Keo Seima Wildlife Sanctuary REDD+ 2018 – 2019

Document Prepared by Wildlife Conservation Society

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MONITORING REPORT:

CCB Version 3, VCS Version 3

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GHG Accounting/Crediting Period	01 January 2010 to 31 December 2069; 60 years
Monitoring Period of this Report	01 January 2018–31 December 2019; 2-year total period
History of CCB Status	Validation Issuance: 16 November 2015, First Verification Issuance: 04 April 2017, Second Verification Issuance: 29 November 2018
Gold Level Criteria	The Seima REDD+ Project qualifies for CCB Biodiversity Gold for the following criteria: Vulnerability—over 55 confirmed Globally Threatened species occur in the Project Zone. Irreplaceability—the Project Zone holds significant populations of at least three restricted-range species and large proportions of the world's population of at least five other species. Project supports law enforcement action against poaching, snare removal, and economic livelihood alternatives to poaching.

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1 SUMMARY OF PROJECT BENEFITS

1.1 Unique Project Benefits

Outcome or Impact	Achievements during Monitoring Period	Section Reference	Achievements during the Project Lifetime
Number of indigenous community lands officially titled in the project area	6 communities in process to get titles	2	7 out of 14 communities
Number of community protected area established in the project area	1 Srae Preah Community Protected Area	2	1 out of 6 communities

1.2 Standardized Benefit Metrics

Category	Metric	Achievements during Monitoring Period	Section Reference	Achievements during the Project Lifetime
GHG emission reductions & removals	Net estimated emission removals in the project area, measured against the without-project scenario	NA	NA	NA
	Net estimated emission reductions in the project area, measured against the without-project scenario	1,641,141	3.2	16,378,530
Forest[1] cover	For REDD[2] projects: Number of hectares of reduced forest loss in the	2,325		21,589

[1] Land with woody vegetation that meets an internationally accepted definition (e.g., UNFCCC, FAO, or IPCC) of what constitutes a forest, which includes threshold parameters, such as minimum forest area, tree height, and level of crown cover, and may include mature, secondary, degraded, and wetland forests (*VCS Program Definitions*).

[2] Reduced emissions from deforestation and forest degradation (REDD): Activities that reduce GHG emissions by slowing or stopping conversion of forests to non-forest land and/or reduce the degradation of forest land where forest biomass is lost (*VCS Program Definitions*).

Category	Metric	Achievements during Monitoring Period	Section Reference	Achievements during the Project Lifetime
	project area measured against the without-project scenario			
	For ARR[3] projects: Number of hectares of forest cover increased in the project area measured against the without-project scenario	NA	NA	NA
Improved land management	Number of hectares of existing production forest land in which IFM[4] practices have occurred as a result of the project's activities, measured against the without-project scenario	NA	NA	NA
	Number of hectares of non-forest land in which improved land management has occurred as a result of the project's activities, measured against the without-project scenario	NA		NA
Training	Total number of community members who have improved skills and/or knowledge resulting from training provided as part of project activities	9,024	2	21,817
	Number of female community members who have improved skills and/or knowledge resulting from training provided as part of project activities	4,558	2	8,672

[3] Afforestation, reforestation and revegetation (ARR): Activities that increase carbon stocks in woody biomass (and in some cases soils) by establishing, increasing, and/or restoring vegetative cover through the planting, sowing, and/or human-assisted natural regeneration of woody vegetation (*VCS Program Definitions*).

[4] Improved forest management (IFM): Activities that change forest management practices and increase carbon stock on forest lands managed for wood products such as saw timber, pulpwood, and fuelwood (*VCS Program Definitions*).

Category	Metric	Achievements during Monitoring Period	Section Reference	Achievements during the Project Lifetime
Employment	Total number of people employed in project activities,[5] expressed as number of full time employees[6]	207	2	1,624
	Number of women employed in project activities, expressed as number of full time employees	22	2	168
Livelihoods	Total number of people with improved livelihoods[7] or income generated as a result of project activities	1,096	2, 4	5,808
	Number of women with improved livelihoods or income generated as a result of project activities	167	2, 4	1,793
Health	Total number of people for whom health services were improved as a result of project activities, measured against the without-project scenario	291	2	3,116
	Number of women for whom health services were improved as a result of project activities, measured against the without-project scenario	206	2	978
Education	Total number of people for whom access to, or quality of, education was improved as a result of project	101	4	226

[5] Employed in project activities means people directly working on project activities in return for compensation (financial or otherwise), including employees, contracted workers, sub-contracted workers and community members that are paid to carry out project-related work.

[6] Full time equivalency is calculated as the total number of hours worked (by full-time, part-time, temporary and/or seasonal staff) divided by the average number of hours worked in full-time jobs within the country, region or economic territory (adapted from UN System of National Accounts (1993) paragraphs 17.14[15.102];[17.28]).

[7] Livelihoods are the capabilities, assets (including material and social resources), and activities required for the means of living (Krantz, Lasse, 2001. *The Sustainable Livelihood Approach to Poverty Reduction*. SIDA). Livelihood benefits may include benefits reported in the Employment metrics of this table.

Category	Metric	Achievements during Monitoring Period	Section Reference	Achievements during the Project Lifetime
	activities, measured against the without-project scenario			
	Number of women and girls for whom access to, or quality of, education was improved as a result of project activities, measured against the without-project scenario	55	4	133
Water	Total number of people who experienced increased water quality and/or improved access to drinking water as a result of project activities, measured against the without-project scenario	1,200	4	4,012
	Number of women who experienced increased water quality and/or improved access to drinking water as a result of project activities, measured against the without-project scenario	650	4	1,753
Well-being	Total number of community members whose well-being[8] was improved as a result of project activities	3,523	4	8,484
	Number of women whose well-being was improved as a result of project activities	1,734	4	5,896

[8] Well-being is people's experience of the quality of their lives. Well-being benefits may include benefits reported in other metrics of this table (e.g., Training, Employment, Health, Education, Water, etc.), but could also include other benefits such as empowerment of community groups, strengthened legal rights to resources, conservation of access to areas of cultural significance, etc.

Category	Metric	Achievements during Monitoring Period	Section Reference	Achievements during the Project Lifetime
Biodiversity conservation	Change in the number of hectares significantly better managed by the project for biodiversity conservation,[9] measured against the without-project scenario	187,983 ha	5.1	187,983 ha
	Number of globally Critically Endangered or Endangered species[10] benefiting from reduced threats as a result of project activities,[11] measured against the without-project scenario	CR: 9 EN: 25	5.1	CR: 9 EN: 25

[9] Biodiversity conservation in this context means areas where specific management measures are being implemented as a part of project activities with an objective of enhancing biodiversity conservation.

[10] Per IUCN's Red List of Threatened Species

[11] In the absence of direct population or occupancy measures, measurement of reduced threats may be used as evidence of benefit.

2 GENERAL

2.1 Project Description

The Keo Seima Wildlife Sanctuary (KSWS) covers 292,690 ha. It is located in eastern Cambodia, mainly in Mondulkiri Province with a small area extending into Kratie Province. The REDD+ Project Area covers 166,983 ha of forest in the KSWS Core Protection Area. The KSWS was created by a Prime Ministerial Sub-Decree in late 2009. This upgraded the conservation status of the former Seima Biodiversity Conservation Area, which operated during 2002–2009. In 2016, the Seima Protection Forest (SPF) was reclassified by the Royal Government of Cambodia as KSWS under Sub-Decree No. 83 dated 09 May 2016, and is now managed by the Ministry of Environment. The site is part of the ancestral homeland of a large number of ethnic Bunong people, for whom the forest is a key source of income and central to their spiritual beliefs. The area is also a meeting place for two important ecoregions—the Annamite Mountains (notable for high levels of local endemism among evergreen forest species) and the lower Mekong dry forests (which are crucial for the survival of many species typical of lowland deciduous forests). There are 55 Globally Threatened vertebrate species recorded in the Project Area (including 9 Critically Endangered and 25 Endangered species). Many of these occur in globally or regionally outstanding populations, including Asian elephants, primates, wild cattle, several carnivores and birds such as the giant ibis and green peafowl. KSWS supports the world's largest known populations of several species, including the black-shanked douc langur, and the southern yellow-cheeked crested gibbon.

The KSWS is currently under threat from accelerating forest clearance for agriculture together with unsustainable resource extraction (including hunting, logging, and fishing). These activities harm both biodiversity and local forest-dependent livelihoods. Current drivers of these direct threats include improved road access, population growth, weak law enforcement and governance frameworks, limited recognition of the value of biodiversity and environmental services, and rising market demand for both wild products and agricultural produce. The development of extractive industries and agro-industrial plantations could also become potential future deforestation drivers if the area lacked full protection by the government. The illegal selective harvesting of rare luxury-grade tree species is a serious law enforcement issue at the site, as elsewhere in Cambodia, but has negligible long-term effects on carbon stocks.

Since 2002, the Forestry Administration (FA) has collaborated with the Wildlife Conservation Society (WCS) and other local non-governmental organization (NGO) partners to develop management systems for the KSWS, to both conserve and restore the biodiversity values and to protect the livelihoods of local people. The conservation project has a holistic approach with four direct interventions: strengthening legal mechanisms and political support, direct law enforcement, strengthening community natural resource management, and developing alternative livelihoods. Effective law enforcement is essential as it underpins all other activities. The sustained investment in supporting land titling for all indigenous communities in the landscape is particularly notable as it protects livelihoods and land rights while also forming a strong basis for cooperation with project implementation.

In 2016, the KSWS was transferred to the Ministry of Environment (MoE) as part of a national jurisdictional transfer of all protected areas to MoE management. At this time, MoE renamed SPF to KSWS and assumed management of project area operations and REDD+ activity implementation. Most of the KSWS staff were retained and transferred to the MoE with their titles and duties unchanged. WCS has partnered with the MoE since 2000 through protected area co-management of the Prek Toal Conservation Project and Kulen Promtep Wildlife Sanctuary.

Conservation interventions prior to the REDD+ project have been on a fairly limited scale. Law enforcement activities have been successful in moderating (but not preventing) major threats across some parts of the

KSWS, moderating deforestation rates and allowing several key wildlife species to persist in large populations. This limited level of intervention has been assumed to continue as part of the future baseline scenario. However, it falls well below the level needed to match the scale of threats. Most threats remain severe and are increasing in scale and diversity. Deforestation rates and logging have increased, at least one flagship species (tiger) has been lost from the protected area, and declines are suspected for other species. Boundary demarcation, effective patrolling, community outreach, and alternative livelihood activities have been implemented in only a minority of the protected area. The effectiveness of conservation management is severely constrained by insufficient, irregular, and declining funding, and competition with other land uses. Hence, sustainable financing from carbon revenue for the site is essential to enable conservation action to be expanded and sustained in the long-term. It will allow the Royal Government of Cambodia and its NGO partners to expand activities to match the level of threat, ensure long-term support by covering operating costs, and generate financial incentives for conservation at local and national levels.

2.1.1 Project Implementation Description

The project is structured around four direct and three indirect interventions.

2.1.1.1 Direct

Develop the key legal and planning documents needed to manage KSWS. The project participated in the 2016 jurisdictional shift from the Seima Protection Forest under FA management to the Keo Seima Wildlife Sanctuary under the MoE, and the decentralization of management authority from national-level MoE to provincial-level PDoE. The project has provided support to, and participated in, the ongoing zoning and management planning conducted by the MoE, following government procedures.

Reduce forest crime through direct law enforcement. Law enforcement continues, with 56 arrests, 257 warnings, and extensive confiscations of illegal equipment, including 610 snares, 32 guns or crossbows, 504 chainsaws, 215 hand tools, 223 motorbikes, 62 cars, 12 trucks, and 10 tractors during the monitoring period.

Establish sustainable community use of land and natural resources. Implementation during this monitoring period has been through continued efforts to establish Indigenous Communal Title (ICT) tenure for communities who wish to participate; during the period an additional 5 ICTs were in the process for obtaining the communal land titles, bringing the total to 13 ICTs. Additionally, a project to establish Community Protected Areas (CPA) to legalize community use of forests close to villages without ICTs has begun; during the period four villages in the process for obtaining CPAs. One of the CPAs has achieved full recognition – an agreement signed between General Department of Community of Ministry of Environment and Chief of CPA committee occurred in December 2019.

Support alternative livelihoods that reduce pressure on forest and natural resources. This has included ongoing support for ecotourism through the Jahoo Gibbon Camp, NTFP enterprise design and training with a focus on a community-based bamboo enterprise, and training on methods of rice, and vegetable cultivation and livestock raising.

2.1.1.2 Indirect

Effective monitoring. Project staff continue to monitor deforestation throughout the REDD+ project area and wider protected area, using remote sensed imagery in combination with ground-truthing by law enforcement patrols. High resolution (10m) imagery from the SENTINEL-2 satellites, launched as part of the European Commission's Copernicus program, is used to identify and quantify land cover changes. The project

continues to use the Spatial Monitoring and Reporting Tool (SMART) for law enforcement, and has initiated adoption of mobile technology through trainings in the use of the CyberTracker app on ruggedized smartphone devices. Biodiversity monitoring continues, with the 2019-2020 data collection field season starting in November, which will provide updated key species population estimates in the third quarter of 2020.

Effective administration. The project continues to conduct monthly meetings, annual workplan meetings, and uses the WCS accounting system.

Fundraising. The project continues to apply for grant funding from donors, and marketing of REDD+ credits on the voluntary market, with combined total revenue of $895 000 for 2018 and $1,577,000 for 2019.

Leakage and non-permanence are addressed through application of many of the project activities listed above within the leakage area; this includes establishing a CPA that totals 3,438 ha and a community-based bamboo enterprise that seeks to stabilize forest loss. The leakage area is monitored through remote sensing and, within the KSWS, patrols.

2.1.2 Project Category and Activity Type

This project is an Agriculture, Forestry, and Other Land Use (AFOLU) project under the Reduced Emissions from Deforestation and Degradation (REDD+) project category. Specifically, the project is of the 'Avoiding unplanned deforestation and degradation' (AUD) type. This project is not a grouped project.

2.1.3 Project Proponent(s)

Organization name	Ministry of Environment of the Royal Government of Cambodia
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2.1.4 Other Entities Involved in the Project

Organization name	Wildlife Conservation Society
Role in the project	Lead technical partner
Contact person	Mr. Ken Sereyrotha
Title	Country Director

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Organization name	Cambodian Rural Development Team (CRDT)
Role in the project	Community livelihood and development
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Organization name	Sam Veasna Centre (SVC)
Role in the project	Ecotourism
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Organization name	Elephant Valley Project (EVP)
Role in the project	Ecotourism, community livelihoods, and development
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Organization name	World Hope International (WHI)
Role in the project	Community livelihoods and development
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Organization name	RECOFTC- Regional Community Forestry Training Center for Asia and the Pacific
Role in the project	Community Protected Area, community livelihoods
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2.1.5 Project Start Date (G1.9)

The project start date was 1 January 2010.

2.1.6 Project Crediting Period (G1.9)

The duration of the VCS project crediting period is 60 years: 1 January 2010–31 December 2069. In CCBA terminology, this is both the project lifetime and the GHG accounting period. The methodology (page 8) requires that the baseline is fixed for periods of ten years, and then adjusted as necessary. Each ten year period is called a fixed baseline period. The first fixed baseline period will run from 1 January 2010–31 December 2019.

2.1.7 Project Location

The project takes place almost entirely within KSWS, which lies mainly in Mondulkiri Province with some sections extending into Kratie Province. The site abuts the Vietnamese border and is bisected by Cambodian National Route 76. The KSWS headquarters lie at the south-western entrance to the reserve in Keo Seima District at 106°55'15.7" E, 12°8'13.109" N.

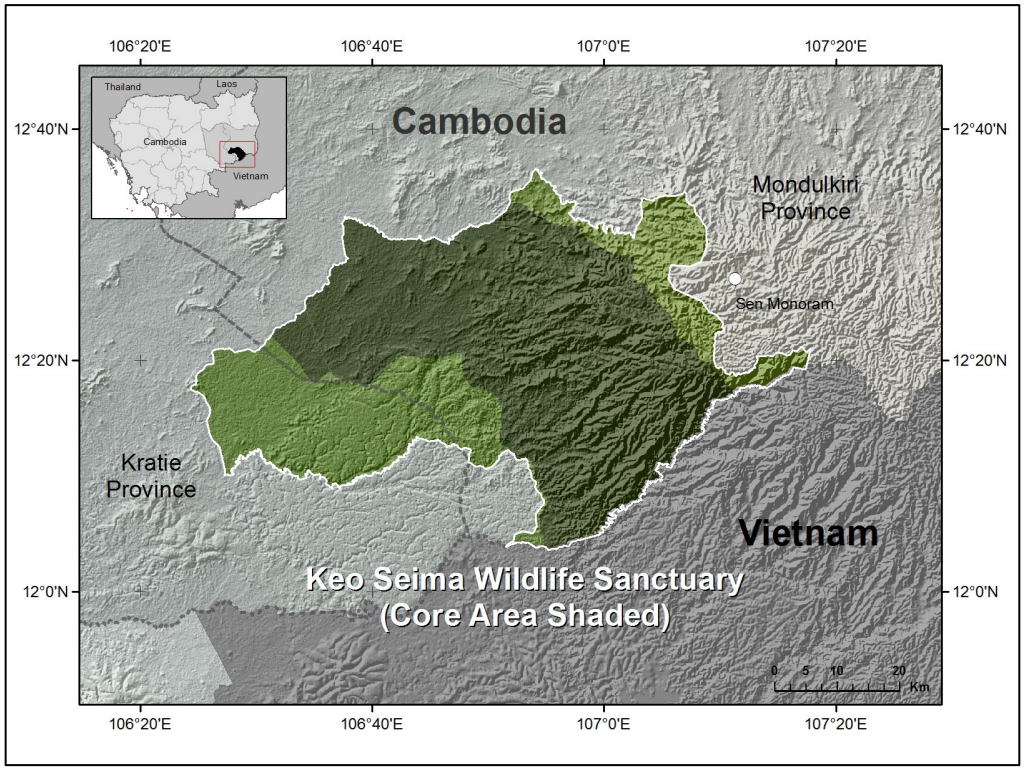


Figure 2.1 Location of KSWS REDD+ project

2.1.8 Title and Reference of Methodology

This project uses the methodology entitled 'Methodology for avoided unplanned deforestation', which is the VCS's approved VM 0015, version 1.1 (December 2012).

2.1.9 Other Programs (G5.9)

There are no other crediting programs being conducted in the area.

2.1.10 Sustainable Development

Project not participating in any national sustainable development programs.

2.2 Project Implementation Status

2.2.1 Implementation Schedule (G1.9)

Implementation is through ongoing activities as described in Section 2.1.1 and is conducted without a specific milestone schedule.

2.2.2 Methodology Deviations

The following methodology deviation was included and accepted in the previous monitoring report for the period 1 January 2016 – 31 December 2017. It is included here for completeness sake.

Addition of hand-digitized areas of deforestation. While activity data for emission calculations is still generated through classification of 30 m resolution USGS Landsat imagery, as outlined in Section 3.1.2, and described in detail in Annex 3.5 of the Project Description (PD),[12] an additional step has been added to take advantage of ongoing remote sensing monitoring activities using 10 m ESA Sentinel 2 imagery. This monitoring activity is described in Section 3.1.3. The outputs of this monitoring are hand-digitized polygons of observed deforestation within the Project Area. As an additional step outside of the methodology, these polygons of observed deforestation are added to the results of the 30 m Landsat land cover classification, ensuring all detected deforestation is included in the classification results (see Section 3.1.3.3). As this can only increase measured deforestation quantities, we feel the addition of this step is conservative.

2.2.3 Minor Changes to Project Description (*Rules* 3.5.6)

No changes made to the Project Description during this period.

2.2.4 Project Description Deviations (*Rules* 3.5.7–3.5.10)

No deviations made to the Project Description during this period.

2.2.5 Grouped Projects

Not applicable

2.2.6 Risks to the Project (G1.10)

A risk analysis was conducted in accordance with the VCS AFOLU Non-Permanence Risk Tool v4.0. The full risk report is presented as a separate standalone document made available to the verifier. A summary of project risks is provided below. The project has a calculated risk rating of 5%. The minimum risk rating for a VCS AFOLU project is 10%, so the KSWS project has a rating of 10%. This is equivalent to a 10% risk buffer set-aside at the time of each verification event. This risk analysis is holistic, covering climate, community, and biodiversity benefits of the project.

2.2.6.1 Internal risks

Risks from weaknesses in project management are assessed as very low due to the high capacity of the implementing partners and the existence of a formal adaptive management system. The financial viability of the project is excellent, having already achieved financial breakeven. The high Net Present Value of alternative land uses relative to the income expected from the project also poses a risk, but this is largely offset by the strong legal basis for long-term protection at the site.

2.2.6.2 External risks

Though land tenure and use in the Reference Region in general is complex, the choice of Project Area avoids most forms of risk to be assessed in this section. The estimated risk scores are reduced somewhat

by the clearly established legal basis for protection of the KSWS and the evidence of strong community agreements clarifying the status of overlapping use rights with respect to the REDD+ project. Cambodia's relatively low scores on the database of Worldwide Governance Indicators increase the assessed risk, although this is partly offset by the existence of a national REDD+ Readiness process.

2.2.6.3 Natural risks

The landscape is not prone to severe natural events. It is geologically stable and experiences only small flooding events that are part of the natural monsoonal cycle. Intact tropical forests of the types found in KSWS or more broadly in Cambodia are not prone to catastrophic pest or disease outbreaks, due to the very high diversity of tree species present. The most likely natural risk is fire. However, the deciduous forests are well adapted to low intensity periodic understory fires (which can be considered a non-destructive part of the ecology of the habitat), whilst the denser forests are not prone to fire due to their evergreen nature and humid understory. There is no history of catastrophic fires in this habitat in the area. Only severe degradation of a kind that is not expected to occur (e.g., wide-scale industrial logging) is likely to make these denser forests prone to damaging fires.

2.2.7 Benefit Permanence (G1.11)

The project incorporates a number of measures to ensure long-term sustainability of the outcomes. The key measures are:

1. Establishment of a strong legal basis, including the permanent declaration of the Protection Forest in the 2009 Sub-Decree, and the program to support permanent titling of eligible land to all relevant villages.
2. Investments in physical demarcation of boundaries and construction of key infrastructure for park management.
3. The inclusion of a permanence fund in the financial model, to ensure a proportion of early revenue is set aside to finance long-term recurrent management costs.
4. The use of adaptive management approaches to ensure work planning responds to changing conditions.
5. The establishment of mechanisms for long-term community involvement in management planning and implementation.
6. The focus of alternative livelihood initiatives on establishing long-term alternatives to deforestation, unsustainable hunting etc., including both income generation activities and the development of fundamental, transferable skills through adult education.
7. The inclusion of environmental awareness activities in the community engagement program.
8. Measures to ensure an increasing proportion of staff are drawn from local communities, and to promote development of staff capacity.

2.3 Stakeholder Engagement

2.3.1 Stakeholder Access to Project Documents (G3.1)

Printed copies of project documents are provided to all stakeholders.

2.3.2 Dissemination of Summary Project Documents (G3.1)

In the KSWS annual meetings, an update on REDD+ project implementation is presented to community representatives, local authorities, and local partners. During these meetings, the process for validation and/or verification against CCBA standards is communicated. Project teams visit the 20 villages to explain about CCBA and the process of validation/verification against the standard. Summaries of the project document and monitoring reports are translated into Khmer and disseminated.

2.3.3 Informational Meetings with Stakeholders (G3.1)

Annual meetings have been held each year. These involve senior staff, team leaders, representatives of major partner organizations, and key technical advisors. The meetings occurred on 6 - 7 July 2018 and 30 June - 2 July 2019, to harmonize with the WCS financial year (1 July–30 June). The meeting typically spans several days. These meetings allow for the following monitoring and response activities:

- Annual project evaluation and adaptive project planning;
- Provision of a community forum for voicing grievances;
- Monitoring participation of traditional institutions;
- Consultation on community perceptions of the condition of high conservation values (HCVs).

Community feedback on the REDD+ project is opportunistically collected during periodic consultation workshops. These workshops also allow for a review of any negative impacts arising, including unexpected impacts. Wherever possible, these discussions will be combined with other project activities (e.g., consultations for the annual work planning process), so as to minimize the financial burden of monitoring. The consultation process improves communication between stakeholders and therefore strengthens project implementation.

2.3.4 Community Costs, Risks, and Benefits (G3.2)

Consent was obtained through a process starting in the early stages of the project, prior to any steps to validate the project or make sales of credits. The consent was freely given and based on extensive efforts to ensure signatories were well informed. The design of the community consent process aimed to follow best practice in all important aspects. Project staff believe that it meets the requirements of Cambodian national law, and conforms to VCS and CCBA requirements and the UN Declaration on the Rights of Indigenous Peoples (UNDRIP, 2007). It describes in detail what is being consented to, the term of the agreement, and the rights and liabilities it confers. The consent agreements were signed by the most appropriate community representatives, as well as with a thumbprint from representatives of the great majority of families in each village. Agreements were also witnessed by the local authorities.

Financial benefits stemming from sale of carbon credits have been shared with the communities based on their priority needs. Consultations on REDD+ benefit sharing in the project were held at various levels such as village, commune, and provincial, to allow the communities to make their own decisions on how the REDD+ fund should be spent to support their community development and meet the needs of each community. In addition, these community consultation meetings were centered on a written Community Agreement on REDD+ Benefit Sharing that were signed by representatives of each community and witnessed by the local authorities, to demonstrate their consent to prioritized activities for their communities.

At the end of 2019, all participating communities decided to enter into an additional agreement to receive extra financial benefits based on their performance, over one year, in maintaining local forest cover;

engaging in conservation efforts; and improving community participation, representation, and development actions. The additional agreements were signed by the community representatives for REDD+ matters and witnessed by local authorities and the KSWS park director.

2.3.5 Information to Stakeholder on Verification Process (G3.3)

Communities were visited to communicate REDD+ updates, including information on the verification process during two stages: 16 villages were conducted during the first official 30-day public comment period which extended from March 2nd – April 1st, 2020, 4 villages could not be consulted during this time due to travel restrictions imposed by the COVID-19 pandemic. The remaining four villages were subsequently visited during the week of August 20th, 2020, prior to the official verification visit. Details on the visits to each village have been provided separately to the verifier.

2.3.6 Site Visit Information and Opportunities to Communicate with Auditor (G3.3)

Communities were contacted in person or by telephone. In addition, they are informed at community meetings about the REDD+ verification process and the visit from the auditors.

2.3.7 Stakeholder Consultation (G3.4)

Consultations take place regularly to share project progress, request participation in project activities, and collect feedback. Consultations are usually held at the village level and community members are encouraged to join. Where consultations may result in changes or additions to community responsibilities and/or benefits, two consultation meetings are held. The first presents and discusses the changes proposed, associated reasons, and potential costs/benefits. The terms of the potential agreement are presented and discussed. A second consultation is held at a later date to seek the decision of the community on the target issue. In the interim, they are encouraged to consider their response, both individually and as a community. Where appropriate and agreed by the community, partner NGOs working in the target community also attend these meetings.

Periodically, meetings are held at commune level, or at site (KSWS) level. Community-selected representatives are supported to join the meetings that are held outside their village. One example of this is the annual workplan stakeholder consultation meeting, which is held either at KSWS headquarters or in the provincial capital, Sen Monorom. Representatives of all participating communities attend, with WCS, provincial and national government, and partner NGOs to share an evaluation of the previous year's activities and plans for the coming year. Monthly KSWS-wide meetings take place at KSWS headquarters, where the provincial Department of Environment, WCS, and partner NGOs join community representatives to discuss monthly progress and plans, This monthly meeting is chaired by the KSWS director and provides a forum for community representatives to raise issues and report on their conservation activities (for example community-led law enforcement patrols). All attendees discuss how to solve issues and improve future results.

2.3.8 Continued Consultation and Adaptive Management (G3.4)

Event	Frequency	Participants	Status
Community forum	Annual	Community representatives from all villages are invited to attend at central location.	Annual Planning meeting in July 2018 and June/July 2019
Formal monitoring of social benefits and impacts	Every 5 years	Sample households, community leaders, focus groups.	Second monitoring completed in 2017 and next monitoring report in 2022
Consultations on design of benefit-sharing arrangements	Multiple meetings	Community representatives plus plenary discussions with all families invited. Central location and village-level meetings.	First phase benefit sharing completed in 2018 and second phase of benefit sharing already discussed for 2019
Consultations on implementation of benefit-sharing arrangements	At least annual once carbon finance is available	Community representatives plus plenary discussions with all families invited. Central location and village-level meetings.	Benefit sharing mechanism is being implemented
Consultations on specific KSWS policies as required	Single or multiple events	Community representatives plus plenary discussions with all affected families invited. Central location and village-level meetings.	Ongoing
Consultations on implementation of specific village-level activities	Routine component of all activities	Community representatives plus plenary discussions with all affected families invited. Village-level meetings.	Ongoing
Participation in Commune Investment Planning process	Annual	Commune Councils, village representatives.	Ongoing
Participation in District Integration Workshop	Annual as necessary	Commune Councils, village representatives, NGOs.	Ongoing
District Commission Meeting	Quarterly	Department of Environment (DoE), WCS	Ongoing
Provincial Commission Meeting	As needed	Department of Environment (DoE), WCS	Ongoing
Participation with Mondulkiri NGO Network	Periodic as necessary	NGOs working in and around the Project Area.	Ongoing
The Civil Society Organizations REDD+ Network	Annual	Cambodian civil society organizations involved in REDD+.	Ongoing

2.3.9 Stakeholder Consultation Channels (G3.5)

The community teams of the project and project partners regularly visit each village to hold meetings to discuss REDD+ benefit sharing, Indigenous Community Land Titling, Community Protected Areas and livelihood improvement activities such as access to clean water, livestock raising, saving groups, and eco-

tourism. The annual consultation meeting for the KSWS annual work-plan is organized every year to include community representatives, local authorities, MoE/DoE officials and NGO partners who are invited to share information and provide inputs for the development of the annual work-plan. The project also distributes the KSWS REDD+ Quarterly Newsletters in Khmer to stakeholders participating in the meetings. The KSWS REDD+ Quarterly Newsletters are also available in English and can be accessed online at WCS Cambodia website (https://cambodia.wcs.org/).

