed between direct, temporary or indirect employment.

#### 4.2.2. Understanding link between conservation and benefits

We found moderate evidence that individuals need to understand the integral link between the benefits they receive and engaging in conservation in order to trigger the reasoning of conservation having economic value. For example, butterfly farmers who reported that they understood the link between their income and the sustainability of the forests were more likely to engage in conservation behaviours than farmers who believed they could farm butterflies without forests (Morgan-Brown et al., 2010; case study 1). Furthermore, in the Torra Conservancy program (case study 5) where successful conservation outcomes were reported, two thirds of community members interviewed linked receiving economic benefits to engaging in conservation behaviours (Scanlon and Kull, 2009).

#### 4.2.3. Capacity

We found potential evidence of the importance of ensuring communities have the capacity to adopt new conservation-orientated livelihood strategies. For example, in case study 4, only 38 families had rice of appropriate type to sell to the agri-environments program described in Clements et al. (2010), despite a majority expressing interest in joining the program. We believe that this expression of interest was due to the greater economic value that this livelihood option provided. However, as they were unable to provide appropriate produce, this livelihood no longer presented an economic value to them. Therefore, whilst this program was successful for those who had the ability to participate, improvements could have been made if resources were in place to ensure more families were able to participate. In case study 6, the program was successful in enabling local community members to become environmental entrepreneurs by assisting them in developing products and setting up a successful artisan network (Savage et al., 2010).

### 5. Additional mechanism identified within Program Theory 1

#### 5.1. Social incentive

##### 5.1.1. Case study 7: Projeto TAMAR-IBAMA – turtle conservation Brazil (Marcovaldi and Marcovaldi, 1999)

We also found that linking livelihoods with conservation may be effective by creating a social incentive for conservation behaviours. For example, providing former turtle and egg poachers in Brazil with a new livelihood of protecting these turtles and eggs has been successful in reducing the harvest of female turtles and eggs (Marcovaldi and Marcovaldi, 1999). This was reported to have given the fishermen positive status within the community and enhanced their conservation ethic. The fishermen were seen as TAMAR (National Marine Turtle Conservation Program established by the Brazilian government) representatives in the outlying villages and were proud of, and respected for, the work that they did towards the preservation of the species. However, no direct evidence was provided for this assumption and therefore we can only assume that the social returns derived from the new livelihood gave these former poachers reason to engage in conservation behaviours. Furthermore, it is possible providing economic value

supported this social incentive, but it is unclear if this livelihood was more economically rewarding than poaching.

#### 5.2. Context

##### 5.2.1. Needs security

The turtles were not the primary source of either income or protein in the above-mentioned program. Therefore, social benefits may only be effective as an incentive to change behaviour when economic and livelihood needs such as food are sufficiently met.

##### 5.2.2. Time

Pride in the turtle project and greater involvement in conservation behaviours such as more nests being left in situ, are reported in areas where the conservation organisation, TAMAR, had been working for several years. It is unclear whether this is because over time the social value increased, or whether there are alternative mechanisms such as stronger relationships between TAMAR and local residents or wider spread of community awareness which resulted in greater involvement in conservation behaviours.

### 6. Program theory 2 – provide economic and development benefits in return for conservation behaviours

#### 6.1. MECHANISM: Benefits outweigh losses

This mechanism refers to programs that provide rewards and benefits, often economic or developmental, for new behaviours related to conservation outcomes that the participant reasons to outweigh the losses from any previous behaviour now prohibited. Whilst similar to the previous mechanism, it differs because an alternative livelihood that is inherently linked to conservation outcomes is not necessary. We found evidence for this mechanism in 8 programs, each varying in effectiveness. The variability in these outcomes was attributed to different contexts in each program.

