

Social impact assessment for the Keo Seima REDD+ project

Technical Report



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Abbreviations

BNS	Basic necessity survey
CCB	Climate, Community and Biodiversity
FA	Forestry Administration
KSWs	Keo Seima Wildlife Sanctuary
ICT	Indigenous communal title
MoE	Ministry of Environment
MFI	Microfinance institution
NTFP	Non-timber forest product
PA	Protected area
REDD+	Reduced emissions from deforestation and forest degradation
SBCA	Seima Biodiversity Conservation Area
SPF	Seima Protection Forest
WCS	Wildlife Conservation Society

Glossary

The following terms are used throughout this report to describe key concepts related to social impact assessments that may often take different meanings in other contexts. As such, they have been defined here to avoid confusion.

Causal inference

An important component of social impact assessments is estimation of *the extent to which observed changes can be said to have been caused by individual programmes*. This is known as causal inference. This can be expressed as the degree to which a programme specifically causes observed changes (i.e. causal attribution) or contributes to observed changes when there may be multiple factors at play (i.e. causal contribution).

Households

For the purposes of this report, a household is defined as an *economic unit* (i.e. a group of people that share their wealth). Under this definition, a household can be more than one family (e.g. children may stay in the same household as their parents even once they marry and form a new family). Although this is an important distinction for understanding the level at which social impacts are incurred, there is inevitably some blurring of the lines between them. For example, some households may share their wealth in certain domains (such as housing) but hold productive assets (such as agricultural land) separately.

Indicators

In the context of impact evaluations, indicators are defined as *means to measure the performance of policies, programmes, projects or interventions*.

Livelihoods

This report follows Chambers and Conway (1991) to define a livelihood as comprising *“the capabilities, assets (including both material and social resources) and activities required for a means of living*. A livelihood is sustainable when it can cope with and recover from stress and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base”. Although there is significant overlap between the concepts of livelihoods and material wellbeing, they are often treated separately.

Social impacts

Social impact assessments focus on the impacts of policies, programmes, projects or interventions on the wellbeing of people who might be affected by them. This report follows the definition of social impacts used by the Climate, Community and Biodiversity (CCB) standards (CCB 2017), which defines impacts as *“benefits, costs and risks, including those that are direct and indirect and including those related to social, cultural, environmental and economic aspects and to human rights and rights to lands territories and resources.”*

Wellbeing

The CCB standards require REDD+ projects to have a net benefit on wellbeing. There are, however, multiple different frameworks that define the concept of human wellbeing. This report

adopts the framework presented in Woodhouse et al. (2016; Fig. i), which splits wellbeing into three interacting dimensions: *material wellbeing* (what people have), *relational wellbeing* (what people can do with what they have) and *subjective wellbeing* (how people feel about what they have and what they can do). Although these three different dimensions are strongly interrelated, they are distinct and must be considered independently.

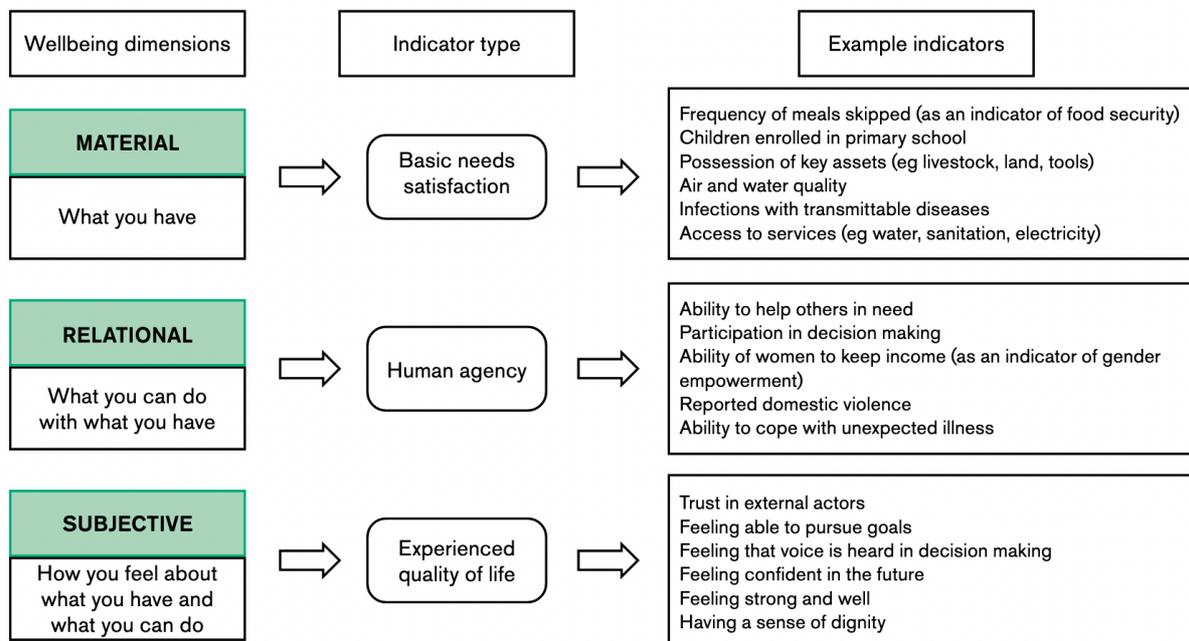


Figure i: Framework for assessing human wellbeing (from Woodhouse et al. 2016).

Executive summary

This aim of this report is to evaluate the trends in key social indicators identified to monitor the social impact of the REDD+ in Keo Seima Wildlife Sanctuary (KSWS), which is managed by the Royal Government of Cambodia's Ministry of Environment with technical assistance from the Wildlife Conservation Society. Following the social monitoring framework designed for KSWS in 2012, a household survey was conducted in each of the 20 villages participating in the REDD+ project, with a minimum of 30 households surveyed in each village. Trends were assessed for each indicator for the period from 2012 to 2022.

Although household material wellbeing - as measured by the BNS - fell slightly between 2017 and 2022, the average household score remains significantly higher than that recorded in 2012. Indigenous households – a key focus group of all social interventions in KSWS – were found to have continued to improve their material wellbeing significantly relative to non-indigenous households. However, there is evidence of increasing inequality within the REDD+ villages, with a widening of the distribution of wellbeing scores. Increasing access to credit from microfinance institutions and banks is likely to be contributing to this trend with most households able to secure loans by using land as collateral. As a result, only better off households are more able to access credit and invest further in income generation. Conversely, poorer households – including those unable to make loan repayments – are at risk of being priced out and left unable to access productive land.

The indicators for the security of natural resources paint a mixed picture. On the one hand, the collection of non-timber forest products and wild protein sources remains strong, while resin tree owners continue to have more trees on average than in 2012. A significant majority of people also felt secure about access to land. Conversely, there has been a significant reduction in the proportion of households owning resin trees, with only 32.9% of resin tree owners reporting feeling secure about their trees. The main indicators used to assess land sufficiency also showed mixed trends between 2012 and 2022. The average land held by households has increased significantly from 2.1 ha in 2012 to 3.4 ha in 2022. However, the percentage of land sufficient households – those households considered able to support themselves through their own production – decreasing from a high of 80.3% of households in 2017 to 68.1% in 2022.

The trends in the threats to social outcomes identified in the conceptual model also present a mixed picture. The proportion of households to have attended village meetings and have access to off farm livelihood opportunities, two areas which the project actively seeks to address through community outreach, institutional development and protection of forest resources, showed positive trends. Conversely, land alienation – where a household is unable to access productive land – has increased significantly in the past five years. Household debt has also increased significantly, both in terms of the proportion of households with outstanding loans and the mean value of those loans. However, for many households, this has been a positive development, with households the report having outstanding found to be better off on average than other households. It remains to be seen whether this trend will continue.

Comparison between the trends observed in the key indicators selected for the social monitoring framework since 2012 and the without-project predicted trends are still strongly favourable, with significant improvements in material wellbeing notable (Table i). However,

there are signs in many indicators that some of the gains made between 2012 and 2017 have been reversed. Whether these reversals were associated with Covid-19 or whether they result from one or more of the broader systemic changes that are being observed across the landscape is not yet clear. In this regard, future assessments will benefit from the inclusion of comparison of changes against control villages and from a reduced period between survey waves. Despite the reversals observed in some indicators, all indicators show an improved (9 indicators) or similar performance (four indicators) to that expected under the no project scenario. As such, the survey findings suggest that the project continues to have a net positive impact on households (including those belonging to vulnerable groups) living inside each of the 20 villages participating in the REDD+ project. Although certain vulnerable groups, notably widow-headed households, continue to experience disadvantages in relation to certain indicators, there have been improvements against some indicators and there is no evidence of the disadvantages experienced by vulnerable groups increasing.

Table i: Table of indicators plus projected trends for the no project scenario and trends found in 2017. DD refers to data deficiency. Projected trends under the no project scenario are described in greater depth in Appendix C.

Category	Indicator	No project trend	2012-2022 trend
Material wellbeing	Average household BNS score	↓↑	↑
Natural resources	Resin tree ownership	↓	↓
	No. of resin trees owned	↓	↑
	No. of resin trees lost	↑	↓
	NTFP collectors	↓	→
	Wild meat meals consumed	↓	↑
Land use	Average land holdings	↓↑	↑
	Rice sufficiency	→	↑
	Land sufficiency	→	↑
Threats	Land alienation	↑	↑
	Lack of voice	↑	↓
	Limited agricultural productivity	↑→	DD
	Scarcity of off-farm livelihoods	→	↓
	Household debt	↑	↑

1 Introduction

1.1 Background

Keo Seima Wildlife Sanctuary (KSWs) is a protected area (PA) located in the Eastern Plains Landscape of Cambodia and covers an area of 2,927 km² (Fig. 1). Originally part of the Samling International Ltd. logging concession, the site was gazetted for the purposes of biodiversity conservation in 2002 and is now managed by the Ministry of Environment (MoE) of the Royal Government of Cambodia with technical and financial support from the Wildlife Conservation Society (WCS) Cambodia Programme.

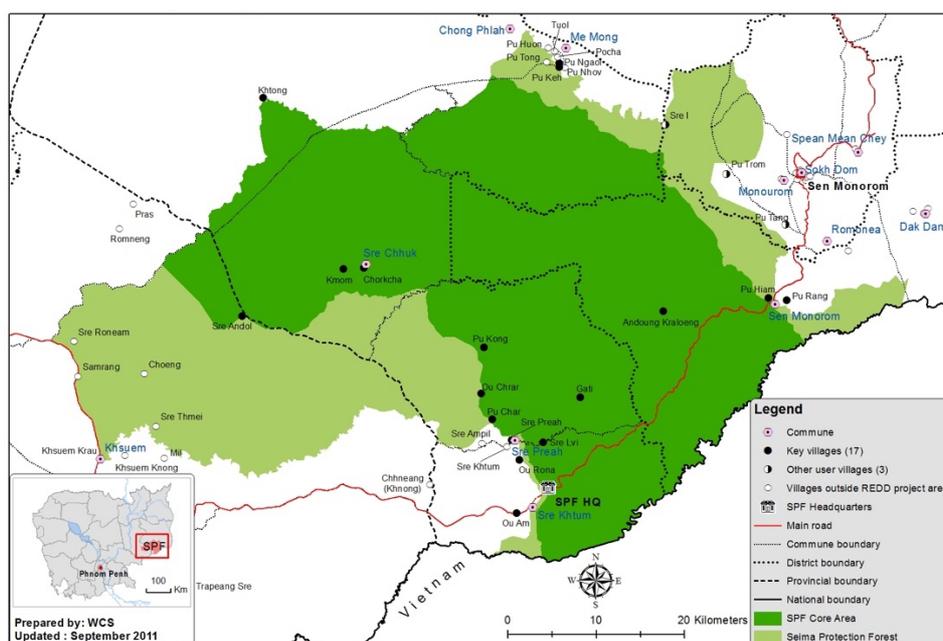


Figure 1: Map showing the 20 villages participating in the KSWs REDD+ project.

In 2010, a project was initiated at KSWs with the aim of enhancing local livelihoods and reducing emissions from deforestation and forest degradation (REDD+). This project is supported by WCS at the request of the Cambodian government. The project area is defined by KSWs's Core Protection Zone (1,885 km²), with the remaining area within the protected areas classified as a buffer zone (1,042 km²). Twenty villages located within or immediately outside the REDD+ area have elected to participate in the project, including 17 villages located within the REDD+ project area and a further three villages from which inhabitants make use of resources within the project area.

1.2 Aim

Version 3.1 of the Climate, Community and Biodiversity (CCB) standards require REDD+ project proponents to demonstrate community co-benefits in order to qualify for certification (CCB 2017). Such co-benefits are largely considered a minimum requirement by corporate buyers of credits sold on the voluntary markets, with demand increasing for credits generated by projects that have demonstrated exceptional community benefits, as defined by the CCB standards. The primary aim of the social monitoring framework designed for KSWs is to provide and assess the evidence necessary to support certification of the KSWs REDD+ project under the CCB standards.