During the public comment period, from 2nd March 2020 to April 1st 2020, project teams visited all villages involved in the project and held community consultation meetings at commune level with commune chiefs, village leaders, village chiefs and others members of the communities. The project team provided a brief overview of REDD+ and the project progress, as well as explanations on CCBA and the public comment period for KSWS REDD project in lieu of the upcoming verification. These consultations included information on the REDD+ verification process, including the fact that third party verifiers might conduct visits in some villages. All the participants were requested to provide comments and feedback during these meetings. They were encouraged to share the MIR in Khmer to their community members. The MIR was also given to community chiefs to distribute in the 20 villages (400 copies). Furthermore, the announcement of the public comment period was put in each village and more than 400 announcements placed in the 20 villages. A follow up phone call to key persons in each village was made to ensure that the community comment and feedback were collected by 1st April 2020 as mentioned in the CCBA website.

2.3.10 Stakeholder Participation in Decision-Making and Implementation (G3.6)

Community consultation meetings and workshops at village, commune, district, and provincial levels are the main approaches used to engage committees or village representative groups in decision-making processes on various project activities. Facilitation teams are mostly led by government officials working together with NGO staff and a cadre of community representatives who have received additional training. At least one speaker of Bunong, the local indigenous language, is included in each team. The facilitation teams strongly encourage participation from the village committee, and women, to make the process fair and transparent to all community members.

2.3.11 Anti-Discrimination Assurance (G3.7)

According to the Cambodian Constitution, all persons are equal before law without any discrimination on the basis of race, color, sex, language, beliefs, religions, political tendencies, birth origin, social status, wealth, or other situations[13]. The Law on the Protection and Promotion of the Rights of Persons with Disabilities prohibits discrimination on the basis of disability to participate in the social, economic, and cultural development plans that may affect the interests of persons[14]. Sexual harassment is strictly prohibited under the Labor Law[15]. The Criminal Code defines sexual harassment as an act when a person abuses the power which is vested to him/her in his/her functions in order to put pressure again and again on other persons for sexual favors. Sexual harassment is punishable by an imprisonment of between 6 (six) days to 3 (three) months and a fine of between 100,000 (one hundred thousand) and 500,000 (five hundred thousand) Riels[16]. All KSWS staff will annually attend staff training for anti-discrimination and gender

[13] The Constitution of the Kingdom of Cambodia (1993), Art. 31
[14] The Law on the Protection and the Promotion of the Rights of Persons with Disabilities (2009), Art. 18
[15] The Labor Law (1997), Art. 172
[16] The Criminal Code (2009), Art. 250

sensitization. The project proponent and all other entities involved in project design and implementation comply with these laws.

2.3.12 Grievances (G3.8)

The grievance process progresses through three stages until a resolution is achieved. The progression is defined by referrals from Stage 1 to Stage 2 and from Stage 2 to Stage 3. The referrals are made within established time limits. The project implementation team takes, in good faith, all reasonable steps to meet these limits. The grievance process was carefully explained to community members and a simple poster in Khmer, with photographs, was created and displayed in every village, showing the project hotline numbers that community members can contact for further clarification. Suggestion boxes with hotline numbers were placed in the 20 villages so that community members can express complaints about the project. The project teams regularly check these boxes to collect any complaints submitted by the communities. No formal grievances have been registered to date.

Figure 2.2 Poster explaining grievance process in Khmer

Figure 2.3 Community grievance box with explanation and hotline numbers

2.3.12.1 Grievance resolution Stage 1

Complaints and grievances submitted to the project implementation team will be assessed and, whenever possible, directly resolved amicably. A written response to all reasonable grievances will be provided within 30 days.

2.3.12.2 Grievance resolution Stage 2

Grievances not satisfied during Stage 1 will be referred to a neutral third party within 14 days of notification that the offered resolution is not acceptable.

One legally mandated role of the existing Commune Councils in the Project Zone is to receive complaints from their constituents on issues of any kind and either direct them to the appropriate place or seek to resolve them directly, often by mediating between the affected parties. Hence, the Commune Councils in the Project Zone function as a third-party grievance mechanism and have done so implicitly since the beginning of conservation activities in 2002. The FA and MoE have committed to this as one element of the formal Community Agreements. A senior member of the management team will be responsible for overseeing the process and ensuring that cases are documented and processed efficiently. Decisions will be made in consultation with, or under the mediation of, the relevant Commune Council, and all written documentation will be copied to them. The project is providing capacity building to the Commune Councils and logistical support to increase their understanding of the REDD+ project and their role in performing this function.

This mechanism has the great advantage of using an existing, familiar, and well-established system, increasing the likelihood that it will be accepted by all stakeholders and will be found to be sustainable and cost-effective. The perceived adequacy of the mechanism in receiving and resolving complaints will be assessed periodically during consultations with community representatives, and if judged necessary through periodic external evaluations.

If either party feel that the Commune Council is not a suitable, neutral third party, an alternative mediator will be engaged through mutual agreement. Options for alternative mediators may include, but are not limited to, NGO social rights proponents.

2.3.12.3 Grievance resolution Stage 3

For grievances not resolved by Stage 1 or Stage 2 (e.g., tenure disputes resulting from activities under Sub-Objective 3), a referral to court proceedings will be made, by either the project implementation team or the neutral third party, within 14 days of notification that third party mediation was not successful. The resolution procedures for Stage 3 will proceed in accordance with Cambodia's legal framework. The project is careful to not prejudice the outcome of these disputes. For example, with tenure disputes this is achieved through systematic adherence to transparent land titling processes, which includes registration with the Ministry of Interior (MoI) as an indigenous community, and the establishment of local commissions and a public village congress, which hold a public consultation meeting. During this meeting, the commissions request official recognition from local authorities and allow for counter claims to be recorded. Resolution at this stage is facilitated by the Commune Council. This process is followed by community registration with the Department of Land Management, Urban Planning and Construction at the provincial level, which

evaluates all land claims, conducts official boundary mapping, and publically releases the land identification and mapping for 30 days.

If disputes arise that cannot be settled through the Commune Council or the Department of Land Management, such as land disputes over legally titled land, they will be brought to the provincial court for settlement or will appeal to a higher court (e.g. Cambodian Supreme Court).

2.3.13 Worker Training (G3.9)

The core MoE staff, WCS staff, and participating community members have received training specific to their respective responsibilities (Table 2.1). In addition to the provisions shown, all partner organizations encourage staff with special potential to pursue further education through day-release or sabbatical arrangements. As shown, most training activities occur on an annual basis, or more frequently, so that new staff can rapidly be inducted. The project has a generally low level of staff turnover, reducing the need for retraining, although the transition to PDoE has required upskilling of a number of new government counterparts.

Table 2.1 Training activities implemented for project staff.

Group/Topics	Training Type	Status
Group: Senior management and technical advisors Topics: Conservation project design; project management; data management; assessment of training effectiveness; administration	• External mentoring through existing WCS and MoE systems—ad hoc basis at least quarterly • Short professional training courses, exchange visits, attendance at conferences—ad hoc	Ongoing
Group: Law enforcement teams Topics: Patrol techniques; equipment and weapons handling; outcome monitoring methods (e.g., SMART); human rights and related issues	• Induction and orientation for new staff—as needed • Intensive training courses (5 days law enforcement trainings) • Cyber Tracker data collection Training • On-the-job mentoring from technical advisors—monthly or more frequent contact • Refresher training in use of SMART monitoring system—quarterly or more frequent • Formal training courses through existing government systems—ad hoc	Ongoing
Group: Community engagement team Topics: Legal systems; effective communication techniques; technical forestry; forest zoning and indigenous land titling; agricultural development skills	• Trainings on indigenous land titling development and strengthening • Training and mentoring on facilitation techniques and writing report • Training on legal issues related to land and communities • Training on community protected areas • Training on zoning, mapping and zoning data collection • Training on community outreach and consultation, in particular related to REDD+ • Involvement in adaptive management, including annual planning—monthly meetings	Ongoing

Group/Topics	Training Type	Status
	• Other training and mentoring as relevant to the position, e.g., tourism development—ad hoc • Short professional training courses, exchange visits—ad hoc	
Group: Monitoring team Topics: Technical and reporting skills relating to measurement of biodiversity (line transect, snaring research, orange-necked partridge monitoring); safety and communications protocols; remote sensing; social factors	• Wildlife monitoring training, including collection and analysis of otter spraint samples; forest degradation assessment training, tree species identification training, habitat assessment training; nest protection program establishment training • On-the-job training for GIS/RS officer—monthly during supervision visits • Training courses on social survey methods—as needed prior to each survey. Includes survey on Human-Wildlife Conflict.	Ongoing

Technical training for community members is used to build capacity, raise interest, and promote informed participation (Table 2.2). Training is usually conducted on specific village-level activities, most notably those under Sub-Objectives 3 & 4 (sustainable land-use and alternative livelihoods). These are conducted on an as-needed basis by the community engagement team or officers of local NGO partners.

Table 2.2 Training activities implemented for community participants.

Objective/Topics	Training Type	Status
Objective: Community-based patrolling Topics: Legal framework; rights and responsibilities of communities; safety and security; patrolling strategies	• Strengthening community based patrolling on patrol procedure and data collection (2+ days) —annual • Regular village meetings, including local authorities—bimonthly or more frequent • Mentoring during patrolling events—bimonthly or more frequent	Ongoing
Objective: Land-use agreements, legal registration of communities and titles Topics: Community land rights; legal framework; procedural steps and documentation; mapping methods; community self-organization; conflict resolution	• Capacity building and mentoring of indigenous community commissions—as needed • Training on mapping, conflict resolution, land use and land management—as needed • Short training courses on relevant topics including ICT land management, internal rule, by law, expose visit to learn on CPA management—more frequent	Ongoing
Objective: Forest Estate demarcation Topics: Community land rights; legal framework; procedural steps and documentation; mapping methods; conflict resolution	• Training on mapping and GPS use—as needed prior to mapping events	Ongoing
	• Training on legal aspects and conflict resolution—as needed	Ongoing
Objective: Ecotourism Topics: Roles and responsibilities; legal framework; introduction to habituation data; tourist monitoring data;	• Community organization, and coordination with authorities—annual or as needed • Training and mentoring on tourism service provision—at least monthly in target areas including tour guide, reviewing role and responsibilities.	Ongoing

Objective/Topics	Training Type	Status
coordination with authorities; service provision and service standards	• Exposure visits to other tourism sites to learn on community ecotourism operation and management in Kampong Speu and Koh Kong provinces.	Ongoing
Objective: Agricultural extension Topics: Product identification and value-chain; sustainability; pest and disease management; post-harvest storage and value adding; product marketing	• Introductory training on Ibis rice (environmental friendly rice) • Support to model farmers to demonstrate the relevant technique (eg. chicken raising)—as needed • Training on relevant techniques such as silviculture—as needed depending on commodity	Ongoing
Objective: NTFP-based livelihoods Topics: Product identification and value chain; sustainability and harvest management; value-adding; product marketing	• Introductory training—as needed prior to extension and product development • Support to interested community members on product value chain, sustainability, value adding, and marketing such as bamboo inventory and sustainable harvesting, bamboo value chain—as needed	Ongoing

2.3.14 Community Employment Opportunities (G3.10)

Article 12 of the Labor Law requires that all employers "not discriminate against any individual based on race, religion, sex, age, wealth, disability, marital status, parental status, or sexual orientation." This also makes sense for sound practical reasons, such as increasing the ability of the project workforce to communicate with local indigenous communities, and to deal with cultural gender barriers. Government staff assigned to the project are selected according to government procedures and policies, which can be assumed to be compliant with the law. Non-governmental positions with WCS are subject to an advertising and selection procedure that also aims to comply with the law, as follows:

- In general, employment opportunities in the project are announced publicly at local and national levels. Special effort is made to encourage applications from typically under-represented groups—notably women and ethnic minority applicants. This is achieved particularly by advertising locally around KSWS through posters, announcements through local networks, and word of mouth as appropriate.
- Selection is conducted in each case by an ad hoc panel of at least two people, according to a pre-agreed set of criteria that includes an emphasis on increasing the diversity of the workforce. Interviews are conducted in such a way as to minimize language or gender barriers. Final approval is given by the Country Director, who also gives attention to the issue of diversity. Other relevant employment policies are listed in the WCS Cambodia Policy Manual.

Given the difficulty of recruiting to more senior positions directly by local recruitment due to the low levels of formal education prevalent in Mondulkiri, project staff are committed to identifying local people with advancement potential, taking them on as junior staff, interns, or volunteers and investing in their professional development. These staff will be promoted to more senior positions as their capacity grows. There is a high proportion of local staff in the more junior levels of the community team, wildlife monitoring team, and ancillary support staff (cooks, drivers etc.).

Education and experience is steadily increasing in local communities as Cambodia develops, and the project regularly seeks staff from local communities who are fluent in Khmer and Bunong languages. During

the past year, six new indigenous Bunong field staff who have all recently completed Bachelor's degrees were employed; these are some of the first generation of indigenous people in Cambodia who have attained such a level of education. In addition, project partners also provided employment opportunities to local communities in ecotourism projects, clean water projects, and other livelihood-related activities. During this monitoring period (2018–2019), there are 159 people, 11 of which are women, working as full time employees within government, NGOs, and communities to implement project activities.

2.3.15 Relevant Laws and Regulations Related to Worker's Rights (G3.11)

Employees of government agencies, including the MoE, are covered by the employment conditions of their host ministries. These can be assumed to adhere to all relevant government law and policies. Government employees are informed of their rights and responsibilities through routine government employment procedures. For NGO partner staff, employer-employee rights and responsibilities are governed by the Labor Law (1997), and additionally by their Employment Contracts, and by WCS's Internal Policies and Regulations. These policies meet or exceed the requirements of laws and regulations covering workers' rights and conditions. All staff are given a copy of their employment contracts, which outline their rights, and refer to other relevant documents. A policy manual, working regulations, and Site Operating Procedures are routinely distributed to new staff on commencement of employment, and relevant documents are available in Khmer at project offices.

2.3.16 Occupational Safety Assessment (G3.12)

All project staff and counterparts enjoy the protection of WCS Health and Safety policies. In the unlikely event of a work-related incident or illness, the project provides health and accident insurance to staff, and all healthcare expenses will be covered. Health and safety in the workplace is both an individual and shared responsibility of staff and the employer. WCS is committed to providing a safe working environment for all employees, contractors, volunteers, and visitors. Every effort is made to minimize work-related risks to the extent reasonably possible in a field setting. The risk minimization strategy is as follows:

Risk Assessment

- A risk assessment has been conducted for the project, and will be formally updated at appropriate intervals (at least every five years, or in the case of a major change to project design or risk levels).
- Project supervisors will monitor workplace risks, to identify any significant changes in the level of risk, which they will report to their line managers.

Standard Operating Procedures and Instructions for Special Tasks

- The site-specific guidelines (Standard Operating Procedures, SOPs) describe procedures that minimize work-related risks for staff. They will be formally updated at appropriate intervals (at least every five years or in the case of a major change to project design or risk levels).
- Occasional activities that fall outside the scope of the SOPs will be the subject of separate processes that assess and minimize work-related risks for staff.

Communicating the Risk Management Plan

The risk assessments, SOPs, and other risk-minimization procedures (together 'the risk management plan') will be communicated to all relevant staff following the communication plan, which is as follows:

- All new staff will be instructed in the risk management plan and their responsibilities under it, and will be provided with a written copy in the most convenient language for them within three days of starting work.
- All staff will be provided with a written copy of the risk management plan annually, or when an update occurs.
- Reference copies of the risk management plan will be available to all staff in a public part of the headquarters.
- Periodic refresher training courses on the risk management plan will be conducted.
- The risk management plan will be reviewed with senior staff during annual planning meetings.
- Senior staff will highlight relevant sections of the risk management plan during staff briefings on new activities.

Staff responsibilities

- Project staff are required to exercise due care at all times, to adhere to safe work practices and to follow the relevant SOPs, including the use of personal protection equipment provided by the project.
- As workplace health and safety is a shared responsibility, staff are required to inform project management of unsafe conditions or equipment, illness, or injury, for prompt remedial action or treatment.

2.4 Management Capacity

2.4.1 Required Technical Skills (G4.2)

The project activities listed in Section 2.1 require a broad range of skills, all of which can be provided by the project participants as set out in Table 2.3.

Table 2.3 Key skills required to implement the project.

Sub-objective	Key skills required	Main partners
#1: Key legal and planning documents for Keo Seima Wildlife Sanctuary are approved and implemented	Protected area management planning, coordination with senior government officials, understanding of private sector	MoE, WCS
#2: To reduce forest and wildlife crime by direct law enforcement	Implementation of enforcement patrols, monitoring outcomes	MoE, WCS
#3: Land and resource use by all core zone communities is sustainable	Participatory land-use planning, implementation of Land Law and Forestry Law, design of natural resource management systems	MoE, WCS
#4: Support for alternative livelihoods that reduce deforestation	Promotion of alternative livelihoods (tourism, agriculture, savings groups, adult education etc.)	MoE, WCS, CRDT other NGOs
#5: Collect information on long-term ecological and social trends	Scientific monitoring (carbon measurement, wildlife and plant species, socio-economics)	MoE, WCS, and tech. partners
#6: Effective administrative, accounting and logistical procedures are in place	Administration and accounting systems	MoE, WCS
#7: Long-term financial security	Fund-raising from traditional donors, management of REDD+ activities	MoE, WCS, CRDT other partners

The implementing organization and several of the implementing partners have been active in conservation at the site for up to eight years prior to the project start date (Evans *et al.* 2013) and already had a well-established core team, which will be expanded to achieve the additional activities required for the REDD+ project as resources become available. The team draws on the combined strengths of a government agency (MoE), an international conservation NGO (WCS), and a number of local and international development NGOs.

The MoE has the legal mandate to manage protected areas (PAs) in Cambodia. It has over 1,500 staff, including senior managers and core technical offices in Phnom Penh and a network of local offices extending out to every district (RGC 2010). Senior MoE management staff assigned to the KSWS REDD+ project vary over time. They are mainly drawn from the General Department of Administration for Nature Conservation and Protection (GDANCP) and the National Council for Sustainable Development (NCSD), with involvement of other technical offices as required. These managers have extensive experience in protected area management, implementation of forestry law enforcement, design of community engagement programs, wildlife monitoring, coordination with other stakeholders, and management of large budgets. They also provide training to, and coordinate the involvement of, officers from the provincial and district branches of the MoE, who have skills in matters such as Forest Estate demarcation, law enforcement, oversight of community forestry, and forest tree nurseries, and include members of the Royal Cambodian Armed Forces who participate in law enforcement patrols.

WCS has strong institutional capacity to support the work of the project proponent. WCS, founded in 1895 as the New York Zoological Society, is an internationally recognized organization dedicated to preserving the Earth's wildlife and wild landscapes and seascapes. WCS currently oversees a portfolio of more than 500 conservation projects in 60 countries in Asia, Africa, Latin America, and North America. WCS works with national governments, universities, NGOs, and dedicated individuals to increase understanding and awareness of the importance of wildlife through the establishment and strengthening of protected areas, conducting scientific research, strengthening national governmental organizations and NGO capacity, and training the next generation of conservation professionals.

Specific REDD+ project management experience within the WCS Global Conservation Program includes three VCS and CCBA dually validated and verified Avoided Unplanned Deforestation projects. These projects are Makira REDD+ in Madagascar, Keo Seima Wildlife Sanctuary REDD+ in Cambodia, and Kulera Landscape REDD+ in Malawi. WCS has successfully managed the Makira REDD+ project, of similar scale and type to the KSWS REDD+ project, from inception through periodic verifications. This includes strong institutional capacity in technical aspects of carbon measurement and monitoring, ranging from locating and applying IPCC Tier 1 defaults and Tier 2 data sources to conducting the Tier 3 GHG estimation procedures required by the KSWS REDD+ methodological approach. Technical skills include carbon density estimations of forest strata from biomass plots, remote sensing monitoring and ex-ante modelling of activity data, calculation of change matrices and application of emission factors, application of leakage corrections, and uncertainty estimation and the calculation and application of deductions. The WCS Global Conservation Program has foresters, modelers, remote sensing specialists, and REDD+ technical experts who are available to support KSWS REDD+ activities. Additionally, WCS maintains strong relationships with numerous technical partners and academic institutions, who are available on a contractual basis if further technical support is required.

2.4.2 Management Team Experience (G4.2)

WCS Cambodia employs various non-government national project staff on the KSWS project, including expatriate or national technical advisors, field team members, volunteers, and Phnom Penh-based technical and administrative personnel. The technical advisors are often long term residents on-site and over the past few years have included at various times, as needed, a Senior Natural Resources Management Advisor, a Community and Civil Society Development Advisor, a Wildlife and Threats Monitoring Advisor, a Law Enforcement Advisor, and a REDD+ Technical Advisor. WCS Global Conservation Program also has a conservation support team based regionally and at its New York headquarters that provides technical assistance, analysis, training and capacity building to WCS field programs. The Conservation Support Unit, established over 10 years ago, provides direct technical support in the areas of conservation strategic development, status and impact monitoring, landscape and ecological modelling, education outreach, and capacity building.

2.4.3 Project Management Partnerships/Team Development (G4.2)

The Cambodian Rural Development Team (CRDT) is a local NGO that was founded in 2001. The mission of CRDT is to improve food security, incomes, and living standards of poor rural communities in support of environmental conservation in Cambodia. CRDT has been active in KSWS since 2005, through a small team of community extension workers supported by a core team of highly experienced development practitioners at their head office in adjacent Kratie Province. The team has experience implementing a range of projects in KSWS including water/sanitation, agriculture/livestock, savings groups, environmental education, and adult literacy.

Sam Veasna Center (SVC) is a Cambodian organization with over 13 years of experience in wildlife and conservation work. They spend years training Cambodian guides and trainees in birding and wildlife-viewing skills. They work with local guides in rural areas, taking tourists to places that are beyond the reach of others, presenting tourists with the best chance to see key species. SVC's work delivers essential conservation through community-based ecotourism and provides sustainable livelihoods to local communities by partnering with WCS Cambodia and RGC in KSWS, and their work has been globally recognized as a model of successful conservation.

Elephant Livelihood Initiative Environment (ELIE) is a local NGO that was founded in 2006 and is based in Mondulkiri, Cambodia. ELIE's aim is to improve the health and welfare of captive elephants in Mondulkiri Province, to conserve the natural habitat of wild elephants, and to support the local people who work with these magnificent creatures, particularly through providing employment, securing their tenure rights, and improving their livelihoods through nature-based tourism.

World Hope International (WHI) has many years of experience working in supporting communities to drill clean water wells and provide necessary sanitation in some of the world's most impoverished communities. The WHI teams drill wells in communities that lack clean water sources, and local community leaders are then trained to keep the clean water flowing long after the drilling is done.

Regional Community Forestry Training Center for Asia and the Pacific (RECOFTC) has many years of experience working to enhance capacities for stronger rights, improved governance and fairer benefits for local people in sustainable forest landscapes in the Asia- Pacific region. RECOFTC provided capacity building on community based natural resource management for improving community livelihoods and conservation of natural resources and biodiversity.

2.4.4 Financial Health of Implementing Organization(s) (G4.3)

The MoE is a legally constituted branch of the Royal Government of Cambodia and as such receives annual allocations from the national budget. Hence, its basic financial health and long-term stability are strong. One of the key strategies of the KSWS REDD+ project is to obtain funding from carbon financing through REDD (voluntary carbon market and/or future compliance markets), which will enable KSWS to be strengthened, scaled up to cover the whole of the site, and sustainably funded for the long term.

The WCS financial report ending fiscal year 2018 and 2019 (WCS Consolidated Financial Statements and Schedules, 2019[17]) demonstrates the financial stability of the organization, with operating revenues of US$ 336.1 million in FY 2018 exceeding expenditures by US $33.3 million. In FY 19, operating expenses of US$ 308.2 million were only slightly exceeded by expenses of US$318.8 million. The WCS Cambodia program has been operational since 1999 and has a strong record of financial health and effective financial management. It has maintained a broad base of donors that enables it to avoid an excessive reliance on any one source of funding.

[17] See: https://c532f75abb9c1c021b8c-e46e473f8aadb72cf2a8ea564b4e6a76.ssl.cf5.rackcdn.com/2019/10/31/483kvseqn9_Audited_Financial_Statements_2019_WCS.pdf

2.4.4.1 Funds for Project Implementation

The work in KSWS has been supported mostly by international donors, including private foundations, bilateral aid agencies, multilateral institutions, and private companies. The government contributes approximately $200,000 annually, for salaries for DoE and MoE rangers involved in the project.

Donor funding for KSWS has been sufficient to maintain core operations, however the project seeks carbon finance to ensure its long term sustainability. Table 2.4 shows a summary of grant revenue received for project implementation, including revenue from carbon finance from 2018 to 2019.

Table 2.4 Revenue received for project implementation.

	2018	2019
Total revenue (USD)	570,436	1,459,921

2.4.5 Avoidance of Corruption and Other Unethical Behavior (G4.3)

To strengthen good governance in Cambodia, fighting against corruption is one of the key programs to achieve social justice, and sustainable and equitable social economic development in the country. The RGC adopted an Anti-Corruption Law[18] in 2010 and the Anti-Corruption Unit (ACU)[19] was established to fight corruption across the country. The ACU has set up a complaint mechanism for citizens to report corruption cases through: hotline: 1282; email: acu@acu.gov.kh, complaint@acu.gov.kh; and website: www.acu.gov.kh.

To enhance social accountability, reporting mechanisms have been put in place at provincial, district, and commune offices throughout the country. Written complaints or requests can be anonymously put in locked boxes. The mechanisms are designed to respond to the needs of citizens and ensure better governance, better public services, and greater citizen participation. At the project level, all relevant stakeholders in the project can report or make a complaint on any corruption case via the hotline number (066 929 006) and project grievance boxes, which have been set up to prevent and deal with possible corruption and misuse of funds. In article 64 of the Protected Area Law, “the administration officer, an inspection or environment officer, for their negligence, carelessness or failure to abide by the order of the MoE, shall face administrative punishment or shall be prosecuted. The administration officer, an inspection or environment officer, who conspires with the offender or facilitates the offences, shall receive the same punishment as the offender.”

WCS is committed to ensuring the integrity of financial information for the benefit of the Board of Trustees, management, donors, creditors, government agencies, and other stakeholders. WCS expects its employees to maintain the highest standards of ethical conduct and to ensure their and WCS’s compliance with all applicable laws and accounting principles. Any accounting fraud or other fiscal impropriety is strictly prohibited and will be subject to disciplinary action, including possibly termination.

All accounting and financial business records and documents must be prepared accurately, reliably, and in a timely manner. These records must conform to generally accepted accounting principles, as well as to all applicable laws and regulations and to WCS finance and administrative policies. Such records are important

[18] Anti-Corruption Law: http://goo.gl/dkNDOI
[19] ACU is a government body under the management of the Office of the Council of Ministers that has a role as the implementing agency in fighting against corruption in every aspect, level, and sector across Cambodia.

to WCS's decision making processes and the proper discharge of its financial, legal, and reporting obligations.

Some examples of fiscal improprieties include but are not limited to: (1) unauthorized or unethical use of WCS funds; (2) fraudulent accounting or reporting expenditures; (3) illegal or unethical fiscal activity (e.g., theft embezzlement); (4) improperly gaining or potentially gaining financial benefit from vendors, partners, donors, suppliers; and (5) aiding and abetting another's fiscal impropriety.

Falsification of financial or any other records or misrepresentation of information may constitute fraud and can result in civil and criminal liabilities. Employees are obliged to report false entries or omissions and to highlight questionable or improper accounting to their supervisor, the Country Director, the Comptroller, or the Office of the General Counsel (OGC). A negligent and/or willful failure to report a fiscal impropriety may be construed as aiding and abetting the wrongdoer.

2.4.6 Commercially Sensitive Information (*Rules* 3.5.13–3.5.14)

No commercially sensitive information was excluded from this report.

2.5 Legal Status and Property Rights

2.5.1 Recognition of Property Rights (G5.1)

The Project Area that will generate credits was 100% State Land at the project start date, under the territorial mandate of the Ministry of Agriculture, Forestry and Fisheries (MAFF) through the FA. It was first formally designated as Permanent Forest Estate in 1994, at which time it was implicitly classified as Production Forest. It was first made a conservation area in 2002, by a government regulation (*prakas*) that was signed by the Minister of Agriculture, Forestry and Fisheries. This status co-existed with its status as Production Forest. The land status of the area was reclassified to Protection Forest on 4 September 2009 by the endorsement of a sub-decree (No. 143, 2009) by the Council of Ministers and Prime Minister Samdach Hun Sen, thus enhancing its conservation status. This legal action created the Seima Protection Forest and reaffirmed MAFF, through the FA, as the government body responsible for managing it. The sub-decree has nine objectives, which are listed below:

1. Protect, conserve, and rehabilitate genetic resources of fauna and flora that are globally threatened.
2. Maintain and rehabilitate important ecosystems as habitat for all forms of biodiversity.
3. Contribute to protection and conservation, to meet the goals of the National Millennium Development Plan of the Royal Government of Cambodia, and to maintain forest cover.
4. Conserve the culture and tradition of indigenous communities and local communities where they are living within the Protection Forest area.
5. Maintain the natural resources that these communities depend on for their livelihoods and implement the program of poverty reduction of the Royal Government of Cambodia.
6. Contribute to sustainable socio-economic development through participation of local communities in the management of harvesting forest resources, development of ecotourism, and other similar activities that have very small impacts on biological resources, forests, and wildlife.
7. Maintain carbon stored in vegetation in order to reduce carbon dioxide (CO_2) emissions into the atmosphere.

8. Prevent soil erosion, to protect soil fertility and to maintain the stability and quality of water sources.
9. Support other activities, including technical and scientific research, education, training, community development, and environmental studies, that are related to sustainable development and conservation at local, national, and international levels.

This sub-decree is the necessary proof of title/right of use for the FA to develop and manage a REDD+ project within the Seima Protection Forest on behalf of the RGC, as the land is clearly government-owned. Also, objective 7 gives the FA a clear mandate to implement policies to manage the area for avoidance of carbon emissions.

In April 2016, the Project Area was transferred to the jurisdiction of the MoE by Sub-Decree No. 69. The Seima Protection Forest was changed to Keo Seima Wildlife Sanctuary (KSWS) by Sub-Decree No. 83 on 9 May 2016. The sub-decree has three objectives:

1. Ensure the protection of wildlife habitat and ecosystems, and the necessary conditions for any type of fauna, flora, and biodiversity to thrive;
2. Provide natural products and services for sustainable uses of natural resources;
3. Promote the participation of local communities, as well as the general public, in contribution to management and conservation of biodiversity and natural resources in the area.

