Re-thinking benefits of community protected areas in Mondulkiri, Cambodia

Sampho Hing [a], Rebecca Riggs [b],[*]

[a] *WWF Greater Mekong Cambodia Country Program, Eastern Plains Landscape Project, #21, St.322, Boeung Keng Kang I, Phnom Penh, PO Box 2467, Cambodia*
[b] *Department of Forest & Conservation Sciences, University of British Columbia, Vancouver, BC, Canada*

ABSTRACT

Balancing the needs of local people with biodiversity conservation is a universal challenge for protected area management. In Cambodia's forest landscapes, community-based forest management schemes are intended for rural communities to gain income in activities that support sustainable forest management in protected areas. Partnerships between communities, government, and non-government organizations to develop community-based forest management are still in their early stages, offering opportunities to learn from successes and challenges. In this paper, we report on the short-term results of a program led by WWF-Cambodia to support Community Protected Areas in Mondulkiri, Cambodia. Surveys were designed to capture changes in the knowledge, attitudes, and practices of members involved in community-based forest management. The surveys elicited local perceptions of benefits of involvement in forest enterprises and protection, and whether perceptions match the program's objective of conservation and income generation. The results of the short-term evaluation show that perceived benefits are linked to non-monetary attributes of the program, such as access to information and resources. There was no significant change in household income from forests over the two-year evaluation period. Overall, members perceived improvements in natural resource management, but expressed concerns over difficulties of managing forest enterprises. The short-term program evaluation suggests Community Protected Areas in Cambodia may have a positive impact on community governance but raises questions over realistic outcomes. Understanding local perceptions of the value of Community Protected Areas may help to better ground program objectives in local realities.

1. Introduction

Supporting rural communities for the conservation of tropical forests is challenging yet crucial for the long-term protection of biodiversity and global carbon sinks. Tropical countries contain 44% of the global forest area, storing carbon and harbouring two-thirds of the world's biodiversity (Keenan et al., 2015; Raven, 1988). The people living closest to tropical forests are some of the poorest in the world, representing a high proportion of households living below the poverty line of low and middle-income countries (Cheng et al., 2019; Fisher and Christopher, 2007). Meeting the development aspirations of communities living in rural tropical forest landscapes generally involves one or a combination of three pathways: (1) rural-urban migration, (2) conversion of forest to agriculture and other uses, (3) increasing the remunerative value of forests for local people. While migration (pathway 1) may be desirable for strict protection of intact ecosystems, it is not a viable option for

many households and does not necessarily lead to improved wellbeing (Hoffmann et al., 2019; Knight and Gunatilaka, 2010). More often than not, forest conversion (pathway 2) leads to negative outcomes for biodiversity and carbon (Norris, 2016; Rosa et al., 2016), and sometimes people (Butler, 2012). Finding ways in which forests can lead to greater prosperity for local people (pathway 3) has therefore become the subject of great investigation by researchers, governments, and conservation agencies (Belcher, 2005; Damania et al., 2020; Miller and Hajjar, 2020; Nambiar, 2019a; Wunder, 2001).

Many factors contribute to the degree to which rural communities can attain benefit from forests (Sunderlin et al., 2005). Tenure and rights, geographic location, institutional arrangements, cultural systems, competition for resources, and availability of capital may be of critical importance depending on the context (Baynes et al., 2015; Guariguata et al., 2010; Pagdee et al., 2006). A large body of work has demonstrated the contributions of Non-Timber Forest Products (NTFPs)

to livelihoods and conservation, and the conditions under which these deliver positive outcomes (Arnold and Pérez, 2001; Belcher et al., 2005; Ros-Tonen and Wiersum, 2005). Managing ecosystems using economic incentives, such as Payments for Ecosystem Services (PES), have also been trialled extensively throughout forested areas, with varying levels of success dependent on program design and local context (Bulte et al., 2008; Clements and Milner-Gulland, 2015; Salzman et al., 2018). Forest products and services may provide monetary and non-monetary value to communities in ways that incentivise active local management and/or protection (Dawson et al., 2014; Meijaard et al., 2013). In some cases, Indigenous and non-Indigenous communities have prevented deforestation by leveraging local action (Nepstad et al., 2006; Nolte et al., 2013; Porter-Bolland et al., 2012). In others, communities that seek to enhance their benefits from forests are unable to do so because of a range of barriers, including access, markets, capacity, regulatory frameworks, and more (Nambiar, 2019a).

To overcome these constraints, governments, multi-lateral organizations, and non-government organizations frequently initiate community-based forest management (Gilmour, 2016). Globally, community-based forest management encompasses a wide range of schemes and appeals to many as an approach for securing historical rights to forests and land while reconciling conservation and livelihood objectives (Charnley and Poe, 2007; Shackleton et al., 2002). Community-based forest management is often targeted towards biodiversity outcomes, but also includes a wide range of activities, such as NTFPs for household or commercial purposes, community forest enterprises, and payments for ecosystem services (Otto et al., 2013; Sikor, 2006). Community-based forest management offers opportunities for enhancing community governance and management in forest conservation, with potential benefits for both people and forest ecosystems (Corrigan et al., 2018; Fa et al., 2019). It may also encompass community forest enterprises, providing avenues for communities to engage in income generating activities, gain access to credit, and capture market benefits (Kozak, 2007; Macqueen, 2008; Tomaselli and Hajjar, 2011). Recently, scholars have drawn attention to broader aspects of well-being that emerge from forest enterprises, including environmental and cultural stewardship, empowerment, interpersonal and organizational relationships, and personal fulfilment (Macqueen et al., 2020).

While many studies document success factors of community-based forest management (Baynes et al., 2015; Bray et al., 2005; Charnley and Poe, 2007), others highlight problems, including access to microfinance (Tomaselli et al., 2013), the need for external support (Bukula and Memani, 2006), negative impacts on biodiversity (Sayer et al., 2017; Shrestha et al., 2010), adverse policy and regulations (Molnar et al., 2007), and disparities in benefits and inclusion (Hajjar, 2015; Maskey et al., 2006). A recent global analysis of community-based forest management shows that pre-existing resource rights may be compromised with the formalization of community forests (Hajjar et al., 2020). Despite advancing equity as a rationale for community-based forest management, experiences suggest many state-driven programs do not lead to more inclusive benefits and participation in decision-making (Essougong et al., 2019; Friedman et al., 2020). Community forest governance and the broader institutions arrangements that guide decision-making are critical to these outcomes (Agrawal and Chhatre, 2006; Mahanty et al., 2006; Piabuo et al., 2018). This includes understanding why households choose to engage in community forestry and, in-turn, pro-environmental behaviour (Agrawal, 2005). Learning from perceptions of governance, benefits, challenges, common interests, and individual aspirations of involved actors is therefore crucial to comprehensively capture how and if community-based forest management is meeting its desired objectives.

