



Verified Carbon Standard

AFFORESTATION IN EUCALYPTUS AND ACACIA PLANTATIONS FOR BURAPHA AGROFORESTRY CO., LTD.



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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

Burapha implements and operates agroforestry plantations (primarily Eucalyptus timber species) in Vientiane Prefecture and the Provinces of Vientiane, Xayabouly, and Saisomboun in Central Lao People's Democratic Republic (Laos). Current operations include over 2,000 individual plantations spread out on approximately 5,800 hectares (ha)¹, wood processing facilities and supporting infrastructure across Vientiane prefecture and the three provinces. The plantations cover approximately 4,200 ha of private land acquired under various land lease agreements with farmers and village cooperations, and close to 1,600 ha of concession land from the Government of Laos (GoL). Burapha's plantations are all Forest Stewardship Council (FSC) certified. Burapha implements a seven-year plantation cycle and an agroforestry model, whereby local villagers are given the option to practice intercropping with annual crops such as rice during year 1-2, and cattle-grazing from years 3 to 7. The cycle continues throughout the lease period, and when the lease expires, the land is returned to the local communities.

Burapha operates a sawmill and furniture factory in Nabong village, Vientiane Prefecture, which processes eucalyptus logs harvested from their plantations, as well as teak and eucalyptus purchased from outside entities. The sawmill has recently been upgraded with new machinery to enhance efficiency and productivity, and the facility currently produces approximately 420 cubic meters (m³) of ready-made products per year. Burapha also has a tree nursery and a research and development (R&D) facility situated adjacent to the Nabong sawmill. Burapha's breeding program includes trials of 60 types of eucalyptus clones to support plantation development, and ongoing trials of bamboo and other species for research purposes.

In 2021, Burapha completed construction and commissioning of a veneer and plywood mill at Hin Heup, in Vientiane Province. The veneer/plywood mill has the capacity to process approximately 150,000 m³ of sawlogs annually, and to produce an estimated 32,500 m³ of veneer and 26,000 m³ of plywood per annum. Operations started in June 2021; the facility is currently running at 60 percent of full production capacity and is expected to reach its full capacity by the end of 2023.

¹ Note the first Project Activity Instance is comprised of 2,946 ha only.

For this first Project Activity Instance a total of 2,946 ha have been planted with Eucalyptus and Acacia species, 2,776 ha are subject to the second monitoring period². The project is implemented in accordance with the PD but there is a deviation in monitoring methodology for this monitoring period. A network of Temporary Sample Plots along with the Permanent Sample Plots have been considered for a better inventory outcome. The total GHG emission reductions of the First Project Instance for the second monitoring period 23.12.2020 until 31.12.2022 are 163,075 tCO₂e. The number of GHG credits eligible to be issued as VCUs for the second verification of the First Project Instance is 146,768 tCO₂e.

Audit Type	Period	Program	VVB Name	Number of years
Validation	02-03-2023	VCS	TUV-Nord	
Verification	31-05-2016 to 22-12-2020	VCS	TUV-Nord	5
Verification	23-12-2020 to 31-12-2022	VCS	Earthood	2
Total				

1.2 Sectoral Scope and Project Type

The project is under Sectoral Scope 14 “Agriculture, Forestry and other Land Use”, in the Afforestation, Reforestation and Revegetation (ARR) category.

The project is designed as a VCS grouped project.

1.3 Project Proponent

Organization name	Burapha Agro-Forestry Co. Ltd.
Contact person	Przemek Pruszyński
Title	CEO
Address	23 Singha Road, Ban Phonexay PO Box 11834 Xaysettha District Vientiane, Lao PDR

² Note that 170 ha has been planted in Xayabouly Province. Xayabouly Province is also one of the northern provinces participating in the World Bank’s FCPF. To avoid the potential of double counting areas planted within Xayabouly Province have been excluded from verifications until a letter from the Government of Laos, confirming no double counting, can be secured.

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1.4 Other Entities Involved in the Project

Organization name	SilviCarbon B.V.
Role in the Project	Carbon asset management
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Title	Director of Carbon
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1.5 Project Start Date

Project Start date: 31.05.2016

The project start date is marked by the beginning of the planting activities in 2016.

1.6 Project Crediting Period

Project start date	31.05.2016
Project end date	30.05.2036
Total No of crediting years	20 years renewable

However, Burapha's village cooperation agreements foresee 30 years of lease with the option for extension of another 20 years, where all stakeholders have to approve concession periods are set to 50 years with the option of a 25 year extension, pending approval by all stakeholders.

1.7 Project Location

The plantations are established in the Prefecture of Vientiane and the Provinces of Vientiane, Xayabouly (note that the 170 hectares planted in this province has been excluded from this verification), and Saysomboun in Lao PDR. The project region boundary encompasses the following provinces of Lao PDR: Bolikhamxay, Saysomboun, Vientiane Province, Xayabouly and Vientiane Prefecture. All project plantations have similar baseline conditions and are established on leased land of village partners and Government-owned Production Forest Areas (PFAs). The current plantations are located between 101°42'21.07E – 102°33'48.32E and 18°20'37.80N – 19°02'33.88N.

Project GIS maps are available as supporting documentation. The table below shows the first activity instances of this grouped project stratified according to the years of planting.

Table 1. First project activity instances included in this project

Planting year	Cumulative Area (ha)	Baseline Stratum
2016	947	Slash-and-Burn
2017	1549	Slash-and-Burn
2018	1,980	Slash-and-Burn
2019	2,210	Slash-and-Burn
2020	2,946	Slash-and-Burn
Total	2,946³	

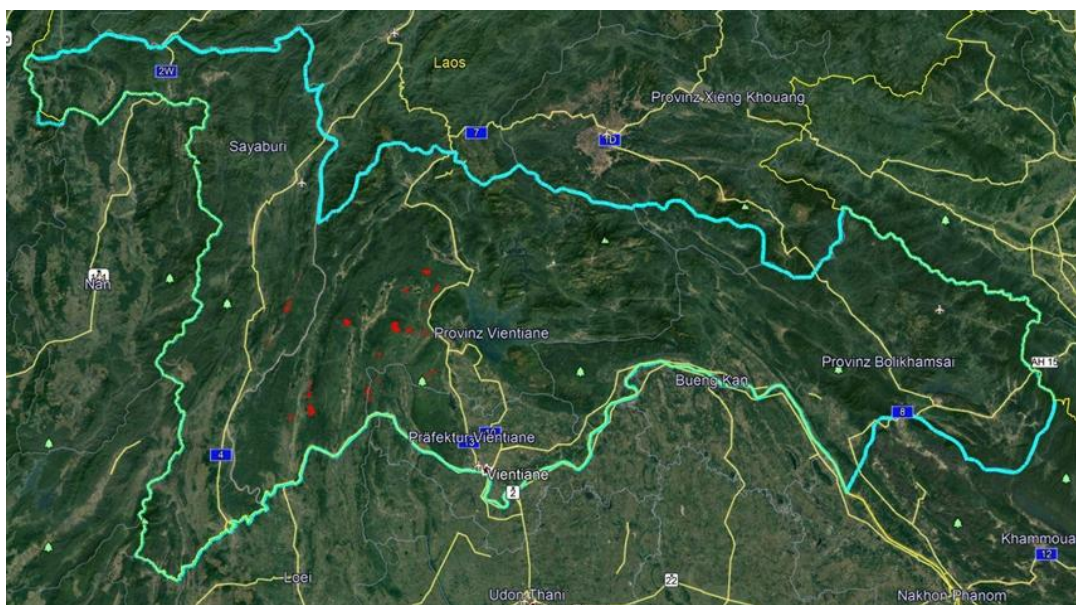


Figure 1. Project region boundary with first project instances, 2020

³ Note this is the total PAI area planted. The 170ha planted in Xayabouly Province is excluded from this verification.

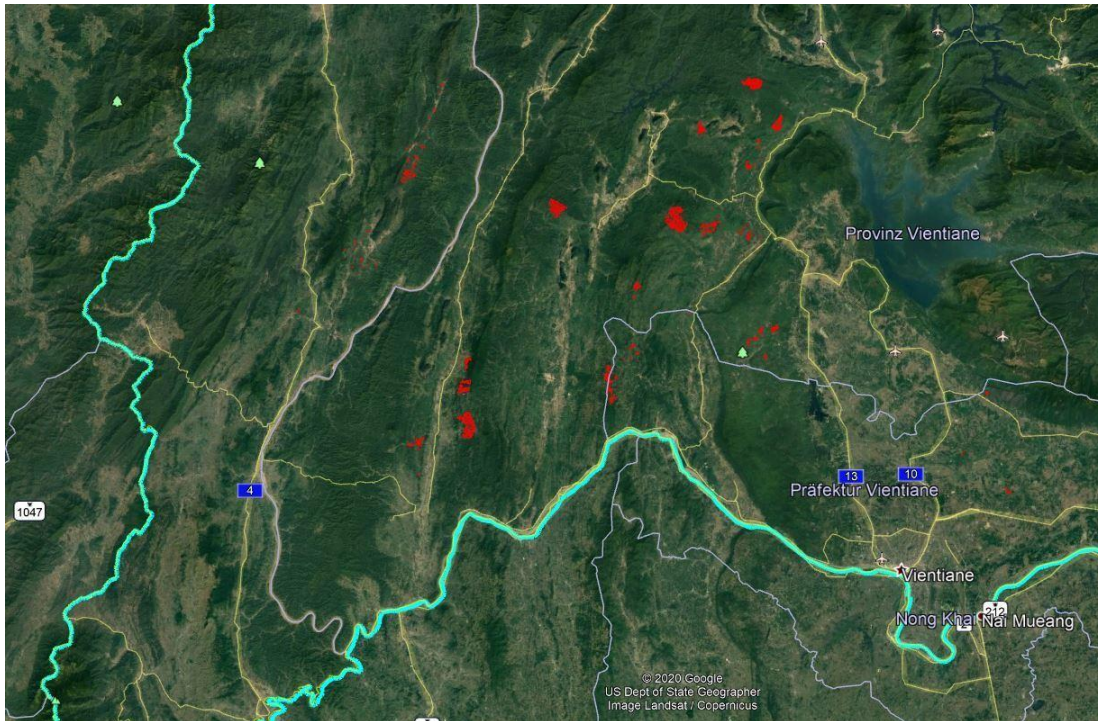


Figure 2. First project instance in detail (red), 2020

1.8 Title and Reference of Methodology

Approved CDM methodology: AR-ACM0003 “AR Large scale - Afforestation and reforestation of lands except wetlands”, version 2

These CDM methodological tools will be used in accordance with the methodology:

- “Combined tool to identify the baseline scenario and demonstrate additionality”, version 7
- “Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities, version 4.2
- “Estimation of non-CO2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity”, version 4.0
- “Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities”, version 1.1.0

- “Demonstrating appropriateness of allometric equations for estimation of aboveground tree biomass in A/R CDM project activities”, version 1.1.0

1.9 Participation under other GHG Programs

1.9.1 Projects Registered (or seeking registration) under Other GHG Program(s)

This project has not and is not seeking registration under another GHG program.

1.9.2 Project Rejected by Other GHG Programs

This project has not been rejected by any other GHG program, since it did not seek registration under a different GHG program.

1.10 Other Forms of Credit and Supply Chain (Scope 3) Emissions

Lao PDR pledged under the Paris agreement to increase Forest cover to 70% by 2020 as part of the Intended National Determined Contributions (INDC's; ndcs.undp.org)⁴. Considering the current situation with widespread shifting cultivation and the new forestry law from 2019, trying to discourage farmers from practicing permanent agriculture, there is a shift in policies towards forest growth and improvement of forests. Burapha contributes with its Agroforestry scheme and plantations to this goal of increasing forest cover. However, the NDC implementation plan is still pending.

Lao PDR is part of the FCPF Carbon fund and registered as a REDD early mover's country (forestcarbonpartnership.org)⁵. Burapha has a Letter of Acknowledgement from the GOL, acknowledging and supporting the ARR project. However, to be eligible to be added to the Burapha project, areas planted in Xayabouly Province (the only province where Burapha will have plantations and the World Bank program will also be implemented), must secure a confirmation letter from the Lao Government stating that there will be no double counting of those areas⁶.

1.10.1 Emissions Trading Programs and Other Bonding Limits

The project does not reduce emissions in another emission trading program.

1.10.2 Other Forms of Environmental Credit

The project is not being used to create other environmental credits.

⁴<https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Lao%20People%27s%20Democratic%20Republic%20First/Lao%20People%27s%20Democratic%20Republic%20First%20NDC.pdf>

⁵ <https://www.forestcarbonpartnership.org/country/lao-pdr>

⁶ Note this is why the 170 hectares planted in Xayabouly have been removed from the verification. A confirmation letter for this area is still pending.

1.11 Sustainable Development Contributions

The Burapha project supports sustainable development at the national and international policy level, and will generate a range of sustainability benefits at the local level. The project will make productive use of degraded land and provide significant local and regional employment opportunities across operations.

The Burapha project is contributing to the following SDG's:

- **SDG 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all**
- **SDG 13: Take urgent action to combat climate change and its impacts**
- **SDG 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**

The SDGs selected are integrated into the policies and strategies of the Government of Laos and consistent with Laos SDG objectives. The Government of Laos has under the Paris Agreement, included Land use Change and Forestry in the Nationally Determined Contribution (NDC). The conditional target aims to reduce emissions from deforestation and forest degradation while enhancing forest carbon stocks. The NDC is aligned with the 9th five-year National Socio-Economic Development Plan, with a focus on combating climate change and its impacts.⁷

The project will provide significant local and regional employment opportunities across operations which will contribute to the SDG 8 The 9th National Socio-Economic Development Plan (NSED) for 2021-25 outlines the country's strategy for economic development and poverty alleviation. It addresses key challenges such as infrastructure development in rural areas, development of trade and economic integration, improved governance, and climate adaptation.

SDG 13 and SDG 15 are aligned with the target and objective of the Government of Laos. Lao PDR pledged under the Paris agreement to increase Forest cover to 70% by 2020 as part of the Nationally Determined Contributions. Considering the current situation with widespread shifting cultivation and the new forestry law from 2019, there is a shift in policies towards forest growth and improvement of forests. The project use land for plantations which are highly degraded from the local practice of slash-and-burn farming. The introduction of Agroforestry allows local farmers to move away from their traditional slash-and-burn farming. The Forestry Law states that: Those engaged in swidden cultivation are to be encouraged to move to settled agriculture (Article 53).

⁷ Lao PDR Nationally Determined Contribution (NDC), 2021,

In 2021, Burapha completed construction and commissioning of a veneer and plywood mill at Hinheup District, Vientiane Province, close to the newly built Lao-China expressway. The veneer/plywood mill has the capacity to process approximately 150,000 m³ of sawlogs annually, and to produce an estimated 32,500 m³ of veneer and 26,000 m³ of plywood per annum. Operations started in June 2021; the facility is currently running at 60 percent of full production capacity and is expected to reach its full capacity by the end of 2023. The plywood is supported by over 300 workers, almost all from villages within 10km of the facility.

As of February 2023, Burapha has planted approximately 5,800 hectares (ha) of land planted across 40 partner villages through different modes of land use rights acquisition. Approximately 1,150 hectares were acquired via lease agreements with individual farmers (415 farmer agreements), 1,537 hectares of communal land via lease agreement with villages (13 village cooperative agreements). For both farmer agreements and village cooperative agreements, land is priced based on market rates and paid on a lumpsum basis. Burapha also has 1,539 hectares of land in state-owned production forest areas, previously used for swidden agriculture (slash and burn). The remaining balance of about 1,500 hectares was acquired through perpetual use rights (90 company land agreements and 7 other concession agreements). Its current landholding also comprises approximately 18 hectares used for company facilities (tree nursery, R&D facility, sawmill and plywood mill) acquired through state concessions.

For its expansion, Burapha will be acquiring land use rights under the Concession Agreement awarded to Burapha by the GoL in July 2020 (amended March 2022) for a period of 50 years. The Concession Agreement allocates to Burapha 60,000 hectares of land in production forest area in the Provinces of Vientiane and Xayaburi. As of February 2023, Burapha has obtained approval from respective government offices (national, provincial, and district) and consent from village committees for 10,000 hectares of land out of the 60,000 hectares for its expansion

For plantation management, workers are prioritized and sourced from the PFA land users themselves, and also through recruitment from the village where the PFA is located. Agreements for labor are entered into via household contract, or via daily labor contract. Where there is insufficient labor from local recruitment efforts contract labor teams are occasionally used.

Table 2: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
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1)	<p>SDG 8 Protect labour rights and promote safe and secure working environments for all workers, including migrant workers, in particular women migrants, and those in precarious employment.</p> <p>8.5 Achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value</p>	<p>Indicator 8.5.1 Average hourly earnings of female and male employees, by occupation, age and persons with disabilities ⁸</p>	<p>Implemented activities will contribute to increased earning among of the female and male employees.</p>	<p>All permanent and daily workers sign written contracts and receive induction covering the Staff Rules prior to starting employment.</p> <p>All workers are paid above the Lao minimum wage.⁹ In recognition of increasing inflation rates in Lao PDR, all Lao employees remunerated in local currency (LAK) received a cost-of-living wage increase in August. Additionally, daily meal allowances for eligible employees were also increased to recognize the increasing food costs in Laos.</p> <p>In August 2022, Burapha participated in independent remuneration surveys with recognized, global providers to better inform future decisions regarding remuneration bands to align the company with the Lao market¹⁰.</p> <p>Burapha employees average hourly earnings for 2023 by occupation:</p> <p>Male 190,724 Female: 3,727,593</p>	<p>As of February 2023, Burapha employs 464 permanent staff across its operations, of which 44% are women¹².</p> <p>Approximately 2,000 additional daily local workers are hired with 100 to 2,000 workers working on the plantations at any given time depending on the type of work required for the different stages of the plantations.</p> <p>Women account for 60% of the workforce at the plantations.</p> <p>About 32 full time employees and up to an additional 45 daily workers (depending on the demand) can be employed at the Nabong sawmill and furniture factory.</p> <p>Compared to the Lao SDG indicator, the average hourly rate recorded was 16,000¹³. Burapha lowest average hourly rate can be found in age group 44 to 48 for females. (48,000)¹⁴ which is above the national average.</p>
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				Burapha employees average hourly earnings for 2023 by age: Male: 100,681 Female: 481,373 Burapha employees average hourly earnings for 2023 disability: Male: 104,683 Female: N/A Detail breakdown by occupation, age and persons with disabilities please refer to the SDG 8 Indicator Average hourly earnings for 2023 in reference ¹¹ .	
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⁸ Lao Statistics Bureau (LSB) SDG <https://www.lsb.gov.la/sdg/en/8/> 2019 hourly average wage was nearly 16 000 LAK

⁹ Sample contracts and training records have been made available to the VVB.

¹⁰ BURAPHA SUSTAINABILITY ANNUAL REPORT 2022

¹² BURAPHA SUSTAINABILITY ANNUAL REPORT 2022

¹³ Lao Statistics Bureau (LSB) SDG <https://www.lsb.gov.la/sdg/en/8/> 2019 hourly average wage was nearly 16 000 LAK (This is the latest data available)

¹⁴ Lowest average hourly rate for female in age group 44 to 48

¹¹ Burapha SDG 8, Indicator 8.5: Average hourly earnings for 2023 [CONFIDENTIAL]

2)	<p>SDG 13 Take urgent action to combat climate change and its impacts</p> <p>13.2 Integrate climate change measures into national policies, strategies and planning</p>	<p>Indicator 13.2.2</p> <p>Total greenhouse gas emissions per year¹⁵</p>	<p>Implemented activities will contribute to carbon removals. Activities further aligns with the NDC of Laos and aligned with the 9th five year National and Socio-economic Development Plan, with a focus on combating climate change and its impact. ¹⁶</p>	<p>168,050 tCO₂e removal credits issued from the first verification (including buffer credits).</p> <p>146,768tCO₂e removal credits being requested as part of this verification (excluding buffer credits of 16,308 tCO₂e). (Including buffer the total would be 163,075 tCO₂e).</p> <p>Total credits to date (including buffer) 314,818tCO₂e removal credits.</p>	<p>Removed 314,818tCO₂e from the atmosphere.</p>
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¹⁵ UN SDG https://sdgs.un.org/goals/goal13#targets_and_indicators

¹⁶ <https://unfccc.int/sites/default/files/NDC/2022-06/NDC%202020%20of%20Lao%20PDR%20%28English%29%2C%2009%20April%202021%20%281%29.pdf>

3)	<p>SDG 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</p> <p>15.2 Promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally</p>	<p>Indicator 15.2.1¹⁷ Progress towards sustainable forest management</p> <p>Number of hectares of sustainably managed forest</p>	<p>Implemented activities will contribute to an increase the number of hectares of sustainably managed forest. The activities will contribute to the Lao National Forest Strategy which aims to return forest cover to 70% of the total land area.¹⁸</p>	<p>Sustainable management is achieved through the application of industry-specific good management practices. Burapha has achieved Forest Stewardship Council (FSC) Forest Management for its agroforestry operations, which requires adherence to the principles and standards of the select certification scheme (Forest Management and Chain of Custody) and is subject to annual independent audits for verification of compliance¹⁹.</p>	<p>By the end of 2022 Burapha had planted a cumulative total of 5,800 ha of plantation forest (note that this first project instance is comprised of 2,946 ha of plantation forest, the additional hectares will be included as PAI additions). Additionally, a total of 1,381 hectares within or adjacent to the plantations were set aside for conservation under the company's Special Management Area Program²⁰.</p>

¹⁷ UN SDG https://sdgs.un.org/goals/goal15#targets_and_indicators

¹⁸ Lao Forestry Strategy

¹⁹ Burapha's FSC certificate has been made available to the VVB.

²⁰ BURAPHA SUSTAINABILITY ANNUAL REPORT 2022, page 12

2 SAFEGUARDS

2.1 No Net Harm

Burapha has developed an Environmental, Social and Safety Management System (ESSMS)²¹. The ESSMS applies to all operations of the Company. The ESSMS provides an overarching project-specific E&S policy; identifies environmental and social risks and impacts; outlines a framework for the development of site-specific management plans; defines obligatory standards; provides guidance and direction for ESSMS implementation to all personnel; and briefly outlines roles and responsibilities. The objective of the ESSMS is to enhance environmental performance and facilitate the fulfillment of compliance obligations and environmental, social and safety objectives. The ESSMS is based on the requirements of the IFC Performance Standards, and the International Standards Organization (ISO) standards for environmental management systems (ISO 14001) and occupational health and safety management systems (ISO 45001).

