Volume A: Executive Summary

Final

Executive Summary

1 INTRODUCTION

This Environmental and Social Impact Assessment (ESIA) for the Mekong Timber Plantation Project (formerly the Oji Lao Plantation Forestry Limited Project or LPFL) has been prepared by Earth Systems for Mekong Timber Plantations Limited (MTP). The ESIA Report forms a component of the Impact Assessment documents for the Project, and has been prepared based on the requirements of the recently updated Technical Guidelines on ESIA for Development Projects for Lao PDR (No. 2796/MONRE) (2016).

An ESIA was previously conducted for the LPFL Plantation Forestry Project by Chareun & Associates in March 2010, with an Environmental Compliance Certificate granted by the Government of Lao PDR (GOL) on 21 May 2010. The Project now requires an update of the ESIA and development of an Environmental and Social Management and Monitoring Plan (ESMMP). The focus of this ESIA is to evaluate the current Project baseline (2017) and its area of influence and assess current and future risks / potential impacts to inform the development or refinement of management strategies to minimise potential impacts for environmental and social receptors and maximise potential benefits.

The specific objectives of this ESIA Report are to:

- Outline relevant legislation and guidelines for the Project;
- Describe the proposed Project including activities conducted to date and consideration of alternatives;
- Characterise the social and environmental baseline of the Project concession area (as of 2017), including for concession lands not assessed during the conduct of the 2010 EIA for the Project;
- Assess key environmental and social management issues and risks associated with the plantation establishment/re-establishment, operation/management, and decommissioning/rehabilitation;
- Identify effective and achievable management and mitigation measures to maximise potential benefits and avoid, minimise, and mitigate adverse environmental and social impacts;
- Outline how MTP will manage environmental and social aspects related to the Project and monitoring requirements to determine and document the efficacy of management measures;
- Summarise stakeholder consultations conducted to date and outline the proposed process for community consultation and engagement moving forward with the Project; and
- Assess residual impacts and any significant cumulative impacts associated with the Project.

1.1 Project Context

Tropical Asia Forest Fund (TAFF) purchased Oji Lao Plantation Holdings Limited's (LPH) shareholdings of the LPFL operations (85%) on 7 March 2017, including its concession area and ancillary infrastructure. Following acquisition of LPH shares; TAFF will officially change the name of the operations to Mekong Timber Plantations Limited (anticipated for week 2, January 2018).

The Company manages plantation units within its 24,099ha concession area scattered throughout villages in Bolikhamxay and Khammouane Provinces in central Lao PDR.

Environmental and social management of the former LPFL operations by MTP is expected to be refined as TAFF is obligated to comply with national legislation and specific international guidelines and criteria as part of its environmental and social sustainability framework. Plantation operations will also be refined to reflect the Company's aim to maximise productivity in plantations. Therefore, an update of the ESIA and development of the Environmental and Social Management and Monitoring Plan (ESMMP) is a corporate obligation and it is considered in the best interest of the Company to provide an updated assessment and management plan to the

Government of Lao PDR (GOL). MTP will manage its plantations (primarily Eucalyptus and Acacia) in accordance with the updated ESIA / ESMMP and associated Environmental Compliance Certificate, pending provision by the GOL.

This ESIA assesses the current baseline conditions across its concession, and focuses on current and potential future physical, biological, and social impacts and potential benefits and identifies likely residual impacts given the implementation of management and mitigation measures provided in the ESMMP. The ESMMP (Volume C) also provides a monitoring strategy to assess the efficacy of management and a framework for working with the GOL for monitoring and reporting.

1.1.1 Concession Agreement and Joint Venture Agreement

BGA Holding Asia Limited

On 10 February 1999, the GOL provided a Concession Agreement (CA) (GOL1999a) and signed a separate Joint Venture Agreement (GOL1999b) with BGA Holding Asia Limited (BHA) to form BGA Lao Plantation Forestry Company Limited. These Agreements defined roles and responsibilities for the BHA and the GOL for their joint venture (JV), comprised of 85% shareholding for BHA and 15% for the GOL with the aim to "*develop plantations for the production of Acacia and Eucalyptus trees, and other forestry and agricultural products as determined by the Company*" (GOL, 1999). Under the JV Agreement, it was the GOL's responsibility to survey and map concessions areas (specifically the Ministry of Agriculture and Forestry (MAF)), cooperate with MAF and BGA in identifying and determining areas suitable for Concession Areas; and provide the Company with a concession and land leases comprising at least 50,000 ha for Project implementation for a duration of 50 years, with options for extension as well as termination of the Concession Agreement in specified Districts in Bolikhamxay and Khammouane Provinces.