Note on forest eligible to be transferred to communal land titles

Parts of KSWS have been claimed as ICT lands under Land Law Articles 23–28, or are potentially eligible. In such areas, ownership is eventually transferred to the communities by process of law and the land ceases to be part of the Permanent Forest Estate, although some parcels remain on the Land Register as State Land and the communities have no right to their sale. Issuance of these titles is a core strategy of the project as it will help to stabilize permitted land uses and protect community rights. Therefore, most eligible areas will likely be titled during the first fixed baseline period. Around several villages, such titles were issued during 2012–2013. Seven out of fifteen eligible villages have been provided land titles by the government, while the others are still in the process of obtaining ICTs. Six villages do not wish to obtain ICTs but have agreed to focus on community land-use planning.

Given uncertainty over carbon rights in these areas, and the difficulties of establishing VCS-compliant, 60-year, 'irrevocable' agreements on rights of use for these areas before benefit-sharing arrangements and long-term income streams are secure, these areas have been excluded from the Project Area. They remain within the Leakage Belt of the project and will be a focus of activities, but will not contribute to the generation of credits.

2.5.2 Free, Prior and Informed Consent (G5.2)

Consent for REDD+ activities is required from communities that use the land concerned, if the activities affect them. Furthermore, under VCS and CCBA rules, the owner of carbon rights for a piece of land must formally agree to the sales of credits derived from these rights. The Project Area is 100% State Public Land in the Permanent Forest Estate, leading to a simple situation where all carbon rights were the property of the state, which was therefore the primary decision-maker. However, the communities do have customary rights, recognized in law, to use State Public Land. Therefore, explicit written community consent was obtained from all 20 participating communities. This demonstrates government commitment to treating the communities as active project participants and rights holders.

Consent was obtained through a process that began in the early stages of the project, prior to any steps to validate the project or make sales of credits. Consent was freely given and based on extensive efforts to ensure signatories were well-informed. Design of the community consent aimed to follow best practice in all important aspects. Project staff believe that it meets the requirements of Cambodian national law, and conforms to VCS and CCBA requirements and the UN Declaration on the Rights of Indigenous Peoples (UNDRIP, 2007). The agreements describe in detail what is being consented to, the term of the agreement, and the rights and liabilities it confers. The consent agreements were signed by the most appropriate community representatives, as well as with a thumbprint from the great majority of families in each village.

2.5.3 Property Rights Protection (G5.3)

The project has not resulted in nor anticipates involuntary relocations of legitimate occupants of the area from either residential or agricultural land. However, illegal settlers or land grabbers attempting to occupy state or community land may be arrested by the relevant authorities and removed without compensation, and possibly prosecuted, in accordance with the law.

In general, the project will impose no restrictions on customary use of forest resources beyond the basic legal requirements for sustainable practices, and in many cases will improve security of access and the status of these resources, through, for instance, identifying community and sustainable use zones in the areas most important to communities. The one exception is that the project is in the process of putting in place restrictions on customary use rights by delineating areas to be designated as core, i.e. strict protection, zones under the MoE zoning guidelines, which will be areas of zero or near zero human use, designed to improve the survival prospects of the most vulnerable wildlife species. Areas of high importance for both communities and wildlife will be designated conservation zones, in these areas communities can extract NTFPs such as resin, with permission of protected area authorities.

The provisional size and location of the proposed strict protection zones has been decided after consultation with communities, PDoE, MoE and other relevant stakeholders (subject to final approval by MoE), the core zones have been placed to minimize the number of forest users affected. Restriction of use falls within the CCBA definition of 'relocation', but this will not be an involuntary process. Designation of such zones has been preceded by detailed consultations and a consent process with potentially affected villages, identification of affected individuals/families, and the negotiation of mutually acceptable compensation packages, including, but not limited to, employment opportunities, in-kind compensation (e.g., alternative livelihoods) or financial compensation (e.g., substituting the value of any resin tree income foregone). Confirmation that this process has entailed consent is included in the text of the Community Consent Agreements.

Due to complex tenure boundaries within the project site, methods for referencing formal boundaries by patrol staff is a requirement of the law enforcement monitoring framework. Field staff identify boundary areas in the field through (a) the use of boundary polygons loaded onto GPS units carried in the field, and (b) site visits accompanied by the on-site GIS coordinator. Regular training in the use of GPS and recognition of the boundaries is provided to patrol staff by the on-site GIS coordinator. These boundaries, including the formal delineation of Directive 001 (2012), are clearly visible in the GPS display. For patrol staff using paper maps, coordinates are checked with the GIS officer prior to taking action. Additionally, a further check is conducted in the office, with field-collected data. Any suspected encroachment is recorded by patrol staff and entered in the Spatial Monitoring and Reporting Tool (SMART) against which formal boundaries (including Directive 001) can be checked.

2.5.4 Identification of Illegal Activity (G5.4)

Project activities combine efforts to prevent illegal activities (e.g., through planning and direct enforcement) and efforts to enhance livelihoods through interventions that are clearly legal (e.g., agricultural assistance on lands that are legally farmed, ecotourism in sites that have government approval). Safeguards will be put in place to ensure that project funds are not used to promote illegal activities (e.g., by screening of grants for community projects).

Illegal activities drive many of the threats to climate, biodiversity, and community well-being in the baseline scenario, so the project has been explicitly designed to address them (Section 2.1.1). Actions under Sub-Objective 2 are designed to enhance direct law enforcement, mainly by government-led patrol teams but also by community-led patrols and other measures, including monthly and annual monitoring of levels of illegal activity. Sub-Objective 1 aims to put in place legal and planning frameworks that deter illegal activity and Sub-Objective 3 aims to establish legal land tenure and land management systems for community areas.

2.5.5 Ongoing Disputes (G5.5)

No ongoing disputes reported to date.

2.5.6 National and Local Laws (G5.6)

Sub-Decree No. 69 (2016)

In April 2016, the Project Area was transferred to the jurisdiction of the MoE by Sub-Decree No. 69, along with all other Protection Forests that previously fell under the management of the FA of the Ministry of Agriculture, Forestry and Fisheries.

Sub-Decree No. 83 (2016)

In addition, Seima Protection Forest was changed to Keo Seima Wildlife Sanctuary by Sub-Decree No. 83 on 9 May 2016. This designation change was required because MoE operates under the Protected Area Law (2008), while FA operates under the Forestry Law (2002). Seima Protection Forest REDD+ was subsequently renamed Keo Seima Wildlife Sanctuary REDD+, all FA staff were replaced with MoE staff, and all reporting submitted to MoE rather than FA.

Sor Chor Nor No. 606 (2016)

The jurisdictional transfer resulted in a change in the Project Proponent from FA to MoE. Sor Chor Nor No. 606 (2016) concerns approval allowing the MoE to collaborate with WCS to implement the REDD+ project in KSWS to generate carbon credits, and designates MoE as the signatory of all official agreements with relevant partners on behalf of the RGC.

While these developments occurred after the previous verification period (2010–2015), they were included in the 2010–2015 Monitoring and Implementation Report as a project deviation and were subject to gap validation[20] conducted by the verification team. The gap validation report concludes that: “Based on the

[20] Reduced Emissions From Deforestation and Degradation in Keo Seima Wildlife Sanctuary Gap Validation Report. http://vcsprojectdatabase.org/services/publicViewServices/downloadDocumentById/26934

results of our validation activities, it is our opinion that there is nothing inherent in the change in project proponent, as described above, that would impact upon the validation statement previously issued by SCS in respect to the CCB Standards."

National REDD+ Strategy (2017)

In December 2017, the National REDD+ Strategy (NRS) and National REDD+ Roadmap—developed through the national REDD+ readiness process—was endorsed by the RGC. The KSWS REDD+ project was considered a national demonstration project, generating lessons learned and experiences for the development of the NRS. The KSWS REDD+ project continues to be the most advanced project in the country and plays a role in demonstrating how results-based payments can work in practice. The NRS is not a law or regulation but rather a precursor to the National REDD+ Action Plan, which remains in draft form currently.

The concept of a jurisdictional nested approach continues to be discussed and preliminary recommendations have been issued on the process for the future nesting of projects within a national REDD+ system. No formal regulations on this however have been issued to date.

3 CLIMATE

3.1 Monitoring GHG Emission Reductions and Removals

3.1.1 Data and Parameters Available at Validation

Data and Parameters Available at Validation	Forest cover maps for selected years of the historical reference period
Data unit	Pixels of 30 m resolution
Description	Land cover classes listed in Table 4.5.1. of the PD
Source of data	Analysis of satellite imagery described in the PD
Value applied	Maps for each time point listed in PD 4.5.2.4 (Step 2.4 of the Methodology)
Justification of choice of data or description of measurement methods and procedures applied	The data and methods are justified in detail in the Methodological Annex to the PD.
Purpose of Data	Determination of baseline scenario To inform development of models of rate and location of deforestation to allow projections for the first fixed crediting period The map for the year 2010 referred to as 'Forest Benchmark Map'

Data/Parameter	Reference region map
Data unit	Shapefile—no specific unit of measurement
Description	Outer boundary of Reference Region
Source of data	Created by applying the definitions set out in PD 4.4.1 (Step 1.1 (1) of the Methodology)
Value applied	Fixed boundaries for the whole historical reference period (Fig 4.4.1 of the PD)
Justification of choice of data or description of measurement methods and procedures applied	The choice of definition for the Reference Region is set out in detail in PD 4.4.1.1 (Step 1.1 (1) of the Methodology)
Purpose of Data	Determination of baseline scenario, calculation of baseline emissions, project emissions, and leakage To define an area within which deforestation patterns and drivers in the past are comparable with those in the project area in the future and so allow the development of predictive models

Data/Parameter	Leakage belt map
Data unit	Shapefile—no specific unit of measurement
Description	Area within which spatially constrained agents of deforestation may conduct deforestation that has been displaced from within the project area by project activities

Source of data	Created by applying the definitions set out in PD 4.4.1.6 (Step 1.1 (3) of the Methodology)
Value applied	One boundary is applied during 2010–2011 and a second, slightly reduced one from 2012 onwards, as a result of parcels of land moving into Stratum 2 and becoming unavailable for unplanned deforestation (Fig. 4.4.2 of the PD).
Justification of choice of data or description of measurement methods and procedures applied	The choice of definition for the leakage belt is set out in detail in PD 4.4.1.6 (Step 1.1 (3) of the Methodology).
Purpose of Data	Calculation of leakage

Data/Parameter	Stratum boundaries map
Data unit	Shapefile—no specific unit of measurement
Description	Divides Reference Region into areas where unplanned deforestation takes place and areas where planned deforestation takes place
Source of data	The choice of definition for the stratum boundaries is described in Annex 3.1 of the PD.
Value applied	The strata are dynamically defined and so vary over time. Stratum boundaries were updated every two years during the historical reference period, as shown by a set of shapefiles supplied to the validator. They were updated again in 2012 and can be updated again if new ELCs become active in the reference region.
Justification of choice of data or description of measurement methods and procedures applied	The choice of definition is set out in detail in Annex 3.1 of the PD.
Purpose of Data	Determination of baseline scenario, calculation of baseline emissions, project emissions and leakage To define the area within which unplanned deforestation takes place, to set a frame for deforestation modelling, projections, and monitoring

Data/Parameter	ABSLLK1,t
Data unit	ha
Description	Area of Stratum 1 deforested at time *t* within the leakage belt in the baseline case
Source of data	Raster files of annual deforestation projections conducted according to the methods set out in Step 4 of the PD, intersected with a shapefile of the Leakage Belt boundary
Value applied	See Table 5.3.3 of the PD
Justification of choice of data or description of measurement methods and procedures applied	The model used to develop the projections is justified in PD 5.3.1 (Step 4 of the Methodology).
Purpose of Data	Calculation of baseline emissions

Data/Parameter	ABSLPA1,t
Data unit	ha

Description	Area of Stratum 1 deforested at time *t* within the project area in the baseline case
Source of data	Raster files of annual deforestation projections conducted according to the methods set out in PD 5.3.1 (Step 4 of the Methodology). Intersected with a shapefile of the Project Area boundary.
Value applied	See Table 5.3.2 of the PD
Justification of choice of data or description of measurement methods and procedures applied	The model used to develop the projections is justified in PD 5.3.1 (Step 4 of the Methodology).
Purpose of Data	Calculation of baseline emissions

Data/Parameter	ABSLRR1,t
Data unit	ha
Description	Area of Stratum 1 deforested at time *t* within the reference region in the baseline case.
Source of data	Raster files of annual deforestation projections conducted according to the methods set out in Section 5.3.2 (Step 4) of the PD.
Value applied	See Table 5.3.1 of the PD
Justification of choice of data or description of measurement methods and procedures applied	The model used to develop the projections is justified in Section 5.3.2 (Step 4) of the PD.
Purpose of Data	Calculation of baseline emissions

Data/Parameter	ABSLLKct,t
Data unit	ha
Description	Area of forest type *ct* deforested at time *t* within the leakage belt in the baseline case
Source of data	Raster files of annual deforestation projections conducted according to the methods set out in Section 5.3.2 (Step 4) of the PD, intersected with a shapefile of the Leakage Belt boundary and with boundaries of land cover categories mapped at start of historical reference period.
Value applied	See Table 5.3.7 of the PD
Justification of choice of data or description of measurement methods and procedures applied	The model used to develop the projections is justified in Section 5.3.2 (Step 4) of the PD.
Purpose of Data	Calculation of baseline emissions

Data/Parameter	ABSLPAct,t
Data unit	ha
Description	Area of forest type *ct* deforested at time *t* within the project area in the baseline case
Source of data	Raster of annual deforestation projections created according to methods set out in Section 5.3.2 (Step 4) of the PD, intersected by a shapefile of

	the Project Area boundary and with boundaries of land cover categories mapped at start of the historical reference period.
Value applied	See Table 5.3.6 of the PD
Justification of choice of data or description of measurement methods and procedures applied	The model used to develop the projections is justified in Section 5.3.2 (Step 4) of the PD.
Purpose of Data	Calculation of baseline emissions

Data/Parameter	ABSLRRct,t
Data unit	ha
Description	Area of forest type *ct* deforested at time *t* within the reference region in the baseline case
Source of data	Raster files of annual deforestation projections conducted according to the methods set out in Step 4 of the PD intersected with the boundaries of the land cover categories mapped at the start of the historical reference period (1998).
Value applied	See Table 5.3.5 of the PD
Justification of choice of data or description of measurement methods and procedures applied	The model used to develop the projections is justified in Section 5.3.2 (Step 4) of the PD.
Purpose of Data	Calculation of baseline emissions

Data/Parameter	AP
Data unit	m^2
Description	Plot area
Source of data	Measured
Value applied	Different plot sizes are applied to different size classes of tree and standing dead wood, and in forest versus non-forest vegetation types. The plot diameters are listed in the PD Annex 4.3 Table 1 and Annex 4.5 Table 2. In each case, the plot area is calculated as $AP = \pi \times (Diameter/2)^2$.
Justification of choice of data or description of measurement methods and procedures applied	The diameter of the plot is measured as twice the radius, with the radius measured using standard forestry techniques, such as a measuring tape or digital measuring equipment. Winrock SOPs (supplied) were followed.
Purpose of Data	Calculation of baseline, project and leakage emissions The plot area is used to convert the plot biomass to a biomass per unit area measure that can be used to calculate an average for the vegetation type being sampled.

Data/Parameter	CFdc
Data unit	tC/tDM
Description	Carbon fraction of the dead wood density class *dc*.

Source of data	IPCC, 2003. Good Practice Guidance for Land Use, Chapter 3.2 Forest Land, page 3.25.
Value applied	0.5
Justification of choice of data or description of measurement methods and procedures applied	IPCC default value, as allowed by the Methodology
Purpose of Data	Calculation of baseline, project, and leakage emissions

Data/Parameter	CFj
Data unit	tC/tDM
Description	Carbon fraction of trees in forest type *j*
Source of data	IPCC, 2003. Good Practice Guidance for Land Use, Chapter 3.2 Forest Land, page 3.25.
Value applied	0.5
Justification of choice of data or description of measurement methods and procedures applied	IPCC default value, as allowed by the Methodology.
Purpose of Data	Calculation of baseline, project, and leakage emissions

Data/Parameter	cl
Data unit	Dimensionless
Description	1, 2, 3, …, CL LU/LC classes
Source of data	Measured
Value applied	See Table 4.5.1of the PD
Justification of choice of data or description of measurement methods and procedures applied	See 3 Annex 3.5 of the PD
Purpose of Data	Calculation of baseline, project and leakage emissions

Data/Parameter	d1, d2, ..., dn
Data unit	cm
Description	Diameters of intersecting pieces of dead wood
Source of data	Measured
Value applied	Different for each piece of wood. See supporting files to Annex 4.3 of the PD.
Justification of choice of data or description of measurement methods and procedures applied	Winrock SOPs (supplied) were followed.
Purpose of Data	Calculation of baseline, project, and leakage emissions

Data/Parameter	DBH
Data unit	cm

Description	Diameter at breast height
Source of data	Measured
Value applied	Different for each tree. See supporting files to Annex 4.3 and 4.5 of the PD.
Justification of choice of data or description of measurement methods and procedures applied	Winrock SOPs (supplied) were followed.
Purpose of Data	Calculation of baseline, project, and leakage emissions

Data/Parameter	Ddc
Data unit	tonnes d m m^{-3}
Description	Dead wood density of class *dc*
Source of data	Measured
Value applied	See Annex 4.3 Table 3 of the PD
Justification of choice of data or description of measurement methods and procedures applied	Winrock SOPs (supplied) were followed. A methodology deviation was proposed to allow this.
Purpose of Data	Calculation of baseline, project, and leakage emissions

Data/Parameter	No abbreviation given [alternate parameter to Dj]
Data unit	t d m m^{-3} [= g cm^{-3}]
Description	Mean wood density of all tree species
Source of data	Estimated from literature
Value applied	0.57 (see Table 3, Annex 4.3 of the PD)
Justification of choice of data or description of measurement methods and procedures applied	Literature value was used, as permitted by the Methodology. The conservativeness of biomass estimates using this figure was confirmed in Annex 4.4 of the PD.
Purpose of Data	Calculation of baseline, project, and leakage emissions

Data/Parameter	fcl
Data unit	Dimensionless
Description	Final (post deforestation) non-forest classes
Source of data	Measured
Value applied	See PD Table 5.3.16
Justification of choice of data or description of measurement methods and procedures applied	The selection of non-forest classes is justified in the PD Annex 4.5 Section 2.2.
Purpose of Data	Calculation of baseline, project, and leakage emissions

Data/Parameter	fj(DBH,H)ab
Data unit	Dimensionless

Description	An allometric equation for species, or group of species, or forest type *j*, linking above-ground tree biomass (in kg tree^{-1}) to diameter at breast height (DBH) and possibly tree height (H).
Source of data	Estimated from literature
Value applied	The chosen equation is set out in the PD Annex 4.3.
Justification of choice of data or description of measurement methods and procedures applied	The choice of equation is justified in PD Annex 4.4.
Purpose of Data	Calculation of baseline, project, and leakage emissions

Data/Parameter	H
Data unit	m
Description	Height of the tree
Source of data	Measured
Value applied	Different for each tree. See supporting files to Annex 4.3 and 4.5 of the PD.
Justification of choice of data or description of measurement methods and procedures applied	Winrock SOPs (supplied) were followed.
Purpose of Data	Calculation of baseline, project, and leakage emissions.

Data/Parameter	icl
Data unit	Dimensionless
Description	1, 2, 3, …, ICL initial (pre-deforestation) forest classes
Source of data	Measured
Value applied	See PD Tables 5.3.11 to 5.3.15
Justification of choice of data or description of measurement methods and procedures applied	The selection of forest classes is justified in the PD Annex 3.5 Section 2.2.
Purpose of Data	Calculation of baseline, project, and leakage emissions.

Data/Parameter	L
Data unit	m
Description	Length of the line
Source of data	Measured
Value applied	100 m
Justification of choice of data or description of measurement methods and procedures applied	Winrock SOPs (supplied) were followed.
Purpose of Data	Calculation of baseline, project, and leakage emissions

Data/Parameter	PP

Data unit	Number of people
Description	Projected population size of the 20 participating villages in each year of the first fixed crediting period.
Source of data	Measured
Value applied	See PD Annex 3.2 Appendix 3
Justification of choice of data or description of measurement methods and procedures applied	See Annex 3.2 and associated Methodology Deviations
Purpose of Data	Calculation of leakage emissions

Data/Parameter	r1
Data unit	m
Description	Radius at the base of the tree
Source of data	Measured
Value applied	Different for each tree. See supporting files to Annex 4.3 and 4.5 of the PD.
Justification of choice of data or description of measurement methods and procedures applied	Winrock SOPs (supplied) were followed.
Purpose of Data	Calculation of baseline, project, and leakage emissions

Data/Parameter	r2
Data unit	m
Description	Radius at the top of the tree
Source of data	Measured
Value applied	Different for each tree. See supporting files to Annex 4.3 and 4.5 of the PD.
Justification of choice of data or description of measurement methods and procedures applied	Winrock SOPs (supplied) were followed.
Purpose of Data	Calculation of baseline, project, and leakage emissions

Data/Parameter	Rj
Data unit	Dimensionless
Description	Root-shoot ratio appropriate for species, group of species, or forest type *j*
Source of data	Estimated from literature
Value applied	0.22
Justification of choice of data or description of measurement methods and procedures applied	The choice of ratio is justified in PD Annex 4.3.
Purpose of Data	Calculation of baseline, project, and leakage emissions

Data/Parameter	tr
Data unit	Dimensionless
Description	1, 2, 3, …, TRpl number of trees in plot *pl*.
Source of data	Measured
Value applied	Different for each plot See supporting files to Annex 4.3 and 4.5 of the PD.
Justification of choice of data or description of measurement methods and procedures applied	Winrock SOPs (supplied) were followed.
Purpose of Data	Calculation of baseline, project, and leakage emissions

Data/Parameter	z
Data unit	Dimensionless
Description	Post-deforestation zones having a characteristic mix of final post deforestation classes
Source of data	Measured
Value applied	See PD tables 5.3.17 and 5.3.18
Justification of choice of data or description of measurement methods and procedures applied	See PD 5.3.2.2 (Step 5.2)
Purpose of Data	Calculation of baseline, project, and leakage emissions

3.1.2 Data and Parameters Monitored

Data/Parameter	Forest cover maps for each monitored year
Data unit	Pixels of 30 m resolution
Description	Land cover classes listed in Table 4.5.1 of the PD
Source of data	Measured
Description of measurement methods and procedures to be applied	Analysis of satellite imagery. The data and methods are justified in detail in the Methodological Annex to the PD. Responsibility rests with the National Project Manager, in collaboration with the KSWS Senior Technical Advisor.
Frequency of monitoring/recording	At a minimum before each verification event, but more often if preferred
Value applied	Forest cover map for 23 February 2020
Monitoring equipment	n/a
QA/QC procedures to be applied	Accuracy assessment using confusion matrix, reporting overall accuracy, users accuracy, producers accuracy, and kappa
Purpose of data	Calculation of project emissions and leakage
Calculation method	n/a

Data/Parameter	Leakage belt map
Data unit	Shapefile—no specific unit of measurement

Description	Area within which spatially constrained agents of deforestation may conduct deforestation that has been displaced from within the project area by project activities
Source of data	Measured
Description of measurement methods and procedures to be applied	Determined by intersecting the leakage belt boundary mapped for 2010 in the PD with the extent of Stratum 1
Frequency of monitoring/recording	When establishing the second fixed baseline
Value applied	No ex-ante value can be presented other than those presented at validation.
Monitoring equipment	n/a
QA/QC procedures to be applied	n/a
Purpose of data	Calculation of baseline emissions, project emissions, and leakage.
Calculation method	n/a

Data/Parameter	Stratum boundaries map
Data unit	Shapefile—no specific unit of measurement
Description	Divides reference region into areas where unplanned deforestation takes place and areas where planned deforestation takes place.
Source of data	Measured
Description of measurement methods and procedures to be applied	The procedure for defining the stratum boundaries is set out in PD Annex 3.1.
Frequency of monitoring/recording	When establishing the second fixed baseline
Value applied	No ex-ante value can be presented other than those at validation.
Monitoring equipment	n/a
QA/QC procedures to be applied	n/a
Purpose of data	Calculation of project emissions and leakage
Calculation method	n/a

Data/Parameter	ACPAicl,t
Data unit	ha
Description	Annual area within the Project Area affected by catastrophic events in class *icl* at year *t*
Source of data	Measured
Description of measurement methods and procedures to be applied	See PD Section 8.1 Task 1.1.4 for procedures for detecting and mapping such events.
Frequency of monitoring/recording	Annual
Value applied	0
Monitoring equipment	n/a
QA/QC procedures to be applied	See PD Section 8.1 Task 1.1.4 for procedures for detecting and mapping such events.
Purpose of data	Calculation of project emissions and leakage

Calculation method	Area of loss is estimated from boundaries using standard GIS tools

Data/Parameter	AP
Data unit	m^2
Description	Plot area
Source of data	Measured
Description of measurement methods and procedures to be applied	Winrock SOPs (supplied) will be followed.
Frequency of monitoring/recording	When plots are required for assessing catastrophic losses and comparable unplanned events, and in establishing the second fixed baseline
Value applied	Different plot sizes are applied to different size classes of tree and standing dead wood, and in forest versus non-forest vegetation types. The plot diameters are listed in the PD Annex 5.3 Table 1 and Annex 5.5 Table 2. In each case, the plot area is calculated as $AP = \pi \times (Diameter/2)^2$.
Monitoring equipment	The diameter of the plot is measured as twice the radius, with the radius measured using standard forestry techniques such as a measuring tape or digital measuring equipment, as appropriate.
QA/QC procedures to be applied	See SOPs
Purpose of data	Calculation of baseline emissions, project emissions, and leakage
Calculation method	See SOPs

Data/Parameter	APDPAicl,t
Data unit	ha
Description	Area of planned deforestation in forest class *icl* at year *t* in the project area
Source of data	Measured
Description of measurement methods and procedures to be applied	See PD Section 8.1 Task 1.1.2 for procedures for detecting and mapping such events
Frequency of monitoring/recording	Annual
Value applied	0
Monitoring equipment	n/a
QA/QC procedures to be applied	See PD Section 8.1 Task 1.1.2 for procedures for detecting and mapping such events
Purpose of data	Calculation of project emissions and leakage
Calculation method	Area of loss is estimated from boundaries using standard GIS tools

Data/Parameter	APFPAicl,t
Data unit	ha
Description	Area of planned fuelwood and charcoal activities in forest class *icl* at year *t* in the project area

Source of data	Measured
Description of measurement methods and procedures to be applied	See PD Section 8.1 Task 1.1.2 for procedures for detecting and mapping such events
Frequency of monitoring/recording	Annual
Value applied	0
Monitoring equipment	n/a
QA/QC procedures to be applied	See PD Section 8.1 Task 1.1.2 for procedures for detecting and mapping such events
Purpose of data	Calculation of project emissions and leakage
Calculation method	Area of loss is estimated from boundaries using standard GIS tools.

Data/Parameter	APLPAicl,t
Data unit	ha
Description	Area of planned logging activities in forest class *icl* at year *t* in the project area
Source of data	Measured
Description of measurement methods and procedures to be applied	See PD Section 8.1 Task 1.1.2 for procedures for detecting and mapping such events
Frequency of monitoring/recording	Annual
Value applied	0
Monitoring equipment	n/a
QA/QC procedures to be applied	See PD Section 8.1 Task 1.1.2 for procedures for detecting and mapping such events
Purpose of data	Calculation of project emissions and leakage
Calculation method	Area of loss is estimated from boundaries using standard GIS tools.

Data/Parameter	APNiPAicl,t
Data unit	ha
Description	Area of forest class *icl* with increasing carbon stock without harvest at year *t* in the project area
Source of data	Measured
Description of measurement methods and procedures to be applied	See PD Section 8.1 Task 1.1.2 & 4 for procedures for detecting and mapping such events
Frequency of monitoring/recording	Annual
Value applied	0
Monitoring equipment	n/a
QA/QC procedures to be applied	See PD Section 8.1 Tasks 1.1.2 & 4 for procedures for detecting and mapping such events
Purpose of data	Calculation of project emissions and leakage
Calculation method	Area affected is estimated from boundaries using standard GIS tools.

Data/Parameter	APSLKfcl,t
Data unit	ha
Description	Annual area of class *fcl* with decreasing carbon stock in leakage management areas in the project case at year *t*
Source of data	Measured
Description of measurement methods and procedures to be applied	See PD Section 8.1 Task 1.1.2 for procedures for detecting and mapping such events
Frequency of monitoring/recording	Annual
Value applied	0
Monitoring equipment	n/a
QA/QC procedures to be applied	See PD Section 8.1 Task 1.1.2 for procedures for detecting and mapping such events
Purpose of data	Calculation of project emissions and leakage
Calculation method	The area affected is estimated from mapped boundaries using standard GIS tools.

Data/Parameter	AUFPAicl,t
Data unit	ha
Description	Areas affected by forest fires in class *icl* in which carbon stock recovery occurs at year *t*
Source of data	Measured
Description of measurement methods and procedures to be applied	See PD Section 8.1 Task 1.1.4 for procedures for detecting and mapping such events
Frequency of monitoring/recording	Annual
Value applied	0
Monitoring equipment	n/a
QA/QC procedures to be applied	See PD Section 8.1 Task 1.1.4 for procedures for detecting and mapping such events
Purpose of data	Calculation of project emissions and leakage
Calculation method	The area affected is estimated from mapped boundaries using standard GIS tools.

