Keo Seima Wildlife Sanctuary REDD+ 2020–2021

Document Prepared by the Wildlife Conservation Society

Project Title	Reduced Emissions from Deforestation and Degradation in Keo Seima Wildlife Sanctuary
Project ID	1650
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Report ID	
Date of Issue	21 April 2023
Project Location	Cambodia, Mondulkiri Province
Project Proponent(s)	H.E. Dr. Choup Paris, Under Secretary of State, Ministry of Environment, Royal Government of Cambodia +855 23 213 908, paris.ncgg@gmail.com
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GHG Accounting/Crediting Period	01 January 2010 to 31 December 2069; 60 years
Monitoring Period of this Report	01 January 2020–31 December 2021; 2-year total period
History of CCB Status	Validation Issuance: 16 November 2015, First Verification Issuance: 04 April 2017 (Revised 26 May 2017), Second Verification Issuance: 26 November 2018, Third Verification Issuance: 16 November 2020
Gold Level Criteria	The KSWS REDD+ Project qualifies for CCB Biodiversity Gold for the following criteria: Vulnerability: at least 84 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	8 additional communities in process to obtain titles	2	7 out of 14 communities with awarded titles
Number of community protected area established in the project area	2 Community Protected Areas (CPA) approved, 4 additional communities in process to obtain rights	2	3 communities with CPA management rights

1.2 Standardized Benefit Metrics

During this monitoring period a review of all project indicators including unique and standard benefit metrics was conducted, and improvements to methodologies were adopted. As the project has scaled, additional resources have become available for monitoring and reporting, and database systems and other tools have facilitated these improvements. For example, by recording individuals attending a training, rather than simply a total count of attendees, duplication can be avoided as the same individual attends more than one event.

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	Not applicable		Not applicable
	Net estimated emission reductions in the project area, measured against the without-project scenario	4,784,566	3.2	21,171,578
For est[1] cov	For REDD[2] projects: Number of hectares of reduced forest loss in the	6,043		25,204

[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	Not applicable		NA Not applicable
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	Not applicable		Not applicable
	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	Not applicable		Not applicable
Training	Total number of community members who have improved skills and/or knowledge resulting from training provided as part of project activities	3,226	2	7,907
	Number of female community members who have improved skills and/or knowledge resulting from training provided as part of project activities	1,660	2	3,985
Employment	Total number of people employed in project activities,[5] expressed as number of full time employees[6]	596	2	2,220

[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*).

[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]).

Category	Metric	Achievements during Monitoring Period	Section Reference	Achievements during the Project Lifetime
	Number of women employed in project activities, expressed as number of full time employees	68	2	236
Livelihoods	Total number of people with improved livelihoods[7] or income generated as a result of project activities	11,799	2, 4	11,799
	Number of women with improved livelihoods or income generated as a result of project activities	5,372	2, 4	5,372
Health	Total number of people for whom health services were improved as a result of project activities, measured against the without-project scenario	2,242[8]	2	2,242
	Number of women for whom health services were improved as a result of project activities, measured against the without-project scenario	1,066	2	1,066
Education	Total number of people for whom access to, or quality of, education was improved as a result of project activities, measured against the without-project scenario	662	4	662
	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	358	4	358
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	2,268	4	2,268
	Number of women who experienced increased water quality and/or	1,066	4	1,066

[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.

[8] Includes improved access toilets, as sanitation is a major public health concern in the area

Category	Metric	Achievements during Monitoring Period	Section Reference	Achievements during the Project Lifetime
	improved access to drinking water as a result of project activities, measured against the without-project scenario			
Well-being	Total number of community members whose well-being [9] was improved as a result of project activities	22,051	4	22,051
	Number of women whose well-being was improved as a result of project activities	10,462	4	10,462
Biodiversity conservation	Change in the number of hectares significantly better managed by the project for biodiversity conservation, [10] measured against the without-project scenario	187,983 ha	5.1	187,983 ha
	Number of globally Critically Endangered or Endangered species [11] benefiting from reduced threats as a result of project activities, [12] measured against the without-project scenario	CR: 13 EN: 26	5.1	CR: 13 EN: 26

2. GENERAL

2.1 Project Description

The Keo Seima Wildlife Sanctuary (KSWS) covers 292,690 hectares. 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 hectares of forest in the KSWS main protection area. These forests were first protected as Seima Biodiversity Conservation Area (SBCA), which operated during 2002–2009 and then became Seima Protection Forest (SPF) until 2016. The SPF was reclassified and renamed by the Royal Government of Cambodia into Keo Seima Wildlife Sanctuary under Sub-Decree No. 83 dated 9 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 indigenous 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

[9] 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.

[10] 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.

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

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

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 84 Globally Threatened species recorded in the Project Area (including 13 Critically Endangered and 26 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, 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 where regrowth occurs in resulting canopy gaps. The with-project emissions scenario conservatively assumes that most stocks of these highly sought-after species in KSWS may eventually be cut, despite the best efforts of the project, because the level of pressure is so intense in relation to the law enforcement effort that is feasible.

From 2002 to 2016, the Forestry Administration (FA) 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. 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 for protected area co-management of the Prek Toal Conservation Project and Kulen Promtep Wildlife Sanctuary, and now supports management of 8 protected sites across Cambodia.

The conservation project in KSWS 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. 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.

Conservation interventions prior to the REDD+ project were on a fairly limited scale. Law enforcement activities were 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 was assumed to continue as part of the future baseline scenario. However, it falls well below the level needed to match the scale of threats. At project inception, most threats remained severe and were increasing in scale and diversity. Deforestation rates and logging were increasing, and at least one flagship species (tiger) was lost from the protected area, and declines were suspected for some key species. Boundary demarcation, effective patrolling, community outreach, and alternative livelihood activities were implemented in only a minority of the protected area. The effectiveness of conservation management was severely constrained by insufficient, irregular, and declining funding, and competition with other land uses. Hence, sustainable financing from carbon revenue for the site was essential to enable conservation action to be expanded and sustained in the long-term. It has allowed 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. During this period, 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 85 arrests, 167 written warnings, and extensive confiscations of illegal equipment, including 588 snares, 28 firearms, 381 chainsaws, 70 hand tools, 171 motorbikes, 53 cars, 3 excavators, and 8 tractors during the monitoring period. Community law enforcement patrol teams have been formed in the twenty villages that participate in the REDD+ project, and carry out law enforcement patrols in conjunction with PDoE rangers. These community patrol teams gave 100 written warnings to perpetrators, and confiscated illegal equipment including 49 snares, 40 chainsaws, 3 hand tools, and 15 motorbikes.

Establish sustainable community use of land and natural resources. Implementation during this monitoring period has included continued efforts to establish Indigenous Communal Title (ICT) tenure for communities who wish to participate. During the monitoring period, an additional six ICTs were in the process of obtaining communal land titles, bringing the total awarded or under process in KSWS to 13 ICTs. Additionally, the project seeks to establish Community Protected Areas (CPAs) to legalize community use of forests close to villages without ICTs. During the monitoring period, two CPAs were established and a further four villages were in the process of obtaining CPAs, which will bring the total in KSWS to seven once complete.

Support alternative livelihoods that reduce pressure on forest and natural resources. This has included ongoing support for ecotourism through the Jahoo project, NTFP[13] enterprise design and training with a focus on a community-based bamboo enterprise, training on improved methods of rice cultivation, and introduction of a scheme offering a market premium to rice farmers who abide by wildlife-friendly, organic requirements such as refraining from clearing forest for agriculture.

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 (10 m) 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 training in the use of the SMART Mobile app on ruggedized smartphone devices. This will allow future real-time responses to incoming patrol data, improving law enforcement outcomes. Biodiversity monitoring continues; line transect surveys that took place in the 2019–2020 data collection field season have provided updated key species population

[13] Non-Timber Forest Products (NTFPs) refer to products that can be used in the household or for other purposes, e.g., honey, rattan, vines, resin, bamboo, vegetables, and medicinal plants.

estimates, and reanalysis of data from 2010–2020 provides robust, long-term, population trend monitoring for a large number of key species.

Effective administration. The project continues to conduct monthly meetings, annual work-plan meetings, and uses the WCS accounting system. The project continues to use a QR-code based asset management system to effectively manage equipment.

Fundraising. The project continues to apply for grant funding from donors, and marketing of REDD+ credits occurs on the voluntary market, with significant VCU sales occurring during the monitoring period.

Leakage and non-permanence are addressed through application of many of the project activities listed above within the leakage area; this includes the establishment of a 3,438 ha CPA that hosts a community-based bamboo enterprise, as well as recruiting farmers for a rice growing scheme, that seek to stabilize forest loss. The leakage area is monitored through remote sensing and for the area within the KSWS, law enforcement patrols provide an additional monitoring mechanism.

During this monitoring period, a total of 4,784,566 tCO_2e emissions reductions were generated by the project.

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	Royal Government of Cambodia (RGC), Ministry of Environment
Contact person	H.E. Chuop Paris
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Telephone	+855 23 213 908
Email	paris.ncgg@gmail.com

2.1.4 Other Entities Involved in the Project

Organization name	Wildlife Conservation Society (WCS)
Role in the project	Lead technical and implementing partner Provides technical and financial support across project activities, including support for securing access rights and land tenure for indigenous and local communities, biodiversity monitoring, forest cover monitoring, law enforcement monitoring, sub-grants to other local stakeholders, communications, outreach including for laws and regulations, grievance and feedback redress mechanism, monitoring and evaluation (including Standard and Unique Benefit Metrics) and reporting.
Contact person	Dr. Ken Sereyrotha
Title	Country Director
Address	House 21, Street 21, Sangkat Tonle Bassac, Phnom Penh Postal: WCS, PO Box 1620, Phnom Penh, Cambodia
Telephone	+855 23 219 443
Email	sken@wcs.org

Organization name	Cambodian Rural Development Team (CRDT)
Role in the project	Community livelihoods and development
Contact person	Mr. Or Channy
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Organization name	Sam Veasna Centre (SVC)
Role in the project	Ecotourism
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Title	Director
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Email	director@samveasna.org

Organization name	Elephant Livelihood Initiative Environment (ELIE)
Role in the project	Ecotourism (Elephant Valley Project, EVP), community livelihoods, and development
Contact person	Ms. Jemma Bullock
Title	Project Manager
Address	ELIE House, Svay Jek Village, Sokhdom Commune, Sen Monorom, Mondulkiri Province, Cambodia
Telephone	+855 97 654 0610
Email	eliecambodia.manager@gmail.com

Organization name	World Hope International (WHI)
Role in the project	Community livelihoods and development
Contact person	Dr. Emelita Goddard
Title	Country Director
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Telephone	+855 12 355 074
Email	emelita.goddard@worldhope.org

Organization name	Regional Community Forestry Training Center for Asia and the Pacific (RECOFTC)
Role in the project	Community protected areas, community livelihoods
Contact person	Ms. Kalyan Ou
Title	Country Program Director
Address	c/o Forestry Administration, 40 Norodom Blvd., Sangkat Phsar Kandal II, Khan Daun Penh, Phnom Penh, Cambodia
Telephone	+855 23 998 784
Email	cambodia@recoftc.org

Organization name	IBIS Rice Conservation Co., Ltd
Role in the project	Providing market-based incentives for wildlife friendly compliance
Contact person	Nicholas Spencer
Title	CEO
Address	No7. St 504, Phnom Penh, Cambodia
Telephone	+855 016 533 005
Email	nick@ibisrice.com

Organization name	Sansom Mlup Prey (SMP)
Role in the project	Improve community livelihood and support conservation through agriculture
Contact person	Keo Socheat
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Email	socheat@smpcambodia.org

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 CCB 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 ran from 1 January 2010 to 31 December 2019. The KSWS REDD+ project aims to nest into a national Forest Reference Emissions Level (FREL), with a National REDD+ Program planned for completion in 2022. As such, the project requested an exemption from Section 3.2.7 of the VCS Standard v4.1, requesting an extension of the initial baseline without the need to reassess until 31 December 2021. Exemption was approved by Verra on 2 August 2021.

2.1.7 Project Location

The project takes place within the KSWS and the surrounding area, 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 12.13903°, 106.91714°.

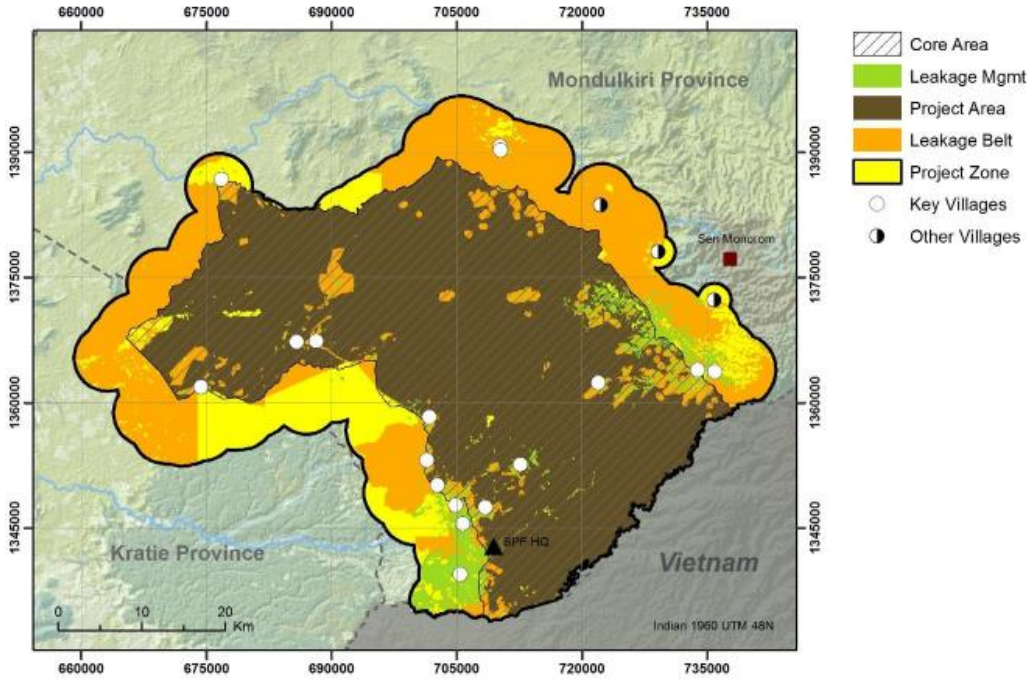

Figure 2.1 Location of KSWS REDD+ project

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 VM0015, version 1.1 (December 2012).

2.1.9 Other Programs (G5.9)

The project has not sought or received another form of GHG-related environmental credit during this monitoring period. The project is not eligible to create another form of GHG-related environment credit under any other programs.

2.1.10 Sustainable Development

Cambodia has adopted the 17 United Nations Sustainable Development Goals (SDGs) and added one additional goal to produce the Cambodian Sustainable Development Goals Framework 2016-2030 (CSDG). The table below gives the seven SDGs/CSDGs and the Targets that the KSWS REDD+ project contributes towards.

Goals and targets	Project contributions
Goal 1. End poverty in all its forms everywhere	
1.1 By 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than $1.25 a day	Agricultural improvement programs including IBIS Rice; land security through ICTs and access to resources through CPAs; income generation through ecotourism programs including Jahoo and EVP, and bamboo handicrafts
1.2 By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions	
1.4 By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance	Access to basic services including clean water systems through C4C; ownership and control of land through ICTs and CPAs, microfinance through local saving schemes.
Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture	
2.1 By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round	School feeding programs funded through C4C; agricultural improvement programs including IBIS Rice; land security through ICTs and access to resources through CPAs; income generation through ecotourism programs including Jahoo and EVP, and bamboo handicrafts
2.2 By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons	
2.3 By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment	Increased agricultural productivity and income of small-scale food producers through agricultural improvement programs including IBIS Rice; secure and equal access to land through ICTs and access to resources through CPAs; opportunities for non-farm income through bamboo handicraft production and ecotourism programs including Jahoo and EVP
2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality	Agricultural improvement programs including IBIS Rice; drought resilience through deep wells funded by C4C

Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	
4.1 By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes	School materials, school enrolment campaigns funded, and school facility upgrades through C4C
4.a Build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all	
Goal 6. Ensure availability and sustainable management of water and sanitation for all	
6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all	Clean water systems funded through C4C
6.6 By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes	Avoided 25,000 ha of deforestation; protection of river watersheds in KSWS
Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	
8.9 By 2030, devise and implement policies to promote sustainable tourism that creates jobs and promotes local culture and products	Ecotourism programs including Jahoo and EVP
Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	
15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements	Protection of forests and associated ecosystem services in KSWS; avoided 25,000 ha of deforestation; protection of river watersheds in KSWS; reforestation program initiated; monitoring of threatened species; direct species conservation programs including nest protection for giant ibis and lesser adjutant; law enforcement to reduce poaching of threatened species
15.2 By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally	
15.5 Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species	
Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels	
16.7 Ensure responsive, inclusive, participatory and representative decision-making at all levels	Gender disaggregated monitoring and evaluation data; processes and systems to ensure representation and participation of women and vulnerable groups; C4C including support to poor households; C4C indicators including representation of women on community management committees.

2.2 Project Implementation Status

2.2.1 Implementation Schedule (G1.9)

There have been no major changes to the project timeline. Implementation of the project is based on key actions related to the project theory of change and involves ongoing activities as described in Section 2.1.1 and summarized in the table below for the current monitoring period.

Activity	Implementation
Objective 1: Key legal & planning documents for KSWS & surrounding landscape are understood by the local community, WCS, government, & private sector actors, and are approved & under implementation	
Activity 1.1: The KSWS sub-decree and PA Law are understood by the majority of residents of communities within and bordering the protected area	• Sub decree on establishment of KSWS in 2016 in Khmer language was circulated to local community and partners following the transition, is publicly available, and is available from the project on request • Six different radio public service announcements on climate change impacts of forest degradation, loss of wildlife habitat, waste management, benefits of ecotourism, and REDD+ were broadcast on provincial radio station 12 times and on national radio 6 times (throughout 2020) • Continued demarcation of the KSWS boundary, focussing on northern border (April–June 2020) • Broadcast six different 30-minute radio shows on forests and conservation on provincial radio station on Saturday evenings (October–December 2020, January–February 2021) • Signboards erected in KSWS giving information on PA Law and the boundaries of KSWS, as well as hotline for reporting illegal activity (February 2021)
Activity 1.2: MoE plans for KSWS and the surrounding landscape, including zonation, are understood and supported	• Nine meetings with KSWS zonation working group to develop zonation map and management plan (throughout 2020) • Provided input to Mondulkiri provincial spatial planning working group (throughout 2020 and 2021) • PDoE rejected proposed titling of individual land parcels in Sre I by the Ministry of Land Management, Urban Planning, and Construction (MLMUPC) due to overlap with proposed KSWS management zones (June 2020) • Draft zonation map approved by Minister of Environment (September 2020) • Draft KSWS management plan submitted for review by senior MoE officials (December 2020) • District and provincial governors supported to prepare documents for KSWS zonation sub-decree (May 2021) • Draft zonation map re-reviewed with added information from land demarcation initiative (July 2021) • Shared information with NGO Forum on zonation of KSWS in relation to customary land tenure (July 2021)
Activity 1.3: Mondulkiri and Kratie commune investment plans are implemented	• Participated in workshop on development of an ecotourism master plan for Mondulkiri province (August 2020) • Engaged with provincial governor to coordinate NGO work across the province and regularly report activities (September 2020) • Participated in spatial planning meetings for development in Oreang and Keo Seima districts, organized by local authorities (October 2020) • Sre Preah CPA management activities incorporated into commune investment plan for Sre Preah commune (November 2020)

	• Contributed to updating commune investment plan for Sre Preah commune (November 2020) • Participated in the district integration workshop for commune investment plans in Sen Monorom district (December 2020) • Reviewed draft of provincial spatial plan for Mondulkiri and advised incorporation of REDD+ project boundary (February 2021) • Participated in district integration workshop for commune investment plans in Oreang, Keo Seima, and Sen Monorom districts (November 2021) • Participated in Extraordinary Meeting of Sen Monorom City Council (December 2021) • Provided input to 20-year spatial planning meeting for Keo Seima district, including maps of KSWS zonation, CPAs, ICTs, and REDD+ area (December 2021)
Activity 1.4: Private sector is monitored and engaged in and around KSWS, and private sector staff understand protected area laws and required conduct	• Participated in series of inter-ministerial meetings on proposed mining project (Renaissance) in KSWS • Provided recommendations to mitigate the impact of mining • Jahoo ecotourism site signed agreement with SVC to accommodate tours (December 2020) • IBIS Rice teams understand Protected Area Law and specific legislation related to KSWS REDD+ project
Activity 1.5: Cross-border dialogue takes place between Cambodian and Vietnamese actors, including government−government and NGO−NGO contact	• Planned cross-border dialogue did not take place in 2020 and 2021 due to COVID-19 restrictions
Activity 1.6: Adaptive management and annual planning is used to plan, implement, and track progress at KSWS	• Monthly meetings of implementing entities to plan activities and revise annual work-plan (~13th of each month throughout 2020–2021) • Quarterly meetings of PDoE in Kratie, attended by NGOs, law enforcement personnel and other stakeholders (quarterly throughout 2020–2021) • Annual review of project activities (year running from July–June) and development of next annual work-plan (June 2020, June 2021) • Stakeholder meeting held to review project activities and discuss next annual work-plan (July 2020, limited meetings in July 2021 due to COVID-19) • Law enforcement work-plan for 2021–2022 finalized with PDoE, park director, and deputy directors (September 2021) • Presentation of 2021–2022 adaptive work-plan to Department of Terrestrial Protected Areas Conservation—Eastern Plains Mekong (October 2021) • Analysis of 2021 activities in Kratie province in KSWS with MoE (December 2021)
Objective 2: Forest and wildlife crime is reduced through direct law enforcement	
Activity 2.1 Wildlife, forestry and protected area laws are fully implemented	• Ongoing patrolling on foot, motorbike and truck by law enforcement team in collaboration with military police: 6,514 patrols by PDoE and military police teams, covering 254,985.58 km in 2020–2021; 85 people arrested and 167 written warnings given; and 1,302 items confiscated • 20 prosecution cases related to natural resource crimes in KSWS submitted to provincial courts (throughout 2021) • Ongoing snare removal patrols in snaring hotspots across KSWS (throughout 2020–2021) • Field inspection of illegal land claims in Andoung Kraloeng ICT (May 2021, August 2021)

	• Nine people sent to prison for natural resource crimes in KSWS, and three more under investigation (June 2021) • Successful provincial court injunction against private land claim in Andoung Kraloeng ICT (June 2021) • Illegally claimed land in Andoung Kraloeng ICT surrendered by perpetrators (August 2021) • Participation in court proceedings in Kratie provincial court against perpetrator of crime in KSWS (September 2021) • Forest access paths used for transporting illegally harvested timber mapped to enable blocking of paths (September 2021)
Activity 2.2: The capacity of patrol personnel is sufficient to carry out effective law enforcement activities	• Provided 12 training courses to PDoE law enforcement team on SMART Connect, GPS use, interpreting laws, and identifying wildlife (see Section 2.3.13 for more detail) • Equipped 38 PDoE law enforcement rangers with motorbikes, hammocks, flysheets, raincoats, backpacks, boots, headlamps, lunch boxes, and water bottles (January 2020) • Equipped KSWS headquarters with office materials (computers, furniture, printer) (August 2021) • Checked capacity of law enforcement personnel operating from substations—results informed capacity building plan (August 2021) • Plan to improve law enforcement management developed in partnership with PDoE (August 2021) • Built awareness in PDoE of their role in resolving conflicts and supporting prosecutions (November 2021) • Updated data packages installed in SMART Mobile for use by new law enforcement personnel (November 2021) • Director of Law Enforcement Department of MoE committed to site visit to inspect law enforcement facilities and pledged support for continued capacity building of law enforcement personnel (November 2021)
Activity 2.3: Law enforcement planning and monitoring framework is under implementation and iteratively improved	• Developed SOP outlining roles and responsibilities of law enforcement personnel and safety in KSWS • Spatial Monitoring and Reporting Tool (SMART) used to identify hotspots of illegal activity to better target patrol effort (throughout 2020–2021) • Monthly meetings with park director and patrol teams to plan patrols based on previous patrol data (monthly throughout 2020–2021) • Results of law enforcement SMART monitoring shared with staff (monthly throughout 2020–2021) • Assessment of risk and law enforcement capacity in KSWS (37 people; community rangers, government rangers, WCS staff) using Law Enforcement Planning Toolkit (January 2020) • Developed law enforcement strategy and action plan for KSWS based on risk assessment (May 2020) • Template for reporting of crimes in ICTs by ICT committees developed to ensure more complete collecting of evidence (October–December 2020) • Law enforcement monitoring extended to include information on criminal prosecution outcomes (starting 2021) • Updated form for recording illegal activities detected during biodiversity research activities in KSWS for incorporation into SMART (October 2021)
Activity 2.4: Establish and manage an information network to support patrol planning	• Equipment and training provided for a protected area operations facility to allow processing of law enforcement intelligence (September 2020) • Used SMART to implement and monitor patrolling activity, including community patrols (throughout 2020–2021)

	• Grievance boxes located in all participating villages and telephone hotline recorded information from community members about natural resource crimes in KSWS (throughout 2021)
Activity 2.5: District, provincial, national, and other authorities, communicate well through liaison by WCS	• Strategic management meeting between WCS, MoE, and PDoE to discuss approaches to tackle deforestation in KSWS, included formation of working group (March 2020) • Special law enforcement patrol in KSWS attended by MoE, PDoE, law enforcement rangers, the Keo Seima district taskforce (including district governor), and village and commune chiefs (March 2020) • Provincial working group met regularly to discuss approaches to tackle natural resource crimes in Mondulkiri (April 2020 onwards) • Supported MoE in raising awareness of land registration process in Kratie province (August 2020) • Provincial management meeting of district and provincial governors and commune councilors outlined plan to improve law enforcement performance at all levels (January 2021) • Provincial taskforce patrol in Pu Kong village confiscated equipment and made an arrest (March 2021) • ICT land conflict in Andoung Kraloeng and Pu Rang included in Ministry of Interior (MoI) report requesting relevant provincial departments find resolutions (August 2021) • Collaboration with WWF and provincial Department of Agriculture, Forestry and Fisheries to develop vaccination program for domestic cattle against lumpy skin disease (October 2021) • Update on disputes related to land use in all five protected areas in Mondulkiri at meeting chaired by deputy provincial governor (November 2021) • District authorities, working with ICT committee, led intervention against military officers claiming land in Pu Rang ICT (November 2021)
Activity 2.6: Community-based patrolling empowers villagers and provides effective law enforcement	• Facilitated formation of community patrol teams in 17 villages, operating under agreement with KSWS park director (bringing total villages with community patrol teams in KSWS to 20) • Supported 20 community patrol teams to undertake monthly patrols in and around KSWS in cooperation with PDoE law enforcement rangers (throughout 2020–2021) • Monthly meetings of community patrol teams to plan patrols (monthly throughout 2020–2021) • Ongoing support for patrol planning, budgeting, and reporting for all community patrol teams (throughout 2020–2021) • Assessment of risk and law enforcement capacity in KSWS (37 people; community rangers, government rangers, WCS staff) using Law Enforcement Planning Toolkit (January 2020) • Data collection on illegal land clearance in Sre Preah CPA (January 2021) • Provision of BlackView smartphones to patrol teams in Andoung Kraloeng (July 2021), Pu Keh, Pu Nhav, Sre I, and Gati (December 2021) for recording patrol data in SMART Mobile app • Guard house built in Sre Preah CPA as overnight accommodation for community law enforcement patrols (September 2021) • Checked SMART data collection capacity of patrol teams from Pu Ngaol and Andoung Kraloeng—understanding and implementation is good (December 2021) • Provided 16 training courses to community law enforcement teams on SMART data collection, patrol guidelines, planning and reporting patrols and collaborating with authorities (see Section 2.3.13 for more detail) (throughout 2020–2021)

	• 93 community patrols covered 3,087.55 km in 2020–2021; 100 written warnings given and 107 items confiscated
Objective 3: Land and resource use by local communities is sustainable	
Activity 3.1: Communities are able to protect their land through Indigenous Communal Land Title registration	• Six new ICTs in KSWS pre-approved by MoE and MLMUPC (2020) • ICT committee in Sre I rejected proposed titling of individual land parcels by MLMUPC due to overlap with their proposed ICT (June 2020) • Support to Ministry of Rural Development for completing registration of Indigenous communities (part of the ICT establishment process) (throughout 2021) • 105 families to join Pu Keh ICT (October 2021) • O Chra, Gati, O Rona, Sre Lvi, and Sre Khtum receive commune-level recognition as Indigenous communities (a stage of ICT establishment) (December 2021)
Activity 3.2: Management of existing ICTs is strengthened through implementation of rules and regulations	• Incorporated approved ICTs in draft KSWS management zonation (2020) • ICT committees in Pu Keh, Pu Nhav, Andoung Kraloeng, O Chra, and Pu Kong requested improved law enforcement action against crimes reported in their ICTs (2020) • Independent legal support provided for ICT committees to pursue prosecution against crimes inside ICTs (started 2021) • Andoung Kraloeng used community income from ecotourism to cover legal costs of court cases defending their ICT against perpetrators seizing land illegally (throughout 2020–2021) • Andoung Kraloeng ICT committee developed procedures for land use monitoring and for members requesting additional agricultural land (January 2020) • Andoung Kraloeng ICT committee held annual election to select committee members (September 2020) • Improved demarcation of ICT in Andoung Kraloeng to reduce land encroachment (October–December 2020) • Lists of ICT members in Sre Lvi, O Chra, and Andoung Kraloeng were updated in conjunction with land inventory and parcel mapping to make it easier to identify illegal land grabbing (October–December 2020) • Incorporated approved ICTs into government land demarcation initiative (2021) • ICT committees supported to engage with state land demarcation process and prevent individual titles being awarded on ICT land (throughout 2021) • Pu Keh ICT committee prepared for MLMUPC land demarcation process (March 2021) • Observation of MLMUPC land demarcation process in Khmom, Sre Andaol, Chakchar, O Chra, Pu Nhav, Pu Kong, and Pu Keh (March 2021) • Petition to remove Andoung Kraloeng ICT committee chief by minority of households engaged in illegal activities overturned as majority of ICT members support the good leadership of the ICT chief (May 2021) • Demarcation of spirit and burial forest in Andoung Kraloeng ICT (July 2021) • Erected signboards giving information about different zones of Andoung Kraloeng ICT and associated regulations (July 2021) • Lists of ICT members in Pu Kong, O Chra, Pu Trom, and O Rona updated (September 2021) • Land use database developed to help ICT committees monitor land use by ICT members (October 2021)