Lao Plantation Forest Company Limited

On 19 September 2007, following a formal name change from BHA Holding Asia Limited to Oji Lao Plantation Holdings Limited (LPH); the Project was officially named the Lao Plantation Forest Co. Limited (LPFL) under the terms of an Amendment (*Addendum Agreement of the Concessions and Joint Ventures Agreement* (GOL, 2007)). Under the Amendment, the potential Project Area was expanded to all Districts of Bolikhamxay and Khammouane Provinces to facilitate obtaining LFPL acquisition of concession land for a cumulative 50,000 ha of plantation as per the 1999 CA. The Amendment also formally stipulates that LPFL will promote "2+3 style" Farmer plantations.

The May 2012 *Articles of Association of Oji Lao Plantation Forest Company Limited* (GOL, 2012) provides the provisions for the operation, including some provisions for social welfare and labour, but does not incorporate provisions for environmental management.

Mekong Timber Plantation Company

On January 5, 2017, the National Assembly issued the *Resolution of the Steering Committee of the Lao PDR National Assembly on Land Concession Agreement between the Government of Lao PDR and BGA Holding Asia Co., Ltd* dated 10 February 1999 and *Amendment of the Joint Venture Agreement* (Ref. No. 04/NA.PSC). This Amendment to the 1999 Joint Venture Agreement has a number of addendum items, including:

- That the GOL has no obligations to provide 50,000 ha of land area for the investor, but may facilitate the Company in further land acquisition, if applicable;
- That the Company expenditure budget for infrastructure development is based on the actual land area provided to the Company (as opposed to the rate for 50,000 ha), at the rate of $50 USD / ha for the 50 year concession period; and

- That the Company should rehabilitate, improve, and implement reforestation activities including tree planting in former concession areas at their termination (unless the operations are sold to another entity or ongoing Eucalyptus plantation management is identified as the preferred option by GOL and communities).

1.2 Project Overview

1.2.1 Project Proponent

The Project operator is Mekong Timber Plantations (hereafter MTP), a Joint Venture Company comprised of Tropical Asia Forest Fund (TAFF) (85% ownership) and the Government of Lao PDR (GOL) (15% ownership). The Company is headquartered in Vientiane in Lao PDR with regional offices in Paksan and Songhong.

Box 1: Mekong Timber Plantations Limited Contact Details

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1.2.2 Brief Project Description

The key components of the Project include:

1. Management of 17,903 ha of timberlands (active and potential Eucalyptus / Acacia plantations);
2. Management of approximately 4,776 ha of seasonally flooded areas including cropping and habitat restoration;
3. Farmer Extension Program (often referred to as an outgrower scheme); and
4. Development and maintenance of roads and ancillary infrastructure, including the upgrade of the existing nursery and research and development (R&D) facility.

Further detail on the Project Description is provided in Section 3.