2 Social monitoring framework

The KSWs social monitoring framework was designed to follow a theory of change-based approach to assess changes in a series of social indicators. The main instrument of the KSWs social monitoring framework is a large-scale household survey, which is repeated every five years and has now been completed three times (in 2012, 2017 and 2022).

2.1 Sampling design

The KSWs survey is conducted in the 20 villages included in the REDD+ project. These villages were identified through the initial stakeholder analysis conducted as part of the project development (Fig. 2; WCS 2015). The survey uses a repeated cross-sectional sampling design to provide longitudinal data. This means that a new random sample of households is selected for each new survey wave, with the aim to interview at least 30 households in each village during each survey wave.

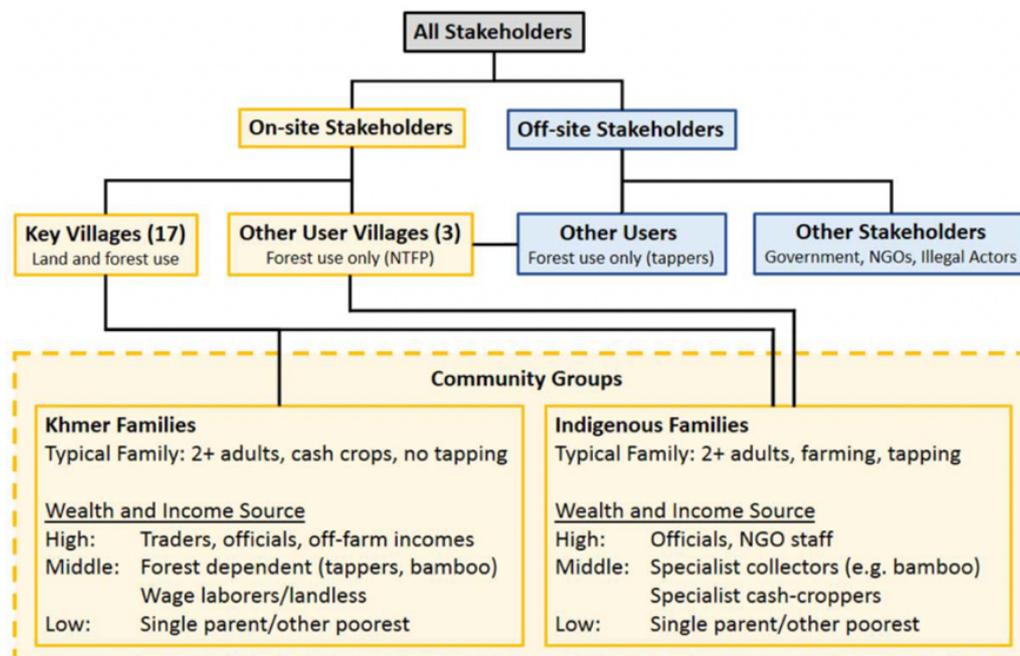


Figure 2: Stakeholders identified in the REDD+ project description (from WCS 2015).

2.2 Causal inference approach

The household survey was designed to follow Part 2 of the CCB manual for social impact assessments (Richards 2011), which recommends against the use of controls on ethical and cost grounds. As a result, the survey adopts a theory-based approach, in which the contribution of the project to observed social changes is inferred through comparison against a hypothetical counterfactual (the without-project baseline scenario). Indicators were drawn from expected or potential changes identified in the REDD+ project's conceptual model (Travers and Evans 2013), which was developed using the Open Standards approach (Conservation Measures Partnership 2007). This involved identifying a series of theoretical causal pathways through which project activities could affect the lives of people living in project villages relative to a business-as-usual scenario in which the REDD+ project was not implemented (Table 1). The without-project scenario was developed following the CCB social

assessment manual (Richards 2011) and is based on predicted trends in aspects of wellbeing most likely to be affected by the REDD+ project (WCS 2015).

Table 1: Table of indicators plus projected trends for the no project scenario and trends found in 2017. DD refers to data deficiency. Projected trends under the no project scenario are described in greater depth in Appendix C.

Category	Indicator	No project trend	2017 trend
Material wellbeing	Average household BNS score	↓↑	↑
Natural resources	Resin tree ownership	↓	↓
	No. of resin trees owned	↓	↑
	No. of resin trees lost	↑	↑
	NTFP collectors	↓	↑
	Wild meat meals consumed	↓	↑
Land use	Average land holdings	↓↑	↑
	Rice sufficiency	→	↑
	Land sufficiency	→	↑
Threats	Population growth	↑	DD
	Land alienation	→	→
	Lack of voice	↑	↓
	Limited agricultural productivity	↑→	↑
	Scarcity of off-farm livelihoods	→	↓
	Household debt	↑	↑

Making comparisons between the with- and without-project scenarios is a challenge in the context of rural Cambodia, which is experiencing rapid socio-economic change. The original intention was for qualitative data collection to support causal inferences of the social impacts of the project. However, this aspect of the design has not worked well in practice. Consequently, in the absence of supporting qualitative data or systematic assessment of alternative causal pathways for observed trends in wellbeing, the causal inferences made using this approach are less robust than initially envisaged. This has been corrected for future iterations of the survey, which will apply a new integrated methodology recommended following a review of the social impact methods in use at WCS REDD+ sites (Travers 2022).

2.3 Community and vulnerable groups

The survey identifies six community and vulnerable groups (Table 2). This is a requirement under the CCB standards and allows for analysis of net wellbeing outcomes for all identified groups in addition to the wider population. The proportion of households that fall into each of these groups varies significantly between groups and, for certain groups, has also changed significantly over time. For example, the proportion of indigenous households, which make up the majority of households within the landscape, has fallen from 80.9% in 2012 to 68.9% in 2022 as non-indigenous migrant households have moved into KSWs from other provinces. However, the proportion of widow-headed households and households engaged in wage labour have both remained largely stable, varying between a maximum of 12.4% of households in 2012 to a minimum of 5.0% in 2017 for widow-headed households and a minimum of 43.2% of households in 2017 to a maximum of 53.7% in 2022 for labour selling households. Landlessness and resin tapping are both indicators within the social monitoring framework and are addressed in greater detail in Sections 6.1 and 4.2 respectively.

Table 2: Community and vulnerable groups identified for monitoring and the reason given for their original selection (from Travers and Evans 2013).

Group	Notes
Widow-headed	Widow-headed households are likely to be more vulnerable to shocks, have fewer labour resources and fewer livelihood opportunities.
Landless	Landless households lack the means to grow their own food. Not all landless households are poor, but many are dependent on daily wage labour opportunities and/or deeply in debt.
Indigenous	At a national and global level indigenous households are typically a disadvantaged and vulnerable group and attract special consideration.
Resin tappers	In general, households collecting NTFPs are often found to be poorer and more vulnerable than average. Resin-tapping is separated as a subclass as it was traditionally the dominant use of NTFPs in the landscape.
Labour sellers	Households that are dependent on daily wage opportunities. Given the growth of wage labour in the landscape, this category is no longer useful.

2.4 Analysis

In order to account for the variation in population size between villages, projected means were calculated for the landscape, weighting by population size in each village. These projections are only at village level and so do not take account of household characteristics, such as ethnicity.

All statistical models were analysed in the lme4 package (version 1.1.32; Bates et al. 2023) in R (version 4.2.3; Core Development Team 2023) using RStudio (version 2023.03.0+386; RStudio Team 2023). For each analysis, a number of household demographic and livelihood variables were investigated as explanatory variables. Backwards stepwise model selection was carried out on the basis of Akaike Information Criterion (AICc) values. If comparison of candidate models produced a $\Delta AICc$ value of less than two then the most parsimonious model was selected, otherwise the model with the lowest AICc was selected. Interactions between key household variables and time period were tested to check whether vulnerable groups were experiencing the same trends as non-vulnerable households. Continuous variables were centred and standardised by subtracting the mean and dividing by twice the standard deviation following Gelman (2008).

3 Household material wellbeing

Indicator Description	Indicator Status/Trend	Additional Comments
Average household BNS score.	The projected average household BNS score across the landscape increased from 11.3 in 2012 to 14.4 in 2017 but fell back slightly to 13.9 in 2022.	High variation in BNS score between villages but remote villages becoming better off faster than towns. Widows, labour sellers and landless households remain vulnerable but are becoming better off at same rate as the wider population.

3.1 Household basic necessity survey score

Household material wellbeing is assessed using a score calculated using the basic necessity survey (BNS; Davies 1997). This is a participatory poverty score, which is derived from household ownership of key assets and access to basic services, such as medical care and education. The list of items included in the survey was originally generated during a workshop held in April 2012. The workshop was attended by community members from villages located across KSWs and selected to represent different livelihood zones within the PA.

To calculate the score, each respondent was asked whether they owned or had access to each of the items in turn. Respondents were also asked whether they considered each item to be a basic necessity, which was defined as “*items that everyone in the community should be able to have and nobody should have to go without*”. Household scores were calculated by weighting each item by the proportion of survey participants who responded that each item was a basic necessity and summing the number of items an individual household owned or had access to. Hence, households with a lower BNS score are poorer than households with a higher score. Items for which fewer than 50% of the sample felt met the definition for basic necessities were discounted. For the purposes of making comparisons between time periods, 2017 weightings were used throughout.

3.2 Temporal trends in household material wellbeing

While the average BNS score increased significantly from 10.2 to 14.2 between 2012 and 2017, there was no corresponding increase observed between 2017 and 2022 (Fig. 3). This suggests that average material wellbeing has plateaued over the past five years. This is despite some households surveyed in 2022 achieving a maximum score (i.e. owning or having access to all items on the list that contribute to the BNS score). There was also an increase in overall variation of BNS scores observed between 2017 and 2022, indicative of widening inequality between surveyed households. Although it is not possible to isolate the effects, it is likely that reduced economic activity during the Covid-19 pandemic contributed to the slowing of material wellbeing increases.

Modelling the combined data from each survey wave gives a similar result to the raw means presented above. After controlling for other factors, average BNS scores are estimated to have increased by 3.2 between 2012 and 2017 and 3.6 between 2012 and 2022. However, in reality, the situation is more complicated than these aggregated figures suggest, with different groups

improving their material wellbeing at different rates. Including interaction terms in the model, which allows the effects associated with different factors to change over time, shows that both the effects associated with indigenous households and households that reported having outstanding debts varied between 2012 and 2022 (Table B.1, Appendix B).

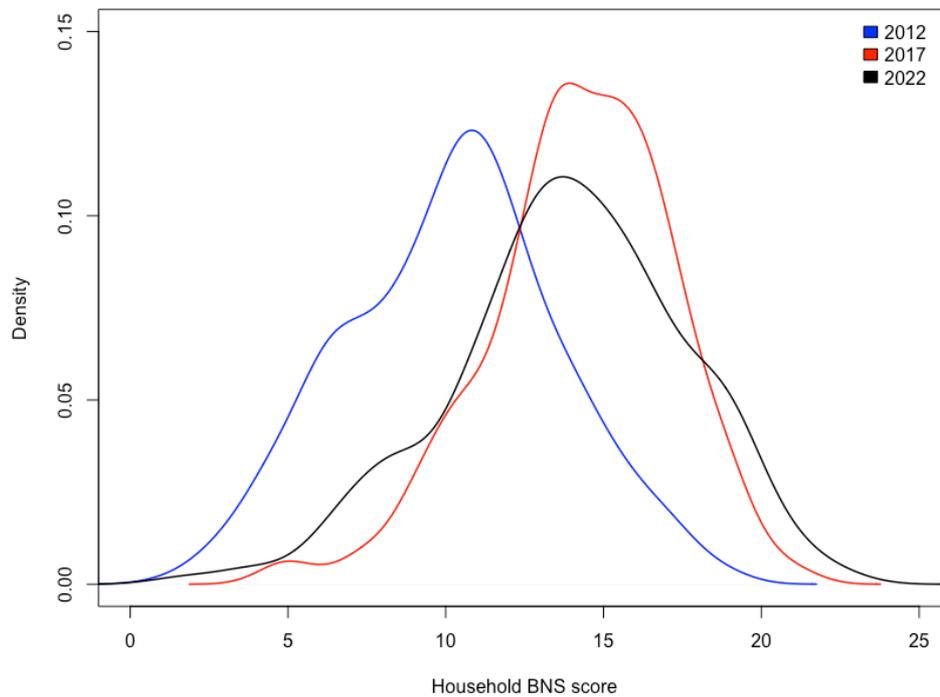


Figure 3: Basic necessity score distributions for 2012, 2017 and 2022 surveys.