##### 6.1.1. Case study 8: Alternative energy and agricultural benefits for forest protection (Cranford and Mourato, 2011)

This community conservation program in the Peruvian Andes gave benefits in the form of energy and agricultural alternatives, and community development in return for conservation-orientated behaviour (agreement to adhere to forest law in this instance), which resulted in large increases of conservationist households (reduced or stopped all of the forest degrading activities). The study investigated the reasons for this reduction in forest-degrading activities and found that 69% of the gross reduction was attributed to community conservation efforts. Fourteen percent of this was attributed to educational activities, 15% attributed to the provision of alternative fuels and more energy efficient stoves and 40% attributed to prohibitions. The prohibitions reflect the conditional agreement of community benefits for good environmental behaviour (adhering to forest law). Households more reliant on receiving income from rearing livestock were less likely to decrease forest-degrading activities (e.g., burning pastures for regeneration of grass and allowing forest grazing by livestock), suggesting that for these households the benefits of forest conservation were outweighed by the costs.

##### 6.1.2. Case study 9: Community-based sustainable turtle egg harvest (Caputo et al., 2005)

A participatory program in Ecuador provided an economic reward in return for successfully hatched turtle eggs, also used as a form of sustenance by the local communities. However, they imposed no restrictions on the consumption of the eggs and therefore the community did not lose by participating in the program. Enough eggs were preserved to allow some harvest, satisfying the community's consumption needs. The community still managed to

successfully deliver hatchlings to the project, which benefited conservation of the turtles. Hence, no losses needed to be outweighed, yet the incentive induced participation.

*6.1.3. Case study 10: Luangwa integrated rural development and community-based management project (Lewis and Phiri, 1998)*

Economic incentives were provided in the form of income for rural communities in Zambia with money obtained from the safari hunting industry. However, high levels of illegal wildlife snaring continued, primarily due to hunger and economic hardship, suggesting insufficient benefits and assistance provided by the program to overcome these challenges.

*6.1.4. Case study 11: Serengeti Regional Conservation Project game cropping operation (Holmern et al., 2002)*

Similarly to case study 10, a game cropping operation in Tanzania involving commercial utilization of wildlife as an incentive to abstain from illegal hunting was not effective in inducing behaviour change, as the gains did not outweigh the losses from stopping hunting.

*6.1.5. Case study 12: Zambia's Administrative Management Design for Game Management Areas (ADMADE) program (Gibson and Marks, 1995)*

This program provided communities with proceeds from the sustainable off-take of wildlife for community development. The program also provided employment for the community, including a village scout program. Data were limited, but indications are that the program was unsuccessful at stopping hunting because rural communities did not experience benefits, receiving little economic benefit or incentives such as jobs. Furthermore, the returns from illegal hunting far outweigh the goods received from ADMADE, and these economic incentives are not an appropriate motivator for some residents who see hunting as part of their identity and important to their social goals. Another problem was the difference in values that locals placed on development projects. Some projects generated greater or lesser interest, value and impact on the lives of different members of the community. In addition, failing to link these benefits, such as mills and schools, to individual behaviour meant those individuals who engaged in illegal hunting could still receive these public benefits. This contributed to undermining the value behind the benefits provided by the program and identified the importance of considering whether private or public benefits (or both) may be more appropriate.

*6.1.6. Case study 13: The Community Baboon Sanctuary in Belize for conserving the Yucatán Black Howler Monkey (Alouatta pigra) (Hartup, 1994)*

This program adopted a voluntary approach to encouraging landowners to sign and abide by management plans on their own land to protect the Yucatán Black Howler Monkey, which is Endangered according to the IUCN Red List (Marsh et al., 2008). The approval of the local community was sought throughout the process and in return they benefitted by a steady increase in tourists to the baboon sanctuary. Sixty percent of the voluntary pledged landowners, out of a total of fifty that were interviewed, reported that they received at least one benefit from the program (social contacts, income, t-shirt and certificate, education, self-satisfaction, wildlife protection) while the remainder reported none. Whilst the program focus is strongly on the voluntary approach to gaining community support, it also recognised that incentives are required to sustain biodiversity. The Yucatán Black Howler Monkey was found to be more abundant and their riverine forest habitat more secure following the establishment of the management program. The community surveys reveal that more direct and secondary utilitarian benefits are expected, which are likely to further help sustain biodiversity.