	• Replacement members elected to Sre Andaol ICT committee (November 2021) • Purchasers of illegally sold land in Andoung Kraloeng ICT issued with legal notice to return land or face prosecution (November 2021) • ICT land inventory working groups in Sre Lvi and O Chra mapped boundaries of ICT land parcels to document land grabbing by outsiders (December 2021)
Activity 3.3: Capacity of community committees in participating villages to manage REDD+ budget allocation is strengthened	• Community committees supported to participate in monitoring activities related to performance-based benefit sharing (throughout 2020–2021) • Ongoing training for committee members on financial management (see Section 2.3.13 for more detail) • Signing of REDD+ Community Performance-based Benefit Sharing Agreements at ceremony attended by Minister of Environment (January 2020) • Participating communities supported to develop community activity plans for REDD+ benefit sharing activities in 2020–2021 (January–February 2020, June 2020, July 2021) • Andoung Kraloeng ICT committee completed second self-assessment of committee capacity to update their capacity building plan (December 2020) • Benefit sharing agreements for 2021 signed by all 20 participating villages (January 2021) • Transparent financial management guidelines for REDD+ committees developed and adaptively updated following feedback from communities (throughout 2021) • Commune-level REDD+ procurement committee (local authorities, REDD+ community committee members, NGO staff) created to support REDD+ benefit sharing activities in all participating villages (February 2021) • Assessment of institutional management capacity of REDD+ committees to inform capacity building planning for the project (May 2021)
Activity 3.4: Forests in participating villages are restored and replanted	• Ongoing germination and propagation of bamboo seedlings in community-run nurseries near Sre Preah CPA (throughout 2020–2021) • Construction and repair of community nurseries to raise bamboo seedlings (June 2020) • Community-raised bamboo seedlings replanted in 21 ha (October 2020) and 3 ha (August 2021) of degraded land in Sre Preah CPA • Beng (*Afzelia xylocarpa*) seedlings planted at O Paim (August 2021) and Oreang (September 2021) law enforcement ranger sub-stations • Sre Preah CPA allocated REDD+ benefit sharing funds for bamboo replanting (September 2021)
Activity 3.5: The process of CPA establishment and management is understood and underway in appropriate areas	• New chief and members elected to Sre Preah CPA management committee to replace individuals who were not adequately fulfilling their responsibilities (January 2020) • Community members recruited for O Pung Rung CPA and proposed land mapped (February 2020) • Potential CPA sites inspected in Pu Haim (May–June 2020) • Participatory rural assessment completed in Sre Andaol as part of CPA establishment process (July 2020) • Bylaws established for bamboo producer group working in Sre Preah CPA (September 2020) • Demarcation of boundary of Sre Preah CPA (October–December 2020) • Bylaws governing management of O Pung Rung finalized (November 2020) • Pu Haim community submitted request to MoE for establishment of a CPA (December 2020) • Identification of potential CPA sites in Pu Nhav (January 2021)

	• Demarcation of outer and zone boundaries of O Pung Rung CPA (January 2021) • Preferred location for Khmom CPA identified with community members and local authorities (February 2021) • MoE approved establishment of O Pung Rung CPA (March 2021) and O Mphek Lvie CPA (December 2021) • Election of management committee for O Mphek Lvie CPA (May 2021) • 150 families from Pu Keh and 31 families from Pu Ngaol join as members of proposed Sre Antung CPA (July 2021) • Temporary working group formed to coordinate Sre Antung CPA committee member election (September 2021) • Field verification of proposed site of O Mphek Lvie CPA (October 2021) • Election of Sre Antung CPA management committee and sub-committee members (November 2021) • Management committees of O Mphek Lvie CPA (July 2021) and Sre Antung CPA (December 2021) formally recognized by commune chiefs • Sre Antung CPA approved by district governor, awaiting approval by PDoE, then provincial governor and MoE (December 2021) • Potential CPA sites identified and mapped in Andoung Kraloeng (December 2021) • 103 families registered as members of Khmom CPA (December 2021) • Application for establishment of Sre Antung CPA approved by PDoE, awaiting approval from provincial governor then MoE (December 2021) • Bylaws for O Mphek Lvie CPA developed by community and approved by commune chief (December 2021)
Activity 3.6: Communication between commune council and other agencies takes place with liaison by WCS	• Consultation to identify potential CPA sites and raise awareness of process with commune administration and community members (January 2020) • PDoE outlined process by which commune administrations should send plans for construction of rural roads in KSWS for approval before their inclusion in commune investment plans (January–March 2020) • Newly elected Sre Preah CPA management committee members formally recognized by *deika* issued by commune council (March 2020) • Sre Preah CPA members submitted letter to district authority requesting intervention to reduce illegal activities in CPA; governor responded by making a site visit (June 2020) • Andoung Kraloeng ICT committee identified perpetrators of illegal land clearance and sale in their ICT and was supported to escalate the cases to the commune council and to prepare documents for potential court cases (June–September 2020) • ICT committees in Sre Lvi, O Rona, and Andoung Kraloeng supported to meet with government-appointed village chiefs to discuss illegal occupation of ICT land and encroachment of KSWS (August 2020) • Restructuring of O Chra ICT committee approved by commune council (January 2021) • Sen Monorom commune council chaired meetings to resolve conflicts regarding private land titles in Andoung Kraloeng ICT (March 2021) • Facilitated invitation of ICT committees to regular commune council meetings to improve engagement (July 2021 onwards)
Activity 3.7: Civil society organizations operating in the project area are engaged, and activities are well-coordinated	• Close collaboration with ELIE and WHI (ecotourism and community development) and SMP (agriculture) (throughout 2020–2021) • Coordinated with Development and Partnership in Action (DPA) to support ICT committees to improve their documentation of suspected crimes in their ICTs and provide legal support where needed (throughout 2020)

	• Collaboration with WHI, Ministry of Rural Development, MyVillage, and DPA identified current challenges faced by ICT committees in KSWS and potential resolutions—findings to be shared nationally (January–March 2020) • Staff representation at national conference on land and natural resource governance hosted by the NGO Forum, aimed at improving collaboration among NGOs and RGC (August 2020) • Collaborated with HECK, CLEC, MyVillage, and DPA to strengthen capacity of ICT committees to defend their ICTs and to better understand land titling processes (July 2020 onwards) • Coordination with Cambodia Indigenous People's Organization (CIPO) to prepare ICT documents for Khtung, Sre Andaol, Chakchar, and Khmom and build committee capacity (November 2020) • Collaboration with NGO Forum to share information on zonation of a protected area and customary land tenure (July 2021) • Collaboration with CIAI to deliver regular mobile health clinics to Pu Tang, Gati, Sre Lvi, and Pu Keh (August 2021 onwards) • Collaboration with ELIE to assist Pu Trom community in addressing land claims overlapping ICT land (September 2021 onwards)
Objective 4: Direct activities that support livelihoods and conservation awareness are active in each commune	
Activity 4.1: Support sustainable natural resource management	• Responded to 65 reports from 11 villages to dedicated hotline for conflict between human and wildlife, including 60 involving elephants, recorded damage, and provided advice to avoid future incidents (throughout 2020–2021) • 78 families in Pu Trom received compensation for foregoing clearance of forest on their agricultural land (by ELIE; November 2020, October 2021) • Survey of NTFP and timber use by households near O Pung Rung CPA to inform development of CPA management plan (January 2021) • Illustrated storybooks discussing human-elephant coexistence, forest protection, and community development designed and printed (Young Eco-Ambassadors, January 2021) • Participation in national feasibility study of commercialization of NTFPs from community-managed areas (March 2021) • Two companies explore wholesale purchase of Sre Preah bamboo handicrafts to use as packaging for food products (April 2021) • Distribution of cookstoves to 138 households in Pu Nhav and Pu Keh, to reduce firewood demand (July 2021) • Distribution of cookstoves to 592 households in Pu Kong, Pu Haim, Pu Tang, Pu Char, Sre Andaol, Gati, and Sre Lvi, to reduce firewood demand (August 2021) • Distribution of cookstoves to 81 households in Sre I and Pu Trom, to reduce firewood demand (November 2021) • Sre Preah CPA management plan updated (November 2021)
Activity 4.2: Community-based ecotourism in KSWS is supported, well managed, and improving	• Total income at Jahoo ecotourism project in Andoung Kraloeng USD 11,046 in 2020 and USD 18,520 in 2021 • Increased proportion of tourism income from Jahoo going to community-managed Gibbon Fund • 2,400 kg supplementary food for elephants at EVP ecotourism site bought from community growers (by ELIE, monthly throughout 2020–2021) • Ongoing training for community members working at Jahoo (by WHI; see Section 2.3.13 for more detail) • Andoung Kraloeng ICT committee committed to securing land reserved for agriculture in the ICT for continued use for ecotourism (February 2020)

	• Construction of new bathrooms and kitchen at Jahoo completed (by WHI; June 2020) • Captive elephant owners in Pu Tang engaged to collect basic data on tourists to allow improved understanding of tourism trends in KSWS (October 2020) • Guidelines on developing community-based ecotourism in KSWS drafted, including assessing potential, making a business plan, and ensuring sustainability (October–December 2020) • Assessment of potential of ecotourism in Sre Preah CPA (December 2020) • Three additional community members employed as research assistants at Jahoo (October 2021) • Three ecotourism selfie signboards installed in KSWS at popular tourist sites (November 2021)
Activity 4.3: Community development activities are linked to conservation benefits	• Participating communities updated on their progress towards earning additional performance-based payments related to conservation and community development (January–February 2020, June 2020) • Andoung Kraloeng committee outlined plans for spending community income from ecotourism: 40% for law enforcement, 20% for capacity building of committee, 10% for community events, 10% for administration, 10% for scholarships, and 5% to support the elderly and vulnerable (May 2020) • Sre Preah bamboo group outlined plans for spending income from sales of sustainably harvested bamboo: 70% for individuals harvesting bamboo and making products, 15% for purchasing production equipment, 5% for equipment maintenance, 5% for CPA management, and 5% for bamboo committee administration (July 2020) • Regular mobile health clinics in Pu Tang, Gati, Sre Lvi, and Pu Keh delivered on request of community, using REDD+ benefit sharing funds (August 2021 onwards)
Activity 4.4: Agricultural practices are improved in target communities	• 58 farming households compliant with IBIS Rice requirements in 2021 • Over 300 hectares of agricultural land in three villages around KSWS managed under IBIS Rice scheme • 15 households sold 11,266 kg of rice at 30% premium above market prices, accessible through respecting IBIS Rice conservation regulations (two harvests in 2020) • Ongoing training for potential and active IBIS Rice farmers in improved agricultural techniques (see Section 2.3.13 for more detail) • Farming diaries of IBIS Rice growers used to determine compliance with requirements for internal audit (July, September 2020) • Awareness-raising of IBIS Rice scheme for potential farmers and key stakeholders (July 2020) • Successful external audit of IBIS Rice's preparation for organic certification in KSWS (by ECOCERT, October 2020) • 690 kg of high quality rice seed distributed to IBIS Rice farmers (July 2021) • Internal control system inspection of farming practices by VMN committee comprised of community members (August 2021) • Collection of data on land clearance by non-compliant IBIS Rice farmers (September 2021) • Agricultural parcels of new IBIS Rice farmers mapped (October 2021)
Activity 4.5: Increase economic benefits from sustainable extraction of NTFPs	• 78 families in Pu Trom received compensation for allowing captive elephants from EVP ecotourism site to graze in forest in their ICT (by ELIE, 2020–2021) • Training for Sre Preah CPA members on improving techniques for processing and selling bamboo products to add value (see Section 2.3.13 for more detail)

	• Sre Preah CPA bamboo group generated USD 953.54 income in 2020–2021 from sale of sustainably harvested bamboo • Sre Preah CPA bamboo enterprise group equipped with machinery to help add value to bamboo handicrafts produced for sale (July 2020) • Participation in national workshop on NTFP commercialization, supply chains, and tax exemption—resulting in request to MoE and MAFF to exempt NTFPs from tax collection (September 2020) • Regulations developed for small business implementation, related to CPA management plan, in Sre Preah CPA (December 2020)
Activity 4.6: Communities and children understand and are engaged with environmental and conservation issues	• Communities in Sre Andaol and Sre Khtong took part in nest protection program for globally threatened birds (throughout nesting seasons in 2020–2021) • Community members joined snare removal patrols across KSWS (throughout 2020–2021) • Kouprey Express mobile education team visited households in Andoung Kraloeng to raise awareness about conservation and illegal wildlife trade (by Wildlife Alliance; October–December 2020) • New "kids retreat" ecotourism product launched at EVP for domestic tourists to provide education and strengthen relationship with nature (December 2020) • Village fairs raised awareness of forest protection and biodiversity conservation (January–February 2021) • Information boards to share community news related to development and the environment installed in front of meeting halls in O Am, O Rona, Sre Preah, Sre I, Pu Haim, Pu Rang, and Gati (December 2021)
Objective 5: Information on long-term ecological and social trends of key indicators is available to support protected area management	
Activity 5.1: Trends in forest cover are monitored and used to inform management	• Produced forest cover change map of KSWS for 2020 and 2021 • Ongoing monitoring of forest cover change in proximity to communities for calculating performance scores (throughout 2020–2021) • Ongoing monitoring of forest cover; any clearance detected is shared with law enforcement to allow on-the-ground inspection (throughout 2020–2021) • Produced land use maps to inform drafting of KSWS management zones (2020) • Maps of deforestation from 2010 to 2020 produced to provide supporting evidence for cadastral officers who demarcated individual land titles in 2021 (July 2020) • Maps of forest cover change in buffers surrounding participating villages updated to support calculation of community performance-based payments based on maintaining forest cover (July–September 2020) • Calculated deforestation at specific locations to support court prosecution documents (November 2021) • Reported land clearance in IBIS Rice target villages for community identification of perpetrating farmers (November 2021) • Database launched for recording unauthorized land clearance in Pu Char, O Chra, and Pu Kong (November 2021)
Activity 5.2: Populations of key species are monitored in KSWS, and monitoring informs management and	• Deployed camera traps across KSWS to monitor cryptic species and provide photos for communications materials (throughout 2020–2021) • Completed line transect monitoring over 1,280 km across KSWS (January–April 2020) • Produced population estimates for 10 key species and population trends for 13 (September 2020)

promotes the value of the protected area	• Presented population estimates and their management implications to MoE and national media (October 2020) • Preparation of transect sites for biannual line transect monitoring in 2022 (December 2021)
Activity 5.3: Socio-economic and demography monitoring takes place and informs management	• Database storing information related to performance-based benefit sharing, including forest cover, conservation engagement, and community development, finalized (September 2020) • Collected information on welfare of local communities to inform incorporation of livelihood strategy improvement into REDD+ benefit sharing plans (September 2020) • Data collection on principle sources of livelihoods in Pu Rang, Pu Haim, Pu Tang (February 2021), Pu Keh (September 2021), Sre Preah, O Rona (November 2021), Pu Ngaol and Pu Trom (December 2021) • Households from Pu Nhav, Pu Keh (July 2021), Pu Char, Pu Kong, Pu Haim, Pu Tang, Sre Andaol, Gati, Sre Lvi (August 2021), Sre I and Pu Trom (November 2021) surveyed to understand baseline fuelwood usage before cookstove distribution • Documentation of access to healthcare, education, and sanitation in Andoung Kraloeng, Pu Rang, and Pu Haim (November 2021)
Activity 5.4: Research that will benefit the management of KSWS takes place	• Partnership with Royal University of Phnom Penh to build capacity of Cambodian students in biodiversity sampling techniques • Joined the LIFEPLAN program, a global monitoring program to provide standardized, extensive community ecology data • Developed partnership with Cornell's K. Lisa Yang Center for Conservation Bioacoustics to implement a future passive acoustic monitoring network in KSWS • Collaboration with Institut Pasteur to monitor emerging zoonotic diseases at Jahoo in Andoung Kraloeng (by WHI) • Supported development of national biodiversity information system that will allow research data to better inform management across Cambodia (throughout 2020) • Supported fieldwork of program studying malaria eradication in KSWS (June–August 2020) • Cookstove use in KSWS investigated to better understand and address natural resource demands (October–December 2020) • Contributed to survey design for government-led study on Indigenous people, conservation, land tenure, and development in Mondulkiri (March 2021) • Challenges to ICT establishment in KSWS documented as case studies in MoI-led national study to improve process of ICT registration (July 2021) • Government-led survey of challenges, including land conflict, faced by ICT communities in KSWS (December 2021)
Objective 6: Effective administrative, accounting, and logistical procedures are in place	
Activity 6.1: Regular evaluation and feedback on staff capacity, effectiveness and training requirements takes place	• Over 25 training courses provided to project staff, including on inclusive development, line transect monitoring, facilitating community advocacy, human rights, land governance, and certification of organic agricultural products (see Section 2.3.13 for more detail) • Annual performance review for each staff member with their direct supervisor to identify strengths and weaknesses • KSWS wildlife monitoring team received national recognition from MoE of their contribution to conservation in KSWS since 2010 (November 2020)

	• Need for village focal points—employed directly from local communities—identified and recruitment process completed (November 2021)
Activity 6.2: Effective management, administrative, and accounting systems are in place	• Continued use of asset management system, ensuring efficient use of material resources • Conducted annual staff performance evaluations • Monthly advance requests and clearances used to carefully monitor project expenses
Activity 6.3: Station and site management is effective	• Confiscated materials stored at project headquarters and managed by PDoE • Law enforcement substations supported
Objective 7: KSWS has long-term financial, social, and political security	
Activity 7.1: KSWS REDD+ project continues and expands	• Meetings held in participating villages to collect comments on REDD+ project during public comment period for third (2018–2019) verification (March 2020) • Signed partnership between MoE and international carbon broker Everland LLC (May 2020) • Appearance on national television to explain the REDD+ project and describe initiatives of NGO–government collaboration (June 2020) • Facilitated field visit of verifiers for third verification (August 2020) • Contributed input to development of a national *prakas* on REDD+ Greenhouse Gas Mechanisms in Cambodia (October–December 2020) • Appearance in MoE video documentary on protected area management (July 2021) • Updated Agency and Delegation of Authority agreement between Seima Carbon Company and MOE executed in July 2021 • Updated Project Implementation Agreement between WCS Cambodia and MOE executed in July 2021 • 10-year financial plan developed for the KSWS REDD project
Activity 7.2: Continued support of a wide range of donor partners	• Continued implementation of the USAID Keo Seima Conservation Project (throughout 2020 and finishing in August 2021) • Continued implementation of CAMPAS project (throughout 2020–2021) • Continued implementation of AFD Conservation de la biodiversité et croissance verte dans le hotspot Indo-Birman (throughout 2020–2021) • Continued implementation of USFWS Endangered Species Asian Elephant Conservation Fund grant (throughout 2020)

2.2.2 Methodology Deviations

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

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), 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.

Extension of project baseline. A two year extension to the project baseline was approved by Verra. See Section 3.2.1.5 for details.

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

Ongoing biodiversity monitoring has identified additional species present within the project area since validation. Additionally, IUCN Red List classifications undergo updates over time, including during this monitoring period. As the newly identified species only contribute to the biodiversity importance of the project under the Vulnerability and Irreplaceability criteria for Indicator GL3.1, these additions represent only a minor change to the project description. Changes to IUCN Red List classification can downgrade or upgrade species Vulnerability ratings. These changes are detailed in Table 5.2. None of these species are trigger species, and there remain a large number of species in the project area satisfying the Vulnerability and Irreplaceability criteria for Indicator GL3.1.

The Project Description states "occupancy surveys may also be implemented for rarer ungulates such as banteng and Eld's deer and would likely utilize camera-traps and/or dung searches", and Table 8.1.8 states camera-trap occupancy surveys would be used for banteng, Eld's deer, and carnivores. Whilst camera trapping is ongoing across the protected area, and banteng, Eld's deer, and small carnivores have been recorded, no occupancy-based analysis has been conducted for these species in this monitoring period due to feasibility (low encounter rates would require excessively high-cost investment in camera traps) and the project has focused on other cost-effective monitoring of priorities critical to management. These camera-trap occupancy surveys will not be conducted in future monitoring periods until cost-benefit analysis shows them to be justified for the return in additional management-relevant data. As none of these species are trigger species, and extensive biodiversity monitoring of many threatened species and habitats continues across the project, this minor change is in conformance with CCB standards.

2.2.4 Project Description Deviations (Rules 3.5.7–3.5.10)

No deviations made to the Project Description during this period.

Previous deviations

During the first monitoring period (1 January 2010 to 31 December 2015) the project proponent changed from the Forestry Administration (FA) of the Ministry of Agriculture, Forestry and Fisheries (MAFF) to the Ministry of Environment (MoE). The Project Description was updated to account for the change of project proponent from the Forestry Administration to the Ministry of Environment (see Section 2.1). The change of project proponent required a Gap Validation review and report which were conducted by SCS Global Services and issued on 4 April 2017 which concluded "Based on the 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". The Gap Validation Report (CCB_VALID_REP_ENG_1650_4APR2017.pdf) is available on the Verra Project Database.

2.2.5 Grouped Projects

Not applicable.

2.2.6 Risks to the Project (G1.10)

Human and natural risks to the project's expected climate, community, and biodiversity benefits during the monitoring period and the actions needed and implemented to mitigate these risks are described in the table below. This risk analysis is holistic, covering climate, community, and biodiversity benefits of the project.

Table 2.1. Project risks table

Identify Risk	Potential impact of risk on climate, community and/or biodiversity benefits	Actions needed to mitigate the risk
Human Risks		
Poor project management	Poor project management would lead to project activities being implemented poorly or ineffectively leading to limited climate, community and biodiversity benefits or a reversal of benefits accumulated over previous monitoring periods. The agents and drivers of deforestation would be allowed to return leading to negative impacts on forest, communities and biodiversity. This risk is considered to be low due to the high capacity of the project staff.	• Strong administrative, financial and managerial procedures to ensure effective project implementation (see Activities 2.3, 2.4 6.2 in Section 2.2.1) • Capacity building and training to ensure effective project staff (see Activities 2.2, 6.1 in Section 2.2.1) • Adaptive project management to identify issues and opportunities early and react accordingly (See Activity 1.6 in Section 2.2.1) • Strong financial position to fund project activities. This was achieved through significant credit sales over the monitoring period (see separate financial analysis provided with the Non-Permanence Risk Report) • Engage with partner organizations with sector specific skills to ensure proper delivery of project activities (see Activity 3.7 in Section 2.2.1)
Low financial viability	Inadequate funding would prevent the project from fully and effectively implementing the broad suite of project activities necessary to sustain the climate, community and biodiversity benefits achieved to date. The agents and drivers of deforestation would be allowed to return leading to negative impacts on forest, communities and biodiversity. For this monitoring period and going forward this risk is considered low due to the recent sizeable credit sales and strong financial position.	• Strong financial position to fund project activities. This was achieved through significant credit sales over the monitoring period (see separate financial analysis provided with the Non-Permanence Risk Report)

Identify Risk	Potential impact of risk on climate, community and/or biodiversity benefits	Actions needed to mitigate the risk
High deforestation pressure from unsustainable, small-scale agricultural expansion	This is the principal driver of deforestation across the project area and the greatest risk to the project's climate, community and biodiversity benefits. This is due both to in-situ expansion of agricultural lands as well as recent immigrants.	The project is designed principally to address this risk and therefore the full suite of project activities are needed to address this risk. Most pointedly, however, are the following: • Law enforcement and protection (see Activities 1.2, 2.1, 2.2, 2.3, 2.6 in Section 2.2.1) • Zoning and support to secure tenure (see Activities 1.2, 3.1, 3.2, 3.5 in Section 2.2.1) • Provision of alternative livelihoods (see Activities 3.3, 4.1, 4.2, 4.3, 4.4, 4.5 in Section 2.2.1)
Illegal logging	While this risk does not pose a large climate risk, the presence of illegal loggers is detrimental to biodiversity (tree extraction but also hunting), NTFPs, and security for local communities. This is a medium risk that requires ongoing project attention.	• Law enforcement and protection is needed to minimize incursions and act as a deterrent (see Activities 1.2, 2.1, 2.2, 2.3, 2.6 in Section 2.2.1) • Clarification of zoning and permissible activities (see Activities 1.1 ,1.2, 3.5 in Section 2.2.1)
Anthropogenic fires	Fires are started by poachers, illegal loggers and those wishing to clear land. 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. Nevertheless, repeated fires on a frequency higher than normal can lead to degradation, especially in the open forests.	• Law enforcement and protection is needed to minimize incursions and act as a deterrent (see Activities 1.2, 2.1, 2.2, 2.3, 2.6 in Section 2.2.1) • Ongoing active monitoring of forest health via patrols and monitoring systems (see Activities 2.4, 5.1, 5.2)
Weak governance	Cambodia suffers from poor governance (see low scores on the database of Worldwide Governance Indicators). This can lead to opaque decision-making, conflicting interests and unequal application of the law. This can minimize the	• Consistent and ongoing consultation with local authorities (see Activities 1.3, 2.5, 3.6 in Section 2.2.1) • Strong focus on zonation and law enforcement (see Activities 1.2 and Objective 2 in Section 2.2.1)

Identify Risk	Potential impact of risk on climate, community and/or biodiversity benefits	Actions needed to mitigate the risk
	effectiveness of project activities that lead to climate, community and biodiversity benefits while also disenfranchising local communities actively participating in project activities. This is a medium risk that requires ongoing project attention.	• Consistent and expanding delivery of project activities that deliver tenure security and livelihood benefits for local communities (see activities under Objectives 3 and 4 in Section 2.2.1)
Limited support for project activities from local communities	A reversal of communities' support for the project activities could lead to an expansion of the drivers of deforestation negatively impacting climate, community and biodiversity benefits. This is considered a low risk due to the strong and ongoing consultation processes of the project and the strong delivery of livelihood benefits to date.	• Consistent and ongoing consultation with local communities (see Activity 1.6 and the extensive consultation associated with all activities under Objective 3 and 4 in in Section 2.2.1) • Consistent and expanding delivery of project activities that deliver tenure security and livelihood benefits for local communities (see activities under Objectives 3 and 4 in Section 2.2.1) • Community monitoring and research to understand socio-economic and demography changes to inform management practices and the delivery of appropriate project activities (see Activities 5.3 and 5.4 in Section 2.2.1)
Incongruent land zoning by national authorities	Permitting overlapping uses of the project area that are incongruent with the project's conservation mission could lead to increased forest loss and resulting impacts on the climate, community and biodiversity benefits.	• Consistent and ongoing consultation with local authorities (see Activities 1.3, 2.5, 3.6 in Section 2.2.1) • Strong focus on zonation and law enforcement (see Activities 1.2 and Objective 2 in Section 2.2.1) • Monitoring of private sector activities to ensure adherence with protected area laws (see Activity 1.4 in Section 2.2.1)

Identify Risk	Potential impact of risk on climate, community and/or biodiversity benefits	Actions needed to mitigate the risk
Natural Risks		
Flooding	The project area experiences only small flooding events that are part of the natural monsoonal cycle.	None
Disease and pests	Intact tropical forests of the types found in the 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.	• Ongoing active monitoring of forest health via patrols and monitoring systems (see Activities 2.4, 5.1, 5.2)
Seismic activity	The project area is geologically stable and this is not considered a risk.	None
Fires	Naturally occurring fires are a feature of the forest ecology in the project area. 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. While there is no history of catastrophic fires in this habitat in the area it remains a risk, especially if forest health and integrity is compromised by ongoing drivers of deforestation and degradation.	As with anthropogenic fires, key activities to mitigate this risk include: • Ongoing active monitoring of forest health via patrols and monitoring systems (see Activities 2.4, 5.1, 5.2)

2.2.7 Benefit Permanence (G1.11)

The project incorporates a number of measures to ensure long-term sustainability of the climate, community, and biodiversity benefits throughout and beyond the project lifetime. These are all implemented on an ongoing basis, including since the last CCB verification. The key measures are summarized here, and detailed extensively in later relevant sections:

1. Establishment and implementation of a strong legal basis, including the permanent declaration of the Protection Forest in the 2009 Sub-Decree 143 and the 2016 Sub-Decree 83 transferring this to a Wildlife Sanctuary, and the program to support permanent titling of eligible land to all relevant villages. Ongoing implementation requires capacity building and institutionalization through training provided by the project. Outreach to local communities also builds longer-term understanding of the legal underpinnings of the protected area.
2. Investments in physical demarcation of boundaries and construction of key infrastructure for park management. These investments benefit project activities in the immediate term and clearly establish the infrastructural basis on which ongoing, long-term protected area management will be implemented.
3. The inclusion of an operating reserve in the financial model, to ensure a proportion of early revenue is set aside to finance long-term recurrent management costs. This strengthens the project's ability to consistently deliver benefits during the project lifetime and the expectation is that the reserve can continue to grow and act as a trust fund for the long-term, sustainable financing of project activities.
4. The use of adaptive management approaches to ensure work planning responds to changing conditions. The development and adoption of the systems, skills and procedures to respond to changing conditions through protected area adaptive management will allow for benefits to be preserved beyond the project lifetime.
5. The establishment and implementation of mechanisms for long-term community involvement in management planning and implementation, thus ensuring the effective, long-term participation of one of the project's key stakeholder groups.
6. The focus of alternative livelihood initiatives on establishing long-term alternatives to deforestation, unsustainable hunting etc., including both income generating activities and the development of fundamental, transferable skills through adult education.
7. The inclusion of environmental awareness activities in the community engagement program to drive greater awareness and support for conservation in current and future generations.
8. Measures to ensure an increasing proportion of staff are drawn from local communities, and to promote development of staff capacity, thus ensuring strong local ownership and engagement in the preservation of the project benefits.

2.3 Stakeholder Engagement

2.3.1 Stakeholder Access to Project Documents (G3.1)

The Monitoring Report Summary was translated into Khmer and printed copies were made available during the public consultation period to each of the target communities. The full MR was also made publicly available on Facebook and on the WCS website during the public consultation period.

During annual KSWS stakeholder meetings, updated annual project information is shared with project stakeholders via presentations (subsequently provided as printed versions for participants) in Khmer. Regular updates are also shared in the English quarterly newsletter that is sent to an online mailing list

and disseminated offline. An annual update report in Khmer is also generated for the MoE and PDoE to provide additional project implementation updates.

Informational meetings were also held in all villages; these meetings are described in greater detail below. During these meetings, project information relevant to the subject matter of the meeting is prepared and provided to community participants.

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 CCB standards is communicated. Project teams visit the 20 villages to explain about CCB standards 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, key technical advisors, and representatives of each community. The meetings occurred on 30 June and 16 July 2020, and remotely on 21 June 2021 to harmonize with the WCS financial year (1 July–30 June). The community consultation on the 2021 annual work plan did not take place due to COVID-19 restrictions. 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, in addition to the formal grievance procedures. 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 on both the project and community members. 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. This 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 the consent process meets the requirements of Cambodian national law and conforms to VCS and CCB requirements and the UN Declaration on the Rights of Indigenous Peoples (UNDRIP, 2007). The consent agreement 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.

For core project activities, benefits, risks, and costs, including those identified in Annex 5.1 of the Project Description and in section 4.1 of this Monitoring Report are discussed and mitigations for each are

identified on an ongoing basis as part of frequent and regular community meetings in a timely manner prior to implementation of new and ongoing activities during this monitoring period.

Financial benefits stemming from sales of carbon credits have been shared with all participating communities during project implementation. Consultations on REDD+ benefit sharing in the project were held at various levels such as village, commune, and province, 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, and included participatory discussion on benefits, costs, and risks. These community consultation meetings were centered on a written Community Agreement on REDD+ Benefit Sharing that was signed by representatives of each community and witnessed by the local authorities, to demonstrate their consent to prioritized activities for their communities. Funds were administered as grants to complete activities planned by each community and addressing their most pressing needs in terms of community development. Support was provided to develop work-plans and budgets. The system has been designed with a long-term goal of handing over financial management responsibilities to communities. This will be achieved through a step-wise process, ensuring that capacity of community committees is improved every year and that additional responsibilities are imparted incrementally and appropriately.

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 in 2019 by the community representatives for REDD+ matters and witnessed by local authorities and the KSWS park director. Funds were ultimately not distributed based on performance for the agreement period due to COVID-19 limiting village activities and project staffs' abilities to support and monitor performance and activity implementation. Instead, additional installments of the previous awards were made, as activities were implemented, and in June 2021 an additional unconditional payment of $10,000 per village was made to all 20 villages. Performance-based payments will be reinstituted in the next monitoring period, provided COVID-19 restrictions continue to abate.

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 the 30-day public comment period prior to the VVB's visit in October 2022. Community leaders and members were invited to attend meetings in their village meeting halls or other suitable location. Refreshers on the REDD+ project including project benefits and impacts, summaries of the activities implemented during the reporting period, and the purpose and process of verification including VVB site visit were presented by a project facilitator, including the use of printed slides and posters. Physical and electronic copies of the Khmer language Monitoring Report summary were provided to community stakeholders.