For indigenous households, the average effect across the three survey waves of belonging to one or more indigenous group was a modest increase in BNS score of 0.2 relative to non-indigenous households (Table B.1, Appendix B). This is largely unsurprising as indigenous households are often more established than non-indigenous households, which have primarily migrated to KSWs from elsewhere in Cambodia. However, this average effect masks how the difference in household material wellbeing between indigenous and non-indigenous households has changed over time (Fig. 4).

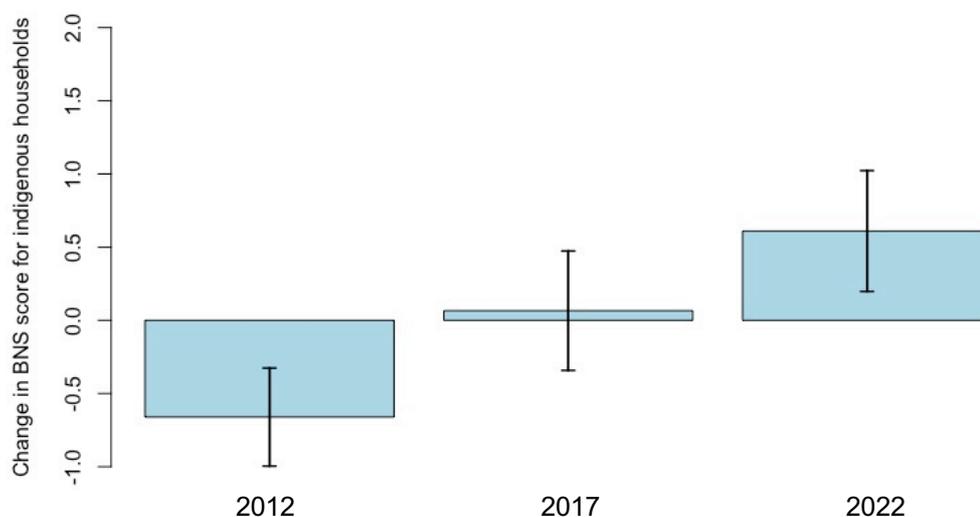


Figure 4: Indigenous households have become better off relative to non-indigenous households since 2012. Error bars show one standard error.

In 2012, the BNS score of indigenous households was on average 0.6 less than non-indigenous households. Between 2012 and 2017, the average BNS score of indigenous households increased by 0.5 more relative to non-indigenous households. In 2022, this trend continued such that the increase in average BNS score for indigenous households was estimated to be 1.1 higher than for non-indigenous households. This suggests that the material wellbeing of indigenous households has increased at a consistently greater rate than non-indigenous households over the period of the REDD+ project implementation. At the population level, this increase has been slightly cancelled out by the changing proportion of indigenous households within the surveyed sample, which has reduced from 80.9% in 2012 to 68.9% in 2022 as more non-indigenous households migrate to the area.

The situation for households that reported being in debt is similarly complex. This group can be loosely split into households that received informal loans within the community or loans from formal lending institutions such as banks or microfinance institutions (MFIs). In 2012, 29.3% of respondents reported having some form of outstanding loan. By 2022, this had increased to 52.9% of respondents. This increase in the proportion of households with outstanding loans has been driven by the massive growth in lending from formal institutions over this period from 8.4% of the survey sample in 2012 to 47.8% in 2022. This growth has been particularly strong among Khmer households, with 61.8% of non-indigenous households reporting an outstanding loan from a bank or MFI in 2022, compared to 41.5% of indigenous households. As a result of both the increasing ease with which households can access credit and the size of loans available, loans have shifted from mostly small sums taken out to cover immediate household needs to larger sums primarily used to invest in economically productive activities (see Section 6.5 for greater detail). This shift is reflected in the results of the household BNS score model. In 2012, households that reported having informal loans had average BNS scores of 0.6 lower than households without such debts (Table B.1, Appendix B). Conversely, there was no statistical difference between households with formal loans and households without. In 2022, however, households with formal loans had an average BNS score of 1.0 higher than households without such loans, whereas there was no statistical difference between households with informal loans and households without.

The model of household BNS score can also be used to assess the association between membership of a vulnerable group and household material wellbeing. This shows that widow-headed, landless and labour-selling households had significantly lower material wellbeing on average (1.1, 1.0 and 1.5 lower BNS scores respectively). Resin collectors were found to have marginally higher BNS scores, but this was not statistically significant. However, no interaction was observed for any vulnerable group, suggesting that members of these groups have increased their average household material wellbeing at the same rate as other respondents.

3.3 Spatial trends in household material wellbeing

There has been significant spatial variation observed in household material wellbeing across the monitoring period. The social impact assessment conducted in 2012 found that the average BNS scores in different villages varied significantly and that this variation had increased in the preceding five years. During this period, households in villages closer to major roads were on average better off than households in more remote villages with fewer economic opportunities. However, road access has improved significantly over the intervening period, such that households living in more remote areas of KSWs have become better off at a greater rate than households in previously better-connected villages. While the beginnings

of this reversal could be seen in 2017, the data collected in 2022 show that the process has since accelerated (Fig. 5). As a result of these changes, the projected average BNS score for the landscape, which accounts for variation in population size between different villages and had increased from 11.3 in 2012 to 14.4 in 2017, fell back slightly to 13.9 in 2022¹.

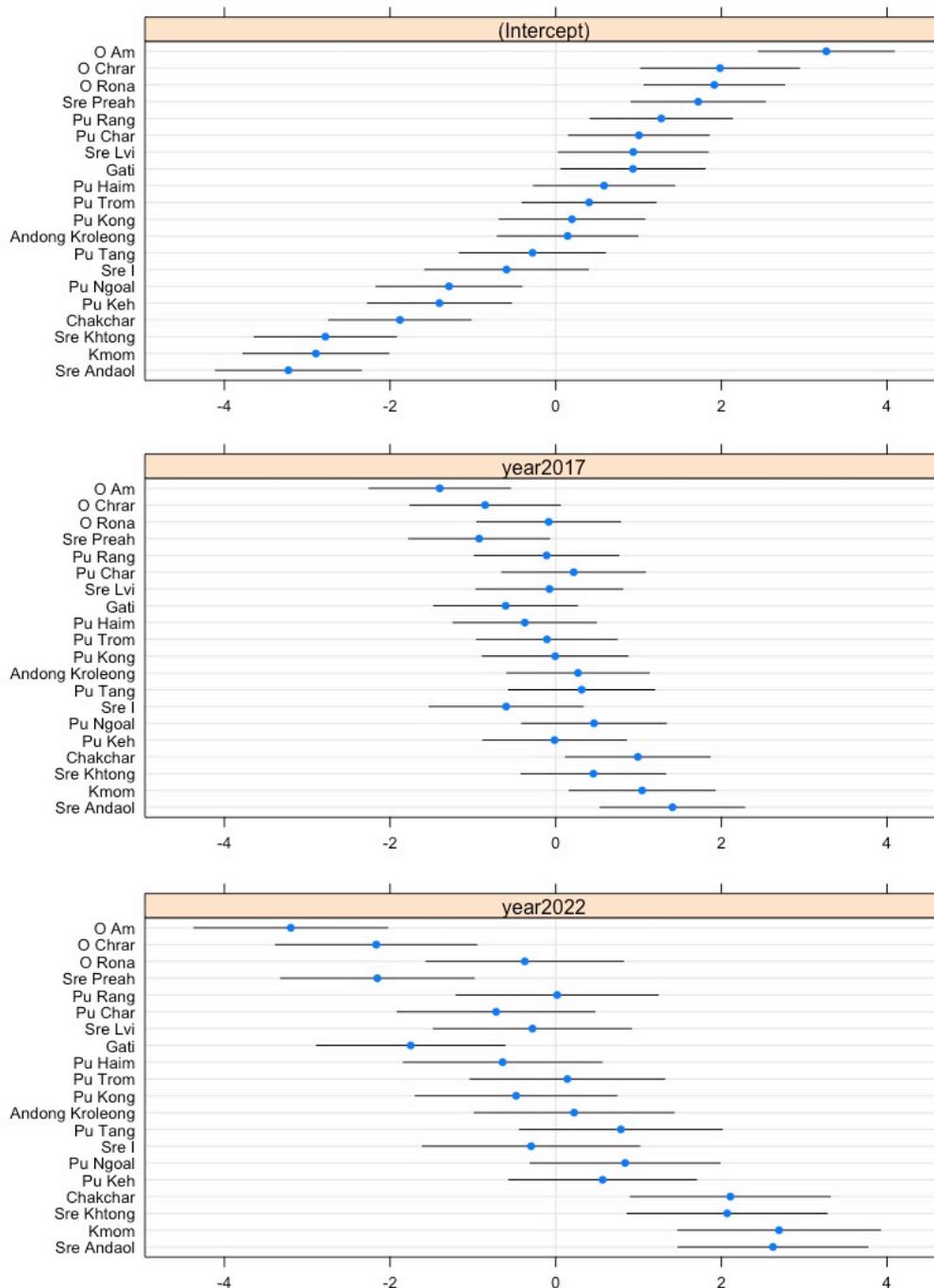


Figure 5: Changes to the average BNS score by village in 2012, 2017 and 2022.

¹ The projected average BNS values given here for 2012 and 2017 are lower than those given in previous reports because a reduced list of items has been used to calculate the scores for this report. This does not affect the overall findings.

4 Security of natural resources

Target 1 of the project conceptual model is to increase the security and productivity of natural resources to support local livelihoods. Under this target, the social monitoring framework identifies five performance indicators (Table 1).

4.1 Resin tree ownership

Indicator Description	Indicator Status/Trend	Additional Comments
Whether a household reports owning any resin trees.	The projected percentage of households owning trees has declined from 44.7% in 2006/7 to 11.4% in 2022.	Although indigenous households remain more likely to own resin trees than non-indigenous households, tree ownership among this group has collapsed.

The importance of liquid resin as a source of household income has collapsed since the start of the REDD+ project as a combination of threats, such as the loss of trees to loggers, and alternative opportunities, such as the emergence of new commodity markets, have combined to make resin tapping a significantly less attractive livelihood opportunity. This is evidenced by the steep decline in the proportion of respondent households that reported claiming customary ownership of resin trees from 44.7% in 2006/7 to 33.9% in 2012, 20.2% in 2017 and just 11.4% in 2022.

Modelling survey responses confirms that resin tree ownership suffered a significant decline between 2012 and 2022 (Table B.2, Appendix B). This decline was found to be particularly severe for indigenous households for whom, after controlling for other factors, the probability of being resin tree owners fell from 0.57 in 2012 to 0.23 in 2017 and 0.14 in 2022. In general, larger households and households that reported collecting other NTFPs were found to be more likely to own resin trees, while widow-headed households or households with at least one member in permanent employment, that were engaged in wage labour or were landless were found to be less likely to own resin trees.

4.2 Number of resin trees owned and lost

Indicator Description	Indicator Status/Trend	Additional Comments
This indicator applies only to resin tree owning households and measures how many trees they own.	Controlling for other factors, the average number of trees claimed by resin tree owning households increased from 98 in 2012 to 143 in 2017 and 136 in 2022.	There was no evidence of previously observed specialisation in resin tapping among landless households.

Despite the collapse of resin tree owning more broadly, survey responses suggest that there has been some consolidation of resin tree ownership, such that households that have maintained resin tapping as a livelihood activity have actually increased the number of trees over which they claim ownership (Table B.3, Appendix B). The data suggest that this process of consolidation largely occurred between 2012 and 2017, and that the average number of trees claimed has remained relatively stable since then. Widow-headed tree-owning

households were found to claim marginally fewer trees on average. In the past, there was also a very small group of landless households that claimed a significant number of resin trees but only two households meeting this description were interviewed in 2022.

The proportion of households that reported losing trees to loggers grew from 23 households (3.7%) in 2012 to 89 households (14.3%) in 2017 but fell slightly to 60 households (8.8%) in 2022. The average number of trees reported lost followed a similar pattern, growing from 114 in 2012 to 138 in 2017 and reducing to 80 in 2022. It is likely that the reduction in both the number of households reporting losing trees and the average number of trees reported lost between 2017 and 2022 are largely a simple consequence of the reduction in the overall stock of resin trees within the landscape due to logging. For 2022, it is also possible to compare the average number of trees lost between households living in REDD+ and control villages. Although the pattern of resin tree ownership differed slightly between these two groups, with a lower proportion of tree owners in control villages, the average number of trees reported per household was very similar (17.8 in REDD+ villages and 19.2 in control villages). The average number of trees reported lost was also broadly similar (5.8 in REDD+ villages and 3.9 in control villages). Given that the control villages receive less protection than REDD+ villages – although certain villages do fall within WCS or WWF patrol areas – these figures suggest that improved patrolling is unlikely to be responsible for the declines in trees reported to be lost.