Identification of Risks and Impacts:

Priority environmental aspects identified for ongoing operational management are catalogued in the Burapha Environmental Management and Monitoring Plans (ESMMP), Plantation Site Development Plans, Operation Manuals, SOPs, Work Instructions etc. Risk Assessments are conducted for all company sites and specific tasks / programs deemed potentially hazardous to Burapha staff, contractors and / or the environment. The risk assessment process is described in the Hazard Identification and Risk Management procedure. Social risks are screened through the PFA Manual. Key risks screened through the risk assessment process include biodiversity; community land use; community and occupational health and safety (including fire and transportation accident risks); and erosion and general water quality impacts. The risk assessment process procedure is described in the Hazard Identification and Risk Management procedure. Once potential risks are identified, for individual plantations, significant environmental and social risks are mitigated through site selection (i.e. sites are selected to avoid significant adverse environmental and social impacts).

The framework ESIA²² also identifies the potential for “leakage”(i.e. replacing the historic subsistence agricultural land now used by the Project by converting natural forest to new subsistence agricultural land). The potential for leakage will be somewhat mitigated by allowing intercropping in the plantation. Burapha will also include consideration of the risk of leakage in their site selection process, and where there is high risk of leakage, Burapha will consider livelihood restoration measures in addition to

²¹ BAFCO_ESSMS_Manual_SOP_200312_Final_V1.0

²² Burapha Agroforestry ESIA

intercropping and incorporate communication discouraging leakage into community engagement processes.

There are a large number of existing agricultural activities and agricultural and / or industrial projects planned and operational in Vientiane Prefecture and the three provinces where Burapha operates and plans to expand. These existing activities and projects include subsistence agriculture and livestock grazing, growing of cash crops (e.g. rubber and cassava), mining, hydropower, development of other industries, and transportation infrastructure. Any project that requires large-scale vegetation clearing may have similar impacts to those of the Project. The framework ESIA indicates that the cumulative impacts from the existing activities and planned and operational projects in the region, including the Project, are expected to be: (i) high for air quality due to regional slash and burn activity; (ii) moderate for biodiversity, forest clearance, erosion, and sedimentation; and (iii) minor for hydrology and water use. Burapha's contribution to all identified adverse cumulative impacts was estimated to be low.

Organizational Capacity and Competency:

Burapha has established a Risk and Sustainability Department (RSD) department that oversees and manages the E&S risks and impacts at all Burapha facilities, forest operations and land acquisitions. The department is responsible for implementation of the ESSMS in line with Company policies and standards, including the Performance Standards. The RSD team is comprised of the RSD Manager, a Health, Safety and Environment (HSE) Superintendent (vacant), two HSE officer (one currently vacant) and 3 community liaison officers (one position currently vacant) who are responsible for managing the projects E&S risks and impacts. The RSD Manager has overall responsibility for establishing, operating, maintaining, and reporting on the performance of the ESSMS and oversees all ESSMS related activity across Burapha operations. The RSD Manager is supported in day-to-day implementation of the ESSMS by all Department Managers of land acquisition, forestry operations, and industry managers (at the sawmill, nursery, and plywood mil). As the Project expands, Burapha will hire an additional qualified HSE superintendent and an additional safety officer, community liaison officer, and biodiversity specialist. Burapha will engage a qualified biodiversity consultant to lead biodiversity risk screening and support Project management of biodiversity risks and impacts in line with PS6²³ requirements.

Burapha has a comprehensive annual training program for staff and contractors. The ESSMS is introduced in the staff and contractors' induction training, which is followed up by regular refresher sessions. All Burapha employees participate in a training needs analyses, and then attend training sessions as required. Burapha Human Resources department ensures that all E&S personnel are qualified and competent to carry out their duties through a rigorous hiring and selection process.

Emergency Preparedness and Response:

Burapha has developed and implemented an Emergency Preparedness and Response Plan (EPRP), and site-specific emergency preparedness and response procedures for all district offices, camps, the Nabong Sawmill, the nursery facility, and the plywood mill. The focus of the emergency preparedness

²³ IFC Performance Standard 6 Biodiversity Conservation and Sustainable Management of Living Natural Resources

plan is the evacuation and treatment of the injured. As part of the ESSMS, Burapha will prepare site-specific EPRPs for the expansions phase.

All Burapha's operational facilities and plantations have fire management plans and firefighting equipment. Fire is the more significant emergency risk in plantation operations, and is managed through Burapha's procedure for plantation fire management²⁴. The procedure includes appointment of fire guards from local villages, plantation patrols, fire risk information signs, the establishment of fire breaks, specific controlled burns during preparation for plantation establishment and training for local villages. Burapha also employs a 'Call Before You Burn' program which provides an incentive payment to local villagers who provide Burapha with advance warning of their intent to backburn for agriculture. At these activities, Burapha mobilize its own firefighting crew and equipment to control out breaks but also give locals fire management advice.

Burapha forestry teams carry out firefighting activities themselves and have all necessary equipment. All districts have their own designated fire crews who training locals on fire management and safety. workers are provided with safety training and contacts in case of incidents. Fire campaign signs are posted at appropriate locations around the PE's plantations, and fire drills are conducted on a regular basis at the plywood mill and sawmill. Burapha fire guards are employed to routinely patrol plantations between the high fire risk dry season months of February to May.

Monitoring and Review:

As part of the ESSMS, Burapha has established, implemented, and maintains procedures to monitor its operations and activities that have may have impacts on the environment, local communities, and OHS. This includes procedures for tracking of performance, applicable operational controls and conformity with the Company's objectives and targets. The Company uses 3rd party service providers to test environmental aspects such as wastewater and emissions. The RSD department is responsible for analyzing the results of monitoring and reporting on E&S and OHS performance of Burapha. Burapha undertakes internal compliance audits (Non-Compliance Reporting) on a regular basis. Burapha senior management team along with the RSD department undertake reviews of the implementation of the ESSMS to confirm its suitability and effectiveness. The ESSMS is updated as needed to address any issues or gaps identified through the review.

The RSD Manager develops monthly safety, environmental and social (E&S) management reports covering all aspects of company operations for Burapha management. Burapha has also been providing GOL with quarterly E&S / OHS reports in relation to the plywood mill development since June 2019. For the Forestry operations, Burapha reports to GoL on a quarterly and annual basis. Under Lao law sawmills and tree nurseries are not required to prepare environmental and social impact assessments. However, these facilities are subject to Forest Stewardship Council and investor annual audits that cover these issues, along with OHS.

²⁴ Standard Operating Procedure PR800 v1.0 – Plantation Fire Management, Preparedness and Response

The GOL conducts periodic site visits of Burapha operations for both silviculture and land acquisition aspects. Burapha reports to Ministry of Agriculture and Forestry (MAF) government on a monthly and annual basis on plantation expansion progress. Burapha also reports to the Ministry of Environment and Natural Resources (MONRE) on a quarterly and annual basis regarding environmental and social impacts, as is required under the ECC conditions.

Burapha prepares Annual Sustainability Report that provides internal and external stakeholders with information about the Company's activities and programs. This report is publicly disclosed on its website in English.

Stakeholder Engagement:

Burapha undertakes extensive stakeholder engagement as part of its land acquisition and ongoing operations. As part of the ESIA process formal consultations were undertaken with national, provincial and district government officials, as well as local communities that are participating or otherwise have been affected by the implementation of the first 3,000 ha. The consultation included regular discussions and the dissemination of Project information to local residents and government staff. Formal consultations have included meetings with all relevant government agencies and environmental and socio-economic studies at the village level. Consultation workshops at all levels are structured with comments from stakeholders recorded in formal minutes that are then transferred into subsequent redrafts of the ESIA and ESMMP reports.

For its expansion activities and in addition to the ESIA consultations, Burapha undertakes a process of informed consultation and participation, including disclosure and dissemination of information and consultation with project communities as part of its land use rights acquisition process at village level and at individual households. Currently, after securing land consent, communication with partner villages reduces until such times that Burapha has a planned activity and there is at times limited communication until Burapha's receives the permit to plant or undertake maintenance. Burapha will update its Community Engagement and Communication Procedure to include regular communication with villages during the period between securing consent and starting to plant, and to better record informal consultation. Once there is a plantation within a village, meetings are held with the village on an annual basis. Key topics discussed include the progress of operations, community development activities, upcoming work programs and employment opportunities, and any grievances raised. Meeting minutes and registers of community concerns are maintained by Burapha. In addition to the formal annual meetings, there is ongoing regular informal communication with the local villages and Burapha plantation staff.

External Communication and Grievance Mechanisms:

As part of the ESSMS, Burapha has developed a grievance management and dispute resolution procedure for the Project. This procedure is designed to provide an open and transparent channel for communication between the community and Burapha. The grievance mechanism is disclosed to communities during consultations meetings and through village notice boards. A dedicated telephone number has also been set up to receive grievances, details of which are available from village

authorities and Burapha notice boards installed at each partner village. All grievances are recorded in a grievance register²⁵.

Burapha prepares and discloses an Annual Sustainability Report on its website, and Burapha has a team responsible for communicating with external parties requesting information on Burapha operation.

Labor and Working Conditions

As of February 2023, Burapha employs 464 permanent staff across its operations, of which 44% are women²⁶. Approximately 2,000 additional daily local workers are hired with 100 to 2,000 workers working on the plantations at any given time depending on the type of work required for the different stages of the plantations. Women account for 60% of the workforce at the plantations. About 32 full time employees and up to an additional 45 daily workers (depending on the demand) can be employed at the Nabong sawmill and furniture factory. The plywood mill is currently running at 60% of full production capacity and has approximately 320 staff in total, of which approximately 60% are women. It is anticipated that about 1500 full-time positions will be required to implement the Project at full capacity.

For plantation management, workers are prioritized and sourced from the PFA land users themselves, and also through recruitment from the village where the PFA is located. PFA land users also come from nearby villages, and these are also given priority. Agreements for labor are entered into via household contract, which are contracts with local households to manage plantation work, or via daily labor agreement, which is typically with individuals from outside the project area. The preference for Burapha is for household contracts. Where there is insufficient labor from local recruitment efforts contract labor teams are occasionally used.

For the sawmill, plywood mill and nursery operations, while most of the workforce comes from the local communities, the Company workforce also includes those coming from other parts of the country and/or nearby countries (supervisory and management level) to complement and assist local labor.

Working Conditions and Management of Worker Relationship:

Burapha has developed and implemented a Human Resources (HR) Policy and a set of standards and procedures (Code of Conduct; Workplace Behavior and Standard; and Counseling and Discipline Standards), consistent with Lao law and PS2²⁷ requirements. All permanent and daily workers sign written contracts and receive induction covering the Staff Rules prior to starting employment. All workers are required to work 48 hours per week and are paid salaries above the Lao minimum wage. Burapha's HR documentation also includes a Fair Treatment Standard which provides a process for concerns related to unfair treatment. A worker grievance mechanism is also in place and

²⁵ The Grievance Register has been made available to the auditor.

²⁶ BURAPHA SUSTAINABILITY ANNUAL REPORT 2022

²⁷ IFC Performance Standard 2: Labor and Working Conditions.

communicated to workers as part of the induction process. The mechanism includes various channels to file complaints either by directly submitting a form to HR or through grievance boxes or email.

The Workplace Behavior Standards contain provisions against sexual harassment which apply to all persons who are engaged by Burapha or who are working on its behalf (e.g. contractors and consultants). The standards extend outside of the workplace and cover community interactions of Burapha personnel. The standards also include a grievance procedure to receive complaints, and a corresponding investigation procedure is outlined in the Counseling and Disciplining Standard. Training on these standards will be conducted by Burapha for all its personnel. Burapha shall also increase capacity to manage GBV risks by developing procedures related to gender-based violence (GBV) response.

Burapha's Code of Conduct affirms the companies' commitment to the freedom of workers to establish and join trade union organizations without intimidation or fear of reprisal. An Employee Working Group is in place, comprised of 9-12 individuals elected for a two-year period and the Employee Working Group's rights and responsibilities are set out in the Employee Working Group Charter. An Internal Staff Rules is also in place and will be reviewed by end of 2023.

Burapha operates multiple worker camp facilities to provide accommodation for field staff. Rates of occupancy depend on the type of plantation work being undertaken throughout the year. Burapha has a procedure in place for Camp Establishment, Safety and Environmental Management, and conducts periodic inspections of work camps.

Protecting the Work Force:

Undocumented migrant workers coming from neighboring Vietnam, Myanmar and China are present in Laos, however risks related to migrant and forced labor are considered to be low given that Burapha employs mostly Lao nationals and conducts identification checks prior to recruitment.

Child conducting labor in the Lao agriculture sector in the context of working family groups is common, and at times children may be engaged to support their parents with activities at the PE's plantations. Burapha has policies and procedures in place to minimize and monitor the risk of use of child labor within its workforce. As per Burapha's HR Policy, the Recruitment and Selection Standard includes provisions against child labor and measures to ensure minimum employment age for employees, contractors and employees is 14 years. Workers between 14 and 18 are limited to 6 hours of work per day, and to perform light duties only. Personal identity documents are checked to verify the age of new recruits, and each Plantation Site Manager visits the household plots on a regular basis to identify any heavy or dangerous work being undertaken by children. Burapha also conducts awareness raising on prevention of child labor in its operations. Anti-child labor conditions are in all types of Burapha labor contracts.

Occupational Health and Safety:

Burapha has established an OHS management procedure process which includes: i) health and safety risk assessment ii) identification and management of hazards; (iii) provision of preventive and

protective measures; (iv) training; (v) documentation and reporting of occupational accidents, and incidents; and (vi) emergency preparedness and response. The procedure is applicable to all Burapha personnel (full time staff and the casual workforce) and all contractors working within Burapha operations. Monitoring reports indicate that each operational facility has a site-specific safety plan (including a fire management plan), firefighting equipment and Material Safety Data Sheets (MSDS) that is available in both Lao / Thai and English at the operational facilities. A strong occupational health and safety (OHS) culture is maintained across Burapha's operations through regular toolbox meetings, allocation of OHS responsibilities to suitably qualified staff, routine OHS monitoring, and implementation of appropriate corrective actions when OHS accidents occur. All new Burapha staff receive training on personal protective equipment (PPE) requirements, emergency response and first aid during induction and ongoing refresher training. Annual health checks are carried out for full-time staff. Hearing protection is enforced near any noisy equipment at the wood processing facilities and while using mobile machinery. The OHS procedure also details incident reporting and response process, and workers receive training on its implementation. Burapha Incident and Accident Reporting Database has been established to record: (i) accidents, incidents, or near misses; (ii) actions taken in response; (iii) dates of corrective actions; (iv) measures to avoid or minimize the chance of a similar action occurring in the future; and (v) dates for ensuring implementation of corrective actions identified. Burapha has a Covid-19 emergency operational plan in place, which includes measures to reduce transmission such as regular disinfection of work areas, minimization of meetings and travel, and provision of PPE.

The transportation contractor, Linfox, that is responsible to transport Burapha's raw logs from plantations to the mills and to the port has their own strict safety protocols and through introduction of the new harvesting equipment that included comprehensive training for Burapha staff, they have further strengthened Burapha's OHS culture.

Workers Engaged by Third Parties:

Forestry operations work such as clearing, planting and maintenance activities are undertaken by local villagers under the supervision of Burapha staff. Burapha employs contractors for harvesting and haulage of materials, and for provision of road works. Burapha's HR Policy and ESSMS require all contractors and service providers to follow Lao labor law and to adhere to the PE's environmental, social, health and safety standards and policies. Burapha's Contractors Operational Plan includes provisions on working hours and number of shifts of contracted employees, training requirements, safety and emergency measures, accommodation arrangements, vehicles maintenance requirements, recruitment, monitoring and auditing. The service agreements signed with contractors include requirements for provision of safe working conditions, submission of all employees' wages and salaries, and compliance with the Burapha Code of Conduct which covers aspects such as use of drugs, sexual misconduct, and trade in wildlife and plants. Contractors use their own internal grievance management procedures, including weekly toolbox talks. The Burapha conducts periodic audits and spot checks to oversee contractors' compliance with its requirements, any gaps identified are captured in a non-compliance report register for appropriate corrective actions.

Non-Native Species Assessment

The implementation of Eucalyptus and / or Acacia plantations provides some risk for establishment and spread of non-native invasive plants, namely: (i) the potential for the spread of the Eucalyptus/ Acacia beyond plantation boundaries; (ii) domination of plantation trees following the end of the concession period; and (iii) introduction or spread of invasive weed species. Burapha plantation trees have been found to produce viable seed during the seven year plantation rotation. If unmanaged, plantation trees may spread beyond boundaries and alter the species assemblage of neighbouring stands. However, advancement beyond plantation boundaries is slow and easily managed. With implementation of the management and monitoring regime provided in the ESMMP, impacts are expected to be negligible.

As the Burapha Eucalyptus plantation trees rapidly coppice sprout following harvest, there is a risk that the stands will dominate the canopy in perpetuity following the end of the concession/ lease agreement. It is anticipated that a suitably effective and nationally / internationally acceptable herbicide will be applied to cut stumps (e.g. Metsulfuron) to prohibit regeneration of Eucalyptus stands following the final harvest, and likely follow-up monitoring / herbicide application after one growing season.

Since 2019 Burapha, has conducted twice yearly (dry season and wet season) biodiversity surveys of three representative Special Management (conservation) Areas (SMAs)²⁸. The biodiversity studies includes vegetation species and abundance. The SMAs are within and encircled by Burapha plantations and are therefore the most likely to be affected by invasive eucalyptus. The survey data from May 2022 shows no eucalyptus had begun to colonize the SMAs.

By monitoring SMAs/buffers for the spread of Eucalyptus / Acacia beyond plantation boundaries and removing seedlings, Burapha can effectively ensure potentially invasive plantation species do not spread to neighbouring stands

Fertilizer and Biological Control Agent Impact

Burapha currently utilises the following hazardous materials for plantation establishment and operations:

1. Herbicides, including Glyphosate and Metsulfuron.
2. Soil conditioners and fertilisers such as Dolomite, Rock Phosphate, Boron and general fertiliser (NPK 15-15-15).

²⁸ Naan SMA

<https://buraphawood.sharepoint.com/:f:/g/cser/EmS6A11JL3BMiX908in4pWoBc8uKhsiAxuOM458uhYODAg?e=K9JzEU>

Feung SMA https://buraphawood.sharepoint.com/:f:/g/cser/EjloRI5vxGtLqP-4alb8b70BhyRQJM-wT_6NNhQpWZq_AA?e=u1Mm1a

Xanakham PFA <https://buraphawood.sharepoint.com/:f:/g/cser/EucO-XqMrU5Gi3gloUJ5NL8B6wZrOpe5yKVX1s1pqZWqLA?e=JfWrHP>

Risk management and mitigation measures are contained in the Forest Operations ESMMP²⁹ and are audited annually by FSC. The measures include the following:

Training - Employees and relevant contractors will need be trained to manage hazardous materials, meet compliance with regulatory requirements, apply proper use of PPE, and understand emergency response and preparedness planning³⁰.

Personal Protective Equipment - Burapha supplies PPE for all chemical handling and routinely monitors staff to ensure PPE are utilised at all times³¹.

Herbicide Application - Burapha manages herbicide applications accordingly:

- The use of nationally and internationally banned chemical pesticides or herbicides, as well as World Health Organization Type 1A and 1B and chlorinated hydrocarbon pesticides is prohibited;
- Herbicide is mixed and applied according to MSDS and label instructions;
- Herbicide is mixed at least 50 m from watercourses; and
- Herbicide is not applied if rain is forecasted or likely for the day.

Fertilisers - Burapha uses quality certified sources of fertilizers; and where applicable, soils are tested³² for nutrient status / pH prior to fertilisation to ensure that areas are not over-fertilised³³.

Storage - All hazardous materials storage installations are well-ventilated areas that are protected from rain. Facilities (including temporary), are designed and constructed for secondary containment which have the capacity to hold a minimum of 110 percent of the volume of the largest tank in the containment area. Where applicable, storage facilities will include suitable fencing, signage, roofing, and lighting; Incompatible materials are segregated / stored in separate facilities - corrosive, oxidizing,

²⁹ Please also refer to the set of Work Instructions contained in the zipped file Work Instruction and Planation Flowchart

³⁰ Training Record 2020 <https://buraphawood.sharepoint.com/:x:/g/cser/EWO2lqNOVbVHoz-dMbwBmVoBUj83v-DVwYak1whW2L3HIQ?e=BbbihF>

Training record 2021 https://buraphawood.sharepoint.com/:x:/g/cser/EePzhY-gXrtKr57bKuNQVwgBS67ZwQ-_yE6KMQPIBc7xkA?e=UU3B9r

Training Record 2022 https://buraphawood.sharepoint.com/:x:/g/cser/EeqP2nJ6cZFKq_Hh5Q6-00YBuXoECJxV-po0d-bU-icR9g?e=QdaLnW

Training record 2023 – separate attachment made available to the auditor.

³¹ See training records

³² Soil testing 2021 - 2023 https://buraphawood.sharepoint.com/:x:/g/cser/EXzQmitBxMhEpphm0HUUWQIBGsZ3Qb9KvzwlWXloiSq_GQ?e=9A1iH6

³³ Records of fertilizer application 2021 https://buraphawood.sharepoint.com/:x:/g/forestry/ETq_bIMIsWxDlsz8bCc6vQABi4uqLLdTS3wlePo_Ft7oTA?e=3K77ma

2022 <https://buraphawood.sharepoint.com/:x:/g/forestry/Ec4kph0j-6hFjwM2scFojQ8ByfdG18w4qvY3cHUvvh-fzQ?e=B87hog>

and reactive chemicals are separate from flammable materials and from other chemicals of incompatible class (e.g. acids and bases, oxidizers vs. reducers, etc.).

Adherence to management and mitigation measures listed above are expected to minimise the likelihood and severity of impacts. Herbicides used in plantations have relatively low persistence, low toxicity, and are biodegraded by microbes rapidly. With the diligent application of management measures identified above, risks are minimal and impacts are expected to be Low.

Pollution Prevention:

The Project potential environmental impacts from the plantations and operations of plywood mill, Nabong Sawmill, and the nursery facility include impacts on air quality; noise; water usage, effluent discharges (e.g. pesticides, hydrocarbons, fertilizers), waste generation; hazardous and non-hazardous materials spillages, erosion, and sediment transport (from vegetation clearing), and forest fires. These potential impacts will be minimized through adherence to GOL laws and regulations, international environmental standards and through the application of good international industry practices. The relevant recommendations and mitigation measures suggested in the ESIA are incorporated into the Project ESSMP and operational procedures and manuals, and the implementation of these measures is applied across all operations and is regularly monitored by Burapha.

Measures have been identified to minimize the impact of dust emissions on local communities, and the potential for nuisance dust will be monitored through the grievance mechanism, and additional measures to address nuisance dust will be implemented, as needed.