Data/Parameter	CFdc
Data unit	tC/tDM
Description	Carbon fraction of the dead wood density class *dc*
Source of data	IPCC, 2003. Good Practice Guidance for Land Use, Chapter 3.2 Forest Land, page 3.25.
Description of measurement methods and procedures to be applied	n/a
Frequency of monitoring/recording	Whenever mandatory
Value applied	0.5

Monitoring equipment	n/a
QA/QC procedures to be applied	n/a
Purpose of data	Calculation of baseline emissions, project emissions, and leakage
Calculation method	n/a

Data/Parameter	cl
Data unit	Dimensionless
Description	1, 2, 3, …, CL LU/LC classes
Source of data	Measured
Description of measurement methods and procedures to be applied	The Methodology specifies criteria for selection of these classes.
Frequency of monitoring/recording	Reassessed at baseline renewal
Value applied	See Table 4.5.1 of the PD for current values
Monitoring equipment	n/a
QA/QC procedures to be applied	n/a
Purpose of data	Calculation of baseline emissions, project emissions, and leakage
Calculation method	n/a

Data/Parameter	d1, d2, ..., dn
Data unit	cm
Description	Diameters of intersecting pieces of dead wood
Source of data	Measured
Description of measurement methods and procedures to be applied	Winrock SOPs (supplied) will be followed.
Frequency of monitoring/recording	When plots are required for assessing catastrophic losses and comparable unplanned events, and in establishing the second fixed baseline
Value applied	Cannot be estimated ex ante
Monitoring equipment	Standard forestry equipment, according to SOPs
QA/QC procedures to be applied	See SOPs
Purpose of data	Calculation of baseline emissions, project emissions, and leakage
Calculation method	n/a

Data/Parameter	DBH
Data unit	cm
Description	Diameter at breast height
Source of data	Measured
Description of measurement methods and procedures to be applied	Winrock SOPs (supplied) will be followed.

Frequency of monitoring/recording	When plots are required for assessing catastrophic losses and comparable unplanned events, and in establishing the second fixed baseline
Value applied	Cannot be estimated ex ante
Monitoring equipment	Standard forestry equipment, according to SOPs
QA/QC procedures to be applied	See SOPs
Purpose of data	Calculation of baseline emissions, project emissions, and leakage
Calculation method	n/a

Data/Parameter	Ddc
Data unit	tonnes d m m^{-3}
Description	Dead wood density of class *dc*
Source of data	Measured
Description of measurement methods and procedures to be applied	Winrock SOPs (supplied) will be followed.
Frequency of monitoring/recording	When establishing the second fixed baseline
Value applied	See Annex 5.3 Table 3 of the PD for current values
Monitoring equipment	Standard forestry equipment, according to SOPs
QA/QC procedures to be applied	See SOPs
Purpose of data	Calculation of baseline emissions, project emissions, and leakage
Calculation method	See SOPs

Data/Parameter	No abbreviation given [alternate parameter to Dj]
Data unit	t d m m^{-3} [= g cm^{-3}]
Description	Mean wood density of all tree species
Source of data	Estimated from literature
Description of measurement methods and procedures to be applied	n/a
Frequency of monitoring/recording	Reassess when establishing the second fixed baseline
Value applied	0.57
Monitoring equipment	n/a
QA/QC procedures to be applied	n/a
Purpose of data	Calculation of baseline emissions, project emissions, and leakage
Calculation method	n/a

Data/Parameter	fcl
Data unit	Dimensionless
Description	Final (post-deforestation) non-forest classes
Source of data	Measured

Description of measurement methods and procedures to be applied	The Methodology specifies criteria for selection of these classes.
Frequency of monitoring/recording	Reassessed at baseline renewal
Value applied	See Table 5.3.16 of the PD for current values
Monitoring equipment	n/a
QA/QC procedures to be applied	n/a
Purpose of data	Calculation of baseline emissions, project emissions, and leakage
Calculation method	n/a

Data/Parameter	fj(DBH,H)ab
Data unit	Dimensionless
Description	An allometric equation for species, or group of species, or forest type *j*, linking above-ground tree biomass (in kg tree^{-1}) to diameter at breast height (DBH) and possibly tree height (H).
Source of data	Estimated from literature
Description of measurement methods and procedures to be applied	The Methodology sets out criteria for selection and validation of this equation.
Frequency of monitoring/recording	Reassessed at baseline renewal
Value applied	The current chosen equation is set out in the PD Annex 5.3.
Monitoring equipment	See Methodology
QA/QC procedures to be applied	See Methodology
Purpose of data	Calculation of baseline, project, and leakage emissions
Calculation method	See Methodology

Data/Parameter	H
Data unit	m
Description	Height of the tree
Source of data	Measured
Description of measurement methods and procedures to be applied	Winrock SOPs (supplied) will be followed.
Frequency of monitoring/recording	When plots are required for assessing catastrophic losses and comparable unplanned events, and in establishing the second fixed baseline
Value applied	Cannot be estimated ex ante
Monitoring equipment	Standard forestry equipment, according to SOPs
QA/QC procedures to be applied	See SOPs
Purpose of data	Calculation of baseline emissions, project emissions, and leakage
Calculation method	n/a

Data/Parameter	icl
Data unit	Dimensionless

Description	1, 2, 3, …, ICL initial (pre-deforestation) forest classes
Source of data	Measured
Description of measurement methods and procedures to be applied	The Methodology specifies criteria for selection of these classes.
Frequency of monitoring/recording	Reassessed at baseline renewal
Value applied	See Tables 5.3.11 to 5.2.15 of the PD for current values
Monitoring equipment	n/a
QA/QC procedures to be applied	n/a
Purpose of data	Calculation of baseline emissions, project emissions, and leakage
Calculation method	n/a

Data/Parameter	L
Data unit	M
Description	Length of the line
Source of data	Measured
Description of measurement methods and procedures to be applied	Winrock SOPs (supplied) will be followed.
Frequency of monitoring/recording	When plots are required for assessing catastrophic losses and comparable unplanned events, and in establishing the second fixed baseline
Value applied	100 m
Monitoring equipment	Standard forestry equipment, according to SOPs
QA/QC procedures to be applied	See SOPs
Purpose of data	Calculation of baseline emissions, project emissions, and leakage
Calculation method	n/a

Data/Parameter	OP
Data unit	Number of people
Description	Observed population size of the 20 participating villages in each year of the first fixed crediting period
Source of data	Measured
Description of measurement methods and procedures to be applied	See Annex 4.2 and associated Methodology Deviations. Data derived from Commune Database or a directly comparable source.
Frequency of monitoring/recording	Required at each verification event; can be measured at higher frequency if preferred
Value applied	For 2020: 18,480
Monitoring equipment	n/a
QA/QC procedures to be applied	Expert inspection of the data and correction of any evident errors (with written justification). Periodic comparison with other datasets of comparable or better quality if available and selection of the most conservative.

Purpose of data	Calculation of leakage.
Calculation method	n/a

Data/Parameter	r1
Data unit	m
Description	Radius at the base of the tree
Source of data	Measured
Description of measurement methods and procedures to be applied	Winrock SOPs (supplied) will be followed.
Frequency of monitoring/recording	When plots are required for assessing catastrophic losses and comparable unplanned events, and in establishing the second fixed baseline
Value applied	Cannot be estimated ex ante
Monitoring equipment	Standard forestry equipment, according to SOPs
QA/QC procedures to be applied	See SOPs
Purpose of data	Calculation of baseline emissions, project emissions, and leakage
Calculation method	n/a

Data/Parameter	r2
Data unit	m
Description	Radius at the top of the tree
Source of data	Measured
Description of measurement methods and procedures to be applied	Winrock SOPs (supplied) will be followed.
Frequency of monitoring/recording	When plots are required for assessing catastrophic losses and comparable unplanned events, and in establishing the second fixed baseline
Value applied	Cannot be estimated ex ante
Monitoring equipment	Standard forestry equipment, according to SOPs
QA/QC procedures to be applied	See SOPs
Purpose of data	Calculation of baseline emissions, project emissions, and leakage
Calculation method	n/a

Data/Parameter	tr
Data unit	Dimensionless
Description	1, 2, 3, …, TRpl number of trees in plot *pl*
Source of data	Measured
Description of measurement methods and procedures to be applied	Winrock SOPs (supplied) will be followed.

Frequency of monitoring/recording	When plots are required for assessing catastrophic losses and comparable unplanned events, and in establishing the second fixed baseline
Value applied	Cannot be estimated ex ante
Monitoring equipment	Standard forestry equipment, according to SOPs
QA/QC procedures to be applied	See SOPs
Purpose of data	Calculation of baseline emissions, project emissions, and leakage
Calculation method	n/a

Data/Parameter	z
Data unit	Dimensionless
Description	Post-deforestation zones having a characteristic mix of final post deforestation classes
Source of data	Measured
Description of measurement methods and procedures to be applied	The Methodology specifies criteria for selection of these classes.
Frequency of monitoring/recording	Reassessed at baseline renewal
Value applied	See PD tables 5.3.17 and 5.3.18
Monitoring equipment	n/a
QA/QC procedures to be applied	n/a
Purpose of data	Calculation of baseline emissions, project emissions, and leakage
Calculation method	n/a

Data/Parameter	F_{burnt} [icl]
Data unit	%
Description	Proportion of forest area burned during the monitoring period in the forest class
Source of data	Estimated from GIS analyses
Description of measurement methods and procedures to be applied	Based on a 1km buffer around FIRMS hotspots with 75% confidence or higher the amount of deforestation in the OF and DF class was calculated. From this the proportion of the total loss in each forest class that was burned could be calculated.
Frequency of monitoring/recording	At each monitoring event
Value applied	Fburnt OF: 56.09% Fburnt DF: 55.25%
Monitoring equipment	n/a
QA/QC procedures to be applied	n/a
Purpose of data	Calculation of project emissions
Calculation method	The area affected is estimated from mapped area using standard GIS tools.

Data/Parameter	P_{burnt} [p,icl]
Data unit	%
Description	Average proportion of mass burnt in the carbon pool *p* in the forest class *icl*
Source of data	Estimated from the literature
Description of measurement methods and procedures to be applied	n/a
Frequency of monitoring/recording	Once at start of project
Value applied	A value of 0.50 is used for both open and dense forest classes. This is the value for 'primary tropical moist forest' listed in Table 2.6 of IPCC, 2006 (Annex 2) http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_02_Ch2_Generic.pdf. This is consistent with the climate regime at the site and is also the most conservative option in the table.
Monitoring equipment	n/a
QA/QC procedures to be applied	n/a
Purpose of data	Calculation of project emissions
Calculation method	n/a

Data/Parameter	CE [p,icl]
Data unit	Dimensionless
Description	Average combustion efficiency of the carbon pool *p* in the forest class
Source of data	Estimated from the literature
Description of measurement methods and procedures to be applied	n/a
Frequency of monitoring/recording	Once at start of project
Value applied	Value of 0.30 is used for both open and dense forest. This is the upper bound of the range for drying seasons <6 months (and also the value for drying seasons >6 months) for primary tropical forests in Table 3A.1.14 of the Good Practice Guidelines for LULULCF (2003), Chapter 3.
Monitoring equipment	n/a
QA/QC procedures to be applied	n/a
Purpose of data	Calculation of project emissions
Calculation method	n/a

3.1.3 Monitoring Plan

3.1.3.1 Organizational structure, responsibilities, and competencies

Figure 3.1 shows the general organizational structure of the KSWS site. The Project Manager (1) manages technical teams (4–8) who in turn manage field activities (9–15). The Project Manager is supported by one or more Technical Advisors. Responsibility for the monitoring of project implementation rests with the Project Manager, in collaboration with a KSWS Technical Advisor (2). Additional technical support is

provided by the Country Program main office, including a REDD+ Technical Advisor and a National REDD Specialist. The GIS/SMART team is managed from the Country Program main office by a GIS Manager and a SMART Manager. The GIS Team also includes an on-site GIS Officer and/or GIS Analyst. Occasional support is also provided by the WCS global network of specialists.

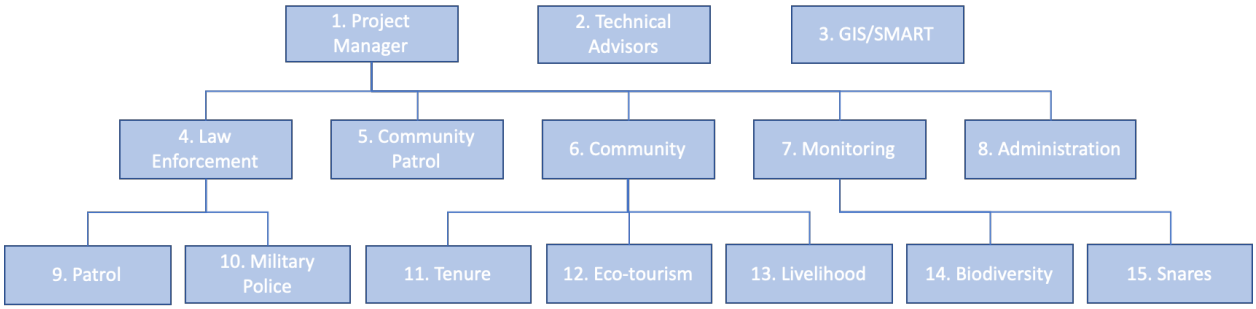


Figure 3.1 Organizational structure of KSWS project staff

KSWS operates an adaptive management system based on an annual work-planning cycle. A new annual plan is developed each year. The new plan is based on two main inputs: the strategic management plan, and the results of implementing the previous year's plan.

Monitoring responsibility is distributed across the KSWS organizational structure. Specific roles and responsibilities for the three required monitoring tasks are listed in Table 3.1.

Table 3.1 Three monitoring tasks and their responsible parties and required competencies.

Monitoring Task	Responsible Parties	Competencies
Monitoring of carbon stock changes and GHG emissions	Project Manager, GIS Team Leader, Technical Advisor(s)	Remote sensing, land cover classification, GIS, carbon measurement, data analysis
Monitoring community impacts	Project Manager, GIS Team Leader, Community Team Leader, Technical Advisor(s), Consultants	Social survey methods, community outreach, networking, socio-economic analyses
Monitoring biodiversity impacts	Project Manager, Law Enforcement Team Leader, GIS Team Leader, Monitoring Team Leader, Technical Advisor(s)	Law enforcement patrol planning and implementation, biodiversity survey methods, wildlife and plant species identification, data analysis

3.1.3.2 Monitoring of project implementation

Project activities are carefully monitored and recorded through monthly reporting by Team Leaders to the Project Manager, who in turn reports to the MoE. Annual reports are produced during annual work-planning meetings. Law enforcement activity is recorded in a SMART database. All data and information is archived with the MoE (various offices), on-site, and/or at the WCS Country Program office.

3.1.3.3 Monitoring of land-use and land-cover change

Qualitative monitoring is regularly conducted to identify locations of deforestation and to inform management decisions. This monitoring includes visual identification of deforestation areas on satellite

imagery, rapid non-rigorous land cover classifications, and occasional review of globally available deforestation datasets.

Quantitative monitoring, using land cover classification Landsat imagery, was conducted in preparation for verification. The only mandatory category of change subject to measuring, reporting, and verification (MRV) in the KSWS project is Category I, the area of forest land converted to non-forest land (Methodology Table 37). There is no national monitoring program that is comparable to those used to determine the project baseline, so data must be collected specifically for the project. The monitoring task was conducted using the same methods as used for the 2010–2015 and 2016-2017 verification. The deforestation monitoring method as detailed in Annex 3.5 of the PD uses a change detection method that requires comparison of imagery values for two time periods (Table 3.2).

Table 3.2 Landsat 8 scenes used for land cover classification. Note that two scenes are required to provide full coverage for each time period.

Sensor	Path-Row	Date	Notes
Landsat 8 OLI	125-051	01 February 2018	First suitable image after 2017 rainy season
Landsat 8 OLI	125-052	01 February 2018	First suitable image after 2017 rainy season
Landsat 8 OLI	125-051	23 February 2020	First suitable image after 2019 rainy season
Landsat 8 OLI	125-052	23 February 2020	First suitable image after 2019 rainy season

The satellite monitoring period is 01 February 2018 to 23 February 2020.

The full processing steps used for land cover classification are as follows:

1. Download Landsat imagery from USGS.
2. Ensure both dates are co-registered (L1T processing level from USGS was sufficient).
3. Mosaic and create single multiband file from all four scenes.
4. Clip to Area of Interest (AOI).
5. Create training areas for supervised classification.
6. Use LNCD Sampling Tool to sample the training and imagery.
7. Use See5 data mining tool to construct classifier.
8. Use See5 Image Classifier to generate classification with change detection.
9. Iterate Steps 5 through 8 until diminished returns.
10. Edit classification error areas.
11. Filter 3 by 3 pixels to eliminate isolated pixels.
12. Assess accuracy, using 10 m resolution Sentinel 2 imagery as reference.
13. Apply Sentinel 2-based manual image interpretation polygons of observed deforestation (see deviation description, Section 2.2.2).
14. Mask to the full KSWS boundary and Project Zone.

The imagery used was clear with cloud coverage less than 1% within the Project Zone (see Figure 3.2). No cloud removal, radiometric correction, nor haze reductions were necessary for the 2020 imagery. Cloud areas were verified by Sentinel-2 imagery which was acquired in the same month as the 2020 imagery to make sure what forest cover type were obscured in the 2020 Landsat image.

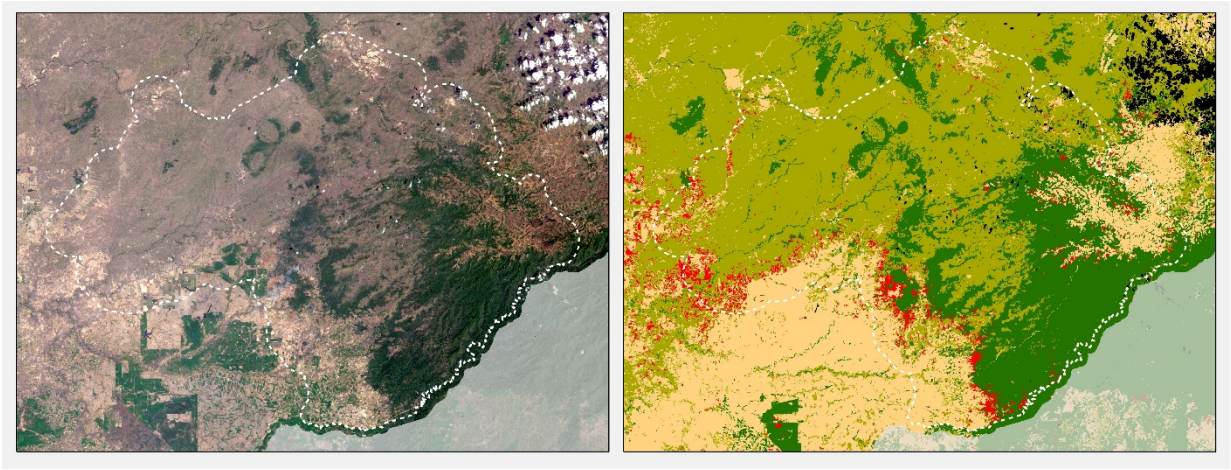


Figure 3.2 Landsat 8 image from 23 February 2020 on left and classification on right. Project Zone shown as white line. Classes shown are Dense Forest (dark green), Open Forest (olive green), and Non-Forest (light tan). Deforestation during the monitoring period shown in red.

Classification accuracy was assessed using an error matrix (Table 3.4), using visual interpretation of 10 m resolution Sentinel 2 high resolution imagery for a series of random points. The matrix includes the three land cover types, Dense Forest (DF), Open Forest (OF), and Non-Forest (NF), as well as a single land cover change category, Change (CH), shown in red in Figure 3.2 above.

The stratified random sample design uses contiguous areas of land cover of 0.81 ha or greater (area of a 3 × 3 pixel grid) that are less than 127.3 m (diagonal distance across 3 × 3 pixel grid) from cover type boundaries to ensure points are located in unambiguous cover areas. Random point distribution was stratified between the land cover classes and a land cover change category (Table 3.3). The 10 m resolution imagery is from the ESA Sentinel 2-A satellite, with an overpass date of 20 February 2020 (Figure 3.3).

Table 3.3 Relative proportion of sample point counts compared to relative proportion of land cover. DF = dense forest, OF = open forest, NF = non-forest, CH = land cover change (deforestation).

Type	Point Count	Point Ratio	Area Ratio
DF	164	32.8%	32.8%
OF	278	55.6%	55.6%
NF	41	8.2%	8.2%
CH	17	3.4%	3.4%
N	**500**		

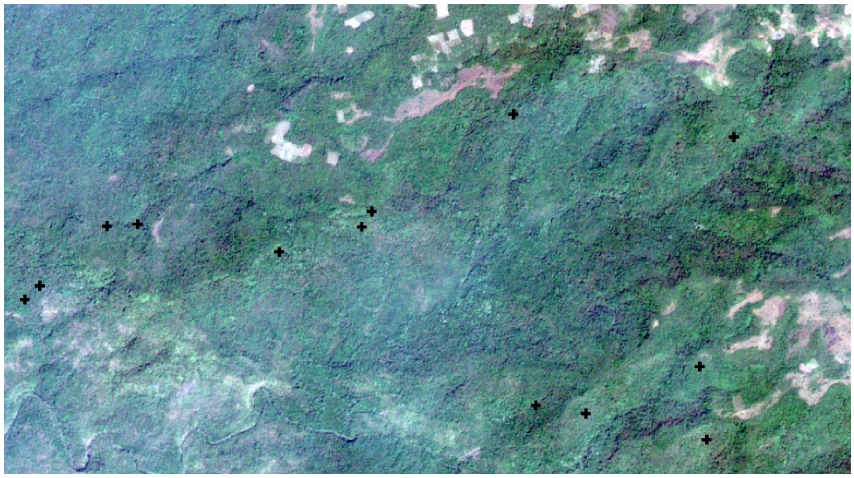


Figure 3.3 Example of Sentinel 2 imagery (acquired on 20 February 2020). Dense Forest, Open Forest, and Non-Forest are all readily identifiable

Table 3.4 Error matrix used to access accuracy of activity data land cover classification. DF = dense forest, OF = open forest, NF = non-forest, CH = land cover change.

	DF	OF	NF	CH	Producers
DF	163	0	0	1	99.4%
OF	1	272	4	0	98.2%
NF	0	6	37	0	86.0%
CH	0	0	0	16	100%
Users	99.4%	97.8%	90.2%	94.1%	**97.6%**

Overall Accuracy	97.60%
Users	95.40%
Producers	95.91%

3.1.3.4 Monitoring of carbon stock changes and non-CO_2 emissions from forest fires

Ongoing qualitative forest monitoring includes forest fire observations. No controlled deforestation and planned harvest occurred during the verification period. No significant deforestation from forest fires was observed during the verification period. Fire frequencies are also monitored using the USGS Fire Information Resource Management System (FIRMS), a point-based dataset derived from the Moderate Resolution Imaging Spectroradiometer (MODIS). Fire occurrences are created when middle and thermal infrared thresholds are exceeded by measured reflectance within a 1 km pixel. Table 3.5 shows fire counts from MODIS from 2006 onwards. The incidence of fires has progressively increased since 2016 (Figure 3.4). However the majority of these occurred within fire-adapted dry forest or in areas of land being cleared for agriculture. There is an emerging trend of increasing fire occurrences within the KSWS REDD+ project area, as illegal land conversion pressure is increasing. However, no cases of large areas of deforestation caused by fire have been observed, only burning of cut material or seasonal fires in the dry fire-adapted forests.

Table 3.5 Fire point occurrences with greater than 75% certainty in the Project Area, as detected by MODIS FIRMS.

2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
75	20	63	69	54	39	28	69	77	59	105	81	109	114

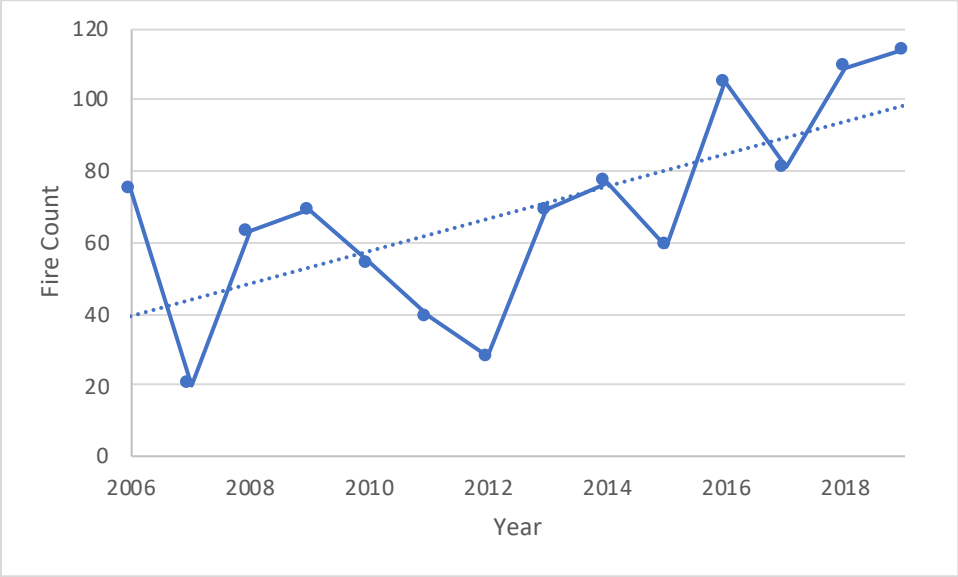


Figure 3.4 Fire frequencies from 2006 to 2019

Due to the observed increase in fires detected, quantitative monitoring of non-CO_2 emissions began during this monitoring period. To estimate the significance of CH_4 and N_2O emissions from burned wood in deforested areas, areas of deforestation located within 1 km (spatial resolution of MODIS) of where MODIS FIRMS detected fires during the monitoring period were summed (Figure 3.5). This resulted in 1658 hectares of deforested area in which fires were detected during the monitoring period.

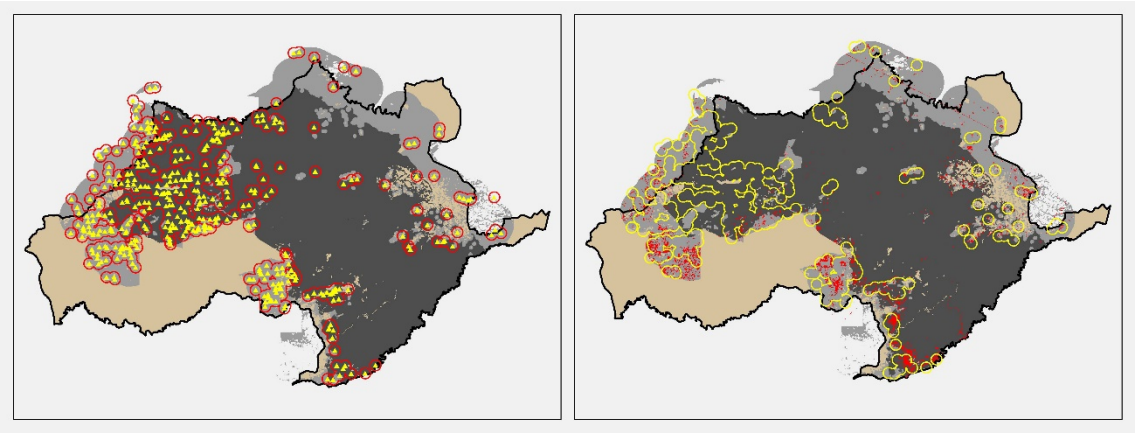


Figure 3.5 Left: Fire occurrences (yellow triangles) detected by MODIS-FIRMS during the monitoring period, buffered by 1 km (red circles). Right: Deforested areas (red) within burn zones (yellow circles).

Using Equations 11, 12, and 13 of the Methodology we calculate that there was 28,558 tCO_2e of non-CO_2 emissions in the Project Area during the monitoring period. For this same period, we calculate 2,238,325 tCO_2e emissions from deforestation in the Project Area. At 1.28% of total project area emissions, the non-

CO_2 emissions do not meet the 5% significance threshold and are therefore not included in final emission calculations. Tables 23 and 24 are in the calculation workbook and are available on request.

Table 3.6 Parameters for calculating non-CO_2 emissions from burning. Carbon pools are Dense Forest (DF) and Open Forest (OF).

Description	Value	Source
% Deforestation Area Burnt (Dense Forest)	55.25%	Remote sensing, GIS
% Deforestation Area Burnt (Open Forest)	56.09%	Remote sensing, GIS
Carbon Pools that Burn	AGB, DW	Expert opinion
Nitrogen to Carbon Ratio	0.01	IPCC default
Emission Ratio (NO_2)	0.007	IPCC default
Emission Ratio (CH_4)	0.012	IPCC default
Global Warming Potential (NO_2)	310	IPCC default
Global Warming Potential (CH_4)	21	IPCC default
Average Proportion of Mass Burnt (Dense Forest)	50%	2006 IPCC Guidelines for National Greenhouse Gas Inventories Table 2.6
Average Proportion of Mass Burnt (Open Forest)	50%	2006 IPCC Guidelines for National Greenhouse Gas Inventories Table 2.6
Average Combustion Efficiency (Dense Forest)	30%	GPG-LULUCF Table 3A.1.14
Average Combustion Efficiency (Open Forest)	30%	GPG-LULUCF Table 3A.1.14
Proportion Burnt & Combustion Efficiency for DF Dead Wood	100%	Conservatively set to 100%
Proportion Burnt & Combustion Efficiency for OF Dead Wood	100%	Conservatively set to 100%

3.1.4 Dissemination of Monitoring Plan and Results (CL4.2)

Monthly meetings with project staff and partners are held in KSWS to provide a regular update on REDD+ project implementation and deforestation monitoring results. The results of deforestation in KSWS are shared with rangers and community patrol teams to allow them to strategically plan actions to address the drivers. In the KSWS annual meetings, updates on results of monitoring deforestation, forest fires, and forest crimes are presented to the community representatives, local authorities, and local partners, so that the new KSWS annual workplan can be designed to address the appropriate drivers. The KSWS Quarterly Newsletters are an online platform used to disseminate the results of monitoring, and are publicly available in both Khmer and English. The recent compliance monitoring program for REDD+ benefit sharing is focused on reporting the results of deforestation and community participation in addressing this issue, particularly through community efforts such as community based patrolling, and community informant reporting. Monitoring results and the progress of REDD+ implementation were reported to donors, partners, and government agencies at various meetings and workshops.

3.2 Quantification of GHG Emission Reductions and Removals

3.2.1 Baseline Emissions

See Section 5.3 and related Annexes of the PD for the full description and justification of the baseline scenarios. A summary of the key components is provided below.

The most plausible baseline scenario for the Project Area is accelerating unplanned deforestation from smallholder farmers partly mitigated by continued grant-funded conservation activities at declining levels. In this scenario, the Project Area would continue to be managed as it was during 2002–2010, as an area of Production Forest designated as a Biodiversity Conservation Area by Ministerial Decree. This management approach would take place against a background of threats that are similar in nature but greater in intensity compared to the historical period.