Figure 1 MTP concession area overview

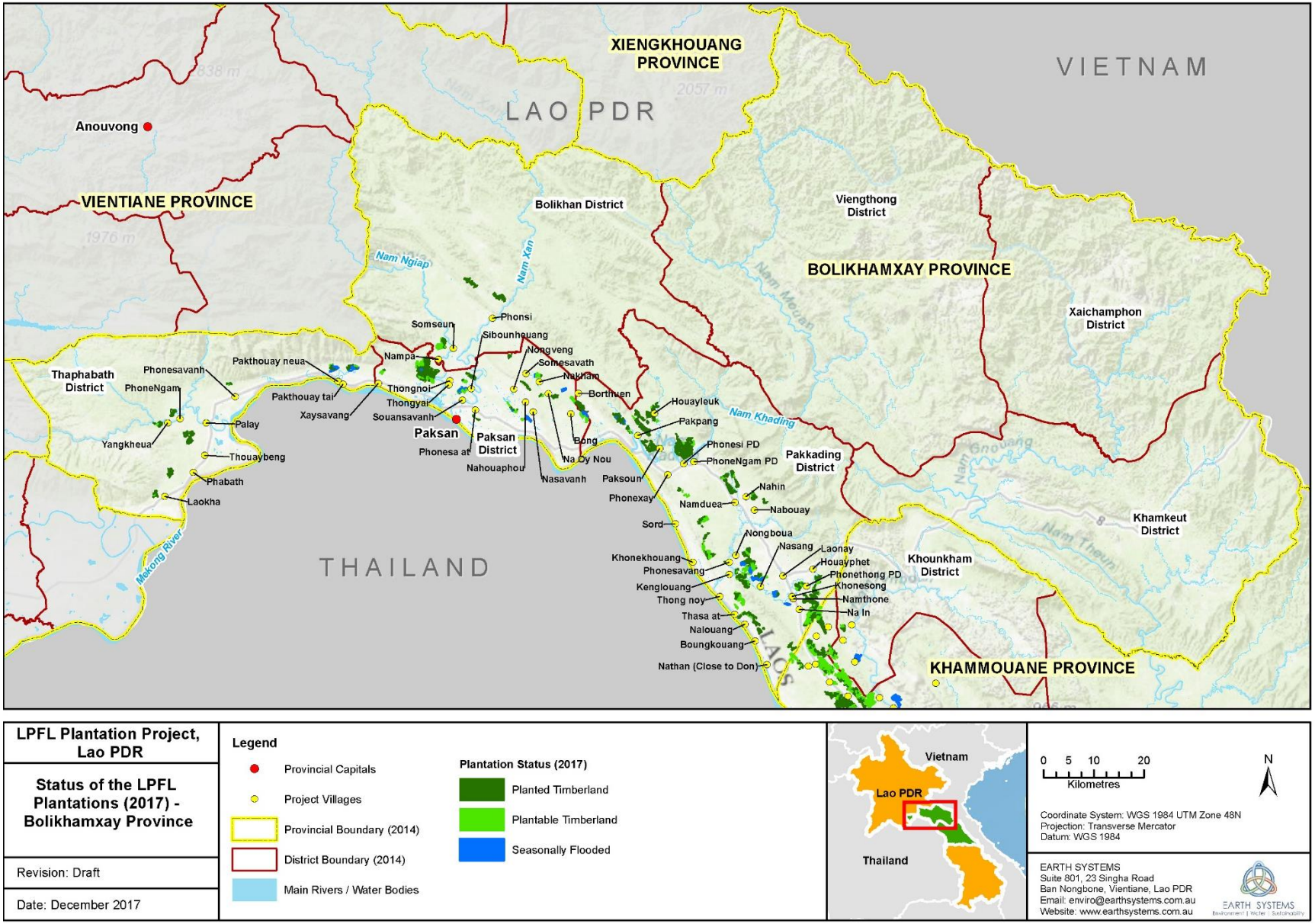

Figure 2 MTP Timberland and inundation areas, Bolikhamxay Province

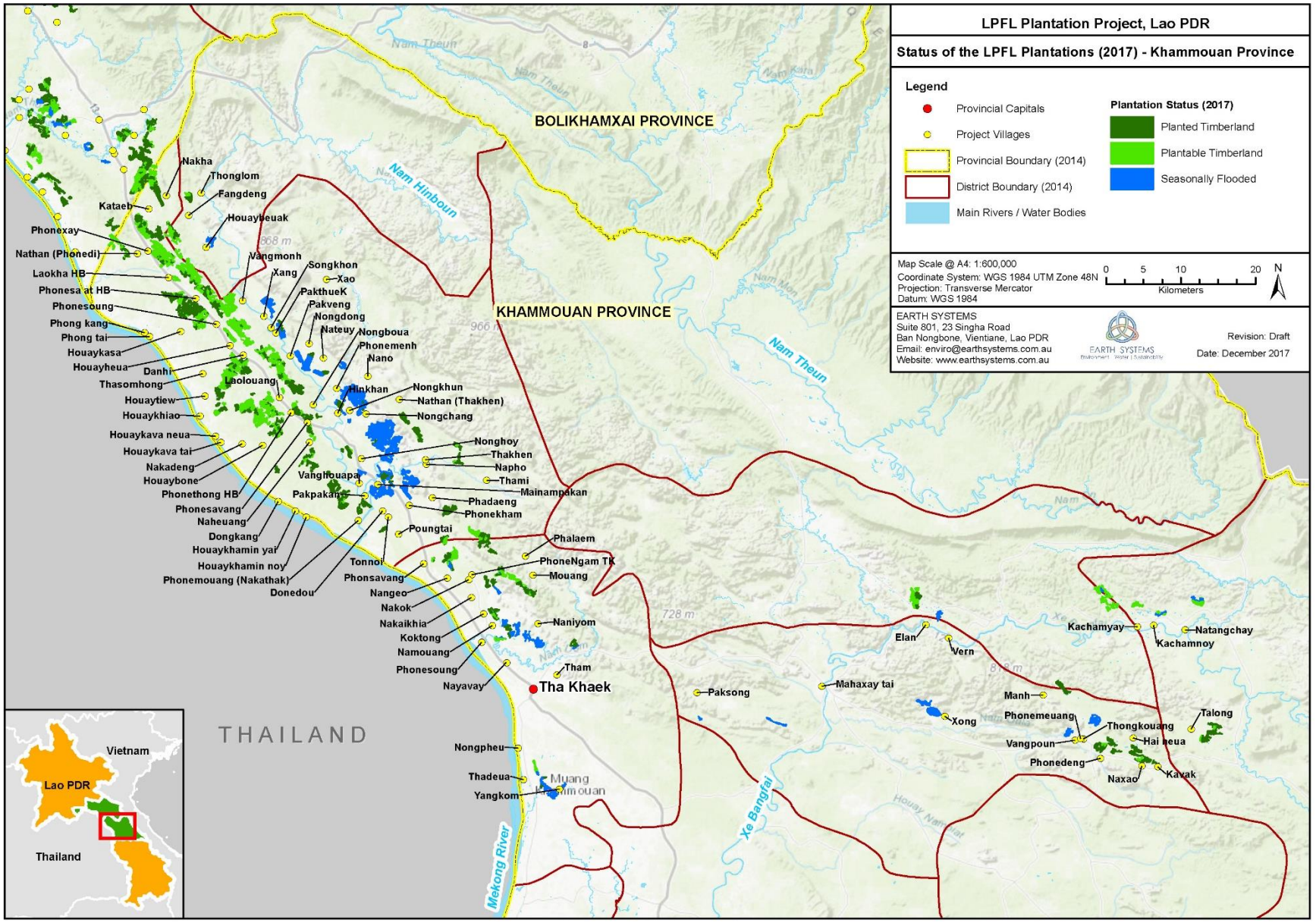

Figure 3 MTP Timberland and inundation areas, Khammouane Province

As of a 2016 survey, there were approximately 5,071 farmers managing 5,188 farmer extension units within approximately 272 villages or sub-villages in Bolikhamxay and Khammouane Provinces and an additional 34 plantations in Savannakhet, Xiengkhouang, and Vientiane Capital Provinces. These plantations range from productive, well-stocked plots; to moderately well-established plantations; but include many that have wholly or partially failed due to flood, fire, or other issues. When farmers pay back LPFL loans to MTP, they are no longer actively participating in the extension project. As of 2016, 87 farmers had paid back loans, and it is understood that approximately 150 have now paid back loans; leaving approximately 4,900 farmers still active participants.

The LPFL Farmer Extension Program has not yet provided the intended return on investment for farmers or Project owners. MTP is initiating the 'Outgrower Scheme (OGS) Phase 2 Program', with refined strategies and the aim to providing the intended benefits to respective participants of the program.