Noise impacts are mainly from the sawing and milling process at operating facilities and increased noise along haul routes (hauling of raw logs and finished product). Given the location of the mills, the ESIA indicates that the potential noise impacts on local communities are expected to be low. Noise impacts from plantations are also expected to be low, and to further minimize the potential for impact, Burapha only operates during the day, including haulage of logs. For plantations, the site screening process will identify the nearest sensitive receptor, and where noise-related risks are high, specific measures will be identified to minimize the risk. Nuisance noise will be monitored through the grievance mechanism, and measures to address noise will be developed and implemented, if needed.

Waste generated by Burapha from the operational facilities and plantation activities consists of 2 types of waste namely solid wastes and hazardous waste. All waste is managed in line with the applicable laws and regulations and per the ESIA, impacts to receptors from non-hazardous waste will be low. Solid waste mainly includes waste wood generated from the sawmills and other domestic waste. All waste wood at the sawmill and the plywood mill is either sold or utilized to fuel the boiler for mill drying processes. The wood grading process used at the sawmill and plywood mill reduces waste by ensuring that all high-quality timber is utilized to produce premium products while lesser quality timber is utilized for other products. Solid waste at all operational facilities is collected by a licensed waste contractor.

For hazardous materials, Burapha uses glyphosate for weed spraying across its operations. Chemicals used at the nursery and timber processing facilities are kept in locked storage areas that are well ventilated and include adequate spill containment measures.

Land Acquisition and Involuntary Resettlement

As of February 2023, Burapha has planted approximately 5,800 hectares (ha) of land planted across 40 partner villages through different modes of land use rights acquisition. Approximately 1,150 hectares were acquired via lease agreements with individual farmers (415 farmer agreements), 1,537 hectares of communal land via lease agreement with villages (13 village cooperative agreements). For both farmer agreements and village cooperative agreements, land is priced based on market rates and paid on a lumpsum basis. Burapha also has 1,539 hectares of land in state-owned production forest areas. The remaining balance of about 1,500 hectares was acquired through perpetual use rights (90 company land agreements and 7 other concession agreements). Its current landholding also comprises approximately 18 hectares used for company facilities (tree nursery, R&D facility, sawmill and plywood mill) acquired through state concessions.

For its expansion, Burapha will be acquiring land use rights under the Concession Agreement awarded to Burapha by the GoL in July 2020 (amended March 2022) for a period of 50 years. The Concession Agreement allocates to Burapha 60,000 hectares of land in production forest area in the Provinces of Vientiane and Xayaburi. As of February 2023, Burapha has obtained approval from respective government offices (national, provincial, and district) and consent from village committees for 10,000 hectares of land out of the 60,000 hectares for its expansion.

Community Engagement:

Production Forest Areas are state owned land gazetted for the specific use of timber and timber products procurement. As it is state owned land, there is no legal land title afforded to the general public. The PFAs are however used by villagers and communities for livelihood and Burapha acknowledges these customary uses. Burapha seeks to minimize adverse impacts from land acquisition through the implementation of the land selection criteria defined in its Production Forest Area (PFA) Land Acquisition Manual – nine step program. Upon obtaining respective authorizations from national, provincial, and district offices, Burapha conducts initial village level consultation with members of the village committee for purposes of explaining the operation model and for gathering information on land cover and land use patterns in the production forest area, including information on lands used for customary purposes, identification of sacred forest areas and cultural sites, and existing land disputes. The results of this exercise comprise a village profile, history, community map, and seasonal calendar. Village level consent is then secured to conduct an in-depth land classification survey and land user survey which targets all those who are using land in the identified potential production forest area (PFA land users). This agreement to conduct survey is documented in village community meeting minutes. In addition to the selection criteria applied to determine suitable PFA land for plantation, in practice through the request of the village and /or individual land users, Burapha also excludes certain areas from the concession area; however, this is not currently articulated in the consolidated site selection criteria. Burapha will update the PFA Manual with clear site selection criteria combining both environmental and social considerations

The PFA land user survey gathers information on each household's livelihoods and where and how they are – or have been – using the land in the PFA, and consequently conducts a series of consultations

(up to 3 times) with land users to secure consent for the use of the land for Burapha plantation. This survey includes land users who may reside in other villages. Results of the survey including the boundaries of the plantation identified in the PFA area are presented in a village meeting with respective PFA land users for validation. The results of this meeting are documented via minutes of the meeting. In both village consultations and PFA land user consultations, Burapha presents the operation model in detail, including labor opportunities and inter-cropping arrangements for land users as well as the various measures offered to support village development (such as the village development funds, road improvement and other voluntary contributions)

The final proposed concession area (i.e. area where the land users have consented to be planted) is then presented in a community meeting where agreement is reached between Burapha, the Village Chief, and the District Governor as chairperson on the concession area (as evidenced by maps, location of border posts and layout of the proposed access roads), and any requests made by the villagers and any commitments made by the Company. The minutes of this meeting document the formal consent of the village to the project and proposed concession. After which district, provincial and central approval from Department of Forestry are respectively obtained over the concession area. Once approval from these government offices is secured, Burapha applies for planting authorization from DoF and enters into a lease agreement for the remaining period of the concession agreement (50 years) with respective Village Committees upon receipt of such authorization. Under the Concession Agreement requirements Burapha provides financial compensation for land acquired for the Project through payment of land lease (Village Development Fund) fees to impact villages, village khoums (a cluster of villages under the same administration), district and provincial authorities. These arrangements are captured in lease agreements with respective authorities³⁴.

Livelihood Restoration:

At the PFA land user level, agricultural development within the Project plantation areas is an integral part of Burapha's agroforestry model. PFA land users have access to intercropping agreements and support to develop agricultural crops, pasture, and livestock. Through intercropping agreements, Burapha provides PFA land users with plots in the Project plantations to cultivate annual crops between the trees during the first year of the plantation cycle, and for livestock grazing from year three to seven; after which the 7-year cycle is repeated until the end of the lease agreement. While impacts resulting from the development of plantations do not include physical displacement, restrictions on the use of land and loss of natural resources, including non-timber forest products, may adversely impact communities' livelihoods. A summary of impact will need to be prepared to capture impact of project activities in the concession area with corresponding measures to be undertaken to address such impact with special focus on livelihood restoration particularly of those belonging in vulnerable groups. Burapha will update the PFA Land Acquisition Manual to include an entitlement matrix offered to both

³⁴ Village Cooperation Agreements have been made available to the auditor
https://buraphawood.sharepoint.com/:f/g/cser/Ev8dnXZ8ouJPq3hvw0sURPIBgEtmB5_9ieySNdHhrzLWg?e=7uFdld

For Land Lease Agreement refer to Appendices in the Land Acquisition Manual

at village level and PFA land user and to document actual entitlements received by respective PFA land user.

Grievance Mechanism:

In cases where consent is obtained at village level but not the entire PFA land users, this is documented in the minutes of meetings and co-signed by the PFA land user withholding consent, the village chief who has authority over the PFA land user (i.e., the village chief of the village where the PFA land user resides) and the survey team. The documentation includes details about the land (area and location) and the reason for the lack of consent. These cases are entered in the land use limitation register and monitored by Burapha until a solution to the limitation is found. While the areas with concerns are not taken out of the identified PFA plantation area, Burapha operations over the area does not commence until concern has been resolved. In cases where the meeting cannot reach consensus and it is the Village Authority who does not wish to provide the consent of his village to the project and sign the meeting minutes, Burapha repeats its process of negotiation with support from District authorities to try and reach agreement with the local community. These cases are also entered in the land use limitation register for monitoring of resolution³⁵.

Biodiversity Conservation and Sustainable Management of Living Natural Resource

The GoL has designated three forest management categories, each with its own corresponding level of protection and use according to the Forestry Law. These are protection, conservation, and production forests. Protection forests are largely to preserve soil and water resources and prevent natural disasters – ecosystem services. Conservation forests are designed to protect species and ecosystems and are represented by the National Parks and Provincial Protected area network, and production forest areas are for wood production. Burapha's future planting is concentrated in three central Laos Production Forest Areas (PFAs) namely: (1) Phou-Yeuy (100,184 ha); (2) Nongpet-Naxaeng (68,771 ha); and (3) Phou pha dam (95,174ha).

Legally Protected and Internationally Recognised Areas:

There are no internationally protected areas or Alliance for Zero Extinction (AZE) sites in Burapha's existing or Project expansion areas. Several national, provincial, district and village Conservation Forests as well as Key Biodiversity Areas (KBAs) are present. The three National Protection Areas (NPA) in proximity to Burapha's existing and future plantations are the Nam Pouy, the Phou Pha Nang and Phou Khao Khuay. The Nam Pouy/Nam Phouy NPA encompasses dry evergreen and mixed deciduous forest and is home to the largest wild population of Asian elephants left in Laos. Phou Pha Nang NPA is largely degraded with patches of evergreen forest and the Phou Khao Khoay which is also a KBA, contains a mosaic of forest types and supports several species of conservation value. The Nam Ngum Reservoir is a KBA due to the presence of threatened and range restricted fish. The Mekong River from Luang Prabang to Vientiane is also a KBA supporting an exceptional diversity of fish, some of which are

³⁵ Land Use Limitation Register <https://buraphawood.sharepoint.com/:x:/g/cser/ERpHsBDY-J1DrrpRK0OfYyYB7j0MqkdeCkXcCQg4DZYSXg?e=SM13yd>.

threatened, and range restricted. It also comprises a variety of habitat types, sand and gravel bars, islands, rock outcrops, which are particularly important for birds. None of the KBAs overlap the PFAs.

The Burapha Land Acquisition process requires that all protected areas are avoided. A review of areas planted to date; however, indicated that there has been encroachment into the very degraded Provincial Protected Area (PPA) Phou Inthin, as Burapha was unaware of its status. Government approval was granted for Burapha to continue its plantation within the PPA, which, due to the degraded nature, was subsequently reclassified under the Forestry Law from “protected” to “ordinary.” Burapha is enhancing their ESSMS to prevent planting in protected areas in the future, regardless of whether they are degraded (PS1³⁶). Burapha will engage a qualified biodiversity consultant to lead biodiversity risk screening and support Project management of biodiversity risks and impacts in line with PS6³⁷ requirements.

Protection and Conservation of Biodiversity: Natural Habitat:

They key risks and impacts associated with eucalyptus plantations include the potential for direct and indirect loss of and fragmentation of Natural Habitat, as well potential indirect impacts related to increased accessibility due to the upgrade of existing and construction of new roads, particularly in some of the more remote parts of Nongpet Naseng PFA. The cumulative loss of swidden and crop land within the PFA, could result in clearance of other remaining Natural Habitat within and / or outside of the PFA, as villagers develop new swidden areas to replace the areas lost to Burapha’s plantations. If not properly managed, increased erosion and sedimentation, and improper use of herbicides and fertilisers may also affect water quality and biodiversity in receiving waterways, particularly in the wet season, and water abstraction may also affect aquatic ecology.

With respect to loss of habitat, Burapha’s practices are in line with PS 6 requirements, which indicate that “where feasible, the client will locate land-based agribusiness and forestry projects on unforested land or land already converted.” Burapha’s land acquisition process stipulates that plantations cannot be established on native forests as classified by the Department of Forestry or areas that support High Conservation Values (HCV). They should only be established in degraded landscapes. As per the definition in the Forestry Law of 2019, this includes “forest land areas where forests have been heavily and continuously disturbed and will take a number of decades to regenerate naturally”. Degraded areas identified by Burapha have typically been used for swidden (shifting cultivation) agriculture and are regenerating fallow forests as well as some bamboo forests. Natural and modified habitats exist on a continuum ranging from the pristine to those that are intensively managed. Although fallow forests are composed of native species, young fallow is clearly a modified habitat. As fallow matures, this habitat can revert to Natural Habitat (as defined by PS6) over time depending on the extent of anthropogenic disturbance in the surrounding area and pool of species available for recolonisation. In general, the level of disturbance in the PFAs is high, and it is unlikely that succession of fallow into

³⁶ IFC Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts

³⁷ IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resource

Natural Habitat forests within the fallow cycle would occur due to the high pressures on the surrounding land. Burapha tend to avoid more mature swidden if it is contiguous to native forests.

Burapha's process for determining whether a site is "degraded" involves various steps including desktop analysis, site visits to determine topography, land use, vegetation, soil character as well using satellite imagery, drone imagery, photography, and consultation with local communities. A review of recently (2018 – 2023), cleared land for Burapha was undertaken to determine potential impacts on Natural Habitat. Over this period, a total of 2,855ha was planted. Of this, approximately 1,255 ha comprised upland crop, 805 ha were young fallow (defined as fallow for less than 5 years), 636 ha was old fallow (greater than 5 years fallow), 66.76 ha was bamboo, and 88.5 ha were other plantations or agriculture. While no areas of undisturbed forest were found to have been cleared, as there is no distinct cut-off point for when regenerating fallow forest becomes 'Natural Habitat'. Therefore, additional parameters were included to assess whether the vegetation cleared was 'Natural' or 'Modified'. These included vegetation density / condition using Normalised Differential Vegetation Index (NDVI) analysis; canopy cover; signs of anthropogenic disturbance (roads, settlements etc.); distance from forest edge; and history of swidden agriculture. Based on this review, no Natural Habitat has been identified as having been cleared as part of Burapha's operations in the last five years.

Despite very high levels of forest loss and land clearance within the PFAs, patches of natural forests still exist alongside seasonal wetlands particularly in Nongpet-Naseng PFA where GIS analysis indicates 59% of it could be degraded deciduous forests with some degraded evergreen forest. Some of these may support habitats or species that trigger Critical Habitat (CH) which could be affected through by Burapha's operations. The Forest Stewardship Council FSC requires Burapha to set aside 10% of every management unit to facilitate retention of Natural Habitat and migration corridors. These areas are called Special Management Areas (SMAs). SMAs include single large trees, remnant patches of natural forest, wetlands and riparian/gallery forests along waterways and areas with steep slopes. SMAs are not currently actively managed and are not consistently demarcated on maps. Burapha will develop a management framework for SMAs. The framework will require engagement with affected communities and other interested stakeholders and experts to identify a site-specific management strategy for SMAs within each management unit.

Protection and Conservation of Biodiversity: Critical Habitat:

A desktop Critical Habitat Assessment (CHA) and a site visit was carried out to assess both Burapha's existing plantations that were planted in the last five years and potential future expansion into the three PFAs. The key objectives were (i) to assess whether there may be Critical Habitat adjacent to existing plantations that may require enhanced management; and (ii) to identify future areas in the PFAs that may support Critical Habitat and therefore will require additional species-specific survey work. As indicated previously, Burapha's systems will be strengthened to improve risk screening, including screening for potential risks and impacts to Critical Habitat, and Burapha's E&S team will include a biodiversity specialist.

Given the size of the Production Forest Areas (PFAs) and the fact that the location of future management units within the PFAs are unknown at present, it is not possible to undertake a site-

specific CHA. With respect to future plantations, the desktop CHA identified one species, *Elephas maximus* Asian Elephant which is considered to qualify for Critical Habitat (despite being wide ranging), under Criterion 1a as it is the last viable population in Laos. It has recently been recorded within the southern and northern Phoupadam PFA. An additional eight species likely qualify if present, and another four possibly qualify under Criteria 1-3 if they are present. It is unlikely that all of these species are present for a range of reasons, including hunting pressure and / or river regulation, but even if present, not all species are likely to be impacted by Burapha's future expansion. For example, six of species are fish. Potential impacts on fish are anticipated to be limited, as the project is not expected to result in significant changes to hydrology or water quality and Burapha's screening process leaves riparian buffers near watercourses. Burapha's will use the desktop CHA to inform its enhanced sites selection process and implement targeted surveys if CH or CH-triggering species are likely to be present within the potential expansion areas. The objective of the site selection process will be to avoid expansion into areas identified as CH.

With respect to CH in proximity to existing plantations, there has been a possible sighting of the Critically Endangered Northern White-cheeked Gibbon *Nomascus leucogenys* in or near the Na-An plantation in Nongpet PFA which includes a large SMA. Burapha will conduct a specific survey for *Nomascus leucogenys* to determine its presence and range in the area, and if needed, will identify measures to prevent current and future activities from impacting the population. As mentioned above, Burapha will also be developing an SMA Management Plan. Burapha is currently extracting 150m³/day water from the Nam Lik for the plywood mill and 348m³/day of groundwater for the nursery. Planned nursery expansion will require approximately 1,000 m³/day during the dry season, which Burapha intends to source from the Nam Ngum river. Based on desktop research, the Nam Lik used to support the range restricted and Data Deficient *Pseudecheneis sympelvetica*. This species was last assessed in 2012 and it is not clear whether it is still present given that it prefers strong rapids and edges of waterfalls, and the river is now heavily regulated by a hydropower dam about 17km downstream of the plywood mill site. The abstraction relative to existing flows is small and the species is unlikely to be affected. Any Burapha future abstraction from the Nam Ngum river will be downstream of the Nam Ngum reservoir and downstream of the confluence with the Nam Lik river. This stretch of river is heavily regulated by the dams on the Nam Ngum and Nam Lik rivers, and the proposed abstraction compared with the existing flow is low, and therefore, impact on aquatic species and habitat is unlikely. Foraging areas for the range restricted and Vulnerable Phou Khao Khouay Leaf-nosed Bat *Hipposideros khaokhouayensis* and the Endangered La Touche's Free-tailed Bat *Tadarida latouchei* overlap with some of Burapha's existing plantations; however, Burapha is waiting for expert opinion to confirm their presence and foraging ranges in the area, and if present what the potential impacts might be. If Critical Habitat is confirmed adjacent to any of management units, then Burapha will prepare a Biodiversity Action Plan to facilitate effective management of areas supporting Critical Habitat. Burapha's site selection process will be independently reviewed annually to verify effective implementation, and, in the unlikely event that Burapha's plantation is in Critical or Natural Habitat was affected, then Burapha will need to quantify any impacts and develop a biodiversity action plan to achieve no net loss for Natural Habitat and net gain for Critical Habitat.

Indigenous Peoples:

Lao PDR is a multi-ethnic country with 50 major ethnic groups classified into four ethnolinguistic families: Lao-Tai (8 groups), Mon-Khmer (33), Sino-Tibetan (7) and Hmong-Mien (2). Lao Tai speaking people account for majority of the population and are the economically and culturally dominant group in the country. The rest of the ethnic groups are considered socially and culturally distinct from the Lao majority population and meet the characteristics and definition of Indigenous Peoples (IPs) under PS7, including self-identification as distinct cultural and ethnic group, speaking distinct languages, having customary cultural practices and reliance to natural resources in their habitat.

Typically, the Lao-Tai reside in the agriculturally productive lowland areas around the Vientiane Plains and are also primary residents of urban areas. The Mon Khmer traditionally live in midland rural areas, whilst the Hmong Mien are generally found in the upland and highland mountains in the northern section of the Project area. The Project area is comprised of a mix of Lao-Tai, Mon Khmer and Hmong Mien ethnic groups. All ethnic groups in the Project area recognize the governance structure of the Village Committee.

Circumstances requiring Free, Prior, and Informed Consent (FPIC):

For projects with adverse impacts to IPs, the additional FPIC requirement applies when there are: (i) impacts on lands and natural resources subject to traditional ownership or under customary use; (ii) relocation of IPs from lands and natural resources subject to traditional ownership or under customary use; or; (iii) significant impacts on IPs' critical cultural heritage, or proposed commercial use of their cultural heritage.

Per its PFA Manual, Burapha does not develop plantations in areas that are identified as important for traditional cultures of local communities or indigenous peoples. However, PFA land is subject to customary use of households across all ethnic groups for both livelihood and subsistence (collection of timbers and NTFPs) and impacts may vary according to the specific use of each ethnic groups present in the village. The PFA manual will be updated to include screening for impacts specific to ethnic groups based on information collected through Burapha's consultation process and commensurate measures adopted if impacts are confirmed.

As taking of PFA land for Burapha operations may affect land under customary use of ethnic groups, FPIC principles are applicable and currently incorporated in Burapha's PFA Land Acquisition Manual through a process of informed consultation and participation, good faith negotiation, and securing of consent of both individual PFA land users and Village Authority.

The Burapha process for acquiring PFA land is outlined in its PFA Land Acquisition Manual (refer to PS5). A key step in this process is data collection on village profile and history where Burapha obtains information on the ethnic diversity of a village. Burapha then engages with communities through a process involving informed consultation and participation (ICP). This includes multiple rounds of community consultation meetings, land use surveys conducted with all affected land users, consultations with focus groups such as women and vulnerable households, validation of minutes, engagement with village councils and elders, etc. Ethnic groups are integrated into the ICP activities

carried out during the land acquisition process, though because impacts are consistent across ethnic groups, they are not necessarily treated as a separate distinct group.

A key objective of the Burapha community consultation process is avoidance of impacts, by identifying any plots with cultural, spiritual, archeological or other values identified by the community so that such plots are excluded from plantation development. Decision-making process involves securing individual consent of all affected PFA land users and a wider village commitment secured for the entire concession area through the consent of the village committee in the presence of community members. Throughout this process members of ethnic groups may participate in the process either as an affected PFA land user or as a community member during community-wide consultations. In cases where consent is not secured from either an individual PFA land user or from a village authority, these are entered into a land use limitation register for appropriate resolution (refer to PS5). Burapha's FPIC process will be verified by an independent expert on a yearly basis with focus on participation of vulnerable groups.

Mitigation and Development Benefits:

While Burapha operations provide for access to employment opportunities and inter-cropping arrangements, considering the nature and scale of project impacts and the dependence of ethnic groups to PFA land, Burapha also conducts awareness raising activities in partner villages to promote conservation and sustainable management of the natural resources to help reduce forest dependency.

Cultural Heritage

The study on Archaeology and Cultural Heritage which was undertaken as part of the ESIA for the current plantations did not identify any direct impacts of the Project on sites of archaeological or cultural heritage significance. As part of its land acquisition process, Burapha conducts consultations with the relevant authorities, potential partner village committees and community members to identify any sites of cultural significance and excludes them from the proposed plantation areas. Stakeholders interviewed during MIGA's and the IESC's site visits did not report concerns or incidents related to Project impacts on cultural heritage or the Project's consultation process on cultural heritage matters.

A Chance Find Procedure in line with PS 8³⁸ requirements has been in place since 2019. The procedure defines the roles and responsibilities of Burapha's staff, as well as the governmental representatives of the Ministry of Information and Culture at the district, provincial and central levels. No chance finds have been reported to date, however, given the expansion plans, Burapha's operations staff will receive training on the Chance Find Procedure to manage the potential risk of chance finds during future plantation establishment.

³⁸ IFC Performance Standard 8: Cultural Heritage

Burapha prepares an Annual Sustainability Report³⁹ that provides internal and external stakeholders with information about the Company's activities and programs. This report is publicly disclosed on its website in English.