In this baseline scenario, operational funds would continue to derive from short-term grants that are raised by WCS from a variety of donors. Management effectiveness would decline under this baseline scenario, due to declining availability of grant funds and concomitant declines in political support. The funding history of the site and the reasons for projecting a decline in funding for core protection activities are set out in Annex 3.4 of the PD. Past levels of funding have been sufficient to mitigate but not prevent the effects of these drivers on deforestation rates (see Section 5.3 of the PD, and Evans *et al*. 2013). Hence, a decline in funding will exacerbate the impact of rising threats on rates of deforestation.

3.2.1.1 Historic deforestation

Historic deforestation in the Reference Region was measured using land cover classification of 14 historic Landsat images ranging from 1998 to 2010. A detailed description of the analysis of historical land use and land cover change within the Reference Region can be found in Annex 3.5 of the PD. Figure 3.6 shows the results of the classification and change detection.

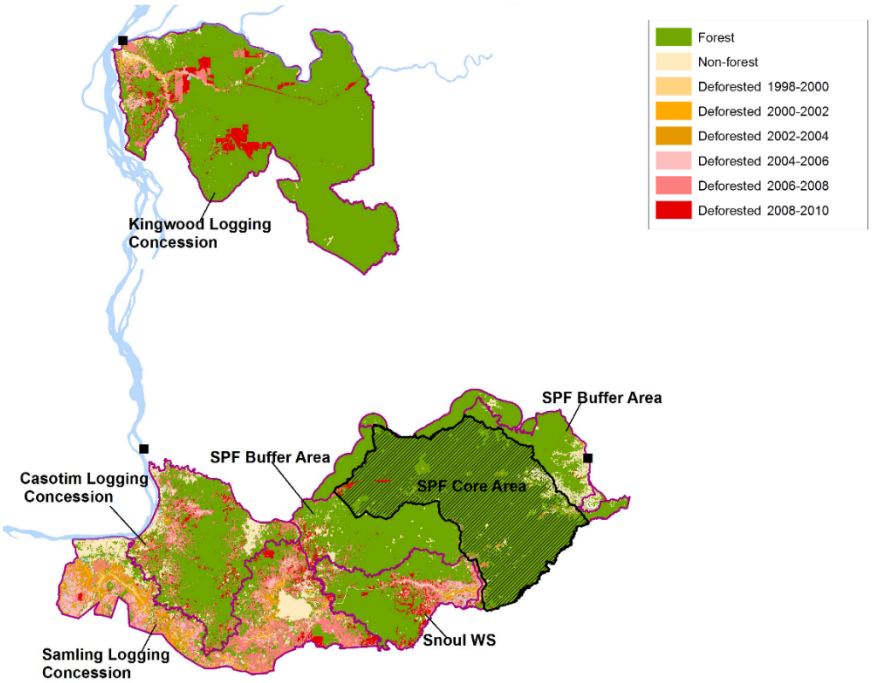


Figure 3.6 Deforestation over reference region from 1998 to 2010

3.2.1.2 Deforestation drivers

An analysis of the causes of deforestation (see Section 4.5.2 of the PD) identified two main agents of deforestation in the Reference Region (Table 3.7), and the relative contribution of these agents to historic deforestation (Table 3.8).

Table 3.7 Summary of the main agents of deforestation in the Reference Region.

Agent group	Type of deforestation	Stratum (see Annex 3.1)	Occurs in Project Area	Comments
Smallholder farmers	Unplanned	1 (Non-ELC)	Yes	Active throughout the historical reference period
Economic Land Concessions	Planned	2 (ELC)	No	Very limited prior to 2008; greatly increased through 2008–2012

Table 3.8 Deforestation attributable to each of the main groups of agents.

	Deforestation (ha) by Period					
Agent or Group	**1998–1999**	**2000–2001**	**2002–2003**	**2004–2005**	**2006–2007**	**2008–2009**
Smallholder Farmers						
Extent of forest at start of period	933,598	928,404	917,658	898,255	843,139	715,296
Deforestation during period	5,194	10,747	19,403	27,413	80,622	25,633
Cumulative deforestation	5,194	15,941	35,344	62,757	143,379	169,012
Economic Land Concessions						
Extent of forest at start of period	0	0	0	0	27,703	71,436
Deforestation during period	0	0	0	0	3,488	11,800
Cumulative deforestation	0	0	0	0	3,488	15,288
All Agents						
Extent of forest at start of period	933,598	928,404	917,658	898,255	870,841	786,732
Deforestation during period	5,194	10,747	19,403	27,413	84,110	37,433
Cumulative deforestation	5,194	15,941	35,344	62,757	146,867	184,300

3.2.1.3 Driver variables explaining quantity and location of deforestation

Table 3.9 summarizes key proximate driver variables that affect the rate of deforestation in the Reference Region, while Table 3.10 summarizes factors correlated with location of deforestation. Some of the drivers can be partly mitigated by project activities, within the Project Area and Leakage Belt. No statistical model was developed for planned deforestation since no quantitative projection is required, so the conclusions in Table 3.9, in this case, are based on qualitative sources and are provided mainly for illustration.

Table 3.9 Proximate drivers of the rate of deforestation in the Reference Region as a whole.

Factor	Relevance for smallholder farmers	Relevance for ELC	Likely trend in first fixed baseline period	Project measures to control drivers
Population size/density	More families interested in farm expansion; proxy for higher local market demand and reduced costs through access to local markets	Unknown. Implies better accessibility, available labor, and lower input costs. It also implies higher risk of land conflict.	Likely to increase across the region, with rates varying from place to place	Deterring in-migration. Decouple population density from forest pressure by facilitating move to off-farm/off-site livelihoods
Availability of fertile land to deforest	Areas with extensive fertile land are attractive	Companies are likely to prefer areas with a high % of forest, since they need large blocks of land for economies of scale.	Likely to decline due to progressive forest loss and exclusion from land under ELCs but likely to remain high relative to demand for land	No action possible
Access to external markets	Regions closer to large centers have better market access and so higher returns of farming	Regions closer to large centers have better market access and so higher returns of farming	Increasing access as regional transport networks and infrastructure expand	No action possible
Road density	Increases accessibility and lowers input costs; also a proxy for general levels of economic development	Increased accessibility and lowers input costs; also a proxy for general levels of economic development	Likely to increase significantly	Prevent the creation of unnecessary secondary roads in areas with high carbon density
Proportion of the region under effective protection	Deters deforestation	Reduces likelihood of permits being issued	Likely to decrease in the absence of REDD funding; government policies promote the region as a 'development pole'	Increase the extent of effectively protected areas; promote application of current environmental protection policies

Table 3.10 summarizes the most important factors influencing the two main agents of deforestation and the likely trends in the drivers over time (see Annex 4.2 of the PD for the formal statistical analysis).

Table 3.10 Factors correlated with location of deforestation during the historical reference period.

Factor	Relevance for smallholders	Relevance for ELCs	Likely trend in first baseline period	Project measures to control drivers
Distance to recently deforested land	Economies of scale; minimized travel cost; preference to live near others; proven fertility of area	Probably not relevant (may even be a negative factor)	Increased relative risk—declining distance to nearest recent deforestation as deforestation expands according to modelled trends	Reduce the total extent of deforestation and limit it to near existing locations where possible; decouple risk from this variable by improved demarcation, patrolling and community acceptance of forest boundaries
Travel time to nearest district town and distance to Mekong River	Proximity to markets/suppliers	Proximity to markets/suppliers	Increased relative risk—reducing travel times to remote areas as road network improves	Prevent the creation/upgrading of unnecessary secondary roads; increased controls on movement along forest roads through better law enforcement and community-based management
Protection status (combination of legal status and level of investment/technical support)	Ease of deforesting without intervention of the authorities	Difficulty of obtaining permits; risk of public criticism	Increased relative risk—flat or declining effectiveness, due to increasingly constrained funding opportunities	Enhance protection status and effectiveness
Vegetation type (dense vs. open forest)	Presumably an indicator of better soils for farming	Presumably an indicator of better soils for farming	No change	Not applicable
Elevation	Steep slopes are impractical to farm and often of lower fertility	Steep slopes are impractical to farm and often of lower fertility	No change	Not applicable

3.2.1.4 Identification of underlying causes of deforestation

As elsewhere in the world, the fundamental driving force for deforestation in the reference area, by both smallholder farmers and large economic concessions, is the general aspiration of people to improve their material standard of living. For the poorest, this means attaining food security; for the less poor, middle-income, and rich smallholders, it means seeking increasing levels of wealth; and for companies, it means achieving a strong return on investments. Deforestation occurs when it is perceived as the easiest way of

fulfilling these aspirations in a given location. Project interventions are aimed at reducing the factors that encourage deforestation whilst strengthening some of the opportunities for people to follow other paths for improving their well-being.

In the Reference Region, as in most of Cambodia, agriculture is currently a dominant source of income, and one of a number of sectors where smallholders and large companies seek income growth. Several factors encourage a focus on agriculture rather than other sectors, in particular the rising prices of agricultural products, limited rural education levels that make it difficult to enter other sectors, and the relatively limited availability of employment in other sectors in Cambodia. Within the agricultural sector, growth can come about through expansion or intensification. While intensification does not directly cause deforestation, expansion usually does (since most unfarmed land with agronomic potential in Cambodia is still forested). Several factors encourage people to expand the area of land they farm rather than intensifying or concentrating on other economic activities. Five of the dominant underlying factors are listed in Table 3.11. For some of these underlying drivers, trends are predicted to be either flat or rising. It should be noted that flat levels of underlying drivers (e.g., governance effectiveness) combined with rising levels of proximate drivers (e.g., human population size) combine to give a rising level of threat of deforestation.

Table 3.11 Underlying causes encouraging expansion of agriculture into forest that are relevant to both smallholders and ELCs.

Factor	Likely trend	Project measures to control drivers
Barriers to farm intensification or moving into other sectors	Flat or rising (and hence an increasing driver)	Reduce barriers to intensification; promote access to other sectors (alternative livelihoods)
Weak governance and poor funding to enforce laws protecting forest	Rising (and hence an increasing driver)	Increase funding; strengthen governance
Limited ability of local stakeholders who value forest to prevent clearance	Flat, currently very low (and hence a steady driver)	Empower community approaches and increase formal land tenure
Low perceived value of standing forest by many stakeholders (costs of clearance externalized)	Flat, currently very low (and hence a steady driver)	Increase value through environmental payments (REDD+ etc.)
High and rising prices for agricultural products, linked to national, regional, and global demand trends	Rising (and hence an increasing driver)	Outside scope of project

Based on the historical relationship between the main agent groups, key drivers, and underlying causes, it has been found that the following two sequences of causative steps have typically led to and will lead to deforestation:

1. Sequence for smallholder farmers:

- Smallholder farmers wish to achieve food security and improve their levels of income.
- Income growth is mainly dependent on agriculture, as opportunities to move into other sectors are often limited.
- Opportunities to intensify agriculture are often limited. By contrast, expansion of farmland into forest areas is relatively easy under current conditions, despite the existence of laws controlling such expansion.

- Weak forest governance, low investment in forest protection, poor recognition of non-monetary forest values, and limited opportunities for current forest-users to protect their resources all facilitate expansion of farmland into forest areas.
- This process is accelerated by rising commodity prices, improving road networks, rising populations, and other economic development factors.

2. Sequence for ELCs:

- Companies and investors increasingly wish to invest in profitable ventures in Cambodia.
- Rising regional and global demand creates strong markets for crops.
- Good soils, climate, and access make the Reference Region potentially attractive and so companies propose projects.

Rising availability of foreign direct investment and pro-business government policies interact with weak forest governance, low investment in forest protection, poor recognition of non-monetary forest values, and limited opportunities for current forest-users to protect their resources to facilitate issuance of concessions in forest areas.

Many of the direct and underlying drivers of deforestation in the Reference Region (and specifically in the Project Area) are expected to increase during the project crediting period, compared to the historical reference period, with respect to both smallholder farmers and ELCs. While some drivers may remain stable, none are likely to decline. This can be considered conclusive evidence that deforestation rates will rise across the Reference Region, and within the Project Area, through the first project crediting period. This provides a basis for the quantitative projection of the most credible baseline scenario.

3.2.1.5 Projected baseline

A linear regression was identified as the best time series function for projecting deforestation, and a regression with good fit to the historical data was found (Figure 3.7). This regression also provides a very close fit to the first data point of the with-project period. As the regression projects an increase without limit, the Methodology requires a cap to be set once a certain cumulative amount of deforestation has been predicted. This process is explained in Annex 4.1 of the PD.

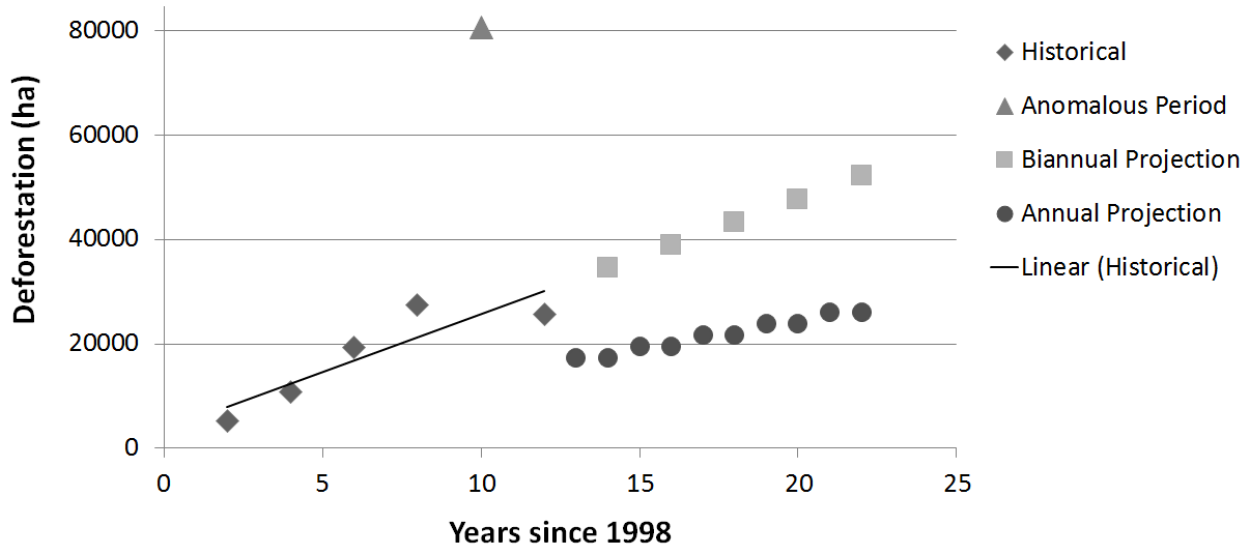


Figure 3.7 Modelled deforestation 2010–2019 in comparison to observations from the historical reference period.

A generalized linear model (GLM) using spatially explicit deforestation risk explanatory variables was used to determine deforestation probabilities. Combined with the projected deforestation baseline, these probabilities were used to model future deforestation under the baseline scenario (see Figure 3.8).

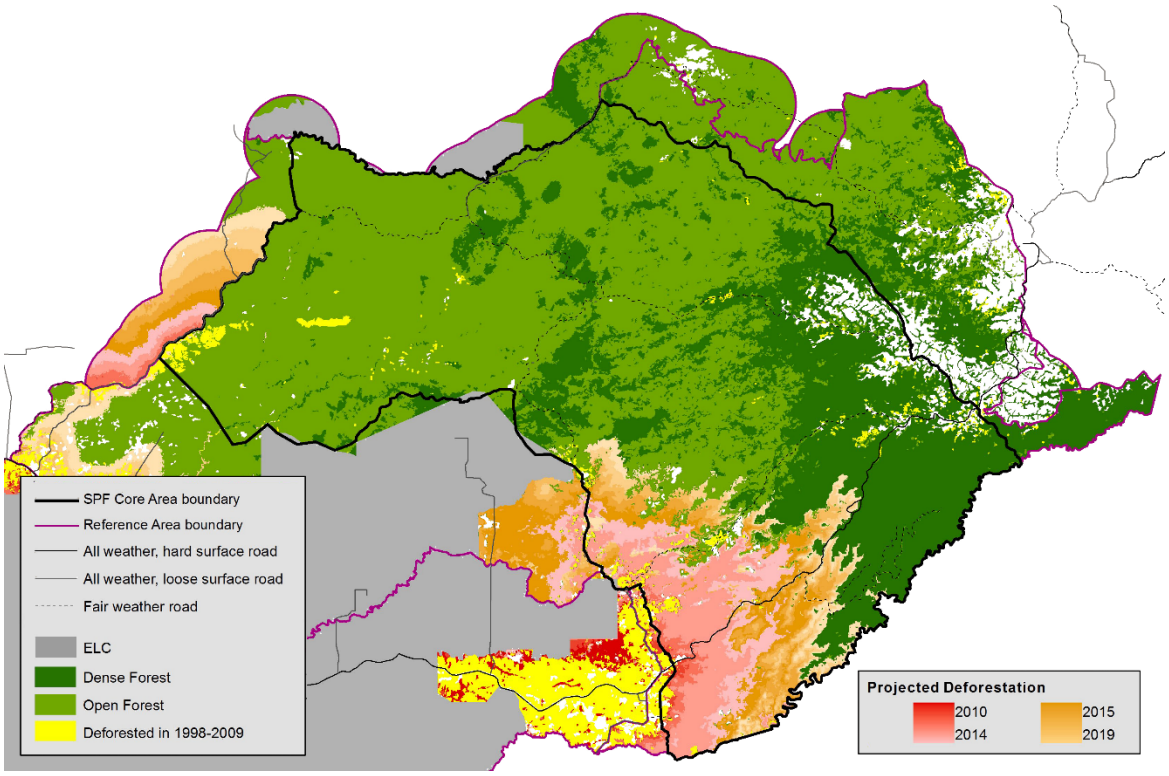


Figure 3.8 Total projected deforestation over the Project Area from 2010–2019.

3.2.1.6 Baseline carbon stock changes

The baseline carbon stock changes in the initial forest classes in the project area during the monitoring period are shown in Table 3.12.

Table 3.12 Annual area of baseline deforestation in the Project Area.

Project year [t]	Projected deforestation in the Project Area [ABSLPA1,t] ha	Cumulative total
	[= total ABSLPAt]	[ABSLPA] ha
1	-	-
2	130	130
3	663	793
4	6,975	7,768
5	4,959	12,727
6	3,606	16,333
7	3,601	19,934
8	2,869	22,803
9	2,663	25,466
10	2,838	28,304

The baseline carbon stock changes in the initial forest classes in the leakage belt during the monitoring period are shown in Table 3.13.

Table 3.13 Annual area of baseline deforestation in the Leakage Belt.

Project year [t]	Projected deforestation in the Leakage Belt [ABSLLK1,t] ha	Cumulative total [ABSLLK] ha
	[= total ABSLPAt]	
1	936	936
2	456	1,392
3	1,516	2,908
4	3,127	6,035
5	2,281	8,316
6	4,176	12,492
7	2,404	14,896
8	2,120	17,016
9	1,912	18,928
10	2,640	21,569

Table 3.14 Baseline carbon stock change in above-ground biomass in the Project Area [= Table 21.b.1 of the Methodology].

Carbon stock changes in above-ground biomass per initial forest class *icl*				Total C stock change in above-ground biomass of the initial forest classes in the Project Area	
	ID[cl]>	1	2	ΔCabBSLPA [icl,t]	ΔCabBSLPA [icl,t]
	Name>	Dense Forest	Open Forest	Annual	Cumulative
Project Year *t*		$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$
0		-	-	-	-
1	t*	-	-	-	-
2	t* + 1	(98,683)	(13)	(98,696)	(98,696)
3	t* + 2	(504,363)	(81)	(504,445)	(603,141)
4	t* + 3	(5,291,640)	(6,704)	(5,298,344)	(5,901,485)
5	t* + 4	(3,724,999)	(22,845)	(3,747,844)	(9,649,329)
6	t* + 5	(2,645,165)	(46,953)	(2,692,118)	(12,341,447)
7	t* + 6	(2,611,043)	(61,470)	(2,672,513)	(15,013,959)
8	t* + 7	(2,070,119)	(53,837)	(2,123,956)	(17,137,916)
9	t* + 8	(1,901,824)	(59,364)	(1,961,189)	(19,099,104)
10	t* + 9	(1,936,896)	(106,394)	(2,043,290)	(21,142,394)

Carbon stock changes in above-ground biomass per post-deforestation zone *z*			Total C stock change in the above-ground biomass of post-deforestation zones in the Project Area		Total net C stock change in above-ground biomass of the Project Area	
	ID[cl]>	1	ΔCabBSLPA [icl,t]	ΔCabBSLPA [icl,t]	ΔCabBSLPA [t]	ΔCabBSLPA
	Name>	Mixed Crop	Annual	Cumulative	Annual	Cumulative
Project Year *t*		$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$
0		-	-	-	-	-
1	t*	-	-	-	-	-
2	t* + 1	705	705	705	(97,991)	(97,991)
3	t* + 2	4,307	4,307	5,011	(500,138)	(598,129)
4	t* + 3	42,184	42,184	47,195	(5,256,160)	(5,854,289)
5	t* + 4	69,117	69,117	116,313	(3,678,727)	(9,533,016)
6	t* + 5	88,700	88,700	205,013	(2,603,418)	(12,136,434)
7	t* + 6	108,255	108,255	313,268	(2,564,258)	(14,700,692)
8	t* + 7	123,835	123,835	437,103	(2,000,121)	(16,700,813)
9	t* + 8	138,296	138,296	575,398	(1,822,893)	(18,523,706)
10	t* + 9	153,706	153,706	729,105	(1,889,583)	(20,413,289)

Table 3.15 Baseline carbon stock change in below-ground biomass in the Project Area [= Table 21.b.2 of the Methodology].

Carbon stock changes in below-ground biomass per initial forest class *icl*				Total C stock change in the below-ground biomass of the initial forest classes in the Project Area		Carbon stock changes in below-ground biomass per post-deforestation zone *z*			Total C stock change in below-ground biomass of post-deforestation zones in the Project Area		Total net C stock change in below-ground biomass of the Project Area	
	ID[cl]>	1	2	ΔCbbBSLPA [icl,t]	ΔCbbBSLPA [icl,t]		ID[cl]>	1	ΔCbbBSLPA [icl,t]	ΔCbbBSLPA [icl,t]	ΔCbbBSLPAt	ΔCbbBSLPA
	Name>	Dense Forest	Open Forest	Annual	Cumulative		Name>	Mixed Crop	Annual	Cumulative	Annual	Cumulative
Project Year *t*		$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	Project Year *t*		$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$
0		-	-	-	-	0		-	-	-	-	-
1	t*	-	-	-	-	1	t*	-	-	-	-	-
2	t* + 1	(2,171)	(0)	(2,171)	(2,171)	2	t* + 1	176	176	176	(1,995)	(1,995)
3	t* + 2	(13,267)	(2)	(13,269)	(15,440)	3	t* + 2	1,077	1,077	1,253	(12,192)	(14,187)
4	t* + 3	(129,680)	(149)	(129,829)	(145,269)	4	t* + 3	10,546	10,546	11,799	(119,283)	(133,470)
5	t* + 4	(211,628)	(652)	(212,279)	(357,549)	5	t* + 4	17,279	17,279	29,078	(195,000)	(328,470)
6	t* + 5	(269,820)	(1,684)	(271,504)	(629,053)	6	t* + 5	22,175	22,175	51,253	(249,329)	(577,799)
7	t* + 6	(327,261)	(3,036)	(330,297)	(959,350)	7	t* + 6	27,064	27,064	78,317	(303,233)	(881,033)
8	t* + 7	(372,802)	(4,220)	(377,022)	(1,336,372)	8	t* + 7	30,959	30,959	109,276	(346,064)	(1,227,097)
9	t* + 8	(414,641)	(5,525)	(420,167)	(1,756,539)	9	t* + 8	34,574	34,574	143,850	(385,593)	(1,612,690)
10	t* + 9	(457,252)	(7,865)	(465,117)	(2,221,656)	10	t* + 9	38,427	38,427	182,276	(426,691)	(2,039,380)

Table 3.16 Baseline carbon stock change in the deadwood pool in the Project Area [= Table 21.b.3 of the Methodology].

Carbon stock changes in the deadwood pool per initial forest class *icl*				Total C stock change in the deadwood pool of the initial forest classes in the Project Area		Carbon stock changes in the deadwood pool per post-deforestation zone *z*			Total C stock change in the deadwood pool of post-deforestation zones in the Project Area		Total net C stock change in the deadwood pool of the Project Area	
	ID[cl]>	1	2	ΔCdwBSLPA [icl,t]	ΔCdwBSLPA [icl,t]		ID[cl]>	1	ΔCdwBSLPA [icl,t]	ΔCdwBSLPA [icl,t]	ΔCdwBSLPAt	ΔCdwBSLPA
	Name>	Dense Forest	Open Forest	Annual	Cumulative		Name>	Mixed Crop	Annual	Cumulative	Annual	Cumulative
Project Year *t*		$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	Project Year *t*		$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$
0		-	-	-	-	0		-	-	-	-	-
1	t*	-	-	-	-	1	t*	-	-	-	-	-
2	t* + 1	(826)	-	(826)	(826)	2	t* + 1	171	171	171	(655)	(655)
3	t* + 2	(5,046)	(1)	(5,047)	(5,873)	3	t* + 2	1,044	1,044	1,214	(4,003)	(4,658)
4	t* + 3	(49,326)	(54)	(49,380)	(55,253)	4	t* + 3	10,222	10,222	11,437	(39,158)	(43,816)
5	t* + 4	(80,496)	(237)	(80,733)	(135,986)	5	t* + 4	16,749	16,749	28,186	(63,984)	(107,801)
6	t* + 5	(102,631)	(612)	(103,243)	(239,229)	6	t* + 5	21,494	21,494	49,680	(81,748)	(189,549)
7	t* + 6	(124,480)	(1,103)	(125,583)	(364,812)	7	t* + 6	26,233	26,233	75,913	(99,349)	(288,898)
8	t* + 7	(141,802)	(1,533)	(143,335)	(508,147)	8	t* + 7	30,009	30,009	105,922	(113,327)	(402,225)
9	t* + 8	(157,716)	(2,007)	(159,724)	(667,871)	9	t* + 8	33,513	33,513	139,435	(126,211)	(528,436)
10	t* + 9	(173,924)	(2,857)	(176,781)	(844,652)	10	t* + 9	37,247	37,247	176,682	(139,534)	(667,970)

Table 3.17 Baseline carbon stock change in above-ground biomass in the Leakage Belt [= Table 21.c.1 of the Methodology].

Carbon stock changes in above-ground biomass per initial forest class *icl*				Total C stock change in above-ground biomass of the initial forest classes in the Leakage Belt		Carbon stock changes in above-ground biomass per post-deforestation zone *z*			Total C stock change in above-ground biomass of post-deforestation zones in the Leakage Belt		Total net C stock change in above-ground biomass of the Leakage Belt	
	ID[cl]>	1	2	ΔCabBSLLK [icl,t]	ΔCabBSLLK [icl,t]		ID[cl]>	1	ΔCabBSLLK [icl,t]	ΔCabBSLLK [icl,t]	ΔCabBSLLKt	ΔCabBSLLK
	Name>	Dense Forest	Open Forest	Annual	Cumulative		Name>	Mixed Crop	Annual	Cumulative	Annual	Cumulative
Project Year *t*		$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	Project Year *t*		$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$
0		-	-	-	-	0		-	-	-	-	-
1	t*	(711,231)	(474)	(711,705)	(711,705)	1	t*	4,125	4,125	4,125	(707,580)	(707,580)
2	t* + 1	(343,500)	(2,293)	(345,793)	(1,057,498)	2	t* + 1	6,135	6,135	10,260	(339,658)	(1,047,238)
3	t* + 2	(530,601)	(419,134)	(949,736)	(2,007,234)	3	t* + 2	12,815	12,815	23,075	(936,920)	(1,984,158)
4	t* + 3	(1,593,043)	(529,220)	(2,122,264)	(4,129,497)	4	t* + 3	26,599	26,599	49,674	(2,095,665)	(4,079,823)
5	t* + 4	(850,154)	(596,030)	(1,446,184)	(5,575,681)	5	t* + 4	36,652	36,652	86,326	(1,409,532)	(5,489,355)
6	t* + 5	(2,336,224)	(566,074)	(2,902,298)	(8,477,979)	6	t* + 5	55,059	55,059	141,385	(2,847,239)	(8,336,594)
7	t* + 6	(677,579)	(775,025)	(1,452,605)	(9,930,584)	7	t* + 6	65,653	65,653	207,038	(1,386,952)	(9,723,547)
8	t* + 7	(245,975)	(920,600)	(1,166,575)	(11,097,159)	8	t* + 7	74,998	74,998	282,036	(1,091,577)	(10,815,124)
9	t* + 8	(112,278)	(903,912)	(1,016,191)	(12,113,350)	9	t* + 8	83,425	83,425	365,461	(932,765)	(11,747,889)
10	t* + 9	(132,375)	(1,263,546)	(1,395,922)	(13,509,272)	10	t* + 9	95,063	95,063	460,525	(1,300,859)	(13,048,747)

Table 3.18 Baseline carbon stock change in below-ground biomass in the Leakage Belt [= Table 21.c.2 of the Methodology].

Carbon stock changes in below-ground biomass per initial forest class *icl*				Total C stock change in below-ground biomass of the initial forest classes in the Leakage Belt	
	ID[cl]>	1	2	ΔCbbBSLLK [icl,t]	ΔCbbBSLLK [icl,t]
	Name>	Dense Forest	Open Forest	Annual	Cumulative
Project Year *t*		$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$
0		-	-	-	-
1	t*	(15,647)	(10)	(15,657)	(15,657)
2	t* + 1	(23,203)	(61)	(23,264)	(38,921)
3	t* + 2	(34,876)	(9,286)	(44,162)	(83,083)
4	t* + 3	(69,922)	(20,933)	(90,856)	(173,939)
5	t* + 4	(88,625)	(34,051)	(122,677)	(296,616)
6	t* + 5	(140,021)	(46,510)	(186,531)	(483,146)
7	t* + 6	(154,927)	(63,567)	(218,495)	(701,641)
8	t* + 7	(160,339)	(83,829)	(244,167)	(945,808)
9	t* + 8	(162,809)	(103,723)	(266,532)	(1,212,340)
10	t* + 9	(165,721)	(131,532)	(297,253)	(1,509,593)

Carbon stock changes in below-ground biomass per post-deforestation zone *z*			Total C stock change in below-ground biomass of post-deforestation zones in Leakage Belt		Total net C stock change in below-ground biomass of the Leakage Belt	
	ID[cl]>	1	ΔCbbBSLLK [icl,t]	ΔCbbBSLLK [icl,t]	ΔCbbBSLLKt	ΔCbbBSLLK
	Name>	Mixed Crop	Annual	Cumulative	Annual	Cumulative
Project Year *t*		$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$
0		-	-	-	-	-
1	t*	1,031	1,031	1,031	(14,626)	(14,626)
2	t* + 1	1,534	1,534	2,565	(21,731)	(36,356)
3	t* + 2	3,204	3,204	5,769	(40,958)	(77,315)
4	t* + 3	6,650	6,650	12,418	(84,206)	(161,521)
5	t* + 4	9,163	9,163	21,582	(113,513)	(275,034)
6	t* + 5	13,765	13,765	35,346	(172,766)	(447,800)
7	t* + 6	16,413	16,413	51,759	(202,081)	(649,882)
8	t* + 7	18,750	18,750	70,509	(225,418)	(875,299)
9	t* + 8	20,856	20,856	91,365	(245,675)	(1,120,975)
10	t* + 9	23,766	23,766	115,131	(273,487)	(1,394,462)

Table 3.19 Baseline carbon stock change in the deadwood pool in the Leakage Belt [= Table 21.c.3 of the Methodology].