1.2.3 Stakeholder Identification

A comprehensive list of stakeholders is provided in Chapters 4 and 23 of the ESIA Report. Key stakeholders for the Project are:

- Mekong Timber Plantations Incorporated, the Project Manager owned by the Tropical Asia Forest Fund and applicable lenders (85%) and the Government of Lao PDR (15%);
- Communities residing in 133 villages (consolidated by the GOL from approximately 147) with MTP plantation management units within their respective boundaries (referred to as 'Project villages' or 'Project affected villages' throughout this ESIA;
- Approximately 4,921 - 5,071 farmers participating in the Farmer Extension Program associated with the Project;
- Central and applicable Provincial and District GOL authorities and relevant line agencies;
- Applicable environmental and social non-governmental organisations (NGO) active in region;
- Wood processing facilities in Bolikhamxay, Khammouane, and potentially Vientiane Capital and Vientiane Province, which may purchase raw logs from MTP and outgrowers;
- Forest Stewardship Council and other potential certifying bodies.

1.2.4 Project Benefits

It is anticipated that MTP operations will provide benefits at the community, regional, and national level, as follows.

1.2.4.1 Regional and Community Benefits

Anticipated Project benefits at the community and regional levels include:

- *Employment* – The Project employs 92 staff for full-time positions (including international staff), ranging from employees working from Vientiane, Paksan, and Songhong offices for forestry operations and nursery staff comprised largely of local residents of Songhong. MTP also employs 110 Village Assistants that serve as the primary point of contact between the Company and applicable villages.

  MTP plans to develop a *Community Work Contract and Incentive Scheme* (CWCIS), which will be trialled in 2018 in a select number of communities. If successful, the CWCIS will be expanded across most of the other Project villages in 2019. The objective of the CWCIS is to replace the existing Village Assistants with a more focused and transparent system that distributes expenditure more widely throughout communities, and which provides more clarity on work requirements and work completed.

It is also anticipated that *s*easonal employment opportunities will be available at various times throughout plantation rotation, with the largest number of jobs available during site preparation and planting, and lesser jobs throughout the management phase of the plantation (e.g. thinning, fertilising, weeding, etc.). Seasonal jobs are expected to be provided based on a 'local first' basis, with people from Project affected villages provided the first opportunity for employment.

- *Community Development* – Community / Social Relations (CSR) payments ($50 USD/ha) were paid by LPFL for infrastructure development or enhancement in Project affected villages. LPFL also contributed small donations to communities throughout its operations for festivals, sporting events, etc.

  CSR funding has been paid in-full. MTP is currently developing a Community Investment Program (CIP). The purpose of this CIP is to identify potential linkages between MTP's business needs and what communities can offer, and then to act as an investor to help create those linkages. Focus will be on the development of standalone businesses in rural communities that, once set up, can act as suppliers and / or contractors to MTP and also as suppliers / contractors to any other potential clients.
- *Training and Capacity Building* – Refinement in plantation and nursery operations will require investment in training and capacity building initiatives with Company staff and the GOL. The Project is expected to create further investment in regional jobs and skills enhancement.
- *Farmer Extension Plantations* – When MTP finds suitable vendors for raw logs, those farmers that participated in the Farmer Extension Project and successfully managed plantations for productive growth, will be provided returns on their investment in the 2+3 model.
- *Carbon Capture* – The growth of fast growing Eucalyptus trees is expected to sequester a much greater volume of greenhouse gases than that emitted through operational activities. Whilst those may not exceed that of natural forest growth, they are expected to exceed that of swidden agriculture, the common practice on much of the land they are utilising.

1.2.4.2 National Benefits

Anticipated Project benefits at the national level include:

- *Revenue* – GOL, a minority-owner of the Project, will directly benefit from Project profits;
- *Government Revenue* – The Project will provide the GOL with land rents, fees, and taxes; increased direct foreign investment in the county; and potentially new employment opportunities;
- *Indirect benefits* – Indirect benefits are expected to include flow-on benefits including opportunities for other businesses to provide goods and services to the Project, additional tax generation from external business development, and injection of cash into the local economy.
- *Enhanced Environmental / Social Sustainability* - MTP obligations for environmental and social sustainability under lender / owner requirements and Forest Stewardship Council certification may provide the industry with a model for plantation forestry in the country, with lessons learned through new cooperative associations recently established for the industry in Lao PDR.