2.2 Local Stakeholder Consultation

Burapha updated its Land Acquisition Manual (LAM) in January 2022⁴⁰. The LAM has become more practical and applied. The LAM has a complete set of document templates completed as part of the acquisition process, and also completed examples. The detail in the current version of the LAM provides accurate household and village information sufficient to ensure the balance is maintained between Burapha plantation programs and village livelihoods.

The LAM and Community Engagement SOP⁴¹ sets out comprehensively the procedures for engaging local stakeholders, documenting meeting outcomes and on-going communication mechanisms (e.g. annual meetings supplemented by pre-planting labour meetings and informal communications).

Under the LAM, Burapha applies a participatory rural appraisal (PRA) format that collects and records information. This includes; village community mapping, seasonal agricultural calendar, and a village history profile collected from villager authorities, elders and clan leaders.

Two new community engagement specialists were recruited into the Lands Team in 2021 to implement the social safeguard requirements of land acquisition and grievances around land access. Burapha has also diversified the lingual capabilities of its community engagement team, which were historically Lao Loum only, and now also have ethnic Hmong speakers. Burapha consultation processes now also include engagement with ethnic clan leaders, equally with village authorities. This significantly strengthens village cooperation with Burapha.

New consultation procedures and increased staff capacity in the land acquisition team has enabled Burapha to identify 100% of households who use land within PFAs. Burapha meets with these families at least three times to ensure they fully understand Burapha's plantation project, their participation and Burapha's support. The community meeting structures have been reorganized to ensure community members have a much more improved forum that facilitates enhanced two-way communications.

³⁹ https://www.buraphawood.com/application/files/8416/7359/0875/Burapha_Annual_Sustainability_Report_2021_Final.pdf

⁴⁰ LAM Update

https://buraphawood.sharepoint.com/:b:/g/cser/EedYwzuQe4FOi8ph0_XHBbkB_YIfvm8LHhOqE9rDDWHfgg?e=UdGZ67

LAM Appendices https://buraphawood.sharepoint.com/:f:/g/cser/Et0yHX3-we5Dht9oStRHSLwBDo0k8Ff_5YNc-rjV7EJavg?e=YCbFX3

⁴¹ Community Engagement SOP

<https://buraphawood.sharepoint.com/:b:/g/cser/EeDSwVV43e9NgP8OplY6uesB5UriDUFwaJ11jWKsGQhpkw?e=okp8mO>

A Community Liaison Team was formed in 2022 tasked with the responsibility of providing a constant point of communication for post-land acquisition and into plantation operations. The team manage the village grievances, village development requests and labor scouting for plantation work.

To better streamline the transition of acquired land to forestry operations, the Lands Team now prepare, a Community Consultation Report (CCR). The CCR is a summary document that outlines the results of consultations along with minutes of meetings, it contains links to land user and household data, land survey and mapping data.

One of the most important aspects of engagement from the Forestry Department is the ongoing communication with partner villages through ad hoc meetings with locals and authorities and social events. In the context of Laos this aspect is key to maintaining social license to operate within their area. Although these interactions are not formally recorded, they are possibly the most important component of maintaining the relationship and communication with the local communities. This informal communication includes phone calls and/or visits to arrange meeting with external visitors (e.g. VCS or FSC auditors, investors, consultants etc) Importantly, the Forestry Department also meet formally on an annual basis with all partner villages at which current issues are discussed including project updates, upcoming silviculture plans, harvesting, labor requirements and grievances⁴². These meetings are recorded in minutes signed by the village and Burapha⁴³.

2.3 AFOLU-Specific Safeguards

Updates and Ongoing Engagement

Not only for newly acquired lands but also for existing partner villages, the Forestry Department conducts village consultations which provides them with information on the forthcoming period. This includes the proposed planting area or plantation maintenance, the location of camps and road upgrades. As with land acquisition, Burapha's Grievance Management System is a standing item discussed at these consultations.

The upgrade of roads and or the construction of new roads is an important aspect of the Forestry Departments operations. At the land acquisition stage the road network required to service plantations is planned with the village. The proposed road easement is then provided to the Forestry Department which in-turn negotiates its construction with the village. All land users affected by road development are re-engaged by the Forestry Department, the easement corridor is 'walked' and information on construction activities and timeline is shared. At this stage the road alignment can be adjusted to

⁴² The Grievance Register has been made available to the VVB
https://buraphawood.sharepoint.com/:f/g/cser/EmudqeRM0HZBi3cmoiGAK2UBldlIXidK_cOYUXwhCeofPg?e=fokX1f

⁴³ Formal Village Meetings 2020
https://buraphawood.sharepoint.com/:f/g/cser/Ehk9EFKjHJJCueXU1IF86oEBtxAleneFSPM3tRzGpF6_kg?e=grE9G9

Formal Village Meetings 2021 Cancelled due to COVID outbreak

Formal Village Meetings 2022
<https://buraphawood.sharepoint.com/:f/g/forestry/EhSzcYz3cZpLm5DeCFH478kB5EW51dHvjMZf5-fVMrCi4g?e=fRIHXw>

ensure there is minimal impact on the land users. The final alignment and design is then confirmed and implemented.

Another important factor for the Forestry Departments plantation management is village engagement around fire risk management. Prior to the fire season between February and June, Burapha provides formal notice to all partner villages and districts government officials of fire risks and management strategies. The notice contains information on fire awareness and risk reduction methods, including Burapha's 'Call-Before-Burn' program, that mobilizes Burapha fire control units to be on standby and or assist village backburning efforts in areas adjacent to plantations. Burapha staff contact details are also shared. Additionally, local media is also consulted prior to the fire season, who then use their outlets to help inform local communities of fire risk and management.

In 2022 the employment of three consultation specialists and the formation of the Community Liaison Team has significantly helped improve village relations, and who also bring greater structure and improved approaches to community engagement.

One of the most important aspects of engagement from the Forestry Department is the ongoing communication with partner villages through ad hoc meetings with locals and authorities and social events. In the context of Laos this aspect is key to maintaining social license to operate within their area. Although these interactions are not formally recorded, they are possibly the most important component of maintaining the relationship and communication with the local communities. Importantly, the Forestry Department also meet formally on an annual basis with all partner villages at which current issues are discussed including project updates, upcoming silviculture plans, harvesting, labor requirements and grievances⁴⁴. These meetings are recorded in minutes signed by the village and Burapha⁴⁵.

Village Development Funds

From 2022 Burapha paid the first installments of Village Development Funds (VDF) to partner villages within PFAs. The VDF is a voluntary financial contribution from Burapha paid to partner villages on a per hectare basis for plantations within village boundaries. The VDF can be used by the village for infrastructure upgrades. To 2023 Burapha has paid 200,000,000 LAK (approx. USD \$12,000) to 16 partner villages.

Labor Opportunities

⁴⁴ The Grievance Register has been made available to the VVB
https://buraphawood.sharepoint.com/:f/g/cser/EmudqeRM0HZBi3cmoiGAK2UBldlIXidK_cOYUXwhCeoFPg?e=fokX1f

⁴⁵ Formal Village Meetings 2020
https://buraphawood.sharepoint.com/:f/g/cser/Ehk9EFKjHJJCueXU1IF86oEBtxAleneFSPM3tRzGpF6_kg?e=grE9G9

Formal Village Meetings 2021 Cancelled due to COVID outbreak

Formal Village Meetings 2022
<https://buraphawood.sharepoint.com/:f/g/forestry/EhSzcYz3cZpLm5DeCFH478kB5EW51dHvjMZf5-fVMrCi4g?e=fRIHXw>

As per the Burapha model, labor opportunities are prioritized toward villages that have agreed to have plantations established within their administrative areas (the ‘owner village’). Seeking labor is usually the first reason that villages meet staff from the Forestry Team. Through structured consultations, first with the village authority and then through whole-village meetings, confirmation is sought on the level of labor participation available. Individuals and households that wish to participate are then contracted to Burapha. If a village can’t support labor due to other priorities the village authority formally advises Burapha and permits the company to seek labor from nearby villages, or to recruit contract-labor teams to fill labor shortages.

A Standard Operating Procedure and structured consultation program has been developed for this process. Labor agreements with villages are recorded and signed by both parties. Labor consultations normally take place during the dry season November to May.

Labor rates are reviewed periodically and communicated to all partner villages. Triggers for review are based on local economic factors such as inflation and competitive industries. Links to documentation related to the 2022 and 2023 review and communications has been made available to the auditor⁴⁶.

Socioeconomic and Livelihood Tracking

Baseline assessment of each new partner village (socioeconomic and livelihoods) which are periodically reviewed to track progress on village wellbeing and monitor risks and plan, where relevant, mitigation measures. Follow up resurveying is scheduled for 2023⁴⁷.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The grouped project started implementation of the first project activity instance in April 2016. As shown in Table 1 the total 2,946 ha (2,776 ha excluding Xayabouly Province) have been planted with Eucalyptus (*Eucalyptus spp.*) and Acacia (*Acacia auriculiformis*) which are subject to this monitoring period. The project is implemented in accordance with the PD. The second monitoring report is written

⁴⁶ Daily Labor Wages Review 2023

https://buraphawood.sharepoint.com/:b:/g/cser/EZJuRVwNL3pPpdSENR3_JdUBvm_eRXsV1XcXXOjC1CA6yw?e=p1Dso

Daily Labor Wages Review 2022 <https://buraphawood.sharepoint.com/:b:/g/cser/Ec-GN7fuo85Dg6oAmuZd3m8B4HeuqU5gETLj1IYnYtf5Vw?e=VABcsu>

⁴⁷ New partner village socioeconomic surveys in 2021

<https://buraphawood.sharepoint.com/:f:/g/cser/Ekm0qW8U3k5OpC6pLb6DdGgBfbLuMhF99GKkdc98aN96Yw?e=7phsgJ>

New partner village socioeconomic surveys in 2022

https://buraphawood.sharepoint.com/:f:/g/cser/EsS_Gx0p6jJEggFnEYd67jMBrU-EYw2Q89NCGK42ashFzg?e=SYtQ3y

along with an updated Non-Permanence Risk Report⁴⁸ assuring congruence among the different documents.

Burapha avoids the shift of pre-project agricultural activities (i.e. leakage) by allowing intercropping in the first and second year of the rotation cycle. Burapha is well aware that it works with vulnerable low-income households and wants to avoid that using their land will negatively impact their food security as it follows closely socioeconomic and livelihood status on partner villages. Evidence from the pilot projects shows that rice growing in the project areas produces significant higher yield than upland rice growing through shifting cultivation. In addition, because of the project clearance of land by the project it takes significant much less time to grow rice resulting in much higher labor productivity.

Another effect is that through the additional cash income from the project villagers appear to spend less time on upland rice cultivation. Villages earn significant cash income from labor and lease fees . This allows them to purchase rice from the market and thus increase their food security . The increase in income from the project and reduced time spent on upland rice production also allows villagers to invest more in productive income generation activities such as cash crops, sale of NTFP's, raising livestock . Furthermore, studies in similar projects evidence that no increase of shifting cultivation could be detected while planting plantation areas .

Given the very high levels of anthropogenic pressures – wide spread and historic clearing in PFAs (and outside), Burapha's mosaic pattern of plantations establishment, the distance of plantations from native forests, and the fact that Burapha plan to establish 60,000 ha in 3 PFAs within a total area of 264,000 ha it is difficult to demonstrate any leakage is a direct consequence of Burapha plantation activities. A Village Benefits Assessment will be conducted in 2023 (contract now being signed) in which Burapha will ask directly to households: "Will you clear native forests due to less agricultural land available as a result of Burapha plantations?". Results will be known by Q1 2024 and will include the identification of potential actions necessary to ensure that leakage is monitored effectively).

3.2 Deviations

3.2.1 Methodology Deviations

Temporary and Permanent Sampling Plots

There has been a deviation in the monitoring plan for the second monitoring period (**m2**) of this project. During the first monitoring period, a network of Permanent Sample Plots (PSPs) were used for conducting the inventory. Whereas for **m2** Temporary Sample Plots (TSPs) are also being taken into consideration along with Permanent Sample Plots (PSPs). In order to predict woodflow supply for commercial use and forest volume, continuous estimates of standing volumes (forest inventory or enumeration) need to be made through temporary sample plots (TSPs). Once normalised over time, the mean annual increment (MAI) is one of the key inputs into the business model. Continuous

⁴⁸ Burapha_Risk-Report_MR2 v4.2 20250402

measurements provided by permanent sampling plots (PSPs) provide a foundation for predicting future growth and optimizing rotation age based on continuous measurements.

In November 2022 a field inspection of mensuration practices at Burapha was conducted by Paperbark Forestry Consulting⁴⁹. The review found that the measurement processes of the enumeration team were thorough and conducted to a high standard. Some measures were recommended in the report to improve the efficiency of the measurement process and to prevent errors particularly with respect to ensuring the inclusion/exclusion of trees on plot boundaries and permanent central point markers within each permanent sampling plot (PSP).

Central to improvements is the establishment of a comprehensive forest inventory programme using temporary sample plots (TSPs) in each stand measured at regular intervals throughout the rotation. During the last monitoring period all growth stock and woodflows were determined using a large permanent sampling plot (PSP) network and data outputs, uploaded into the Company's forest management system (IPTIM). PSP data provides broad descriptions at an estate level of Site Index (SI) which is used to calibrate the growth models, survival trends, current stocking and volume development.

While the data from PSPs is valuable for developing growth and yield models, they are inadequate for use in forest inventory as they represent a relatively small proportion of the plantation area: 0.6% compared to a minimum standard of 5% in a normal plantation inventory.

A sampling strategy to better consider variation within stands and more accurately describe the growth in the plantation resource was proposed by paperbark Forestry Consulting. A comprehensive TSP network on each stand based on a minimum 5% sampling strategy conducted at several stages during the rotation (3 years old, 6 years old and another pre-harvest) was proposed. A smaller plot size of 500 m² was proposed to reduce inclusion errors in edge trees which is critical to the scaling up to stems per hectare and reducing errors in volume estimation.

This new strategy will also address the issue of under-sampling of larger stands. A logistical framework was outlined to accommodate the previous measurement programme and the newly proposed enumerations. Since there is no enumeration model within IPTIM such functionality would need to be added. In this respect additional statistical information should be included such as sampling intensity, sampling errors, graphical displays of DBH-height dataset and model, and DBH distribution by stand and plot.

Existing PSPs will be measured until rotation-end, and a sample kept within a newly planted compartment for long-term monitoring. New PSPs will be established in a rectangular shape and each tree given a number to assist in growth tracking.

PSPs should also be distributed according to the various site types/classes across the plantations. In both PSPs and TSPs improved descriptions of the stand are recommended to reinforce the enumeration

⁴⁹ Reviewing and Developing Forest Mensuration Procedures, Report to Burapha Agro-Forestry, Paperbark Forestry Consulting, 27 November 2022

process. Information such as stem form, stand health, defect, disease and weed understory should also be recorded. In order to ensure quality control, follow up audits are recommended on both PSPs and TSPs involving a field audit of a sample of completed enumerations. Because of the seasonality of the rainfall, it is important that measurements on PSPs be conducted on a strict annual basis and if possible, during the dry season when growth has tapered off. Logistically this will not be possible for the measurement of TSPs but still needs to be taken into account when interpreting inventory data.

A summary of the changes to the sampling practices is shown in *Table 3* below:

Table 3: Proposed sampling schedule for enumerating, including TSP plots

Age (years)	Data Source	Comments
	GIS	Location, Area
0	Planting plan	Location, Area, Species, Genetic material, Planting Espacement
0.6	Survival count	Survival of planted stems per ha
3	Mid rotation enumeration	Stocking, DBH frequency distribution, DBH-height pairs, descriptive information
3	Enumeration audit	Checking the data of a sub-set of enumeration data
6	Pre-harvest / 3-year enumeration	Stocking, DBH frequency distribution, DBH-height pairs, descriptive information. If harvesting is not due at age 7 then enumeration must still be done
6	Enumeration audit	Checking the data of a sub-set of enumeration data
Any Age	Enumeration	Enumeration where previous measurements is 3 years or older and the stand has not been harvested.
Any Age	Pre-harvest enumeration	Enumeration where previous measurements is 2 years or older and the stand will be harvested in the next year.
9 and more	Enumeration update	Enumeration where previous measurements are older than 3 years and the stand has not been harvested.
Harvesting date	Volume recording	Comparing actual volumes produced compared to projected volumes from the woodflow.

A full description of the processes followed for PSPs and TSPs are available in Section 6 & 7.

VCS Standard v 4.4 allows deviations under the following conditions:

Projects may deviate from the procedures set out in methodologies in certain cases, where alternative methods may be more efficient for project-specific circumstances, and where the deviation will achieve the same level of accuracy or is more conservative than what is set out in the methodology.

Requirements

3.19.1 Deviations from the applied methodology are permitted where they represent a deviation from the criteria and procedures relating to monitoring or measurement set out in the

methodology (i.e., deviations are permitted where they relate to data and parameters available at validation, data and parameters monitored, or the monitoring plan).

3.19.2 Methodology deviations shall not negatively impact the conservativeness of the quantification of GHG emission reductions or removals, except where they result in increased accuracy of such quantification. Deviations relating to any other part of the methodology shall not be permitted.

These changes increase the accuracy of estimations of the biomass volume and therefore does not negatively impact the conservativeness of the quantification of GHG emission reductions or removals. In addition, the deviations relate only to the procedures for monitoring or measurement, and do not relate to any other part of the methodology.

3.2.1 Project Description Deviations

Change in Carbon Adviser

There has been a deviation in the Other Entities Involved in the Project. Burapha’s carbon adviser has changed from Unique – Forestry and Land Use to SilviCarbon B.V⁵⁰. This deviation does not impact the applicability of the methodology, additionality or the appropriateness of the baseline scenario, and the project remains in conformance with the applied methodology.

Inclusion of Leakage Variables in Monitoring Plan

The registered PD did not contain specific variables for the monitoring of leakage. Three variables have been added to the monitoring plan:

- 1) Area of intercropping,
- 2) Year of intercropping
- 3) Type of crops.

These variables, and values applied for this verification, have been included in Section 4.2 of this monitoring report as below.

Data / Parameter	Area of intercropping
Data unit	Hectares (ha)

⁵⁰ VCU Sale, purchase and Carbon asset management agreement dated June 2, 2021 (original agreement), Deed of amendment in relation to the VCU Sale, purchase and carbon asset management agreement between Burapha and SilviCarbon BV [CONFIDENTIAL] – documents have been made available to the auditor

Description	Area of crops planted within the plantation area by villagers taking up intercropping in the first and/or second year of the plantation rotation.
Source of data	Burapha GIS system
Value applied:	To be reported on establishment of new plantation areas
Justification of choice of data or description of measurement methods and procedures applied	<p>To minimize potential leakage Burapha is explicitly designed as an agroforestry model that mirrors the cycle of traditional shifting cultivation, and allows the local communities to conduct agroforestry practices (intercropping and/or grazing) in between the planting rows as well as generating additional cash income through providing labour opportunities for the villagers.</p> <p>In a shifting cultivation cycle the same plots of land are returned to throughout a cycle. For example, an area planted with rice in Year 1 will then be left fallow for a number of years (typically 5 to 9 years) and then replanted with rice. An example of a typical shifting cultivation cycle is as follows:</p> <ul style="list-style-type: none"> • Year 1: Planting of rice/other crops • Year 2: Area left fallow • Year 3-7: Area left fallow • Year 4: Area left fallow • Year 7: Restart of cycle, clearing and planting of rice/other crops. <p>The Burapha agroforestry rotation mirrors this shifting cultivation cycle, i.e. where an area intercropped with rice in Year 1 will then be left fallow until the trees are harvested in Year 7. After harvesting the area will be re-planted with rice and the rotation cycle will re-start again:</p> <ul style="list-style-type: none"> • Year 1: Planting of trees and rice • Year 2: Planting rice when suitable due to shade from the trees • Year 3-7: Cattle grazing • Year 4: Thinning operations • Year 7: Clear cut of trees and restart of cycle <p>Therefore uptake of intercropping at the start of the plantation rotation has the potential to create a positive leakage impact, rather than creating leakage.</p>

Purpose of Data	Assessment of leakage
Comments	-

Data / Parameter	Year of intercropping
Data unit	Year
Description	The year crops planted within the plantation area by villagers taking up intercropping.
Source of data	Burapha GIS system
Value applied:	Year of plantation stand establishment
Justification of choice of data or description of measurement methods and procedures applied	<p>To minimize potential leakage Burapha is explicitly designed as an agroforestry model that mirrors the cycle of traditional shifting cultivation, and allows the local communities to conduct agroforestry practices (intercropping and/or grazing) in between the planting rows as well as generating additional cash income through providing labour opportunities for the villagers.</p> <p>In a shifting cultivation cycle the same plots of land are returned to throughout a cycle. For example, an area planted with rice in Year 1 will then be left fallow for a number of years (typically 5 to 9 years) and then replanted with rice. An example of a typical shifting cultivation cycle is as follows:</p> <ul style="list-style-type: none"> • Year 1: Planting of rice/other crops • Year 2: Area left fallow • Year 3-7: Area left fallow • Year 4: Area left fallow • Year 7: Restart of cycle, clearing and planting of rice/other crops. <p>The Burapha agroforestry rotation mirrors this shifting cultivation cycle, i.e. where an area intercropped with rice in Year 1 will then be left fallow until the trees are harvested in Year 7. After harvesting the area will be re-planted with rice and the rotation cycle will re-start again:</p> <ul style="list-style-type: none"> • Year 1: Planting of trees and rice • Year 2: Planting rice when suitable due to shade from the trees

	<ul style="list-style-type: none"> Year 3-7: Cattle grazing Year 4: Thinning operations Year 7: Clear cut of trees and restart of cycle <p>Therefore uptake of intercropping at the start of the plantation rotation has the potential to create a positive leakage impact, rather than creating leakage.</p>
Purpose of Data	Assessment of leakage
Comments	Intercropping is assessed during stand establishment.

Data / Parameter	Type of crops
Data unit	-
Description	The type of crops planted within the plantation area by villagers taking up intercropping in the first and/or second year of the plantation rotation.
Source of data	Burapha GIS system
Value applied:	Varies
Justification of choice of data or description of measurement methods and procedures applied	<p>To minimize potential leakage Burapha is explicitly designed as an agroforestry model that mirrors the cycle of traditional shifting cultivation, and allows the local communities to conduct agroforestry practices (intercropping and/or grazing) in between the planting rows as well as generating additional cash income through providing labour opportunities for the villagers.</p> <p>In a shifting cultivation cycle the same plots of land are returned to throughout a cycle. For example, an area planted with rice in Year 1 will then be left fallow for a number of years (typically 5 to 9 years) and then replanted with rice. An example of a typical shifting cultivation cycle is as follows:</p> <ul style="list-style-type: none"> Year 1: Planting of rice/other crops Year 2: Area left fallow Year 3-7: Area left fallow Year 4: Area left fallow Year 7: Restart of cycle, clearing and planting of rice/other crops.