4.3 Non-timber forest product collection

Indicator Description	Indicator Status/Trend	Additional Comments
The main indicator of NTFP collection is the number of households involved with this activity. A secondary indicator in future years will be average harvest offtakes.	Across the whole project area, the percentage of households engaged in both the collection and sale of NTFPs has remained largely stable.	NTFP collection is positively correlated with indigenous, labour selling and resin tapping households, as well as households with outstanding loans.

The collection and use of non-timber forest products has traditionally been an important component of Bunong livelihoods. As with liquid resin, some NTFPs are collected for sale as a source of income, while others, such as forest vegetables, are mostly consumed in the home. These latter resources have traditionally been particularly important for poorer, more vulnerable households. Hence, the collection and sale of NTFPs are important indicators of the security and productivity of natural resources that contribute to the livelihoods of local people.

The projected percentage of households across the landscape that collected or sold NTFPs in the 12 months preceding the 2022 survey was 42.2% and 20.6% respectively. Comparing data from all surveys since 2012 shows that the percentage of households engaged in the sale of NTFPs has remained stable. However, there has been greater volatility in the proportion of households engaged in the collection of NTFPs for domestic consumption, with a significant increase from 30.3% in 2012 to 49.0% in 2017 and a subsequent fall to 42.2% in 2022.

As in previous years, modelling the survey responses shows a strong association between the probability of a household collecting NTFPs and indigenous households, who have strong cultural ties to the forest and forest products (Table B.4, Appendix B). Other groups found to

be more likely to collect NTFPs included resin collectors, labour sellers, and households with outstanding loans. The association between households in debt and NTFP collection is interesting as it suggests that some households may be using NTFP consumption as a safety net due to constrained household finances, but the effect is relatively weak. Unsurprisingly, there is a strong spatial factor associated with the probability of collecting NTFPs, with households in remote, well forested villages (e.g. Pu Keh and Sre I) on average significantly more likely to collect NTFPs than households in more built-up areas (e.g. O Am, Pu Rang, O Rona).

4.4 Wild protein meals

Indicator Description	Indicator Status/Trend	Additional Comments
The number of meals eaten per household in one week that included wild animal protein (i.e. fish or meat).	The average number of wild protein meals increased from 2.9 per household per week in 2012 to 5.1 in 2022. Wild meat meals fell from 1.1 meals per week to 0.2.	High variation in the number of meat meals eaten per week between villages.

Although the number of wild animal protein meals (e.g. meals containing meat from either fish or terrestrial species) consumed per week is another important indicator of the contribution of natural resources to household needs, it is subject to several factors, including the abundance of harvested species, hunting effort, availability of alternative protein sources, consumption preferences and household finances. As a consequence, trends in consumption patterns can be difficult to interpret. Between 2012 and 2017, the projected average number of meals containing wild protein – either meat or fish – consumed across the landscape more than doubled from 2.9 meals per week to 6.8, whereas the number of meals containing meat from terrestrial wildlife fell from 1.1 meals per week to 0.7. In 2022, the projected average number of wild protein meals consumed fell slightly to 5.1 meals per week but remained higher than in 2012. In contrast, wild meat has been almost eliminated from people’s diets, with the average number of wild meat meals falling to a historic low of 0.2 meals per week.

Modelling the number of wild protein and wild meat meals consumed shows that broadly the same groups are associated with higher levels of consumptions. These models show resin and other NTFP collectors, larger households and those in debt more likely to consume both wild protein and wild meat, with labour sellers and widow-headed household less likely (Tables B.5 and B.6, Appendix B). Interestingly, indigenous households were found to consume significantly fewer meals containing wild meat than non-indigenous households. However, the strongest effects are spatial, with distinct differences in the number of meals consumed depending on locality.

4.5 Household resource security

Indicator Description	Indicator Status/Trend	Additional Comments
Percentage of households that report that they feel that their land, resin trees and other resources are secure.	The projected percentage of households that feel secure about their land fell from 70.0% in 2017 to 56.0% in 2022.	Households in villages without collective titles were more likely to feel secure about their land.

How secure people feel about their resources is a key indicator of the REDD+ programme's impact, particularly in relation to land given programme investment in supporting indigenous communities apply for and obtain collective land titles. This indicator has changed over time as it was originally conceived as a general indicator of how secure people feel about their resources. In 2017, the indicator was split into land and resin trees, as the trends in these two resources were thought to be diverging, and then in 2022 an additional measure was added to cover NTFPs. As a consequence, data for land and resin security were collected twice (in 2017 and 2022) and data for NTFPs in 2022 only.

For land, responses given in 2022 show that, although the majority of people interviewed still feel secure about their land, the projected proportion of people across the landscape who feel this way has fallen significantly from 70.0% in 2017 to 56.0% in 2022. The reasons given by respondents who reported that they felt insecure about access to their land can broadly be split into two types of responses (Fig. 6): concerns related to tenure insecurity (e.g. lack of a hard title) and concerns related to conflicts over land (e.g. fearing dispossession by the rich and powerful).

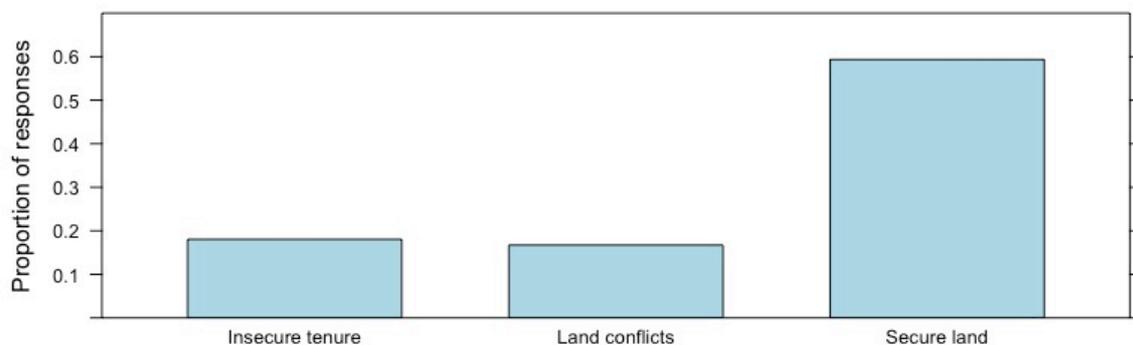


Figure 6: Summary of reasons given to explain how people feel about the security of their land.

Due to changes in the way the question of land security was asked between 2017 and 2022, it was necessary to run independent models for each year. These models show that although indigenous households were not found to feel any more or less insecure about their land than non-indigenous households in 2017 (Table B.7, Appendix B), they were 12 percentage points less likely to be feel secure about their land in comparison to non-indigenous households in 2022 (Table B.8, Appendix B). This is a particular concern given programme support for indigenous communal titles (ICTs) and the fact that non-indigenous households are more likely to be recent migrants, a group typically associated with less secure access to land. How secure people feel about their land also varied spatially. In both 2017 and 2022, households in villages that have not applied for ICTs were found to be significantly more likely to feel secure about their land than households in villages with either existing or provisional communal title.

For resin trees, despite the proportion of resin tree owners declining significantly, the projected percentage of tree owners that feel secure about their resin trees has remained stable from 2017, increasingly very slightly from 30.9% in 2017 to 32.9% in 2022.

5 Land use and agricultural productivity

Target 2 of the project conceptual model is to ensure sufficient farmland is available to support the livelihoods of current residents of KSWS. Under this target, the social monitoring framework identifies two performance indicators (Table 1): the area of land farmed and average household land/rice sufficiency.

5.1 Household Land Use

Indicator Description	Indicator Status/Trend	Additional Comments
Average household productive land holdings.	The projected average household land holdings increased from 2.1 ha in 2012 to 2.6 ha in 2017 and 3.4 ha in 2022.	Cash crop growing households had an average of 1.38 ha more than other households.

The average area of productive land claimed per household is a key indicator of household productivity across the KSWS landscape. The importance of this indicator has only increased as access to markets has improved and agriculture has become a more important source of income. Access to land has also been a key focus of conservation activities, with significant effort put into supporting local communities to apply for and obtain ICTs, and government policy. There has also been significant encroachment into areas of KSWS where agriculture is not permitted, including in the provisional core and conservation areas. Hence, although increases in the area of land claimed are indicative of social benefits, such increases are likely to have associated conservation costs. The projected average land holdings increasing from 2.1 ha in 2012 to 2.6 ha in 2017 and 3.4 ha in 2022. However, this trend masks an increasing inequality with respect to land ownership, with a greater proportion of landlessness and households claiming more than 5 ha reported in 2022 (Fig. 7).

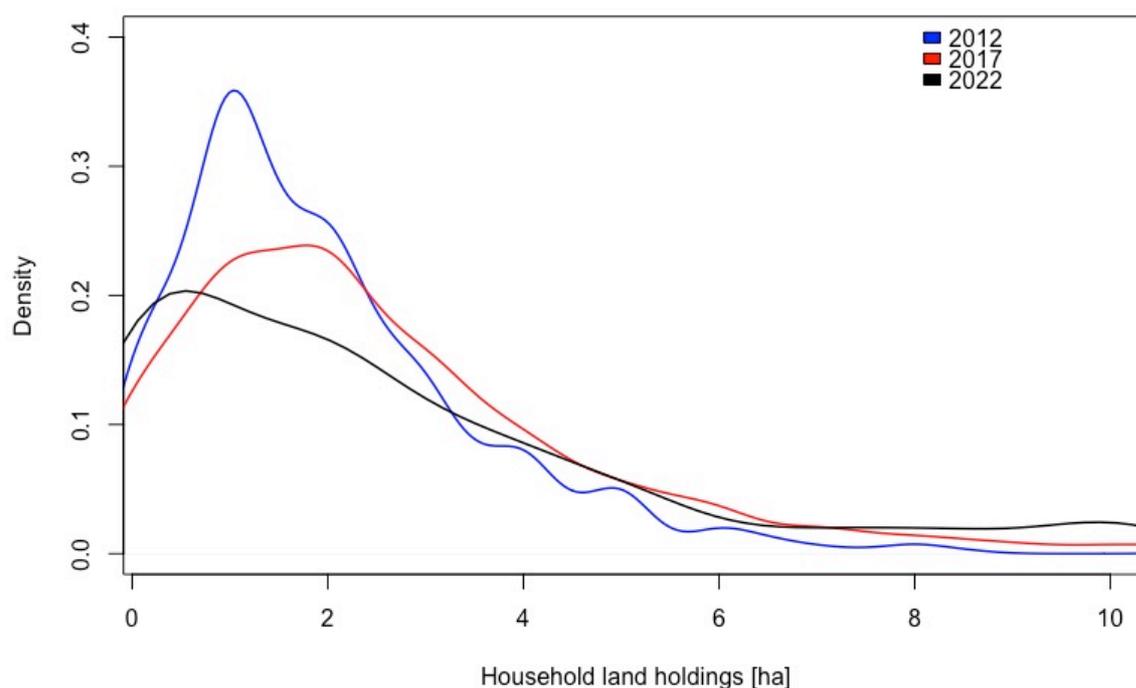


Figure 7: Distribution of reported productive land holdings in 2012, 2017 and 2022.

Modelling the area claimed per household confirms the significant increase in productive land since the start of the REDD+ project (Table B.9, Appendix B). Although some household characteristics were found to be significantly associated with household land holdings, most of these effects were small (less than 0.25 ha on average). For example, indigenous households were found to have 0.25 ha more productive land on average than non-indigenous households, while labour selling households were found to have 0.14 ha less land on average. The single biggest predictor of the area of land claimed was whether a household produced cash crops, with these households found to have an additional 1.38 ha on average.

5.2 Land sufficiency

Indicator Description	Indicator Status/Trend	Additional Comments
Percentage of households with sufficient land to meet annual rice consumption needs.	The projected percentage of households across project area sufficient in rice or with sufficient land to be able to meet annual rice needs fell from 80.3% in 2017 to 68.1% in 2022.	Indigenous households were significantly more likely to be rice and land sufficient than non-indigenous households.

Given the potentially negative conservation impacts of unchecked agricultural encroachment into KSWs, the rice and land sufficiency indicators complement average productive land holdings by quantifying the percentage of households that are able to meet their own subsistence needs. Rice sufficiency is a measure of the percentage of households that produce sufficient rice to meet their consumption needs directly. As not all households prioritise subsistence production, land sufficiency provides a complementary measure, which is calculated by summing a household's reported rice yields with the predicted yields if all other productive land was given to rice production (assumed to be 1T/ha) and subtracting the household's reported consumption needs. This provides a conservative measure of whether a household would be able to feed themselves from their own production if they used their reported land holdings for rice production.