*6.1.7. Case study 14: Community-based payment for environmental services (PES) intervention on forest use in Menabe, Madagascar (Sommerville et al., 2010)*

An evaluation of PES for biodiversity conservation found that payments had limited impact on individual's decisions to change self-reported behaviour towards forest use. The individual benefits provided were likely not enough to offset the high costs of changing behaviour. The payments were received primarily by the community associations and therefore encouraged community rather than individual-level participation in the PES program. Participation in the PES program required the community institutions to directly engage in monitoring. Monitoring was found to be the greatest factor influencing an individual's willingness to change their behaviour. Therefore, the provision of PES for monitoring is indirectly instrumental in achieving behavioural change.

*6.1.8. Case study 6: (also program theory 1) Community conservation program for Cotton-headed Tamarin (Saguinus oedipus) in Colombia (Savage et al., 2010)*

The conservation program provided community empowerment programs including providing economic incentives to protect wildlife and forested areas. One approach was the use of traditional Colombian binde (a small cook stove made from clay). This option provided greater benefits to the community than using old methods of fuel wood collection. For example, respondents reported that the use of binde saves money, reduces the need to collect firewood, cooks food faster, makes cooking easier through less burning, there is less burning of pots and pans, and is better for their health. This resulted in a reduction in number of trees harvested for firewood, as the binde is a more fuel-efficient option. Surveys indicated that all 107 individuals who received a binde in 2006 were still using it in 2008. The participants estimated that there was a 50% reduction in firewood required for cooking each year. This significantly reduced the threat of forest disturbance to the Cotton-headed Tamarin survival.

## 6.2. Context

### 6.2.1. Logistically feasible

For this mechanism to 'fire' (reason the benefits to outweigh losses), the program needs to be logistically feasible for the community to participate. Evidence for this was in the Serengeti cropping operation case (Holmern et al., 2002; case study 11), where the program was logistically ineffective due to the use of only one vehicle, long distances involved, and poor infrastructure that contributed to low participation.

### 6.2.2. Capacity

We found potential evidence of the importance of ensuring communities have the capacity to adopt encouraged conservation behaviours. In case study 13, one stipulation of the land management plan in the baboon sanctuary was to leave a nature strip when clearing vegetation on their land (Hartup, 1994). Agricultural clearing data indicates that 73% of the community abided by this, whilst 27% did not because clearing riverbanks allowed their cattle to have access to water during the dry season (Hartup, 1994). Case study 14 also reports some unsuccessful findings in cases where individuals were not able to abide by PES requirements. In these cases, it was not possible to change behaviour as agricultural expansion, and tuber collections were necessary for maintaining subsistence livelihoods (Sommerville et al., 2010).

### 6.2.3. Culturally acceptable

The new behaviour also needs to be culturally acceptable to outweigh the losses. When hunting was a cultural and recreational practice within a village it subsequently conflicted with the cropping operation, which aimed to induce individuals to abstain from hunting, and hence was unsuccessful (Holmern et al., 2002; case study 11). It was also reported in Gibson and Marks (1995) that hunting was a part of the community's identity and important to their social goals, and hence

this cultural practice conflicted with the sustainable hunting required by the ADMAD program (Case study 12). In Case study 6, the use of bindes was already a part of Colombian culture and therefore accepted by local communities, even after improvements in their design (Savage et al., 2010). However, previous attempts at introducing alternatives such as solar box cookers were unfamiliar to the community and unsuccessful (Savage et al., 2010).