	<p>The Burapha agroforestry rotation mirrors this shifting cultivation cycle, i.e. where an area intercropped with rice in Year 1 will then be left fallow until the trees are harvested in Year 7. After harvesting the area will be re-planted with rice and the rotation cycle will re-start again:</p> <ul style="list-style-type: none"> • Year 1: Planting of trees and rice • Year 2: Planting rice when suitable due to shade from the trees • Year 3-7: Cattle grazing • Year 4: Thinning operations • Year 7: Clear cut of trees and restart of cycle <p>Therefore uptake of intercropping at the start of the plantation rotation has the potential to create a positive leakage impact, rather than creating leakage.</p>
Purpose of Data	Assessment of leakage
Comments	-

This deviation does not impact the applicability of the methodology, additionality or the appropriateness of the baseline scenario, and the project remains in conformance with the applied methodology.

3.3 Grouped Projects

No new instances are being added to the Grouped Project as part of this verification.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	CF_{TREE}
Data unit	t C (t.d.m.) ⁻¹
Description	Carbon fraction of tree biomass in the baseline

Source of data	Default Value
Value applied:	0.47
Justification of choice of data or description of measurement methods and procedures applied	<p>According to the applied tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities" IPCC default value of 0.47 is used unless transparent and verifiable information can be provided to justify a different value.</p> <p>This carbon fraction was taken from IPCC (2006), Guidelines for National Greenhouse Gas Inventories - Volume 4, Agriculture, Forestry and Other Land Use, Forestry, Table 4.3, tropical/subtropical wood.</p>
Purpose of the data	Determination of baseline emissions/removals and project emission/ removals
Comments	

Data / Parameter	C _{BSL_fallow}
Data unit	t C/ha ⁻¹
Description	Carbon stock in pre-project biomass per stratum
Source of data	Hett, C., Heinemann, A., & Messerli, P. (2011). Spatial assessment of carbon stocks of living vegetation at the national level in Lao PDR. <i>Geografisk Tidsskrift-Danish Journal of Geography</i> , 111(1), 11-26. ⁵¹
Value applied:	12.5
Justification of choice of data or description of measurement methods and procedures applied	The value is an average of the carbon stocks of different forest ecosystem (tropical rainforest, tropical moist deciduous and tropical dry) carbon stocks published by Hett et al. (2011).
Purpose of Data	Determination of baseline emission/removals
Comments	-

⁵¹ Hett, C., Heinemann, A., & Messerli, P. (2011). Spatial assessment of carbon stocks of living vegetation at the national level in Lao PDR. *Geografisk Tidsskrift-Danish Journal of Geography*, 111(1), 11-26.

Data / Parameter	CBSL_upland rice
Data unit	t C/ha ⁻¹
Description	Carbon stock in pre-project biomass per stratum
Source of data	Default value, IPCC (2006), Guidelines for National Greenhouse Gas Inventories - Volume 4, Agriculture, Forestry and Other Land Use, Agriculture, Table 5.9, annual cropland
Value applied:	5
Justification of choice of data or description of measurement methods and procedures applied	The value is a default value of carbon stocks in annual cropland under IPCC (2006), Guidelines for National Greenhouse Gas Inventories - Volume 4, Agriculture, Forestry and Other Land Use, Agriculture, Table 5.9, annual cropland ⁵² 5 t CO ₂ /ha were also used in the FREL of Lao PDR (2018) ⁵³ .
Purpose of Data	Determination of baseline emission/removals
Comments	-

Data / Parameter	BEF
Data unit	dimensionless
Description	Biomass expansion factor, expressing the additional biomass of a tree when only stem volume is known.
Source of data	Default factor
Value applied:	2
Justification of choice of data or description of measurement methods and procedures applied	According to IPCC Good Practice Guidance for LULUCF – Table 3A.1.10, Broadleaf Tropical forest, lower confidence interval ⁵⁴
Purpose of Data	Calculation of project emission removals
Comments	-

⁵² IPCC (2006), Guidelines for National Greenhouse Gas Inventories - Volume 4, Agriculture, Forestry and Other Land Use, Chapter 5 Cropland

⁵³ https://redd.unfccc.int/files/lao_2018_frel_submission_modified.pdf p.28

⁵⁴ IPCC (2006), Guidelines for National Greenhouse Gas Inventories - Volume 4, Agriculture, Forestry and Other Land Use, Chapter 4 Forestry

Data / Parameter	R _{TREE_project}
Data unit	dimensionless
Description	Mean of Root:Shoot ratio of Eucalyptus used from the AR CDM Methodological Tool AR-TOOL 14
Source of data	<p>Average of published R:S ratios in scientific literature.</p> <p>Barton, C. V., & Montagu, K. D. (2006). Effect of spacing and water availability on root: shoot ratio in Eucalyptus camaldulensis. <i>Forest Ecology and Management</i>, 221(1-3), 52-62.⁵⁵</p> <p>Fabião, A., Madeira, M., Steen, E., Kätterer, T., Ribeiro, C., & Araújo, C. (1995). Development of root biomass in an Eucalyptus globulus plantation under different water and nutrient regimes. <i>Plant and Soil</i>, 168(1), 215-223.⁵⁶</p>
Value applied:	0.37
Justification of choice of data or description of measurement methods and procedures applied	Enhancing the Tier value by using published values from scientific literature and the species used, instead of default values of IPCC.
Purpose of Data	Calculation of ex-ante and ex-post project emission removals
Comments	-

Data / Parameter	R _{TREE_project}
Data unit	dimensionless
Description	Mean of Root : Shoot ratio of <i>Acacia auriculiformis</i> used from the AR CDM Methodological Tool AR-TOOL 14
Source of data	<p>Average of published R:S ratios in scientific literature.</p> <p>ISLAM, M. A., RAHMAN, R., & HOSSAIN, M. K. (2019). Effect of container and potting media on raising quality seedlings of <i>Acacia auriculiformis</i> in the nursery. <i>Asian Journal of Agriculture</i>, 3(01).</p>
Value applied:	0.26

⁵⁵ Barton, C. V., & Montagu, K. D. (2006). Effect of spacing and water availability on root: shoot ratio in Eucalyptus camaldulensis. *Forest Ecology and Management*, 221(1-3), 52-62.

⁵⁶ Fabião, A., Madeira, M., Steen, E., Kätterer, T., Ribeiro, C., & Araújo, C. (1995). Development of root biomass in an Eucalyptus globulus plantation under different water and nutrient regimes. *Plant and Soil*, 168(1), 215-223.

Justification of choice of data or description of measurement methods and procedures applied	Enhancing the Tier value by using published values from scientific literature and the species used, instead of default values of IPCC.
Purpose of Data	Calculation of ex-ante and ex-post project emission removals
Comments	-

Data / Parameter	Wood density Eucalyptus camaldulensis
Data unit	t dm./m ³
Description	Weight to volume relation of three Eucalyptus clones: <i>E. pellita x E. urophylla</i> , <i>E. pellita x E. brassiana</i> and <i>E. pellita x E. camaldulensis</i>
Source of data	Mean value of three different Eucalyptus clones. The data is from local wood industry contacts by Burapha (Poyry).
Value applied:	0.51
Justification of choice of data or description of measurement methods and procedures applied	A mean of all available wood densities of all Eucalyptus clones used was calculated.
Purpose of Data	Calculation of project emission removals
Comments	Internal wood density database from Burapha. Aged 4

Data / Parameter	Wood density Acacia auriculiformis
Data unit	t dm./m ³
Description	Weight to volume relation of Acacia auriculiformis
Source of data	Internal wood density database from Burapha. Aged 4
Value applied:	0.51
Justification of choice of data or description of measurement methods and procedures applied	Burapha measured own wood densities over the years and could therefore develop the most specific numbers to be used for this study.

Purpose of Data	Calculation of project emission removals
Comments	-

Data / Parameter	SOC _{REF,i}
Data unit	t C ha ⁻¹
Description	Reference SOC stock corresponding to the reference condition in native lands
Source of data	IPCC Default value, See CDM Tool 'tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities'
Value applied:	47
Justification of choice of data or description of measurement methods and procedures applied	According to the applied tool "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities" a default value of 60 for tropical wet climate regions and soils with low activity clay (LAC).
Purpose of Data	Calculation of project emission removals
Comments	-

Data / Parameter	f _{Lu, i}
Data unit	dimensionless
Description	Relative stock change factor for baseline land-use in stratum I of the areas of land
Source of data	IPCC Default value, See CDM Tool 'tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities'
Value applied:	Short-term or set aside cropland: 0.82
Justification of choice of data or description of measurement methods and procedures applied	Table 4 of the applied tool "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities" gives 0.82 as a relative stock change factor for short-term or set aside cropland.
Purpose of Data	Calculation of project emission removals
Comments	-

Data / Parameter	$f_{MG,i}$
Data unit	dimensionless
Description	Relative stock change factor for baseline management regime in stratum I of the areas of land
Source of data	IPCC Default value, See CDM Tool 'tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities'
Value applied:	1.15
Justification of choice of data or description of measurement methods and procedures applied	Table 4 of the applied tool "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities" gives a default value of 1.15 for reduced tillage/ short-term or set aside cropland.
Purpose of Data	Calculation of SOC stock change.
Comments	Calculation of project emission removals

Data / Parameter	$f_{i,i}$
Data unit	dimensionless
Description	Relative stock change factor for baseline input regime (e.g. crop residue returns, manure) in stratum I of the areas of land.
Source of data	IPCC Default value, See CDM Tool 'tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities'
Value applied:	0.92
Justification of choice of data or description of measurement methods and procedures applied	According the Table 5 of the applied tool "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities" an input factor of 0.92 is used when low input is applied in tropical, wet climate to cropland.
Purpose of Data	Calculation of project emission removals
Comments	-

Data / Parameter	$SOC_{0,i}$
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Data unit	dimensionless
Description	SOC stock at project beginning, based on FLU, FMG and FI input parameters.
Source of data	IPCC Default value, See CDM Tool 'tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities'
Value applied:	40.78
Justification of choice of data or description of measurement methods and procedures applied	According to the Table 5 of the applied tool "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities" an input factor of 40.78 is used.
Purpose of Data	Calculation of project emission removals
Comments	-

Data / Parameter	$SOC_{0,i} - SOC_{Ref}$
Data unit	dimensionless
Description	SOC stock accountable by the project.
Source of data	IPCC value calculated based on above mentioned input parameters. See CDM Tool 'tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities'
Value applied:	6.22
Justification of choice of data or description of measurement methods and procedures applied	According to the applied tool "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities" a total SOC change of 6.22/ha divided by 20 years (0.31) can be applied by the afforestation activities of the project.
Purpose of Data	Calculation of project emission removals
Comments	-
Purpose of Data	Calculation of project emission removals
Comments	-

4.2 Data and Parameters Monitored

Data / Parameter	Ai															
Data unit	Ha															
Description	Area of tree biomass stratum i															
Source of data	GIS or/and GPS															
Description of measurement methods and procedures applied	Areas in project area will be tracked in the field using the GPS. Each plot which will be subject to planting is tracked - a standard procedure of the baseline and monitoring inventory															
Frequency of monitoring/recording	Before the start of the project (planting) and adjusted thereafter every y since yearly with satellite imagery															
Value applied:	<table border="1"> <thead> <tr> <th><i>Stratum (Plantation year)</i></th> <th><i>Area⁵⁷</i></th> </tr> </thead> <tbody> <tr> <td>2016</td> <td>947</td> </tr> <tr> <td>2017</td> <td>601</td> </tr> <tr> <td>2018</td> <td>369</td> </tr> <tr> <td>2019</td> <td>158</td> </tr> <tr> <td>2020</td> <td>701</td> </tr> <tr> <td><i>Total</i></td> <td>2774</td> </tr> </tbody> </table>		<i>Stratum (Plantation year)</i>	<i>Area⁵⁷</i>	2016	947	2017	601	2018	369	2019	158	2020	701	<i>Total</i>	2774
<i>Stratum (Plantation year)</i>	<i>Area⁵⁷</i>															
2016	947															
2017	601															
2018	369															
2019	158															
2020	701															
<i>Total</i>	2774															
Monitoring equipment	GPS (Garmin), GPS Smartphones, QGIS software															
QA/QC procedures applied	Field-team members are fully aware of all procedures and the importance of collecting data as accurately as possible; all field team members are trained in GPS/GIS application															
Purpose of data	Calculation of project emissions															
Calculation method	GIS tool															
Comments	-															
Data / Parameter	wi															
Data unit	Dimensionless															

⁵⁷ Note this area excludes all areas planted in Xayabouly Province.

Description	Relative weight of the area of stratum I, the area of the stratum i divided by the project area.	
Source of data	Calculated	
Description of measurement methods and procedures applied	N/A	
Frequency of monitoring/recording	Calculated for each monitoring event, at least every five years	
Value applied:	Stratum	Wi
	EUC-2016	0.33
	EUC-2017	0.19
	EUC-2018	0.12
	EUC-2019	0.06
	EUC-2020	0.25
	AC-2016	0.01
	AC-2017	0.03
	AC-2018	0.02
	TOTAL	1.00
	For ex ante Baseline situation the following values are estimated from the First Project Instance:	
	Stratum (Year)	Wi
	Cropland	0.25
	regenerating fallow	0.75
Monitoring equipment	N/A	
QA/QC procedures applied	N/A	
Purpose of data	Calculation of project removals and baseline emissions.	
Calculation method	Area of the stratum i divided by the project area	
Comments	-	

Data / Parameter	S_i																		
Data unit	t d.m. (or t d.m. ha ⁻¹)																		
Description	Estimated standard deviation of biomass stock in stratum i																		
Source of data	Project based monitoring system																		
Description of measurement methods and procedures applied	N/A																		
Frequency of monitoring/recording	s_i is calculated for each monitoring event, at least every five years																		
Value applied:	<p>For ex ante situation the following values are estimated from the First Project Instance:</p> <table border="1"> <thead> <tr> <th>Stratum</th> <th>S_i</th> </tr> </thead> <tbody> <tr> <td>EUC-2016</td> <td>48.9</td> </tr> <tr> <td>EUC-2017</td> <td>59.2</td> </tr> <tr> <td>EUC-2018</td> <td>28.8</td> </tr> <tr> <td>EUC-2019</td> <td>22.7</td> </tr> <tr> <td>EUC-2020</td> <td>7.4</td> </tr> <tr> <td>AC-2016</td> <td>35.2</td> </tr> <tr> <td>AC-2017</td> <td>62.6</td> </tr> <tr> <td>AC-2018</td> <td>38.4</td> </tr> </tbody> </table>	Stratum	S_i	EUC-2016	48.9	EUC-2017	59.2	EUC-2018	28.8	EUC-2019	22.7	EUC-2020	7.4	AC-2016	35.2	AC-2017	62.6	AC-2018	38.4
Stratum	S_i																		
EUC-2016	48.9																		
EUC-2017	59.2																		
EUC-2018	28.8																		
EUC-2019	22.7																		
EUC-2020	7.4																		
AC-2016	35.2																		
AC-2017	62.6																		
AC-2018	38.4																		
Monitoring equipment	N/A																		
QA/QC procedures applied	N/A																		
Purpose of data	Calculation of uncertainty of project emissions/removals																		
Calculation method	Excel or tool available to calculate standard deviation																		
Comments	-																		
Data / Parameter	DBH																		

Data unit	<i>cm</i>
Description	The diameter at breast height is the diameter of a tree stem.
Source of data	Inventory
Value applied:	-
Justification of choice of data or description of measurement methods and procedures applied	Most important parameter to measure wood volume.
Purpose of Data	Calculation of project emission removals
Comments	-

Data / Parameter	Tree height
Data unit	<i>m</i>
Description	The height of a tree.
Source of data	Inventory
Value applied:	-
Justification of choice of data or description of measurement methods and procedures applied	One of the most important parameter to measure wood volume.
Purpose of Data	Calculation of project emission removals
Comments	-

Data / Parameter	Permanent Sample plot Area
Data unit	<i>m²</i>

Description	The permanent sample plot is the spatial unit of a forest inventory. It is used to expand the measured wood volume to a hectare.
Source of data	Inventory
Value applied:	-
Justification of choice of data or description of measurement methods and procedures applied	Important parameter to measure wood volume.
Purpose of Data	Calculation of project emission removals
Comments	-
Data / Parameter	Temporary Sample plot Area
Data unit	m^2
Description	The temporary sample plot is the spatial unit of a forest inventory. It is used to expand the measured wood volume to a hectare.
Source of data	Inventory
Value applied	
Justification of choice of data or description of measurement methods and procedures applied	Important parameter to measure wood volume.
Purpose of Data	Calculation of project emission removals
Comments	
Data / Parameter	Tree species
Data unit	-
Description	The tree species is used to define the stratum of trees to be counted in.

Source of data	Inventory
Value applied:	-
Justification of choice of data or description of measurement methods and procedures applied	Important parameter to measure wood volume per hectare.
Purpose of Data	Calculation of project emission removals
Comments	-

Data / Parameter	Tree Spacing
Data unit	-
Description	The tree spacing is used to define the stratum of trees to be counted in.
Source of data	Inventory
Value applied:	-
Justification of choice of data or description of measurement methods and procedures applied	Important parameter to measure wood volume per hectare.
Purpose of Data	Calculation of project emission removals
Comments	-

Data / Parameter	Area of intercropping
Data unit	<i>Hectares (ha)</i>
Description	Area of crops planted within the plantation area by villagers taking up intercropping in the first and/or second year of the plantation rotation.
Source of data	Burapha GIS system

Value applied:	To be reported on establishment of new plantation areas
Justification of choice of data or description of measurement methods and procedures applied	<p>To minimize potential leakage Burapha is explicitly designed as an agroforestry model that mirrors the cycle of traditional shifting cultivation, and allows the local communities to conduct agroforestry practices (intercropping and/or grazing) in between the planting rows as well as generating additional cash income through providing labour opportunities for the villagers.</p> <p>In a shifting cultivation cycle the same plots of land are returned to throughout a cycle. For example, an area planted with rice in Year 1 will then be left fallow for a number of years (typically 5 to 9 years) and then replanted with rice. An example of a typical shifting cultivation cycle is as follows:</p> <ul style="list-style-type: none"> • Year 1: Planting of rice/other crops • Year 2: Area left fallow • Year 3-7: Area left fallow • Year 4: Area left fallow • Year 7: Restart of cycle, clearing and planting of rice/other crops. <p>The Burapha agroforestry rotation mirrors this shifting cultivation cycle, i.e. where an area intercropped with rice in Year 1 will then be left fallow until the trees are harvested in Year 7. After harvesting the area will be re-planted with rice and the rotation cycle will re-start again:</p> <ul style="list-style-type: none"> • Year 1: Planting of trees and rice • Year 2: Planting rice when suitable due to shade from the trees • Year 3-7: Cattle grazing • Year 4: Thinning operations • Year 7: Clear cut of trees and restart of cycle <p>Therefore uptake of intercropping at the start of the plantation rotation has the potential to create a positive leakage impact, rather than creating leakage.</p>
Purpose of Data	Assessment of leakage
Comments	-

Data / Parameter	Year of intercropping
Data unit	Year
Description	The year crops planted within the plantation area by villagers taking up intercropping.
Source of data	Burapha GIS system
Value applied:	Year of plantation stand establishment
Justification of choice of data or description of measurement methods and procedures applied	<p>To minimize potential leakage Burapha is explicitly designed as an agroforestry model that mirrors the cycle of traditional shifting cultivation, and allows the local communities to conduct agroforestry practices (intercropping and/or grazing) in between the planting rows as well as generating additional cash income through providing labour opportunities for the villagers.</p> <p>In a shifting cultivation cycle the same plots of land are returned to throughout a cycle. For example, an area planted with rice in Year 1 will then be left fallow for a number of years (typically 5 to 9 years) and then replanted with rice. An example of a typical shifting cultivation cycle is as follows:</p> <ul style="list-style-type: none"> • Year 1: Planting of rice/other crops • Year 2: Area left fallow • Year 3-7: Area left fallow • Year 4: Area left fallow • Year 7: Restart of cycle, clearing and planting of rice/other crops. <p>The Burapha agroforestry rotation mirrors this shifting cultivation cycle, i.e. where an area intercropped with rice in Year 1 will then be left fallow until the trees are harvested in Year 7. After harvesting the area will be re-planted with rice and the rotation cycle will re-start again:</p> <ul style="list-style-type: none"> • Year 1: Planting of trees and rice • Year 2: Planting rice when suitable due to shade from the trees • Year 3-7: Cattle grazing • Year 4: Thinning operations • Year 7: Clear cut of trees and restart of cycle

	Therefore uptake of intercropping at the start of the plantation rotation has the potential to create a positive leakage impact, rather than creating leakage.
Purpose of Data	Assessment of leakage
Comments	Intercropping is assessed during stand establishment.

Data / Parameter	Type of crops
Data unit	-
Description	The type of crops planted within the plantation area by villagers taking up intercropping in the first and/or second year of the plantation rotation.
Source of data	Burapha GIS system
Value applied:	Varies
Justification of choice of data or description of measurement methods and procedures applied	<p>To minimize potential leakage Burapha is explicitly designed as an agroforestry model that mirrors the cycle of traditional shifting cultivation, and allows the local communities to conduct agroforestry practices (intercropping and/or grazing) in between the planting rows as well as generating additional cash income through providing labour opportunities for the villagers.</p> <p>In a shifting cultivation cycle the same plots of land are returned to throughout a cycle. For example, an area planted with rice in Year 1 will then be left fallow for a number of years (typically 5 to 9 years) and then replanted with rice. An example of a typical shifting cultivation cycle is as follows:</p> <ul style="list-style-type: none"> • Year 1: Planting of rice/other crops • Year 2: Area left fallow • Year 3-7: Area left fallow • Year 4: Area left fallow • Year 7: Restart of cycle, clearing and planting of rice/other crops. <p>The Burapha agroforestry rotation mirrors this shifting cultivation cycle, i.e. where an area intercropped with rice in Year 1 will then be left fallow until the trees are harvested in</p>

	<p>Year 7. After harvesting the area will be re-planted with rice and the rotation cycle will re-start again:</p> <ul style="list-style-type: none"> • Year 1: Planting of trees and rice • Year 2: Planting rice when suitable due to shade from the trees • Year 3-7: Cattle grazing • Year 4: Thinning operations • Year 7: Clear cut of trees and restart of cycle <p>Therefore uptake of intercropping at the start of the plantation rotation has the potential to create a positive leakage impact, rather than creating leakage.</p>
Purpose of Data	Assessment of leakage
Comments	-

4.3 Monitoring Plan

Monitoring system structure

Burapha has a technical team that manages and monitors the plantations. Using standard operational procedures, the monitoring system provides verifiable and reliable information on the plantations' growth, allowing for carbon sequestration accounting.