The rich empirical evidence demonstrating the potential for community-based forest management aligns with the moral imperative to empower rural forest communities to pursue Amartya Sen's development as freedom (Sen, 1999). Community-based forest management is not simply about poverty alleviation and biodiversity protection – it is attentive to the spectrum of attributes that constitute well-being and sustainability in societies (Macqueen et al., 2020; Miller and Hajjar, 2020). It is therefore essential that community-based forest management is developed with a sound understanding of community values, preferences, and aspirations, and the barriers for meeting them (Hajjar et al., 2013). Enabling conditions must be grounded in context – what works and what doesn't work, and according to whom. Opportunities for learning might be built into decision and management systems, such as the use of theories of place and change (van Noordwijk, 2017). As initiatives progress, monitoring and evaluations systems are necessary to track performance, including changing preferences and conditions, and emergent challenges (Maryudi et al., 2012). Monitoring and evaluation systems should inform adaptive management (Brewer et al., 2020; Fernandez-Gimenez et al., 2008). They can also highlight hidden benefits or risks, creating new opportunities for learning and strategic action.

In this paper, we report on the short-term program evaluation of community-based forest management in the Eastern Plains Landscape in Cambodia. Rural forest landscapes in Cambodia epitomize conservation and development challenges across the tropics (Riggs et al., 2020a; Riggs et al., 2020d). Communities are poor and often disempowered with limited development opportunities. Cambodia's forests are rich in biodiversity and provide important ecological and climatic benefits for region. Forest conservation occurs within a complex social-political setting and pathways for sustainable development are difficult to find (Beauchamp et al., 2018b; Riggs et al., 2020c; Riggs et al., 2018). Community forestry offers opportunities for rural communities to gain income in activities that support sustainable forest management, reducing involvement in activities that lead to the over-exploitation of resources. Many forms of community forestry have existed over time in Cambodia (Biddulph, 2015; De Lopez, 2004; Lambrick et al., 2014; Nhem and Lee, 2019). Here, we focus on government sanctioned sustainable use zones within protected areas, referred to as Community Protected Areas (CPAs).

We present the short-term results of a program evaluation covering 19 CPAs in eastern Cambodia. We report on changes over a two-year period, in which WWF-Cambodia worked extensively with communities to support sustainable forest management, with the explicit goal of reducing threats to conservation targets by generating income through community forest enterprises. The theory of change behind this approach is that communities will reduce their impact on conservation targets as a result of alternative income-generating activities that offset income otherwise generated from over-exploitation of these target resources. Embedded into this theory of change is the explicit assumption that community participation in natural resource management will lead to greater knowledge and value in biodiversity conservation, leading to pro-environmental behavior. Here, pro-environmental behavior describes behavior that improves or conserves the environment, due to beliefs, attitudes, values, knowledge, norms, and other factors (Steg and Vlek, 2009). Previous studies have shown that pro-environmental behaviors may result from complex interactions between the state and communities, including technologies, discourses, and the interplay of power (Agrawal, 2005). In this paper, we focus on perceptions of change for the objective of adaptive management and learning (Bennett, 2016).

The purpose of this study is to understand how communities perceive the benefits of CPAs, and whether these perceptions align with the program's objective of conservation and income generation. Our findings highlight the positive impact CPAs can have at the community level, but their limitations regarding impact on income and conservation. We offer insights into the complex relationships between CPAs and external drivers of change, including market instability, infrastructure expansion, and immigration. Community-based forest management is unlikely to offer a panacea for reconciling conservation and development in Cambodia, but it may positively contribute to a wider set of sustainable development models, as it aligns with broader aspects of well-being and sustainability in rural communities.

1.1. Study site

The Eastern Plains Landscape (EPL) in Cambodia covers 28,000km^2 and includes a network of six protected areas containing a large portion of Cambodia's remaining natural forests (Fig. 1). The landscape is situated within the Indo-Burma biodiversity hotspot and forms one of the largest remaining deciduous dipterocarp forests in Southeast Asia (Myers et al., 2000). Historically home to Indigenous populations dependent on forest resources, the landscape has changed rapidly in the past twenty years. Poor farmers have moved from the lowland parts of Cambodia to the forest areas to establish agricultural land, resulting in an annual population growth rate of 4.8% in Mondulkiri province between 1998 and 2019 (NIIS, 2019). Economic Land Concessions – the conversion of natural forest to rubber, tree plantations, and other crops – expanded rapidly in the area between 2005 and 2013. These events coincided with a rise in the illegal harvesting of high value timber, facilitated by the landscape's proximity to the Vietnamese border. A large portion of EPL's forest is under legal protection, but conservation agencies struggle to prevent deforestation and forest degradation by Indigenous and non-Indigenous smallholders seeking to improve incomes through agriculture or logging (Riggs et al., 2020a).

Recognising the growing competition between forest conservation and local development in the EPL, a number of conservation agencies are exploring options for community-based forest management. In Cambodia, government programs for community-based forest management fall under two categories; Community Forestry (CF) and Community Protected Area (CPA). Legislated in 2002, CF exists in areas managed by the Ministry of Agriculture, Forestry, and Fisheries and CPAs exist within protected areas managed by the Ministry of Environment. CPAs and CFs are intended to provide access rights for communities to meet livelihood needs through sustainable forest management, including harvesting of forest products for income and subsistence and the maintenance of cultural and spiritual values. Currently, government programs for community-based forest management (CPAs and CFs) span approximately 800,000 hectares and 1400 villages (Department of Livelihoods, 2017; Forestry Administration, 2017). There are very few studies documenting the progress of these programs, although there is broad support among non-government organizations, international donors, and conservation scientists. Existing studies highlight the potential for CFs and CPAs to reduce forest degradation but note the complex social-political conditions that influence the degree to which communities and forests can really benefit (Lambrick et al., 2014; Pasgaard and Chea, 2013; San, 2006). Unequal distribution of benefits due to inequity in decision-making are recognised as key issues in community-based forest management in Cambodia, exacerbated by the wider context of weak governance (Pasgaard and Chea, 2013; San, 2006).