2 LEGISLATION AND GUIDELINES

2.1 National Legislation and Guideline

2.1.1 Environmental and Social Impact Assessment

The key government agency responsible for environmental and social assessment of the Project via the EIA process is the Department of Natural Resources and Environmental Policy (DNREP), and Department of Natural Resources and Environmental Monitoring (DNREM), Ministry of Natural Resources and Environment (MONRE). The ***Decree on Environmental Impact Assessment*** **(2019)** and the ***Ministerial Instructions on ESIA Process (No. 8030 – December 2013)*** currently guide the environmental and social assessment process in Lao PDR, which has considerably strengthened the associated permitting requirements and applicable industry requirements. Recently released ***Environmental Assessment Guidelines (2016)*** outline the updated format and procedural requirements of this process.

2.1.2 Governance of Forestry

The Ministry of Agriculture and Forestry is responsible for regulating and promoting plantation forestry operations. MONRE, Ministry of Planning and Investment and their Provincial and District offices provide additional oversite.

Ministry of Agriculture and Forestry (MAF) is the lead agency responsible for the management of natural resources associated with forests and agricultural land, including production forests, conservation forests, and protected areas. MAF is the main agency responsible for the sustainable development and management of the plantation sector and implements relevant policies, laws and regulations related to forestry. MAF designates various responsibilities to Provincial Agriculture and Forestry Offices (PAFO) and / or District Agriculture and Forestry Offices (DAFO).

Department of Forestry (DOF), an agency within the MAF, provides services related to forest management, protection and development, including: inspecting, monitoring, and evaluating the implementation of laws set forth by the National Assembly, and decrees, decisions, orders, and regulations issued by the government concerning the management, protection, use, and sustainable development of forest resources. The DOF, via its Provincial (PAFO) and District (DAFO) offices also monitor plantation project operations.

Ministry of Natural Resources and Environment (MONRE) is the chief agency responsible for the management of natural resources and environment and social management in the Lao PDR. MONRE and its Provincial Departments (PONRE) will monitor / audit the Project for adherence to environmental standards. MONRE, through the Department of Land Administration, also has the right to approve the lease or concession of degraded forest land for commercial timber activities.

Ministry of Planning and Investment (MPI) is the responsible agency for promoting domestic and foreign investments and monitoring investment performance. The MPI is also responsible for negotiating land lease or land concession agreements for investment projects in collaboration with its Provincial Departments and MONRE.

Ministry of Finance (MOF) is responsible for the collection of taxes and royalty payments as stipulated in various laws including the *Law on Tax Administration, No. 10/NA* (2019). Within the MOF, the Department of Customs is the agency tasked with determining and collecting the duties on goods exported for Lao PDR.

2.1.3 Relevant National Legislation and Guidelines

Table 2-1 identifies the primary decrees, laws, regulations and policies applicable to industrial plantation forestry in Lao PDR.

Table 2-1: Summary of relevant Lao PDR laws, regulations and policies for the MTP Project