The complete monitoring system of the project includes the following parts:

1. Annual monitoring ensures current and updated data every year.
2. All inputs and costs are recorded and checked to ensure high productivity and efficiency.
3. All specific operations and information regarding every plantation are kept also as spatial explicit information, such as plantation and project boundaries, location, plots and infrastructure in a GIS project. The respective databases are updated at least annually during each inventory period.

Forest growth monitoring is based on annual inventory/ field measurements, usually conducted at the end/beginning of a calendar year. During these inventories parameters, such as DBH and height are measured, while others, such as stand health, stand quality and condition, requirements for action, etc. are evaluated. Growth models are developed using this information by the third party operator "Simosol".

The analysis of the inventory data as well as the growth models feed into the decision-making for the upcoming year. This allows the reporting of reliable information to all parties and stakeholders, the basis for adaptive management.

Geographical delineation of project boundaries

The area of the project has been visited and reviewed with field staff and villagers. The boundaries of each sub-compartment and compartment of plantation is tracked and recorded using a GPS device. The overall plantation boundaries, are continuously re-assessed and updated with remote sensing techniques and satellite imagery.

Stratification and update of effective areas

Site conditions in Burapha plantations are fairly similar. As such, the plantation areas are severely degraded by several cropping cycles of swidden agriculture. Thus, the plantations are stratified using political boundaries of different villages/management units as well as plantation age. This is the smallest unit used for all silvicultural measures.

Enumerations, sampling intensity and sample plot size

Enumerations are undertaken on the basis that the population parameters can be estimated accurately by a given sampling intensity. For general enumerations the required accuracy is set at 10%, in other words the estimated or sample mean volume should aim to be within 10% of the true mean volume. In order to achieve such a result, the sampling intensity for enumerations should be adjusted according to the purpose of the inventory. Sampling intensity in standard forest inventories in single-species plantation forests is generally accepted to be between 2.5 and 10% (Howard, 2012⁵⁸). While sampling in clonal stands in countries such as Brazil and South Africa where high survival and uniformity levels in clonal stands are common, sampling intensity may be lowered slightly without a loss in accuracy (Howard, 2012⁵⁹). However, where survival rates are low and variability high and where terrain is highly variable as in the case of some of the Burapha stands, a higher sample size is recommended. In addition, measurements taken in large stands are statistically more efficient and therefore the number of plots required in large stands should be proportionately less than in small stands. e.g., 5% for larger stands > 5 ha, 7.5% for stands 5 - 10 ha and 10 - 20% ha for small stands less than 5 and 2 ha respectively (Table 4).

Table 4: Proposed stand sampling intensity

Stand size class (ha)	Sampling intensity (%)	Plot size (m ²)	No. of plots per stand
< 2.0	20.0%	500	< 8

⁵⁸ Howard M (2012). Plantation Inventory. In: Bredenkamp BV and Upfold SJ (Eds), South African Forestry Handbook 5th Edition 2012. Southern African Institute of Forestry (SAIF), Menlo Park South Africa. p. 211 – 220.

⁵⁹ Howard M (2012). Plantation Inventory. In: Bredenkamp BV and Upfold SJ (Eds), South African Forestry Handbook 5th Edition 2012. Southern African Institute of Forestry (SAIF), Menlo Park South Africa. p. 211 – 220.

2 - 5	10.0%	500	4 – 10
5 - 10	7.5%	500	7.5 - 15
> 10	5.0%	500	> 15

Data Collection

Following data is measured: Vitality of the tree, tree height, diameter at breast height (DBH), manifestation of diseases or damages, quality of silvicultural treatments applied, and additional observations if any. The company has SOPs for the measurement of PSPs and data collection.

Data analysis

The growth analysis is conducted by the third party company “Simosol”, based in Finland using different models to describe the growth and yield expectations and wood flows as precise as possible. However, the PSP and TSP analysis core data area

- Mean, Maximum and Minimum diameter
- Height and dominant height of trees
- Current no. of trees

On the compartment level the following parameters are calculated per PSP and TSP using the area of the plot:

- Density of living trees
- Basal area
- Volume
- Volume below bark

Procedures for internal auditing and QA/QC

Monitoring requires provisions for quality assurance (QA) and quality control (QC) to be implemented via a QA/QC plan. The main parts of this QA/QC are:

- Collecting reliable field measurements
- Verifying methods used to collect field data
- Procedures to ensure reliable field measurements
- Data maintenance and archiving

Collecting reliable field measurement data

Collecting reliable field measurement data is an important step in the quality assurance plan. Those responsible for the measurement work are properly trained in all aspects of the field data collection as well as the different instruments to use during the activity. The local forest manager responsible is well trained to use the instruments and conduct the inventories. The FMU manager

conducts yearly on-the-job trainings with the workers supporting the activity, ensuring new workers are properly trained.

Verifying methods used to collect field data

The field staff is trained every year in refresher trainings to ensure correct field data collection. The correct procedures are described by SOPs, which are updated whenever necessary by the monitoring responsible.

Before conducting the analysis of the data, quality control of the obtained data is conducted by the monitoring responsible. Unexpected results or high deviations between trees in the PSPs are evaluated, and PSPs are re-measured when necessary. Also, and a comparison with previous years is conducted to ensure consistency of the data throughout the project lifetime.

Verifying analysis techniques

Yield and growth analysis, as well as entire plantation reviews are done by the third party operators “Simosol” and “AFRY Management Consulting” (UK) Ltd. to ensure highest quality and independent quality control.

Data archiving

Copies of all raw data, reports of analysis and supporting spreadsheets will be stored in a dedicated long-term electronic archive for at least 2 years following the end of the last crediting period.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

The achieved GHG emission reductions presented in this chapter refer to the second monitoring period of this project m2 from 23.12.2020 to 31.12.2022 for all plantations planted until 2020, excluding 170 ha in Xayabouly.

Plantings from 2020 were not included in the first monitoring report, but have been added for this monitoring period. The monitoring has been completed for the 701 ha of plantings from 2020 and the total area, which is considered in this monitoring report (m2) is 2,774 ha.

5.1 Data and Parameters Monitored

Data / Parameter	Ai
Data unit	Ha
Description	Area of tree biomass stratum i

Value applied:	Stratum (Plantation year)	Area
	2016	947
	2017	601
	2018	369
	2019	158
	2020	701
	Total	2774
Comments	Areas are yearly updated using satellite imagery	

Data / Parameter	$A_{p,i}$	
Data unit	Ha	
Description	Size of a sample plot in stratum i. This varies depending on the plantation density. Permanent Sample Plots have always a radius of approximately 17.4m (0.1 ha), depending on slope correction.	
Value applied:	Type of Plantation	Area (ha)
	888 trees/ha (5x2.5m)	0.1
	1.111 trees/ha (5x2)	0.1
Comments	-	

Data / Parameter	DBH
Data unit	cm
Description	The diameter at breast height (1.3 m from the ground).
Value applied:	See Excel File "Burapha_Second_Monitoring_Calculation_v2 07082024'.xlsx"
Comments	-

Data / Parameter	W_i
-------------------------	-------

Data unit	Dimensionless	
Description	Relative weight of the area of stratum I, the area of the stratum I divided by the project area	
Value applied:	Stratum (Year)	Wi
	EUC-2016	0.33
	EUC-2017	0.19
	EUC-2018	0.12
	EUC-2019	0.06
	EUC-2020	0.25
	AC-2016	0.01
	AC-2017	0.03
	AC-2018	0.02
Comments	-	

Data / Parameter	Si	
Data unit	t.d.m. (or t dm.m. ha ⁻¹)	
Description	Estimated standard deviation of biomass stock in stratum i	
Value applied:	Stratum (Year)	Si
	EUC-2016	51.4
	EUC-2017	57.5
	EUC-2018	28.8
	EUC-2019	22.7
	EUC-2020	7.4
	AC-2016	35.2
	AC-2017	63.1
	AC-2018	38.4
Comments	-	

Data / Parameter	ni	
Data unit	Dimensionless	
Description	Number of sample plots in stratum i	
Value applied:	Stratum (Year)	ni
	EUC-2016	328

	EUC-2017	276
	EUC-2018	38
	EUC-2019	23
	EUC-2020	8
	AC-2016	14
	AC-2017	31
	AC-2018	6
	Total	724
Comments	-	

Data / Parameter	Tree height (H)
Data unit	m
Description	Height of tree planted
Value applied:	See Excel "Burapha_Second_Monitoring_Calculation_v2 07082024'.xlsx"
Comments	-

Data / Parameter	T
Data unit	Year
Description	Time period elapsed between two successive estimation of carbon stock in a carbon pool
Value applied:	1 year
Comments	-

Data / Parameter	Permanent Sample plot Area
Data unit	m^2
Description	The permanent sample plot is the spatial unit of a forest inventory. It is used to expand the measured wood volume to a hectare.

Value applied:	-
Comments	-

Data / Parameter	Temporary Sample plot Area
Data unit	m^2
Description	The temporary sample plot is the spatial unit of a forest inventory. It is used to expand the measured wood volume to a hectare.
Value applied:	-
Comments	-

Data / Parameter	Tree species
Data unit	-
Description	The tree species is used to define the stratum of trees to be counted in.
Value applied:	-
Comments	-

Data / Parameter	Tree Spacing
Data unit	-
Description	The tree spacing is used to define the stratum of trees to be counted in.
Value applied:	-
Comments	-

Data / Parameter	Area of intercropping																																
Data unit	<i>Hectares (ha)</i>																																
Description	Area of crops planted within the plantation area by villagers taking up intercropping in the first and/or second year of the plantation rotation.																																
Source of data	Burapha GIS system																																
Value applied:	<table border="1"> <thead> <tr> <th>Crop Type by Province</th> <th>Crops Planted (ha)</th> <th>2020 Plantation Area Established (ha)</th> </tr> </thead> <tbody> <tr> <td>P.Vientiane</td> <td>492.77</td> <td>604.30</td> </tr> <tr> <td>Casava</td> <td>1</td> <td></td> </tr> <tr> <td>Jobs-tear's</td> <td>315.19</td> <td></td> </tr> <tr> <td>Rice</td> <td>157.65</td> <td></td> </tr> <tr> <td>Sesame</td> <td>0.34</td> <td></td> </tr> <tr> <td>Vientiane Capital</td> <td>225.5</td> <td>96.28</td> </tr> <tr> <td>Jobs-tear's</td> <td>1.5</td> <td></td> </tr> <tr> <td>Rice</td> <td>224</td> <td></td> </tr> <tr> <td>Grand Total</td> <td>718.27</td> <td>700.58</td> </tr> </tbody> </table>			Crop Type by Province	Crops Planted (ha)	2020 Plantation Area Established (ha)	P.Vientiane	492.77	604.30	Casava	1		Jobs-tear's	315.19		Rice	157.65		Sesame	0.34		Vientiane Capital	225.5	96.28	Jobs-tear's	1.5		Rice	224		Grand Total	718.27	700.58
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Justification of choice of data or description of measurement methods and procedures applied	<p>To minimize potential leakage Burapha is explicitly designed as an agroforestry model that allows the local communities to conduct agroforestry practices (intercropping and/or grazing) in between the planting rows, mirroring the traditional shifting cultivation cycle, as well as generating additional cash income through providing labour opportunities for the villagers.</p> <p>In a shifting cultivation cycle the same plots of land are returned to throughout a cycle. For example, an area planted with rice in Year 1 will then be left fallow for a number of years (typically 5 to 9 years) and then replanted with rice. An example of a typical shifting cultivation cycle is as follows:</p> <ul style="list-style-type: none"> • Year 1: Planting of rice/other crops • Year 2: Area left fallow • Year 3-7: Area left fallow • Year 4: Area left fallow • Year 7: Restart of cycle, clearing and planting of rice/other crops. <p>The Burapha agroforestry rotation mirrors this shifting cultivation cycle, i.e. where an area intercropped with rice in Year 1 will then be left fallow until the trees are harvested in Year 7. After harvesting the area will be re-planted with rice</p>																																

	<p>and the rotation cycle will re-start again:</p> <ul style="list-style-type: none"> • Year 1: Planting of trees and rice • Year 2: Planting rice when suitable due to shade from the trees • Year 3-7: Cattle grazing • Year 4: Thinning operations • Year 7: Clear cut of trees and restart of cycle <p>Therefore uptake of intercropping at the start of the plantation rotation has the potential to create a positive leakage impact, rather than creating leakage.</p>
Purpose of Data	Assessment of leakage
Comments	-

Data / Parameter	Year of intercropping
Data unit	Year
Description	The year crops planted within the plantation area by villagers taking up intercropping.
Source of data	Burapha GIS system
Value applied:	2020
Justification of choice of data or description of measurement methods and procedures applied	<p>To minimize potential leakage Burapha is explicitly designed as an agroforestry model that allows the local communities to conduct agroforestry practices (intercropping and/or grazing) in between the planting rows, mirroring the traditional shifting cultivation cycle, as well as generating additional cash income through providing labour opportunities for the villagers.</p> <p>In a shifting cultivation cycle the same plots of land are returned to throughout a cycle. For example, an area planted with rice in Year 1 will then be left fallow for a number of years (typically 5 to 9 years) and then replanted with rice. An example of a typical shifting cultivation cycle is as follows:</p> <ul style="list-style-type: none"> • Year 1: Planting of rice/other crops • Year 2: Area left fallow • Year 3-7: Area left fallow

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Purpose of Data	Assessment of leakage
Comments	No new areas are being added as part of this verification. However the areas planted in 2020 were not included in the previous verification as the trees were not old enough to be inventoried. Therefore potential for leakage impact will be considered for the 2020 planted areas only

Data / Parameter	Type of crops
Data unit	-
Description	The type of crops planted within the plantation area by villagers taking up intercropping in the first and/or second year of the plantation rotation.
Source of data	Burapha GIS system
Value applied:	Rice, casava, Jobs tears, sesame
Justification of choice of data or description of	To minimize potential leakage Burapha is explicitly designed as an agroforestry model that allows the local communities to conduct agroforestry practices (intercropping and/or

<p>measurement methods and procedures applied</p>	<p>grazing) in between the planting rows, mirroring the traditional shifting cultivation cycle, as well as generating additional cash income through providing labour opportunities for the villagers.</p> <p>In a shifting cultivation cycle the same plots of land are returned to throughout a cycle. For example, an area planted with rice in Year 1 will then be left fallow for a number of years (typically 5 to 9 years) and then replanted with rice. An example of a typical shifting cultivation cycle is as follows:</p> <ul style="list-style-type: none"> • Year 1: Planting of rice/other crops • Year 2: Area left fallow • Year 3-7: Area left fallow • Year 4: Area left fallow • Year 7: Restart of cycle, clearing and planting of rice/other crops. <p>The Burapha agroforestry rotation mirrors this shifting cultivation cycle, i.e. where an area intercropped with rice in Year 1 will then be left fallow until the trees are harvested in Year 7. After harvesting the area will be re-planted with rice and the rotation cycle will re-start again:</p> <ul style="list-style-type: none"> • Year 1: Planting of trees and rice • Year 2: Planting rice when suitable due to shade from the trees • Year 3-7: Cattle grazing • Year 4: Thinning operations • Year 7: Clear cut of trees and restart of cycle <p>Therefore uptake of intercropping at the start of the plantation rotation has the potential to create a positive leakage impact, rather than creating leakage.</p>
<p>Purpose of Data</p>	<p>Assessment of leakage</p>
<p>Comments</p>	<p>-</p>

5.2 Baseline Emissions

Baseline emissions for this monitoring period m2 was calculated following the approach demonstrated in section 4.1 of the PDD. The table below displays the baseline carbon stocks for the pre-existing trees for the planting years 2016-2020 which are subject to this monitoring period.

Table 5. Baseline biomass for this monitoring period.

Year	Areas planted / restored per year (ha)	C _{TREE_BSL} Pre-existing biomass of trees (tCO ₂ -e)	C _{CW_BSL} Dead wood pre-existing trees (tCO ₂ -e)	C _{SHRUB_BSL} Pre-existing shrub biomass (tCO ₂ -e)	C _{BSL_TOTAL} Total Biomass baseline (tCO ₂ -e)
2016	0	0	0	0	0
2017	0	0	0	0	0
2018	0	0	0	0	0
2019	0	0	0	0	0
2020	0	0	0	0	0
Total	0	0	0	0	0

5.3 Project Emissions

The actual net GHG removals by sinks have been calculated using equation 2 of the methodology (AR-ACM0003: Afforestation and reforestation of lands except wetlands. Version 02.0) as described below.

$$\Delta C_{ACTUAL,t} = \Delta C_{P,t} - GHG_{E,t}$$

Where:

$\Delta C_{ACTUAL,t}$ = Annual actual net greenhouse gas removals by sinks at time t ; t CO₂-e yr⁻¹

$\Delta C_{P,t}$ = Change in carbon stocks in project, occurring in the selected carbon pools, at time t ; t CO₂-e yr⁻¹

$GHG_{E,t}$ = Increase of non-CO₂ GHG emissions within the project boundary as a result of the implementation of the A/R CDM project activity, in year t , t CO₂-e

Change in the carbon stocks in project have been calculated using equation 3 of the methodology, however shrub biomass is not considered in this project:

$$\Delta C_{P,t} = \Delta C_{TREE_PROJ,t} + \Delta C_{SOC_PROJ,t}$$

Where:

$\Delta C_{P,t}$ = Change in carbon stocks in project, occurring in the selected carbon pools, at time t; t CO₂-e yr⁻¹

$\Delta C_{TREE_PROJ,t}$ = Change in carbon stock in tree biomass in project in year t, as estimated in AR-TOOL14; t CO₂-e yr⁻¹

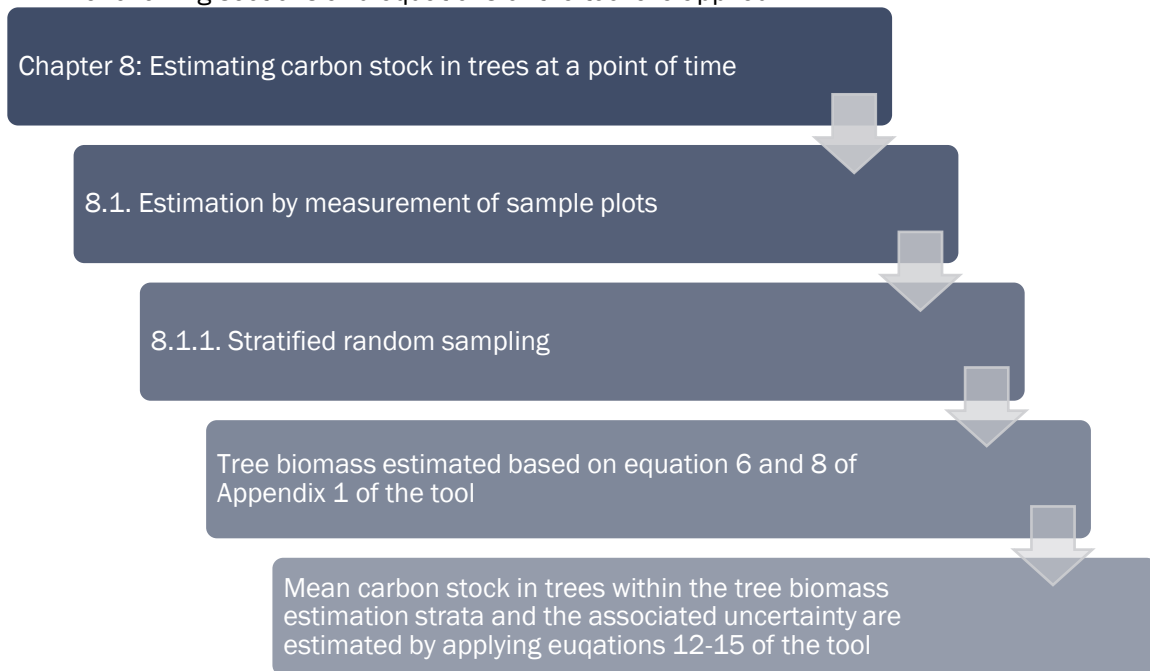
$\Delta C_{SOC_PROJ,t}$ = Change in carbon stock in the soil organic carbon (SOC) pool within the project boundary, as estimated in AR-ACM003, in year t; t CO₂-e yr⁻¹

Estimation of carbon stock changes in trees and shrubs

Carbon stock changes of trees and shrubs are estimated applying the AR-Tool 'A/R Methodological tool: Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities' (Version 04.1).

Estimation of carbon stock change in trees

The following sections and equations of the tool are applied:



The following equations of the methodology have been applied:

$$C_{TREE,t} = \frac{44}{12} * CF_{TREE} * B_{TREE,t}$$

$$B_{TREE,t} = b_{TREE,t} * A$$

$$b_{TREE,t} = \sum_{i=1}^M w_i * b_{TREE,t,i}$$

Where:

- $C_{TREE,t}$ = Carbon stock in tree biomass within the project boundary at a point in time in year t ; t CO₂-e.
- CF_{TREE} = Carbon fraction of tree biomass; t C (t d.m.)⁻¹.
- $B_{TREE,t}$ = Total tree biomass within the project boundary at a given point in time in year t ; t d.m.
- $b_{TREE,t}$ = Mean tree biomass per hectare within the project boundary at a given point in time in year t ; t d.m. ha⁻¹
- A = Project area; ha
- w_i = Ratio of the area of stratum i to the sum of areas of tree biomass estimation strata (A_i/A), dimensionless
- $b_{TREE,t,i}$ = Mean tree biomass per hectare in stratum i at a given point in time in year t ; t d.m. ha⁻¹

Determination of tree biomass $b_{TREE,t,j}$

Tree biomass estimation follows the guidance for measurement of variable plots given in Appendix 1 of the Tool, equations 6 and 8.