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 were informed at community meetings about the REDD+ verification process and the visit from the auditors. The VVB name, audit team leader, the dates and locations of the audit, contact details, and means of communicating with the audit team were provided in discussions as well as in the form of printed posters in each community meeting hall.

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 to 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 work-plan 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 in 2020–2021
Community forum	Annual	Community representatives from all villages are invited to attend at central location.	Annual Planning meeting on 16 July 2020. Community forum did not take place in 2021 due to national and provincial COVID-19 restrictions.
Formal monitoring of social benefits and impacts	Every 5 years	Sample households, community leaders, focus groups.	Next monitoring report in 2022
Adaptive management planning meeting	Monthly	WCS, PDoE, community members, partner organizations, local authorities	Activity progress and implementation challenges shared by all teams and partner organizations; community members can provide feedback on these, as well as report their own activities. Activities for following month updated according to stakeholder feedback in these meetings
Consultations on design of benefit-sharing arrangements	Multiple meetings	Community representatives plus plenary discussions with all families invited. Central location and village-level meetings.	Meetings in all villages in January, February, and June 2020 and February, September, October, November, and December 2021 to identify community development priorities for the year to be funded with revenue from REDD+ benefit sharing
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.	All participating communities have signed up to receive additional performance-based payments Consultations held on: • Design of financial guidelines for communities managing REDD+ benefit sharing funds (throughout 2021) • Annual scores for performance-based payments for Sre I, Pu Keh, Pu Tang, and Pu Ngaol (February 2021) • Formation of commune-level procurement committees to assist implementation of activities funded by community REDD+ benefit sharing (February 2021, November 2021) • Collection of data to support allocation of performance-based payments in Sre Andaol, Khmom, and Chakchar (September 2021) • Q3 performance scores and outcomes of village-level conflict resolution committees in Pu Keh, Pu Ngaol (October 2021), O Chra, Sre Preah, Gati, Pu Char, Pu Kong (November 2021), Chakchar, Khmom, Sre Andaol, and Khtung (December 2021) • Forest boundary for performance-based payments and community law enforcement patrols in Gati (December 2021)

Event	Frequency	Participants	Status in 2020–2021
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.	Consultations held on: • Risk assessment and assessment of law enforcement capacity in KSWS (January 2020) • Process of establishing a CPA for villages in Sen Monorom commune (January 2020) • Public comment period for 2018–2019 verification (March 2020) • Systematic land titling and ICT in Sre I (June 2020) • Process of recording land use within protected area boundaries in Kratie province section of KSWS (August 2020) • KSWS park director response to families with existing agricultural land under cultivation in Sre Preah CPA (October 2020) • Identification of beneficiaries of cook stoves with local authorities and community committees (May 2021) • Extending agreement on REDD+ benefit sharing with participating communities (December 2021)

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.	Consultations held on: • Recruitment of community patrol team members (January, February 2020) • Registration to establish a CPA in O Pung Rung (May, June 2020) • IBIS Rice compliance processes in three villages (June 2020) • Finalization of application for CPA establishment in O Pung Rung (July 2020) • IBIS Rice conservation regulations (July 2020) • Identification of suitable potential land for a CPA in Andoung Kraloeng (July 2020) • Respecting CPA and ICT land use plans in Sre Preah (August 2020) • Identification of IBIS Rice farmers that have broken conservation agreement (October 2020) • Ecotourism potential in Pu Tang (October) and Sre Preah CPA (December 2020) • Small business regulations in Sre Preah CPA (December 2020) • Work-plan for procurement of IBIS Rice from compliant farmers (December 2020) • Finalization of application for CPA in Pu Haim (December 2020) • Dissemination of O Pung Rung CPA bylaws and development of management plan (January 2021) • Cultural traditions with potential for community-based ecotourism in Pu Char (January 2021) • Illegal land use in Sre Preah CPA and importance of maintaining forest (January 2021) • Establishment of a CPA in Chakchar (January 2021) • Potential CPA sites in Pu Keh (January 2021) • Sharing results of IBIS Rice farming from 2020 and raising awareness of benefits of IBIS Rice to new farmers in Pu Kong and Pu Char (January 2021) • Verification of rule-breaking by 9 IBIS Rice farmers in Pu Kong (January 2021) • Participatory rural appraisal to map livelihood activities and resource use in Sre I, Sre Preah, and Pu Haim (February 2021) • Preparation of ICT documents for state land demarcation in Pu Keh (February 2021) • Registration of members for Pu Haim CPA (February 2021) • Identification of potential locations for CPA in Sre Andaol (February 2021) • Continuing ICT membership in Pu Keh (March 2021) • Selection of temporary working group to support O Mphek Lvie CPA committee election (May 2021) • Addressing challenges faced by Sre Preah CPA bamboo business group (May 2021) • Successful establishment of O Pung Rung CPA (June 2021) • Identification of sites for Sre Andaol CPA and results of natural resource use assessment (August 2021)

			• Identification of priority site for Khmom CPA (Chheung Phnom Beng) and results of natural resource use assessment (August 2021) • Support for community forest management in Sre Roneam (August 2021) • Drafting bylaws for O Mphek Lvie CPA (August–October 2021) • Benefits and disadvantages of ICT and CPA establishment in Pu Keh (September 2021) • Procedure for CPA development and identification of areas for CPA in Sre Andaol (September 2021) • Drafting management plan for O Pung Rung CPA (September 2021) • Registration of members for Chheung Phnom Beng CPA in Khmom (September 2021) • Preparing application for establishment of Sre Antung CPA in Pu Ngaol (September 2021) • Land mapping process for Sre Lvi and O Chra ICTs (October 2021) • Formation of committees for grievance mechanism in Pu Keh and Pu Ngaol (October 2021) • Selection of candidates for election to Sre Antung CPA management committee (October 2021) • Livelihood benefits and natural resource management of three potential sites for Sre Antung CPA (October 2021) • Draft management plan for O Pung Rung CPA (October 2021) • Provisional list of non-compliant IBIS Rice farmers in Pu Kong, Pu Char, and O Chra (October 2021) • Updated patrol boundaries for community patrol teams in Pu Trom, Sre I, Pu Tang, Pu Rang, O Rona, O Am, Sre Lvi, Pu Keh, and Pu Ngaol (November 2021) • Progress of membership registration for Sre Andaol CPA (November 2021) • Identification of potential sites for CPAs in Sre Andaol and Andoung Kraloeng (November 2021) • Updating Sre Preah CPA management plan (November 2021) • Final identification of eligible IBIS Rice farmers for current harvest (November 2021) • Selection of committee for community savings group in Gati (November 2021), Pu Rang, and Pu Keh (December 2021) • Selection of members for community patrol team in Pu Haim (November–December 2021) • Bylaws of O Mphek Lvie CPA (December 2021) • Restructuring REDD+ committee in Pu Haim (December 2021) • Identifying boundary of area to be covered by community patrol teams in Pu Haim (December 2021) • Choice of livelihood improvement interventions to be supported by REDD+ benefit sharing fund in Pu Char (December 2021)

Event	Frequency	Participants	Status in 2020–2021
			• Roles and responsibilities of newly recruited Sre Antung CPA management committee (December 2021) • Progress on implementation of REDD+ benefit sharing activities in Pu Trom (December 2021) • Selection of temporary working group to organize election of CPA management committee in Sre Andaol (December 2021) • CPA member registration in Khmom and Andoung Kraloeng (December 2021) • Establishment of community savings group in Pu Haim, Sre I, Pu Tang, and Pu Rang (December 2021) • Bylaws of community savings group in Gati and Pu Haim (December 2021) • Recruitment of members of cow raising group in O Chra (December 2021)
Participation in Commune Investment Planning process	Annual	Commune Councils, village representatives	• Sre Preah Commune Investment Plan meeting (October 2020) • Andoung Kraloeng & Pu Trom village Commune Investment Plans (October 2020) • Sen Monorom commune (Pu Keh, Pu Ngoum, Sre I villages) and Keo Seima district Commune Investment plan meeting (November 2020) • O Reang district Commune Investment Plan meeting (November & December 2021)
Participation in District Integration Workshop	Annual	Commune Councils, village representatives, NGOs	• Sen Monorom District Integration Workshop (December 2020) • Oreang, Keo Seima, and Sen Monorom District Integration Workshops (November 2021)
District Commission Meeting	Quarterly	Department of Environment (DoE), WCS	KSWS director committed to engaging with provincial administration, district governor and commune councilors to improve law enforcement and ensure that there are no illegal developments in KSWS • Coordination of work-plan for CPA establishment and support in KSWS, with district governor (September 2020) • Review of law enforcement actions against forest clearance and illegal land claims (November 2020) • Demarcation of Pu Keh ICT and private land with ICT committee, commune council, DoE, MLMUPC, Ministry of Interior (March 2021)

Event	Frequency	Participants	Status in 2020–2021
Provincial Commission Meeting	As needed	Department of Environment (DoE), WCS	• Working group meeting to seek solutions to illegal land encroachment for agriculture and alongside new infrastructure (January 2020) • Review of locations of new and planned infrastructure development and ICTs in KSWS (February 2020) • Strategic management meeting to tackle deforestation (March 2020) • Review of law enforcement actions against forest clearance and illegal land claims (November 2020) • Legalisation of ICT registration and bylaws in Pu Keh and Sre I with MoI, provincial governor, deputy provincial governor, ICT committee, and commune council (December 2021)
Commune council meetings	Monthly	Commune Councils, ICT committee representatives	• Andoung Kraloeng and Pu Rang ICT committee members took up invitation to attend Sen Monorom Commune Council meeting (July 2021) • Land inventory procedure and working group formation with Sen Monorom commune council and Andoung Kraloeng ICT (November 2021)
Participation in Mondulkiri NGO Network	Periodic as necessary	NGOs working in and around the Project Area	Contributed to development of new bylaws, including identification of sub-groups of NGOs focusing on common goals (October 2020) Ongoing financial and technical support during ICT process review (2021)
Network for Forest Governance (N4F)	Annual	Cambodian civil society organizations involved in REDD+	Ongoing, member and part of steering committee. Reduced meetings in this period due to COVID-19.

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 ecotourism. 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 KSWS REDD+ Quarterly Newsletters are also available in English and can be accessed online at the WCS Cambodia website (https://cambodia.wcs.org/).

During the project's 30-day consultation period all target communities were consulted to present the results of the current monitoring period, distribute the language summary MR and inform communities of the upcoming third-party audit of the project.

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 NGO staff with support from government officials as needed and a cadre of community representatives who have received additional training. Although most Bunong community members speak Khmer, a Bunong-speaking project staff member is often included in teams. The facilitation teams strongly encourage participation from the village committee, and women, to make the process fair and transparent to all community members. The frequency of meetings during agriculturally important periods is minimized where possible, to ensure that participation does not require individuals to make a trade-off with their farming for subsistence or livelihoods. Meetings are also avoided during periods of cultural significance, for example the new year celebrations that occur in mid-April.

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 [14]. 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 [15]. Sexual harassment is strictly prohibited under the Labor Law [16]. 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 [17]. All KSWS staff annually attend staff training for anti-discrimination and gender 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

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

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. Follow-up explanation and refreshers have been provided as needed. Grievance boxes with hotline numbers are present in the 20 villages so that community members can express grievances about the project, and grievances can also be made directly to project staff. To ensure maximum familiarity and usage of the process, the same boxes and hotline are also used by the community to report issues that are not specifically related to the actions of the project, for example to report land encroachment by a neighbor, or to report that someone from Kratie was logging near their village. The project teams regularly check these boxes to collect any submissions from the communities. The phone is manned 24/7, and a Telegram account linked to the number is active to allow submission by text message. Reported issues not related to project implementation are passed to local authorities, or appropriate project teams if they are able to support resolution despite not being issues related to project implementation. Project grievances, those related to project implementation, pass through the three stages of the grievance process are described below.

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

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 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 in Stage 1 or Stage 2, 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 publicly 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).

2.3.12.4 Grievances received during the monitoring period

Community members from 17 of the 20 REDD+ villages made 26 submissions during the monitoring period. The majority of these (25 of 26 submissions) were not related to disputes with the project: 23 were reports of illegal logging or land clearance, one was a report of an illegal bushmeat seller, and one was a complaint against a commune-level government official for being unreliable and not supporting poor families. As these were not disputes with the project, these were not addressed through the grievance mechanism. Instead, the reports of illegal activity were provided to the Department of Environment, local police, or other competent authorities outside of the project for action, responses to which included follow-up by law enforcement but fall outside of the monitoring and response tracking processes of the grievance mechanism, which is limited to project grievances.

One submission was received at the end of 2021 that constituted a project grievance: a dispute with the project related to project planning, implementation, or evaluation. This grievance was received from a village with an ICT and stated that committee members appointed to the ICT committee, REDD+ committee, and community patrol committee should be different people.

In villages with existing ICTs, the ICT committee manages the REDD+ benefit sharing process, for a number of reasons:

- ICT committees are democratically elected by community members to manage the title, including spending on community development support by REDD+
- ICT committees are legally recognized and able to receive REDD+ funds
- ICT committees are legally able to open bank accounts to manage community funds, including those from REDD+
- ICT committee members received financial management training in order to manage community funds

While committee members are selected by the community, not by the KSWS REDD+ project, the project works closely with these committee members and so it was decided to address this as a project grievance. The project aims to avoid elite capture and to ensure equitable distribution of benefits. It also works with communities to ensure elections can take place as and when needed, and inactive committee members are removed and replaced. During this monitoring period, the project community team worked with community members in this village to discuss why elected committee members hold positions on several committees, and following the end of the monitoring period, an official response letter was provided to this community. The community and project consider this grievance resolved and the case closed at Stage 1.

2.3.13 Worker Training (G3.9)

The core MoE and PDoE staff, and WCS staff have received training specific to their respective responsibilities (Table 2.2). 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.

Table 2.2 Training activities implemented for project staff

Group/Topics	Training Focus
Group: Senior management and technical advisors Topics: Conservation project design; project management; data	• Ongoing 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

Group/Topics	Training Focus
management; assessment of training effectiveness; administration	• Gender equity training (January 2020) • Inclusive development and non-discrimination for 22 WCS staff (February 2020) • Supporting community advocacy for NTFPs (by NTFP-EP, September 2020) • Protected area zoning and protected area management plans (by MoE, January 2021) • Building an enabling environment for sustainable development (by NCSD, January 2021) • Human rights and environmental and social safeguards for 11 WCS staff (by Office of the United Nations High Commissioner for Human Rights and United Nations Development Programme, December 2021)
Group: Law enforcement teams Topics: Patrol techniques; equipment and weapons handling; outcome monitoring methods (e.g., SMART); human rights and related issues	• Ongoing induction and orientation for new staff—as needed • Ongoing mentoring from technical advisors—monthly or more frequent contact • SMART field data collection, using GPS and Avenza map application for 18 law enforcement personnel (February 2020) • Collecting patrol data using SMART Mobile app for 19 law enforcement personnel (July 2020) • Identification of key wildlife species encountered during law enforcement for 19 law enforcement personnel (July 2020) • Laws related to ICT establishment and legal forms of obtaining other titles including CPAs for 9 law enforcement personnel (September 2020) • Using SMART Mobile app and SMART Connect database for centralized law enforcement responses for 22 protected area managers and PdoE patrol leaders (October 2020) • Using SMART Mobile app for patrol data collection for 20 PdoE rangers, provincial police officers and military police officers (January 2021) • Patrolling tactics and first aid skills for 24 law enforcement personnel (January, February 2021) • Using updated feature in SMART Mobile app to navigate to spatial patrol targets for 40 PdoE rangers and community law enforcement patrol teams (June, July, August 2021) • Field training at ranger stations on use of SMART Mobile app for 11 law enforcement personnel (September 2021) • Geospatial technology for sustainable landscape management and REDD+ implementation in Cambodia for WCS SMART personnel (by SERVIR-Mekong, September 2021) • Using SMART Mobile app for patrol data collection for 9 newly employed law enforcement personnel (September 2021) • Recording and investigating wildlife health during law enforcement patrols for 17 law enforcement personnel (November 2021) • Formal training courses through existing government systems—ad hoc
Group: Community engagement team Topics: Legal systems; effective communication techniques; technical forestry; forest zoning and indigenous land titling; agricultural development skills	• Inclusive development and non-discrimination for 22 WCS staff (February 2020) • Data collection for demonstrating compliance with IBIS Rice requirements for 4 WCS staff (May 2020) • Requirements of external audits for SMP staff (by ECOCERT Organic Standard and National Organic Program, September 2020)

Group/Topics	Training Focus
	• Facilitating community advocacy for NTFPs (by NTFP-EP, September 2020) • Facilitating development of community livelihood improvement plans for 5 WCS staff (February 2021) • Gender and land governance interactions for 15 WCS staff (by Mekong Region Land Governance project, July 2021) • Protected area zoning and the FPIC principle for WCS staff (by NGO Forum, July 2021) • Land use and resource mapping for 14 WCS staff (September 2021) • Interviewing and selecting village focal points for WCS staff (September 2021) • Facilitating community savings group establishment for 9 WCS staff (September, November 2021) • Facilitating communities to develop long-term natural resource management plans, for WCS staff (October 2021) • General facilitation skills for 13 WCS staff (November 2021) • Community-based conflict resolution and management for 3 WCS staff (November 2021) • Data collection to record community livelihood information for 6 WCS staff (November 2021) • Facilitating long-term community development planning for 18 WCS staff (November 2021) • 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	• Methodology for line transect monitoring of key species for 6 WCS staff (January 2020, December 2021) • Maintaining hygiene standards during fieldwork for 6 WCS staff (January 2020) • Inclusive development and non-discrimination for 22 WCS staff (February 2020) • Methodology for forest degradation assessment and plant identification skills for 6 WCS staff (December 2020) • Using a new datasheet to record human−elephant conflict for 1 WCS staff (December 2020) • Installing monitoring equipment in tree canopy for 6 WCS staff (October 2021)

Technical training for community members is used to build capacity, raise interest, and promote informed participation (Table 2.3). 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 2.3 Training activities implemented for community participants

Objective/Topics	Training Focus
Objective: Support community-based patrolling Topics: Legal framework; rights and responsibilities of communities; safety and security; patrolling strategies;	• Ongoing mentoring during patrolling events—bimonthly or more frequent • SMART data collection for 20 people from Sre Preah CPA (January 2020) • SMART data collection, patrol guidelines, and GPS use for 53 people from villages across KSWS (June 2020) • Writing patrol reports for 7 people from O Pung Rung CPA (July, August 2020)

Objective/Topics	Training Focus
SMART data collection; reporting	• Writing patrol reports, SMART data collection, and developing patrol work-plans for 3 people from Sre Roneam CPA (October 2020) • Using SMART Mobile app and good field patrol practices for 67 community law enforcement patrol team members (January 2021) • Using BlackView smartphones to access SMART Mobile app during patrols for 29 community law enforcement patrol team members (February 2021) • Using updated feature in SMART Mobile app to navigate to spatial patrol targets for 21 PdoE rangers and community law enforcement patrol teams (July 2021) • Using SMART Mobile app to record patrol data for 7 community patrol team members from Andoung Kraloeng (July 2021) • Planning and reporting patrols, and coordinating with authorities, for 30 people from Sre Roneam, Khmom, O Chra, and Sre Preah (August 2021) • Planning and reporting patrols, and coordinating with authorities, for 27 people from Sre Andaol, O Am, O Rona, and Sre Lvi (August 2021) • Planning and reporting patrols, and coordinating with authorities for 12 people in Pu Nhav, Pu Ngaol, and O Chra (September 2021) • Financial management of community law enforcement patrols for 4 people in Sre Roneam (September 2021) • Using SMART Mobile app to record patrol data for 5 community patrol team members from Andoung Kraloeng and Sre Preah CPA (September 2021) • Planning and reporting patrols, and coordinating with authorities for 9 people in Sre I and O Rona (November 2021) • Using SMART Mobile app to record patrol data for 17 community patrol team members from Pu Ngaol and Khtong (November 2021) • Using SMART Mobile app to record patrol data for 53 community patrol team members from Pu Keh, Pu Nhav, Sre I, and Gati (December 2021)
Objective: Development of land-use agreements, legal registration of communities and titles, supporting management of community areas (ICT and CPA) Topics: Community land rights; legal framework; procedural steps and documentation; mapping methods; community self-organization; conflict resolution	• Financial management for 20 committee members of Sre Preah CPA (January 2020) • Field trip to Prey Lang Wildlife Sanctuary to celebrate natural environment and learn about natural resource management and ecosystem services for people from communities across KSWS (February 2020) • Taking meeting minutes, processing requests for agricultural land use within ICT, and formal communications with local authorities for 3 committee members from Pu Keh ICT (April 2020) • Financial management for 7 people from O Pung Rung CPA (July, August 2020) • Rights and responsibilities of community resource management inside CPA for 29 members of Sre Preah CPA (August 2020) • Financial management for 3 people from Sre Roneam CPA (October 2020) • Developing a CPA management plan for 15 O Pung Rung CPA members (January 2021) • Community protected area management for 46 commune councilors and district officials (by WCS, MoE, WWF, and RECOFTC, February 2021) • Methodology for demarcation of ICT land for pre-approval for 14 ICT committee members in Khmom, Chakchar, Khtung, and Sre Andaol (July 2021) • Coaching on exercising ICT ownership rights and reporting illegal land claims for 9 ICT committee members in Pu Trom and Andoung Kraloeng (October 2021)

Objective/Topics	Training Focus
	• Community-based conflict resolution and management for members of Sre Preah, O Mphek Lvie, and O Pung Rung CPA management committees (by CAMPAS, November 2021) • Use of data collection template for ICT committee members to record land claims by ICT members and non-members in O Chra, Sre Lvi, Sre Khtum, and Andoung Kraloeng (December 2021) • Incorporating adaptation to climate change into livelihood improvement for 4 CPA management committee members from Sre Preah, O Pung Rung, and O Mphek Lvie (by CPA Network, MoE, and Natural Resources Conservation Federation, December 2021)
Objective: Increased community engagement with and participation in REDD+ project Topics: Benefit sharing management, community development activity planning	• Financial management for 53 people from REDD+ committees across KSWS (June 2020) • Clearing expenses based on a monthly budget for 54 people from REDD+ committees across KSWS (July 2021) • Grievance mechanism and hotline to report illegal activity for 55 people in Pu Ngaol and Pu Keh (October 2021) • Roles and responsibilities of village focal points (VFPs) for 16 newly recruited VFPs (November 2021) • Budget advance and clearance for REDD+ benefit sharing funds for 63 members of REDD+ committees across 20 villages and village focal points (December 2021) • REDD+ performance-based payment scoring and grievance mechanism for 63 members of REDD+ committees across 20 villages and village focal points (December 2021) • Financial management, and writing reports and minutes for REDD+ fund management for 17 people in Pu Kong, O Chra, and Pu Char (December 2021)
Objective: Forest Estate demarcation Topics: Community land rights; legal framework; procedural steps and documentation; mapping methods; conflict resolution	• Workshop to develop national conflict resolution mechanisms for CPA and ICT establishment attended by committee members from Sre Preah and O Pung Rung CPAs and Andoung Kraloeng ICT (November 2020) • Preparing for land demarcation initiative by the state for 9 members of Pu Keh ICT committee (February, March 2021) • Land inventory methodology for 36 community members from Sre Lvi and O Chra (November 2021) • Land inventory methodology for 9 people (local authorities and ICT committee) in the Andoung Kraloeng ICT land inventory working group (December 2021)
Objective: Ecotourism Topics: Roles and responsibilities; legal framework; introduction to habituation data; tourist monitoring data; coordination with authorities; service provision and service standards	• Ongoing mentoring for gibbon guides at Jahoo in Andoung Kraloeng, including leading tours and improving English skills (by WHI) • Cleaning and cooking responsibilities for hospitality staff at Jahoo (by WHI, August 2020) • Overseeing staff and infrastructure development for Jahoo camp manager (by WHI, September 2020) • Collecting samples of wild animal feces at Jahoo for collaboration with Institut Pasteur on zoonotic disease monitoring (by Institut Pasteur and WHI, January 2021) • Intensive course on bird guiding for Jahoo guides (by SVC, November 2021) • Using KoBoToolbox to collect data on gibbon habituation for research assistants at Jahoo (November 2021)

Objective/Topics	Training Focus
Objective: Agricultural extension Topics: Product identification and value-chain; sustainability; pest and disease management; post-harvest storage and value adding; product marketing	• Ongoing training on increasing crop yield and respecting conservation regulations of IBIS Rice for participating farmers (by SMP) • Ongoing mentoring of farmers on demonstration plots to improve agricultural techniques including water retention, transplanting, and weed removal (by SMP) • Ongoing mentoring for IBIS Rice farmers on using diaries to record agricultural activities for organic certification (by SMP) • Complying with conservation regulations of IBIS Rice (by SMP, June 2020) • Producing dry compost, improving soil fertility, and natural fertilizers for IBIS Rice farmers (by SMP, August 2020) • Inspecting IBIS Rice farmers' fulfilment of requirements to participate in the scheme (by SMP, September 2020) • Pre- and post-harvesting techniques, including drying and threshing, and avoiding contamination, for 26 IBIS Rice farmers (by SMP, October−November 2020) • Improving soil fertility, maintaining water, and avoiding contamination by chemical run-off from neighboring fields for 11 IBIS Rice farmers (by SMP, June 2021) • Training of trainers on farmer diary completion for 20 Village Marketing Network (VMN) committee members (by SMP, July 2021) • Internal control system inspections for 7 VMN committee members (by SMP, August 2021)
Objective: NTFP-based livelihoods Topics: Sustainability and harvest management; value-adding; product marketing	• Natural treatment of harvested bamboo and production of handicrafts for 9 people from Sre Preah CPA (March 2020) • Operating machinery to improve quality of bamboo handicrafts for 14 people from Sre Preah CPA (August 2020) • Sustainable harvesting of fresh bamboo shoots for consumption for 21 people from Sre Preah CPA (October 2020) • Improving quality of bamboo products for 3 people from Sre Preah CPA (February 2021)
Objective: Awareness raising Topics: COVID-19, conservation engagement	• COVID-19 preventive measures for general public in Andoung Kraloeng (by Jahoo community staff, WHI, and primary school teachers) • Recruitment of 21 students from Phnom Penh, primary school teachers in KSWS, and members of communities in KSWS for conservation leadership mentoring (by Young Eco-Ambassadors, September 2020) • Delivering education on environmental conservation for primary school teachers in Andoung Kraloeng (by Kouprey Express, November 2021)

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." 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 complies with the law and with WCS' Equal Employment Opportunity Policy, 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 with 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 Human Resources 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 (e.g., cooks, drivers).

Education and experience are 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. 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 (2020–2021), the project provided 596 full-time equivalent positions, 68 of whom were to women. These full-time equivalent positions were within government, NGOs, and communities implementing project activities. The project is familiar with many of the female community members who may be suitable for project staff roles, approaching ad encouraging suitable candidates to apply. During interview processes, the recruitment panel is sensitive to gender issues and considers ways the role could be adapted to potential female candidates.

Natural resource management is traditionally a male dominated field for a number of reasons, with concerns around risky, physically intensive work with long periods away from home. A number of the positions within the project are seasonal with multi-day trips to the forest, including the support staff for the biodiversity monitoring program. These roles are often not attractive to women, who may have activities in their village and home which requires their presence. Traditional and cultural gender roles in this area and in Cambodia in general place expectations on women to be the main child carers.

Despite this the project succeeds in encouraging female employment and has doubled the number of female FTE roles since the last reporting period, with the proportion being 11.4% for this period. Comparing this to the national ranger force (less than 4% women) and to other Cambodian REDD+ projects, the efforts taken by the project to support female employment can be seen to be effective. Development of a gender equality strategy is planned for the next reporting period, which will expand and build on this further.

In addition to the HR and recruitment processes above, the project uses a combination of formalized policies protecting and normalizing women's roles in the workplace (such as the WCS Harassment Sexual Harassment Policy) and programs to encourage female participation (such as MOE promoting female rangers, https://phnompenhpost.com/national-post-depth/woman-ranger-risks-her-life-wildlife). The project also builds in processes to encourage female community representation (such as including indicators related to female representation in community leadership positions for the Cash For Communities program).

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, including the WCS Human Resources Manual, WCS Cambodia Vehicle Use and Safety Policy, WCS Code of Conduct, WCS Safeguarding Policy, and WCS Whistleblower Policy. These policies, and an example staff contract and translations of relevant sections of the Labor Law were provided separately to the auditors.

2.3.16 Occupational Safety Assessment (G3.12)

All project staff and counterparts enjoy the protection of WCS Health and Safety policies. In the 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.
- Project supervisors will monitor workplace risks, to identify any significant changes in the level of risk, which they will report to their line managers.
- A site health review was initiated in October 2021, with site visits in December 2021. The review is being conducted by International SOS, and assesses the capabilities of the local healthcare system in Mondulkiri, as well as potential health risks likely to be faced by WCS staff working in the Keo Seima Wildlife Sanctuary. The report also makes recommendations for reducing and mitigating health risks which will be integrated into project activities.

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). In 2020, the SOP on law enforcement patrols, including code of conduct and safety, was updated and is available in English and Khmer.
- 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 protective 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.

COVID-19

From January to October 2020, no local-transmission cases of COVID-19 were reported in Cambodia, only imported cases of infected travelers arriving in the country. In November 2020, the first local transmission was recorded, and additional restrictions were imposed. These restrictions changed month to month as caseloads rose and fell. Most restrictions were lifted in November 2021.

The project has complied with all national and provincial COVID-19 guidelines during the monitoring period, and WCS has also provided internal policies for project staff to ensure their safety and the safety of the communities in which the project works. The project has provided temperature testing and alcohol hand gel at all project office sites and for meetings which were permitted to take place. Project staff have followed mask mandates in meetings and at office sites. WCS provided rapid tests for staff with potential COVID-19 contact, and ongoing guidance and support to staff who were required to isolate.

To ensure risks are managed with the local communities with whom WCS works closely, the global WCS Rights and Communities Team produced specific guidance in “The COVID-19 Pandemic and Indigenous Peoples and Local Communities: Protecting People, Protecting Rights”.

An evolving set of guidelines following best practice have been produced and shared with staff, globally and nationally, to ensure staff and public safety during the COVID-19 pandemic. These documents have been made available to auditors.

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 2.4.

Table 2.4 Key skills required to implement the project

Objective	Key skills required	Main partners
#1: Key legal and planning documents for Keo Seima Wildlife Sanctuary and surrounding landscape are approved and implemented	Protected area management planning, coordination with senior government officials, understanding of private sector	MoE, WCS
#2: Forest and wildlife crime is reduced through direct law enforcement	Implementation of enforcement patrols, monitoring outcomes	MoE, WCS
#3: Land and resource use by local communities is sustainable	Participatory land-use planning, implementation of Land Law and Forestry Law, design of natural resource management systems	MoE, WCS
#4: Direct activities that support livelihoods and conservation awareness are active in each commune	Promotion of alternative livelihoods (tourism, agriculture, savings groups, adult education etc.)	MoE, WCS, SMP, CRDT, ELIE/EVP, WHI/Jahoo, other NGOs
#5: Information on long-term ecological and social trends of key indicators is available to support protected area management	Scientific monitoring (carbon measurement, wildlife and plant species, socio-economics)	MoE, WCS, and technical partners
#6: Effective administrative, accounting and logistical procedures are in place	Administration and accounting systems	MoE, WCS
#7: KSWS has long-term financial, social, and political security	Fundraising from traditional donors, management of REDD+ activities	MoE, WCS, WHI, other partners

The implementing organization and several of the implementing partners were 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 is 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 varies 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 staff 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. Technical capacity of MoE and the sub-national PdoE is maintained and enhanced through technical support and training as described in Table 2.2.