Carbon stock changes in the deadwood pool per initial forest class *icl*				Total C stock change in the deadwood pool of the initial forest classes in the Leakage Belt		Carbon stock changes in the deadwood pool per post-deforestation zone *z*			Total C stock change in the deadwood pool of post-deforestation zones in the Leakage Belt		Total net C stock change in the deadwood pool of the Leakage Belt	
	ID[cl]>	1	2	ΔCdwBSLLK [icl,t]	ΔCdwBSLLK [icl,t]		ID[cl]>	1	ΔCdwBSLLK [icl,t]	ΔCdwBSLLK [icl,t]	ΔCdwBSLLKt	ΔCdwBSLLK
	Name>	Dense Forest	Open Forest	Annual	Cumulative		Name>	Mixed Crop	Annual	Cumulative	Annual	Cumulative
Project Year *t*		$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	Project Year *t*		$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$
0		-	-	-	-	0		-	-	-	-	-
1	t*	-	-	-	-	1	t*	-	-	-	-	-
2	t* + 1	(826)	-	(826)	(826)	2	t* + 1	171	171	171	(655)	(655)
3	t* + 2	(5,046)	(1)	(5,047)	(5,873)	3	t* + 2	1,044	1,044	1,214	(4,003)	(4,658)
4	t* + 3	(49,326)	(54)	(49,380)	(55,253)	4	t* + 3	10,222	10,222	11,437	(39,158)	(43,816)
5	t* + 4	(80,496)	(237)	(80,733)	(135,986)	5	t* + 4	16,749	16,749	28,186	(63,984)	(107,801)
6	t* + 5	(102,631)	(612)	(103,243)	(239,229)	6	t* + 5	21,494	21,494	49,680	(81,748)	(189,549)
7	t* + 6	(124,480)	(1,103)	(125,583)	(364,812)	7	t* + 6	26,233	26,233	75,913	(99,349)	(288,898)
8	t* + 7	(141,802)	(1,533)	(143,335)	(508,147)	8	t* + 7	30,009	30,009	105,922	(113,327)	(402,225)
9	t* + 8	(157,716)	(2,007)	(159,724)	(667,871)	9	t* + 8	33,513	33,513	139,435	(126,211)	(528,436)
10	t* + 9	(173,924)	(2,857)	(176,781)	(844,652)	10	t* + 9	37,247	37,247	176,682	(139,534)	(667,970)

Table 3.20 Total net baseline carbon stock change in the leakage belt (Table 21.d of the Methodology)

	Total ex ante baseline carbon stock change		Ex-Post CO2 emissions		Total ex post leakage	
	annual	cumulative	annual	cumulative	annual	cumulative
Project yr	∆CBSLLK[t]	∆CBSLLK	∆CBSLLK[t]	∆CBSLLK	∆CBSLLK[t]	∆CBSLLK
t	tCO_2e	tCO_2e	tCO2e	tCO2e	tCO_2e	tCO_2e
1	727,200.7	727,200.7	975,783	975,783	248,582.0	248,582.0
2	368,810.1	1,096,010.8	995,821	1,971,604	627,011.2	875,593.2
3	992,031.5	2,088,042.3	1,015,860	2,987,464	23,828.2	899,421.5
4	2,209,001.4	4,297,043.7	1,510,487	4,497,951	-	899,421.5
5	1,562,419.1	5,859,462.8	1,540,439	6,038,390	-	899,421.5
6	3,079,836.6	8,939,299.5	1,570,390	7,608,780	-	899,421.5
7	1,659,181.8	10,598,481.3	596,256	8,205,036	-	899,421.5
8	1,395,476.0	11,993,957.3	607,298	8,812,334	-	899,421.5
9	1,264,196.2	13,258,153.5	1,833,489.7	10,645,824.2	569,293.6	1,468,715.0
10	1,670,098.5	14,928,251.9	1,865,882.6	12,511,706.8	195,784.1	1,664,499.2

3.2.2 Project Emissions

Table 3.21 Ex-post carbon stock changes in the Project Area during the monitoring period.

	Area deforested per class within the Project Area		Total ex-post deforestation in the Project Area		Total net C stock change in all pools in the Project Area	
ID	Fd	Fo	AEXPPA1,t	AEXPPA	∆CtotEXPPAt	∆CtotEXPPA
Name	Dense forest	Open forest	Annual	Cumulative	Annual	Cumulative
year [t]	ha	ha	ha	ha	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$
1	82	43	125	125	(79,584)	(79,584)
2	82	43	125	250	(80,941)	(160,525)
3	82	43	125	375	(82,298)	(242,822)
4	625	48	673	1,048	(506,539)	(749,361)
5	625	48	673	1,721	(516,049)	(1,265,410)
6	625	48	673	2,393	(525,559)	(1,790,968)
7	500	72	573	2,966	(447,323)	(2,238,291)
8	500	72	573	3,538	(455,033)	(2,693,324)
9	1278	314	1591	5,129	(1,154,270)	(3,847,594)
10	1275	311	1585	6,714	(1,170,886)	(5,018,481)

3.2.3 Leakage

Table 3.22 Ex-post carbon stock changes in the Leakage Area during the monitoring period.

	Area deforested per class within the Leakage Area		Total ex-post deforestation in the Leakage Area		Total net C stock change in all pools in the Leakage Area	
ID	Fd	Fo	AEXPLK1,t	AEXPLK	∆CtotEXPLKt	∆CtotEXPLK
Name	Dense forest	Open forest	Annual	Cumulative	Annual	Cumulative
year [t]	ha	ha	ha	ha	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$
1	953	451	1,404	1,404	(975,783)	(975,783)
2	953	451	1,404	2,807	(995,821)	(1,971,604)
3	953	451	1,404	4,211	(1,015,860)	(2,987,464)
4	1,483	571	2,054	6,265	(1,510,487)	(4,497,951)
5	1,483	571	2,054	8,318	(1,540,439)	(6,038,390)
6	1,483	571	2,054	10,372	(1,570,390)	(7,608,780)
7	354	324	678	10,726	(596,256)	(8,205,036)
8	354	324	678	11,079	(607,298)	(8,812,334)
9	938	1891	2,829	13,908	(1,887,452)	(10,699,786)
10	931	1806	2,737	16,644	(1,871,051)	(12,570,837)

3.2.4 Net GHG Emission Reductions and Removals

Year	Baseline emissions (tCO_2e)	Project emissions (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions (tCO_2e)
2018	2,334,697	1,154,270	623,256	557,171
2019	2,455,808	1,170,886	200,952	1,083,969
Total	**4,790,505**	**2,325,157**	**824,208**	**1,641,141**

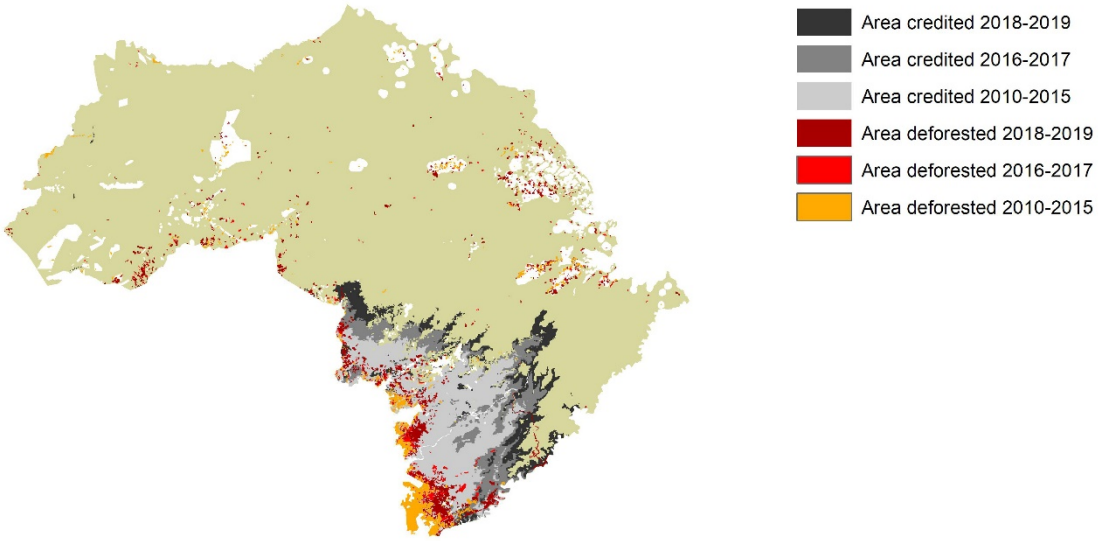


Figure 3.9 Cumulative areas credited in the first two monitoring periods shown in light and dark gray, and area credited in the 2018–2019 monitoring period shown in black.

3.2.4.1 Overall Risk Rating

Risk Category	Rating
a) Internal Risk	0
b) External Risk	0
c) Natural Risk	5
Overall Risk Rating (a + b + c) Minimum Value	**10**

The project has a calculated risk rating of 5. The minimum risk rating for a VCS AFOLU project is 10, so the KSWS project has a rating of 10%. This is equivalent to a 10% risk buffer set-aside at the time of each verification event.

Total number of buffer credits to be deposited into the AFOLU pooled buffer account: 246,534 VCUs.

3.2.4.2 Ex-post net anthropogenic GHG emission reductions (ΔREDDt) and Verified Carbon Units (VCUt)

Table 3.23 Ex-post net anthropogenic GHG emission reductions (ΔREDDt) and Tradable VCUs; the 2018–2019 monitoring period is highlighted in gray.

	Baseline carbon stock change in Project Area		Ex-post project carbon stock change		Baseline carbon stock change in Leakage Area		Ex-post leakage carbon stock change		Ex-post net anthropogenic GHG emission reductions		VCUs tradable		Buffer credits	
	Annual	Cumulative	Annual	Cumulative	Annual	Cumulative	Annual	Cumulative	Annual	Cumulative	Annual	Cumulative	Ann	Cum
Year	ΔCBSLPA[t]	ΔCBSLPA	ΔCPSPA[t]	ΔCPSPA	ΔCPSPA[t]	ΔCPSPA	ΔCLK[t]	ΔCLK	ΔREDDt	ΔREDD	VCU[t]	VCU	VBC[t]	VBC
t	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e				
1	-	-	79,584	79,584	727,201	727,201	975,783	975,783	(328,166)	(328,166)	(320,207)	(320,207)	(7,958)	(7,958)
2	100,641	100,641	80,941	160,525	368,810	1,096,011	995,821	1,971,604	(607,311)	(935,477)	(609,280)	(929,487)	1,970	(5,988)
3	516,334	616,975	82,298	242,822	992,032	2,088,042	1,015,860	2,987,464	410,208	(525,269)	366,804	(562,683)	43,404	37,415
4	5,414,601	6,031,576	506,539	749,361	2,209,001	4,297,044	1,510,487	4,497,951	4,908,063	4,382,794	4,417,256	3,854,573	490,806	528,222
5	3,937,711	9,969,287	516,049	1,265,410	1,562,419	5,859,463	1,540,439	6,038,390	3,421,662	7,804,456	3,079,496	6,934,069	342,166	870,388
6	2,934,495	12,903,782	525,559	1,790,968	3,079,837	8,939,299	1,570,390	7,608,780	2,408,936	10,213,393	2,168,042	9,102,111	240,894	1,111,281
7	2,966,841	15,870,623	447,323	2,238,291	1,659,182	10,598,481	542,568	8,151,347	2,519,518	12,732,910	2,267,566	11,369,677	251,951	1,363,232
8	2,459,511	18,330,134	455,033	2,693,324	1,395,476	11,993,957	550,196	8,701,543	2,004,479	14,737,389	1,804,031	13,173,708	200,447	1,563,679
9	2,334,697	20,664,831	1,154,270	3,847,594	1,264,196	13,258,153	1,887,452	10,699,786	557,171	15,294,560	439,129	13,612,837	118,042	1,681,721
10	2,455,808	23,120,639	1,170,886	5,018,481	1,670,098	14,928,252	1,871,051	12,570,837	1,083,969	16,378,530	955,477	14,568,314	128,492	1,810,213

3.3 Optional Criterion: Climate Change Adaptation Benefits

Not applicable

3.3.1 Activities and/or Processes Implemented for Adaptation (GL1.3)

Not applicable

4 COMMUNITY

4.1 Net Positive Community Impacts

4.1.1 Community Impacts (CM2.1)

Project Action	Positive Impacts
Sub-Objective #1: Key legal and planning documents for the KSWS and surrounding landscape are approved and implemented	
Action #1: Support for sub-decree maintained among senior government and general public	Recognition of the importance of the KSWS for local communities
	Maintenance of natural resources
	Deterrence of large-scale external threats
Action #2: Management plan approved and implemented (including zonation and regulations)	Land-use zoning ensures long-term access for legitimate users
	Clarified regulations for forest use will ensure long-term access and deter damaging activities
Action #4: Develop partnerships with the private sector (to reduce impacts by companies)	Reduced impact from industrial activities in the landscape will minimize disturbance to the KSWS. Key aspects that will be controlled are land-grabbing by company staff, illegal logging, land pollution
Action #5: Develop international cross-border dialogue	Cross-border threats to natural resources reduced
Action #6: Apply adaptive management	Increased opportunities for participation and influence on reserve management
Sub-Objective #2: To reduce forest and wildlife crime by direct law enforcement	
Action #1: Enforce wildlife, forest, and protected area laws and sub-decree through patrols	Reduced threats to natural resources, risk of land alienation, etc.
Action #2: Establish and implement law enforcement monitoring framework	Monitoring of law enforcement impacts will enable the project to track effectiveness and improve practices as necessary
Action #3: Ensure sufficient patrol buildings, equipment and staffing; and Action #4: Ensure sufficient patrol personnel capacity	Sufficient staff and resources are available, leading to improved effectiveness of enforcement efforts and increased protection of natural resources and land against all threats
Action #5: Liaise with provincial, national, and other authorities	Coordination will improve effectiveness, for example in processing criminal cases
Action #6: Establish community-based patrolling and/or monitoring system	Community-based patrolling will increase social capital and increase protection efforts further, ensuring continued protection of species and habitats
Sub-Objective #3: Land and resource use by all core zone communities is sustainable	
Action #1: Form and maintain land-use agreements with communities	Agreements will strengthen tenure security and use rights
	Agreements allow for improved management of forest resources, thus controlling over-harvesting
Action #2: Legally register communities and users	Further strengthening of tenure security and use rights

Project Action	Positive Impacts
Action #3: Support indigenous communal land titling in appropriate communities	Further strengthening of tenure security and use rights
Action #4: Demarcation of the Forest Estate	Clarification of the forest boundary will reduce forest conversion, thus protecting natural habitats and reducing future conflict
Action #5: Conduct extension and communication activities	Increased awareness of rights and of the opportunities for better forest management
Action #7: Engage with civil society organizations operating in the Project Area	Organizations with specialist rural development skills can improve project services
Sub-Objective #4: Support for alternative livelihoods that reduce deforestation	
Action #1: Establish community-based ecotourism	Income generation and livelihood diversification; opportunities for skill development
Action #2: Support agricultural extension activities	Improved agricultural productivity increases food security, incomes, resilience to shocks and climate change, and livelihood diversity.
Action #3: Provide infrastructure support linked to conservation activities	Improved quality of life and/or income generating opportunities
Action #4: Develop NTFP-based livelihood projects	Improved NTFP marketing increases food security, incomes, resilience to shocks and climate change, and livelihood diversity
Action #5: Develop and manage a system to share carbon benefits	Benefit depends on type of benefits selected; in each community may increase incomes, development activities, or both
Action #6: Improve literacy and numeracy	Increase adult literacy and numeracy, increasing off farm livelihood options

During the monitoring period 2018 and 2019, the project has been supporting local communities to obtain official recognition of their lands from the government through the Ingenious Community Land Title (ICT). Seven communities are in the process of obtaining an ICT, while the seven communities that previously received ICTs are receiving support to strengthen management of their land. In addition, the project teams are working on mapping areas occupied by individual households and the needs of land in the ICT villages for the implementation of wildlife-friendly rice. Eighteen farmers in the south-east of KSWS have committed to growing organic, wildlife-friendly rice, for which they will receive a price premium if they fulfil the requirements of their conservation agreement. The project supports the communities to gain access to clean water by building pump wells and water supply systems. More than ten pump wells and two water supply systems have been built in the target villages. More than 1,200 people (650 females) were granted access to clean water as a result of project activities. There are three indigenous ecotourism committees (one female) that received scholarships for hospitality training. During the monitoring period, more than 3,525 people (1,734 women) have improved their well-being due to project activities.

Community Group	Indigenous and Khmer communities
Impact	Access to land and forest resources, income improvement
Type of Benefit/Cost/Risk	These positive outcomes include improvements in overall livelihood measures, improved status of natural resources and

	agricultural productivity for participating communities, and a reduction in the levels of several key threats to livelihoods. These net benefits will be positive for all community groups.
Change in Well-being	Communities formally granted access to land and forest resources, improved incomes and access to clean water

4.1.2 Negative Community Impact Mitigation (CM2.2)

Action	Expected positive impacts	Potential negative impacts	Most vulnerable	Assessment & threat mitigation
Sub-Objective #1: Key legal and planning documents for the Keo Seima Wildlife Sanctuary and surrounding landscape are approved and implemented				
Action #1: Support for sub-decree maintained among senior levels of government and general public	Recognition and protection of traditional/existing livelihoods; reduced risk from concessions, infrastructure, migration etc.; improved status of key natural resources; REDD+ finance for livelihood improvement	Restriction of development options	Poorest, women, IP	In fact, there is no significant restriction on options for community development beyond those in national law. Mitigation of any possible restriction of options comes from increased investment in alternative and improved livelihoods.
Action #2: Management plan approved and implemented (including zonation and regulations)	Clearer definition of existing rights and responsibilities; strengthened capacity of MoE to implement activities/manage threats; improved status of key natural resources	Zonation will exclude traditional harvest activities in certain areas (to be defined through consultation)	IP, forest-dependent Khmer users	This is best considered voluntary displacement of customary uses: further FPIC will be sought for this step; risks will be countered by careful design and piloting, compensation for resin tree users, and targeted provision of alternative livelihoods.
Action #6: Adaptive management system (regular public reviews and workplans)	KSWS management responds to changes in community needs/attitudes	Undue representation of certain groups	-	Structured, balanced forum for participation
Sub-Objective #2: To reduce forest and wildlife crime by direct law enforcement				
Action #1: Enforce wildlife, forest, and protected area laws and sub-decree through patrols	Effective control and deterrence of illegal activities by outsiders and community members; improved security of land and forest resources; improved general law and order situation	Inappropriate prevention of legal uses, selective enforcement, over-harsh punishment, unclear rules	IP, poor Khmer users	Legal awareness, monitoring, training, enforcement strategies, demarcation/regulations, grievance system, regular staff reviews, strong responses to any corruption found

Action	Expected positive impacts	Potential negative impacts	Most vulnerable	Assessment & threat mitigation
Action #2: Establish and implement law enforcement monitoring framework	Increased effectiveness of Action #1	Physical risks to informants from criminals	Non-powerful people	Voluntary participation, incentives not enough to motivate undue personal risk taking, confidentiality rules, adaptive management, grievance system
Action #3: Ensure sufficient patrol buildings, equipment and staffing	Increased effectiveness of Action #1	Buildings on community land		Obtain community approval before building or seek other locations
Action #6: Establish community-based patrolling and/or monitoring system	Additional control and deterrence of illegal activities by outsiders and community members; improved security of land and forest resources; improved general law and order situation; jobs for community members	Risk from offenders, conflict within community; legal liability	IP, poor Khmer users	Manage through community groups; voluntary participation, participatory approaches; coordinate with local government; adaptive management; develop cautiously to resolve legal issues
Sub-Objective #3: Land and resource use by all core zone communities is sustainable				
Action #1: Form and maintain land-use agreements with communities	Increase tenure security, improve management of threats, build community cooperation, strengthen traditional systems and cultural norms	Communities allocated too little land; process causes/revives conflicts or changes social dynamics; marginalized groups not accounted for	IP, poor Khmer users	Participatory process, safeguards for all village members; grievance process; local government oversight
Action #2: Legally register communities and users	Increase tenure security, improve management of threats, build community cooperation, strengthen traditional systems and cultural norms	CBO formation gives too much power to some groups; individual registration excludes some users unfairly	IP, poor Khmer users	Participatory process (= national process for ICC, local process for user cards); safeguards for all village members; grievance process; local government oversight
Action #3: Indigenous land titling in appropriate communities	Further increase tenure security and define boundaries of carbon ownership	Communities allocated too little land; process causes/revives conflicts or changes social dynamics; marginalized groups not accounted for	IP, poor Khmer users	Participatory process; safeguards for all village members; grievance process; local government oversight
Action #4: Demarcation of the Forest Estate; reforestation of recent clearance	Improved management of threats; clarify extent of rights (reduce risk of conflict with the law); reforestation sequesters carbon,	Communities allocated too little land; process causes/revives conflicts or changes social dynamics; marginalized groups not accounted for; reforestation in wrong areas	IP, poor Khmer users	Participatory process; safeguards for all village members; grievance process; local government oversight

Action	Expected positive impacts	Potential negative impacts	Most vulnerable	Assessment & threat mitigation
	increases supply of forest products and biodiversity			
Sub-Objective #4: Support for alternative livelihoods that reduce deforestation				
Action #1: Establish sustainable timber harvests in buffer zone areas	Bring forest under sustainable management; control threats; alternative and improved livelihoods	Damage from logging; corruption/social conflict; inequitable benefit-sharing; business liabilities	IP, women, elderly	FA approval of management plan/ESIA; financial safeguards; participatory approach, oversight by local authorities
Action #2: Establish community-based ecotourism	Alternative and improved livelihoods; incentives to change behavior and control threats	Environmental and social impacts of tourists; corruption/social conflict; inequitable benefit-sharing; business liabilities	IP, women, elderly	Environmental screening/monitoring; code of conduct for tourists and agents; participatory approach; oversight by local authorities
Action #3: Support agricultural extension activities	Alternative and improved livelihoods; incentives to change behavior and control threats	Inequitable benefit-sharing; corruption	IP, women, elderly	Participatory approach, oversight by local authorities
Action #4: Provide infrastructure support linked to conservation activities	Alternative and improved livelihoods; incentives to change behavior and control threats	Inequitable benefit-sharing; corruption	IP, women, elderly	Participatory approach; oversight by local authorities
Action #5: Develop NTFP-based livelihood projects	Bring forest under sustainable management; control threats; alternative and improved livelihoods	Over-harvest; corruption/social conflict; inequitable benefit-sharing; business liabilities	IP, women, elderly	FA approval of management plan/ESIA; participatory approach; oversight by local authorities
Action #6: Develop and manage a system to share carbon benefits	Alternative and improved livelihoods; incentives to change behavior	Corruption/social conflict, inequitable benefit-sharing	IP, women, elderly	Participatory approach; oversight by local and national authorities
Action #7: Improve literacy and numeracy	Increase capacity to participate in other activities; increase off-farm livelihood opportunities	Inequitable benefit-sharing	IP, women, elderly	Participatory approach; oversight by local authorities

Action	Expected positive impacts	Potential negative impacts	Most vulnerable	Assessment & threat mitigation
Sub-Objective #5: Collect information on long-term ecological and social trends				
Action #1: Monitoring of trends in forest cover	Assess threats, measure success	None		
Action #2: Monitoring of key wildlife species	assess threats, measure success	None		
Action #3: Socio-economic and demography monitoring	assess threats, measure success/negative impacts	None		
Action #4: Facilitate research that will benefit the management of KSWS	Inform adaptive management	Unethical research		Ensure ethical review by source institution
Action #5: Ensure sufficient staff capacity is available	Support other activities	None		
Sub-Objective #6: Effective administrative, accounting, and logistical procedures are in place				
Action #1: Evaluation and feedback on staff capacity, effectiveness, and training needs	Support other activities	None		
Action #2: Develop and maintain effective management, administrative, and accounting systems	Support other activities	None		
Sub-Objective #7: Long-term financial security				
Action #1: Develop and implement REDD+ project	Ensure documentation, consent, and approvals to allow sale of carbon credits	Covered elsewhere		
Action #2: Establish Eastern Plains Trust Fund	Ensure transparent long-term sustainable management of funds	None		
Action #3: Continued support of a wide range of donor partners	Maintain funding for baseline levels of protection	None		
Action #4: Increase use of commune development funds for project activities	Reduce need for external funding	None		System already has many safeguards

4.1.3 Net Positive Community Well-Being (CM2.3, GL1.4)

The project has been designed so as to maximize the positive impacts on communities and minimize the negative ones, seeking to ensure a net positive impact for all stakeholder groups.

The key predictions for the business as usual scenario for communities (Section 4.5) were as follows:

- Average income is likely to increase for most social groups but some groups may become worse off as a result of increasingly unsustainable use of the NR base (rattan, timber, bamboo, sleng fruits, fish, wildlife, etc.) and an overall long-term decline in NR-based income. This will be true for both Khmer and indigenous families, but more significant for the latter due to their higher dependence on NR.
- Declines in water supply and quality will occur due to deforestation and intensive agriculture/mining in the Project Area and upstream.
- Some farmers will benefit from the expansion of their land holdings, but many others, especially weaker indigenous families, may experience land alienation and lose income or subsistence products from this source, increasing vulnerability and reducing food security. Many Khmer families may experience high insecurity due to insecure tenure on illegally grabbed land, and all families face the potential risk of dispossession and conflict due to problems with land concessions.
- Land fertility is likely to decline in many areas due to unsustainable practices made worse by insecure tenure.
- Indigenous communities are likely to suffer declines in non-material aspects of well-being, due to weakening of cultural institutions, loss of access to spiritually important forest and land, the shift from farming to laboring and so on.
- Very low levels of adult literacy will persist due to the lack of non-formal education.

It is not realistic to expect that all social problems will be avoided, but the with-project case is nonetheless expected to result in much better social situation for those community members affected by the issues listed above. In comparison to the business as usual scenario the main social benefits are listed below (see also the table in section 4.1.1 that lists the full extent of expected benefits for communities of the project):

- Improving well-being for all social groups, including those vulnerable to declines in natural resources.
- Declines in security and productivity of natural resources minimized and where possible reversed.
- Declines in the quality of water sources prevented or minimized.
- Landlessness among the poor kept low and stable.
- Agricultural productivity and sustainability increasing.
- Losses to concessions minimized/halted.
- Land alienation and land illegally minimized or halted.
- Traditional and new community institutions effective, cultural cohesion improved and adult literacy increased.

- Diversity of viable, sustainable livelihood options increasing.

The expected overall positive impacts of the project on livelihoods are set out in Section 2.2 of the PD (especially Table 2.1) using a conceptual model ('theory of change') to make the links and assumptions clear, as recommended by Richards and Panfil (2011). These positive outcomes include improvements in overall livelihood measures, improved status of natural resources and agricultural productivity for participating communities and a reduction in the levels of several key threats to livelihoods. These net benefits will be positive for all community groups.

Potential negative impacts should also be considered but for these, instead of a theory of change approach, it is recommended to conduct multi-stakeholder assessments, reviewing each element of the project in turn and assessing its likely impacts on each stakeholder group (Richards and Panfil 2011). In the Seima REDD+ Project a preliminary impact assessment was developed within the project team, and then consulted widely on this with local stakeholders, incorporating most of these discussions into the awareness raising stage for the consultation described in this document and also holding a dedicated workshop for community leaders (Sopha Sokhun Narong 2010). The proposed mitigation measures were in most cases already a part of project design, and the remainder have now been incorporated. As described in section 4.3.1 below, no negative impacts of the project on communities have been reported or recorded to date.

4.1.4 Protection of High Conservation Values (CM2.4)

No definitive project related impacts to community HCVs were detected during the monitoring period.

An HCV assessment was conducted in 2010 (Pollard and Evans 2012), which identified HCV5 and HCV6 community values (Table 4.1).

Table 4.1 Summary of social HCVs identified in the KSWS Core Area

High Conservation Value	Details
HCV5: Forest areas fundamental to meeting basic needs of local communities	Approximately 12,500 people living in 20 villages use the KSWS Core Area, of whom a large proportion depend on forest resources. Collection of liquid resin from forest trees, mainly *Dipterocarpus alatus* is the most important source of cash income for remote communities, providing income that is essential for purchasing rice and other basic needs. The fisheries of the rivers and pools of the KSWS Core Area are of fundamental importance as the main protein source for most households. Other important resources include rattan, bamboo, honey, and medicinal plants.
HCV6: Forest areas critical to local communities' traditional cultural identity	Nineteen of the 20 villages are predominantly ethnic Bunong, who are animist with very strong cultural links to the forest. Culturally important areas ('spirit forests', 'spirit pools', and grave forests) have been mapped for nine villages and are known to exist for most other communities.

The demographic component of the 2012 household survey (HHS) collected basic data on the number of individuals and households in each village. The baseline survey also collected information on dominant livelihoods and use of various NTFPs. These data can be used to track the status of critically important values (HCV5) as they were then they were compared with the social impact assessment in KSWS in 2017 and presented in the previous MIR for the period 2016 – 2017. The next HHS is scheduled for 2022 or 2023.

Remote sensing is used primarily to monitor land use change and will detect disturbances due to deforestation in spirit forest areas (HCV6). This information is supplemented with data gathered by law enforcement teams, and managed in the SMART database.