Title	Year
Laws	
Land Law, No 70/NA, dated 21 June 2019	2019
Forestry Law, No, 64/NA, dated 13 June 2019	2019
Law on Resettlement and Vocation, No. 086/NA, dated 15 June 2018	2018
Law on Water and Water Resources, No. 010/NA, dated 11 May 2017	2017
Law on Grievance Redress, No. 05/NA, dated 9 November 2016	2016
Law on Investment Promotion (amended), No. 14/NA, dated 17 November 2016	2016
Law on Resolving Public Complaints, No. 53/NA, dated 15 December 2014	2014
Law on Labour Protection, No. 43/NA, dated 24 December 2013	2013
Law on National Heritage, No. 44/NA, dated 24 December 2013	2013
Environmental Protection Law, No. 29/NA, dated 18 December 2012	2012
Law on Hygiene, Disease Prevention and Health Promotion, No. 08/NA, dated 21 December 2011	2011
Law on Aquatic and Wildlife, No. 07/NA, dated 24 December 2007	2007
Law on Fire Prevention and Firefighting, No. 09/NA, dated 24 December 2007	2007
Law on Agriculture, No. 01-98/NA, dated 10 October 1998	1998
Decrees	
Decree on Environmetal Impact Assessment, No. 21/GOL, dated 31 January 2019	2019
Decree on National Environmental Standards, No. 81/GOL, dated 21 February 2017	2017
Decree on Compensation and Resettlement Management in Development Projects No. 84/GoL, dated 5 May 2016	2016
Decree on Conservation Forest, No. 134/GoL, dated 13 May 2015	2015
Decree on Protection Forest, No. 333/PM, dated 19 July 2010	2010
Decree on State Land Lease and Concession, No. 135/PM, dated 25 May 2009	2009
Decree on the Endorsement and Declaration of the Forestry Strategy to the Year 2020, No.229/PM, dated 9 August 2005	2005
Decree on Industrial Tree Plantation and Environmental Protection, No. 96/PM (under revision)	2003
Decree No. 96/PM on Industrial Tree Plantations and Environmental Protection (2003)	2003
Presidential Decree on Preservation of Cultural, Historical, and Natural Heritage, No. 03/PO, dated 20 June 1997	1997
Decree on The Allotment of Forests for Plantation and Preservation, No. 186	1994
Decree of The Prime Minister on The Management and Use of Forests and Forest Land, No. 169 (1993)	1993
Decree on the Establishment of National Forest Reserves, No. 164/PM, dated 29 October 1993	1993
Decisions, Directives, Regulations, and other Legislation	
Order of the Prime Minister on Strengthening the Management and Inspection of Logging, Wood Transport and Timber-Related Businesses, No. 15/PM, dated 13 May 2016	2016
Technical Guidelines on Environmental Impact Assessment, 2796.1/MONRE.DESIA, dated 19 December 2016	2016
Notification from the Ministry of Labour and Social Welfares on Minimum Wage in Lao PDR, No. 808/MLSW, dated 09 February 2015	2015
Ministerial Instruction on the Process of EIA of the Investment Projects and Activities, No. 8029/MONRE, dated 17 December 2013	2013
Guidelines on Public Involvement in ESIA Process of Investment Project, No. 707/MONRE, dated 05 May 2013	2013

Title	Year
Moratorium on Land Concession for Mining, Rubber and Eucalypt Investment Projects, No. 13/PM, dated 11 June 2012	2012
Agreement of the Minister on the Management and Use of Plant Variety, No. 3919/MAF, dated 12 December 2012	2012
National UXO and Mine Action Standards, issued 15 October 2012	2012
Regulation on the Control of Pesticides in Lao PDR, No. 2860/MAF, dated 11 June 2010	2010
Agreement on the National Environmental Standards No. 2734/WREA-PMO, dated, dated 7 December 2009	2010
Notification of MAF on Development and Promotion of Sustainable Forest Plantation, No. 1374/MAF	2010
Guidelines of the Department of Forestry on the Conduct of Economic-Technical Studies for Industrial Tree Plantation and Non-timber Forest Product, No. 1643/DOF	2010
Ordinance of the Prime Minister concerning the enhancement of forestry management, protection, and coordination in the management of forestry and wood business, No. 17 (2008)	2008
Presidential Decree on Land Tax, No. 07/PO, dated 8 May 2007	2007
Lao PDR Forestry Strategy 2020, dated July 2005	2005
National Biodiversity Strategy 2020 and Action Plan 2010, No. 01631/WREA-PMO, dated 18 August 2004	2004
Instruction of MAF on Plantation Forest for Wood Processing Factory, Plantation Registration, Plantation Tree Harvest Permit and Export of Planted Timber, No. 0115/MAF	2003
Regulation of MAF on Development and Promotion of Sustainable Forest Plantation. No. 0196/MAF	2000
Instruction of MAF on Forest Plantation Registration Process, No. 1849/MAF	1999
Instruction of the Prime Minister on the Implementation of Land and Forest Allocation Program, No. 03/PM	1996
Instruction of MAF on Management of Tree Planting and Planted Forests, No. 0822/MAF	1996
Directive Concerning Tree Planting on Degraded Forest Lands, No. 0234/MAF	1992

The ***Law on Forestry*** (2007) sets the fundamental principles, regulations and measures for management planning, conservation, and development and utilization of forest resources, promotion of tree plantations and increasing forest resources.