In the Eastern Plains Landscape, WWF-Cambodia have supported the establishment of 19 community-based forest management programs since 2008 (Table 1). The programs are classified as CPAs and exist within Srepok Wildlife Sanctuary and Phnom Prich Wildlife Sanctuary. WWF also provides technical support to the Ministry of Environment in the management of the two wildlife sanctuaries and has been involved in conservation in the landscape since 2002. As such, WWF support for CPAs sits within a broader, long-term strategy for community engagement in conservation and improving well-being. In the Eastern Plains Landscape, WWF-Cambodia have adopted a "Wildlife Conservation by Sustainable Use" approach to support protected area management. Working with partners, WWF manages programs to improve landscape governance, biodiversity and ecosystem health, and sustainable livelihoods. Part of this approach includes supporting the development of community-use zones within protected areas, which provide formal recognition to existing land and forest use, including harvesting of NTFPs.

At present, WWF conducts various activities (Table 2) with the primary focus of establishing and maintaining Community Forest Enterprises (CFEs). Due to limited funding and resources, support for all 19 CPAs is varied and changes depending on donor priorities and
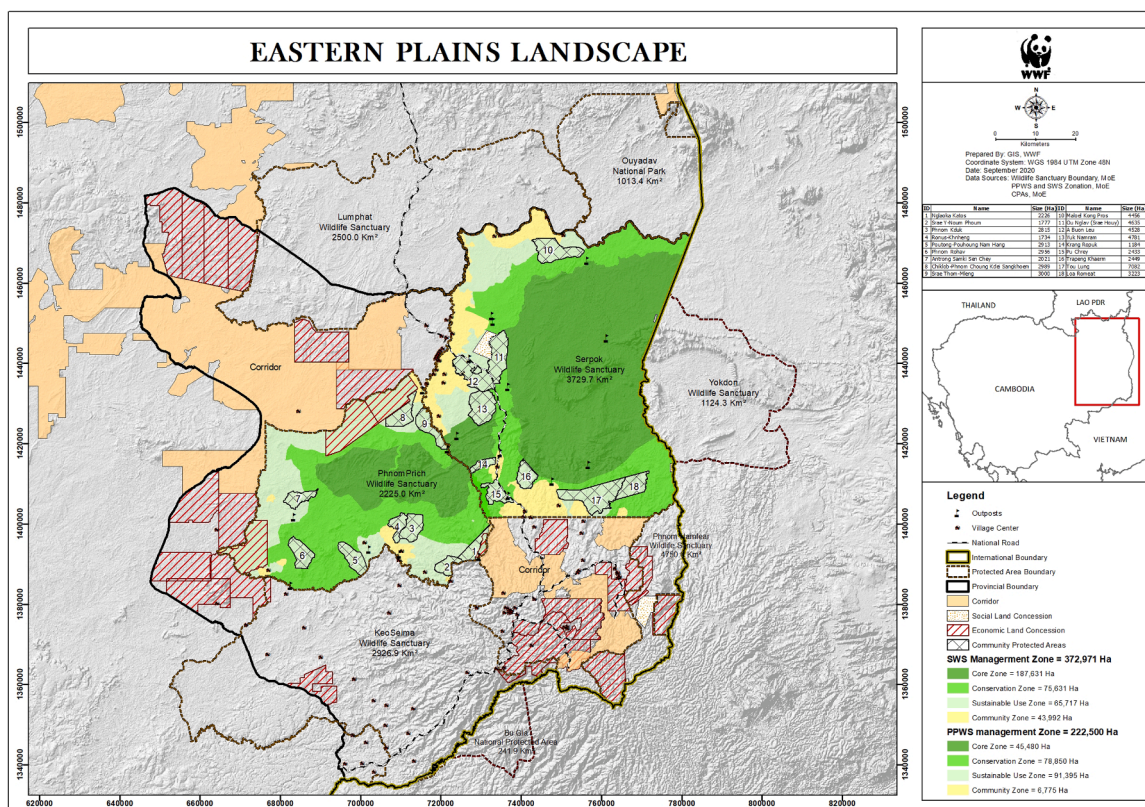

Fig. 1. Map of Eastern Plains Landscape and community protected areas.

Table 1

List of CPAs supported by WWF.

Map No.	Name of CF/CPA	Year established	CPA Sizes (Ha)	CPA members registered			Management plan[1] established	WWF level of support[2]	Sample for baseline (Households)	Sample for evaluation (Households)
				Total Family	Total person	Female				
Phnom Prich Wildlife Sanctuary										
0	Ronus-Khnheng	2007	1734	96	587	253	Y	M		
1	Putong Pouhuong Nam Hang	2009	2913	161	749	393	Y	H		
2	Sre Thom-Mleng	2008	3000	171	849	407	Y	H		
3	Sre Y-Noum Phoum	2012	1777	101	227	115	Y	H	30	30
4	Chiklob-Phnom Choung Kdei Sangkhoem	2012	2989	147	678	323	Y	H	31	30
5	Nglaoka Katos	2012	2226	175	320	152	Y	H		
6	Phnom Rohav	2016	2956	157	683	339	Y	M		31
7	Phnom Kduk	2018	2815	143	629	317	Y	M	30	30
8	Antrong Samki Sen Chey	2016	2021	NA	NA	NA	NY	L		
Srepok Wildlife Sanctuary										
9	Tou Lung	2005	7082	342	2217	754	Y	M	30	40
10	Maloel Kong Pros	2013	4654	460	2599	1379	NY	H		
11	Ou Nglav (Sre Huy)	2008	4635	166	878	429	Y	H	30	31
12	Pu Chrey	2013	2433	160	682	328	Y	M	30	40
13	Trapeng Khaerm	2008	2410	153	459	295	Y	M		30
14	A Buon Leu	2014	4528	354	1681	797	Y	M		30
15	Yuk Namram	2017	4781	388	1288	652	NY	H		
16	Loa Romeat	2012	3223	57	231	113	NY	H		
17	Krang Ropuk	2008	1184	93	237	115	Y	H		
18	O Chhoul*	NA	NA	NA	NA	NA	N	M		30
	Total		**57361**	**3324**	**14994**	**7161**			**181**	**332**

[1] Y=Yes, NY=Not Yet.

[2] H=high, M=medium, L=low. *Current dispute over CPA borders, previously a community forest under MAFF.

Table 2

WWF activities to support Community Protected Areas (CPAs) and Community Forest Enterprises (CFEs) in the Eastern Plains Landscape.