Annual meetings allow key community representatives to review project activities, impact, and progress. The meetings include consultation on community perceptions of the condition of HCVs. Table 4.2 summarizes HCV indicators and monitoring methods.

Table 4.2 HCV indicators monitored.

High Conservation Value	Indicators	Monitoring Method
HCV 5: Basic needs	Resin productivity, bamboo sustainability, fish catches	Demography monitoring, socio-economic monitoring protocol
HCV 6: Cultural values	Maintenance of spirit forest and pools; involvement of indigenous communities in management planning	Socio-economic monitoring, remote sensing, threats monitoring

Remote sensing and SMART data from the law enforcement and community patrol teams are used to monitor land use change will be used to monitor disturbance due to deforestation to spirit forest areas (HCV6). The rates of deforestation in spirit forest area are very low and the results of the deforestation assessment was shared with the community representatives at the KSWS annual meetings to provide comment and feedbacks.

4.2 Other Stakeholder Impacts

4.2.1 Mitigation of Negative Impacts on Other Stakeholders (CM3.2)

No negative offsite stakeholder impacts from project activities are expected as all significant legitimate user groups of the area have been included in the project design.

4.2.2 Net Impacts on Other Stakeholders (CM3.3)

No negative offsite stakeholder impacts from project activities were expected or observed.

4.3 Community Impact Monitoring

4.3.1 Community Monitoring Plan (CM4.1, CM4.2, GL1.4, GL2.2, GL2.3, GL2.5)

A community impact monitoring plan (including social HCVs) has been developed and a full monitoring program has been put in place. Furthermore, the project disseminated this plan and the results of monitoring, ensuring that they are made publicly available on the internet and are communicated to community groups and other stakeholders during community consultation meetings, annual work-plan consultation meetings, and quarterly newsletters.

Table 4.3 KSWS REDD project community impact monitoring plan

	Without Project	Impacts on	With Project	Indicator Quant	Method*	Indicator Qual	Method*	Frequency
CCB Core Standards								
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.SAM, LNGOs	5 to 6 years for HHS. Opportunistically for Partic/LNGO. Annually for SAM.
Conceptual Model Target								
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.SAM, LNGOs	5 to 6 years for HHS. Opportunistically for Partic/LNGO. Annually for SAM.
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/crop sales	HHS	Reported trends	Partic, SAM, LNGOs	5 to 6 years for HHS. Opportunistically for Partic/LNGO. Annually for SAM.
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, SMART	Reported trends	Partic, SAM, LNGOs	Annually for GIS Ongoing for SMART Opportunistically for Partic/LNGO.

								Annually for SAM.
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, SMART	-	-	Ongoing for GIS and SMART
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 controlled	Net in-migration negligible; access system excludes non-legitimate users	HHS, Demog	Reported trends	Partic, SAM, LNGOs	5 to 6 years for HHS and Demog. Opportunistically for Partic/LNGO. Annually for SAM.
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.SAM, LNGOs	5 to 6 years for HHS Opportunistically for Partic/LNGO Annually for SAM
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	SAM,	5 to 6 years for HHS Annually for committee records, Annually for SAM
Limited agricultural productivity	Decline, stagnation or slow improvement	All onsite communities	Agricultural productivity increasing	Agricultural productivity indicators (e.g. t/ha)	HHS (all HH); LNGOs (target families)	Reported trends	Partic.SAM, LNGOs	5 to 6 years for HHS Opportunistically for Partic/LNGO
Scarcity of sustainable dev. livelihood	Continued dependence on limited number of often	All onsite communities	Increasing diversity of viable, sustainable	# of liv activities; size of reported income sources	HHS (all HH); LNGOs(target families)	Reported trends	Partic.SAM, LNGOs	5 to 6 years for HHS LNGO income data when

opportunities, on and off farm	unsustainable livelihoods		livelihood opportunities					available (typically every 3 years).

*Method: HHS = Household survey, Demog = Rapid demographic survey, SAM = Seima Annual Meeting, LNGOs = Local NGOs' own monitoring, Partic. = WCS/FA-led consultation workshops, GIS = Mapping approaches such as remote sensing, SMART = Spatial Monitoring and Reporting Tool

4.3.1.1 Household Survey (HHS) and Demographic Surveys

The program involves a combination of quantitative and qualitative measures for each of the indicators, including an extensive, periodic questionnaire-based household survey and a range of qualitative, participatory approaches. The baseline survey was conducted in 2012. The next household survey was undertaken in 2017, with preparatory activities carried out in 2016. Coupled with demographic identification of community members' ethnicity, all analyses are conducted to assess Khmer and Indigenous Community groups collectively and separately, allowing for differentiation of impacts, benefits, costs, and risks with results made available to community groups for evaluation.

Respondents in the survey villages are asked to rank the importance of various livelihoods in their settlement: paddy rice, hill rice, cash crops, liquid resin, and others. This forms the basis for regular monitoring of social well-being indicators, which will in turn allow for the assessment and monitoring of social impacts associated with conservation measures implemented as part of the project.

The next HHS is scheduled for 2022 or 2023.

4.3.1.2 Annual meeting and consultation workshops

Annual meetings have been held each year. These involve the senior staff, team leaders, representatives of major partner organizations, and key technical advisors. The meetings typically occur around June, to harmonize with the WCS financial year (1 July–30 June). The meeting typically spans several days. These meetings allow for the following monitoring and response activities:

- Annual project evaluation and adaptive project planning;
- Provision of a community forum for voicing grievances;
- Monitoring participation of traditional institutions;
- Consultation on community perceptions of the condition of HCVs.

Community feedback on the REDD+ project is opportunistically collected during periodic consultation workshops. These workshops also allow for a review of any negative impacts arising, including unexpected impacts. Wherever possible, these discussions are combined with other project activities (e.g., consultations for the annual work planning process), so as to minimize the financial burden of monitoring. The consultation process improves communication between stakeholders and therefore strengthens project implementation.

4.3.1.3 Local NGOs (LNGOs)

Some results of specific interventions (e.g. agricultural extension, saving group, adult education, ecotourism and so on) will be derived from the work of local NGO partners (e.g. CRDT and Elephant Valley project) implementing their own activities. These partners are working closely with the local communities in the area and monitoring the impact of their activities on the livelihood of local communities. As a result, various information related to forest resources use and livelihood improvement are also collected and reported in both monthly meetings and Seima annual meetings.

4.3.1.4 Spatial Monitoring (GIS/SMART)

Some quantitative measures on concession impacts, land grabbing, and community agricultural expansion will be derived from GIS mapping activities such the remote sensing analyses of forest cover trends and patrol records using the Spatial Monitoring and Reporting Tool software.

4.3.2 Monitoring Plan Dissemination (CM4.3)

In every annual meeting, community representatives are invited to the KSWS Headquarters to provide an update on project implementation. The methods and results from community and biodiversity impact assessment are presented by the project teams. During the CCBA public comment period in 2014, the PD, in Khmer, was disseminated in all 20 villages (there is no written Bunong language, so PDs were only produced in Khmer). In the Khmer PD, key parameters to be monitored during the project—taken from the community and biodiversity monitoring plans—were included. These were explained in the meetings, in Khmer and Bunong. The project organized a meeting in each community to present the PD in more detail.

During the CCBA MIR public comment period, the MIR report (in Khmer) was distributed to communities in the 20 villages of the Project Area. This report also contained information on key parameters to be monitored in the project. In addition to the CCBA website, the project team has uploaded the monitoring plans to the WCS Cambodia website (https://cambodia.wcs.org/About-Us/Publications.aspx), where they are available in Khmer and English.

4.4 Optional Criterion: Exceptional Community Benefits

Not applicable

4.4.1 Short-term and Long-term Community Benefits (GL2.2)

Not applicable

4.4.2 Marginalized and/or Vulnerable Community Groups (GL2.4)

Not applicable

4.4.3 Net Impacts on Women (GL2.5)

Not applicable

4.4.4 Benefit Sharing Mechanisms (GL2.6)

Not applicable

4.4.5 Governance and Implementation Structures (GL2.8)

Not applicable

4.4.6 Smallholders/Community Members Capacity Development (GL2.9)

Not applicable

5 BIODIVERSITY

5.1 Net Positive Biodiversity Impacts

5.1.1 Biodiversity Changes (B2.1)

Change in Biodiversity	Red muntjac population decline
Monitored Change	A decline in population, from an average of 2,800 before 2016, to 1,400 after 2016.
Justification of Change	Change was monitored using robust line transect-based distance sampling. Populations of wild species fluctuate, and the 2018 population estimate is used to confirm the apparent decline, with a z-test value of 2.56 ($p < 0.05$) between 2014 and 2018 estimates.

Populations of monitored species in KSWS have stayed stable within the power of the analysis to detect change, with the exception of red muntjac from 2016 onwards (Figure 5.1). A decline from an average of 2,800 pre-2016 to an average of 1,400 in the following years has been detected, and supported by a z-test value of 2.56 ($p < 0.05$) between 2014 and 2018 estimates. It should be noted that this decline is not due to project activities; in the absence of project activities this decline would have been even more severe.

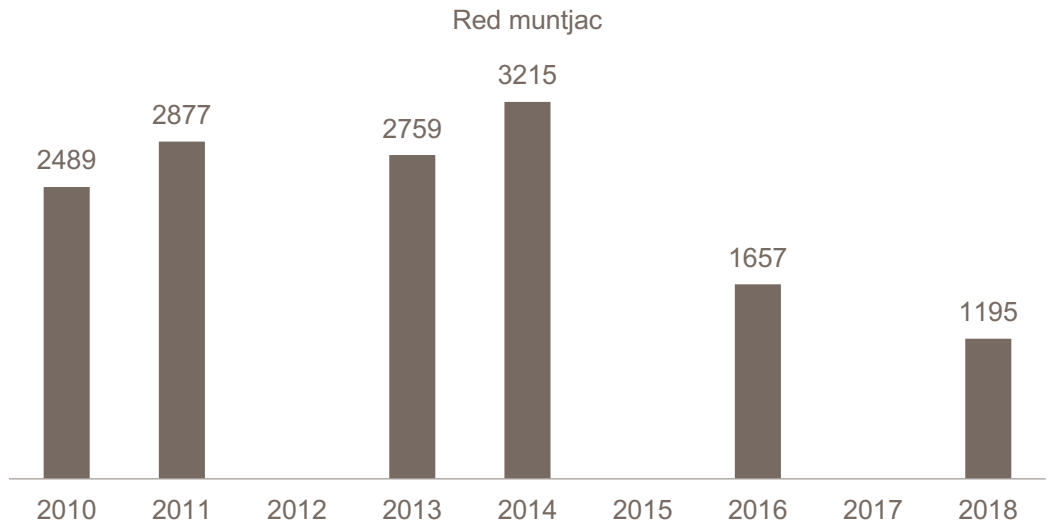


Figure 5.1 Estimated red muntjac population in Project Area; z-test value of 2.56 ($p < 0.05$) between 2014 and 2018 estimates

Red muntjac are a common, widespread and robust species, likely to quickly recover where conditions are favorable. However, a decline in this species can act as an indicator for risk in other lower density, rarer, and slower breeding species that are likely to be targeted by similar threats, including gaur, banteng, sambar, and Eld's deer. These species are found at low densities in KSWS, at the lower end of

the ability of distance sampling to detect population changes, meaning a very large change in population would be required before a true change in population can be confirmed. Population estimates for banteng and guar have large confidence intervals due to a low sample size. Although no statistically significant decline is detected in the 2018 data, based on recent anecdotal evidence it is likely that all four of these larger ungulate species are in decline.

Research into hunting prevalence and methods has recently taken place across KSWS, and research results have been drafted and are awaiting publication in a peer-reviewed journal. Preliminary results suggest a decrease in hunting with snares, and a decrease in the number of people hunting. Whilst these results sound like positive changes, a large part of this change is due to decreases in prey density making traditional hunting methods less effective. An increase in hunting with dogs was found, and a change of target species away from ungulates to species including monitor lizards.

Line transect monitoring will take place at the end of 2019 and provide updated data on the 13 KSWS key species.

Change in Biodiversity	Increased number of CR and EN species recorded
Monitored Change	Previous monitoring period: CR: 8 EN: 21 This monitoring period: CR: 9 EN: 25
Justification of Change	Increased study has identified additional species. One species, the elongated tortoise (*Indotestudo elongata*) has be globally reassessed from EN to CR since the previous monitoring period. Several plant species previously identified within KSWS have been assessed for the first time, and classed as EN.

Change in Biodiversity	Green peafowl population increase
Monitored Change	373 (95% CI 108 - 1287) in 2016 to 1303 (95% CI 633 - 2684) in 2018.
Justification of Change	Change was monitored using robust line transect-based distance sampling. A z-test shows a statistically significant increase from previous estimates. Green peafowl have large broods, so rapid population increases are possible in favorable conditions.

Change in Biodiversity	Pig-tailed macaque population increase
Monitored Change	2919 (95% CI 1759 - 4844) in 2016 to 6065 (95% CI 3473 - 10591) in 2018.
Justification of Change	Change was monitored using robust line transect-based distance sampling. A z-test shows a statistically significant increase from previous estimates.

5.1.2 Mitigation Actions (B2.3)

Snares are a threat to ungulate species across south-east Asia, and with its proximity to the Vietnam border and large human population, KSWS is targeted by poachers using snares. Law enforcement teams collect snares, but it is rarely a key focus on their patrols, which typically concentrate on land clearance. To address this, at the end of 2017 a dedicated anti-snare team was launched. This team targets priority areas, including wildlife hotspots, areas known to be targets for poachers, and areas reported by local informants as likely to be targeted. Recent research confirms that snare removal alone is not enough to reduce the impact of snare hunting to sustainable levels. Community outreach and improved law enforcement, as well as legislative change will all contribute to reducing snare impacts.

The decline in muntjac discussed above has been raised with project management and will continue to be highlighted with relevant authorities.

Research during the monitoring period highlights the threat posed by domestic dogs, with estimates of more than 4000 dogs within the 20 REDD+ villages. This is an average of 2.3 dogs per household, with dogs accompanying local people into the forest and being reported as the most common hunting technique. A project has been initiated to address this issue, starting with a data collection phase to understand the movement and disease load of dogs in the area.

5.1.3 Net Positive Biodiversity Impacts (B2.2, GL1.4)

Table 5.1 Positive biodiversity impacts of project activities (in italics are the threats addressed with major threats underlined).

Project Action	Positive Impacts
Sub-Objective #1: Key legal and planning documents for KSWS and surrounding landscape are approved and implemented	
Action #1: Support for sub-decree maintained among senior government and general public. *All threats, especially important in controlling <u>habitat loss</u>*	Recognition of the importance of KSWS for local communities was reaffirmed during numerous meetings with government and community stakeholders during the verification period.
Action #2: Management plan approved and implemented (including zonation and regulations). *All threats*	Stabilized land-use by residents has protected natural habitats.
	Clarified regulations for forest use has reduced damaging activities.
	Areas of strict protection were identified and included in draft zonation plans.
Action #3: Mondulkiri Provincial Corridors strategy implemented (maintain links to other forests). *<u>Habitat loss</u> and fragmentation in the wider landscape*	Protection of the wider landscape helped conserve species that range widely through the area, for example Asian elephants, large carnivores, and vultures.
Action #4: Develop partnerships with the private sector (to reduce impacts by companies). *<u>Hunting</u>, <u>habitat loss</u>, incidental disturbance, pollution*	Reduced impact from industrial activities in the landscape minimized disturbance to the KSWS. Key aspects that were controlled are hunting and trapping by company staff, illegal logging, and pollution. Environmental Impact Assessments for projects impacting KSWS were supported with data and

Project Action	Positive Impacts
	technical advice, and mitigation measures proposed were relevant.
Sub-Objective #2: To reduce forest and wildlife crime by direct law enforcement	
Action #1: Enforce wildlife, forest, and protected area laws and sub-decree through patrols. *Hunting, habitat loss, over-harvest of NTFPs*	This is the key strategy to protect biodiversity.
	Patrols helped protect biodiversity from direct exploitation, disturbance, and loss of habitat leading to increasing or stable populations of many species of conservation concern and protection of threatened ecosystems.
Action #2: Establish and implement law enforcement monitoring framework. *Hunting, habitat loss, over-harvest of NTFPs*	Monitoring of law enforcement impacts enabled the project to track effectiveness and improve practices. This ensured that efforts adapted to changing threats, and protection of species and habitat is maintained. Monitoring of law enforcement impacts will enable the project to track effectiveness and improve practices as necessary. All law enforcement activity was recorded and reported using the Spatial Monitoring and Reporting Tool (SMART).
Action #3: Ensure sufficient patrol buildings, equipment, and staffing; and Action #4: Ensure sufficient patrol personnel capacity. *All threats*	Sufficient staff and resources are available leading to improved effectiveness of enforcement efforts and increased protection of species and habitat against all threats. Patrol personnel numbers and resources increased throughout the verification period. New REDD finance will be used to increase the number of patrol personnel.
Action #5: Liaise with provincial, national and other authorities. *All threats*	All project activities conducted in close partnership with provincial, national, district, and commune authorities throughout the verification period. This coordination improved project effectiveness, for example in processing criminal cases, and for addressing threats such as wildlife trade that extend beyond the borders of the project.
Action #6: Establish community-based patrolling and/or monitoring system *Hunting, habitat loss, over-harvest of NTFPs, incidental disturbance*	Community-based patrolling established during the verification period increased community support for activities helping to ensure continued protection of species and habitat.
Action #7: Establish dedicated anti-snare team and conduct snare detection research *Hunting*	Removal of snares from the forest reduces threats to many ground-based species. Snare detection research allows a better understanding of snare placement and methods of control.
Sub-Objective #3: Land and resource use by all core zone communities is sustainable	
Action #1: Form and maintain land-use agreements with communities. *Habitat loss, over harvesting of NTFPs, incidental disturbance*	Agreements helped stabilize land-use and reduced conversion of natural habitats, especially in critical areas such as grasslands and wetlands that are important to large waterbirds and Eld's deer, bamboo groves used by elephants, and salt-licks used by ungulates.
	Agreements during the verification period allowed for improved management of forest resources, thus controlling over-harvesting and minimizing habitat disturbance.

Project Action	Positive Impacts
Action #4: Demarcation of Community Protected Areas; reforestation of recent clearance. *Habitat loss*	A Community Protected Area has been established at Sre Preah commune and managed by three villages. Bamboo grown at a nursey has been used to plant up recently deforested areas and will be sustainably harvested to provide income to local communities.
Action #5: Conduct extension and communication activities. *All threats*	Increased awareness of forest laws, and the impact of activities on the forest and wildlife led to changes in attitude and behavior. Outreach on the negative impact of snares given to key target villages will reduce snare incidence. Increased compliance with laws will reduce pressures on species and ecosystems.
Action #6: Establish a human-wildlife conflict team *Hunting*	Collection of conflict data allows better design of interventions. Providing a channel for grievances reduces negative attitudes to wildlife, reducing chances of revenge-killing of wildlife.
Sub-Objective #4: Support for alternative livelihoods that reduce deforestation	
Action #1: Establish community-based ecotourism. *Habitat loss, over harvesting of NTFPs*	Income generation from legal activities reduced the need for local communities to engage in destructive activities such as hunting, and the conversion of forest to cash crops.
	Tourism links income to forest and species conservation, providing a direct incentive for local residents to protect species and habitats.
Action #2: Support agricultural extension activities. *Habitat loss*	Improved agricultural productivity and diversity helped stabilize land use, thus reducing habitat conversion.
	Cash income from farming reduced the need for local communities to engage in destructive activities such as hunting.
Action #3: Develop NTFP-based livelihood projects. *Over harvesting of NTFPs*	Improved NTFP management led to more sustainable harvesting and reduced habitat disturbance.

5.1.4 High Conservation Values Protected (B2.4)

High Conservation Value	Project Targets	Implemented Interventions	Negative Impacts
HCV1: Forest areas containing globally, regionally, or nationally significant concentrations of biodiversity values	Increase populations of wildlife of conservation concern	Law enforcement activities to reduce hunting and trapping of Globally Threatened and endemic species	None
		Law enforcement to reduce conversion of forest and wetland habitats	None
		Livelihood support activities to improve management for forest resources and reduce hunting pressure	None
HCV2: Forest areas containing globally,	Maintain the variety, integrity,	Law enforcement to reduce conversion of forest and wetland habitats	None

High Conservation Value	Project Targets	Implemented Interventions	Negative Impacts
regionally, or nationally significant large landscape level forests	and extent of all forest types	Land-use planning at village, provincial and national level to reduce conversion and fragmentation of KSWS and wider landscape	None
HCV3: Forest areas that are in or contain rare, threatened or endangered ecosystems	Maintain the variety, integrity, and extent of all forest types	Law enforcement to reduce conversion of forest and wetland habitats	None
		Land-use planning at village, provincial and national level to reduce conversion and fragmentation of KSWS and wider landscape	None
HCV5: Forest areas fundamental to meeting basic needs of local communities	Increase security and productivity of natural resources to support local livelihoods	Land-use planning at a village level to protect forest resources	None
		Development of community natural resource management rules to encourage more sustainable use of resources	None
	Maintain the variety, integrity, and extent of all forest types	Livelihood support activities to reduce pressures to harvest resources unsustainably	None
		Law enforcement to protect forest and aquatic resources from external pressures	None
		Appropriate zoning of KSWS that recognizes NTFP collection and compensates for any unreasonable reductions in access	None
HCV6: Forest areas critical to local communities' traditional cultural identity	Increase security and productivity of natural resources to support local livelihoods	Village level land-use planning to map and protect spiritual sites	None
		Law enforcement to protect spiritual sites from outside threats	None
	Maintain the variety, integrity, and extent of all forest types	Appropriate zoning of KSWS that recognizes spiritual sites	None

5.1.5 Invasive Species (B2.5)

All reforestation activities managed by the project use local native tree or bamboo species.

Four invasive species are known from the project site, although none were introduced by project activities, although the extent and impact of these species is not known across the project area.

Table 5.2 Known invasive species present at the project site

Scientific name	Family	English name	Khmer name
Eichhornia crassipes	Pontederiaceae	Common water hyacinth	
Chromolaena odorata	Asteraceae	Siam weed	ទន្ទ្រានខេត្ត

Passiflora foetida	Passifloraceae	Wild maracuja	រល្លិសារម៉ារ
Psidium guajava	Myrtaceae	Guava	ត្រកៃ

Siam weed is known to suppress regeneration of native flora. In one area of the project, near Pu Trom village, it is actively managed by manually removal, with each clearance reducing regrowth of siam weed to around 10% of the previous density.

5.1.6 Impacts of Non-Native Species (B2.6)

Nine non-native species have been recorded within the project area. Aside from the four invasive species listed above, these non-native species have been shown to not have any negative impact, and are typically crop species that have become naturalized from nearby villages.

Table 5.3 Known non-native species present at the project site

Scientific name	Family	English name	Khmer name
Eichhornia crassipes	Pontederiaceae	Common water hyacinth	
Cenchrus polystachios	Poaceae	Mission Grass	
Chromolaena odorata	Asteraceae	Siam weed	ទន្ទ្រានខេត្ត
Momordica charantia	Cucurbitaceae	Bitter melon	ម្រ៉ះ
Euphorbia hirta	Euphorbiaceae	Garden spurge	ទឹកដោះខ្លា
Passiflora foetida	Passifloraceae	Wild maracuja	រល្លិសារម៉ារ
Psidium guajava	Myrtaceae	Guava	ត្រកៃ
Physalis angulata	Solanaceae	Angular Winter-cherry	ប៉ង់ជោះស្រោម
Solanum torvum	Solanaceae	Turkey berry	ប្រមង ប្រ ពលញ

5.1.7 GMO Exclusion (B2.7)

No genetically modified organisms (GMOs) are currently used in the Project Zone, as far as is known. GMOs will not be used in any project activities. The use of GMOs on farms in the Project Zone will not be supported by REDD+-funded agricultural assistance projects.

5.1.8 Inputs Justification (B2.8)

The main project strategy is to address the loss of forest from agricultural expansion. Most project activities, by definition, reduce the potential use of fertilizer, pesticides, or biological control agents since they reduce the conversion of forest to agricultural lands. In some limited cases, activities supporting indigenous communities within the Project Area include supporting sustainable agricultural practices as an economic alternative to NTFP harvesting. These sustainable agricultural approaches include fertilizer and chemical pesticide alternatives such as compost and plant-based pest deterrents.

5.1.9 Waste Products (B2.9)

No project activities have generated waste outside of waste generated by typical human habitation and trash production from day to day living.

5.2 Offsite Biodiversity Impacts

5.2.1 Negative Offsite Biodiversity Impacts (B3.1) and Mitigation Actions (B3.2)

No negative offsite biodiversity impacts from project activities observed.

5.2.2 Net Offsite Biodiversity Benefits (B3.3)

No negative offsite biodiversity impacts from project activities observed.

5.3 Biodiversity Impact Monitoring

5.3.1 Biodiversity Monitoring Plan (B4.1, B4.2, GL1.4, GL3.4)

Current biodiversity monitoring in KSWS is conducted using three broad methodologies, listed below.

- Distance-sampling methods
- Capture-recapture methods
- Occupancy methods

Incidental records of rare or important species are also collected. The main monitoring program is complemented by various studies conducted by independent researchers.

5.3.1.1 Distance-sampling methods

These are the most frequent systematic quantitative surveys conducted during the verification period. The two most recent surveys took place between November and June of 2015 to 2016, and of 2017 and 2018, and the next will take place between the same months of 2019 and 2020, with analysis in July 2020. These surveys use fixed transect locations (Figure 5.2) that are revisited during subsequent surveys.

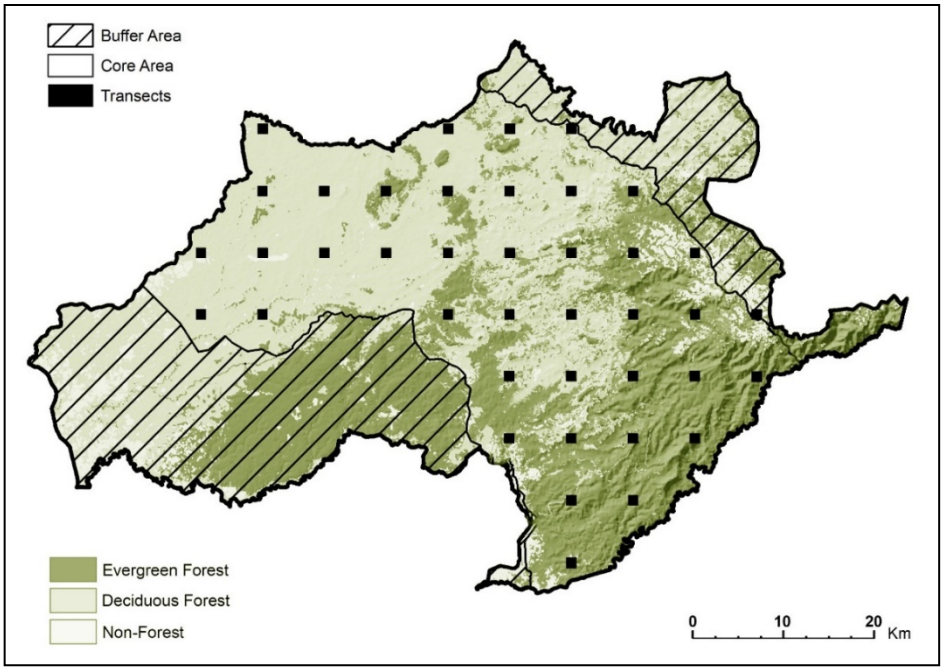


Figure 5.2 Location of KSWS transects

Survey targets are individuals or groups of animals and detections are visual observations of these animals (i.e., animal sounds or signs are not recorded). Multiple species are recorded during these surveys, including six ungulate species, six primates, and one bird species (Table 5.4).

Table 5.4. Species surveyed on the line transects.

English Name	Scientific Name	Status*
Black-shanked douc	*Pygathrix nigripes*	EN
Yellow-cheeked crested gibbon	*Nomascus gabriellae*	EN
Banteng	*Bos javanicus*	EN
Gaur	*Bos gaurus*	VU
Sambar	*Rusa unicolor*	VU
Eld's deer	*Rucervus eldii*	EN
Green peafowl	*Pavo muticus*	EN
Northern pig-tailed macaque	*Macaca leonina*	VU
Stump-tailed macaque	*Macaca arctoides*	VU
Long-tailed macaque	*Macaca fascicularis*	LC
Germain's silvered langur	*Trachypithecus germaini*	EN
Red muntjac	*Muntiacus vaginalis*	LC
Wild pig	*Sus scrofa*	LC

* According to the IUCN Red List of Threatened Species

Distribution maps are produced for each key species based on transect encounter rates, and an aggregate is produced to show wildlife hotspots across KSWS (Figure 5.3).