The project has regular meetings, including monthly and quarterly senior management meetings to strengthen the management of the KSWS. A provincial taskforce was established to strengthen law enforcement implementation for the KSWS. The provincial taskforce consists of the technical leadership and management of the Ministry of Environment (MoE), the sub-national provincial administration, and receives facilitation, coordination and technical support from WCS. The provincial taskforce aims to focus efforts to deepen the effective and sustainable management of natural resources of the KSWS. Its objectives are: 1) strengthen the roles/responsibility of the local authorities, line departments and concerned law enforcement stakeholders for better implementation of the law enforcement strategy and more sustainable use of the KSWS; 2) identify key activities to promote participation and collaboration between citizens/communities, commune authorities, district administrators, provincial governors, PdoE, and park rangers for the protection and management of natural resources in its jurisdiction; and 3) provide support and technical input, facilitation and coordination for the development of work-plans for implementation through quarterly meetings of high-level senior management of the provincial taskforce. Through this cross-stakeholder body, the project aims to increase accountability and address coordination challenges that have prevented the effective implementation of law enforcement measures across the KSWS, particularly with regards to the institutional support that community patrols require from PdoE.

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 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 and national technical advisors, field team members, volunteers, and Phnom Penh-based technical and administrative personnel. Technical advisors provide domain-specific expertise, including private sector engagement, biodiversity monitoring, law enforcement, community titling and development, community monitoring, research and REDD+. The 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.

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 MoE in the 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) aim to alleviate poverty, suffering, and injustice, and have worked in KSWS for several years, mostly in Andoung Kraloeung village. Here they have supported clean water systems, school-feeding programs, and responsible ecotourism.

The 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 has provided capacity building on community-based natural resource management for improving community livelihoods and conservation of natural resources and biodiversity.

Sansom Mlup Prey (SMP) is a Cambodian NGO that focuses on developing sustainable, organic, and wildlife-friendly agricultural systems in rural communities in Cambodia. Based on a successful program developed in northern Cambodia, SMP operates the IBIS Rice Program in KSWS, in partnership with their market-facing partner the IBIS Rice Conservation Company. The partnership provides a meaningful opportunity for rural households to earn living incomes, while discontinuing activities that are harmful to the environment. SMP provides agronomic support to farmers, which includes training and demonstrations on organic and wildlife-friendly standards and practices, and helps to conduct the required auditing and quality inspections to ensure organic compliance. Concurrently, IRCC provides a guaranteed buyer, marketing expertise, and premium international and domestic market access for rice produced according to these standards.

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 reports ending fiscal year 2020 and 2021 (WCS Consolidated Financial Statements and Schedules, 2020 & 2021[18]) demonstrates the financial stability of the organization, despite impacts

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

from COVID on zoo and aquarium visitation. Operating revenues for 2020 were USD 285.1 million, with expenditures exceeding revenue by USD 33 million, and in 2021 operating revenues were 415.9 million, exceeding expenses by 86 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. Recent substantial VCU sales from the project further secure the operating budget of both the project and WCS Cambodia.

2.4.4.1 Funds for Project Implementation

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

Donor funding for KSWS has been historically sufficient to maintain core operations, however recent substantial carbon revenues have helped to ensure the project's long term sustainability.

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 Royal Government of Cambodia (RGC) adopted an Anti-Corruption Law[19] in 2010 and the Anti-Corruption Unit (ACU)[20] was established to fight corruption across the country. The ACU has set up a complaint mechanism for citizens to report corruption cases through the following methods: 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 (088 926 1234) and project grievance boxes, which have been set up to prevent and deal with possible corruption and misuse of funds and are described in Section 2.3.12.

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 possible termination.

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[19] The Anti-Corruption Law is available at http://goo.gl/dkNDOI

[20] 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, at every level, and in all sectors across Cambodia.

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 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, or 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.

Based on the above, the project is confident that the project nor its staff are involved in or complicit in any form of corruption such as bribery, embezzlement, fraud, favoritism, cronyism, nepotism, extortion, and collusion

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

Carbon revenue details and the results of financial modeling are deemed commercially sensitive and provided separately to the auditor.

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 percent 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 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 Samdech 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 had 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 was 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. Objective 7 gave 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. The first such titles were issued in 2012–2013, and to date seven out of fifteen eligible villages have been provided with land titles by the government, while 8 others are still in the process of obtaining ICTs. The process has been delayed for longer than expected due in part to the complicated process of obtaining ICT approval, which involves procedures with five different government ministries. WCS is taking part in a review of the ICT approval process and its challenges, with the intention of providing recommendations to streamline the process in future. Six villages do not wish to obtain ICTs but have agreed to focus on community land-use planning and Community Protected Areas.

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 were secure, these areas were 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. The villages associated with these ICT areas nevertheless remain key target communities for the project.

Private title areas mapped and granted under Directive 001 (2012) were also removed from the Project Area before validation. The original intention of the Directive was to reduce conflict between communities and ELCs, but mapping took place in areas away from ELCs, and the process was used to obtain legal title to state public land within protected areas; approximately 3,396 ha of land in KSWS was given as private title.

Circulation 06 (2019), Measures and Criteria of Granting State Property to Citizens and Civil Servants, was intended to provide land allocations to those citizens and civil servants using state public land for 10 years (before 2015) or being poor or landless, which can be converted to land titles after 5 years. It is unclear if any land within KSWS has been allocated under this regulation.

An addition phase of private land titling was initiated by Prime Ministerial Proclamation on 3 July 2020 (Press Release 05, 2020), aimed to provide legal land titles to areas that have been traditionally owned and used in Protected Areas, but which were missed in previous titling processes. Intended to clarify ownership and reduce conflict, interpretation of this order was mixed, with discussion of a 10% target of protected areas to be awarded in some cases, and in others a limit of only land that has been occupied and developed since the issuance of Directive 001. Land measurement for this process is ongoing.

Note on areas with overlapping use rights with mining exploration licenses

During the monitoring period, mining exploration licenses for Preak Khlong and O'Khtung concessions were issued from the Ministry of Mines and Energy to Renaissance Minerals (Cambodia) Ltd, 23rd June 2020. These overlap with portions of both the project area and leakage belt. These licenses do not confer ownership rights, only limited use rights whilst the site remains under control of the project proponent.

Section 3 of the 2016 Sub-Decree 72 on *Management of Exploration and Industrial Mining Licenses* defines how mining exploration within protected areas can occur. The sub decree allows for limited exploration (<1000 tonnes removed) and necessary infrastructure for this exploration. Ownership and management rights remain with the Ministry of Environment, with the concessionaire needing permission from MOE for the license, as well as requiring sufficient measures to prevent environmental impacts in the protected area, written permission from the MOE for any activities that would be counter to the current management objectives of the site, and/or to fully rehabilitate any unavoidable damage. As such, control of the project area continues to remain with the project proponent.

Key sections from this sub-decree to consider are Article 10, 11, 37 and 43.

Issuance of a formal Industrial Mining License can only be issued upon submission and approval of technical, financial, environmental, social and economic analyses that determine the socio-economic feasibility of a mine. The license is issued in the form of a sub-decree. See the Mining Law of 2001, specifically Article 7 and 11.6.

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 CCB 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 percent State Public Land, 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 CCB 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 any involuntary relocations of legitimate and customary occupants of the area from either residential or agricultural land. However, recent 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 support for ICTs and CPAS, and through zonation by 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 zone i.e., strict protection, 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 the 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. Restriction of use falls within the CCB definition of relocation of activities, but this will not be an involuntary process. The proposed core zones have been placed to minimize the number of forest users affected following detailed and iterative consultations with potentially affected villages and/or families, including confirmation from those affected that the community, sustainable-use and conservation zones would be sufficient to meet all livelihood needs.

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 or rugged smartphones 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 or smartphone 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.

Communities are able to directly protect their property rights through community patrols, which are supported by PDOE rangers as needed. Community patrol representatives are invited to participate in the KSWS monthly management meetings to discuss the support and interventions needed from PdoE to facilitate these community patrols.

2.5.4 Identification of Illegal Activity (G5.4)

Illegal activities drive many of the threats to climate, biodiversity, and community well-being in the baseline scenario and include, as described in other sections: illegal logging; illegal land clearance, issuance of false land titles/land claims; illegal poaching and bushmeat selling; and illegal or unethical use of project funds.

The project has been explicitly designed to address them (Section 2.1.1 and 2.2.1). 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.

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 have been put in place to ensure that project funds are not used to promote illegal activities. For activities directly implemented by the project proponent or lead implementing partner, internal safeguards include financial control systems and audits, with budgetary oversight from regional and global offices in the case of the implementing partner. Project planning processes include a review of proposed activities to identify any that may directly or indirectly promote illegal activities. For funding provided to other stakeholders, review of proposed activities also takes place. Sub-grant proposals by project partners are reviewed separately by a team of around five, with any concerns around legality raised during review. During implementation, partners sign agreement and submit to financial review and monitoring by project staff. Proposed activities under the Cash For Communities program are also reviewed by project teams, and financial guidelines and accounting processes ensure funding is used for only the approved activities.

2.5.5 Ongoing Disputes (G5.5)

Land rights and land tenure is a significant issue across Cambodia. A key strategy of the project is to support processes to address this and reduce disputes, through ICTs, CPAs, protected area zonation, and supporting dispute resolution processes. Successes during the monitoring period are summarized in Section 2.2.1.

Even with a clear legal basis, some disputes arise between community members or outsiders seeking land within the project zone, the most significant example being an external land claim within the O Rona ICT in 2015, which was ultimately taken to the Cambodian Supreme Court before being resolved in favor of the community. Land disputes between community members are typically solved through arbitration by traditional process, and where this fails, by government authorities, first at a village level, and later at a commune level if unresolved. Ultimately, cases can reach the courts if arbitration fails. Project support in these processes includes preparing documentation and facilitating communities through the process, which can ultimately call on several ministries to defend the ICT rights, including the Ministry of Interior, the Ministry of Land Management, Urban Planning and Construction, and MoE.

The ongoing illegal land clearing by recent migrants and some community members by recent migrants or some community members can also lead to some level of conflict with the law enforcement teams charged with enforcing existing zoning regulations, including during the monitoring period. In almost all cases of conflict the clearance is outside of permissible zones. Where a conflict emerges in permissible areas the project works with the law enforcement teams to clarify allowable use and community members are allowed to continue to use the land. The project has worked extensively with local communities to clearly identify land-use zones and boundaries, including efforts to clarify permissible land-uses consistent with both customary and legal protections. In doing so, communities have the evidence base and knowledge to demonstrate tenure over areas where expansion and use is permissible and therefore there is no potential for the project to prejudice any decision or outcome of a dispute through its activities.

2.5.6 National and Local Laws (G5.6)

The project is in compliance with all national and local laws and regulations in the host country that are relevant to the project activities. In order to be granted permission to operation under Article 21 and Article 22 of the 2015 Law on Associations and Non-Governmental Organizations, NGOs must in

compliance with all existing national laws and regulations. The continued license to operate held by all NGO project partners is demonstration of their compliance with these laws and regulations.

These include:

National laws

- Constitution of Cambodia (1993).
- Protected Area Law (2008)
- Land Law (2001).
- Forestry Law (2002).
- Labor Law (1997).
- Sub-decree #146 on Economic Land Concessions (2005).
- Sub-decree # 118 on State land Management (2005).
- Sub-decree #83 on Procedures for the Registration of Land of Indigenous Communities (2009).
- Sub-decree #143 on Establishment of Seima Protected Forest and Biodiversity Conservation Area (2009).
- Sub-decree # 83 on Establishment of Keo Seima Wildlife Sanctuary (2016).

Local laws and regulations

- Forest Policy (2002).
- Declaration on the Establishment of Seima Biodiversity Conservation Area in Samling Forest Concession in Mondul Kiri and Kratie Provinces (2002).
- Sar Chor Nor #699 on the designation of the Forestry Administration as the representative of Royal Government of Cambodia to execute the sale of Cambodia forest carbon with consultation within the TWG-F&E (2008).
- Sor Chor Nor #606 on the approval to allow the Ministry of Environment to implement the Reducing Emissions Deforestation and Forest Degradation (REDD+) project in Seima Protected Forest and Biodiversity Area (Seima REDD+ Project) (2016).
- National Forest Program 2010 –2029 (2010).
- Cambodia REDD+ National Roadmap (2011).
- Directive 001 (2012) on the Titling of Lands in Land-conflict Areas.

During this monitoring period, a number of laws and regulations were enacted to prevent the spread of COVID-19. The KSWS REDD+ project acted in compliance with these, and in some cases where local context was significant, enacted more cautious internal policies to reduce risks to local communities and project staff. Typical responses include work from home policies, limits to group size, mask requirements, and selecting outdoor venues. Access to vaccinations for project staff was facilitated.

Copies of the laws and regulations given below are provided in the supporting documents.

COVID-19

- Sub-decree No. 88 on the implementation of the cash assistance program for poor and vulnerable families during the COVID-19 pandemic

- Notification No. 1123 on the implementation of the Royal Government's regulations on travel restrictions in the country for the purpose of preventing the spread of COVID-19
- Government's order No. 02 on the travelling restriction within the country to prevent the spread of COVID-19
- Decision No. 39 of the government on the change of the order No. 02 on the travel restriction across the country to prevent the spread of the COVID-19 pandemic
- Notification No. 012 on the suspension of 2020 Khmer New Year Holiday
- Instruction on enforcement of the implementation of social safety measures in accordance with the guidelines of the Royal Government and the Ministry of Health to reduce the risk of spreading COVID-19 disease during the upcoming holidays
- Instruction No. 039 on the Procedure of 14 Days Self-imposed Quarantine for Preventing and Combating COVID-19 Disease
- Circular No.01 on measures to prevent and control the outbreak of COVID-19

Other

- Notification No. 001 on the opening of mining concession areas for applying for mineral exploration licenses
- Announcement of mining exploration licenses for Preak Khlong and O'Khtung concessions, from the Ministry of Mines and Energy to Renaissance Minerals (Cambodia) Ltd, 23rd June 2020
- Circulation 06 (2019), Measures and Criteria of Granting State Property to Citizens and Civil Servants
- Press Release 05 (2020), Prime Ministerial Proclamation, Press Release on the Outcome of the Plenary Session of the Council of Ministers July 3, 2020

The mining exploration licenses do not confer ownership rights and grant only limited use rights whilst the site remains under the control of the project proponent as described in more detail in Section 2.5.1.

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, including two additional baseline extension years as described in MR 3.2.1.5
Value applied	See Table 5.3.3 of the PD and Table 3.14 of the MR
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), with additional explanatory text for the baseline extension in MR 3.2.1.5.
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, including two additional baseline extension years as described in MR 3.2.1.5
Value applied	See Table 5.3.2 of the PD and Table 3.13 of the MR

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), with additional explanatory text for the baseline extension in MR 3.2.1.5.
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, including two additional baseline extension years as described in MR 3.2.1.5
Value applied	See Table 5.3.1 of the PD and Table 3.12 of the MR
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, with additional explanatory text for the baseline extension in MR 3.2.1.5.
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, including two additional baseline extension years as described in MR 3.2.1.5
Value applied	See Table 5.3.7 of the PD and Table 3.14 of the MR
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, with additional explanatory text for the baseline extension in MR 3.2.1.5..
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, including two additional baseline extension years as described in MR 3.2.1.5
Value applied	See Table 5.3.6 of the PD and Table 3.13 of the MR
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, with additional explanatory text for the baseline extension in MR 3.2.1.5.
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), including two additional baseline extension years as described in MR 3.2.1.5
Value applied	See Table 5.3.5 of the PD and Table 3.12 of MR
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, with additional explanatory text for the baseline extension in MR 3.2.1.5.
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. With addition of manually digitized areas under the approved deviation given in Section 2.2.2, *Addition of hand-digitized areas of deforestation*
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 and 28 February 2022
Monitoring equipment	n/a
QA/QC procedures to be applied	Accuracy assessment using confusion matrix, reporting overall accuracy, users accuracy, producers accuracy, and kappa, inclusion of manually digitized areas under the approved deviation given in Section 2.2.2, *Addition of hand-digitized areas of deforestation*
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 = π × (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	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: 56.34% Fburnt DF: 52.97%
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 Forest Carbon Technical Advisor. 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.

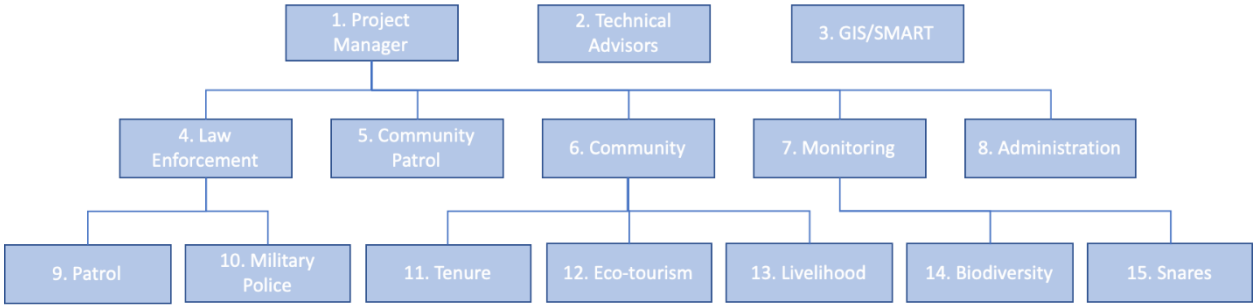


Figure 3.1 Organizational structure of KSWS project staff

Monitoring of carbon stock changes and GHG emissions is led by the WCS GIS Team, who access remote sensed data, produce land cover classifications and other GIS services. In this period, as the Spatial Analytics Officer who leads this work left WCS shortly before the activity data was due to be produced, they were engaged in a consultancy contract to generate the activity data. This ensured consistency and timeliness of results. Independent accuracy assessment was conducted by a WCS GIS officer. These data are then provided to the Forest Carbon Technical Advisor who uses them to calculate carbon stock changes for the monitoring period. Details of this process are provided in the sections below.

3.1.3.2 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 2016-2017 and 2018 – 2019 verifications. 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 3.1).

Table 3.1 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	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
Landsat 8 OLI	125-051	28 February 2022	First suitable image after 2020 rainy season
Landsat 8 OLI	125-052	28 February 2022	First suitable image after 2020 rainy season

The satellite monitoring period is 23 February 2020 to 28 February 2022.

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 Landsat 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 2022

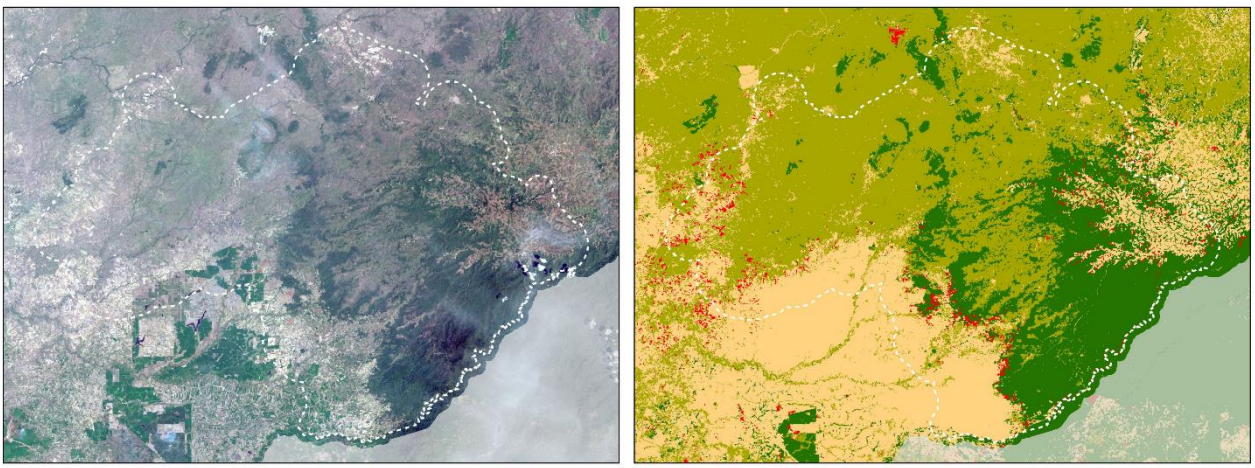


Figure 3.2 Landsat 8 image from 28 February 2022 on left and classification on right. Project Zone shown as white line. Classes shown are Dense Forest (dark green), Open Forest (olive green), and Non-Forest (light tan). Deforestation during the monitoring period shown in red.

imagery. Cloud areas were verified by Sentinel-2 imagery which was acquired in the same month as the 2022 imagery to identify what forest cover type were obscured in the 2022 Landsat image.

Classification accuracy was assessed using an error matrix (Table 3.3) 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 3.2). The 10 m resolution imagery is from an ESA Sentinel-2 satellite, with an overpass date of 28 February 2022 (Figure 3.3).

Figure 3.3 Example of Sentinel-2 imagery (acquired on 28 February 2022). Dense Forest, Open Forest, and Non-Forest are all readily identifiable.

Table 3.2 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	142	28.4%	28.4%
OF	245	49.0%	49.0%
NF	102	20.4%	20.4%
CH	11	2.1%	2.2%
N	**500**		

Table 3.3 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	142	1	0	0	99.3%
OF	0	241	2	0	99.2%
NF	0	2	99	1	97.1%
CH	0	1	1	10	83.3%
Users	100.0%	98.4%	97.1%	90.9%	**98.4%**

Overall Accuracy	
Users	96.60%
Producers	94.73%
Kappa	97.49%

3.1.3.3 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 fuel-wood collection or charcoal production occurred. No catastrophic natural disturbances occurred in the respective project and leakage areas. 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 3.4 shows fire counts from MODIS from 2006 onwards.

The incidence of fires has progressively increased since 2006 (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 3.4 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	2020	2021
75	20	63	69	54	39	28	69	77	59	105	81	109	114	99	95

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 2376 hectares of deforested area in which fires were detected within the project area during the monitoring period.

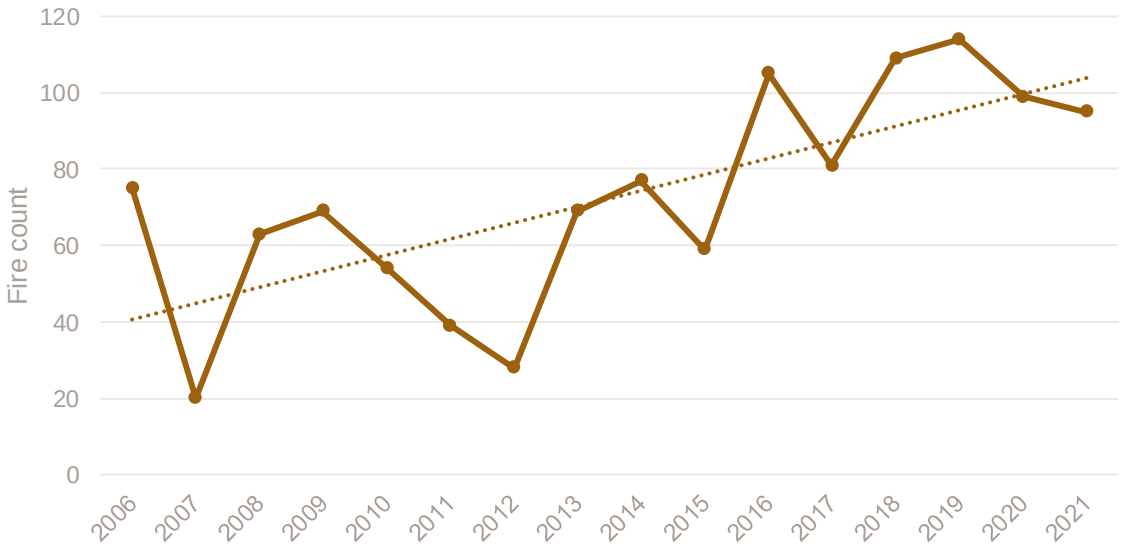


Figure 3.4 Fire frequencies from 2006 to 2021

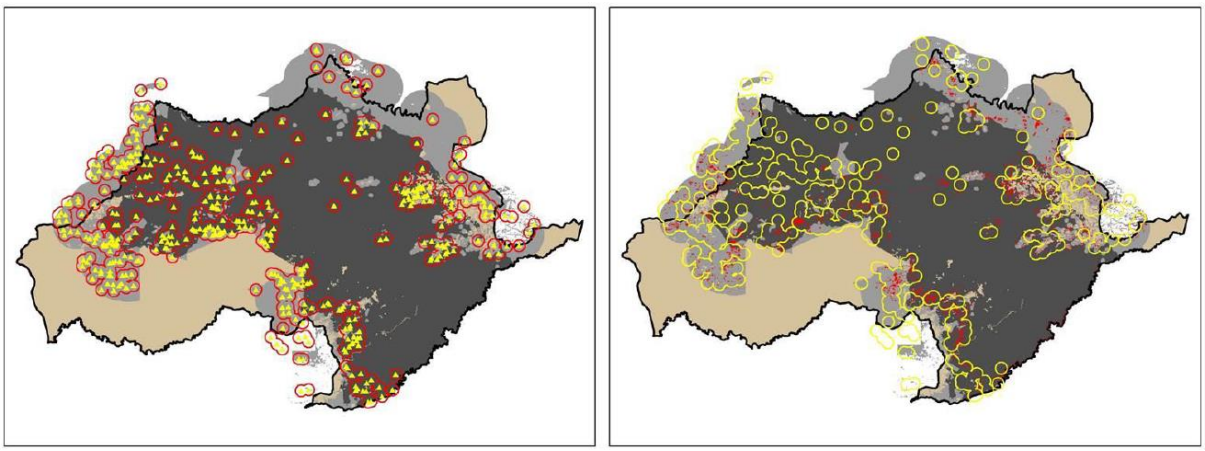


Figure 3.5 Left: Fire occurrences (yellow triangles) detected by MODIS-FIRMS during the monitoring period, buffered by 1 km (red circles). Right: Deforested areas (red) within burn zones (yellow circles).

Using Equations 11, 12, and 13 of the Methodology we calculate that there was 43,088 tCO_2e of non-CO_2 emissions in the Project Area during the monitoring period. For this same period, we calculate 2,801,085 tCO_2e emissions from deforestation in the Project Area. At 1.54% 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 3.5 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)	56.34%	Remote sensing, GIS
% Deforestation Area Burnt (Open Forest)	52.97%	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)	265	IPCC default (AR5)
Global Warming Potential (CH_4)	28	IPCC default (AR5)
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 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.

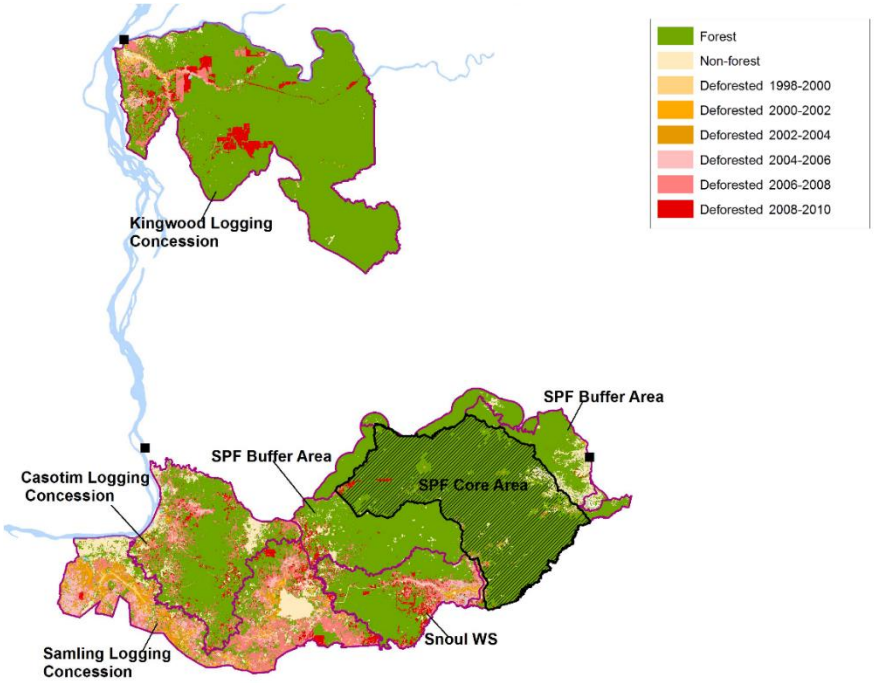


Figure 3.6 Deforestation over reference region from 1998 to 2010

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 3.6), and the relative contribution of these agents to historic deforestation (Table 3.7).

Table 3.6 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 3.7 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 3.8 summarizes key proximate driver variables that affect the rate of deforestation in the Reference Region, while Table 3.9 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 3.8, in this case, are based on qualitative sources and are provided mainly for illustration.

Table 3.8 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 3.9 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 3.9 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 3.10. 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 3.10 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

The original validated baseline was projected for 10 years from 2010 to 2019, following guidance in 1.2.3 and 1.1.1.5 of VM0015. Cambodia is moving towards a jurisdictional and nested REDD+ program, and the KSWS REDD+ project intends to nest within this using a national Forest Reference Emissions Level (FREL). This process was aimed to be completed in 2022. As such, the project requested an exemption to extend the use of the initial baseline without the need to reassess it until 31 December 2021 (letter from Colin Moore, Regional Carbon Advisor – Mekong, WCS, to Verra Secretariat, 25 May 2021). This exemption request was approved by Verra in August 2021 (letter from Tanushree Bagh Mukherjee, Senior Program Manager, Verra Programs to Colin Moore, dated 02 August 2021). As such the94escryiption below of the projected baseline includes references to analyses done at validation for the project's first ten-year baseline period, as well as additional analysis conducted for this monitoring period to develop the baseline values for project years 11 and 12.

For the projection of the annual areas of baseline deforestation in the Reference Region (VM0015 Substep 4.1.2.1), Approach "b": Time function was used. 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 (see Figure 3.7 which includes the two additional baseline years representing years 11 and 12). 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 including the calculation of the areas of Aoptimal and Aaverage.

As explained in Annex 4.1 of the PD, the parameter t-optimal was achieved in year 9 of the project's baseline. At this point the project fixes $ABSLRR_{i,t}$ to the amount in the year in which t-optimal was achieved. Subsequently, the project must determine when t-average is achieved equating to the year in which $Aaverage_i$ is exhausted. As shown in Table 3.11 this was determined to occur in year 11. As such, for all years after this, the project must assume a linear decrease of ABSLRRi,t down to zero over 20 years using equation 7 of the VM0015 reproduced below:

$$ABSLRR_{i,t} = ABSLRR_{taverage,i} (1 – 1/20 * (t – taverage_i))$$

Table 3.11 Application of the cap on deforestation related to the availability of optimal and average land. This table builds off Table 2 in Annex 4.1 of the PD.