WWF activities to support CPAs	Examples
Capacity building for sustainable forest management and CFEs, including honey production, bamboo harvesting, and other non-timber forest products.	Introduction of new products (exposure tours, training), Protected Geographical Identification (PGI) registration, and implementation, business planning and management, marketing, product processing, sustainable production (pepper, bamboo), bee-keeping training, plant nurseries, fire break and seedling maintenance, community monitoring systems, training on wild honey harvesting, support for saving groups
Capacity building and support for CPA	Management plans, financial management, communication plans, reporting requirements, technical training and financial support for patrolling, training on legal rights and legislation, commitments to gender equity and women's participation in CPAs
Addressing broader landscape issues	Interventions to reduce human-wildlife conflict, strengthening community involvement in forest protection to maintain CPA corridors, agricultural support
Establishing networks to support CPAs and CFEs	Facilitating third party financing, establishing and supporting dialogue platforms between CPA and forest governance actors, market linkages and value chain potential for enterprise groups

community needs. Enterprise activities have focused on honey and bamboo, determined by local forest attributes and historical use (Guerin, 2020). More recently, WWF is piloting a program to encourages households to grow pepper on living trees (*Leucaena leucocephala* and *Albizia lebbeck*), rather than wooden poles harvested from the forest. The short-term evaluation attempted to capture how and if members of CPAs

have changed their behavior as a result of WWF support, and whether individuals perceive benefits from their participation in CPAs.

2. Methodology

2.1. Design and data collection

Given the extent of WWF activities in the landscape, the short-term evaluation was designed to capture a two-year period of targeted support for CPAs. The purpose of the evaluation was to test the project theory of change, including the contribution of CFEs to household income and if participation in CPAs led to changes in attitudes and behaviors towards natural resource management. A baseline livelihood survey was conducted in 2017 and the evaluation was completed in 2019. The evaluation consisted of two main components; structured household questionnaires and focus group discussions. An independent consultant conducted the data collection and additional information was provided by WWF staff. Evaluation design was informed by the Knowledge, Attitude and Practices (KAP) survey (Du Monde, 2011) and the Most Significant Change (MSC) technique (Dart and Davies, 2003). The KAP survey aims to capture changes in an individual's understanding, thoughts, and behaviours, drawing attention to personal experiences and stories. As a preliminary evaluation, it is intended to provide specific information on an intervention in order to strengthen and inform implementation. Survey questions in 2019 were carefully chosen to replicate many of the questions asked in 2017, targeting individual perceptions of changes due to CPAs. The MSC technique encourages participatory reflection, allowing for individuals to share perceptions in-depth during focus group discussions. Together, these approaches elicited quantitative and qualitative information on socio-economic characteristics and individual perceptions on benefits of CPAs, biodiversity conservation, and CPA governance.

To capture the full breadth of the program, 10 CPA sample sites were selected for the program evaluation. Sites were selected through stratified random sampling (Newing, 2010) to ensure representation across different donors, livelihoods, accessibility, private sector investment,

distance from provincial town, and under-represented groups (ethnicity and gender). Sites were then classified into low, medium, and high support from WWF, depending on whether WWF assisted with CPA formation, development of management plan, capacity building, and the distribution of small grants. Sites were considered high support if all four activities took place, medium for three activities, and low if only one or two. The classification of sites allowed for the identification of control (low support) and treatment (medium and high support) groups to evaluate the impact of the program. A complete list of all sites is provided in Table 2, highlighting those included in the evaluation. In total, 332 households were surveyed across 10 sites. Approximately half of all survey participants were women. Some 75% of survey participants were members of the CPA in the first year of creation and 88% identified as members at the time of the survey. One focus group discussion was held in each site, with a maximum of 12 participants. For parts of the discussion, participants were separated by gender to ensure participants felt comfortable discussion gender-specific issues.

2.2. Analysis

Following the 2019 evaluation, the household survey data was entered into SPSS for descriptive and inferential statistical analysis. Descriptive statistics provided information on socio-economic and demographic characteristics of households. Inferential statistics included correlation and regression analysis to determine patterns statistically significant differences between the responses of participants in the sites with low, medium, and high support from WWF. To evaluate changes in household income due to the program, a one-way analysis of variance (ANOVA) test was used to determine if participants reported a statistically significant increase in income between 2017 and 2019. This test was performed only for the 6 CPAs that took part in both the 2017 and 2019 survey (181 participants). In addition, correlation analysis was performed on the entire 2019 sample (322 participants) to identify which household socio-economic variables were significantly correlated with total household income. An ANOVA test was then used to determine the contribution of different sources of income (forest, agriculture, off-farm) to the total income. The purpose of these tests was to evaluate the impact of the program on household income (demonstrated by the contribution of income from forest products). Reponses regarding household perceptions were triangulated using information gathered in focus group discussion.

3. Results

3.1. Demographics and household income

Socio-economic and demographic characteristics of survey participants were consistent across low, medium, and high support sites, demonstrating appropriate selection of control and treatment sites (Table 3). Majority of households were Indigenous Bunong ethnicity with 2-3 hectares of land and various education levels. Households obtained annual income from growing rice, cash crops, livestock, timber, resin, honey, employment and numerous other forest, agricultural, and off-farm activities. Divided into categories, agricultural crops and livestock contributed the largest source of income to households, followed by off-farm income, and then forest products.

For households that took part in the livelihood assessment in 2017 ($n = 181$), average annual household income improved over the two-year period, from $1749 to $2088. The increase in income can be attributed to improved incomes across all categories, with the largest increase in off-farm income. The one-way ANOVA test showed the increase in income was not statistically significant at the 95% confidence level ($p = .563$). Regression analysis identified three variables with statistically significant effect on total income: agricultural income (rice paddy and cash crops), off-farm income, and livestock (cows, buffalos, pigs, and poultry). Income from the forest was not an important contributor to total income, indicating participant engagement in CFEs did not add significant value to overall household income.

Y (Total Income) = 134.834 + 1.016 (Agriculture Income) + 0.993 (Off-Farm Income) +1.007 (Poultry and Livestock)

3.2. Perceptions of CPA governance and management

To elicit perceptions on the benefits of CPAs, survey participants were asked to agree or disagree with a list of five potential benefits of CPAs. The five benefits were (1) access to information, (b) access to credit, (c) access to resources, (d) reduced fees for natural resource products, (e) gain in social status, and (f) increased solidarity. While participants could interpret these terms individually, in general, this question referred to the activities listed in Table 2. Social status is intended to mean a gain in recognition among peers, either as a household or community, and solidarity is the act or feeling of being supported, sharing, and helping others in the community. Access to information was identified as a benefit for most participants (81%), followed by access to resources (67%) (Fig. 2). Perceptions differed depending on the level of CPA support, with participants involved in CPAs with higher level support more likely to agree with benefits provided by the CPA. The greatest difference between sites was agreement with the benefit of gained social status, which only 7% of participants in the low support site agreed with compared to 36% in treatment sites.