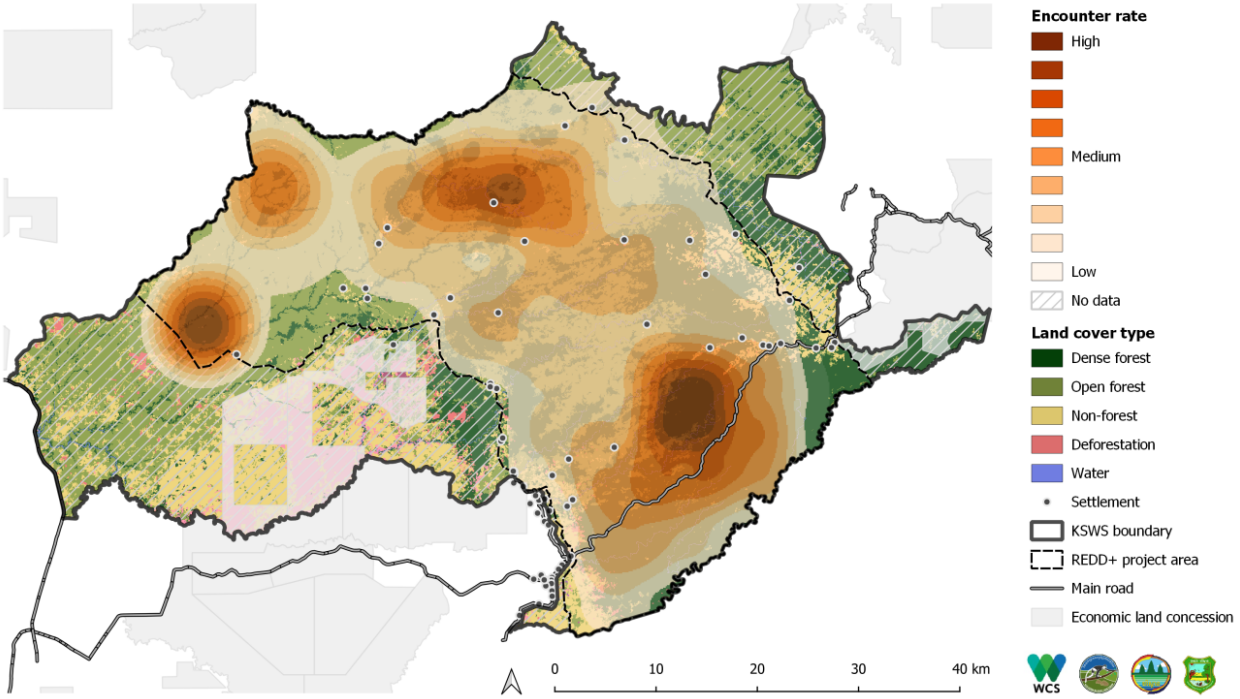


Figure 5.3 Spatial distribution of 13 key species in KSWS based on line transect encounter rates with line transect data from 2010 to 2018

5.3.1.2 Capture-recapture methods

Fecal DNA-based capture-recapture is currently being used to monitor the population of Asian elephants in the Project Area. This is the preferred method specified by CITES MIKE monitoring protocols. Survey protocols involve firstly conducting a thorough recce survey to identify and map known elephant hotspots (i.e., areas that elephants frequently visit and at which they congregate, such as around streams, saltlicks and wallows, and in bamboo forest patches) throughout the Project Area. This is done based on local expert knowledge and past records. Sampling involves repeated visits to these hotspots to collect samples of fresh dung from which microsatellite DNA was extracted. Survey teams visit each hotspot a number of times, leaving sufficient time between visits for fresh dung to accumulate. Teams destroy dung piles after taking samples to ensure that piles are not mistakenly re-sampled. They also search for additional dung piles whilst traveling between hotspots.

5.3.1.3 Occupancy methods

Traditional wildlife monitoring techniques are generally concerned with estimating population size (i.e., density or abundance) but over the last 10–15 years the distribution or 'occupancy' of a population has been increasingly adopted as an alternative parameter of interest. Occupancy is defined as the probability that a sampling unit is occupied by a species, or generalized to mean the proportion of an area occupied by a species. This has been found to be a relevant and useful measure when assessing the impact of management actions, especially in long-term monitoring programs, and a large body of research now exists surrounding occupancy-type approaches Otter surveys using this methodology took place in February and March 2019, extending the known range of otters in KSWS, and confirmed the presence of oriental small-

clawed otter (*Aonyx cinereus*, VU) for the first time – this species was suspected to occur, but had never been captured by camera trap until this recent survey.

Occupancy modelling will be assessed for suitability in modelling the distribution of small mammals in the project area, using camera trap data and environmental covariates.

5.3.1.4 SMART data-based CPUE indices

Ongoing law enforcement efforts both outside and inside the Project Area are based upon regular patrols. Whilst patrolling, teams collect information on threats (e.g., snares, hunting camps, illegal hunters encountered). This information is entered into a SMART database that allows for subsequent analyses and tracking of threats through the use of catch per unit effort (CPUE) indices. CPUE indices are a relative measure derived by dividing total 'catch' (in this case, observations of hunting, logging, and other illegal activities) by some standard unit of the effort required to obtain this catch (e.g., days patrolled, kilometers patrolled, or number of patrol visits to a grid cell). In this way, variable survey or search efforts can be corrected for, and, by assuming that catch is proportional to both the number of ongoing infractions and the amount of search effort expended, CPUE can be used as an index of true levels of underlying illegal activity. When applied to the rate of encounters of infractions by patrol teams, this metric describes the relative frequency of occurrence of illegal activities.

Patrol teams also collect biological information (i.e., observations of animals or animal sign), which is recorded in the SMART database in exactly the same way and can be used to generate relative indices of abundance. It is important to recognize such data collection is a secondary function for patrol teams and this has implications in terms of data quality. Nevertheless, these data are used to supplement other sources of biological data. Such measures are especially useful for areas outside the Project Area, for which few other data are available. In addition, dedicated biological monitoring teams also collect SMART data on threats whilst they travel to and from survey locations throughout the Project Area. CPUE indices can be generated frequently and repeatedly from routinely collected SMART data and will provide important information on trends in wildlife presence and threat levels in between the major biological monitoring events outlined above.

5.3.1.5 Trigger species monitoring

Three 'trigger species' were selected for KSWS on the basis of both the global importance of the site for their survival, and their suitability as indicative of changing management effectiveness. Monitoring methods for the trigger species are outlined in Table 5.5.

Table 5.5 Trigger species and monitoring methods used.

Species	Monitoring data source	Frequency
Asian elephant	Fecal DNA-based capture-recapture	~5 yearly
	CITES Monitoring of Illegal Killing of Elephants (MIKE) program	Ongoing
	SMART data-based indices (from patrol teams and monitoring teams)	Ongoing
	Incidental records from communities	Ongoing
Black-shanked douc	Distance sampling-based line transects	Biannual
	SMART data-based indices (from patrol teams and monitoring teams)	Ongoing
	Tourism-related records	Ongoing

	Independent researcher data	Variable
Southern yellow-cheeked crested gibbon	Distance sampling-based line transects	Biannual
	SMART data-based indices (from patrol teams and monitoring teams)	Ongoing
	Tourism-related records	Ongoing
	Independent researcher data	Ongoing

5.3.1.6 Opportunistic records and studies

Notable records of all species encountered in the Project area are documented, regardless of whether they were collected during formal structured surveys such as transects. Records of observations, signs (tracks and dung), and calls are collated from monitoring team members, project staff, and visiting researchers and bird tour groups. For highly vocal species, such as gibbons, peafowl, and Germain's peacock pheasant, call records are a particularly important source of information.

These records supplement routine quantitative methods and in particular enhance understanding of the presence and distribution of lesser-known species. They can help to alert project managers to possible changes in population size, ranging behavior, altered group sizes, and other factors that may indicate changed threat levels and would warrant more detailed study. Although they do not provide absolute measures of varying population size over time, they do confirm the continued presence of target species in each sector and also help to identify areas of critical importance. For example, records of tracks, and occasional observations of Eld's deer reveal that they are currently to be found only in the far west of the Project area, in areas of very open deciduous dipterocarp forest with large natural grasslands.

Periodically, selected species will also be the subject of focused studies by visiting researchers facilitated by the project. These studies are valuable for clarifying threats, identifying management priorities, and informing the design of future monitoring efforts.

5.3.1.7 Monitoring impacts outside the Project Area

Impacts of project activities outside the Project Area are monitored in a number of ways (Table 5.6). Routine law enforcement patrols take place across the wider landscape outside the Project Area. Forest cover monitoring extends beyond the boundaries of the Project Zone. Project staff are in regular communication with villages using the outer parts of the Project Zone, which allows them to gain qualitative information across a wider area. There is an ongoing system of collaboration between the KSWS management team and government agencies and NGOs working in neighboring areas. This has been further strengthened recently by the implementation of a human-wildlife conflict survey, which spanned three PAs and involved WCS, WWF, and the Provincial Department of Environment, with permissions from MoE. These agencies also carry out their own additional biodiversity and threat monitoring activities. Results of biodiversity monitoring are shared among all of these partners. This information will indicate whether there are significant displaced negative impacts on the most important concentrations of biodiversity adjacent to the Project Zone.

Table 5.6 Methods used to monitor biodiversity outside of the Project Area.

Data source	Indicator	Extent	Frequency
Fecal DNA-based capture-recapture surveys	Asian elephant density/abundance	Entire landscape	Every 8 years

CITES Monitoring of Illegal Killing of Elephants (MIKE) program	Asian elephant mortalities	Entire landscape	Ongoing
Line transect-based distance sampling surveys	Banteng density Gaur density Eld's deer density Muntjac density	Adjacent PAs (PPWS & SPWS)	Every 2 years
Remote sensing data	Forest cover loss (%)	Entire landscape	Ongoing (reported annually)
SMART data	CPUE indices of threats	Inside and outside Project Area	Ongoing
SMART data	CPUE indices of key wildlife species	Inside and outside Project Area	Ongoing

5.3.1.8 Monitoring of ecological High Conservation Values

The monitoring of HCVs is outlined in more detail in the HCV assessment report (Pollard and Evans 2012). Monitoring of ecological HCVs (HCVs 1–3) is effectively covered by the overall project monitoring framework outlined above, since the same methods are suitable for assessing whether the project activities maintain or enhance HCVs. A summary of the methods used to monitor the values is provided in Table 5.7.

Table 5.7 Methodologies used for monitoring High Conservation Values in KSWS.

High Conservation Value	Indicators	Monitoring Method
HCV 1: Significant concentrations of biodiversity values	See relevant sections	Line transects, fecal DNA capture-recapture, occupancy surveys (see above)
HCV 2: Landscape level forests	Forest cover	Remote sensing forest cover assessments
HCV 3: Threatened ecosystems	Forest cover and condition	Remote sensing forest cover assessments; measurements of forest condition during reassessment of the project baseline

5.3.2 Biodiversity Monitoring Plan Dissemination (B4.3)

In the KSWS annual meetings, updates on REDD+ project implementation are presented to community representatives, local authorities, and local partners. The process for validation and/or verification against CCBA standards is also discussed in these meetings. The monitoring plans (in Khmer) are disseminated after each meeting and additional copies were given to communities to further distribute in their villages. The project has also printed hard copies of the KSWS REDD+ Quarterly Newsletters in Khmer—which provide regular updates on the project for every quarter—to distribute to the communities. During the CCBA public comment period for project verification in 2020, the project teams visited the 20 villages to explain CCBA and the process of validation/verification against the standard. Before the CCBA MIR public comment period, the project teams visited the villages in the Project Area to distribute the MIR and explain the verification process to local communities. During community meetings in the 20 villages, the project teams informed all participants that there would be independent auditors coming to visit their villages and interview some of them regarding the project. This was a part of the process for project validation/verification against CCB standards.

5.4 Optional Criterion: Exceptional Biodiversity Benefits

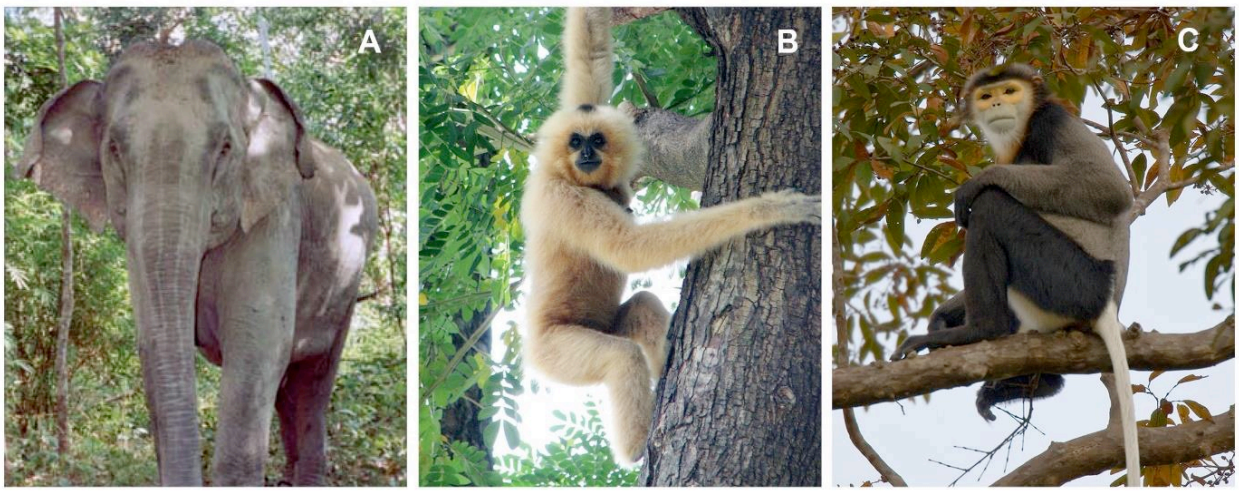
The project qualifies for Gold Level as it will have globally exceptional biodiversity benefits. The Project Area meets both of the main criteria for Gold Level:

1. Vulnerability: at least 75 Globally Threatened species occur in the Project Area;
2. Irreplaceability: the Project Area holds significant populations of at least three restricted-range species and large proportions of the world's population of at least five other species.

The site has also been recognized as outstanding in many previous priority-setting exercises. The project goes beyond simply noting the presence of these key species. Project design aims to improve the population status of these key species through targeted measures, and a significant number of the species are included among those that are formally monitored to confirm status improvement. Numerous species occurring in KSWS meet the qualifying conditions of vulnerability or irreplaceability. A subset of these were selected to demonstrate conservation importance of the Project Area. Asian elephant, southern yellow-cheeked crested gibbon, and black-shanked douc were selected as three 'trigger' species to illustrate the high conservation priority of the project site and the success of conservation measures (Figure 5.4). These three species are threatened by habitat loss and by hunting for both consumption and trade.

Elephants are targeted by poachers due to extremely high demand for ivory and other body parts. Primates are targeted to be eaten, or sold as pets or for body parts. These species were selected due to their (1) endangered status, (2) globally significant populations, (3) risk of extirpation, and (4) management relevance for other key species present in KSWS. For all of the trigger species, a rigorous monitoring system is in place that will provide precise population estimates that will allow definitive identification of population trends.

Figure 5.4 KSWS trigger species are: (A) Asian elephant, (B) yellow-cheeked crested gibbon, and (C) black-shanked douc



The Project Area is home to at least 55 Globally Threatened vertebrate species, as listed in the table below. The site is also of exceptional importance for the conservation of threatened trees, and is home to the type locality of several insect species.

Table 5.8 Globally threatened species recorded in the Project Area (trigger species in bold text). Status refers to threat status as given by the IUCN Red List of Threatened Species. Changes in status since project inception are denoted by an asterisk.

Class	English name	Scientific name	Status	KSWS Importance
Actinopterygii	Giant Carp	*Catlocarpio siamensis*	CR	
Actinopterygii		*Hypsibarbus lagleri*	VU	
Actinopterygii	Yellow Tail Brook Barb	*Poropuntius deauratus*	EN*	
Actinopterygii	Jullien's Golden Carp	*Probarbus jullieni*	EN*	
Actinopterygii	Thicklipped Barb	*Probarbus labeamajor*	EN	
Actinopterygii	Red Mahseer	*Tor sinensis*	VU	
Amphibia	O'Reang Horned Frog	*Ophryophryne synoria*	VU*	Global
Aves	White-Rumped Vulture	*Gyps bengalensis*	CR	Possibly global
Aves	Red-Headed Vulture	*Sarcogyps calvus*	CR	Possibly global
Aves	White-Winged Duck	*Asarcornis scutulata*	EN	Regional
Aves	Great Hornbill	*Buceros bicornis*	VU	
Aves	Wreathed Hornbill	*Rhyticeros undulatus*	VU	
Aves	Asian Woollyneck	*Ciconia episcopus*	VU	
Aves	Greater Adjutant	*Leptoptilos dubius*	EN	
Aves	Lesser Adjutant	*Leptoptilos javanicus*	VU	National
Aves	Pale-Capped Pigeon	*Columba punicea*	VU	
Aves	Green Peafowl	*Pavo muticus*	EN	Global
Aves	Sarus Crane	*Antigone antigone*	VU	
Aves	Masked Finfoot	*Heliopais personatus*	EN	
Aves	Manchurian Reed Warbler	*Acrocephalus tangorum*	VU	
Aves	Yellow-Breasted Bunting	*Emberiza aureola*	CR	
Aves	White-Shouldered Ibis	*Pseudibis davisoni*	CR	Possibly global
Aves	Giant Ibis	*Thaumatibis gigantea*	CR	National
Aves	Great Slaty Woodpecker	*Mulleripicus pulverulentus*	VU	
Mammalia	Gaur	*Bos gaurus*	VU	Regional
Mammalia	Banteng	*Bos javanicus*	EN	Global
Mammalia	Eld's Deer	*Rucervus eldii*	EN	Regional
Mammalia	Sambar	*Rusa unicolor*	VU	Possibly regional
Mammalia	Dhole	*Cuon alpinus*	EN	Possibly regional
Mammalia	Clouded Leopard	*Neofelis nebulosa*	VU	Possibly regional
Mammalia	Leopard	*Panthera pardus*	VU*	
Mammalia	Oriental Small-Clawed Otter	*Aonyx cinereus*	VU	
Mammalia	Hog Badger	*Arctonyx collaris*	VU*	
Mammalia	Smooth-Coated Otter	*Lutrogale perspicillata*	VU	
Mammalia	Sun Bear	*Helarctos malayanus*	VU	National
Mammalia	Asiatic Black Bear	*Ursus thibetanus*	VU	Possibly regional

Mammalia	Binturong	*Arctictis binturong*	VU	
Mammalia	Large-Spotted Civet	*Viverra megaspila*	EN*	
Mammalia	Malay Pangolin	*Manis javanica*	CR	Regional
Mammalia	Stump-Tailed Macaque	*Macaca arctoides*	VU	Possibly regional
Mammalia	Northern Pig-Tailed Macaque	*Macaca leonina*	VU	National
Mammalia	**Black-Shanked Douc**	***Pygathrix nigripes***	**EN**	**Global**
Mammalia	Germain's Silvered Langur	*Trachypithecus germaini*	EN	Possibly global
Mammalia	**Yellow-Cheeked Crested Gibbon**	***Nomascus gabriellae***	**EN**	**Global**
Mammalia	Pygmy Loris	*Nycticebus pygmaeus*	VU	Global
Mammalia	**Asian Elephant**	***Elephas maximus***	**EN**	**Regional**
Reptilia	Siamese Crocodile	*Crocodylus siamensis*	CR	
Reptilia	King Cobra	*Ophiophagus hannah*	VU	
Reptilia	Burmese Python	*Python bivittatus*	VU	
Reptilia	Ruby-Eyed Green Pit-Viper	*Trimeresurus rubeus*	VU	Possibly global
Reptilia	Yellow-Headed Temple Turtle	*Heosemys annandalii*	EN	Global
Reptilia	Giant Asian Pond Turtle	*Heosemys grandis*	VU	Regional
Reptilia	Elongated Tortoise	*Indotestudo elongata*	CR	Global
Reptilia	Asiatic Softshell Turtle	*Amyda cartilaginea*	VU	

Table 5.8 includes 25 vertebrate species that are listed as either Critically Endangered or Endangered, each of which alone would qualify the site for Gold Level status. The Gold Level threshold for Vulnerable species is thirty individuals or ten pairs, a level that is likely to be met by almost all of the remaining species listed in the table.

The southern part of the Project Area, which is dominated by evergreen and semi-evergreen forest formations, is part of the Southern Vietnam/Cambodia Endemic Bird Area (Stattersfield *et al.* 1998). This is in recognition of the presence of three restricted-range bird species: Germain's peacock pheasant, orange-necked partridge, and grey-faced tit-babbler. It is not yet known whether the Project Area supports more than 5% of the global population of these species. The orange-necked partridge is known from only 17 disjunct forest patches in southern Vietnam, and KSWS in Cambodia (IUCN 2010). Given that the potential area in KSWS of the species' preferred habitat of bamboo forest is large relative to many of the <20 Vietnamese sites, it seems likely that more than 5% of the global population of the species is found in the Project Area. Further research is required to confirm this.

The protected area represents the type locality (where the specimen first used to scientifically describe a species was collected) for a total of 15 species; two mammals, two amphibians, two reptiles, and nine insects:

- Titania's wooly bat (*Kerivoula titania,* LC)
- Indochinese thick-thumbed bat (*Glischropus bucephalus,* NE)
- O'Reang horned frog (កង្កែបស្នែងអូររ៉ាង, *Ophryophryne synoria*, VU)
- Mouhot's litter frog (កង្កែបស្លឹកមូហ្ហូត, *Leptobrachium mouhoti*, LC)
- Red-eyed green pit-viper (*Trimeresurus rubeus*, VU)
- *Scincella nigrofasciata* (NE), a skink species
- *Cyana angkorensis* (NE), a moth species
- *Naarda furcatella* (NE), a moth species

- *Dichomeris hainanensis* (NE), a moth species
- *Dichomeris magnimacularis* (NE), a moth species
- *Thubana seimaensis* (NE), a moth species
- *Promalactis apicuncata* (NE), a moth species
- *Promalactis quadrilobata* (NE), a moth species
- *Promalactis seimana* (NE), a moth species
- *Tanna kimtaewooi* (NE), *a* cicada species.

The O'Reang horned frog (*Ophryophryne synoria*) is known globally from only one river system in the south of KSWS, although it is likely to occur in areas of similar habitat and elevation in the surrounding area. Mouhot's litter frog (*Leptobrachium mouhoti)* is known from only a few locations (J Rowley pers. comm.). The Project Area therefore most likely contains more than 5% of the world's population of these two species.

Figure 5.5 Two new species of frogs were discovered within the Project Area: (A) Mouhot's litter frog, and (B) O'Reang horned frog

Globally significant populations of several other species occur in the Project Area. A lack of robust data on global population sizes or species ranges for these species makes assessment of whether they qualify under the irreplaceability criterion hard to judge. Nevertheless, on current evidence it is reasonable to presume that, among others, some or all of the species listed below have globally significant populations (>1% of global population) in the Project Area (Figure 5.6).

Black-shanked douc. This monkey is restricted to southern Vietnam and eastern Cambodia. It is currently known from a few fragmented forest patches, but the total area of the species' range is yet to be determined. The population of the species in the Project Area is estimated to be 23,628 individuals (95% CI 15,616–35,752; WCS 2018 unpublished data). This is the largest known population in the world, and significantly larger than the next largest reported population of an estimated 500–700 in Nui Chau National Park, Vietnam (Nader *et al.* 2003, Rawson 2009).

Southern yellow-cheeked crested gibbon. This species is restricted to southern Vietnam and eastern Cambodia, but the total range of the species is yet to be determined. The population of the species in the Project Area has been estimated at around 1,016 individuals (95% CI 585–1763; Nuttall *et al.* 2014). This is the largest known population in the world. The next largest recorded populations are around 150 groups in Phnom Prich Wildlife Sanctuary (Phan Channa and Gray 2009), and around 150 groups in Cat Tien National Park, Vietnam (Hao *et al.* 2005 in IUCN 2010).

Germain's silvered langur. Although widespread, this species is rare throughout most of its range (Nadler *et al.* 2003). With only a few sightings documented in Vietnam over the last 50 years, and no large continuous area in Laos known to support high populations, the population in Cambodia forms a critical component of the population of this species. KSWS is home to a large part of this, estimated at 1,882 individuals (95% CI 556–6374; Nuttall *et al.* 2014).

Banteng. This was historically a wide ranging species found in Java and Borneo, through peninsular Malaysia, Thailand, Myanmar, Cambodia, Vietnam, and Laos. It is now restricted to a few scattered populations, none thought to be larger than 400–500 animals. The global wild population is not known, but could be between 5,000 and 8,000 (IUCN 2010). The population in KSWS is part of a larger meta-population in neighboring protected areas (Gray *et al.* 2012). Such significant populations make KSWS, and Mondulkiri as a whole, of global importance for the species.

Green peafowl. The range of this formerly widespread and abundant species covered parts of Java and peninsular Malaysia, Thailand, Myanmar, north-east India, Indochina, and southern China. It is now restricted to a few small fragmented populations, with a global population estimated at 10,000–20,000 (IUCN 2010). The population in the Project Area is estimated to be 1303 (range 271–1194), which is around 5% of global estimates (Birdlife International 2001). Brickle *et al.* (2008) suggest that Mondulkiri is a global stronghold of this Endangered species, with KSWS forming a core part of the population.

Giant ibis. The largest ibis species in the world is restricted to the deciduous dipterocarp forests of the lower Mekong. It lives at low densities (IUCN 2010) and is dependent on areas of forest with very low levels of human disturbance. As a consequence of habitat loss and disturbance, the global population of the species was estimated as a minimum of only 100 pairs (IUCN 2010), and is now found almost exclusively in northern and eastern Cambodia. Giant Ibis have been recorded in the Project Area on several occasions (Bird *et al.* 2006, Claasen and Ou 2007, WCS data). In 2017, the first of two nests were discovered within KSWS (Sot 2017). Given the area of potential habitat, and the number and distribution of records obtained, it seems likely that several pairs occur, in which case the population would easily represent more than 1% of the estimated global population. In 2019, the first successful fledging events in KSWS were recorded for two chicks.

Figure 5.6 The Project Area contains globally significant populations of both (A) germain's silvered langur, and (B) the Critically Endangered Giant Ibis

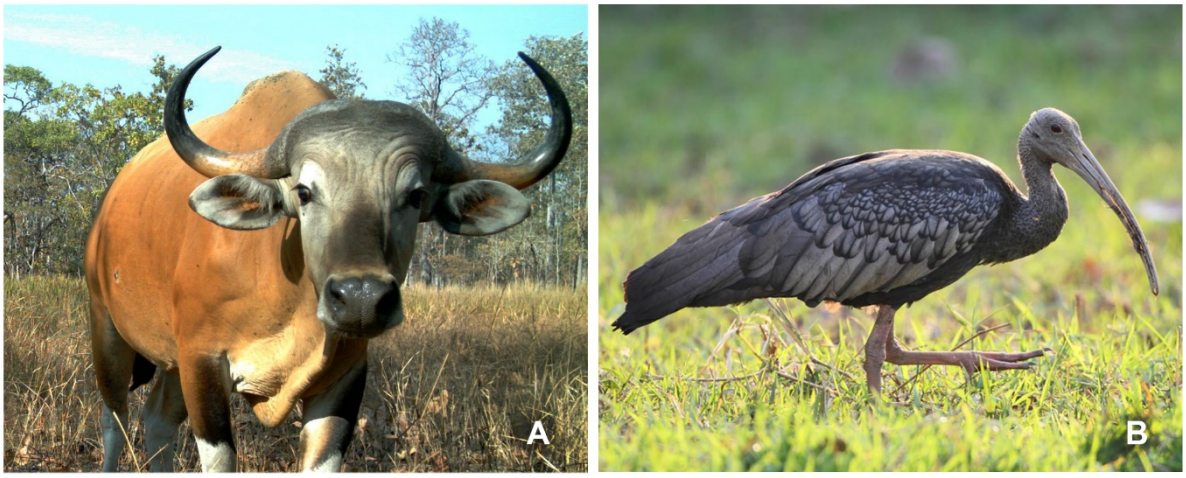


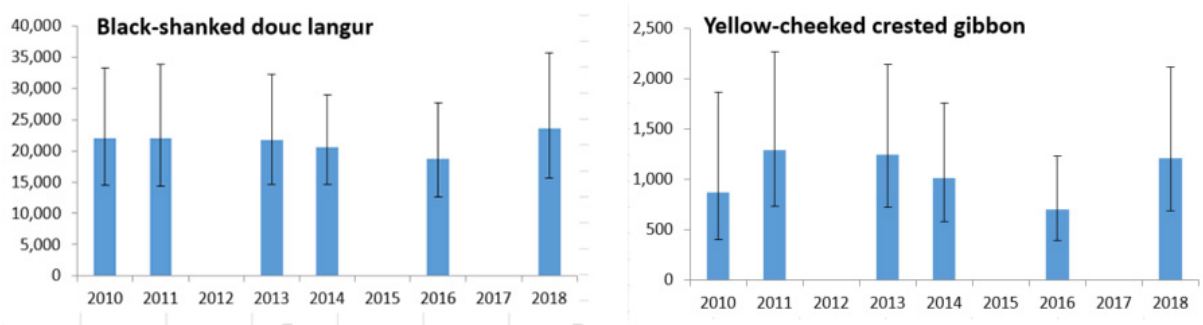
Table 5.8 Globally threatened plant species recorded in the Project Area (trigger species in bold text). Status refers to threat status as given by the IUCN Red List of Threatened Species.

Class	English name	Scientific name	Status	Use/grade
Cycadopsida		*Cycas siamensis*	VU	Medical Plant
Magnoliopsida		*Dipterocarpus dyeri*	EN	
Magnoliopsida		*Shorea farinosa*	EN	
Magnoliopsida		*Afzelia xylocarpa*	EN	Luxury
Magnoliopsida	Burmese Rosewood	*Dalbergia bariensis*	EN	Luxury
Magnoliopsida	Black Rosewood	*Dalbergia oliveri*	EN	Luxury
Magnoliopsida		*Anisoptera costata*	EN	
Magnoliopsida		*Dipterocarpus intricatus*	EN	Grade 2
Magnoliopsida	White Meranti	*Shorea hypochra*	EN	Grade 2
Magnoliopsida	White Meranti	*Shorea roxburghii*	VU	
Magnoliopsida	Big Leaf Mahogany	*Swietenia macrophylla*	VU	
Magnoliopsida		*Craibiodendron scleranthum*	VU	
Magnoliopsida	Siamese Rosewood	*Dalbergia cochinchinensis*	VU	Luxury
Magnoliopsida		*Cinnamomum litseifolium*	VU	
Magnoliopsida	Hairy-Leafed Apitong	*Dipterocarpus alatus*	VU	Grade 2
Magnoliopsida		*Dipterocarpus costatus*	VU	Grade 2
Magnoliopsida		*Dipterocarpus turbinatus*	VU	Grade 2
Magnoliopsida		*Hopea odorata*	VU	Grade 1
Magnoliopsida	Asian Crape Myrtle	*Lagerstroemia floribunda*	VU	Medical Plant

5.4.1 Trigger Species Population Trends (GL3.3)

Of the three trigger species, yellow-cheeked crested gibbon and black-shanked douc continue to have stable populations. Population results from the 2016 elephant survey suffered significant genetic sample degradation and did not produce new population estimates.

Figure 5.4 Population trends of the douc and gibbon trigger species



Trigger Species	Asian elephant, southern yellow-cheeked crested gibbon, and black-shanked douc
With-project Scenario	The two primary threats to the trigger species in KSWS are loss of habitat and poaching. Patrolling by rangers since the project inception has dissuaded poaching, illegal logging, and illegal forest conversion to agriculture within KSWS.

6 ADDITIONAL PROJECT IMPLEMENTATION INFORMATION

No additional information to add.

7 ADDITIONAL PROJECT IMPACT INFORMATION

No additional information to add.