Projected rice sufficiency was found to have remained largely stable between 2017 and 2022 (42.5% and 40.4% respectively), having risen from 23.7% in 2012. However, the projected percentage of land sufficient households fell over the same period from 80.3% in 2017 to 68.1% in 2022. This is broadly in line with the finding that there was a greater proportion of households without any productive land in 2022. Modelling the two indicators shows that, in 2012, indigenous households were 17.1 percentage points more likely than non-indigenous household to be rice sufficient and 19.3 percentage points more likely to be land sufficient (Tables B.10 and B.11, Appendix B). This effect increased in 2022, with indigenous households 11.4 percentage points more likely to be rice sufficient than non-indigenous households and 13.7 percentage points more likely to be land sufficient. These results suggest that, while some non-indigenous are in a more precarious situation than in the past - lacking sufficient land to be able to support themselves - indigenous households are increasingly food secure through as a result of their own production.

6 Threats to project outcomes

The social monitoring framework identifies five performance indicators related to threats project outcomes (Table 1).

6.1 Land alienation

Indicator Description	Indicator Status/Trend	Additional Comments
The main indicator of land alienation is the percentage of households with no productive land.	The projected percentage of landless households increased significantly from 9.7% in 2017 to 19.6% in 2022.	In 2022, a third of landless households reported being landless through choice.

Land alienation is a complex issue that is becoming increasingly stark throughout rural Cambodia as access to land becomes more limited. This is evident from the projected average percentage of households across the landscape with no productive land, which increased slightly from 8.7% in 2012 to 9.7% in 2017 but has since grown significantly to 19.6% in 2022. Of the households that reported having no productive land in 2022, a third of these reported that this was through choice, whereas the remaining two thirds reported this as being due to being unable to access land. Many of these households have small plots of residential land but report being unable to afford agricultural land. These results suggest that, while some landlessness is through choice, the majority is due to barriers to accessing land. This points to a growing inequality between those that have access to productive agricultural land and those unable to afford access.

Modelling the survey responses shows that, once other factors are controlled for, indigenous households are approximately four times less likely to report having no productive land than non-indigenous households, whereas labour selling households are approximately 32% more likely to be landless (Table B.12, Appendix B). These findings add support to the hypothesis that migrating households, which often lack familial ties and are therefore unlikely to benefit from inheriting or gifts of land, may find themselves only able to find wage labour if they are unable to afford land. There is a risk that this process traps poor migrant households in a poverty trap, while enriching households with more land and helping drive further encroachment into KSWs.

6.2 Weak traditional institutions and lack of voice

Indicator Description	Indicator Status/Trend	Additional Comments
Percentage of respondents that attended a village meeting in the past year.	Projected household attendance of village meetings is 59.6% of respondents across the project area.	Of the respondents that attended village meetings in 2022, 55.8% reported playing an active role.

Village meetings are a sign of a healthy civil society within project villages and individual engagement within that society. As such the percentage of respondents that attended village meetings over the course of the year preceding the survey provides a useful measure for how engaged local people are within their communities. In 2012, the projected average percentage of respondents that had attended at least one village meeting in the past year was 37.6%.

This grew significantly to 73.8% of respondents in 2017 but fell slightly to 59.6% in 2022. Of the respondents that attended village meetings in 2022, 55.8% reported playing an active role.

Modelling the likelihood of having attended at least one meeting over the course of the previous year shows that none of the vulnerable groups identified in the monitoring framework were less likely to have attended a meeting (Table B.13, Appendix B). Controlling for other factors, indigenous households were 35.7% more likely to have attended at least one village meeting than non-indigenous households and, in 2022, labour sellers were 31.0% more likely to have attended than non-labour sellers. This is a reassuring result, as it suggests that vulnerable groups are not being excluded from participating in village institutions or denied a voice.

In 2022, all female respondents were asked if they regularly attended village meetings or meeting of another group. Of these female respondents, 37.1% reported that they regularly attended meetings.

6.3 Limited agricultural productivity

Indicator Description	Indicator Status/Trend	Additional Comments
Average productivity of cassava and rice fields.	No result in 2022.	No result in 2022.

In 2022, the results related to agricultural productivity were considered to be too unreliable to assess. These results rely on reported areas and yields, which for key crops such as cashew and cassava, can be unreliable. Unfortunately, mistakes made by enumerators during the survey – such as failing to check contradictory responses – increased the level of unreliability associated with this indicator.

6.4 Scarcity of sustainable development, livelihood opportunities, on- and off-farm

Indicator Description	Indicator Status/Trend	Additional Comments
Percentage of households involved in off-farm livelihood activities.	Projected 55.5% of households across project area involved in off-farm livelihood activities.	Nearly all households surveyed (60.4%) are involved in the production of cash crops.

The proportion of households involved in off-farm livelihood activities is an important indicator of sustainable development across the 20 REDD+ villages. Agricultural land is a finite resource and, while reserve land has been identified within each of the ICT areas and land use plans to allow for population growth, continued expansion of agricultural land holdings and immigration will threaten to constrain household livelihoods without diversification of livelihoods. As such, the proportion of households pursuing off-farm income generating activities provides a measure of resilience to land constraints.

Although the percentage of households engaged in off-farm livelihood activities grew significantly between 2012 and 2017 from 29.0% of households to 60.6%, there was a slight decline in 2022 to 55.1%. This matches similar trends seen on other key indicators that suggest there was a slight contraction of economic opportunities over the period from 2017 to 2022, which may indicate an effect from the Covid-19 pandemic. Of the off-farm activities

considered, only the provision of village services has seen meaningful increases, rising from 11.1% in 2017 to 20.4% in 2022. In terms of different livelihood categories included in the social monitoring framework, the two agriculture-based activities of cash crops and wage labour still dominate (Fig. 8). It is notable that the proportion of households engaged in cash crop production has followed a similar pattern as those engaged in off-farm livelihoods, growing from 65.2% of households in 2012 to 83.8% in 2017, before falling again to 60.4% in 2022.

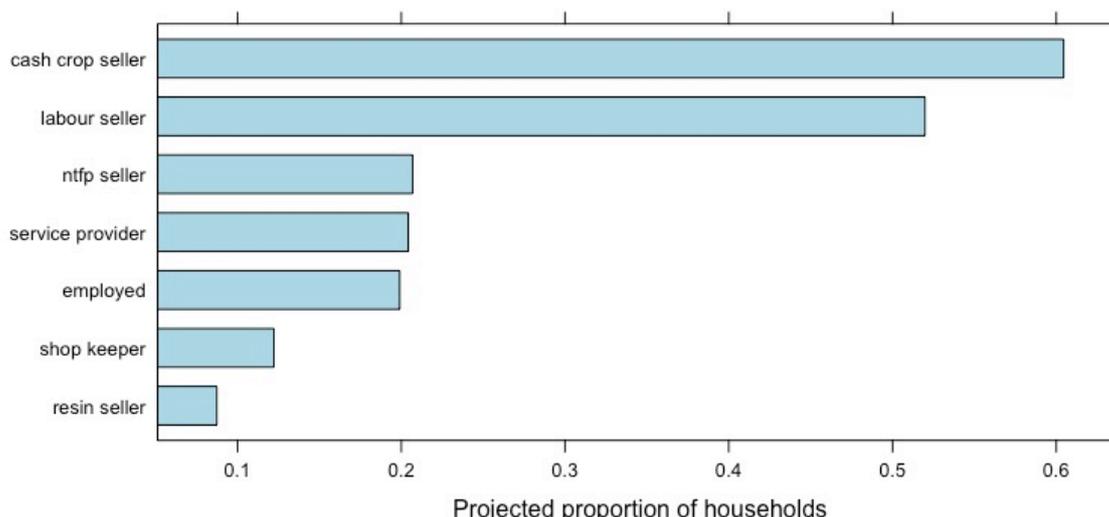


Figure 8: Proportion of households in 20 REDD+ villages engaged in different livelihoods in 2022.

Modelling the probability of being engaged in off-farm livelihoods shows that indigenous and labour selling households were 53% and 45% less likely respectively than other households to work off-farm in 2012 once other factors were controlled for (Table B.14, Appendix B). However, in both cases, these households were found to have broadly the same probability of having off-farm work as other families in 2022, suggesting that they have been able to successfully diversify their livelihoods over this period. Widow-headed households were also found to have a lower probability of being engaged in off-farm activities, but this has remained unchanged since 2012. Resin tapping, landless and educated households were all found to have a greater likelihood of working off-farm.

6.5 Household Debt

Indicator Description	Indicator Status/Trend	Additional Comments
Average outstanding loans to microfinance institutions and proportion of households with outstanding loans.	The percentage of households with outstanding loans increased from 29.8% in 2012 to 52.8% in 2022. Average debt to MFIs rose from \$358 in 2012 to \$3,656 in 2022.	An estimated \$13.2 million worth of loans are projected to be secured with land across the 20 REDD+ villages.

The nature of household debt has changed significantly over the period in which the social monitoring framework has been implemented. In 2012, the majority of households that reported being in debt had outstanding loans with members of their own community, largely with relatives or friends. These loans were typically for relatively small sums and were often

used to meet immediate household needs. By 2022, the significant majority of loans were with formal institutions (banks or microfinance institutions) and were for significantly higher sums. In this way, the role of debt has moved from predominantly acting as a social safety net for households in financial difficulty to serving as credit for investments in income generation. As a consequence, the profile of households with outstanding loans has changed significantly over this period.

Since 2012 the projected percentage of households with outstanding loans across the 20 REDD+ villages has increased from 29.8% in 2012 to 52.8% in 2022. Over the same period the percentage of households with loans from MFIs or banks has increased from 13.2% to 46.8%, while the percentage with informal loans from within the community has dropped from 17.1% to 8.6%. The average outstanding sum owed by indebted households has risen by an order of magnitude from \$358 in 2012 to \$3,656 in 2022, while per capita debt has increased from \$103 per household to \$1,923.

The profile of households with outstanding debts has also changed over the period from 2012 to 2022 (Table B.15, Appendix B). For example, compared to non-indigenous households, indigenous households were equally likely to have outstanding loans in 2012 but 15.4 percentage points less likely to have outstanding loans compared to other households in 2022. Conversely, labour selling households were 15.0 percentage points more likely to have outstanding loans in 2012 relative to households not engaged in wage labour, but this had dropped to 4.5 percentage points in 2022. The effect of other household characteristics were found not to vary over time. Widow-headed and older households were found to be less likely to report outstanding loans, whereas larger households and household heads with higher levels of education were more likely.

Given concerns about the risk of bad debts serving to drive forest clearance and result in negative social outcomes, additional questions were added to the survey in 2022 to better understand the extent of these risks. In 2022, 32.4% of households reported that they have struggled with loan repayments. Of the strategies such households adopt in situations where they struggled to meet loan repayments, the majority (72.0%) reported renegotiating the terms of the loan with the lender (Fig. 9). Another commonly reported strategy was to borrow informally, either from relatives (33.1%) or private lenders (12.7%). In both these cases, households are able to meet immediate demands for repayments but sink further into debt through formal bridging loans or informal lending from within their community.

One strategy notable by its absence was selling land to meet loan repayments, a widely documented practice in other parts of Cambodia (Green & Bylander 2021). This is surprising given the extent to which loans from MFIs or banks have been secured through some form of land title, either legally registered hard titles or so-called soft titles produced by local authorities that recognise a household's claim over land without granting legal title. There is also evidence that land inside ICTs, which remains state land, has been used to secure loans. Across the 20 REDD+ villages, loans totalling approximately \$13.2 million are projected to be secured with land. This represents about 85% of the total value of loans held by households within these villages.

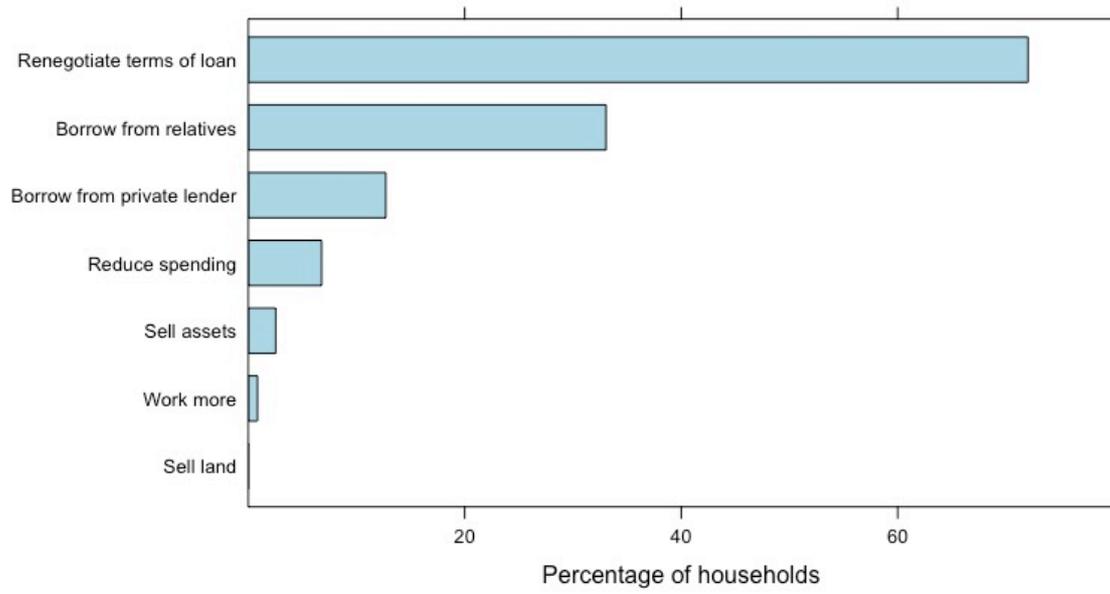


Figure 9: Reported strategies adopted by households struggling to make loan repayments.