Annual projections and inclusion of caps												
Years from 1998	**Year Project Period**	**Parity**	**Predicted annual defor (uncapped)**	**Cumulative predicted deforestation**	**Applicable optimal land**	**t optim achieved**	**Applicable average land**	**t average achieved**	**Capped annual deforestation predicted after t optim. And t average**	**Capped estimates of predicted defor.**	**Capped estimates of sum. Defor.**	**Capped estimates of bi annual defor**
			ha	**ha**	**ha**		**ha**	**ha**	**ha**	**ha**	**ha**	**ha**
13	1	Odd	17,248	17,248	178,416		77,716			17,248	17,248	
14	2	Even	17,248	34,495	178,416		77,716			17,248	34,495	34,495
15	3	Odd	19,460	53,956	177,085		60,212			19,460	53,956	
16	4	Even	19,460	73,416	177,085		60,212			19,460	73,416	38,921
17	5	Odd	21,673	95,089	177,085		60,212			21,673	95,089	
18	6	Even	21,673	116,763	177,085		60,212			21,673	116,763	43,347
19	7	Odd	23,886	140,649	177,085		60,212			23,886	140,649	
20	8	Even	23,886	164,535	177,085		60,212			23,886	164,535	47,772
21	9	Odd	26,099	190,634	177,085	**t optim**	60,212		26,099	26,099	190,634	
22	10	Even	26,099	216,733	177,085		60,212		26,099	26,099	216,733	52,198
23	11	Odd	28,312	245,044	177,085		60,212	**t average**	26,099	26,099	242,831	
24	12	Even	28,312	273,356	177,085		60,212		24,794	24,794	267,625	56,623

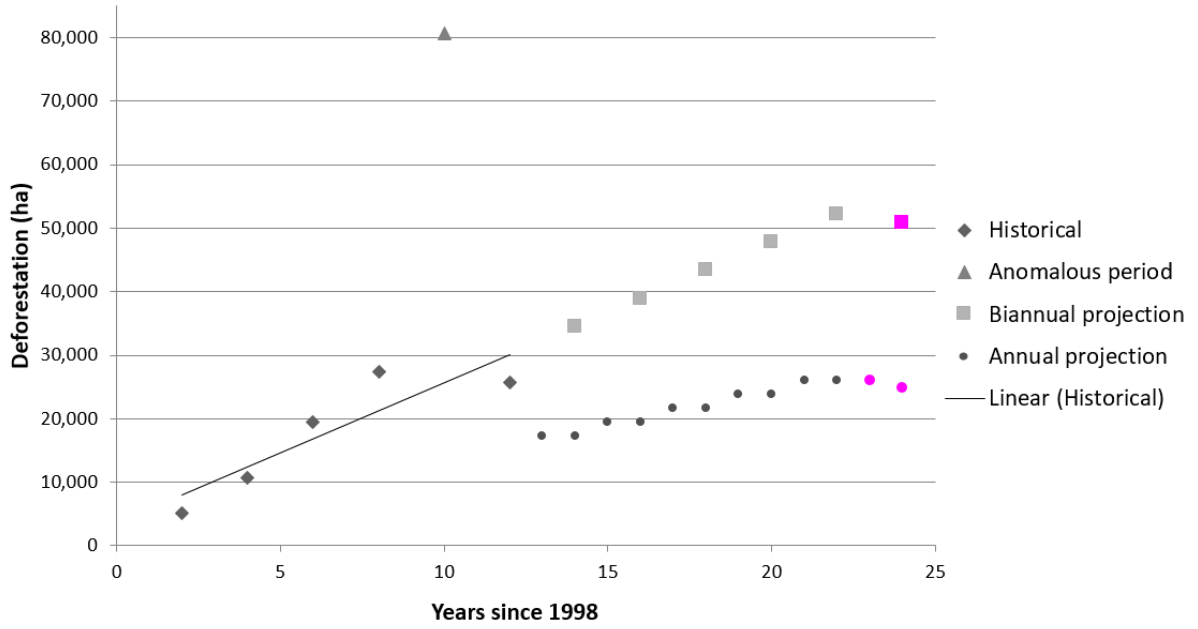


Figure 3.7 Modelled deforestation 2010–2021 in comparison to observations from the historical reference period. Extension period in pink demonstrating a continuation in year 11 (during which $t_{average}$ is achieved) and followed by a decline in year 12.

To spatially predict the location of deforestation in the Reference Region for the two-year baseline extension, the same generalized linear model (GLM) using spatially explicit deforestation risk explanatory variables used for the PD was re-run with the updated annual capped deforestation values for the reference region for years 11 and 12. The same environmental scientist who conducted this analysis for the PD was hired to do this for the baseline extension. All of the same input parameters and approaches employed to build the model of deforestation risk were kept for the baseline re-run thus ensuring continuity in the prediction of deforestation across the Reference Region. A full description of the model and its parametrization can be found in Annex 4.2 of the PD.

The annualized predictions of deforestation from the validated baseline were firstly retabulated to confirm consistency with the PD values. Two years of the original baseline were then remodeled to validate continuity between the original and extended projection process, with maximum differences of projected deforestation within the Project Area of less than 0.3%. These *de minimis* differences are likely caused by the change in software versions over the decade since the first model was run.

Upon confirmation that the model performed entirely consistently with the validated PD baseline, the reference region deforestation rates calculated in Table 3.11 for years 11 and 12 were inputted to predict deforestation across the reference region and generate the baseline activity data for the project area and leakage belt. The results of this modeling are presented in Figure 3.7, Table 3.12, Table 3.13 and Table 3.14. The two latter tables show annual deforestation in the project area and leakage belt, and from these it can be seen there is an increase in deforestation rate in both areas for years 11 and 12 compared to year 10. This is due to the nature of the progression of the spatial prediction of deforestation. As the baseline model is iterative, annualized, and spatially explicit, it is able to capture the effects of dynamics observed across Cambodia and in the reference region. Unplanned, mosaic deforestation driven by smallholders typically occurs at the boundary between forested and deforested areas, with this boundary then progressing across a landscape year on year as a frontier. Distance to nearest historical deforestation is a highly predictive and widely used covariate for future deforestation, with additional factors such as slope, road access, and forest type also influencing the progression of the frontier. Towards the end of the initial ten-year baseline, this frontier reaches Keo Seima Wildlife Sanctuary and in the baseline extension period continues on into the leakage belt and project area, especially in the west and concentrated in the open forest; ~95% of the extension period leakage belt

deforestation occurs within the open forest. This is to be expected as the majority of the remaining forest within the wider reference region available to be deforested in years 11 and 12 lies within the project area and leakage belt, as can be seen visually in Figure 3.8.

The outputs of the model have been provided to the auditor separately to confirm consistency with the model developed for the PD.

Table 3.12 Annual area of baseline deforestation in the Reference Region.

	Area deforested per class within the Reference Region		**Total baseline deforestation in the Reference Region**	
ID	**Fd**	**Fo**	**$ABSLRR_{1,t}$**	**ABSLRR**
Name	**Dense forest**	**Open forest**	**annual**	**cumulative**
Project year [t]	**ha**	**ha**	**ha**	**ha**
1	9,466	7,700	17,165	17,165
2	10,107	7,072	17,179	34,344
3	10,882	8,523	19,405	53,749
4	14,432	5,001	19,433	73,182
5	12,954	8,687	21,641	94,823
6	13,726	7,921	21,647	116,470
7	12,393	11,460	23,853	140,323
8	10,641	13,208	23,848	164,171
9	11,556	14,513	26,069	190,240
10	8,622	17,437	26,059	216,299
11	9,330	16,765	26,095	242,394
12	11,145	13,648	24,793	267,187

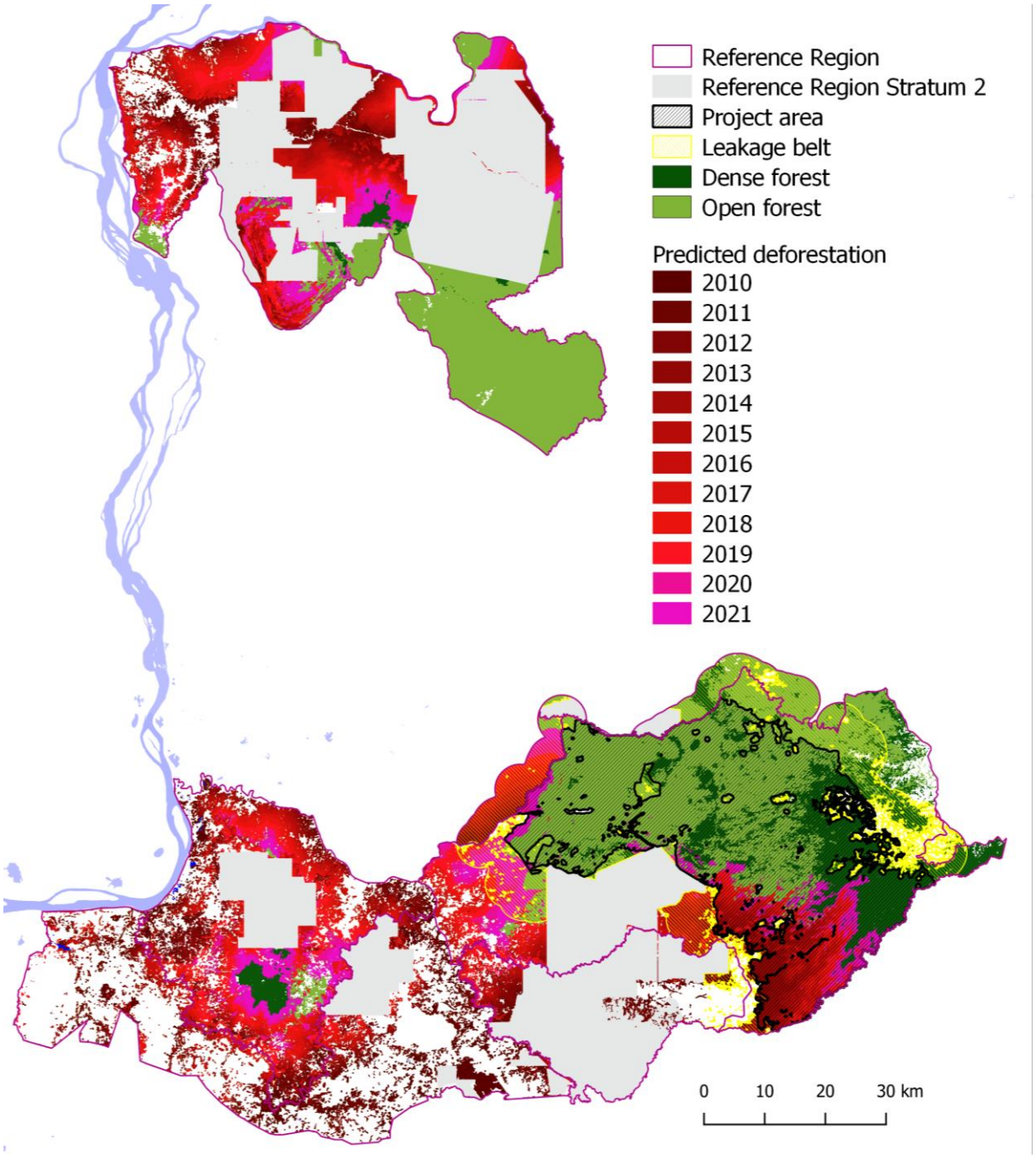


Figure 3.8 Total projected deforestation over the Project Area from 2010–2021.

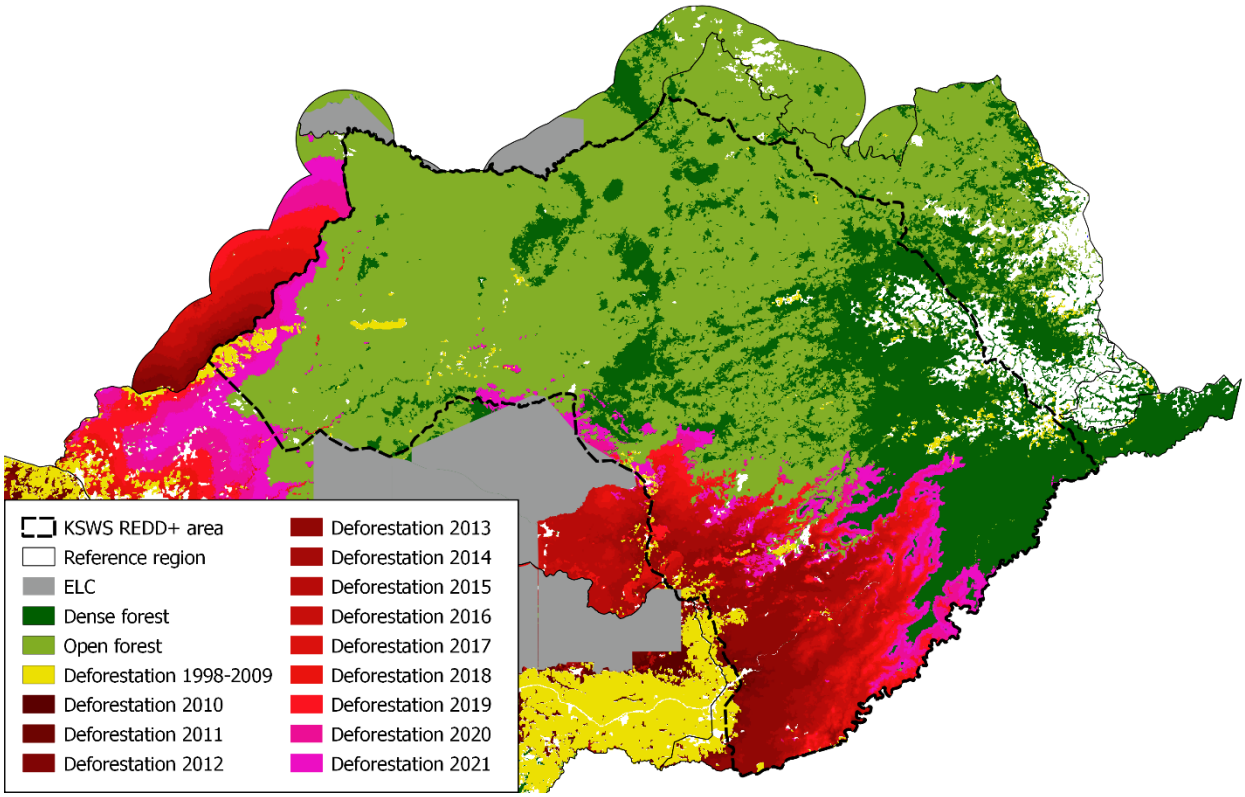


Figure 3.9 Total projected deforestation over the Project Area from 2010–2021.

Table 3.13 Annual area of baseline deforestation in the Project Area.

	Area deforested per class within the project area		Total baseline deforestation in the project area	
ID	**Fd**	**Fo**	**$ABSLPA_{1,t}$**	**ABSLPA**
Name	**Dense forest**	**Open forest**	**annual**	**cumulative**
Project year [t]	**ha**	**ha**	**ha**	**ha**
1	0	0	0	0
2	130	0	130	130
3	663	0	663	793
4	6,956	18	6,975	7,768
5	4,897	63	4,959	12,727
6	3,477	129	3,606	16,333
7	3,432	168	3,601	19,934
8	2721	148	2,869	22,803
9	2,500	163	2,663	25,466
10	2,546	291	2,838	28,304
11	3,437	1,056	4,493	32,797
12	3,657	2,220	5,877	38,674

Table 3.14 Annual area of baseline deforestation in the Leakage Belt.

	Area deforested per class within the leakage belt		Total baseline deforestation in the leakage belt	
ID	**Fd**	**Fo**	**$ABSLLK_{1,t}$**	**ABSLLK**
Name	**Dense forest**	**Open forest**	**annual**	**cumulative**
Project year [t]	**ha**	**ha**	**ha**	**ha**
1	935	1	936	936
2	452	4	456	1,392
3	698	818	1,516	2,908
4	2,094	1,033	3,127	6,035
5	1,118	1,163	2,281	8,316
6	3,071	1,105	4,176	12,492
7	891	1,513	2,404	14,896
8	323	1,797	2,120	17,016
9	148	1,764	1,912	18,928
10	174	2,466	2,640	21,569
11	143	4,299	4,442	26,010
12	261	4,437	4,697	30,708

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 3.15 through Table 3.17.

The baseline carbon stock changes in the initial forest classes in the leakage belt during the monitoring period are shown in Table 3.15 through Table 3.20.

Table 3.15 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		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	2	ΔCabBSLPA [icl,t]	ΔCabBSLPA [icl,t]		ID[cl]>	1	ΔCabBSLPA [icl,t]	ΔCabBSLPA [icl,t]	ΔCabBSLPA [t]	ΔCabBSLPA
	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	(98,683)	(13)	(98,696)	(98,696)	2	t* + 1	705	705	705	(97,991)	(97,991)
3	t* + 2	(504,363)	(81)	(504,445)	(603,141)	3	t* + 2	4,307	4,307	5,011	(500,138)	(598,129)
4	t* + 3	(5,291,640)	(6,704)	(5,298,344)	(5,901,485)	4	t* + 3	42,184	42,184	47,195	(5,256,160)	(5,854,289)
5	t* + 4	(3,724,999)	(22,845)	(3,747,844)	(9,649,329)	5	t* + 4	69,117	69,117	116,313	(3,678,727)	(9,533,016)
6	t* + 5	(2,645,165)	(46,953)	(2,692,118)	(12,341,447)	6	t* + 5	88,700	88,700	205,013	(2,603,418)	(12,136,434)
7	t* + 6	(2,611,043)	(61,470)	(2,672,513)	(15,013,959)	7	t* + 6	108,255	108,255	313,268	(2,564,258)	(14,700,692)
8	t* + 7	(2,070,119)	(53,837)	(2,123,956)	(17,137,916)	8	t* + 7	123,835	123,835	437,103	(2,000,121)	(16,700,813)
9	t* + 8	(1,901,824)	(59,364)	(1,961,189)	(19,099,104)	9	t* + 8	138,296	138,296	575,398	(1,822,893)	(18,523,706)
10	t* + 9	(1,936,896)	(106,394)	(2,043,290)	(21,142,394)	10	t* + 9	153,706	153,706	729,105	(1,889,583)	(20,413,289)
11	t*+10	(2,614,691)	(385,464)	(3,000,155)	(24,142,549)	11	t*+10	178,108	178,108	907,213	(2,822,047)	(23,235,336)
12	t*+11	(2,781,985)	(810,195)	(3,592,180)	(27,734,729)	12	t*+11	209,319	209,319	1,116,532	(3,382,861)	(26,618,198)

Table 3.16 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	
	ID[cl]>	1	2	ΔCbbBSLPA [icl,t]	ΔCbbBSLPA [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	(2,171)	(0)	(2,171)	(2,171)
3	t* + 2	(13,267)	(2)	(13,269)	(15,440)
4	t* + 3	(129,680)	(149)	(129,829)	(145,269)
5	t* + 4	(211,628)	(652)	(212,279)	(357,549)
6	t* + 5	(269,820)	(1,684)	(271,504)	(629,053)
7	t* + 6	(327,261)	(3,036)	(330,297)	(959,350)
8	t* + 7	(372,802)	(4,220)	(377,022)	(1,336,372)
9	t* + 8	(414,641)	(5,525)	(420,167)	(1,756,539)
10	t* + 9	(457,252)	(7,865)	(465,117)	(2,221,656)
11	t*+10	(514,774)	(16,342)	(531,115)	(2,752,772)
12	t*+11	(573,805)	(34,158)	(607,963)	(3,360,734)

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	
	ID[cl]>	1	ΔCbbBSLPA [icl,t]	ΔCbbBSLPA [icl,t]
	Name>	Mixed Crop	Annual	Cumulative
Project Year *t*		$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$
0		-	-	-
1	t*	-	-	-
2	t* + 1	176	176	176
3	t* + 2	1,077	1,077	1,253
4	t* + 3	10,546	10,546	11,799
5	t* + 4	17,279	17,279	29,078
6	t* + 5	22,175	22,175	51,253
7	t* + 6	27,064	27,064	78,317
8	t* + 7	30,959	30,959	109,276
9	t* + 8	34,574	34,574	143,850
10	t* + 9	38,427	38,427	182,276
11	t*+10	44,527	44,527	226,803
12	t*+11	52,330	52,330	279,133

Total net C stock change in below-ground biomass of the Project Area	
ΔCbbBSLPAt	ΔCbbBSLPA
Annual	Cumulative
$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$
-	-
-	-
(1,995)	(1,995)
(12,192)	(14,187)
(119,283)	(133,470)
(195,000)	(328,470)
(249,329)	(577,799)
(303,233)	(881,033)
(346,064)	(1,227,097)
(385,593)	(1,612,690)
(426,691)	(2,039,380)
(486,588)	(2,525,968)
(555,633)	(3,081,601)

Table 3.17 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)
11	t*+10	(195,804)	(5,937)	(201,740)	(1,046,392)	11	t*+10	43,160	43,160	219,842	(158,580)	(826,550)
12	t*+11	(218,257)	(12,409)	(230,666)	(1,277,058)	12	t*+11	50,724	50,724	270,566	(179,942)	(1,006,492)

Table 3.18 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)
11	t*+10	(108,808)	(2,202,144)	(2,310,952)	(15,820,224)	11	t*+10	110,515	110,515	571,039	(2,200,437)	(15,249,184)
12	t*+11	(198,277)	(2,272,869)	(2,471,146)	(18,291,370)	12	t*+11	129,208	129,208	700,247	(2,341,938)	(17,591,122)

Table 3.19 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)
11	t*+10	(152,468)	(179,989)	(332,457)	(1,842,050)
12	t*+11	(149,273)	(229,962)	(379,235)	(2,221,285)

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)
11	t*+10	27,629	27,629	142,760	(304,828)	(1,699,290)
12	t*+11	32,302	32,302	175,062	(346,933)	(2,046,223)

Table 3.20 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*	(5,951)	(4)	(5,956)	(5,956)	1	t*	961	961	961	(4,995)	(4,995)
2	t* + 1	(8,826)	(25)	(8,851)	(14,807)	2	t*+1	1,430	1,430	2,391	(7,422)	(12,416)
3	t* + 2	(13,266)	(3,874)	(17,139)	(31,947)	3	t*+2	2,986	2,986	5,377	(14,153)	(26,569)
4	t* + 3	(26,596)	(8,733)	(35,329)	(67,275)	4	t*+3	6,198	6,198	11,576	(29,130)	(55,700)
5	t* + 4	(33,710)	(14,205)	(47,915)	(115,191)	5	t*+4	8,541	8,541	20,117	(39,374)	(95,074)
6	t* + 5	(53,259)	(19,402)	(72,662)	(187,852)	6	t*+5	12,830	12,830	32,947	(59,831)	(154,905)
7	t* + 6	(58,929)	(26,518)	(85,447)	(273,300)	7	t*+6	15,299	15,299	48,247	(70,148)	(225,053)
8	t* + 7	(60,988)	(34,970)	(95,958)	(369,258)	8	t*+7	17,477	17,477	65,724	(78,481)	(303,534)
9	t* + 8	(61,927)	(43,269)	(105,197)	(474,454)	9	t*+8	19,441	19,441	85,164	(85,756)	(389,290)
10	t* + 9	(63,035)	(54,871)	(117,905)	(592,360)	10	t*+9	22,153	22,153	107,317	(95,753)	(485,043)
11	t*+10	(57,994)	(75,085)	(133,079)	(725,439)	11	t*+10	25,754	25,754	133,071	(107,325)	(592,368)
12	t*+11	(56,779)	(95,932)	(152,710)	(878,149)	12	t*+11	30,110	30,110	163,180	(122,601)	(714,969)

Table 3.21 Total net baseline carbon stock change in the project area before accounting for leakage

	Total ex ante baseline carbon stock change		Total ex post net actual carbon stock change		Total net carbon stock change	
	annual	cumulative	annual	cumulative	annual	cumulative
Project yr	ΔCtotBSLPAt	ΔCtotBSLPA	ΔCtotEXPPAt	ΔCtotEXPPA	ΔCPSPAt	ΔCPSPA
t	tCO_2e	tCO_2e	tCO2e	tCO2e	tCO_2e	tCO_2e
1	-	-	(79,584)	(79,584)	(79,584)	(79,584)
2	(100,641)	(100,641)	(80,941)	(160,525)	19,701	(59,883)
3	(516,334)	(616,975)	(82,298)	(242,822)	434,036	374,153
4	(5,414,601)	(6,031,576)	(506,539)	(749,361)	4,908,063	5,282,215
5	(3,937,711)	(9,969,287)	(516,049)	(1,265,410)	3,421,662	8,703,878
6	(2,934,495)	(12,903,782)	(525,559)	(1,790,968)	2,408,936	11,112,814
7	(2,966,841)	(15,870,623)	(447,323)	(2,238,291)	2,519,518	13,632,332
8	(2,459,511)	(18,330,134)	(455,033)	(2,693,324)	2,004,479	15,636,811
9	(2,334,697)	(20,664,831)	(1,154,270)	(3,847,594)	1,180,427	16,817,237
10	(2,455,808)	(23,120,639)	(1,170,886)	(5,018,481)	1,284,922	18,102,159
11	(3,467,215)	(26,587,854)	(1,390,579)	(6,409,059)	2,076,636	20,178,795
12	(4,118,436)	(30,706,291)	(1,410,506)	(7,819,565)	2,707,930	22,886,725

Table 3.22 Total net baseline carbon stock change in the leakage belt (Table 21.d of the Methodology)

	Total ex ante baseline carbon stock change		Total ex post net actual carbon stock change		Total ex post leakage	
	annual	cumulative	annual	cumulative	annual	cumulative
Project yr	ΔCBSLLK[t]	ΔCBSLLK	ΔCBSLLK[t]	ΔCBSLLK	ΔCBSLLK[t]	ΔCBSLLK
t	tCO_2e	tCO_2e	tCO2e	tCO2e	tCO_2e	tCO_2e
1	727,201	727,201	975,783	975,783	(248,582)	(248,582)
2	368,810	1,096,011	995,821	1,971,604	(627,011)	(875,593)
3	992,032	2,088,042	1,015,860	2,987,464	(23,828)	(899,421)
4	2,209,001	4,297,044	1,510,487	4,497,951	-	(899,421)
5	1,562,419	5,859,463	1,540,439	6,038,390	-	(899,421)
6	3,079,837	8,939,299	1,570,390	7,608,780	-	(899,421)
7	1,659,182	10,598,481	594,136	8,202,916	-	(899,421)
8	1,395,476	11,993,957	603,057	8,805,973	-	(899,421)
9	1,264,196	13,258,153	1,883,211	10,689,184	(619,015)	(1,518,436)
10	1,670,098	14,928,252	1,866,810	12,555,994	(196,711)	(1,715,147)
11	2,612,590	17,540,842	1,346,147	13,902,141	-	(1,715,147)
12	2,811,472	20,352,314	1,348,275	15,250,415	-	(1,715,147)

3.2.2 Project Emissions

Table 3.23 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**	**ΔCtotEXPPAt**	**ΔCtotEXPPA**
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)
11	1246	918	2164	8,878	(1,390,579)	(6,409,059)
12	1246	918	2164	11,042	(1,410,506)	(7,819,565)

3.2.3 Leakage

Table 3.24 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**	**ΔCtotEXPLKt**	**ΔCtotEXPLK**
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	11,050	(594,136)	(8,202,916)
8	354	324	678	11,728	(603,057)	(8,805,973)
9	938	1891	2,829	14,557	(1,883,211)	(10,689,184)
10	931	1806	2,737	17,293	(1,866,810)	(12,555,994)
11	669	1,174	1,843	19,136	(1,346,147)	(13,902,141)
12	669	1,174	1,843	20,980	(1,348,275)	(15,250,415)

3.2.4 Net GHG Emission Reductions and Removals

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
2020	3,467,215	1,390,579	-	2,076,636
2021	4,118,436	1,410,506	-	2,707,930
Total	**7,585,651**	**2,801,085**	**-**	**4,784,566**

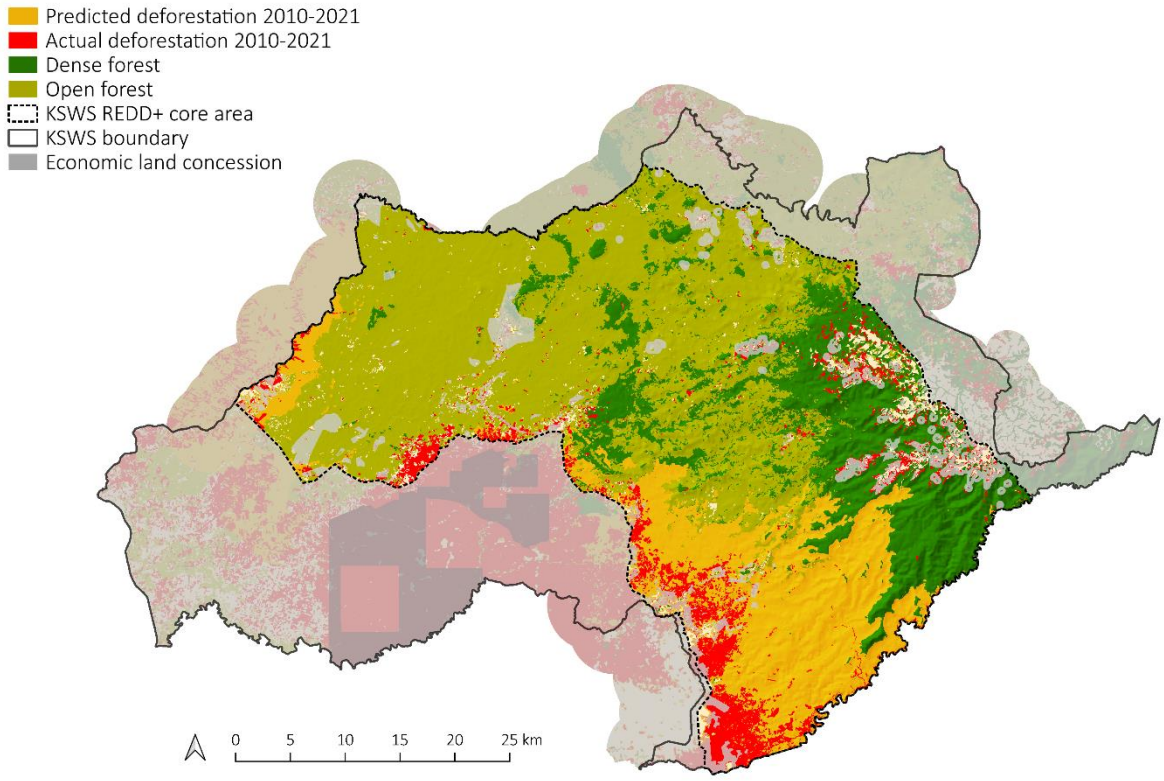


Figure 3.10 Cumulative credited area of KSWS. Ex ante predicted deforestation (orange) and ex post observed deforestation (red) in the KSWS REDD+ project area. Grey area includes the leakage belt and parts of KSWS not included within the project zone, dark grey shows economic land concessions outside of the project zone.

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: 478,456 VCUs.

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

Table 3.25 Ex post net anthropogenic GHG emission reductions (ΔREDDt) and Tradable VCUs; the 2020–2021 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		Ex post 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	594,136	8,202,916	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	603,057	8,805,973	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	1,883,211	10,689,184	561,412	15,298,801	443,370	13,617,078	118,042	1,681,721
10	2,455,808	23,120,639	1,170,886	5,018,481	1,670,098	14,928,252	1,866,810	12,555,994	1,088,210	16,387,011	959,718	14,576,796	128,492	1,810,213
11	3,467,215	26,587,854	1,390,579	6,409,059	2,612,590	17,540,842	1,346,147	13,902,141	2,076,636	18,463,648	1,868,973	16,445,769	207,663	2,017,876
12	4,118,436	30,706,291	1,410,506	7,819,565	2,811,472	20,352,314	1,348,275	15,250,415	2,707,930	21,171,578	2,437,137	18,882,906	270,793	2,288,669

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)

Community impacts resulting from project activities under the with-project scenario were preliminarily identified in Table 6.1.1 of the PD. These are reproduced below along with justification for their impact on community well-being during the monitoring period. See Section 4.1.2 for details of risk mitigation. Community groups have participated in the evaluation of all the impacts listed below at various intervals via the project's ongoing and extensive community engagement process, including: during ongoing community-based consultations on activities; during consultations on the MR summary; and with village representatives during the Annual Workplan review meeting. This is consistent with the project's Community Monitoring Plan as outlined in Section 4.3.1. As this is the approach taken with all impacts, it is not repeated in each of the tables below. No other unplanned impacts were identified.