To gain insight into decision-making processes, survey participants were asked whether decisions regarding CPAs were made by (a) majority, (b) consensus, (c) committee leader, or (d) I don't know. Decisions could include defining the access and user rights of products within the CPA, demarcation of boundaries, CPA by-laws and regulations, and use of CPA funds. Across all sites, participants responded that most decisions were made by either consensus or majority, indicating participation in decision-making. Decisions regarding CPA funds were perceived to be made by committee leaders (48% across all sites), which reflects the ways CPAs are intended to operate. The establishment of CPAs includes bylaws, outline decision-making processes and operations. The bylaws state that committee leaders are re-elected every five years and can be removed if community members are unsatisfied with this process. Each community enterprise also has by-laws, which include how which communities decide what portion of profits will be spent on forest management, enterprise re-investment, community development etc. Starting from 2020, communities have begun to raised funds through membership and user fees to contribute to conservation activities in Table 2.

One visible difference in the survey results was the percentage of participants that responded "I don't know" in the low support sites (39% and 50% in the two questions regarding decision-making processes).
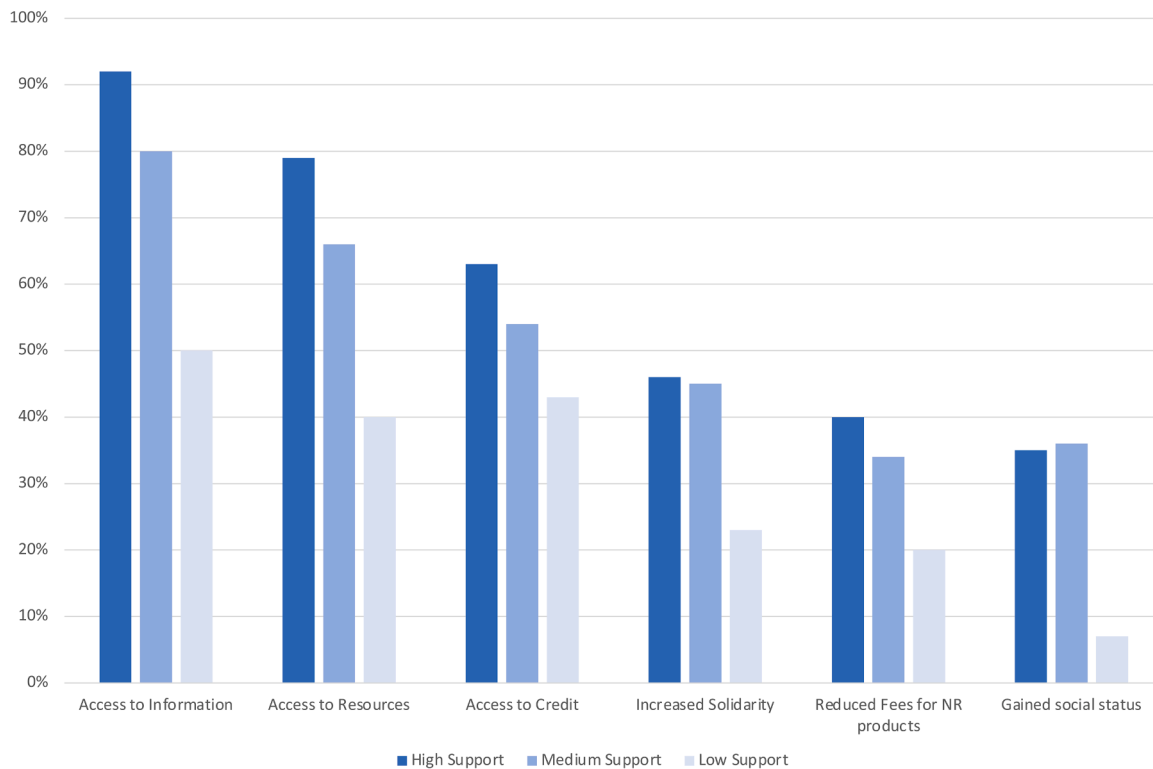
Table 3
Description of participants.

Site	Average Age	Ethnicity Khmer	Bunong	Average household size	Female	Education Literate only (L)	Numerate only (N)	Both L&N	None	Average Land holding (ha)
High	37	16%	84%	6	45%	1%	12%	41%	46%	2.59
Medium	38	18%	82%	6	58%	4%	12%	44%	40%	2.05
Low	41	20%	80%	5	47%	0%	10%	37%	53%	3.14

Fig. 2. Perceived benefits of CPAs.

These responses align with the lack of perceived benefit in access to information, suggesting that CPA members in low support sites may be less informed than members in CPAs with higher support.