7 Conclusion

The overall picture of social change across the 20 REDD+ villages between 2017 and 2022 is mixed, although this finding is perhaps unsurprising given that this period included the worst effects of the Covid-19 pandemic. However, it appears that there have also been several inter-related systemic changes ongoing during this period that have affected key social indicators. The first of these trends appears to be a continuing divergence between households able to access productive land - those able to afford to buy land, willing to clear land (although available land is becoming increasingly distant from settlements), able to access reserve land held inside ICTs or have inherited land from relatives – and households without access. In the five years between 2017 and 2022, the proportion of households in KSWs that reported no productive land doubled. This matches a broader trend seen elsewhere in Cambodia and is often driven by incoming migration associated with labour opportunities.

The second important trend is increasing access to credit, enabling households to make on-farm investments in agricultural machinery, inputs and labour or off-farm livelihood opportunities, which have seen a significant increase since 2012. In KSWs, the proportion of households with outstanding loans from MFIs has increased by 250% since 2012, while the average value of outstanding loans has increased by an order of magnitude. This trend has also been observed elsewhere and has been found to be driving agrarian transition throughout rural Cambodia.

Finally, there is some evidence of decreasing use of natural resources, with further significant declines in the proportion of households claiming customary ownership of resin trees and in the proportion of meals consumed containing wild meat. However, use and sale of NTFPs other than liquid resin has remained largely stable and the proportion of meals containing some form of wild protein (i.e. meat and fish) continues to increase. This trend is tied both to reductions in available resources – as evidenced by analyses of forest cover and population estimates of key indicator species – as well as changing preferences within local communities.

Although household material wellbeing - as measured by the BNS - fell slightly between 2017 and 2022, the average household score remains significantly higher than that recorded in 2012. Indigenous households – a key focus group of all social interventions in KSWs – were found to have continued to improve their material wellbeing significantly relative to non-indigenous households. However, there is evidence of increasing inequality within the REDD+ villages, with a widening of the distribution of wellbeing scores. This trend is further supported by the increasing proportion of households that report no access to productive agricultural land and associated declining proportion of land sufficient households. As with overall material wellbeing, however, indigenous households were found to be significantly more likely to have access to productive land than non-indigenous households. Although, they were also found to feel less secure about access to their land.

Comparison between the trends observed in the key indicators selected for the social monitoring framework since 2012 and the without-project predicted trends are still strongly favourable, with significant improvements in material wellbeing notable (Table 3). However, there are signs in many indicators that some of the gains made between 2012 and 2017 have been reversed. Whether these reversals were associated with Covid-19 or whether they result from one or more of the broader systemic changes that are being observed across the

landscape is not yet clear. In this regard, future assessments will benefit from the inclusion of comparison of changes against control villages and from a reduced period between survey waves. Despite the reversals observed in some indicators, all indicators show an improved (9 indicators) or similar performance (four indicators) to that expected under the no project scenario. As such, the survey findings suggest that the project continues to have a net positive impact on households (including those belonging to vulnerable groups) living inside each of the 20 villages participating in the REDD+ project. Although certain vulnerable groups, notably widow-headed households, continue to experience disadvantages in relation to certain indicators, there have been improvements against some indicators and there is no evidence of the disadvantages experienced by vulnerable groups increasing.

Table 3: Table of indicators plus projected trends for the no project scenario and trends found in 2017. DD refers to data deficiency. Projected trends under the no project scenario are described in greater depth in Appendix C.

Category	Indicator	No project trend	2012-2022 trend
Material wellbeing	Average household BNS score	↓↑	↑
Natural resources	Resin tree ownership	↓	↓
	No. of resin trees owned	↓	↑↑
	No. of resin trees lost	↑↑	↓↓
	NTFP collectors	↓	→
	Wild meat meals consumed	↓	↑
Land use	Average land holdings	↓↑	↑↑
	Rice sufficiency	→	↑↑
	Land sufficiency	→	↑↑
Threats	Land alienation	↑	↑↑
	Lack of voice	↑	↓↓
	Limited agricultural productivity	↑→	DD
	Scarcity of off-farm livelihoods	→	↓
	Household debt	↑	↑

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Appendix A: Household Questionnaire

Interviews should be conducted with the individual on the list of selected interviewees. If they are unavailable, interview their spouse or another adult from the same household.

Interviewer _____ Date _____ Time _____

Name of respondent as written in village book _____

Tel. of respondent _____ Equity card number _____

Village _____ Settlement _____

1. Household Demographics

1.1 How many members in your household? _____ Female _____ Male _____

1.2 Please list all members of your household.

Enter data for the interviewee first. For the purposes of this survey, a household should be an **economic unit**. i.e. a group of people that share their wealth. A household could be more than one family, e.g. newly married children may stay in the same household as their parents. Write full names as they appear in the village book, not nicknames.

No	Name [in Khmer]	Age	Sex M/F	Education [#yr]	In education (Grade)	Function in HH (Code A)	Family Status (Code B)	Literate (Yes/No/ Unknown)	Ethnicity
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									

Code A: 1=Household head 2=HH head spouse 3=Children
4=Children-in-law 5=Parents 6=Relatives

Code B: 1=Married 2=Single
3=Widow/widower 4=Divorced/separated

2. Physical Capital

2.1 What land does your household own or use?

If there are multiple plots list all. Yield data should be collected in the most appropriate units (eg number of rice sacks (bay) for rice yields or kg for cassava). Sizes of all units should be checked locally. **Ask about fallow or forest land that may not be under current cultivation.**

No	Land type (code A)	W (m)	L (m)	Area (m ²)	Access to land (Code B)	Crop type (last year)	Yield last year
1							
2							
3							
4							
5							
6							
7							
8							

Code A: 1= Residential 2= Non-rice chamkar 3= Rice chamkar
4= Paddy 5=Fallow 6=Forest

Code B: 1=Cleared 2=Bought 3=Rent in
4=Rent out 5=Inherited 6=Gift

If households report no productive land (i.e. Code A = 2, 3 or 4), follow up with question 2.2. Otherwise, jump to question 2.3.

2.2 Your household does not currently have access to any productive land, is this through choice or because you have been unable to access land?

Choice

Access If access, why can't you access land? _____

If households report using paddy land, follow up with question 2.3. Otherwise, jump to question 2.4.

2.3 For your paddy rice, do you use a nursery or broadcast the seed?

Nursery

Broadcast If broadcast, why do use this method? _____

2.4 Did you buy any land in the last 5 years? Yes No

If yes, what size? _____ m² (Width _____ m x Length _____ m)

What price? _____ riel

2.5 Did you sell any land in the last 5 years? Yes No

If yes, what size? _____ m² (Width _____ m x Length _____ m)

What price? _____ riel

How was the land used by your household before the sale?

Why did you sell the land?

<input type="checkbox"/> To repay informal debt	<input type="checkbox"/> To repay formal loans (MFI/Bank loans)
<input type="checkbox"/> To pay for hose construction	<input type="checkbox"/> To pay for health expenses
<input type="checkbox"/> To pay for a wedding or funeral ceremony	<input type="checkbox"/> To buy land elsewhere
<input type="checkbox"/> To buy farm machinery	<input type="checkbox"/> Other, please specify: _____

2.6 How many cows and buffalo does your household own? _____ total

2.7 How many resin trees does your household own? _____

2.8 Did you buy any resin trees in last 5 years?

Yes If yes, how many? _____ trees What was the price paid (total)? _____ riel

No

2.9 Did you sell any resin trees in last 5 years?

Yes If yes, how many? _____ trees What was the price paid (total)? _____ riel

No

2.10 Have any of your resin trees been cut down by other people in the last 5 years?

Yes If yes, how many did you lose: _____

No

3. Livelihoods

3.1 Does anyone in your household have a job? Yes No

Individual (Name)	Job type	Salary [riel/month]	No. of months worked [months/year]

3.2 Does anyone in your household sell their labour? Yes No

Individual (Name)	Purpose of labour	Wage [riel/day]	Days worked per month	Approx. no of months worked last year

3.3 What did your household earn from selling agricultural produce in the last 12 months?

No	Crop type	Total sold (in Kg)	Price [riel/Kg]	Where did you sell (code)?
1	Paddy rice			
2	Chamkar rice			
3	Cashew			
4	Cassava			
5	Rubber			

Code (allow multiple): 1=Inside village 2=At market (specify) 3= Outside village

3.4 Did your household use any agricultural chemicals last year? Yes No

No	Crop type	Use (code)	Amount used	Reason used
1				
2				
3				
4				

Code: 1=fertiliser 2=herbicide 3=pesticide 4=fungicide

3.5 Does your household operate any enterprises in the village?

No	Service	Tick
1	Village shop	<input type="checkbox"/>
2	Rice threshing service	<input type="checkbox"/>
3	Rice milling service	<input type="checkbox"/>
4	Produce rice wine	<input type="checkbox"/>
5	Karaoke shop	<input type="checkbox"/>
6	Video service	<input type="checkbox"/>
7	Generate electricity / charge battery	<input type="checkbox"/>
8	Resin trader/collector	<input type="checkbox"/>
9	Cassava trader/collector	<input type="checkbox"/>
10	Cashew trader/collector	<input type="checkbox"/>
11	Rubber nursery	<input type="checkbox"/>
12	Blacksmith	<input type="checkbox"/>
13	Mechanic	<input type="checkbox"/>
14	Carpenter	<input type="checkbox"/>
15	Rent buffalo for ploughing	<input type="checkbox"/>
16	Rent koyun for ploughing	<input type="checkbox"/>
17	Moto service	<input type="checkbox"/>
18	Ecotourism	<input type="checkbox"/>
19	Other _____	<input type="checkbox"/>

3.6 What did your household harvest from the forest in the last 12 months?

This table can include any forest product, including timber and wildlife.

No	Forest product	Amount collected [units/trip]	# trips last year	Price [riel/unit]
1	Liquid resin			
2	Hard resin			
3	Rattan			
4	Bamboo			
5	Mushrooms			
6	Vine/liana			
7	Wild vegetable			
8	Wild fruit			
9	Honey			
10	Building materials			
11	Other (specify) _____			

3.7 Do you receive money from anyone working elsewhere in Cambodia or abroad?

Yes If yes, how much did you receive in the past 12 months: _____ riel

No

4. Consumption

4.1 How much rice does your household cook per day? _____ kg/day

4.2 How many months did your household eat rice from your own production last year?
_____ months

4.3 How many times in the past seven days did you eat wild food you had harvested?

No	Food type	No. of meals
1	Meat	_____/21
2	Fish	_____/21
3	Wild vegetable	_____/21
4	Wild fruit	_____/21
5	Other _____	_____/21

5. Household debt

5.1 Does your household currently have an outstanding loan? Yes No

Lender	Amount [Riel]	Amount outstanding [Riel]	Interest rate % in month	When did you borrow?	What was used as collateral?
Saving group					
Rice bank					
Private money lender					
Relatives/neighbours					
MFI					
Bank					
Other _____					

[If respondent has an outstanding MFI or bank loan]

How many outstanding loans do you have with an MFI or bank? _____

5.2 If yes, what were the three main purposes of taking the loan?

<input type="checkbox"/> To buy farm or other tools/implements	<input type="checkbox"/> To buy food/goods for the HH
<input type="checkbox"/> To buy inputs such as seeds/fertilizers/ pesticides	<input type="checkbox"/> To pay for building materials
<input type="checkbox"/> To buy livestock	<input type="checkbox"/> To pay for health expenses
<input type="checkbox"/> To pay for hired labour	<input type="checkbox"/> To pay for education expenses
<input type="checkbox"/> To buy land	<input type="checkbox"/> To pay for debt
<input type="checkbox"/> To pay rent/taxes	<input type="checkbox"/> For wedding
<input type="checkbox"/> To start or additionally equip an off-farm business	<input type="checkbox"/> Support migration of a relative
<input type="checkbox"/> For funeral	<input type="checkbox"/> Other, please specify: _____

5.3 If yes, how did you actually spend the loan?

<input type="checkbox"/> To buy farm or other tools/implements	<input type="checkbox"/> To buy food/goods for the HH
<input type="checkbox"/> To buy inputs such as seeds/fertilizers/ pesticides	<input type="checkbox"/> To pay for building materials
<input type="checkbox"/> To buy livestock	<input type="checkbox"/> To pay for health expenses
<input type="checkbox"/> To pay for hired labour	<input type="checkbox"/> To pay for education expenses
<input type="checkbox"/> To buy land	<input type="checkbox"/> To pay for debt
<input type="checkbox"/> To pay rent/taxes	<input type="checkbox"/> For wedding
<input type="checkbox"/> To start or additionally equip an off-farm business	<input type="checkbox"/> Support migration of a relative
<input type="checkbox"/> For funeral	<input type="checkbox"/> Other, please specify: _____

5.4 Have you struggled to repay a loan in the last twelve months? Yes No

If yes, what actions have you taken to cope with this situation?