#### 6.2.4. Equal distribution

Cohesion within the community regarding program operations and equal or fair distribution of benefits are necessary prerequisites for success. We found evidence of this in the ADMAD program (Case study 12). Unfortunately, village chiefs who were given a large responsibility in running the program took advantage of many of the benefits for personal gain, including benefiting family and friends, which created resentment in some members of the community. There were also issues with local participation, including allowing opportunities to voice concerns and issues regarding the implementation of the program. Such opportunities were generally not provided, and the chief had considerable control over these situations. Village scouts, who were trained and employed as law enforcement and monitoring for the program, were unpopular in many communities, despite aims of providing greater trust due to being selected by local communities rather than from outside sources. Reasons varied from either lack of commitment from the scouts, including reportedly poaching themselves when they were not closely supervised, or conversely strict enforcement including harassment that alienated the scouts from the community when effective supervision was present.

### 7. Program theory 3 – provide communities control over natural resources

#### 7.1. MECHANISM: Local authority and empowerment

To make protected area conservation more effective, some programs have taken a community-conservation approach by giving communities control over their natural resources. There is little direct evidence in these evaluations to demonstrate how this strategy changes individuals' reasoning and hence conservation behaviour. Therefore, we have minimal evidence of what mechanisms derive from this strategy. However, the limited evidence suggests that providing communities with control gives them authority over management decisions, which in turn empowers them to make sustainable management decisions that cater for their needs. Previous studies have found that programs which allowed communities the use and control over natural resources, generally achieved better outcomes than those that did not (Waylen et al., 2010).

##### 7.1.1. Case study 15: Community-based management of the Annapurna Conservation Area, Nepal (Bajracharya et al., 2005)

Local communities in Annapurna Conservation Area (ACA), were given legal responsibility over local natural resources, which resulted in increases in forest basal area, the number of tree species, and abundance of wild animals, as well as a decline in fuel wood use. This was attributed to local communities changing their behaviour. Local communities were involved in the conservation planning and management of this protected area and were able to continue traditional land-use practices (KMTNC-ACAP [King Mahendra Trust for Nature Conservation-Annapurna Conservation Area Project] 1997, 2001 as cited in Bajracharya et al., 2005). A large majority of respondents (70.2%) within ACA indicated they were involved in making conservation decisions through various local institutions.

##### 7.1.2. Case study 16: Community forests in middle hills of Nepal (Adhikari et al., 2007)

The local benefits of community forests in the middle hills of Nepal were evaluated. This found that, whilst there was controlled access to the community forest, there was an increase in collection of natural resources since the introduction of community forestry. The study also reported some positive behavioural outcomes such as an increase in trees planted on private lands. The resources available from these privately owned trees meant pressure was reduced on the community forests. These results demonstrate that the community forestry regime has not adversely affected the livelihoods of the community. Therefore continued support from the community is likely, which improves the chances of environmental success.

##### 7.1.3. Case study 17: Collaborative resource management program at Kibale National Park, Uganda (Solomon et al., 2011)

A collaborative resource management scheme in Uganda permitted residents to legally fish inside the National Park according to an agreement based on a 'rights for responsibility' scheme. The aim was to promote support for conservation and reduce illegal and uncontrolled use of the protected area by providing legal resource extraction. The program was not always effective at deterring illegal resource extraction of firewood and water. This was suggested to be because fishers were possibly unaware of these activities being illegal or unsanctioned. However, some fishers did engage in pro-environmental behaviour by extinguishing bush fires or removing snares. Despite these varied results, there is no explanation for the varied reasoning among these fishers, and hence for the variability in outcomes.

##### 7.1.4. Case study 5 (also program theory 1): Torra Conservancy Namibia (Scanlon and Kull, 2009)

The community-based scheme in the Torra Conservancy of Namibia gave residents of 'communal lands' rights over wildlife and tourism once they created a community-level resource management institution. This also reflects program theory 3, as it provides the community with the power and control of local resources, which has reportedly resulted in the cessation of commercial poaching, and the majority of residents reported participating in conservation activities.