3.3. Changes in attitude and capacity

To understand how involvement in CPAs might affect attitudes and capacity for natural resource management, survey participants were asked their perceptions of changes over a period of 15 months. Perceptions focused on three questions regarding changes in; (1) attention paid to natural resource management, (2) knowledge of natural resource management, (3) capacity to use natural resources in a more sustainable way. Across all sites, participants were more likely to report an increase across all three questions (Fig. 3). Members of CPAs with medium support were more likely to report an increase in capacity to use natural resource management in a more sustainable way (75%), compared to
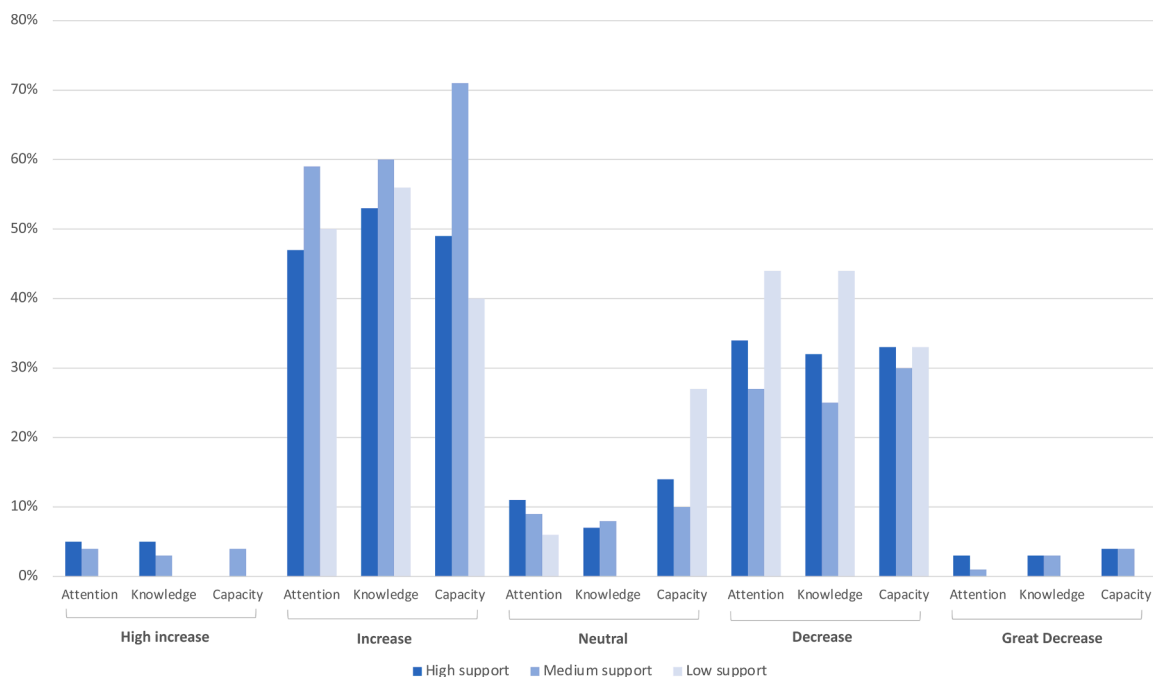

Fig. 3. Changes in (1) attention paid by CPA members to natural resource management, (2) knowledge of CPA members about natural resource management, and (3) capacity of CPA members to use natural resources in a more sustainable way.

the members of high support sites, of whom 49% reported an increase. In addition to reporting an increase, members of low support CPAs were more likely than high and medium support CPAs to report a decrease in attention, knowledge, and capacity (Fig. 3). As some of the CPA processes and boundaries changed throughout this period, participants may have reported decrease in these areas due to uncertainty.

3.4. Perceptions of conservation objectives

In line with the conservation strategy of the Eastern Plains Landscape, the CPAs are expected to help achieve conservation objectives, including reducing illegal activity and forest conversion and protecting biodiversity. While CPA members are not able to provide true evaluations of conservation measures, they are able to report on perceptions of site-level biodiversity and threats (Southon et al., 2018). In the 2019 survey, participants were asked their perceptions of illegal logging, recalling levels in January 2018 (when an initial smaller survey took place) and comparing them to April 2019. Across all sites, survey participants tended to report a decrease in illegal activities over the previous 14 months. This included a decline in illegal logging (Fig. 4) and illegal wildlife hunting (Fig. 5). Participants reported the greatest decline in illegal activities by members of the CPA or village, indicating a level of trust and perceived change in behaviour among members of the same village.

Survey participants also reported they experienced a decline in conflict over forest conversion, including conflicts that arise among CPA members and between CPA members and new immigrants. However, participants did not report a decline in conflict caused by rich and powerful individuals that pay local people in the village to clear land and use resources. Conflict of this type increased slightly; 23 participants reported experiencing conflict in April 2019 compared to 20 participants in January 2018. All new conflicts occurred in the low support CPA of Ou Chhoul, which is currently in conflict with an Economic Land Concession and the Ministry of Environment over CPA boundaries.

To determine perceptions of changes in biodiversity, survey participants were asked about the presence of flora and fauna within their CPAs. Flora and fauna included key species under threat from logging or hunting, including; trees within the Dipterocarpaceae family, wild pig,

banteng (*Bos javanicus*), turtle (*Heosemys annandalii*), green peafowl (*Pavo muticus*) and deers (*Rusa Unicolor* and *Rucervus Eldii*). Survey participants were asked if they had observed a high increase, increase, no change, decrease, or great decrease for each species between January 2018 and April 2019. For flora, survey participants were most likely to report a decrease in presence, although some members reported that they observed an increase. Similar patterns exist for wildlife presence, with a range of survey responses from high increase to great decrease. Due to the wide spread of results, it is difficult to draw conclusive information from the survey responses. WWF conduct regular biodiversity surveys in the landscape using various methods (Gray and Phan, 2011; Gray et al., 2012) to measure these trends over time. Information for the period January 2018 – April 2019 was not available at the time of publication.

4. Discussion

The short-term evaluation of WWF support for CPAs in the Eastern Plains Landscape highlights important and locally relevant benefits of community-based forest management. In the sites evaluated, CPAs did not significantly increase household incomes over the two-year period. This finding reflects concerns over community-based forest management that raise questions over realistic benefits (Anderson et al., 2015; Sayer et al., 2017). Throughout the evaluation, CPA members reported a range of concerns over enterprise development, including market instability, production disruptions due to natural weather events and wildlife interference, and pressure on natural resources due to increased immigration to the area. Some success has been documented, such as the harvesting of wild honey as part of the Mondulkiri Forest Venture (Guerin, 2020; Seat et al., 2015). However, as highlighted by Badini et al. (2018), long-term success of small forest enterprises requires enabling conditions across a range of social, economic, and environmental factors that may be difficult to obtain. Pathways to prosperity through NTFPs are notoriously rare and difficult to achieve (Nambiar, 2019b). As formalized community forestry, CPAs have the potential to contribute to prosperity through different means, such as improved access rights for households and benefit sharing from diverse forest-based activities (Miller and Hajjar, 2020; Sunderlin, 2006).
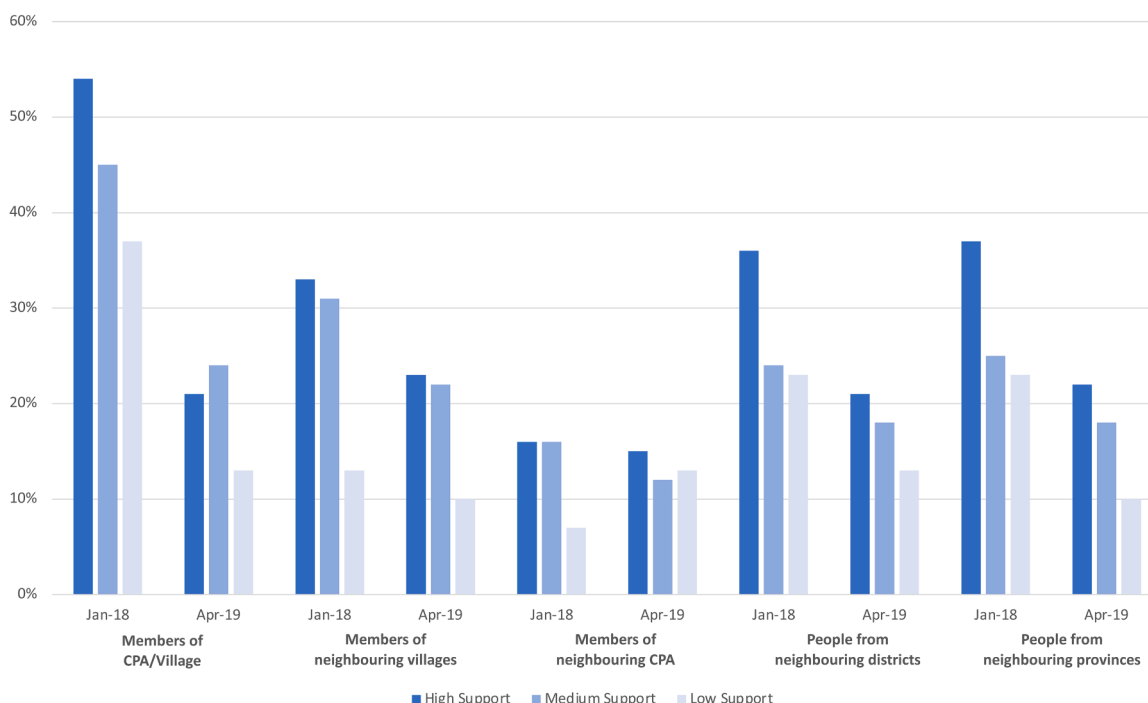