<input type="checkbox"/> Negotiate with lenders	<input type="checkbox"/> Borrow from relatives with no interest
<input type="checkbox"/> Borrow from informal lenders with interest	<input type="checkbox"/> Sell belongings (e.g. motorbike, car, koyun)
<input type="checkbox"/> Sell piece of land	<input type="checkbox"/> Send children to work in the city
<input type="checkbox"/> Clear forest	<input type="checkbox"/> Cut timber
<input type="checkbox"/> Reduce domestic consumption	<input type="checkbox"/> Other, please specify: _____

5.5 Is anyone in your household a member of a community savings group? Yes No

6. Opinions

For each of the following statements, I would like you to tell me how it makes you feel.

6.1 Over the last three years, your household's livelihood has improved

Strongly disagree Disagree Neutral Agree Strongly agree Don't know

Why do you feel this way?

6.2 You feel your access to your land is secure

Strongly disagree Disagree Neutral Agree Strongly agree Don't know

Why do you feel this way?

6.3 You feel your access to products you collect in the forest is secure

Strongly disagree Disagree Neutral Agree Strongly agree Don't know

Why do you feel this way?

6.4 You feel your access to resin trees is secure [only ask people who own resin trees]

Strongly disagree Disagree Neutral Agree Strongly agree Don't know

Why do you feel this way?

6.5 Have you attended a village meeting in the past year?

Yes If yes, have you taken an active role in a meeting (e.g. made a comment or asked a question)? Yes No

No

6.6 You feel able to take an active role in village decision-making

Strongly disagree Disagree Neutral Agree Strongly agree Don't know

Why do you feel this way?

6.7 You trust the commune council

Strongly disagree Disagree Neutral Agree Strongly agree Don't know

Why do you feel this way?

6.8 You trust the CPA committee

Strongly disagree Disagree Neutral Agree Strongly agree Don't know

Why do you feel this way?

6.9 You trust the Department of Environment rangers

Strongly disagree Disagree Neutral Agree Strongly agree Don't know

Why do you feel this way?

6.10 You trust the staff of the Wildlife Conservation Society (WCS)

Strongly disagree Disagree Neutral Agree Strongly agree Don't know

Why do you feel this way?

6.11 You trust the staff of Sansom Mlup Prey (SMP)

Strongly disagree Disagree Neutral Agree Strongly agree Don't know

Why do you feel this way?

6.12 Have you had any unmet health needs in the past year?

Yes If yes, why could your needs not be met? _____

No

7. Basic Necessity

“Basic necessities are the minimum requirement for living that all households of the community should have and no-one should not have.”

No	Type of basic necessity	Is it a necessity?	Does your HH have it?
1	Having at least one week holiday per year for all family members to visit other provinces or tourist site (e.g. Siem Reap)		
2	Having three meals per day regularly for all family members		
3	Having gas-cook stove (two stoves using with 14.7Kg gas containers)		
5	Having mosquito net for all family members		
6	Having health insurance for all family members		
7	Having car battery 40 A or more (for domestic use)		
8	Having at least two big cattle (buffalos or cows) for farming		
9	Having at least one 120 L water jar for keeping water for consumption		
10	Having a fan using electricity in the family		
11	Having access to electricity (from public or own generator)		
12	Having thick blanket for all family members		
13	Having at least one long knife		
14	Having a motor-trailer (Ko Yun)		
15	Having a fridge (not cooler box)		
16	Having hand pump well or other water source at home		

No	Type of basic necessity	Is it a necessity?	Does your HH have it?
17	Having home-toilet connecting with sewer or septic tank		
18	Having one wooden wardrobe in the family		
19	Having access to a car-taxi service from village to district town?		
20	Having one motorbike in the family		
21	Having roof with zinc sheet/tile/fibro		
22	Having wooden wall house		
23	Having a television		
24	Having a washing machine using electricity		
25	Having a mobile phone		
26	Having homestead land at least 50m x 100 m or 5000m ²		
27	Having farming at least 3 ha for rice cultivation or doing chamkar?		
28	Having a concrete house		
29	Having access to water supply system (arriving at home)		
30	Having ability to send children to school at least grade 9		
31	Having an electric rice cooker		
32	Having capacity to buy two sets of new clothes for all family members each year		
33	Having plastic tent for camping in the forest		
34	Having a hammock with mosquito net		
35	Having a grass cutting machine		
36	Having a kettle for boiling water in the family		

8. Household food insecurity

No	Question	Tick if yes	Frequency (Code)
1	In the past four weeks, did you worry that your household would not have enough food?	<input type="checkbox"/>	
2	In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?	<input type="checkbox"/>	
3	In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?	<input type="checkbox"/>	
4	In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?	<input type="checkbox"/>	
5	In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	<input type="checkbox"/>	
6	In the past four weeks, did you or any household member have to eat fewer meals in a day because there was not enough food?	<input type="checkbox"/>	
7	In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?	<input type="checkbox"/>	
8	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?	<input type="checkbox"/>	
9	In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?	<input type="checkbox"/>	

- Code:** 1=Rarely (once or twice in the past four weeks)
 2=Sometimes (three to ten times in the past four weeks)
 3=Often (more than ten times in the past four weeks)

9. Household decision-making

Only ask this section if the respondent is a **woman aged between 18 and 49 who lives with her husband or partner**. Use the following codes but do not read out options.

- 1=Respondent herself 2=Husband 3=Respondent and husband jointly
 4=Another household member 5=Respondent and another household member jointly
 6=Someone outside the household 7=Household not involved in this activity

No	Question	Code
1	Who usually decides how much rice grown by your household will be kept for consumption in the household and how much will be sold?	
2	Who usually decides how much of the vegetables grown by your household will be kept for consumption in the household and how much will be sold?	
3	Who usually decides how to spend the income that you bring into the household?	
4	Who usually decides how to spend the income that your partner brings into the household?	
5	Who usually decides about making smaller purchases, such as food or less expensive items?	
6	Who usually decides about making more expensive purchases, such as new animals or household equipment?	
7	Who usually decides on which family members you will visit and when?	
8	Who usually decides whether your child will be taken to a health facility when s/he is sick?	
9	Who usually decides whether you or your partner will use any types of contraception, such as condoms or pills?	
10	Who decides how many children you will have?	

10. Participation in community groups

Only ask this section if the respondent is a **woman**.

10.1 Do you regularly attend meetings of any village committee? Yes No

10.2 Do you regularly attend meetings of any other group?

Yes If yes, what is the focus of the group? _____

No

11. Subjective wellbeing

I am now going to give you a series of questions about how you feel about your life. For each one, I would like you to tell me how you feel on a scale of 0 to 10, where 10 is the best possible for you and 0 is the worst possible for you.

11.1 How do you personally feel about your life at this time? _____

11.2 How do you personally feel about your livelihood at this time? _____

11.3 How do you personally feel about your health at this time? _____

11.4 How do you personally feel about your relationships with the people that are important to you? _____

Appendix B: Statistical model tables

Statistically significant estimates are shown in **bold**. Continuous variables were centred and standardised following Gelman (2008).

Table B.1: Parameter estimates for model of household BNS scores over time.

	BNS score	
	mean	95% CI
Intercept	10.699	(9.763, 11.633)
<i>Time effects</i>		
2012-2017	2.938	(2.117, 3.757)
2012-2022	2.167	(1.169, 3.164)
Indigenous * 2012	-0.661	(-1.331, 0.008)
Indigenous * 2012-2017	0.727	(-0.089, 1.542)
Indigenous * 2012-2022	1.271	(0.445, 2.096)
Formal debt * 2012	-0.579	(-1.146, -0.010)
Formal debt * 2012-2017	-0.149	(-1.043, 0.745)
Formal debt * 2012-2022	0.658	(-0.335, 1.651)
Informal debt * 2012	-0.035	(-0.942, 0.872)
Informal debt * 2012-2017	0.180	(-0.867, 1.226)
Informal debt * 2012-2022	1.030	(0.014, 2.045)
<i>Vulnerable groups</i>		
Widow headed	-1.133	(-1.607, -0.657)
Resin tapper	0.263	(-0.078, 0.605)
Labour seller	-1.485	(-1.760, -1.209)
Landless	-0.940	(-1.439, -0.440)
<i>Household and livelihood variables</i>		
Household size	0.819	(0.539, 1.098)
Education	0.614	(0.316, 0.911)
Service provider	0.964	(0.544, 1.382)
Employed	0.699	(0.308, 1.089)
Shop owner	0.844	(0.399, 1.288)
Cash crop farmer	1.227	(0.856, 1.598)
Remittances	-0.836	(-1.449, -0.222)

Table B.2: Parameter estimates for model of resin tree ownership over time.

	BNS score	
	mean	95% CI
Intercept	-1.076	(-1.655, -0.495)
<i>Time effects</i>		
2012-2017	-1.528	(-1.835, -1.219)
2012-2022	-2.142	(-2.472, -1.811)
<i>Vulnerable groups</i>		
Indigenous	1.369	(0.949, 1.788)
Widow headed	-0.280	(-0.710, 0.151)
Labour seller	-0.422	(-0.684, -0.158)
Landless	-0.970	(-1.574, -0.365)
<i>Household and livelihood variables</i>		
Household size	0.665	(0.411, 0.919)
NTFP user	0.492	(0.221, 0.761)
Employed	-0.479	(-0.870, -0.08)

Table B.3: Parameter estimates for model of the number of resin tree claimed by resin tree owning households [ln(trees)] over time.

	BNS score	
	mean	95% CI
Intercept	4.251	(3.917, 4.585)
<i>Time effects</i>		
2012-2017	0.374	(0.198, 0.549)
2012-2022	0.305	(0.100, 0.508)
<i>Vulnerable groups</i>		
Indigenous	-0.040	(-0.340, 0.260)
Widow headed	-0.304	(-0.552, -0.054)
Labour seller	-0.106	(-0.257, 0.044)
Landless	0.878	(0.434, 1.322)

Table B.4: Parameter estimates for model of NTFP use over time.

	BNS score	
	mean	95% CI
Intercept	-1.690	(-2.121, -1.258)
<i>Time effects</i>		
2012-2017	1.071	(0.801, 1.340)
2012-2022	0.731	(0.458, 1.003)
<i>Vulnerable groups</i>		
Indigenous	0.674	(0.404, 0.943)
Widow headed	-0.083	(-0.445, 0.279)
Resin tapper	0.489	(0.226, 0.750)
Labour seller	0.884	(0.668, 1.100)
Landless	-0.255	(-0.606, 0.096)
<i>Household and livelihood variables</i>		
Employed	-0.492	(-0.798, -0.186)
Shop owner	-0.549	(-0.895, -0.203)
In debt	0.238	(0.017, 0.457)

Table B.5: Parameter estimates for model of wild protein consumption over time.

	BNS score	
	mean	95% CI
Intercept	-1.806	(-1.952, -1.659)
<i>Time effects</i>		
2012-2017	0.750	(0.684, 0.815)
2012-2022	0.769	(0.701, 0.836)
<i>Vulnerable groups</i>		
Indigenous	-0.042	(-0.104, 0.019)
Widow headed	-0.261	(-0.355, -0.167)
Resin tapper	0.319	(0.257, 0.379)
Labour seller	-0.039	(-0.118, 0.041)
Landless	-0.106	(-0.155, -0.057)
<i>Household and livelihood variables</i>		
Age of household head	0.070	(0.020, 0.120)
Household size	0.039	(-0.013, 0.090)
In debt	0.207	(0.156, 0.256)
NTFP user	0.279	(0.228, 0.330)

Table B.6: Parameter estimates for model of wild meat consumption over time.