The following table summarizes the values applied for equation 8 (of Appendix 1 of the Tool):

Table 6: Values applied to calculate tree biomass

Equation value	Description	Value applied	Source
$V_{TREE,j}(BA_{p,i})$	Stem volume per hectare of trees of species j in sample plot p of stratum i estimated by using the basal area of the plot as entry data into a volume table or volume equation; m ³ ha ⁻¹	See Excel inventory data	Allometric equations developed by Simosol on the basis of growth parameters in Burapha
D_j	Density (over-bark) of tree species j ; t d.m. m ⁻³	0.51; 0.68	Burapha internal documentation
$BEF_{2,j}$	Biomass expansion factor for conversion of tree stem	2	IPCC value, Table 3A.1.10, Broadleaf Tropical

	biomass to above-ground tree biomass, for tree species j; dimensionless		
R _j	Root-shoot ratio for tree species j; dimensionless	0.37;0.68	Average from two sources: Barton and Montagu, 2006, Effect of spacing and water availability on root:shoot ratio in Eucalyptus camaldulensis & Fabiao et al. 1995, Development of root biomass in an Eucalyptus globulus plantation under different water and nutrient regimes, Plant and soil 168-169; Acacia auriculiformis from Islam et al 2019

The calculation of the tree biomass was done in Excel. The file 'Burapha_Second_Monitoring_Calculation_v2_07082024' is available as supporting documentation.

Table 7. Summary calculation B_{TREE} and C_{TREE}

Stratum	Area (ha)	w _i	b _{TREE} , t t d.m. ha ⁻¹	B _{TREE} , t t d.m.	C _{TREE} , t t CO ₂ -e
EUC-2016	916	0.33	45.05	113,120	194,944
EUC-2017	526	0.19	45.12	65,078	112,151
EUC-2018	323	0.12	33.19	29,385	50,639
EUC-2019	158	0.06	17.82	7,693	13,257
EUC-2020	701	0.25	2.85	5,480	9,444
AC-2016	30	0.01	46.51	3,548	6,114
AC-2017	74	0.03	44.14	8,249	14,216
AC-2018	46	0.02	22.36	2,570	4,428
TOTAL	2774	1.00	31.09	235,121	405,193

Calculation of uncertainty following the guidance of Appendix 2 of the A/R Methodology Tool
Table 8. Calculation of uncertainty.

Stratum	S _i t.d.m. ha ⁻¹	n _i	U _c %	U _c mean (t CO ₂ -e)	U _c Discount (t CO ₂ -e)
EUC-2016	51.4	328	3%	11,662	0
EUC-2017	57.5	276			
EUC-2018	28.8	38			
EUC-2019	22.7	23			
EUC-2019	7.4	8			
AC-2016	26.4	14			
AC-2017	47.3	31			
AC-2018	28.8	6			
Total	270.3	724			

Based on the Tool no discount of C_{TREE} is necessary as u_c < 10%.

Estimation of changes in soil organic carbon stocks

For ex-post estimation of the SOC changes under the project scenario for this monitoring period, the default method of the A/R Methodological tool 'Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities' (Version 01.1.0) is applied. The application and justification of the tool is outlined in section 4.2.

The rate of change in SOC stock in the project scenario until the steady state in SOC content is reached (assumed in 20 years from the time of the initial site preparation) is calculated as 0,4 tC/ ha/ yr which represents the weighted average value over all baseline strata.

SOC stock change starts from 1 year after activity start.

The "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities", version 01.1.0. states that:

(b) The A/R CDM project activity meets the following conditions:(i) Litter remains on site and is not removed in the A/R CDM project activity; and

(i) Litter remains on site and is not removed in the A/R CDM project activity; and

(ii) Soil disturbance attributable to the A/R CDM project activity, if any, is:

- In accordance with appropriate soil conservation practices, e.g. follows the land contours;
- Limited to soil disturbance for site preparation before planting and such disturbance is not repeated in less than twenty years.

“Soil disturbance” is an anthropogenic activity that results in release of soil organic carbon into the atmosphere, e.g. ploughing, ripping, scarification, digging of pits and trenches, stump removal, drainage of soil, etc

Stumps are left in situ. Pits are dug by hand before planting, with each pit no larger than 20 cm in diameter and depth, ensuring minimal soil disturbance. Pits are dug approximately every 14 years, based on the practice of replanting every second rotation. These practices are confirmed in “BAFCO_WI03_V02_Manual site preparation 230220”⁶⁰

Replanting does not include ploughing, ripping, scarification, digging of pits and trenches, stump removal or drainage of soil and soil disturbance is minimised and follows appropriate soil conservation practices. Therefore the project remains in compliance with the requirements of “Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities”, version 01.1.0

Table 9. Calculation of SOC change for this monitoring period

Year	Area (ha)	Cummulative SOC area (ha)	Annual SOC Carbon stock change (t CO2e)	Accumulated Carbon stock change (t CO2e)
2016	947	947	1,389	1,389
2017	601	1,548	2,270	3,659
2018	369	1,916	2,811	6,469
2019	158	2,074	3,042	9,511

⁶⁰ BAFCO_WI03_V02_Manual site preparation 230220
https://www.dropbox.com/scl/fi/0sadowk876zkabqnbtd/BAFCO_WI03_V02_Manual-site-preparation-230220.docx?rlkey=4nuwameds8qeyv2ffdb4zhp2q&st=vzpih54d&dl=0

2020	701	2,775	4,070	13,581
2021	0	2,775	4,070	17,650
2022	0	2,775	4,070	21,720
Total	2,775	2,775	21,720	21,720

Change in carbon stocks of trees

According to the tool AR-TOOL14 A/R Methodological tool 'Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities' (Version 04.1) at the first verification $C_{TREE, t2}$ is set equal to the carbon stock in the first verification. Based on this, the following table shows the change in carbon stock during the period between two points of time $t2$ (Tree biomass from the first monitoring which is considered as the baseline for the second monitoring period) and $t3$. The Excel sheet 'Burapha_Second_Monitoring_Calculation_v2 07082024' details the full calculation of emission reductions for this monitoring period.

Table 10. Change in carbon stocks during the period between two points of time t2 (end of first monitoring period) and t3 (end of second monitoring period).

Year of inclusion of project areas	Area strata included in year t (ha)	$C_{TREE,t2} = C_{TREE,BSL,t2}$	$C_{DW,BSL,t2}$	$C_{SHRUB,BSL,t2}$ (t CO ₂ -e)	$C_{TREE,PROJ_DISCOUNT,t3}$ (2020)	$C_{TREE,PROJ_DISCOUNT,t3}$ (2021)	$C_{TREE,PROJ_DISCOUNT,t3}$ (2022)	Actual SOC net GHG removals by sinks, in year t; (t CO ₂ -e)	Including SOC (2020)	Including SOC (2021)	Including SOC (2022)	$C_{DW,PROJ,t2}$	$C_{DW,PROJ,t3}$	$\Delta C_{TREE+DW,PROJ,t3-t2}$ (2020)	$\Delta C_{TREE+DW,PROJ,t3-t2}$ (2021)	$\Delta C_{TREE+DW,PROJ,t3-t2}$ (2022)
2016	946.6		0	0.0	29,099	18,521	18,521	18,521		18,521	18,521	18,521	0	0	18,521	18,521
2017	600.5		0	0.0	44,878	21,017	21,017	21,017		21,017	21,017	21,017	0	0	21,017	21,017
2018	368.7		0	0.0	53,298	8,368	8,368	8,368		8,368	8,368	8,368	0	0	8,368	8,368
2019	157.6		0	0.0	54,447	3,227	3,227	3,227		3,227	3,227	3,227	0	0	3,227	3,227
2020	701.0		0	0.0	54,447	0	4,722	4,722	1,028	1,028	5,750	5,750	0	0	1,028	5,750
2021	0		0	0.0	–	0	0	0	4,070	4,070	4,070	4,070	0	0	4,070	4,070
2022	0		0	0.0	–	0	0	0	4,070	4,070	4,070	4,070	0	0	4,070	4,070
Total	2774.5		0	0.0	236,168	51,133	55,854	55,854	9,168	60,300	65,022	65,022	0	0	60,300	65,022

Actual net greenhouse gas removals by sinks
Table 11. Actual net greenhouse gas removals by sinks for the different years of the monitoring period.

Year of inclusion of project areas	Project implementation (cum. months)	Cumulative tree net GHG removals by sinks, in year t; (t CO ₂ -e) (2020)	Cumulative tree net GHG removals by sinks, in year t; (t CO ₂ -e) (2021)	Cumulative tree net GHG removals by sinks, in year t; (t CO ₂ -e) (2022)	Actual tree net GHG removals by sinks, in year t; (t CO ₂ -e) (2020)	Actual tree net GHG removals by sinks, in year t; (t CO ₂ -e) (2021)	Actual tree net GHG removals by sinks, in year t; (t CO ₂ -e) (2022)	Buffer pool allocation (2020)	Buffer pool allocation (2021)	Buffer pool allocation (2022)	VCUs eligible for Issuance (2020)	VCUs eligible for Issuance (2021)	VCUs eligible for Issuance (2022)
2016	8	18,521	18,521	18,521	18,521	18,521	18,521	1,852	1,852	1,852	16,669	16,669	16,669
2017	20	39,538	39,538	39,538	21,017	21,017	21,017	2,102	2,102	2,102	18,915	18,915	18,915
2018	32	47,906	47,906	47,906	8,368	8,368	8,368	837	837	837	7,532	7,532	7,532
2019	44	51,133	51,133	51,133	3,227	3,227	3,227	323	323	323	2,904	2,904	2,904
2020	56	52,161	56,883	56,883	1,028	5,750	5,750	103	575	575	925	5,175	5,175
2021	68	56,230	60,952	60,952	4,070	4,070	4,070	407	407	407	3,663	3,663	3,663
2022	80	60,300	65,022	65,022	4,070	4,070	4,070	407	407	407	3,663	3,663	3,663
Total	80	60,300	65,022	65,022	60,300	65,022	65,022	6,030	6,502	6,502	54,270	58,520	58,520

5.4 Leakage

To minimize potential leakage Burapha is explicitly designed as an agroforestry model that allows the local communities to conduct agroforestry practices (intercropping and/or grazing) in between the planting rows as well as generating additional cash income through providing labour opportunities for the villagers.

The Burapha rotation cycle mirrors the shifting cultivation cycle, which is prevalent in Laos. In a shifting cultivation cycle the same plots of land are returned to throughout a cycle. For example, an area planted with rice in Year 1 will then be left fallow for a number of years (typically 5 to 9 years) and then replanted with rice. An example of a typical shifting cultivation cycle is as follows:

- Year 1: Planting of rice/other crops
- Year 2: Area left fallow
- Year 3-7: Area left fallow
- Year 4: Area left fallow
- Year 7: Restart of cycle, clearing and planting of rice/other crops.

The Burapha agroforestry rotation mirrors this shifting cultivation cycle, i.e. where an area intercropped with rice in Year 1 will then be left fallow until the trees are harvested in Year 7. After harvesting the area will be re-planted with rice and the rotation cycle will re-start again:

- Year 1: Planting of trees and rice
- Year 2: Planting rice when suitable due to shade from the trees
- Year 3-7: Cattle grazing
- Year 4: Thinning operations
- Year 7: Clear cut of trees and restart of cycle

This is the second monitoring period for the first PAI. No new areas are being added as part of this verification. However the areas planted in 2020 were not included in the previous verification as the trees were not old enough to be inventoried. Therefore potential for leakage impact will be considered for the 2020 planted areas only (701 ha).

AR Tool 15 “A/R Methodological tool: Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity” (Version 2.0) applies to the project. AR Tool 15 states that leakage emissions attributable to the displacement of grazing activities under the following conditions is considered insignificant and hence accounted as zero:

- (a) Animals are displaced to existing grazing land and the total number of animals in the receiving grazing land (displaced and existing) does not exceed the carrying capacity of the grazing land;
- (b) Animals are displaced to existing non-grazing grassland and the total number of animals displaced does not exceed the carrying capacity of the receiving grassland;
- (c) Animals are displaced to cropland that has been abandoned within the last five years;
- (d) Animals are displaced to forested lands, and no clearance of trees, or decrease in crown cover of trees and shrubs, occurs due to the displaced animals;
- (e) Animals are displaced to zero-grazing system.

The tool also states that “In all other cases, the lands within the project boundary from which the pre-project agricultural activities are to be displaced outside the project boundary are delineated and their area is estimated.”

Impact on Grazing Activities

The 2019 Village Benefits Assessment⁶¹ reported that “*village residents can graze cattle in plantation stands from the third year of a plantation cycle until harvest and residents generally understood that Burapha allowed cattle grazing on plantations. However very few actively graze primarily because the plantation areas are too far away from the village residential areas.*”

It is standard practice that cattle/other livestock are mustered at the end of each day and penned in areas close to homes or nearby to the village. This practice is essential to prevent livestock theft which is common. For this practical reason, lands approved by villagers for conversion to plantations during the land acquisition process are often far from village centres and are not used for grazing in the pre-project situation given the distance required to daily muster.

Even where grazing was happening in the project area there is only partial displacement of grazing in the first 2 years of the project. It is unlikely that the project is creating leakage in this context as abundant fallow land⁶² is available where cattle can graze outside the project area (condition c and or d of the above list of exempted conditions applies). Therefore leakage due to displacement of grazing activities is assumed to be zero.

Impact on Agricultural Activities

As mentioned already, the agroforestry plantation model reduces the risk of leakage by allowing for intercropping of agricultural crops during the first 1-2 years of plantation establishment. The agroforestry cycle mirrors the shifting cultivation cycle, where the same plots of land are returned to throughout the cycle (e.g. an area planted with rice in Year 1 will then be left for a number of years until the trees are harvested in Year 7. After harvesting the area will be re-planted and the rotation cycle will re-start again, i.e the re-planted area will be Year 1).

Uptake of Intercropping Opportunities

For areas within the Agroforestry Model for rice growing, families/individuals are provided (by village committees) user rights to individual plots to grow crops between the trees at their discretion. Crop production and associated activities are separate from formal Burapha activities (i.e. user rights are granted, but paid labour is reserved for forestry operations). The family/individual for whom the plot has been assigned is provided user rights for the leased area, undertakes the work at their

⁶¹ Note that the 2019 Village Benefits Assessment covered 23 villages in Vientiane Capital Province, Vientiane Province and Xayabouly Province.

⁶² As of August 2023 Burapha has established 5,800 ha of plantations (including areas to be included as future PAIs). For context the 3 PFAs Burapha operates in have a total area of 264,000 ha.

convenience, and harvests the crops for their own utilisation (consumption or sale). Where intercropping occurs, the risk of leakage due to shifting agricultural activities is reduced.

The framework ESIA found that in 23 villages with plantations (2,928 ha), approximately 1,829 ha of plantation land was intercropped. The size of village intercropping areas ranged from less than 20 ha to more than 100 ha for larger plantations.

The Village Benefits Assessment found that “81 households (21 of those surveyed%) reported intercropping in plantations. Crops included rice, Job’s Tears, peppers, corn, cassava, eggplant, beans, onions, pumpkins, taro, and sesame, many of which are sold as cash crops. Of the households that report intercropping on plantation stands, the average (mean) plot size is approximately four hectares.”

The uptake of intercropping opportunities reduces the risk of leakage from the project. This is tracked in Village Benefits Assessments, and the baseline socioeconomic and livelihood studies (for all new partner villages) including area of intercropping, type of crops, and yields.

Burapha’s GIS system captures information on the uptake of intercropping opportunities by villagers during the process of stand establishment. Area and type of crops planted in the first year of plantation areas established in 2020 are shown below:

Table 12 Intercropping in 2020 Plantation Establishment Areas

Crop Type by Province	Crops Planted (ha)	2020 Plantation Area Established (ha)
P.Vientiane	492.77	604.30
Casava	1	
Jobs-tear's	315.19	
Rice	157.65	
Sesame	0.34	
Vientiane Capital	225.5	96.28
Jobs-tear's	1.5	
Rice	224	
Grand Total	718.27	700.58

The fact the areas are cleared by Burapha decreases the labour required for preparing areas for growing crops. The data shows that villagers took up the opportunity for intercropping (and even planting beyond the plantation areas into buffer areas, roads, fire breaks etc that have been cleared as part of the plantation infrastructure), which creates a positive leakage impact.

Burapha closely follows the socioeconomic and livelihood status on partner villages and undertakes Village Benefits Assessments to quantify the impact of the project on villages at a 5-yearly interval⁶³. The ESIA for the project concluded that “the intercropping scheme appears to have had a positive effect on food security for participating households⁶⁴.” Evidence from the early years of the project shows that rice growing in the project areas (Agroforestry Model) produces a significantly higher yield than upland rice growing through shifting cultivation. In addition, the Project assists and supports the preparation of land for planting of agriculture crops. By doing so, the participating households save time in terms of labour input, as they do not have to prepare the land themselves. This results in higher productivity with less labour input and higher output (rice) from working on the land⁶⁵.

The evidence suggests that the Burapha project areas planted to date are not contributing to leakage. Studies suggest that the project is instead having a positive impact. The risk of future leakage remains however and Burapha has included specific metrics within its Village Benefits Assessment process which will track indicators such as uptake of intercropping, yields, areas occupied by crops, livestock numbers and levels of household income. Leakage will be assessed and estimated when new Project Activity Instances are added to the Grouped Project.

Table 13. GHG emissions due to leakage, in year t

Year	Leakage (t CO2-e)
2016	0
2017	0
2018	0
2019	0
2020	0
2021	0
2022	0

⁶³ Note the frequency from 2024 has been changed to every 3 years. A Village Benefits Assessment is currently underway. It was due to be completed in early 2024 but delays have been incurred and the assessment is now due to be completed in early 2025.

⁶⁴ Earth System, 2017, Environmental and Social Impact Assessment, Executive Summary, p. 5-43

⁶⁵ Stora Enso Lao, 2017, Kacham case study, p.5 – 7.

Total	0
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5.5 Net GHG Emission Reductions and Removals

Table 14. Net GHG Emission reductions and removals

Year of inclusion in project area	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e) (2020)	Project emissions or removals (tCO ₂ e) (2021)	Project emissions or removals (tCO ₂ e) (2022)	Leakage emissions (tCO ₂ e) (2020)	Leakage emissions (tCO ₂ e) (2021)	Leakage emissions (tCO ₂ e) (2022)	Net GHG emission reductions or removals (tCO ₂ e) (2020)	Net GHG emission reductions or removals (tCO ₂ e) (2021)	Net GHG emission reductions or removals (tCO ₂ e) (2022)	Buffer pool allocation (2020)	Buffer pool allocation (2021)	Buffer pool allocation (2022)	VCUs eligible for Issuance (2020)	VCUs eligible for Issuance (2021)	VCUs eligible for Issuance (2022)
2016	0	18,521	18,521	18,521	-	-	-	18,521	18,521	18,521	1,852	1,852	1,852	0	0	0
2017	0	21,017	21,017	21,017	-	-	-	21,017	21,017	21,017	2,102	2,102	2,102	18,915	18,915	18,915
2018	0	8,368	8,368	8,368	-	-	-	8,368	8,368	8,368	837	837	837	7,532	7,532	7,532
2019	0	3,227	3,227	3,227	-	-	-	3,227	3,227	3,227	323	323	323	2,904	2,904	2,904
2020	0	1,028	5,750	5,750	-	-	-	1,028	5,750	5,750	103	575	575	925	5,175	5,175
2021	0	4,070	4,070	4,070	-	-	-	4,070	4,070	4,070	407	407	407	3,663	3,663	3,663
2022	0	4,070	4,070	4,070	-	-	-	4,070	4,070	4,070	407	407	407	3,663	3,663	3,663
Total	0	60,300	65,022	65,022	-	-	-	60,300	65,022	65,022	6,030	6,502	6,502	54,270	58,520	58,520

The Long-Term Average (LTA) was calculated as the total removals during the crediting period divided by the number of years (20), using the updated average MAI of 18, which is the average across the entire estate (i.e. eucalyptus and acacia). The LTA was calculated in accordance with sections 3.2.28 and 3.2.30 of VCS standard 4.7 and the AFOLU Guidance: Example for Calculating the Long-Term Average Carbon Stock for ARR Projects with Harvesting to calculate the LTA.

The following equation was used to calculate the long-term average GHG benefit:

$$LA = \frac{\sum_{t=0}^n PE_t - BE_t}{n}$$

Where:

LA = The long-term average GHG benefit.

PE_t = The total to-date GHG emission reductions and removals generated in the project scenario (tCO₂e). Project scenario emission reductions and removals shall also consider project emissions of CO₂, N₂O, CH₄ and leakage.

BE_t = The total to-date GHG emission reductions and removals projected for the baseline scenario (tCO₂e).

Table 15 Updated LTA⁶⁶

harvesting year	Carbon stored (PE)	Baseline emissions (BE)	PE - BE (LTA Calculation)	PE-BE (LTA Calculation, adjusted for achieved CDR)	CDR	Cumulative CDR
	(tCO ₂)	(tCO ₂)	(tCO ₂)	(tCO ₂)	(tCO ₂)	
2016	48,734	-36,823	11,912	0	0	0
2017	128,385	-23,359	105,025	23,806	23,806	23,806
2018	227,017	-14,342	212,675	41,777	41,777	65,582
2019	333,763	-6,131	327,633	51,281	51,281	116,863
2020	476,600	-27,269	449,331	117,791	117,791	234,655
2021	619,436	0	619,436	65,022	65,022	299,677
2022	762,272	0	762,272	65,022	65,022	364,699

⁶⁶ See 07022025 Updated LTA for MR2 v3.xls, Tab "Carbon Stock", Column AB

2023	563,967	0	563,967	563,967	122,149	486,847
2024	490,392	0	490,392	490,392	0	486,847
2025	500,354	0	500,354	500,354	0	486,847
2026	700,986	0	700,986	700,986	0	486,847
2027	640,232	0	640,232	640,232	0	486,847
2028	832,109	0	832,109	832,109	0	486,847
2029	1,023,985	0	1,023,985	1,023,985	0	486,847
2030	757,596	0	757,596	757,596	0	486,847
2031	658,760	0	658,760	658,760	0	486,847
2032	672,142	0	672,142	672,142	0	486,847
2033	851,137	0	851,137	851,137	0	486,847
2034	730,786	0	730,786	730,786	0	486,847
2035	949,802	0	949,802	949,802	0	486,847
				LTA		
			Average:	486,847		

As shown at the bottom of Table 15, the updated Long-Term Average is 486,847 tCO₂e. The total volume of credits already issued from the first verification for this project is shown in Table 16 (134,440 tCO₂e). The total volume of credits requesting issuance from this verification is shown in Table 17 (146,768 tCO₂e). Total issuance plus issuance requested is 281,208 tCO₂e which is below the LTA cap.