##### 7.1.5. Case study 3 (also program theory 1): Community-based ecotourism in Cambodia (Clements et al., 2010)

There is potential evidence to suggest the mechanism of local authority was operating within the Cambodian community-based ecotourism program, and could potentially impact outcomes. Rules regarding species protection and conserving bird nesting and feeding sites were developed and locally enforced by villagers. Furthermore, instead of using strong punishments, there were often verbal or written contracts between individuals and the committee to stop illegal activities.

#### 7.2. Contexts

##### 7.2.1. Reliance on natural resources

The ACA program (case study 15) was successful in engaging communities in pro-conservation behaviour, which could be related to their being highly dependent on natural resources for their livelihood, especially native forests for fuel, fodder and timber (Bajracharya et al., 2005). This context contributed to communities agreeing to act upon sustainable management policies due to their livelihood relying on the sustainable use of these resources, but direct evidence is not available.

##### 7.2.2. Livelihood needs met

Adhikari et al. (2007; Case study 16) investigated the impact of the community forestry regime on the community and found forest product collection increased and livelihoods were not adversely affected. This is noted to likely effect greater sustainability of the program due to



people's greater commitment, and to the community being highly involved and acquiring benefits. Conservation of freshwater fish inside ACA has not been effective, based on focus group discussions between ACA staff and Conservation Area Management Committees, which reported uncontrolled use of electric rod fishing and poisoning in major rivers (Bajracharya et al., 2005; case study 15). Whilst the reasoning behind this is unclear, it could indicate a livelihood need.

### 7.2.3. Provision of alternatives

The provision of alternatives as described in Bajracharya et al. (2005; Case study 15) suggests that those options empowered the community to make more sustainable choices. A participatory rural appraisal indicated that there was a substantial decrease in collection of fodder and non-timber forest products due to increased use of farm fodder. The collection rates of two other major non-timber forest products, *nigalo* bamboo (*Arundinaria* spp.) and nettle fibre plants (*Girardinia diversifolia*) decreased due to other easily accessible market-based products. Contributing to these outcomes was the planting of fuelwood species with more than 1,666,000 tree seedlings planted on communal lands and private farmlands in ACA by local communities during 1986–2000. The reduced pressure on native forests was due to introducing alternate forms of energy, and the availability of fuelwood on private woodlots.

## 8. Program theory 4 – conservation education

Many programs (n = 8; Case studies 2, 4, 6, 7, 8, 13, 14, 16) reported using conservation education as an additional strategy to the main program strategy. However, despite details on the types of conservation education activities such as increased awareness and training programs (Savage et al., 2010), there was very little (if any) direct evidence on the reasoning of individuals to engage in conservation behaviour outcomes. Therefore, we can only speculate, as did the authors, on the reasons why education can promote change in individual behaviour.

Perhaps the strongest reasoning we could find was based on education about conservation techniques, which could imply a mechanism of 'self-efficacy', 'knowledge', or 'skill.' For instance, in Nepal there was a reported increase of trees planted on private land due to a government supported tree-planting initiative, which provided technical support such as free seedlings and planting methods (Adhikari et al., 2007; Case study 16). Furthermore, in Colombia, education was provided on more effective farming techniques to minimize impact on the tamarins' remaining forest habitats by minimizing impact on adjacent forest (Savage et al., 2010; Case study 6). This program also promoted the use of bindes (small cooking stoves made from clay), which was already part of the community culture but needed to be made more effective. Instructions were given on how to use them as well as how they benefit tamarin conservation efforts, which has reduced the number of trees used for firewood (Savage et al., 2010). However whilst this program likely prompted 'self-efficacy', 'knowledge', or 'skill' within the community to use bindes, it was not clear how the education provided about how using bindes benefits the conservation of tamarins influenced an individual's decision to engage in their use. It was observed from focus group discussion that, whilst individuals were concerned about wildlife conservation issues, there was still no direct linkage between conservation education programs and the abilities of communities to engage in conservation, supposedly due to economic issues.