Fig. 4. Perceptions of illegal logging (Percentage of people perceived to be engaged in illegal logging in January 2018 compared to April 2019).
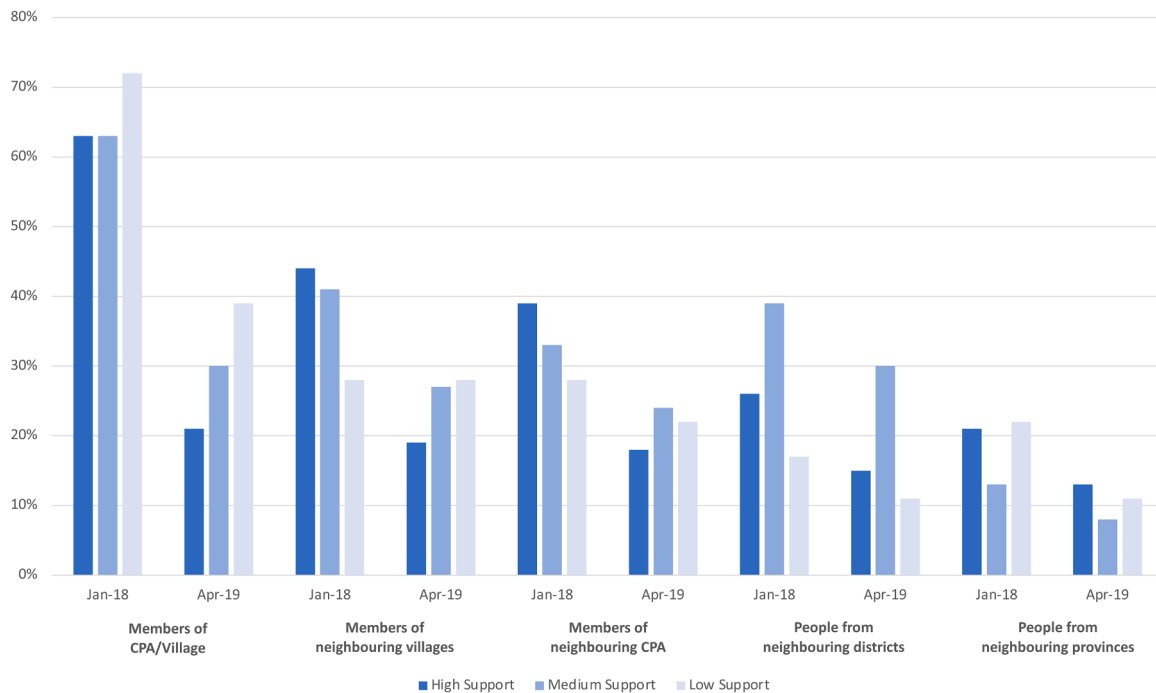
Fig. 5. Perceptions of illegal wildlife hunting (Percentage of people perceived to be engaged in illegal logging in January 2018 compared to April 2019).

Benefits to household income may not be immediate, but accumulate over time through entrepreneurship, innovation, and access. Longer-term studies that explore CPAs as platforms for innovation and collective organization may generate important insights into the contributions of community-based forest management to livelihoods and prosperity in Cambodia (Bray et al., 2006; Macqueen et al., 2020).

Despite challenges establishing income-flows from forests, participants reported positive impacts of CPAs on community governance. Equitable information sharing, increased solidarity (social capital), and democratic decision-making processes are widely recognised as important for community-based forest management (Baynes et al., 2015; Van Laerhoven, 2010). They may also bring broader benefits to the community, including positive social relationships, trust, and fair and just processes for resolving conflict. These elements are part of a broader criteria for collaborative resource management initiatives (Lockwood et al., 2010; Musavengane and Simatele, 2017; Sick, 2008). They are also particularly salient for rural communities in Cambodia, where issues of corruption, inequality and land conflict are high (Beauchamp et al., 2019; Riggs et al., 2020a). As CPA members tend to be disadvantaged households within villages, improvements in subjective elements of well-being, such as experienced quality of life and agency in decision-making, should not be under-valued (Beauchamp et al., 2018c; Woodhouse et al., 2015). Surveys are limited in their ability to capture what responses truly mean in broader aspects of life. However, they offer entry points for further discussions, such as how and if CPAs impact social justice or restore social capital lost in past conflicts (Ido, 2019; Nhem and Lee, 2019). The lack of new conflicts in 90% of sites also suggests there could be potential for CPAs to enhance tenure security for remote communities. Further investigation is needed to verify these trends, including outcomes at the household, village, landscape, and higher scales. For example, whether these benefits reach vulnerable households, and whether there are lessons replicable across different regions (Pasgaard and Chea, 2013; Persson and Prowse, 2017).