Community Group	Khmer & Indigenous
Impact	Recognition of the importance of KSWS for local communities
Type of Benefit/Cost/Risk	Actual, indirect, benefit
Change in Well-being	Positive. Major. Promoting the success and profile of KSWS and the REDD project draws attention from national and local government to the project activities and the ability to delivery important benefits to local communities. In the absence of the carbon project this would not have occurred. Additional credit sales have increased the revenue available to be shared with the community through REDD+ benefit sharing funds, which are allocated to self-identified community development priorities. The raised profile of the project has increased support from senior government and accountability of local authorities (see Activities 1.2, 1.3, 2.5, 3.6 in 2.2.1)

Community Group	Khmer & Indigenous
Impact	Maintenance of natural resources
Type of Benefit/Cost/Risk	Actual, direct, benefit
Change in Well-being	Positive. Major. The majority of community members depend on natural resources for their livelihoods, therefore protection of forest and these resources secures their livelihoods and allows continued use into the future. In the baseline loss of natural resources would occur more rapidly. The MR's climate section showing reductions in deforestation demonstrates ongoing performance compared to the baseline. Activities to establish CPAs and ICTs and ensuring they have management plans, as well as the sustainable management of bamboo in Sre Preah (see Activity 3.1, 3.2, 3.4, 3.5 of Section 2.2.1) are evidence of ongoing action to protect these resources.

Community Group	Khmer & Indigenous
Impact	Deterrence of large-scale external threats (including ELCs)
Type of Benefit/Cost/Risk	Actual, direct, benefit
Change in Well-being	Positive. Major. Large scale external threats (such as ELCs or industrial activities) can have a devastating impact on the forest and natural resources upon which the community groups rely for their livelihoods. As such, reduced concession risk compared to baseline, supporting land dispute resolution, and lowering the risk of land loss and displacement from ELCs and other large-scale external threats benefits the community groups. No ELCs were issued that overlap with the project zone during the monitoring period. During the monitoring

	period, the project actively engaged with government on a proposed mine in the project area and provided recommendations to mitigate potential impacts as described in Activity 1.4 of Section 2.2.1. Reduction in threat in KSWS from ELCs compared to other sites also determined by external research: https://doi.org/10.1038/s41598-022-19660-0

Community Group	Khmer & Indigenous
Impact	Land-use zoning ensures long-term access for legitimate users
Type of Benefit/Cost/Risk	Actual, direct, benefit
Change in Well-being	Positive. Major. Zonation clarifies legal status of land use, reduces conflicts and provides legal routes to obtaining titles and formalised rights to areas for the community groups. Increasing land insecurity was predicted in the baseline. The project engaged extensively on zonation of the wildlife sanctuary, as well as supported the issuance of additional ICTs and CPAs and supported the development of by-laws (see Activity 1.2, 3.1, 3.2, 3.5 of Section 2.2.1). Successes during the monitoring period include: community groups participated in the zonation process; six ICTs preapproved by MoE; individuals within these communities regularly consulted on progress of application and participate in liaisons with local authorities and cadastral officers; three CPAs approved and four in the process of being established. Locations of all have been identified through detailed community consultation and area prioritization. All will be managed according to individual plans that are informed by current community usage of natural resources and in line with bylaws developed by each community within the context of the PA Law.

Community Group	Khmer & Indigenous
Impact	Clarified regulations for forest use will ensure long-term access and deter damaging activities
Type of Benefit/Cost/Risk	Actual, direct, benefit
Change in Well-being	Positive. Major. Many communities depend on natural resources and maintaining those natural resources allows continued use into the future. Clarifying regulations gives legal protections and rights. Successes during the project period include: ICT committees better equipped to manage requests for additional agricultural land from ICT members, allowing more transparent parcel allocation. Several ICT committees have turned down requests from in-migrating non-ICT members to access ICT land; three CPAs approved and four in the process of being established. Locations of all have been identified through detailed community consultation and area prioritization. All will be managed according to individual plans that are informed by current community usage of natural resources and in line with bylaws developed by each community within the context of the PA Law. See activities 1.2, 3.1, 3.2, 3.5 of Section 2.2.1).

Community Group	Khmer & Indigenous
Impact	Reduced impact from industrial activities in the landscape, minimize disturbance to KSWS
Type of Benefit/Cost/Risk	Actual, direct, benefit
Change in Well-being	Positive. Major. Large scale external threats (such as ELCs or industrial activities) can have a devastating impact on the forest and natural resources upon which the community groups rely for their livelihoods. As such, reduced concession risk compared to baseline, supporting land dispute resolution, and lowering the risk of land loss and displacement from ELCs and other large-scale external threats

	benefits the community groups. No ELCs were issued that overlap with the project zone during the monitoring period. During the monitoring period, the project actively engaged with government on a proposed mine in the project area and provided recommendations to mitigate potential impacts as described in Activity 1.4 of Section 2.2.1 Reduction in threat in KSWS from ELCs compared to other sites also determined by external research: https://doi.org/10.1038/s41598-022-19660-0

Community Group	Khmer & Indigenous
Impact	Cross-border threats to natural resources reduced
Type of Benefit/Cost/Risk	Actual, direct, benefit
Change in Well-being	Positive. Minor. Law enforcement addressing cross-border logging and snaring reduces loss of biodiversity within the project area that sustains a healthy ecosystem upon which the community groups. These threats are expected to be higher in the baseline in the absence of the project's increased law enforcement efforts. This is expected to be a minor positive impact as the species illegally extracted are generally not a major contributor to community groups livelihoods. During the monitoring period, law enforcement helped with 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. The extensive law enforcement implemented during the monitoring period are described in Activities 2.1, 2.2 and 2.3 in Section 2.2.1.

Community Group	Khmer & Indigenous
Impact	Increased opportunities for participation and influence on reserve management
Type of Benefit/Cost/Risk	Actual, direct, benefit
Change in Well-being	Positive. Minor. By engaging in consultative processes on project activities and workplans community groups are able to ensure their needs and challenges are addressed thus ensuring greater protections for their natural resource-based livelihood needs. Communities continued to engage extensively with the project during the monitoring period and provide feedback through: activity-based consultations; village consultations; collective decision-making on activiites to spend the Cash for Communities; and through representatives during annual workplan reviews and meetings. Communities also offered the opportunity to voice grievances through the grievance redress mechanism as well as report illegal activity through phone lines and suggestion boxes (both anonymous), and informing village focal point. See Activities 1.6, 2.5, 3.3, 3.6 in Section 2.2.1.

Community Group	Khmer & Indigenous
Impact	Reduced threats to natural resources, risk of land alienation etc.
Type of Benefit/Cost/Risk	Actual, direct, benefit
Change in Well-being	Positive. Major. Reducing threats to natural resources and the risk of land alienation will ensure continued access to the natural resource based important to community group livelihoods, which otherwise in the baseline would have gotten worse. During the monitoring period, this was achieved through: 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. The extensive law enforcement implemented during the monitoring period are described in Activities 2.1, 2.2 and 2.3 in Section 2.2.1.

Community Group	Khmer & Indigenous
Impact	Monitoring of law enforcement impacts will enable the project to track effectiveness and improve practices as necessary.
Type of Benefit/Cost/Risk	Actual, indirect, benefit
Change in Well-being	Positive. Major. Improving the effectiveness of law enforcement through data collection and monitoring ensures a greater ability to reduce threats to natural resources and risks of land alienation thus securing the natural resource based important to community groups' livelihoods. In the baseline ineffective or absent law enforcement would have contributed to an accelerated loss of natural resources. This data collection (see Activity 2.3, 2.4 of Section 2.2.1) also contributes to adaptive management and an iterative improvement in delivery of project activities as described in Activities 1.6 of Section 2.2.1.

Community Group	Khmer & Indigenous
Impact	Sufficient staff and resources are available leading to improved effectiveness of enforcement efforts and increased protection of natural resources and land against all threats
Type of Benefit/Cost/Risk	Actual, indirect, benefit
Change in Well-being	Positive. Major. Sufficient staff and resources are available leading to improved effectiveness of enforcement efforts and increased protection of natural resources and land against all threats that threaten the natural resource base important to community groups' livelihoods. During the monitoring period significant resources were directed towards improving law enforcement capacities via training and new equipment (see Activity 2.2 and 2.6 of Section 2.2.1)

Community Group	Khmer & Indigenous
Impact	Coordination will improve effectiveness, for example in processing criminal cases.
Type of Benefit/Cost/Risk	Actual, indirect, benefit
Change in Well-being	Positive. Minor. More effective law enforcement through improved coordination delivers greater land and resource security for the community groups while more effective processing of forest crime cases helps to improve the deterrence effect of law enforcement. In the baseline ineffective or absent law enforcement would have contributed to an accelerated loss of natural resources. During the crediting period the project has continued to improve coordination between community and PDOE enforcement teams and improved law enforcement coordination among district, provincial and national authorities (see Activity 2.5, 2.6 of Section 2.2.1).

Community Group	Khmer & Indigenous
Impact	Community-based patrolling will increase social capital and increase protection efforts further, ensuring continued protection of species and habitat
Type of Benefit/Cost/Risk	Actual, indirect, benefit
Change in Well-being	Positive. Major. Community-based patrolling will increase social capital and increase protection efforts further, ensuring continued protection of species and habitat. This type of activity did not occur prior to the project's actions. During crediting period, community patrols were operating in all participating villages, confiscating illegal equipment and handing over perpetrators to park authorities. Also, patrol personnel joined community patrols on request, where community patrol members desire greater support from those with legal powers to detain perpetrators (see Activity 2.6 of Section 2.2.1).

Community Group	Khmer & Indigenous
Impact	Agreements allow for the improved management of forest resources thus controlling over-harvesting
Type of Benefit/Cost/Risk	Actual, direct, benefit
Change in Well-being	Positive. Minor. Agreements on NTFP offtake and on management of community lands allow for the improved management of forest resources thus controlling over-harvesting and the degradation of resources important to community group livelihoods. In the baseline these agreements would not have been established or done so poorly and without implementation support. During the crediting period, the project established additional CPAs and ICTs and ensuring they have management plans, as well as the sustainable management of bamboo in Sre Preah (see Activity 3.1, 3.2, 3.4, 3.5 of Section 2.2.1) are evidence of ongoing action to protect these resources.

Community Group	Khmer & Indigenous
Impact	Further strengthening of tenure security and use rights
Type of Benefit/Cost/Risk	Actual, direct, benefit
Change in Well-being	Positive. Major. Loss of land security and increasing land alienation was predicted in the baseline and therefore actions to strengthen tenure and use rights grant community groups greater security to the resources important for their livelihoods. During the crediting period, the project established additional CPAs and ICTs and ensuring they have management plans, as well as the sustainable management of bamboo in Sre Preah (see Activity 3.1, 3.2, 3.4, 3.5 of Section 2.2.1) are evidence of ongoing action to protect these resources. Additional zoning to expand and clarify community zones and sustainable use zones was also promoted (see Activity 1.2 in 2.2.1).

Community Group	Khmer & Indigenous
Impact	Clarification of the forest boundary will reduce forest conversion thus protecting natural habitats and reducing future conflict
Type of Benefit/Cost/Risk	Actual, direct, benefit
Change in Well-being	Positive. Major. In the absence of clarified zoning and boundary demarcation in the baseline it was predicted that more conversion and conflicts would materialize. Clarifying these boundaries therefore helps reduce conflicts and unauthorized clearance. The project engaged extensively on zonation of the wildlife sanctuary, as well as supported the issuance of additional ICTs and CPAs and supported the development of by-laws (see Activity 1.2, 3.1, 3.2, 3.5 of Section 2.2.1). Successes during the monitoring period include: community groups participated in the zonation process; six ICTs preapproved by MoE; individuals within these communities regularly consulted on progress of application and participate in liaisons with local authorities and cadastral officers; three CPAs approved and four in the process of being established. Locations of all have been identified through detailed community consultation and area prioritization. All will be managed according to individual plans that are informed by current community usage of natural resources and in line with bylaws developed by each community within the context of the PA Law.

Community Group	Khmer & Indigenous
Impact	Increased awareness of rights and of the opportunities for better forest management
Type of Benefit/Cost/Risk	Actual, direct, benefit
Change in Well-being	Positive. Major. Awareness of rights and improved forest management practices would lead to greater security over community group

	resources, reduce conflict and encourage more sustainable natural resource management, which otherwise would have gotten worse in the baseline. During the monitoring period, awareness on rights was raised during the consultative zoning processes and the work to establish and manage ICTs and CPAs, as described in Activity 1.2, 3.1, 3.2, 3.5 of Section 2.2.1. See also sustainable management of bamboo in Sre Preah (3.4 of Section 2.2.1).

Community Group	Khmer & Indigenous
Impact	Organizations with specialist rural development skills can improve project services
Type of Benefit/Cost/Risk	Actual, direct, benefit
Change in Well-being	Positive. Major. By coordinating with and, in some cases also, funding with other civil society organizations the delivery of services for rural development is improved offering greater benefits for community groups. During the monitoring period, coordination with other organizations provided greater support for ICTs during state land demarcation, improved access to healthcare through mobile health clinics, supported ecotourism improvement, and provided training in conflict resolution (see Activity 3.7 in 2.2.1).

Community Group	Khmer & Indigenous
Impact	Income generation and livelihood diversification; opportunities for skill development
Type of Benefit/Cost/Risk	Actual, direct, benefit
Change in Well-being	Positive. Minor. A diversification of viable, sustainable livelihood options was not predicted in the baseline thus leaving community groups reliant on a degrading and disappearing natural resource base. Actions to diversify sustainable livelihoods is therefore of a positive well-being change for community groups. During the monitoring period, ongoing substantial efforts in this area were made including the sustainable bamboo enterprise in Sre Preah (see Activity 3.4 and 4.3 in 2.2.1), ecotourism at the Jahoo Gibbon camp (Activity 3.1 in 2.2.1), employment as endangered bird nest protectors (see Activity 4.6 in 2.2.1), and premium paid for wildlife-friendly rice (see Activity 4.4. in 2.2.1).

Community Group	Khmer & Indigenous
Impact	Improved agricultural productivity increases food security, incomes, resilience to shocks and climate change and livelihood diversity.
Type of Benefit/Cost/Risk	Actual, direct, benefit
Change in Well-being	Positive. Minor. Addressing the expected limited agricultural productivity and food scarcity of the baseline delivers well-being improvements to the community groups. During the monitoring period, the expansion of Ibis Rice helped deliver farmers in three villages training on techniques to improve soil fertility, water conservation, and organic principle (see Activity 4.4. in Section 2.2.1)

Community Group	Khmer & Indigenous
Impact	Improved quality of life and/or income generating opportunities
Type of Benefit/Cost/Risk	Actual, direct, benefit
Change in Well-being	Positive. Major. Delivery of rural development support and additional income opportunities not expected in the baseline will support improvements in well-being for the community groups. Additional income opportunities were provided via the sustainable bamboo enterprise in Sre Preah (see Activity 3.4 and 4.3 in 2.2.1), ecotourism

	at the Jahoo Gibbon camp (Activity 3.1 in 2.2.1), employment as endangered bird nest protectors (see Activity 4.6 in 2.2.1), and premium paid for wildlife-friendly rice (see Activity 4.4. in 2.2.1). Further quality of life improvements were delivered via the community-determined investments made from the Cash for Communities program across all 20 target villages which included investments in community infrastructure, health services, education, natural resource management and livelihood support (see Activity 3.3, 4.3 in Section 2.2.1).

Community Group	Khmer & Indigenous
Impact	Improved NTFP marketing increases food security, incomes, resilience to shocks and climate change and livelihood diversity.
Type of Benefit/Cost/Risk	Actual, direct, benefit
Change in Well-being	Positive. Minor. Securing the ongoing presence of NTFPs, the access to these and support to commercialize the NTFPs improves the well-being of community groups compared to ongoing forest loss and loss of access to NTFPs in the baseline. Reductions in deforestation demonstrate the improved ongoing presence of available NTFPs. Additional income opportunities were provided via the sustainable bamboo enterprise in Sre Preah (see Activity 3.4 and 4.3 in 2.2.1)

Community Group	Khmer & Indigenous
Impact	Benefit sharing: Benefit depends on type of benefits selected – in each community may increase incomes, development activities or both
Type of Benefit/Cost/Risk	Actual, direct, benefit
Change in Well-being	Positive. Major. This source of community-based revenue sharing is only possible due to the presence of the project and sales of its carbon credits. This has delivered quality of life improvements via the community-determined investments made from the Cash for Communities program across all 20 target villages which included investments in community infrastructure, health services, education, natural resource management and livelihood support (see Activity 3.3, 4.3 in Section 2.2.1). Benefits also earned from the REDD benefit sharing include empowerment of community groups, strengthened legal rights to resources, and conservation of access to areas of cultural significance.

Community Group	Khmer & Indigenous
Impact	Increase adult literacy and numeracy, increasing off farm livelihood options
Type of Benefit/Cost/Risk	Actual, direct, benefit
Change in Well-being	Positive. Minor. Improving literacy and numeracy of community members helps develop skills and growth potential that was not expected in the baseline scenario. During the monitoring period, all participating communities receiving training on financial management (Activity 3.3 in 2.2.1); school buildings repaired, back-to-school packs distributed, school enrolment campaigns and breakfast clubs supported using benefit sharing revenue from the REDD+ project (Activity 3.3 in 2.2.1), and facilitate literacy at younger ages.

During the monitoring period (2020–2021), the project has been supporting local communities to obtain official recognition of their lands from the government through Indigenous Land Titles (ICTs). Eight 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. Three community protected areas (CPAs) have been officially established (two in the monitoring period), which give local communities rights to manage their local natural resources that fall within the protected area. Another

four CPAs are in the process of being established. Several villages are being supported to conduct land inventories in their ICTs to identify which parcels of land are being used by different members, in order to improve the allocation of land to members. In addition, the project teams have mapped areas occupied by individual households and the needs of land in ICT villages for the implementation of wildlife-friendly rice. Almost 80 farmers in the south-east of KSWS committed to growing organic, wildlife-friendly rice, for which they will receive a price premium if they fulfil the requirements of their conservation agreement. Of these, 58 successfully met all requirements and were eligible to sell in 2020. An external audit confirmed that farmers had met requirements for organic certification. Three villages have been supported to continue their sustainable NTFP community enterprises.

Sharing of financial benefits from the REDD+ project with participating communities has continued throughout the monitoring period. In 2017, a total of UD$238,554 was distributed to the 20 REDD+ villages, and in 2021 villages received a further US$ 200,000. Project staff support communities to identify development priorities at the village level and develop work-plans and budgets to undertake the prioritized activities. Planned activities are reviewed by project staff to ensure that they do not counter the aims of the REDD+ project and are not discriminatory within the community. Approved activities are integrated into commune investment plans, which are a state mechanism to plan development across Cambodia. During the monitoring period, benefit sharing funds have financed the following activities, selected by individual communities (Table 4.1).

Table 4.1 Activities selected by communities to be planned and implemented using funding from REDD+ benefit sharing in 2020 and 2021

Category	Activity
Community infrastructure	Road repair
	Bridge construction
	Installation of road drainage
	Construction or maintenance of community meeting hall
Health	Installation of pump well
	Installation of piped water system
	Construction of toilets
	Mobile health clinics
	Community fund for health emergencies
Education	Maintenance of school buildings
	School equipment
	Back-to-school packs for primary students
	School enrolment drives
	Breakfast clubs for primary schools
	Bicycles for disadvantaged students to travel to attend secondary school
	Scholarships
Natural resource management	Community law enforcement patrols
	Implementation of CPA management plan
	Demarcation of ICT boundaries
Livelihood support	Community savings group
	Equipment for bamboo processing
	Cow bank

Community members have received various training and capacity building during the monitoring period, which has allowed them to engage more fully in REDD+ activities as well as impacting their contribution to other aspects of community and personal life. A full list of training delivered is given in Table 2.3. Delivery of training is based on needs identified through capacity building assessments, village

consultations, and observations by project staff. Community patrol teams have received training on patrol planning, data collection, and collaborating with local authorities. Community committees have received training on financial management, conflict resolution, land inventory, community protected area establishment and management, ICT management, participatory rural appraisal, and climate change adaptation. Ecotourism staff have received training on data collection, guiding on bird tours, and food preparation. Farmers registered with IBIS Rice have received training on organic farming methods and climate-smart agricultural techniques such as maintaining soil fertility and conserving water. Members of Sre Preah bamboo business group have received training on sustainable bamboo harvesting, bamboo processing, bamboo handicraft production, and financial management.

The project has supported communities to gain access to clean water by building pump wells and water supply systems. Twenty-two pump wells and four water supply systems have been built in the target villages. In this period 2,268 people (1,066 females) had improved access to clean water as a result of project activities. During the monitoring period, more than 22,000 people (10,400 women) have improved their well-being (defined as people's experience of the quality of their lives) due to project activities. Well-being benefits may include benefits reported in the above metrics (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, and conservation of access to areas of cultural significance.

4.1.2 Negative Community Impact Mitigation (CM2.2)

Activity	Potential Negative Impacts on Community Groups	Community Group Affected	Assessment and Threat Mitigation
Objective #1: Key legal and planning documents for the Keo Seima Wildlife Sanctuary and surrounding landscape are approved and implemented			
Activity 1.1: The KSWS sub-decree and PA Law are understood by the majority of residents of communities within and bordering the protected area	Restriction of development options	IP, Khmer	There is no significant restriction on options for community development beyond those in national law that require sustainable use. Mitigation of any possible restriction of options comes from increased investment in alternative and improved livelihoods.
Activity 1.2: MoE plans for KSWS and the surrounding landscape, including zonation, are understood and supported	Zonation will exclude traditional harvest activities in certain areas	IP, Khmer	Zonation was defined by extended community consultation and based on weighted zonation maps designed to balance community needs with conservation priorities. Communities were supported to interpret and provide feedback on zonation drafts. Project support for ICTs and CPAs in permitted areas is helping to ensure that as much traditional resource access is maintained as possible.
Activity 1.6: Adaptive management and annual planning is used to plan, implement, and track progress at KSWS	Undue representation of certain groups	IP, Khmer	Structured, balanced forum for participation. Representatives include those selected by project-level community elections as well as those appointed by local authorities.
Objective 2: Forest and wildlife crime is reduced through direct law enforcement			
Activity 2.1 Wildlife, forestry and protected area laws are fully implemented	Inappropriate prevention of legal uses, selective enforcement, unnecessarily harsh punishment, unclear rules	IP, Khmer	Law enforcement personnel have received training in legal community uses of resources and in the laws associated with Indigenous titling. Navigation devices used by patrol personnel during patrols have key boundaries preloaded onto maps to ease the identification of legal use of resources in certain areas. Awareness-raising campaigns in villages have alerted community members to rules and regulations applying to the protected area, and these are summarized on noticeboards in prominent locations.
Activity 2.2: The capacity of patrol personnel is sufficient to carry out effective law enforcement activities	Buildings on community land	IP, Khmer	No buildings constructed during this monitoring period. However, when constructed communities are consulted to seek approval or identify other locations.
Activity 2.4: Establish and manage an information network to support patrol planning	Physical risks to informants from criminals	IP, Khmer	Information network gives informants the option to report information anonymously, so that risk to informants is minimized. Participation is voluntary.

Activity	Potential Negative Impacts on Community Groups	Community Group Affected	Assessment and Threat Mitigation
Activity 2.6: Community-based patrolling empowers villagers and provides effective law enforcement	Risk from offenders; conflict within community; legal liability	IP, Khmer	Community patrols can request support of rangers to complete patrols, and must be accompanied by DoE rangers when patrolling outside of their community area. When patrolling without DoE rangers, community patrols focus on recording information that can be passed to park authorities for further investigation in situations where community patrol members feel uncomfortable taking further action.
Objective 3: Land and resource use by local communities is sustainable			
Activity 3.1: Communities are able to protect their land through Indigenous Communal Land Title registration	Communities allocated too little land; process causes conflicts or changes social dynamics; marginalized groups not accounted for	IP, Khmer	Land included in ICT application identified through repeated consultations with communities and documented in order to demonstrate historical use. Project staff facilitated meetings between communities and authorities where parcels were questioned. ICTs governed by committees selected by community elections. Procedure follows that laid out in national law.
Activity 3.2: Management of existing ICTs is strengthened through implementation of rules and regulations	Community Based Organizations formation (e.g. ICT committees) gives too much power to some groups; individual registration excludes some users unfairly	IP, Khmer	ICT committees encouraged to represent all members of the community. Project staff review implementation of rules and regulations to promote good governance.
Activity 3.3: Capacity of community committees in participating villages to manage REDD+ budget allocation is strengthened	Process causes/revives conflicts or changes social dynamics; marginalized groups not accounted for; opportunity cost of time commitments	IP, Khmer	Where appropriate, existing committees used to manage REDD+ budgets. Where new committees have been created, members were selected by election. Committee meetings combined as much as possible with other meeting business to reduce required time commitments.
Activity 3.4: Demarcation of forest estate; Forests in participating villages are restored and replanted	Communities allocated too little land; process causes/revives conflicts or changes social dynamics; marginalized groups not accounted for; reforestation in wrong areas	IP, Khmer	Identification of community areas identified through repeated consultations with communities and documented in order to demonstrate historical use. No areas where agricultural cultivation is permitted have been replanted. Project staff facilitated meetings between communities and authorities where parcels were questioned. Zoning and management plans are developed based on surveys of natural resource use by all sectors of the community, ensuring that marginalized groups are included Most replanting is currently taking place in areas that have been illegally cleared and should by law be maintained as forest.
Activity 3.5: The process of CPA establishment and management is	Communities allocated too little land; process causes/revives conflicts or	IP, Khmer	Establishment of CPAs in KSWS is being undertaken at the request of MoE. Potential areas are identified in consultation with communities and checked for suitability with MoE before applications are submitted.

Activity	Potential Negative Impacts on Community Groups	Community Group Affected	Assessment and Threat Mitigation
understood and underway in appropriate areas	changes social dynamics; marginalized groups not accounted for		Management plans are developed based on surveys of natural resource use by all sectors of the community, ensuring that marginalized groups are included. Management is overseen by a committee whose members are elected by the community. Procedure follows that laid out in national law.
Objective 4: Direct activities that support livelihoods and conservation awareness are active in each commune			
Activity 4.1: Support sustainable natural resource management	Damage from logging, corruption/social conflict, inequitable benefit-sharing; business liabilities	IP, Khmer	Sustainable harvesting practiced in bamboo enterprise group. Village-level plans for sharing benefits from natural resources have been developed by elected community committees in consultation with community members. Extensive support to communities in the development and establishment of community-based enterprises.
Activity 4.2: Community-based ecotourism in KSWS is supported, well managed, and improving	Environmental and social impacts of tourists; corruption/social conflict; inequitable benefit-sharing; business liabilities	IP, Khmer	Village-level plans for sharing benefits from ecotourism have been developed by elected community committees in consultation with community members. All tourists visiting Jahoo pay a flat fee into the Gibbon Fund which is used to fund community activities for all groups (including e.g., scholarships, support for the elderly, community celebrations). Tourist numbers are limited to reduce impacts.
Activity 4.3: Community development activities are linked to conservation benefits (incl. REDD carbon benefit distribution and infrastructure support)	Corruption/social conflict; inequitable benefit-sharing	IP, Khmer	Village-level plans for sharing benefits from REDD+ have been developed by elected community committees in consultation with community members. Strong project oversight in selection, implementation and financial accounting of community investments from REDD+ distributions. Development of transparent financial management guidelines for REDD+ committees developed.
Activity 4.4: Agricultural practices are improved in target communities	Inequitable benefit-sharing; corruption	IP, Khmer	Farmers eligible to sell rice at premium are identified by village-led committee and potential non-compliance with rules is investigated in consultation with community. Project staff facilitated conflict resolution among farmers and resource managers.
Activity 4.5: Increase economic benefits from sustainable extraction of NTFPs	Over-harvest; corruption/social conflict; inequitable benefit-sharing; business liabilities	IP, Khmer	Sustainable harvest plan for bamboo has been developed in consultation with members of Sre Preah CPA and with guidance from experts. Members have received training in implementing and updating the plan. System for sharing benefits from bamboo developed by community and includes both individual and communal benefits.
Objective 5: Information on long-term ecological and social trends of key indicators is available to support protected area management			

Activity	Potential Negative Impacts on Community Groups	Community Group Affected	Assessment and Threat Mitigation
Activity 5.4: Research that will benefit the management of KSWS takes place	Unethical research	IP, Khmer	Research plans reviewed by project staff and experts. For external researchers, plans reviewed by relevant employer or professional body. All appropriate permits and permissions obtained in advance. Individual participation operates on FPIC principle.

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

The project has been designed so as to maximize positive, and minimize negative, impacts on communities, 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 in PD) 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 natural resource base (e.g., rattan, timber, bamboo, sleng fruits, fish, wildlife) and an overall long-term decline in natural resource-based income. This will be true for both Khmer and indigenous families, but more significant for the latter due to their higher dependence on natural resources.
- 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, for example, weakening of cultural institutions, loss of access to spiritually important forest and land, and the shift from farming to laboring.
- 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 a much better social situation for those community members affected by the issues listed above. In comparison to the business as usual scenario, the main community benefits during the monitoring period are listed below (see also Section 4.1.1):

- Improving well-being for all social groups, including those vulnerable to declines in natural resources: project staff working to formally secure access rights for communities using natural resources through ICTs or CPAs; Andoung Kraloeng ICT committee has decided to allocate portion of community income from ecotourism to support elderly and vulnerable community members; improved access to healthcare through provision of free mobile health clinics; communities empowered to slow declines in natural resources through law enforcement patrolling; membership by community representatives of regional and national networks of NTFP users, providing training and support.
- Declines in security and productivity of natural resources minimized and where possible reversed: support for restoration of degraded areas of forest under CPA management; growth of native bamboo seedlings in community nurseries for replanting in the forest; sustainable natural resource management incorporated into management plans of newly established CPAs, provision of fuel-efficient cook stoves to reduce fuelwood demand; independent legal support provided to ICT committees to defend ICT land from outsiders.

- Declines in the quality of water sources prevented or minimized: benefit sharing revenue from the REDD+ project used to install pump wells and small/medium piped drinking water systems to improve access to drinking water; toilets built to reduce open defecation and improve safety for women; training for farmers in minimizing irrigation requirements for rice crops.
- Landlessness among the poor kept low and stable: Support to ICT committees to improve management of applications for reserved agricultural land from ICTs, including dealing with requests from non-ICT members seeking to migrate to the area; support for MoE identification of location of alternative land for migrants illegally settled on CPA land.
- Agricultural productivity and sustainability increasing: farmers in three villages receiving training on techniques to improve soil fertility, water conservation, and organic principles.
- Losses to concessions minimized/halted: support for residents in Pu Nhav to engage with owner of private tourism concession awarded adjacent to community land.
- Land alienation and illegal land grabbing minimized or halted: support from various NGOs to deepen community understanding of land rights, land registration, and detecting and reporting illegal land claims; ongoing support for ICT committees during state land demarcation and individual titling, to ensure that ICTs are respected; independent legal support provided to ICT committees to defend ICT land from outsiders.
- Traditional and new community institutions effective: Coaching of community committees, transitioning to meetings led fully by committee leaders; community meeting halls constructed with benefit sharing revenue from the REDD+ project; project uses pre-existing institutions where appropriate.
- Cultural cohesion improved: Jahoo supporting community events through the Gibbon Fund; community patrols empowering community members to engage in protecting their natural resources; village fairs raising awareness of forest conservation; formation of community savings groups to support all community members to achieve their goals.
- Adult literacy increased: All participating communities receiving training on financial management; school buildings repaired, back-to-school packs distributed, school enrolment campaigns and breakfast clubs supported using benefit sharing revenue from the REDD+ project, to facilitate literacy at younger ages.
- Diversity of viable, sustainable livelihood options increasing: support for sustainable bamboo harvesting and training to make bamboo handicrafts, including provision of equipment to add value; ecotourism employing local community members; employment as endangered bird nest protectors and elephant carers (mahouts); premium paid for wildlife-friendly rice.

The expected overall positive impacts of the project on livelihoods are set out in Section 2.2 of the PD (especially Table 2.2.1) 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 KSWS REDD+ Project a preliminary impact assessment was developed within the project team, and then consulted widely on with local stakeholders, incorporating most of these discussions into the awareness raising stage for the original consultations of the project 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 4.1.1, no negative impacts of the major project activities on communities have been reported or recorded to date, and specific grievances are addressed in Section 2.3.12.4.