Table 16: Net GHG Emission reductions and removals from 1st verification⁶⁷

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)	Buffer pool allocation	VCUs eligible for Issuance
2016	36,792	30,487	-	-6,304	-	0
2017	23,341	47,147	-	23,806	3,500	14,001
2018	14,331	56,107	-	41,777	8,355	33,421
2019	6,211	57,491	-	51,281	10,256	41,025
2020	0	57,491	-	57,491	11,498	45,993

⁶⁷ Source: 2022-03-31 Burapha Carbon Inventory M1-V5_API (Xayabouly removed)

Total	80,674	248,724	-	168,050	33,610	134,440
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Table 17. Net GHG Emission reductions and removals by Vintage Year⁶⁸

Vintage Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e) (2020)	Net GHG emission reductions or removals (tCO ₂ e)	Buffer pool allocation	VCUs eligible for Issuance
2020	27,269	60,300	-	33,031	3,303	29,728
2021	0	65,022	-	65,022	6,502	58,520
2022	0	65,022	-	65,022	6,502	58,520
Total	0	190,344	0	163,075	16,308	146,768

The total GHG emission reductions of the First Project Instance for the 2nd monitoring period 23.12.2020 until 31.12.2022 are 163,075 tCO₂e. The non-permanence risk rating is 10% (as determined in the AFOLU non-permanence risk report attached as a separate document⁶⁹). Therefore, the total number of buffer credits that need to be deposited into the AFOLU pooled buffer account is 16,308 tCO₂e. The number of GHG credits eligible to be issued as VCUs for the First Project Instance for this second monitoring period is 146,768 tCO₂e.

<u>Ex-ante emissions reductions /removals</u>	<u>Achieved emissions reductions /removals</u>	<u>Percent difference</u>	<u>Justification for the difference</u>
220,566	163,075	26.1%	Areas in Xayabouly have been excluded from vérifications to avoid double counting with the FCPF program ⁷⁰ , however they are still included in the ex-ante estimations as the proponent expects to be able to claim ERs from 2025. The verification only covers areas planted from 2016 to 2020. Areas planted in 2021 and 2022 were not yet old enough to be inventoried.

⁶⁸ Source: Burapha_Second_Monitoring_Calculation_v3 07022025

⁶⁹ See Burapha_Risk-Report_MR2 v4.2 20250402

⁷⁰ Lao PDR is part of the FCPF Carbon fund and registered as a REDD early mover's country (forestcarbonpartnership.org). Burapha has a Letter of Acknowledgement from the GOL, acknowledging and supporting the ARR project. However, to be eligible to be added to the Burapha project, areas planted in Xayabouly Province (the only province where Burapha will have plantations and the World Bank program will also be implemented), must secure a confirmation letter from the Lao Government stating that there will be no double counting of those areas.

6 TEMPORARY SAMPLING PLOTS (TSPS)

6.1 TSP enumerations

This section provides the detail measurement procedure for TSP enumerations. TSP enumerations do not need to use the fixed plot locations for repeated (3 yearly and preharvest) measurements, but it is entirely acceptable to use the same plot locations if preferred.

6.2 Scope

Two-man teams lay out circular plots of 500 m². The equipment currently used for enumerations is as follows:

- Electronic callipers - to capture DBH and tree height data electronically during the enumeration.
 - Vertex III - to measure the plot radius from centre to determine the boundary of plots and for tree height measurements.
 - GPS facility on a mobile device - to load the plantation map as background, overlay a grid to navigate to the location of the plots and upload plot coordinates to the electronic calliper if this functionality is available.
 - Additionally, recording the plot location from Bluetooth GPS is a control measure that enumeration was done in the correct location. The location information should be transferred from the Bluetooth GPS to the calliper. This takes very little time but is an important check, especially if the data is challenged later.
- 1)

The following type of enumerations will be conducted:

- **Early enumeration** – a normal enumeration (often in unthinned stands) at an age of 3 years. The purpose is to give an estimate of stand growth parameters such as SPH and especially Site Index (SI), in order to calibrate the growth models with initial estimations of growth rates for the specific stand.
- **Thinning control** – an enumeration after marking if thinning takes place. The purpose is to test the quality of marking for thinning and to provide data for volume projections and to estimate the product volumes at thinning. Thinning controls are valid for three years.
- **Mid-rotation or pre harvest enumerations** (also called Working Plan enumerations). These are enumerations at fixed 3-year intervals during the lifecycle of the stand. The purpose is to provide data on a stand's standing volume and data used for projecting future volumes.
- **Pre-clearfell enumeration** – an enumeration within two years before clear-felling. The purpose is to provide accurate product volumes at clearfelling.

Standards and intensities discussed in **Section 4.5** will be applied. It is recommended that monthly enumeration audits shall be carried out to ensure that quality data is captured into the IPTIM database.

6.3 Pre-planning

The following preparatory work must be done:

- Ensure that all equipment is in good working order. Check the electronic callipers daily for accuracy and damages to the magnetic strip on the measuring arm.
- To increase and optimize the measuring accuracy, the Vertex should be calibrated⁷¹ twice a day (morning and midday). When calibrating, it is of utmost importance that the instrument be given sufficient time to stabilize at the ambient temperature. It can take up to 10 minutes before it has adjusted to the current ambient temperature. The settings in the Setup menu of the Vertex must be: Metric Deg; P. offset=0.3; T. Height=1.3, M.Distance=0.
- Calibrate the callipers each time at switch on. The callipers measuring arms must be completely closed when the equipment is switched on in order to recalibrate the position encoder correctly.
- Ensure that the total length of the transponder pole when inserted in the ground is 1.3 m. This can be confirmed with a tape measure if the markings on the pole are not visible.
- Spot checks of equipment will be carried out quarterly by the Forest Planner and submitted an equipment inspection report to the Planning Manager.
- Upload the latest shapefiles (GIS data) of the relevant plantation on GPS as provided by the Forest Planner.

To calculate the number of plots required to be measured for a stand can be calculated by using **Table 16**.

6.4 Plot location

A systematic sampling approach with plots located at specified distances from each other on the cruising line (temporary circular plots). Grid overlays per stand will be generated to match the prescribed distances and sampling percentage – see **Table 16** for the recommended sampling percentages by stand area. Although a grid is used the starting point is randomly selected and the statistical assumption of unbiased sampling is not violated. These grid points must be overlaid on the PDF mapping app and used as guidelines for plot center location.

Table 18: TSP Sampling intensity by area class

Stand Size Class (ha)	Sampling intensity (%)
< 2.0	20.0%
2 - 5	10.0%
5 - 7	7.5%
> 10	5.0%

The following procedures must apply for plot location:

⁷¹ Refer to Vertex IV Manual for calibration procedure.

- If the plot centre is closer than the plot radius (12.62 m for 500 m² plots or 9.77 m for 300 m² plots) from the stand boundary or road, shift the plot centre slightly (more than 3 tree rows) into the stand so that a full plot can be laid out next to the stand boundary.
- Stands with a long narrow shape– lay out the plots only in the middle of the stand.
- In case of small stands, the planning forester can use his own discretion for plot location when the grid points do not cover the stand. This will be checked following the enumeration.
- Plots which cover open spaces of less than 20 x 20 m (400 m²) must be established and measured as normal even if there are only limited tree numbers in the plot.
- If the plot falls within a larger unmapped open space (> 400 m²), capture the plot centre with the GPS and indicate open area. Leave the plot and move the required distance to the next one.
- Recommend to the GIS team that the open area is mapped and excluded from the NSA and reduce the “effective area” of the stand.
- Plots must not be laid out in non-commercial areas that are already captured on the map.

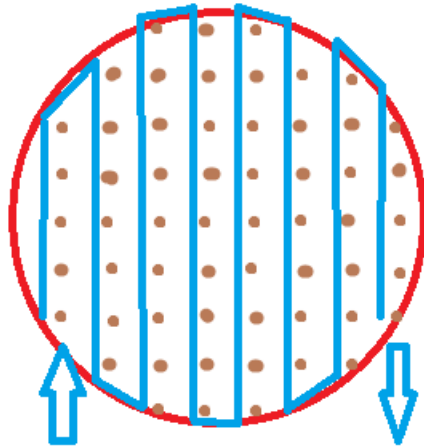
Recording the location of each plot has the added advantage that spatial analysis of the data distributions can be done.

6.5 Plot centre

- All plot centres located in the field are to be clearly marked with a painted stick, which should be no less than 0.3 m tall. The colour of the paint must be clearly visible, e.g., yellow, orange or white.
- The non-marked tree closest to the plot centre should be clearly numbered with the plot number, facing the direction of the cruising line. If plots are not marked, the enumeration will have to be repeated.
- The four trees surrounding the plot centre are marked with an ‘X’ using spray paint.
- The transponder pole must be placed vertically at the plot centre when laying out a plot to determine the plot diameter.
- The centre point of each plot must be captured with the GPS and numbered accordingly.

6.6 Tree measurement pattern

Measure the trees in the plot tree by tree and row by row following the below pattern.



6.7 Plot boundary

- The plot boundary should be established by using a Vertex. The trees within the plot radius (distance from the Vertex to Transponder) fall inside the plot and must be measured. Border trees are located on the plot boundary and are marked with a single ring using spray paint. At least two Vertex readings must be taken on both sides of the tree to determine if it falls inside the plot or not.
- When the distance reading is taken with the Vertex, the Vertex must be held at the centre of the tree's DBH and must face towards the transponder.

6.8 Measuring of DBH

The following procedures apply:

- DBHs for all trees inside the plot are measured, this provides the stocking in the plot as well as the DBH frequency distribution.
- Electronic callipers should be used for DBH measurements.
- All three sides of the callipers must touch the stem and be stationary before the DBH is captured. The callipers must be in a horizontal position during measurement.
- DBH should be measured at a height of 1.3 m.
- On slopes, the calliper operator must capture the DBH while standing up slope of the tree.
- Dead or broken trees without a crown, or without any live branches, must be excluded from the enumeration.
- In case of ovality (elliptical stems) or deformation of the stem, the side with the smallest DBH must be measured as DBH.
- All planted stems must be measured provided the DBH is ≥ 5 cm. This number can be adjusted by the planning team according to the age of the stand being measured. If the stand only contains small trees, then all trees should be measured. If the stand in general have trees of much larger DBH, say 20cm, then small trees less than 5cm may be ignored

during the enumeration. The purpose is to eliminate measurement of stems that will obviously not contribute volumes at clearfelling.

- Do not measure if the tree is a different species to the main stand.
- In case of double stems in one planting pit, measure only the largest DBH.
- If a fork occurs under breast height (1.3 m), then measure only the largest DBH.
- In coppiced stands for trees with multiple stems, measure the stem with the largest DBH for stem counting.

6.9 Measurement of heights

The following procedures apply:

- Heights must be measured with a Vertex hypsometer. Calibration of the Vertex should be done every morning and also if the ambient temperature changes.
- The measurer must stand at least one tree length from the measured tree to allow the greatest accuracy during height measurements. The tip of the tree correctly identified and must be clearly visible.
- Measure and record the height on the electronic callipers.
- Heights must be recorded in metres to a 0.1 m level of precision.
- When measuring heights, the red cross hair sight of the Vertex must be aimed at the tip of the tree.
- A minimum of 30 heights (DBH-height pairs) must be taken, with at least one height pair per plot. It is recommended that the height measurements are equally distributed between the number of plots to be measured to ensure a representative height sample. Guidelines for this distribution by plot is provided in Table 17.
- Mark trees where heights were taken with a number in the order they were measured, facing the plot centre, using spray paint.
- The height trees must be taken across the DBH range of the stand. These trees must be selected by the measurer to ensure that the DBH range is covered.
- The following trees are not suitable for height trees: Trees with broken or dead tops; forked trees; leaning trees; trees with any abnormal growth; dead or dying trees.
- On slopes, do not measure heights down or up the slope. Measure the height by standing on the same contour height as the base of a tree.
- During windy days, more time must be spent on height measurements. Wait until the tree is in a stable upright position before taking a measurement.
- The pruning height of one tree per plot (the first DBH-height tree) must be measured and recorded on the GPS. Pruning heights will be measured just below the lowest branch (dead or alive).

Table 19: DBH/Height Pairs to be measured per plot.

Stand Size (ha)	1	2	3	4 - 6	7 - 16	17 - 32	33 and more
Plot Size (m ²)	500	500	500	500	500	500	500

Number of plots with Height measurements	4	8	6	8	11	17	Each Plot
Height Pairs per plot	8	4	6	4	3	2	1

6.10 Slope measurement

The slope of the plot is measured for each plot and recorded. The slope is measured from the lowest to the highest point at a similar height above ground, by selecting the Angle function on the vertex.

- Press ON to start the Vertex and step with the arrow keys to ANGLE and press ON.
- The angle window is displayed. Aim at the point where you need to know the angle.
- Push and press the ON until the cross disappears. Read the value obtained in the display. The angle is given in grads, degrees and percentage. Note that the angle is measured from the Vertex with the crosshair sight

The plot area will be adjusted by converting the slope area to a level area, the correct approach is provided in **Figure 15** (Van Laar and Akca, 2007). Level Area = Slope area x Cos (angle in degrees between level and slope). The command in Excel is Level Area=Slope Area x COS (RADIANS(slope angle in degrees))

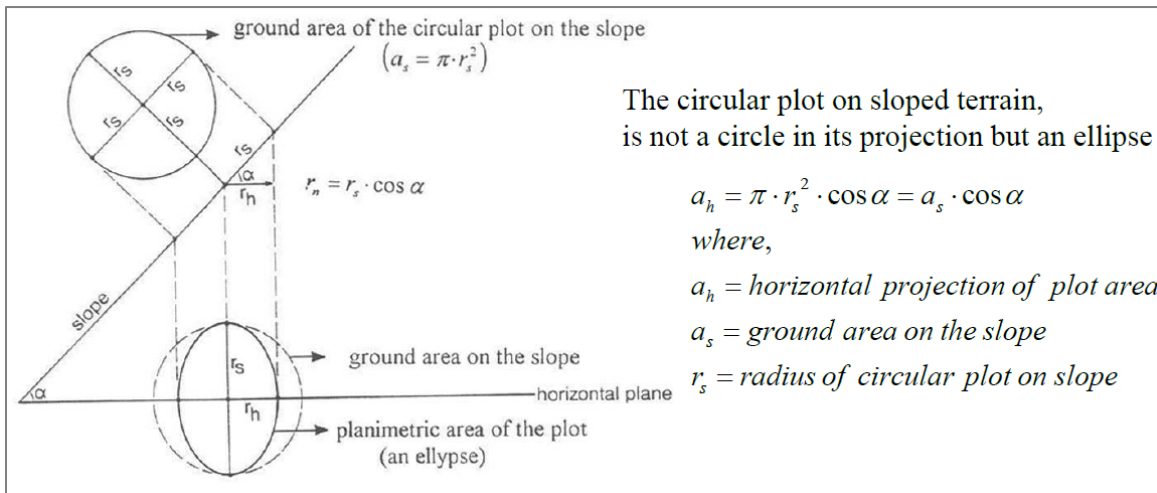


Figure 3: Slope correction of a circular plot on the slope⁷².

6.11 Data recorded

- Stand ID.

⁷² <https://link.springer.com/book/10.1007/978-1-4020-5991-9#bibliographic-information>

- Species.
 - Plot number.
 - Plot Location.
 - Plot slope
 - Comments
 - DBH measurements
 - DBH-height pair measurements

7 CLASSIC PERMANENT SAMPLING PLOTS (CLASSIC PSPS)

At Burapha PSPs with a circular TSP layout design in a fixed location are used. It is recommended that a different PSP design is used, for clarity these PSPs will be referred to as Classic PSPs. Classic PSP consists of square plots with a fixed number of rows of trees. The layout of Classic PSPs needs to be very methodical to ensure that repeat measurements can be made accurately, and the data collected will be useful for time sequences comparisons. This section includes the establishment of Classic PSPs, measurement, capture and audit of data.

7.1 Classic PSP establishment

Plots are established in existing stands. The procedure is as follows:

- Select a plot in a well-stocked part of the stand, at least 30 m from the outside compartment boundary. Avoid open areas or trees with excessive defects.
- Follow a treeline in from the edge of the stand and allow at least five rows from the road. Mark the tree on roadside with the appropriate PSP number.
- It is recommended to standardized on a 40 x 40m square plot size (horizontal distance determined with correctly calibrated VERTEX hypsometer). This allows for about 40 trees at the end of the rotation, given a final stand density of 300 trees per hectare (**Figure 19** shows how the plot layout should normally look).
- Peg out a square plot. Try to align the one plot side with the tree lines.
- Allocate tree number 1 and mark it with a double ring of paint on about DBH-level. Number tree number 1 with paint above DBH-level.
- Follow the tree line and give tree number 2 a single ring of paint at about DBH-level. Number tree number 2 with paint above DBH-level.
- Mark the other corner trees with a single ring of paint on about DBH-level.
- If the stand had all its thinnings, paint the tree numbers permanently with white road-marking paint. If the stand is still young, mark the tree numbers with yellow crayon.
- Make a map for each PSP indicating the positions of the trees and thus also the measurement direction. **Figure 20** shows an example coding sheet for a PSP map. It indicates the stand-level data that should be captured.

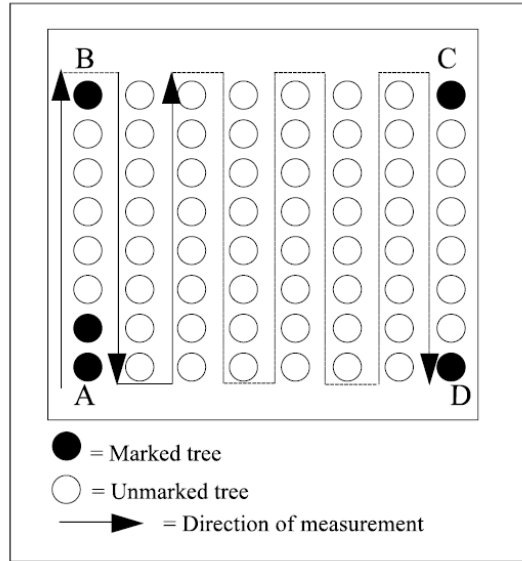


Figure 4 : Representation of a PSP layout and measurement direction.

PSP Plot Map															
Type	Species	Series	Sub-Ser	Suc-Rot	Plant/n	Compt	Date	Officer	Slope	Aspect	Plant/n Name				
PSP	103	4	0		333	A36A	11-Feb-99	T.M	4	300	Lottering				
4	x	x	x	x	x	x	x	x	x	x	x	x	x	40	46
x	x	x	x	x	x	x	x	28	x	x	x	x	x	x	x
x	5	x	x	17	x	25	x	x	x	x	x	x	x	41	x
x	x	x	11	x	x	x	x	x	29	x	x	x	x	x	45
x	x	x	x	x	x	24	x	x	x	x	x	x	39	x	x
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
3	x	x	x	16	x	23	x	x	30	x	x	x	x	x	x
x	x	x	x	x	x	22	x	x	x	x	x	x	x	42	x
x	x	10	x	x	x	x	x	27	x	x	35	x	x	x	x
x	6	x	12	x	18	x	x	x	31	x	x	38	x	x	
x	x	x	x	15	x	21	x	x	x	x	x	x	x	x	x
x	7	x	x	x	x	x	x	x	x	34	x	x	x	x	x
2	x	9	x	x	19	x	x	x	32	x	x	37	x	x	44
x	x	x	13	14	x	x	x	x	x	x	x	x	x	x	x
1	x	8	x	x	20	x	26	x	x	33	x	36	43	x	
Road															

Figure 5: Example of a coding sheet for a PSP map.

7.2 Classic PSP plot measurement

PSPs are measured annually. Before a team goes to the field, the team leader will plan out the work as follows:

- Print out the PSP description page from the database, which shows all the stand-level detail for the PSP and also the data summary for each measurement.
- Go through the plots to indicate if any of the plots needs special attention.
- Ensure that the field sheets for the new measurement are printed.

- Ensure that all the measurement sheets from the previous year will be in the field file.
- Ensure that all the PSP maps are together with the measurement sheets.
- Ensure that the plantation map is up to date.

When the field team arrives at a PSP, they will do the following:

- Verify the location of each tree in the plot and renumber the trees where the old number has faded.
- Commence measurement of all the variables for each tree following the measurement direction as shown in **Figure 19**.
- Cross-check the new measurements against the previous measurements to ensure that no errors have crept in.
- A typical measurement form is shown in **Figure 20**. DBH, height, live crown height, defect height and defects are recorded as specified in **Appendix 3**.
- When necessary, they will confirm the stand-level data:
 - Position of PSP on the map.
 - Aspect
 - Slope

Codes to be used are as follows

Tree status

Evaluation	Description
0	OK
1	Thinned
2	Dead, natural mortality
3	Dead, other factors

Stem form

Factor	Evaluation	Description
Dead/broken top	0-1	(N,Y)
Forked	0-1	(N,Y)
Leaning	0-1	(N,Y)
Butt sweep	0-1	(N,Y)
Foxtail	0-1	(N,Y)
Mechanical damage	0-1	(N,Y)
Evaluation and description details:		
	0 = No (not applicable)	
	1 = Yes (applicable)	

7.3 Classic PSP data capture in Excel

The field team captures the PSP data into spreadsheets. The format of the spreadsheet is given in **Appendix 4**. The data for a series of PSPs, within the same species, are captured into the same spreadsheet. Each PSP is indicated as a separate file name.

The capture procedure is as follows:

- Capture all data.
- Verify against paper data
- Do a range check: min, mean, max, count on each column. The counts must be the same.
- Check the plot number.
- Check the measurement date.
- Verify by plotting and investigate the charts for outliers:
 - Height x DBH
 - Lcht x DBH
 - Defht x DBH
- Once all the plots are OK, combine them in the standardized format, so that they can be loaded into the database.
- Add the new plot to the GIS.

PSP measurement form												
Type	Species	Series	Sub-Ser	Suc-Rot	Plantation old/new no.	Compt	Date	Officer	Plantation Name	Slope	Aspect	
PSP	103	9			409/333	A4A	6-Jul-05	Paul Hutchins	Lottering	2.3	205	
Tree	Dbn	Ht	LcHt	DefHt	Tree Status	DT/BT	Fork	Lean	Butt	Fox	Mdam	Comments
1	270	15.9	7.5	9			1					
2	296	15.2	7.6	7.9			1					
3	215	9.5	4.4									Crooked
4	261	14.9	5.9									
5	205	12.2	5.1									
6	250	15.2	7.5									

Figure 6: A typical PSP measurement form - EXCEL spreadsheet data capture

7.4 PSP field audits

Field audits are part of management control. The purpose of the field audits is:

- Check that measurement is correct.
- Check that stem counts are correct.
- Check that stand level data are correct: altitude, plot slope, aspect, plot side length and slope, plot area, squareness of plot.
- Position of plot on map.
- Check that field files are correct.
- Check that field forms are correctly used.

- Check that the map of tree positions are in file and correct.
- Check that Location of PSPs on plantation maps are correct.

Select a sample of plots to audit while the teams are working on the plantation. A sub-sample for 1-day's auditing on a plantation might be sufficient. Select different plots each time, so that all plots are audited over time. An example of the field audit forms is shown in **Table 17**.