The positive perceptions of changes in natural resource management attention, knowledge, and capacity from majority of households surveyed indicate communities are receptive and supportive of conservation initiatives. Households are willing to contribute funds raised through membership and user fees to conservation activities, such as

community patrolling. Across all CPAs, households were more likely to report an increase in knowledge, attitude and capacity for natural resource management over the 14-month period, as well as a decline in illegal forest activities. These results align with prior studies in Cambodia that identify benefits of conservation programs for communities (Beauchamp et al., 2018a; Clements and Milner-Gulland, 2015). Community perceptions indicate the program is achieving its objective of encouraging pro-environmental behavior, although it is difficult to elicit specific causes from this evaluation. As raised by Pasgaard (2015), careful investigation is needed to avoid assumptions about conservation achievements and ensure evaluations capture the full range of perceptions. As households did not report improvements in income, it's possible that positive perceptions are linked to non-monetary benefits, such as the social impacts highlighted above. This observation is supported by a recent study by Bennett et al. (2019) in the Mediterranean Sea, which found that local support for conservation is associated with perceptions of good governance. While not directly linked to conservation, Macqueen et al. (2020) also find that CFEs deliver on a wide range of non-monetary values, enhancing the contribution of forests to landscape-level prosperity and sustainability.

Supported by these studies, the results of the evaluation raise questions over the assumptions embedded into theories of change for community-based forest management programs. While income generation and conservation outcomes might be long-term goals, more explicit attention may need to be given to intermediate outcomes that eventually lead to high-level goals (Belcher et al., 2020). For example, institutional capacity for community resource management, such as leadership, collaborative learning, and trust, may only emerge through cumulative actions over time (Olsson et al., 2004). Yet their benefits may be particularly significant for disempowered communities seeking to assert their ownership and management over resources. Majority of CPA members in this study are Indigenous and approximately half are not literate or numerate. Experiences from WWF staff involved in CPA development suggest that targets should not be too ambitious - it is good to start simple. For example, as a new activity, CPA members involved in bamboo enterprises have found in particularly difficult to produce quality products and obtain a consistent and reasonable price. Documenting changes across different points in time is imperative for

understanding broader landscape transitions and the role of community-based forest management in meeting long-term conservation and development goals. With adaptive management and learning, these insights should encourage communication between local staff and donor agencies for improving strategies. However, incentives to report success, as often required by donors, may undermine these learning opportunities (Pasgaard, 2015; Sanders et al., 2020)

Many challenges relating to CPAs are likely to reoccur over time, requiring adaptive capacity (Armitage, 2005). If CPAs in the Eastern Plains Landscape are to be self-sustaining, responsibilities for navigating these opportunities and challenges should fall under the management of the CPA, rather than donor-funded projects. Without sufficient and stable funding, WWF cannot consistently respond to the needs of all 19 CPAs within the two protected areas. Yet at present, management committees lack the capital and capacity to be independent from government and non-government assistance. Growing small businesses and developing capacities for collective organization takes time and often requires learning-by-doing (Macqueen et al., 2006). Theories of change that explicitly recognise contextual factors and gradual impact pathways may lead to more accurate understandings and informed learning for adaptive management (van Noordwijk, 2017; Woodhouse et al., 2015; Wright et al., 2016).

As a preliminary and targeted program assessment, the two-year evaluation was not able to capture broader trajectories of change within the landscape. For example, infrastructure development is significantly changing livelihoods and aspirations in Mondulkiri, including improved road conditions for accessibility, emerging markets, and product competition (Riggs et al., 2020d). These changes are most significant for agricultural products, which make up the largest portion of household incomes. Many households prefer to work in agriculture or sell labour than obtain income from NTFPs – they perceive the latter to be labour-intensive and riskier due to difficult roads and illegal activities. It is possible that as agricultural incomes grow, households may lose the incentive to participate in NTFP enterprises, with repercussions for natural resource management. Taking into account these local realities, WWF are pursuing sustainable pepper as reliable and less intensive income source for households. Growing pepper on living trees is attractive to farmers if they can obtain a stable price, and WWF are actively seeking supply-chain partnerships to scale-up the pilot program. Still in its early stage, the pepper program is yet to confront the difficulties of combining sustainable livelihood initiatives with conservation objectives (Wright et al., 2016). A large body of work is contributing to evaluating the success of conservation interventions within Cambodia and what might be needed for measurable impact (Beauchamp et al., 2018a; Clements et al., 2020; Travers et al., 2016). Adapting best practice to local realities, such as infrastructure development, community aspirations, and local human capacity, remains a serious challenge for finding pathways for prosperity in forest landscapes.

5. Conclusions

The potential for community-based forest management to meet the needs and aspirations of rural communities living in forest landscapes in Cambodia is still underexplored. Government programs to support community involvement in forest management are only in their second decade, making it impossible to observe long-term changes. The WWF short-term evaluation of CPAs in Mondulkiri generates important information to help steer the current intervention towards locally meaningful outcomes, such as the potential for CPAs to deliver on a range of community benefits beyond forest incomes. Further in-depth studies are needed to examine the viability of forest enterprises within CPAs under changing landscape conditions, and the degree to which benefits reach marginalized groups (Pasgaard and Chea, 2013; Riggs et al., 2020a). A core part of this processes will involve determining market potential for diverse forest-based activities, and the combination of attributes that incentivize pro-environmental behavior. Theories of change *built with*

communities and practitioners in situ, with explicit learning pathways that allow for adaptation may help to direct appropriately paced targets matched to local needs (Langston et al., 2019).

Globally, evidence for community-based forest management to achieve prosperity in rural forest communities is compelling (Hajjar et al., 2020). Countries such as Cambodia have a lot to gain from international experiences in developing community-based forest management but must be able to adapt these lessons to the local context. The potential positive impacts of CPAs on community governance and social capital may be instrumental to navigating broader development challenges that often arise in frontier forest landscapes (Mahanty and Milne, 2015; Riggs et al., 2020b). Communities of Practice (Arts and de Koning, 2017) comprising of networks of learning, knowledge, and trust are needed to help identify attributes of community-based forest management in Cambodia that match landscape trajectories towards prosperity and sustainability. Benefits from tropical forests for local rural communities will require long-term commitment, adaptive management, and partnerships. Short term evaluations that provide insight into learning within landscapes can contribute to this process.

Declaration of interests

Acknowledgements

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