## 9. Additional mechanisms within program(s)

We identified preliminary evidence suggesting additional mechanisms can contribute to conservation behaviour outcomes. Whilst definitive results were not possible, we believe these mechanisms warrant reporting and further investigation due to their potential in understanding in greater detail the decision-making processes and outcomes in community-based programs.

It is possible that a person's *confidence in conservation* to deliver the benefits promised can influence their engagement in conservation behaviours. Believing in the effectiveness of the conservation behaviours was stronger for butterfly farmers who engaged in conservation behaviours (Morgan-Brown et al., 2010; case study 1). This could also be because butterfly farmers who engaged in conservation behaviours attended more meetings or were more likely to be environmental committee members (Morgan-Brown et al., 2010). Therefore, engaging community members in environmental committees could be a promising approach to changing individuals' behaviour towards conservation.

Whilst this review identified no direct evidence that *monitoring* influenced program outcomes, *monitoring* is a strategy used within many programs that is likely to be influential on their success. Payments to individual farmers in the Cambodian agri-environment payment scheme (Case study 4) were reliant on the *monitoring* of their compliance with the local land use plan and no-hunting rules by the village committee, as well as external verification by the marketing association (Clements et al., 2010).

Interviews of farmers from the agri-environment scheme identified that the reasoning behind the success in selling to the marketing association was because they 'preferred to sell to their own people' rather than outside middlemen (Clements et al., 2010, p1286). This was because they trusted the village committee, were treated with respect, the process was transparent, they had control over their own future, and profits would come back to the village in the future (Clements et al., 2010). Statements such as these identify possible important psychological mechanisms such as *respect, trust and autonomy*, which are often overlooked but are likely to be integrally linked to an individual's conservation decision-making processes.

## 10. Discussion

This review advances our understanding of how and under what circumstances community-based conservation (CBC) programs in developing countries achieve community and individual adoption of conservation behaviours. Furthermore, it demonstrates how a realist synthesis can be of benefit to the design and implementation of conservation programs, an issue vital for conservationists today (Verissimo, 2013). The findings highlight that conservation program managers must consider the effect varying program contexts will have on the individual decision-making process, and therefore the delivery of program outcomes.

### 10.1. The realist approach

A realist approach is novel to conservation evaluations by focusing on explaining the 'why' and 'how' behind program outcomes. This is distinct from traditional evaluations that focus on testing hypotheses: 'does intervention x on subject y produce outcome z?' (Pullin and Stewart, 2006). This synthesis provides a base understanding and explanation of the critical reasoning behind communities' engagement in conservation behaviours and associated influences. The small sample size and exclusion of grey literature in this review limit the scope of our findings. We were limited to synthesizing the mechanisms, contexts and outcomes apparent in the information available, but more mechanisms and contexts likely exist and require further reporting in the future. There is also a lack of clarity in the literature about the design of these programs, as to who in particular within the community is intended and reported to change their behaviours. For these reasons, a thorough refinement of the program theories (Fig. 1) and a detailed understanding of their application were not achievable here. However, this synthesis provides a foundation for the realist synthesis approach for future research.

In order to allow future assessments and help design conservation programs, evaluations that report assessable outcomes in conservation behaviour and investigation into the reasoning behind these outcomes,

as well as the potential circumstantial evidence is required. The contribution from people and institutions engaged in conservation programs would be invaluable to achieving this. We recommend, where possible, that quantitative measures of behaviour, which have a direct impact on program goals, be recorded. However, if this is not possible, quantitative measures of conservation outcomes (e.g., abundance of wildlife) should be reported and their cause explained, particularly the role of the communities behaviour in the outcome. To gain insight into the reasoning behind these behavioural outcomes, greater social science research that has direct community insight into their decisions regarding conservation behaviours is warranted (eg., Cranford and Mourato, 2011; Case study 8). Further to this, detailed information on program design, strategies, implementation process, management and operations should be provided. Finally, specific information needs to be provided on the CBC participants whose behaviour is measured (e.g., gender, socio-economic status, age), village history, and other local characteristics (e.g., recent influential events). This extends from previous calls for greater reporting and monitoring of conservation programs including rigorous outcomes (e.g., Sutherland et al., 2004; Waylen et al., 2010; Brooks et al., 2012).