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 4.2).

Table 4.2 Summary of social HCVs identified in the KSWS main protection 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 twenty 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) by comparing with the social impact assessment in KSWS (last undertaken in 2017 and presented in the MR for the period 2016–2017). The next HHS is scheduled for 2022. During 2020, participatory mapping of natural resource use has occurred in communities preparing to apply for CPAs, which has documented important natural resources in forests adjacent to each community. Sustainability of bamboo shoot harvesting for consumption in Sre Preah CPA was assessed and recommendations made to community members to ensure that harvesting remains at sustainable levels in the future. A sustainable harvesting plan for bamboo in Sre Preah CPA has been developed to ensure that the bamboo handicraft business will not negatively impact bamboo habitat in the CPA.

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. Community committees are receiving capacity building to ensure that they are able to detect (through community law enforcement patrols), assess (through completing template documents and collecting evidence), report (through completing template reports to PDoE and local authorities), and prosecute (through preparation of evidence and, where necessary, provision of legal assistance) encroachment into culturally significant parts of ICT land. Awareness of the cultural and historical importance of these areas of land has also been raised with PDoE, local authorities, and officials from the Ministry of Land Management, Urban Planning, and Construction to ensure that future land demarcation initiatives properly respect IP rights. GDANCP plans to explore additional ways of preserving important sites for Indigenous heritage, beyond ICTs.

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. In January 2020, community members took part in an assessment of risk and law enforcement capacity for KSWS,

identifying priority targets for protection including eight cultural and anthropological targets that are important sites for IP.

Table 4.3 summarizes HCV indicators and monitoring methods.

Table 4.3 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 and will be used to monitor disturbance due to deforestation to spirit forest areas (HCV6). The rates of deforestation in spirit forest areas are very low. The results of deforestation assessments are shared with community representatives at KSWS annual meetings for feedback. Deforestation assessments of forest land close to community land are shared more regularly with communities as part of monitoring for performance-based payments and planning for community law enforcement patrols.

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. The project has 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 4.4 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 maximized; 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; average 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 minimized 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 KSWS	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	Serious decline	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 development and livelihood opportunities, on and off farm	Continued dependence on limited number of often unsustainable livelihoods	All onsite communities	Increasing diversity of viable, sustainable livelihood opportunities	# of livelihood 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 available (typically every 3 years).

*Method: HHS = household survey, Demog. = rapid demographic survey, SAM = KSWS Stakeholder Annual Meeting, LNGOs = local NGOs' own monitoring, Partic. = WCS/FA/MoE-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. Preparations for the 2022 HHS are underway. 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 result of the survey conducted in 2017 showed that there is no negative impact from the project on community. The project helps to improve household economic wellbeing, access to land, and livelihood diversification. The next HHS is scheduled for 2022 or 2023. A rapid demographic survey of all villages in August 2021 has provided a basic update on population sizes, ethnicities, and access to healthcare and education during the interim period before the next full HHS. Amongst other uses, this information is informing the design and delivery of co-benefits to participating communities.

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, key technical advisors, and community representatives. 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, including on community members who may have to forego subsistence or income-generating activities in order to attend. The consultation process improves communication between stakeholders and therefore strengthens project implementation. It also allows for community members to propose their own solutions to any issues and to guide the development of their community.

During 2020, the project conducted an annual meeting (16 July 2020) and 516 community-based meetings including 77 CPA meetings, 66 REDD+ benefit sharing fund meetings, 135 livelihoods meetings, 102 ICT meetings, 47 KSWS management zone meetings, 58 patrol meetings and 32 planning meetings. Annual work plan consultation and project implementation meetings were reduced in 2021 due to national and provincial COVID-19 restrictions. During these meetings, there is an open discussion providing feedback about impacts the project. In the rare cases negative impacts are raised and require escalation, these are addressed through the grievance process (Section 2.3.12).

4.3.1.3 Local NGOs (LNGOs)

Some results of specific interventions (e.g., agricultural extension, saving groups, adult education, ecotourism) will be derived from the work of local NGO partners (e.g., CRDT, WHI, and ELIE) 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 resource use and livelihood improvement are also collected and reported in both monthly meetings and KSWS annual meetings. Where the KSWS REDD+ project provides direct funding for partner organizations, reporting is formalized with quarterly reports and an M&E program.

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. Community members contribute to spatial monitoring through recording data from their law enforcement patrols in SMART and through reporting illegal activities to the anonymous telephone hotline or through written notes left in the complaints boxes located centrally in each village.

4.3.2 Monitoring Plan Dissemination (CM4.3)

Community representatives are invited to, and supported to attend, every annual meeting 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 CCB public comment period in 2014, the PD, in Khmer, was disseminated in all 20 villages (whilst a written Bunong script was recently created, there is still limited uptake). 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 CCB MR public comment period, the MR summary (in Khmer) was distributed to communities in the 20 villages of the Project Area. This report also contains information on key parameters to be monitored in the project. In addition to the CCB 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)

The project maintains a checklist of all species recorded at the site, collected by project staff or recorded in published articles or other data sources. This list is then reconciled with the IUCN Red List to identify the number of threatened species. Over time, the category of species on the Red List is updated by a global review. New species records and changes in category of existing records can both cause changes to the number of threatened species at the site. Table 5.1 shows changes in IUCN Red List status between 2019 and 2021 for species recorded KSWS. The total number of species recorded in KSWS has increased between 2019 and 2021, as additional research and study is conducted.

Table 5.1 Changes in IUCN Red List status for species recorded in Keo Seima Wildlife Sanctuary between 2019 and 2021.Red cells denote declines in status between these dates, blue denote no change, green denote improved status, grey denotes changes related to data availability changes. 2019 data includes the 2019 status of species recorded in 2021, even if they had not been recorded in KSWS in 2019.

		2021							
		CR	EN	VU	NT	LC	DD	NE	
2019	CR	11							11
	EN	1	23						25
	VU		1	39	1				41
	NT			2	25				27
	LC		2	2	1	604			609
	DD					1	7		8
	NE	1		2		19	1	284	307
		13	27	45	27	624	8	284	1028

Table 5.2. Species with changing IUCN status during the monitoring period. Does not include species going from NE to LC or DD, nor species from DD to LC as these are not relevant to Vulnerability criteria.

Kingdom	Scientific name	Common name	2019 Red List	2021 Red List
Animalia	*Probarbus jullieni*	Jullien's Golden Carp	EN	CR
Animalia	*Wallago attu*	Wallago	NT	VU
Animalia	*Chloropsis cochinchinensis*	Blue-winged Leafbird	LC	EN
Animalia	*Eurylaimus javanicus*	Banded Broadbill	LC	NT
Animalia	*Ciconia episcopus*	Woolly-necked Stork	VU	NT
Animalia	*Capricornis sumatraensis*	Indochinese Serow	NT	VU
Animalia	*Hipposideros pomona*	Large-Eared Roundleaf Bat	LC	EN
Animalia	*Macaca fascicularis*	Long-Tailed Macaque	LC	VU
Animalia	*Nycticebus pygmaeus*	Pygmy Loris	VU	EN

Plantae	*Schima wallichii*		LC	VU
Plantae	*Cinnamomum cambodianum*		NE	CR
Plantae	*Knema glauca*		NE	VU
Plantae	*Litchi chinensis*		NE	VU

Changes in biodiversity are monitored in a number of ways detailed in section 5.3. Changes in biodiversity are noted below. Biodiversity changes below for key species monitoring during line transects are reported in the provided report Griffin O. & Nuttall M. (2020) and peer-reviewed journal article Nuttall et al. 2021.

No other unanticipated changes in biodiversity have been observed.

Change in Biodiversity	Black-shanked Douc population trend
Monitored Change	Positive, actual, direct.
Justification of Change	Stable population size under the with-project scenario compared to the baseline of a declining population. As monitored during key species line transect distance sampling monitoring, using robust statistical analysis. Details of methodology are given in 5.3.1.1. Improved status due to reduced habitat loss and reductions in poaching

Change in Biodiversity	S. Yellow-Cheeked Cr. Gibbon population trend
Monitored Change	Positive, actual, direct.
Justification of Change	Stable population size under the with-project scenario compared to the baseline of a declining population. As monitored during key species line transect distance sampling monitoring, using robust statistical analysis. Details of methodology are given in 5.3.1.1. Improved status due to reduced habitat loss and reductions in poaching

Change in Biodiversity	Northern Pig-Tailed Macaque population trend
Monitored Change	Positive, actual, direct.
Justification of Change	Stable population size under the with-project scenario compared to the baseline of a declining population. As monitored during key species line transect distance sampling monitoring, using robust statistical analysis. Details of methodology are given in 5.3.1.1. Improved status due to reduced habitat loss and reductions in poaching. Pig-tailed macaques are an adaptable species and can tolerant disturbed habitats more than other macaque species.

Change in Biodiversity	Long-tailed macaque population trend
Monitored Change	Positive, actual, direct.
Justification of Change	As monitored during key species line transect distance sampling monitoring, using robust statistical analysis. Details of methodology are given in 5.3.1.1. Improved status due to reduced habitat loss and reductions in poaching.

Change in Biodiversity	Germain's Silvered Langur population trend
Monitored Change	Positive, actual, direct.
Justification of Change	Stable population size under the with-project scenario compared to the baseline of a declining population. As monitored during key species line transect distance sampling monitoring, using robust statistical analysis. Details of methodology are given in 5.3.1.1. Improved status due to reduced habitat loss and reductions in poaching

Change in Biodiversity	Green Peafowl population trend

Monitored Change	Positive, actual, direct.
Justification of Change	Stable population size under the with-project scenario compared to the baseline of a declining population. As monitored during key species line transect distance sampling monitoring, using robust statistical analysis. Details of methodology are given in 5.3.1.1. Improved status due to reduced habitat loss and reductions in poaching. Green peafowl and have broods and may be able to respond quickly to changes in threat.

Change in Biodiversity	Asian Elephant population trend
Monitored Change	Positive, actual & predicted, direct.
Justification of Change	Population stable, compared to declining under the baseline scenario. Reduced hunting through direct law enforcement and education programs. Reduced habitat loss through direct law enforcement, land rights and tenure programs, and reduced pressure from ELCs. Deforestation rates monitored with satellite imagery and reported in this Monitoring Report, obtainment of legal titles monitored through tracking awarded legal titles reported in this Monitoring Report, reduced pressure from ELCs monitored through comparisons to other sites by expert review and quantitatively analysed, published here: https://doi.org/10.1038/s41598-022-19660-0. Assumed that reductions in threats and reduction in loss of habitat improves status compared to the baseline. Direct monitoring of elephants with mitochondrial DNA has taken place, but recent monitoring did not produce robust results due to issues with sample degradation. Previous monitoring showed a stable population. Updated monitoring will take place in the next verification period.

Change in Biodiversity	Lesser Adjutant population trend
Monitored Change	Positive, actual, direct.
Justification of Change	Population recovering, compared to declining under the baseline scenario. Anticipated with-project scenario in PD was no change. Reduced hunting through direct law enforcement and education programs. Direct nest protection program where local communities protect nests from human disturbance and natural predators during key nesting period. 9 nests detected in 2019, 4 in 2020, 16 in 2021, 27 to date in 2022. Assumed that reductions in threats improves status compared to the baseline. Direct observation of nests.

Change in Biodiversity	Giant Ibis population trend
Monitored Change	Positive, predicted, direct.
Justification of Change	Population stable, compared to declining under the baseline scenario. Reduced hunting through direct law enforcement and education programs. Direct nest protection program where local communities protect nests from human disturbance and natural predators during key nesting period. Small but stable number of nests detected each year. Assumed that reductions in threats improves status compared to the baseline. Direct observation of nests.

Change in Biodiversity	Yellow-breasted Bunting population trend
Monitored Change	Positive, predicted, direct.
Justification of Change	Population stable, compared to declining under the baseline scenario. Reduced hunting through direct law enforcement and education programs. Reduced habitat loss through direct law enforcement, land rights and tenure programs, and reduced pressure from ELCs. Deforestation rates monitored with satellite imagery and reported in this Monitoring Report, obtainment of legal titles monitored through tracking awarded legal titles reported in this Monitoring Report, reduced pressure from ELCs monitored

	through comparisons to other sites by expert review and quantitatively analysed, published here: https://doi.org/10.1038/s41598-022-19660-0. Assumed that reductions in threats and reduction in loss of habitat improves status compared to the baseline.

Change in Biodiversity	Great Slaty Woodpecker population trend
Monitored Change	Positive, predicted, direct.
Justification of Change	Population stable, compared to declining under the baseline scenario. Reduced hunting through direct law enforcement and education programs. Reduced habitat loss through direct law enforcement, land rights and tenure programs, and reduced pressure from ELCs. Deforestation rates monitored with satellite imagery and reported in this Monitoring Report, obtainment of legal titles monitored through tracking awarded legal titles reported in this Monitoring Report, reduced pressure from ELCs monitored through comparisons to other sites by expert review and quantitatively analysed, published here: https://doi.org/10.1038/s41598-022-19660-0. Assumed that reductions in threats and reduction in loss of habitat improves status compared to the baseline.

Change in Biodiversity	White-Shouldered Ibis population trend
Monitored Change	Positive, predicted, direct.
Justification of Change	Population stable, compared to declining under the baseline scenario. Reduced habitat loss through direct law enforcement, land rights and tenure programs, and reduced pressure from ELCs. Deforestation rates monitored with satellite imagery and reported in this Monitoring Report, obtainment of legal titles monitored through tracking awarded legal titles reported in this Monitoring Report, reduced pressure from ELCs monitored through comparisons to other sites by expert review and quantitatively analysed, published here: https://doi.org/10.1038/s41598-022-19660-0. Assumed that reductions in threats and reduction in loss of habitat improves status compared to the baseline.

Change in Biodiversity	Red-Headed Vulture population trend
Monitored Change	Positive, predicted, direct.
Justification of Change	Decline slowed compared to baseline. Reduced habitat loss through direct law enforcement, land rights and tenure programs, and reduced pressure from ELCs. Deforestation rates monitored with satellite imagery and reported in this Monitoring Report, obtainment of legal titles monitored through tracking awarded legal titles reported in this Monitoring Report, reduced pressure from ELCs monitored through comparisons to other sites by expert review and quantitatively analysed, published here: https://doi.org/10.1038/s41598-022-19660-0 The baseline scenario anticipated a recovery, but intense threats including mass poisonings in Lumphat Wildlife Sanctuary and other areas by diclofenac and other chemicals rapidly reduced the population and changed this anticipated recovery. Assumed that reductions in threats within the site and reduction in loss of habitat still improves status compared to the baseline.

Change in Biodiversity	White-Rumped Vulture population trend
Monitored Change	Positive, predicted, direct.
Justification of Change	Decline slowed compared to baseline. Reduced habitat loss through direct law enforcement, land rights and tenure programs, and reduced pressure from ELCs. Deforestation rates monitored with satellite imagery and reported in this Monitoring Report, obtainment of legal titles monitored through tracking awarded legal titles reported in this Monitoring Report, reduced pressure from ELCs monitored through comparisons to other sites by expert review and quantitatively analysed, published here:

	https://doi.org/10.1038/s41598-022-19660-0 The baseline scenario anticipated a recovery, but intense threats including mass poisonings in Lumphat Wildlife Sanctuary and other areas by diclofenac and other chemicals rapidly reduced the population and changed this anticipated recovery. Assumed that reductions in threats within the site and reduction in loss of habitat still improves status compared to the baseline.

Change in Biodiversity	Clouded Leopard population trend
Monitored Change	Positive, predicted, direct.
Justification of Change	Decline slowed compared to baseline. Reduced habitat loss through direct law enforcement, land rights and tenure programs, and reduced pressure from ELCs. Deforestation rates monitored with satellite imagery and reported in this Monitoring Report, obtainment of legal titles monitored through tracking awarded legal titles reported in this Monitoring Report, reduced pressure from ELCs monitored through comparisons to other sites by expert review and quantitatively analysed, published here: https://doi.org/10.1038/s41598-022-19660-0. Assumed that reductions in threats and reduction in loss of habitat improves status compared to the baseline.

Change in Biodiversity	Marbled Cat population trend
Monitored Change	Positive, predicted, direct.
Justification of Change	Population stable, compared to declining under the baseline scenario. Reduced hunting through direct law enforcement and education programs. Reduced habitat loss through direct law enforcement, land rights and tenure programs, and reduced pressure from ELCs. Deforestation rates monitored with satellite imagery and reported in this Monitoring Report, obtainment of legal titles monitored through tracking awarded legal titles reported in this Monitoring Report, reduced pressure from ELCs monitored through comparisons to other sites by expert review and quantitatively analysed, published here: https://doi.org/10.1038/s41598-022-19660-0. Assumed that reductions in threats and reduction in loss of habitat improves status compared to the baseline.

Change in Biodiversity	Large-spotted Civet population trend
Monitored Change	Positive, predicted, direct.
Justification of Change	Population stable, compared to declining under the baseline scenario. Reduced hunting through direct law enforcement and education programs. Reduced habitat loss through direct law enforcement, land rights and tenure programs, and reduced pressure from ELCs. Deforestation rates monitored with satellite imagery and reported in this Monitoring Report, obtainment of legal titles monitored through tracking awarded legal titles reported in this Monitoring Report, reduced pressure from ELCs monitored through comparisons to other sites by expert review and quantitatively analysed, published here: https://doi.org/10.1038/s41598-022-19660-0. Assumed that reductions in threats and reduction in loss of habitat improves status compared to the baseline.

Change in Biodiversity	Binturong population trend
Monitored Change	Positive, predicted, direct.
Justification of Change	Population stable, compared to declining under the baseline scenario. Reduced hunting through direct law enforcement and education programs. Reduced habitat loss through direct law enforcement, land rights and tenure programs, and reduced pressure from ELCs. Deforestation rates monitored with satellite imagery and reported in this Monitoring Report, obtainment of legal titles monitored through tracking awarded legal titles reported in this Monitoring Report, reduced pressure from ELCs monitored

	through comparisons to other sites by expert review and quantitatively analysed, published here: https://doi.org/10.1038/s41598-022-19660-0. Assumed that reductions in threats and reduction in loss of habitat improves status compared to the baseline.

Change in Biodiversity	Asian Small-Clawed Otter population trend
Monitored Change	Positive, predicted, direct.
Justification of Change	Population stable, compared to declining under the baseline scenario. Reduced hunting through direct law enforcement and education programs. Reduced habitat loss through direct law enforcement, land rights and tenure programs, and reduced pressure from ELCs. Deforestation rates monitored with satellite imagery and reported in this Monitoring Report, obtainment of legal titles monitored through tracking awarded legal titles reported in this Monitoring Report, reduced pressure from ELCs monitored through comparisons to other sites by expert review and quantitatively analysed, published here: https://doi.org/10.1038/s41598-022-19660-0. Assumed that reductions in threats and reduction in loss of habitat improves status compared to the baseline.

Change in Biodiversity	Smooth-Coated Otter population trend
Monitored Change	Positive, predicted, direct.
Justification of Change	Population stable, compared to declining under the baseline scenario. Reduced hunting through direct law enforcement and education programs. Reduced habitat loss through direct law enforcement, land rights and tenure programs, and reduced pressure from ELCs. Deforestation rates monitored with satellite imagery and reported in this Monitoring Report, obtainment of legal titles monitored through tracking awarded legal titles reported in this Monitoring Report, reduced pressure from ELCs monitored through comparisons to other sites by expert review and quantitatively analysed, published here: https://doi.org/10.1038/s41598-022-19660-0. Assumed that reductions in threats and reduction in loss of habitat improves status compared to the baseline.

Change in Biodiversity	Sun Bear population trend
Monitored Change	Positive, predicted, direct.
Justification of Change	Decline slowed compared to baseline. Reduced hunting through direct law enforcement and education programs. Reduced habitat loss through direct law enforcement, land rights and tenure programs, and reduced pressure from ELCs. Deforestation rates monitored with satellite imagery and reported in this Monitoring Report, obtainment of legal titles monitored through tracking awarded legal titles reported in this Monitoring Report, reduced pressure from ELCs monitored through comparisons to other sites by expert review and quantitatively analysed, published here: https://doi.org/10.1038/s41598-022-19660-0. Assumed that reductions in threats and reduction in loss of habitat improves status compared to the baseline.

Change in Biodiversity	Asiatic Black Bear population trend
Monitored Change	Positive, predicted, direct.
Justification of Change	Decline slowed compared to baseline. Reduced hunting through direct law enforcement and education programs. Reduced habitat loss through direct law enforcement, land rights and tenure programs, and reduced pressure from ELCs. Deforestation rates monitored with satellite imagery and reported in this Monitoring Report, obtainment of legal titles monitored through tracking awarded legal titles reported in this Monitoring Report, reduced pressure from ELCs monitored through comparisons to other sites by expert review and quantitatively analysed, published here:

	https://doi.org/10.1038/s41598-022-19660-0. Assumed that reductions in threats and reduction in loss of habitat improves status compared to the baseline.

Change in Biodiversity	Malayan Pangolin population trend
Monitored Change	Positive, predicted, direct.
Justification of Change	Decline slowed compared to baseline. Reduced hunting through direct law enforcement and education programs, monitored through SMART and education program coverage and attendance. A Reduced habitat loss through direct law enforcement, land rights and tenure programs, and reduced pressure from ELCs. Deforestation rates monitored with satellite imagery and reported in this Monitoring Report, obtainment of legal titles monitored through tracking awarded legal titles reported in this Monitoring Report, reduced pressure from ELCs monitored through comparisons to other sites by expert review and quantitatively analysed, published here: https://doi.org/10.1038/s41598-022-19660-0. Assumed that reductions in threats and reduction in loss of habitat improves status compared to the baseline.

Change in Biodiversity	Pygmy Loris population trend
Monitored Change	Positive, predicted, direct.
Justification of Change	Decline slowed compared to baseline. Reduced hunting through direct law enforcement and education programs. Reduced habitat loss through direct law enforcement, land rights and tenure programs, and reduced pressure from ELCs. Deforestation rates monitored with satellite imagery and reported in this Monitoring Report, obtainment of legal titles monitored through tracking awarded legal titles reported in this Monitoring Report, reduced pressure from ELCs monitored through comparisons to other sites by expert review and quantitatively analysed, published here: https://doi.org/10.1038/s41598-022-19660-0. Assumed that reductions in threats and reduction in loss of habitat improves status compared to the baseline.

Change in Biodiversity	Giant Asian Pond Turtle population trend
Monitored Change	Positive, predicted, direct.
Justification of Change	Population stable, compared to declining under the baseline scenario. Reduced hunting through direct law enforcement and education programs. Assumed that reductions in threats improves status compared to the baseline.

Change in Biodiversity	Yellow-Headed Temple Turtle population trend
Monitored Change	Positive, predicted, direct.
Justification of Change	Population stable, compared to declining under the baseline scenario. Reduced hunting through direct law enforcement and education programs. Assumed that reductions in threats improves status compared to the baseline.

Change in Biodiversity	Elongated Tortoise population trend
Monitored Change	Positive, predicted, direct.
Justification of Change	Decline slowed compared to baseline. Reduced hunting through direct law enforcement and education programs. Assumed that reductions in threats improves status compared to the baseline.

Change in Biodiversity	Asiatic Softshell Turtle population trend
Monitored Change	Positive, predicted, direct.

Justification of Change	Decline slowed compared to baseline. Reduced hunting through direct law enforcement and education programs. Assumed that reductions in threats improves status compared to the baseline.

Change in Biodiversity	Banteng, gaur, Eld's deer, sambar population trend
Monitored Change	Positive, actual, direct.
Justification of Change	Decline of population size slowed under the with-project scenario compared to the baseline of a rapidly declining population. Populations of gaur and banteng have rapidly collapsed across Cambodia outside of protected areas, and have been lost entirely from most areas due to deforestation and poaching, especially with snares. The IUCN Red List assessment for banteng states: "In Cambodia … [t]he species was until very recently likely to have been widespread in the northern and eastern forests as well as parts of the Cardamom Mountain range, but with the onset of rampant agroforestry enterprises and other forms of land-grabbing concessions occupied Cambodian range is likely to have significantly decreased in the last half decade. The bulk of the Cambodian population remains in protected areas in the eastern forests, centred on Mondulkiri province" Gaur, being forest cattle, are affected by many of the same threats but also by deforestation, rates of which have been substantially greater outside of the project area and other comparatively-well protected sites. Eld's deer and sambar have similarly been lost from most unprotected areas in Cambodia. Thus because the project has prevented and reduced agroforestry enterprises, land-grabbing, and other types of forest loss compared to the baseline, in addition to conducting anti-snare patrols and law enforcement to reduce poaching, populations of these species have reduced at a rate lower than the baseline model and compared to outside the project area and other well-protected sites. These four species continue to be recorded at the site with camera traps, contrasted with a complete loss at many other sites.

Change in Biodiversity	Stump-Tailed Macaque population trend
Monitored Change	No change compared to baseline, actual.
Justification of Change	Population declining. Did not improve on baseline scenario during this monitoring period. Not a biodiversity change under the with-project scenario, but included for completeness. Stump-tailed macaques are extensively terrestrial, and are exposed to known threats including snares and dogs which are likely responsible for declines in some ungulate species.

Change in Biodiversity	Wild pig
Monitored Change	No change compared to baseline, actual.
Justification of Change	Population declining. Did not improve on baseline scenario during this monitoring period, although remained stable until 2018. Not a biodiversity change under the with-project scenario, but included for completeness. Wild pig experience large population fluctuations in response to disease and mast years, where large amounts of fodder are available. As such, the assessed decline is conservative, and may simply be natural fluctuations of the population. Continued monitoring in 2022 and onwards will allow better understanding of this trend and confirm if it is a true decline or a fluctuation.

Change in Biodiversity	Northern Red Muntjac
Monitored Change	No change compared to baseline, actual.

Justification of Change	Population declining. Did not improve on baseline scenario during this monitoring period, although remained stable until 2014. Not a biodiversity change under the with-project scenario, but included for completeness. The decline of muntjac suggests higher threats than anticipated, especially from snaring and poaching. Muntjac are typically robust to hunting, suggestion the intensity is high. Stump-tailed macaques are a comparatively terrestrial primate, moving on the ground in large groups. As such, they are exposed to similar threats from snares as muntjac are, and snares are likely driving the unanticipated decline of these two species, as well as the anticipated declines in the four large ungulates.

Change in Biodiversity	Forest cover
Monitored Change	Positive, actual, direct.
Justification of Change	Reduced deforestation and thus habitat loss in the with-project scenario compared to the baseline. Core component of the KSWS REDD+ project, with changes, methods, and assumptions documented extensively in the Climate section of this report.

5.1.2 Mitigation Actions (B2.3)

As no specific on-site negative impacts of project activities are anticipated within the project zone, no specific mitigation measures are needed. Following the precautionary principle, the project implements a range of activities that further support biodiversity values.

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. In this period, 747 snares were removed and destroyed.

Recent research confirms that snare removal alone is not enough to reduce the impact of snare hunting to sustainable levels. In the previous reporting period, a Human-Wildlife Conflict Team was established. This team visits villages across KSWS, discussing with them options to reduce crop raiding that do not depend on the use of snares, such as providing lights, megaphones, and training on methods to deter wildlife. This is intended to reduce placement of snares, which can be more effective than removal of snares after placement. Longer-term solutions include changes in crop selection. In this reporting period, a sub-grant process was established to expand project impacts. One of these sub-grants related to the development of sustainable agricultural products using crops that are unattractive to wildlife, again reducing conflict and thus protective snaring.

Research from the site 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.

A core mitigation action is direct law enforcement, focusing on wildlife crimes. In the reporting period, more than 600 snares and 28 firearms were confiscated by the law enforcement teams. With some species still showing significant declines, the scale and effectiveness of these actions needs to be increased. This is planned in the project strategy for the future.

Off-site mitigation measures are also taken as outlined in the PD and as detailed as implemented in 5.2.1, including improve natural-resource management patterns and alternative income sources, and landscape-wide coordination with management authorities.

Section 5.1.4 details measures taken for maintenance and enhancement of the HCV attributes, including law enforcement, alternative livelihoods, natural-resource management planning, and legal zonation.

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

A qualitative assessment of likely biodiversity changes in the *without*-project scenario were made, predicting:

"…a mostly deforested landscape with the remaining forest fragmented, degraded, significantly disturbed by humans due to easier access and heavily over-hunted, leading to a depauperate fauna and flora lacking most of the species of conservation significance present today, with many of the other species surviving in severely reduced numbers."

As such, any improvement on this bleak baseline is a clear net positive impact.

An ex-ante *with*-project scenario was also described, predicting biodiversity trends in the presence of the project. High quality quantitative biodiversity monitoring provides actual ex post trend assessments. These are summarized in Table 5.3. Of 13 species assessed, it can be seen than ex post trends are matched or improved for 10 species. Three species show unanticipated declines, although these declines are within the baseline without project scenario.

*Table 5.3. Ex-ante with-project anticipated species population trends, and ex-post trends from biodiversity monitoring. Data from Nuttall et al., 2021. ^ denotes species for which was a trend assessment was not reported in the Project Document. * denotes trends based on expert assessment.*

English name	Scientific Name	Without project scenario	Anticipated with-project population trend (2010)	Actual with-project population trend (2020)
Black-shanked douc	*Pygathrix nigripes*	Decline	Stable	Stable
Yellow-cheeked gibbon	*Nomascus gabriellae*	Decline	Stable	Stable
Germain's silver langur	*Trachypithecus germaini*	Decline	Stable	Stable
Long-tailed macaque	*Macaca fascicularis*	Decline	Stable^	Stable
Pig-tailed macaque	*Macaca leonina*	Decline	Stable	Increasing
Stump-tailed macaque	*Macaca arctoides*	Decline	Stable	Declining
Green peafowl	*Pavo muticus*	Decline	Stable	Increasing
Wild pig	*Sus scrofa*	Decline	Stable^	Declining
Northern red muntjac	*Muntiacus vaginalis*	Decline	Stable^	Declining
Banteng	*Bos javanicus*	Decline	Decline slowed	Decline slowed
Gaur	*Bos gaurus*	Decline	Decline slowed	Decline slowed
Eld's deer	*Rucervus eldii*	Decline	Decline slowed	Decline slowed*
Sambar	*Rusa unicolor*	Decline	Decline slowed	Decline slowed*

Mondulkiri province is one of the most climate change-vulnerable areas, when considering both potential impacts and mitigation capabilities, identified in climate change vulnerability mapping for Southeast Asia by Yusuf and Francisco, 2009. Although detailed models are not available for the KSWS area. UNDP climate models suggest Mondulkiri will experience higher average temperatures, and increased rainfall in the dry season. Intact forest mitigate both of these, through the lower average temperate provided in forested landscapes, and through water recycle regulation, reducing run-of and soil erosion from heavy rains. Large areas of habitat across elevation gradients also allow movement of populations to areas better suited to their niches. Reducing direct threats to biodiversity, such as

snaring and poaching, allow large populations to persist, with greater genetic diversity and resilience to climate shocks. All activities in KSWS which support forest conservation increase the local biodiversity abilities to adapt to climate change impacts. Table 5.4 gives project activities positively impacting biodiversity and forest cover.

With clear biodiversity benefits in the project area, no anticipated negative impacts from project activities in the project area or leakage belt, and potential off-site negative impacts identified and mitigated, the project demonstrates strong net positive biodiversity impacts across the project zone compared to the baseline scenario.

Table 5.4 Positive biodiversity and forest impacts of project activities, supporting wildlife climate change adaptation (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 habitat loss*	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). *Habitat loss 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). *Hunting, habitat loss, 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 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).

Project Action	Positive Impacts
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.
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.	Improved agricultural productivity and diversity helped stabilize land use, thus reducing habitat conversion.