	BNS score	
	mean	95% CI
Intercept	-2.990	(-3.429, -2.551)
<i>Time effects</i>		
2012-2017	-0.527	(-0.652, -0.400)
2012-2022	-2.107	(-2.311, -1.903)
<i>Vulnerable groups</i>		
Indigenous	-0.201	(-0.354, -0.046)
Widow headed	-0.184	(-0.410, 0.041)
Resin tapper	0.409	(0.285, 0.531)
Labour seller	-0.029	(-0.230, 0.172)
Landless	-0.295	(-0.406, -0.182)
<i>Household and livelihood variables</i>		
Age of household head	-0.340	(-0.468, -0.211)
Household size	0.119	(-0.002, 0.240)
In debt	0.228	(0.112, 0.343)
NTFP user	0.274	(0.160, 0.386)

Table B.7: Parameter estimates for model of reported land security in 2017.

	BNS score	
	mean	95% CI
Intercept	0.616	(-0.089, 1.321)
<i>Vulnerable groups</i>		
Indigenous	0.111	(-0.35, 0.572)
Widow headed	0.109	(-0.823, 1.041)
Resin tapper	0.376	(-0.102, 0.855)
Labour seller	-0.244	(-0.627, 0.138)
<i>Household and livelihood variables</i>		
Age of household head	0.447	(0.060, 0.833)
Educated household head	-0.100	(-0.505, 0.305)
<i>Institutions</i>		
No ICT	0.750	(0.009, 1.491)
Provisional ICT	-0.300	(-0.966, 0.367)

Table B.8: Parameter estimates for model of reported land security in 2022.

	BNS score	
	mean	95% CI
Intercept	0.343	(-0.252, 0.937)
<i>Vulnerable groups</i>		
Indigenous	-0.477	(-0.865, -0.088)
Widow headed	-0.120	(-0.733, 0.493)
Resin tapper	-0.299	(-0.798, 0.200)
Labour seller	-0.122	(-0.453, 0.210)
<i>Household and livelihood variables</i>		
Age of household head	0.468	(0.115, 0.819)
Educated household head	0.402	(0.037, 0.767)
<i>Institutions</i>		
No ICT	0.633	(0.011, 1.254)
Provisional ICT	-0.358	(-0.928, 0.211)

Table B.9: Parameter estimates for model of household land holdings [ln(area)] over time.

	BNS score	
	mean	95% CI
Intercept	-0.714	(-0.906, -0.521)
<i>Time effects</i>		
2012-2017	-0.127	(-0.260, 0.006)
2012-2022	0.042	(-0.095, 0.179)
<i>Vulnerable groups</i>		
Indigenous	0.417	(0.2897, 0.544)
Widow headed	-0.127	(-0.310, 0.057)
Resin tapper	0.134	(0.008, 0.260)
Labour seller	-0.347	(-0.447, -0.246)
<i>Household and livelihood variables</i>		
Age of household head	0.132	(0.027, 0.236)
Household size	0.410	(0.302, 0.517)
In debt	0.205	(0.082, 0.327)
Cash crop producer	1.342	(1.222, 1.460)

Table B.10: Parameter estimates for model of rice sufficiency over time.

	BNS score	
	mean	95% CI
Intercept	-0.249	(-0.806, 0.308)
<i>Time effects</i>		
2012-2017	0.205	(-0.384, 0.794)
2012-2022	-0.427	(-1.004, 0.151)
Indigenous * 2012	0.788	(0.255, 1.320)
Indigenous * 2012-2017	-0.276	(-0.979, 0.426)
Indigenous * 2012-2022	0.553	(-0.107, 1.212)
<i>Vulnerable groups</i>		
Widow headed	-0.311	(-0.730, 0.108)
Resin tapper	0.191	(-0.125, 0.507)
Labour seller	-0.969	(-1.222, -0.715)
<i>Household and livelihood variables</i>		
Age of household head	0.217	(-0.036, 0.470)
In debt	0.260	(-0.052, 0.572)
Cash crop producer	2.048	(1.764, 2.332)

Table B.11: Parameter estimates for model of land sufficiency over time.

	BNS score	
	mean	95% CI
Intercept	-0.249	(-0.806, 0.308)
<i>Time effects</i>		
2012-2017	0.205	(-0.384, 0.794)
2012-2022	-0.427	(-1.004, 0.151)
Indigenous * 2012	0.788	(0.255, 1.320)
Indigenous * 2012-2017	-0.276	(-0.979, 0.426)
Indigenous * 2012-2022	0.553	(-0.107, 1.212)
<i>Vulnerable groups</i>		
Widow headed	-0.311	(-0.730, 0.108)
Resin tapper	0.191	(-0.125, 0.507)
Labour seller	-0.969	(-1.222, -0.715)
<i>Household and livelihood variables</i>		
Age of household head	0.217	(-0.036, 0.470)
In debt	0.260	(-0.052, 0.572)
Cash crop producer	2.048	(1.764, 2.332)

Table B.12: Parameter estimates for model of land alienation over time.

	BNS score	
	mean	95% CI
Intercept	-1.603	(-2.124, -1.080)
<i>Time effects</i>		
2012-2017	-0.157	(-0.609, 0.295)
2012-2022	0.438	(0.023, 0.853)
<i>Vulnerable groups</i>		
Indigenous	-1.451	(-1.801, -1.100)
Widow headed	-0.090	(-0.715, 0.535)
Resin tapper	-0.950	(-1.528, -0.371)
Labour seller	0.326	(0.001, 0.650)
<i>Household and livelihood variables</i>		
Household size	-1.053	(-1.488, -0.618)

Table B.13: Parameter estimates for model of meeting attendance over time.

	BNS score	
	mean	95% CI
Intercept	-0.636	(-1.006, -0.265)
<i>Time effects</i>		
2012-2017	1.692	(1.309, 2.073)
2012-2022	0.636	(0.276, 0.996)
Labour * 2012	-0.028	(-0.369, 0.313)
Labour * 2012-2017	-0.103	(-0.631, 0.426)
Labour * 2012-2022	0.449	(-0.026, 0.925)
<i>Vulnerable groups</i>		
Widow headed	0.516	(0.256, 0.776)
Resin tapper	-0.075	(-0.448, 0.298)
Labour seller	0.336	(0.071, 0.601)
Landless	-0.190	(-0.522, 0.142)
<i>Household and livelihood variables</i>		
Age of household head	0.455	(0.236, 0.672)

Table B.14: Parameter estimates for model of off-farm livelihoods over time.

	BNS score	
	mean	95% CI
Intercept	-0.437	(-0.964, 0.089)
<i>Time effects</i>		
2012-2017	0.503	(-0.100, 1.105)
2012-2022	0.685	(0.096, 1.273)
Indigenous * 2012	-1.038	(-1.558, -0.518)
Indigenous * 2012-2017	1.345	(0.720, 1.968)
Indigenous * 2012-2022	0.758	(0.144, 1.371)
Labour * 2012	-0.853	(-1.266, -0.439)
Labour * 2012-2017	0.423	(-0.121, 0.967)
Labour * 2012-2022	0.720	(0.1922, 1.248)
<i>Vulnerable groups</i>		
Widow headed	-0.467	(-0.873, -0.061)
Resin tapper	1.135	(0.8421, 1.427)
Landless	0.531	(0.183, 0.879)
<i>Household and livelihood variables</i>		
Education of household head	0.766	(0.536, 0.994)

Table B.15: Parameter estimates for model of household debt over time.

	BNS score	
	mean	95% CI
Intercept	-1.087	(-1.634, -0.538)
<i>Time effects</i>		
2012-2017	0.793	(0.193, 1.392)
2012-2022	1.634	(1.037, 2.230)
Indigenous * 2012	-0.085	(-0.589, 0.419)
Indigenous * 2012-2017	-0.418	(-1.033, 0.198)
Indigenous * 2012-2022	-0.628	(-1.238, -0.017)
Labour * 2012	0.689	(0.302, 1.076)
Labour * 2012-2017	-0.348	(-0.868, 0.172)
Labour * 2012-2022	-0.432	(-0.939, 0.075)
Resin * 2012	-0.392	(-0.802, 0.018)
Resin * 2012-2017	0.699	(0.1020, 1.295)
Resin * 2012-2022	0.651	(0.013, 1.288)
<i>Vulnerable groups</i>		
Widow headed	-0.339	(-0.746, 0.069)
Landless	-0.188	(-0.527, 0.151)
<i>Household and livelihood variables</i>		
Education of household head	0.274	(0.051, 0.495)
Age of household head	-0.447	(-0.669, -0.225)
Household size	0.358	(0.133, 0.581)

Appendix C: Summary of projections and indicators

	Projection without project	Impacts on	Projection with project	Indicator (Quant)	Method*	Indicator (Qual)	Method*
<i>CCB Core Standards</i>							
Social and economic well-being of communities; distribution of costs and benefits	Static or decline for vulnerable stakeholders; improve for less vulnerable stakeholders	Primary impact on vulnerable stakeholder groups	Improving for all stakeholder groups, including vulnerable groups	Basic Necessities Survey, basket of assets and income measures for each stakeholder group	HHS	Reported trends	Partic.
Net positive impacts on biodiversity	Severe declines with extinction of many vulnerable species	Biodiversity values, users of biodiversity, forest health	Biodiversity values increasing, return to natural levels	Index based on forest cover and wildlife population trends	Synthesis of target data	-	
Conceptual Model Target							
Maintain the variety, integrity, and extent of all forest types	Declining extent and quality of all vegetation types	Carbon stocks, biodiversity values; livelihoods of vulnerable stakeholders	Stabilized cover of natural vegetation, improving quality	Forest cover monitoring and other parameters required for carbon accounting	GIS		
Increase populations of wildlife of conservation concern	Declining populations of most globally threatened species	Global public goods; cultural losses; dietary contribution; ecotourism projects; health of forest ecosystem	Populations increased to carrying capacity	Population sizes for 4-6 target species	transect surveys and dung DNA	Presence and distribution	Sightings, camera-trapping
Increase security and productivity of natural resources to support local livelihoods	Declining security, abundance and productivity of harvested natural resources and availability of clean water	Especially on vulnerable stakeholders	Security, abundance and productivity of key resources maximised; clean water freely available to all communities	total resin tree ownership, reported harvest levels of other forest products and fish	HHS	Reported trends	Partic.

Sufficient farmland to support the livelihoods of current residents	Increase in landlessness, static or decreasing agricultural productivity	Especially on vulnerable stakeholders	Landlessness among the poor low and stable; agricultural productivity and sustainability increasing	land ownership measures (% landless, % long-term landless; ave holdings); rice sufficiency	HHS, +LNGOs	Reported trends	Partic., LNGOs
Conceptual model threat							
Clearance for land concessions and other projects	Increasing loss to concessions	Especially on vulnerable stakeholders	Losses to concessions minimised and halted	Mapping of affected areas	GIS	Reported trends	Partic.
Undefined borders and regulations for the SPF	Continuing weaknesses in protection	Especially on vulnerable stakeholders	Borders, zones and regulations clearly defined and enforced	Mapping of demarcation, legal documentation	GIS	-	-
Population growth, in-migration, better access	Continued high in-migration, increased competition; increased conflict	Especially on vulnerable stakeholders	Population growth lower than in reference area; net in-migration negligible; access to forest areas fully controlled	Net in-migration negligible; access system excludes non-legitimate users	HHS, Demog	Reported trends	Partic.
Forest clearance/grabbing by individuals; over-fishing, over-hunting of wildlife; illegal logging and overexploitation of NTFPs	Widespread over-harvesting /clearance	Especially on vulnerable stakeholders	Illegal activities (clearance, hunting, over-fishing, hunting, logging, NTFP harvest) at very low levels	Patrol information (MIST system), independent surveys (e.g. snares, stumps), Defor mapping	WCS/FA	Reported trends	Partic.
Land alienation and legal conflict	Alienation, forced sales, Uncertain tenure due to expansion outside agreed land-use plans	Especially on vulnerable stakeholders	Land alienation ceases, no land illegally occupied and subject to conflict	# of reported incidents	HHS, systematic recording of conflicts and legal tenure	Reported trends	Partic.
Weak traditional institutions and lack of voice	Seriously declined	Especially on vulnerable stakeholders	Traditional and new community institutions effective, cultural cohesion improved	Levels of involvement	HHS, committee records	CBO effectiveness self-assessment	Partic.
Limited agricultural productivity	Decline, stagnation or slow improvement	All onsite communities	Agricultural productivity increasing	Agricultural productivity	HHS (all HH); LNGOs	Reported trends	LNGOs

				indicators (e.g. t/ha)	(target families)		
Scarcity of sustainable dev. livelihood opportunities, on/off farm	Continued dependence on limited number of often unsustainable livelihoods	All onsite communities	Increasing diversity of viable, sustainable livelihood opportunities	# of liv activities; size of reported income sources	HHS (all HH); LNGOs(target families)	Reported trends	LNGOs
Climate change	Difficulty adapting to changes in availability of wild-harvested resources and productivity of farming systems	Especially on vulnerable stakeholders	Increased capacity to adapt to climate-driven changes	-	-	Reported trends	Partic., LNGOs