### 10.2. The contexts and mechanisms that lead to conservation behaviour

We provide evidence of the predominant mechanisms and associated contexts identified to influence conservation behaviour (Table 2), based on 17 case studies. It is also possible that combining strategies, and therefore multiple mechanisms operating, can contribute to more successful outcomes. For instance, case study 5 used mechanisms in program theory 1 and 3, and reported very successful outcomes including cessation of commercial poaching and the majority of residents engaging in conservation behaviours. Likewise, Case study 6 used mechanisms in Program theory 1 and 2 and also had successful outcomes in terms of reducing use of firewood and litter, which benefit the conservation of wildlife. With further data, more in-depth analysis will allow for greater interpretation of the effective strength of each approach.

This synthesis highlights the critical importance of a wide array of contexts, including socio-economics, culture, logistical circumstances, individuals' cognitions and time on participants' reasoning and therefore program outcomes. The importance of context-specific solutions has been called previously (Adger et al., 2003). There are also similar reports of the effect of contexts such as local culture (Waylen et al., 2010) and national context, project design and local community characteristics (Brooks et al., 2012) on program outcomes. Whilst these studies also highlight the importance of context, a realist synthesis is able to explain how these contexts impact outcomes by understanding the underlying mechanisms.

### 10.3. Education

A predominant additional strategy was the use of education. However, we identified that there is very little evidence surrounding the effect education has on conservation behaviours. This is of significance to practitioners as education is a strong focus of many behaviour-change programs, and demands valuable time and resources. Hence, there is a strong need to empirically investigate the effect education (and the many forms it can take) has on the reasoning of individuals to engage in various conservation behaviours. Furthermore, the audience (age group) and time length of the educational programs should be reported as this can also influence outcomes. Conservation education programs are commonly created on an ad hoc basis but could benefit from systematic evaluation during all stages of program development (Jacobson, 1991; Cartwright et al., 2012). Identifying which approaches are effective in specific circumstances will aid in designing more successful conservation education programs (Jacobson, 1991). For instance, strategies such as wildlife films could be effective tools but are

underused due to the lack of scientific evidence to warrant their use (Wright, 2010). Whilst research has been conducted on evaluating the effects of conservation education on individual's reasons to conserve wildlife, it has been conducted in highly educated contexts (Caro et al., 2003; Flowers, 2010). Such stark contrasts in contexts to those investigated in this synthesis suggest that these results may not be applicable to CBC programs in developing countries. Nevertheless studies such as Caro et al. (2003) demonstrate that the type of teaching or way of presenting knowledge can have strong influences on arguments for conservation.

## 11. Conclusion

If conservationists are to become more effective at changing human behaviour within community-based conservation (CBC) programs, we need to no longer underestimate the complexities of this process. There are three main strategies within CBC programs that we identified in this synthesis: (1) integrating conservation and livelihood goals, (2) providing economic and development benefits in return for conservation behaviours, and (3) providing communities control over natural resources. These strategies, under the right circumstances (contexts), trigger three respective mechanisms (reasons to engage in conservation behaviours): (1) new conservation-focused livelihood offers economic value, (2) benefits for new behaviour outweigh losses from halting old behaviour, and (3) communities control their resources sustainably out of self-interest. The effectiveness of these approaches depends on the specific contexts of each case study. We provide a foundation for conservation practitioners to understand in which contexts each approach is likely to be effective. However, with greater reporting of detailed program evaluations, a stronger evidence base is possible that will aid in designing CBC programs that have a greater likelihood of effectively engaging communities in conservation behaviours.

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## Appendix A. Supplementary data

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