Project Action	Positive Impacts
Habitat loss	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)

All on-site and off-site negative biodiversity impacts are identified and mitigated, as details in 5.1 and 5.2, and monitored in 5.3. The three major biodiversity related HCVs (HCV1-3) and HCV5 and 6 all relate to forest areas, which as key element protected under the with-project scenario directly and indirectly through project activities throughout the project zone. Protection of this habitat also protects biodiversity and wildlife populations within them. Displacement of impacts from the project area to the leakage belt and wider project zone are avoided through mitigation measures detailed in 5.2.

High Conservation Value	Project Targets	Implemented Interventions	Negative Project 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, regionally, or nationally significant large landscape level forests	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
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

High Conservation Value	Project Targets	Implemented Interventions	Negative Project Impacts
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, including 3 ha of bamboo planted in Sre Preah CPA.

Four invasive species are known from the project site, none introduced or used by project activities, although the extent and impact of these species is not known across the project area. Project activities do no contribute to the expansion of these species within KSWS as tthey typically expand into disturbed ground, whilst project activities aim to stabilize land use and maintain healthy intact forest.

Table 5.5 Known invasive species present at the project site

Scientific name	Family	English name	Khmer name
Eichhornia crassipes	Pontederiaceae	Common water hyacinth	កំបោក
Chromolaena odorata	Asteraceae	Siam weed	ទន្ទ្រានខេត្ត
Passiflora foetida	Passifloraceae	Wild maracuja	វល្លិសាវម៉ាវ
Psidium guajava	Myrtaceae	Guava	ត្របែក

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 manual removal by project partners ELIE/EVP, 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. The project does not introduce or contribute to the proliferation of any of the below.

Table 5.6 Known non-native species present at the project site

Scientific name	Family	English name	Khmer name
Eichhornia crassipes	Pontederiaceae	Common water hyacinth	កំបោក
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	វល្លិសាវម៉ាវ

Psidium guajava	Myrtaceae	Guava	ត្របែក
Physalis angulata	Solanaceae	Angular Winter-cherry	ប៉ោងបោះស្រោម
Solanum torvum	Solanaceae	Turkey berry	របមងរបពលញង

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. No pesticides or fertilizers are used in project-supported activities. 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. Farmers participating in the IBIS Rice scheme aim for independent organic certification to increase their rice sale price.

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)

Negative Offsite Impact	Mitigation Measure(s)
Displacement of deforestation (leakage)	Leakage is addressed through application of many of the project activities listed above within the leakage area; this includes the establishment of a 3,438 ha CPA that hosts a community-based bamboo enterprise, as well as recruiting farmers for a rice growing scheme, that seek to stabilize forest loss. The leakage area is monitored through remote sensing and for the area within the KSWS, law enforcement patrols provide an additional monitoring mechanism.
Displacement of hunting and trapping for high value species	On KSWS' northern border lies PPWS, a protected area managed by MOE and supported by WWF, where similar activities to the KSWS REDD+ project take place, reducing potential for displacement.
Displacement of illegal collection of forest resources (NTFPs, and fish)	On KSWS' northern border lies PPWS, a protected area managed by MOE and supported by WWF, where similar activities to the KSWS REDD+ project take place, reducing potential for displacement. The project coordinates with the Provincial Department of Environment and Governor's office, who support natural

	resource management across the landscape, to improve land planning decisions and to support the management of protected areas. The project works with local communities to improve natural-resource management patterns and alternative income sources. Therefore many practices that have negative impacts on biodiversity are not displaced, but rather are replaced with alternative options. For example, in the bamboo-rich area in the south, the project has established Sre Preah CPA where village groups have developed bamboo management strategies to enhance the sustainability of harvesting and minimize the pressure to over-harvest, or harvest bamboo in neighboring areas. Livelihood support work including IBIS Rice provide alternative sources of income and reduce levels of hunting for food or income, or the over-exploitation of other forest resources.
Displacement of illegal logging	Few stocks of high value luxury timber species remain outside of protected areas in Cambodia, and illegal logging occurs widely in any remaining forest fragments regardless of proximity to protected areas; displacement of illegal logging from KSWS is thus not likely.

5.2.2 Net Offsite Biodiversity Benefits (B3.3)

Potential negative offsite impacts and their mitigations are raised above, and no negative offsite biodiversity impacts from project activities have been observed. The project is likely to have positive biodiversity impacts outside the project area through source populations of species protected within the project area.

Given the project's substantial and well-documented positive biodiversity impacts within the project zone, including supporting stable populations of the critically endangered black-shanked douc and endangered yellow-cheeked crested gibbons, an absence of negative on-site impacts of project activities, likely positive offsite impacts noted above, and an absence of negative off-site impacts, it's clear that the project's net impact on biodiversity is positive.

5.3 Biodiversity Impact Monitoring

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

Section 8.1.5.4 of the project description fully describes the biodiversity monitoring plan. The key biodiversity monitoring that took place during this monitoring period was the bi-annual line transect-based distance sampling. Additional monitoring took place including opportunistic SMART records, targeted camera trap surveys, and nest protection.

5.3.1.1 Distance-sampling methods

A fixed network of 40 square transects, each with total length of 4 km, was distributed systematically across the project area in 2010, and these have been used for each subsequent sampling session. Each transect is walked by observers repeatedly, with all observations of key species recorded (six

ungulate species, six primates, and one bird species (Table 5.7), along with data relating to their position in relating to the line transect. These observations are then used within a distance sampling methodical framework to produce per-species abundance estimates.

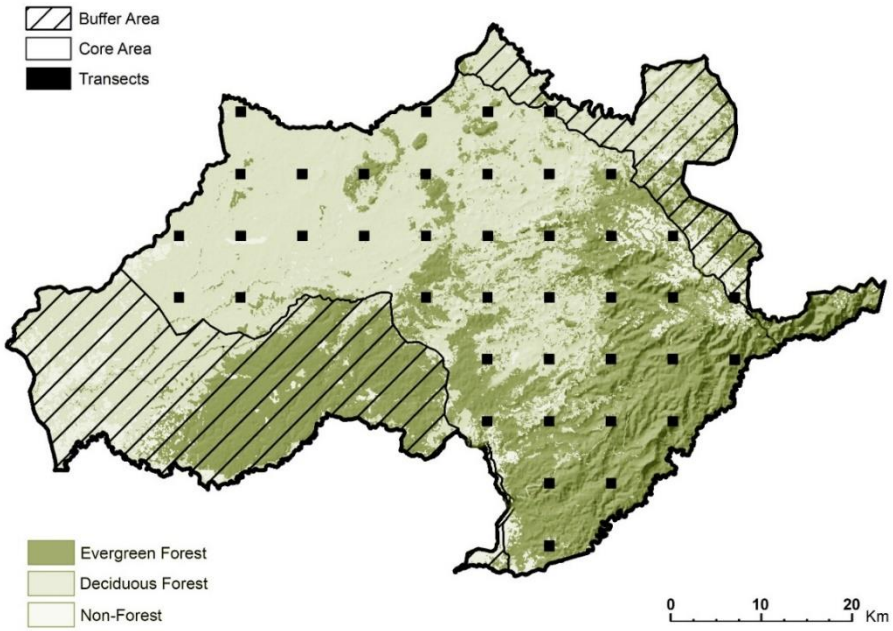


Figure 5.1 Location of KSWS transects

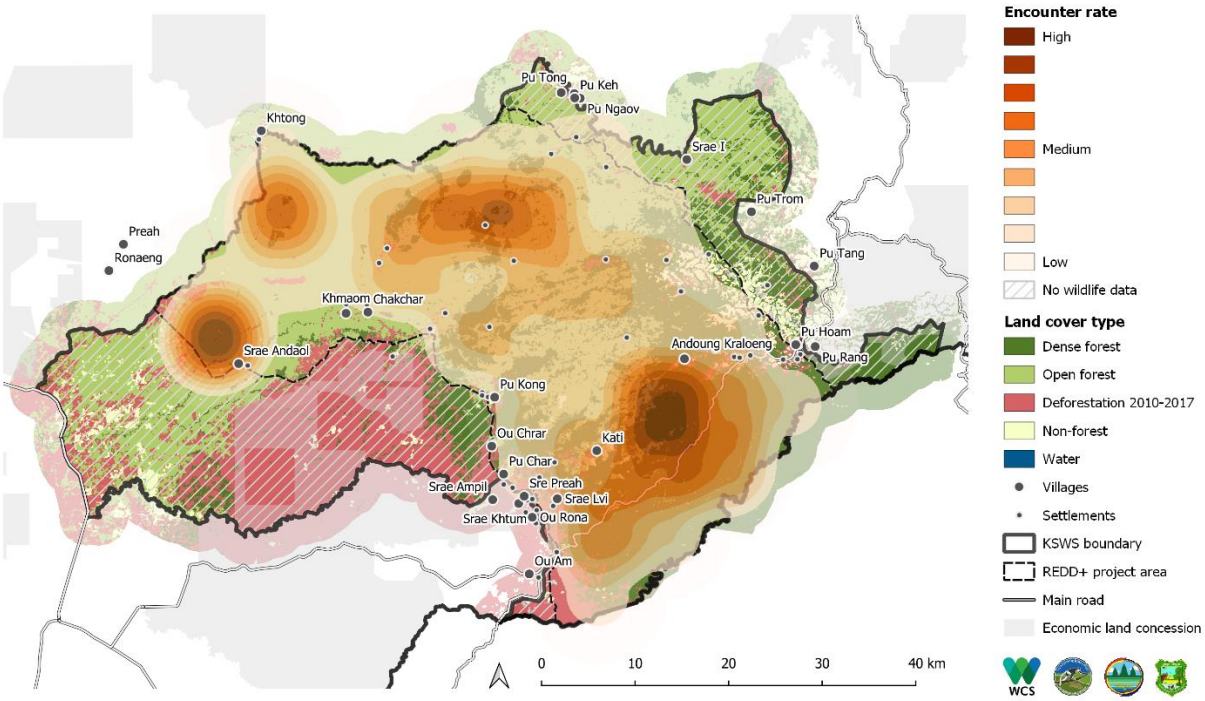
Preparations for the 2020 sampling session began in late 2019 with training of teams and preparation of line transects. Field surveys were conducted from January 2020 until May 2020, with teams walking a combined distance of 1280 km and making 560 observations of 2016 individual animals. These observations are recorded in notebooks, then entered into spreadsheets, where the data are checked and cleaned. Analysis then takes place in R using the `distance` package. Full documentation of process and results is available in the provided report Griffin O. & Nuttall M. (2020) and peer-reviewed journal article Nuttall et al. 2021.

The next sampling session was initiated at the end of 2021, with the preparation of the line transects for survey during the beginning of 2022.

5.3.1.2 Distances sampling monitoring results for this period

Monitoring results for this period are presented in Griffin O. & Nuttall M. (2020) and peer-reviewed journal article Nuttall et al. 2021.

Distribution maps are produced for each key species based on transect encounter rates, interpolated with kernel desnity estimates, and an aggregate is produced to show wildlife hotspots across KSWS (Figure 5.2). These maps show the importance of key parts of the project area for wildlife populations. These data were included in the data-driven zonation process.



Data from 2010-2020 line transect surveys conducted by WCS Cambodia, Forestry Administration, and Ministry of Environment. Scaled, combined kernel density estimates for 13 key species: black-shanked douc langur (*Pygathrix nigripes*), yellow-cheeked crested gibbon (*Nomascus gabriellae*), germain's silvered langur (*Trachypithecus germaini*), long-tailed macaque (*Macaca fascicularis*), northern pig-tailed macaque (*Macaca leonina*), stump-tailed macaque (*Macaca arctoides*), green peafowl (*Pavo muticus*), wild pig (*Sus scrofa*), northern red muntjac (*Muntiacus vaginalis*), banteng (*Bos javanicus*), gaur (*Bos gaurus*), eld's deer (*Rucervus eldii*), sambar (*Rusa unicolor*). Map created 2020.

Figure 5.2. Distribution of key species in Keo Seima Wildlife Sanctuary.

*Table 5.7 Global population trend, Keo Seima Wildlife Sanctuary population trend, and Keo Seima Wildlife Sanctuary 2020 population estimates for key species. * denotes trends based on expert assessment. Population estimates for 2020 are not available for thee key species due to low encounter rates.*

English name	Global population trend & IUCN Red list status	KSWS trend	KSWS population 2010 (95% CI)	KSWS population 2020 (95% CI)
Black-shanked douc	Declining, CR	Stable	24,289 (15,936-37,021)	24,929 (16,241-38,266)
Yellow-cheeked gibbon	Declining, EN	Stable	952 (441-2055)	1432 (750-2735)
Germain's silver langur	Declining, EN	Stable	2912 (974-8712)	1487 (588-3758)
Long-tailed macaque	Declining, VU	Stable	3125 (1379-7080)	1566 (792-3097)
Pig-tailed macaque	Declining, VU	Increasing	2008 (913-4417)	3929 (2457-6284)
Stump-tailed macaque	Declining, VU	Declining	529 (159-1758)	230 (42-1246)
Green peafowl	Declining, EN	Increasing	309 (154-617)	745 (375-1481)
Wild pig	Stable, LC	Declining	3377 (1846-6176)	1100 (587-2063)
Northern red muntjac	Declining, LC	Declining	3383 (2434-4703)	825 (524-1300)
Banteng	Declining, EN	Declining	382 (75-1956)	-
Gaur	Declining, VU	Declining	497 (139-1778)	33 (6179)
Eld's deer	Declining, EN	Declining*	-	-
Sambar	Declining, VU	Declining*	-	-

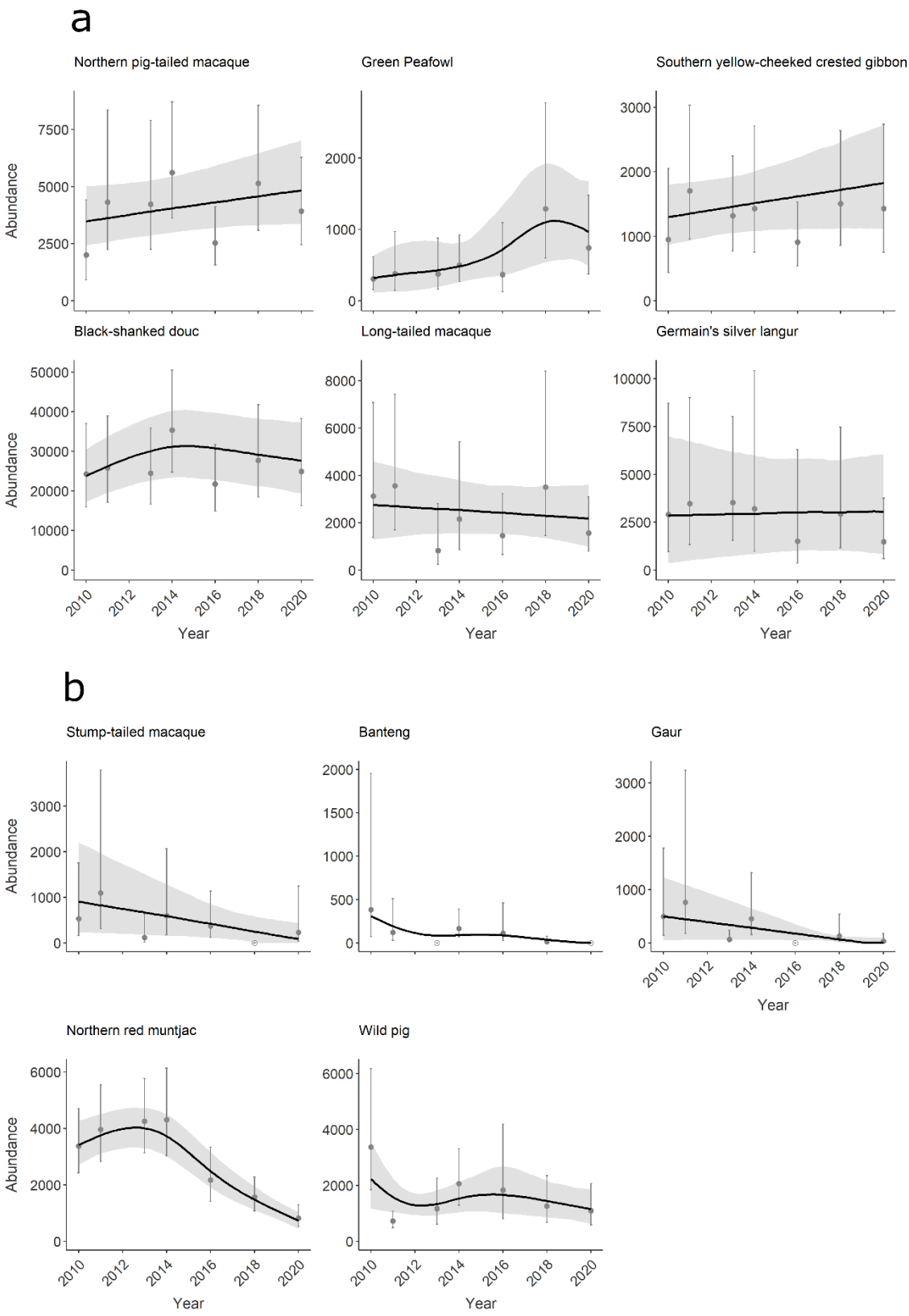


Figure 5.3. Population estimates and trends for key species in the core area of Keo Seima Wildlife Sanctuary from 2010 to 2020. a) Species with stable or increasing population trends; b) species with declining population trends. Black line shows population trend, gray fill shows 95 % (light gray) and 85 % (dark gray) confidence interval of trends. Gray dots show conventional distance sampling annual estimates, and vertical gray lines show confidence intervals of annual estimates.

5.3.1.3 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.

5.3.1.4 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 5.8.

Table 5.8 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

All three trigger species are Endangered or Critically Endangered on the IUCN Red List, which means global populations of these species have undergone declines of more than 50% over the past 3 generations. In contrast, KSWS populations have remained stable since 2010; this demonstrates the effectiveness of the conservation actions taken.

5.3.1.5 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.

5.3.1.6 Monitoring impacts outside the Project Area

Impacts of project activities outside the Project Area are monitored in a number of ways (Table 5.9). 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. Government 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 5.9 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 ~5 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

5.3.1.7 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 5.10.

Table 5.10 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 (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)

This reporting period represented 10 years of key species monitoring. As such, the full 10-year period was reanalyzed using generalized additive models (GAMs) combined with bootstrapping to provide robust population trend estimates. The results of this analysis was published as a technical report (Griffin O. & Nuttall M. (2020). *Status of Key Species in Keo Seima Wildlife Sanctuary 2010–2020*), with a Khmer executive summary, along with Khmer aide-memoires and other materials. These results were presented to PDOE, MoE, and journalists at a press conference at the MoE headquarters in Phnom Penh. Results were reported in both national and international media outlets, including the national TV broadcaster AMC. Reports are publicly available on the WCS Cambodia website. Additional meetings were held with PDOE in Mondulkiri, and with other project partners. Typically, results are presented to each of the 20 REDD+ villages in KSWS by the Wildlife Monitoring Team, but in this period COVID-19 restrictions prevented these village meetings taking place. Khmer summaries will be made available during the community consultation for this period's verification. KSWS project staff were briefed on the results, including discussions on how to learn from these results and improve management.

Figure 5.4. Press conference in at the Ministry of Environment, Phnom Penh, to disemminate the results of the 2020 biodiversity monitoring.

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 84 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.

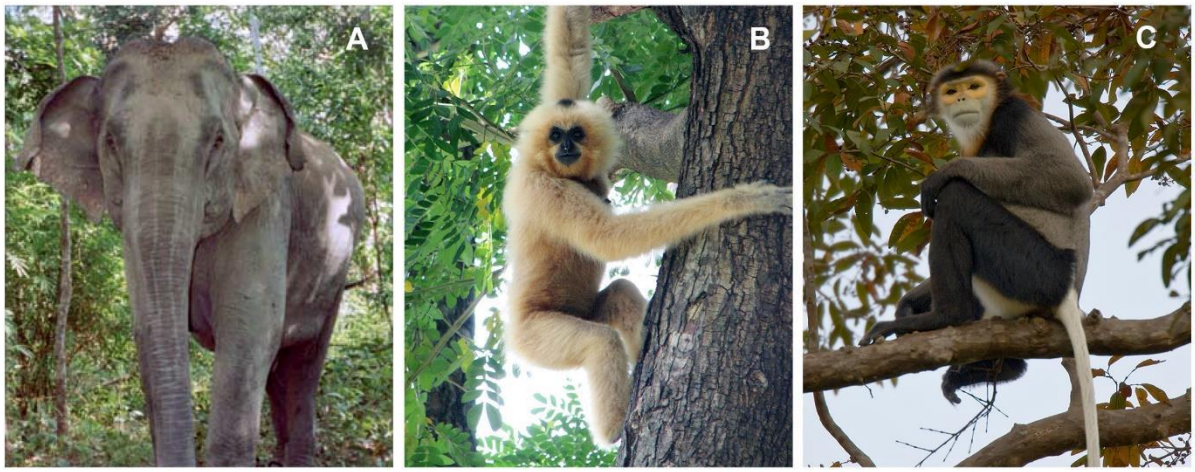


Figure 5.4 KSWS trigger species are: (A) Asian elephant, (B) yellow-cheeked crested gibbon, and (C) black-shanked douc

The Project Area is home to at least 84 Globally Threatened species, including 60 animal species, as listed in the table below.

Table 5.11 Globally threatened animal 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	Global IUCN status	KSWS Importance
Actinopterygii	Giant Carp	Catlocarpio siamensis	*CR*	
Actinopterygii	Jullien's Golden Carp	Probarbus jullieni	*CR*	
Actinopterygii	Red Mahseer	Tor sinensis	*VU*	
Actinopterygii	Thicklipped Barb	Probarbus labeamajor	*EN*	
Actinopterygii	Wallago	Wallago attu	*VU*	
Actinopterygii	Yellow Tail Brook Barb	Poropuntius deauratus	*EN*	
Actinopterygii		Hypsibarbus lagleri	*VU*	
Amphibia	O'Reang Horned Frog	Ophryophryne synoria	*VU*	Global
Aves	Blue-winged Leafbird	Chloropsis cochinchinensis	*EN*	
Aves	Giant Ibis	Pseudibis gigantea	*CR*	National

Aves	Great Hornbill	Buceros bicornis	*VU*	
Aves	Great Slaty Woodpecker	Mulleripicus pulverulentus	*VU*	
Aves	Greater Adjutant	Leptoptilos dubius	*EN*	
Aves	Green Peafowl	Pavo muticus	*EN*	Global
Aves	Lesser Adjutant	Leptoptilos javanicus	*VU*	National
Aves	Manchurian Reed-warbler	Acrocephalus tangorum	*VU*	
Aves	Masked Finfoot	Heliopais personatus	*EN*	
Aves	Pale-capped Pigeon	Columba punicea	*VU*	
Aves	Red-headed Vulture	Aegypius calvus	*CR*	Possibly global
Aves	Sarus Crane	Grus antigone	*VU*	
Aves	White-rumped Vulture	Gyps bengalensis	*CR*	Possibly global
Aves	White-shouldered Ibis	Pseudibis davisoni	*CR*	Possibly global
Aves	White-winged Duck	Asarcornis scutulata	*EN*	Regional
Aves	Wreathed Hornbill	Rhyticeros undulatus	*VU*	
Aves	Yellow-breasted Bunting	Emberiza aureola	*CR*	
Gastropoda		Bertia cambojiensis	*CR*	
Mammalia	**Asian Elephant**	**Elephas maximus**	***EN***	**Regional**
Mammalia	Asiatic Black Bear	Ursus thibetanus	*VU*	Possibly regional
Mammalia	Banteng	Bos javanicus	*EN*	Global
Mammalia	Binturong	Arctictis binturong	*VU*	
Mammalia	**Black-Shanked Douc**	**Pygathrix nigripes**	***CR***	**Global**
Mammalia	Clouded Leopard	Neofelis nebulosa	*VU*	Possibly regional
Mammalia	Dhole	Cuon alpinus	*EN*	Possibly regional
Mammalia	Eld's Deer	Rucervus eldii	*EN*	Regional
Mammalia	Gaur	Bos gaurus	*VU*	Regional
Mammalia	Germain's silver langur	Trachypithecus germaini	*EN*	Possibly global
Mammalia	Hog Badger	Arctonyx collaris	*VU*	
Mammalia	Indochinese Serow	Capricornis sumatraensis	*VU*	
Mammalia	Large-Eared Roundleaf Bat	Hipposideros pomona	*EN*	
Mammalia	Large-Spotted Civet	Viverra megaspila	*EN*	
Mammalia	Leopard	Panthera pardus	*VU*	
Mammalia	Long-Tailed Macaque	Macaca fascicularis	*VU*	
Mammalia	Malay Pangolin	Manis javanica	*CR*	Regional
Mammalia	Northern Pig-Tailed Macaque	Macaca leonina	*VU*	National
Mammalia	Oriental Small-Clawed Otter	Aonyx cinereus	*VU*	
Mammalia	Pygmy Loris	Nycticebus pygmaeus	*EN*	Global
Mammalia	Sambar	Rusa unicolor	*VU*	Possibly regional
Mammalia	Smooth-Coated Otter	Lutrogale perspicillata	*VU*	
Mammalia	Stump-Tailed Macaque	Macaca arctoides	*VU*	Possibly regional
Mammalia	Sun Bear	Helarctos malayanus	*VU*	National
Mammalia	**Southern Yellow-Cheeked Crested Gibbon**	**Nomascus gabriellae**	***EN***	**Global**
Reptilia	Asiatic Softshell Turtle	Amyda cartilaginea	*VU*	
Reptilia	Burmese Python	Python bivittatus	*VU*	
Reptilia	Chinese Water Dragon	Physignathus cocincinus	*VU*	

Reptilia	Elongated Tortoise	Indotestudo elongata	*CR*	Global
Reptilia	Giant Asian Pond Turtle	Heosemys grandis	*VU*	Regional
Reptilia	King Cobra	Ophiophagus hannah	*VU*	
Reptilia	Ruby-Eyed Green Pit-Viper	Trimeresurus rubeus	*VU*	Possibly global
Reptilia	Siamese Crocodile	Crocodylus siamensis	*CR*	
Reptilia	Yellow-Headed Temple Turtle	Heosemys annandalii	*EN*	Global

Table 5.11 includes 29 animal 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:

1. Titania's wooly bat (*Kerivoula titania*, LC)
2. Indochinese thick-thumbed bat (*Glischropus bucephalus*, NE)
3. O'Reang horned frog (កង្កែបស្នែងអូររាំង, *Ophryophryne synoria*, VU)
4. Mouhot's litter frog (កង្កែបស្លឹកមូហួត, *Leptobrachium mouhoti*, LC)
5. Red-eyed green pit-viper (*Trimeresurus rubeus*, VU)
6. *Scincella nigrofasciata* (NE), a skink species
7. *Cyana angkorensis* (NE), a moth species
8. *Naarda furcatella* (NE), a moth species
9. *Dichomeris hainanensis* (NE), a moth species
10. *Dichomeris magnimacularis* (NE), a moth species
11. *Thubana seimaensis* (NE), a moth species
12. *Promalactis apicuncata* (NE), a moth species
13. *Promalactis quadrilobata* (NE), a moth species
14. *Promalactis seimana* (NE), a moth species
15. *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 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 (Table 5.11).

Black-shanked douc. This Critically Endangered primate 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 24,929 individuals (Nuttall et al., 2021). This is the largest known population in the world, and significantly larger than the next largest reported population of an estimated 500–700 individuals 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 1432 individuals (Nuttall et al., 2021). 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 1487 individuals (Nuttall et al., 2021). The population within KSWS appears morphologically to be a transitional form between *T. germani* and *T. margarita* (J Moody, pers. comm. 2020).

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). Although significant declines have taken place across the landscape, these 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 745 individuals, 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. In 2020, one nest was found with no successful fledglings, and in 2021 two nests were found and protected, with two successful fledglings.

Table 5.8 Globally threatened plant species recorded in the Project Area. 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		*Craibiodendron scleranthum*	VU	
Magnoliopsida		*Schima wallichii*	VU	Medical Plant
Magnoliopsida		*Afzelia xylocarpa*	EN	Luxury
Magnoliopsida	Burmese Rosewood	*Dalbergia bariensis*	EN	Luxury
Magnoliopsida	Siamese Rosewood	*Dalbergia cochinchinensis*	VU	Luxury
Magnoliopsida	Black Rosewood	*Dalbergia oliveri*	EN	Luxury
Magnoliopsida	Burma Padauk	*Pterocarpus macrocarpus*	EN	Luxury
Magnoliopsida		*Cinnamomum cambodianum*	CR	
Magnoliopsida		*Cinnamomum litseifolium*	VU	
Magnoliopsida		*Knema glauca*	VU	
Magnoliopsida		*Anisoptera costata*	EN	
Magnoliopsida	Hairy-Leafed Apitong	*Dipterocarpus alatus*	VU	Grade 2
Magnoliopsida		*Dipterocarpus costatus*	VU	Grade 2
Magnoliopsida		*Dipterocarpus dyeri*	EN	Grade 2
Magnoliopsida		*Dipterocarpus intricatus*	EN	Grade 2
Magnoliopsida		*Dipterocarpus turbinatus*	VU	Grade 2
Magnoliopsida		*Hopea odorata*	VU	Grade 1
Magnoliopsida		*Shorea farinosa*	EN	Grade 2
Magnoliopsida	White Meranti	*Shorea hypochra*	EN	Grade 2
Magnoliopsida	White Meranti	*Shorea roxburghii*	VU	Grade 1
Magnoliopsida	Asian Crape Myrtle	*Lagerstroemia floribunda*	VU	Medical Plant
Magnoliopsida	Big Leaf Mahogany	*Swietenia macrophylla*	VU	
Magnoliopsida		*Litchi chinensis*	VU	

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, as measured through the robust, long-term line transect based methodology described in 5.3.1.1. Population results from the 2016 elephant fecal DNA survey suffered significant

genetic sample degradation and did not produce new population estimates. See Figure 5.3 for abundance plots of black-shanked douc and southern yellow-cheeked crested gibbon.

Trigger Species	Asian elephant
With-project Scenario	Stable. Monitoring of Asian elephant populations in KSWS is planned every ~5 years. Whilst a direct measure of population size was not possible in the 2016 session, stability of the population during this monitoring period is assessed through the triangulation of less direct measures as laid out in CCB GL3.1.2 footnote 132: "*site occupancy, intensity of key threats (off-take, mortality, habitat change, disturbance) .... Where direct evidence is lacking, past trends can be determined from threat assessments, credible local reports etc*." Monitoring data show elephants remain widely distributed across KSWS, and elephant have been caught on camera traps within the project area. No legal off-take of elephants is permitted in Cambodia. No mortality events have been recorded in KSWS in the monitoring period. Habitat change is limited by project activities. Threats remain similar in magnitude. Anecdotal but credible local reports suggest continued presence. Primary threats to Asian elephants in the area are habitat loss, poaching, snares (by-catch), and human-elephant conflict. To maintain and enhance the elephant population, these threats are addressed through direct law enforcement, anti-snare patrols, outreach and education on impacts of snaring, and a dedicated human-elephant conflict mitigation team who provide support to farms to mitigate and reduce conflicts.

Trigger Species	Southern yellow-cheeked crested gibbon
With-project Scenario	Stable, based on 2020 key species population monitoring data. The two primary threats to the trigger species in KSWS are loss of habitat and poaching. Patrolling by rangers since the project inception has reduced poaching, illegal logging, and illegal forest conversion to agriculture within KSWS.

Trigger Species	Black-shanked douc
With-project Scenario	Stable, based on 2020 key species population monitoring data. The two primary threats to the trigger species in KSWS are loss of habitat and poaching. Patrolling by rangers since the project inception has reduced 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.