The ***Environmental Protection Law*** (2012) is the overarching environmental legislation in Lao PDR. The law specifies the principles, rules and measures to manage, protect, monitor and rehabilitate the environment, as well as to contribute to the socio-economic development of the nation and reduce the impacts of climate change (Article 1). Articles 51 and 52 specifically address the rights, duties and obligations of natural resource users.

The ***Law onLand*** (2003) describes the system of land tenure, with all land recognised as the property of the State, under the governance of the Government of the Lao PDR. However, the law recognises and protects private land use rights. These rights can be granted by the State, transferred, or inherited provided appropriate land taxes have been paid. Land is categorised in accordance with the form of use, and various principles are outlined in the legislation for respective land use. The *Law on Land* 1997 was amended in 2003 to set out the main institutional responsibilities for land management and administration in Lao PDR and stipulates that the overall responsibility for land administration belongs to the National Land Management Authority (now part of MONRE).

The ***Law on Water and Water Resources***, (2017) outlines a similar approach with all water and water resources remaining the property of the State. If relevant approvals are gained by an applicant seeking to use water resources, individuals or entities may attain water use rights. Part IV stipulates measures for water and water resources protection including land and forest within watershed areas. Article 29 sets out regulations on water and water resources protection areas from development projects and activities through avoidance, mitigation and management of potential impacts on water quality, soil erosion, and water flow regime.

2.2 Applicable International Policies, Guidelines, Standards

2.2.1 Mekong Timber Plantation Policies

MTP is obligated to meet the environmental and social sustainability standards required for TAFF investment projects under New Forests Asia's management of TAFF. These policies are summarised in the New Forests' ***Responsible Investment Policy*** (2015); New Forests' Corporate ***Social and Environmental Policy*** (2014), which are operationally controlled through their *Social and Environmental Management System* (SEMS).

New Forests Asia (and therefore MTP under TAFF) have been a signatory to the United Nations ***Principles for Responsible Investment*** since 2010, with a demonstrated commitment to integrating environmental, social, and corporate governance (ESG) principles into investment activities, decision making processes, and on-the-ground Project management.

New Forests Asia's Social and Environmental Policy requires adherence to four guiding principles: responsible investment, third-party certification, transparency, and continual improvement. The policy is managed through their SEMS which is based on the ISO 14001, Environmental Management Systems Standard.

Under TAFF / New Forests Asia's Corporate SEP, MTP is committed to the following standards:

- Forest Stewardship Council (FSC) Certification within three years of Project acquisition; and
- International Finance Corporation's (IFC) *Performance Standards*, *IFC General Environment, Health, and Safety Guidelines* (2007), and *IFC Environmental, Health and Safety Guidelines for Forest Harvesting Operations* (2007).

2.2.2 International Finance Corporation Standards

TAFF requires that MTP align is operations (including ESIA) in accordance with the ***IFC Sustainability Framework*** (2012). The IFC Sustainability Framework articulates strategic commitments to sustainable development and is an integral part of its approach to risk management.

The updated Sustainability Framework reflects the evolution in good practice for sustainability, risk mitigation, and transparency. The Sustainability Framework consists of the revised ***IFC Policy on Environmental and Social Sustainability***, the ***IFC Access to Information Policy***, and ***IFC Performance Standards***.

Project management under the IFC Sustainability Frameworks requires adherence to the national laws / regulations for the country in which it operates, and obligations articulated in is eight Performance Standards, as follows:

- Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts;
- Performance Standard 2: Labour and Working Conditions;
- Performance Standard 3: Resource Efficiency and Pollution Prevention;
- Performance Standard 4: Community Health, Safety, and Security;
- Performance Standard 5: Land Acquisition and Involuntary Resettlement;
- Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources;
- Performance Standard 7: Indigenous Peoples; and
- Performance Standard 8: Cultural Heritage.

MTP is also required to operate according to the standards of *IFC's General EHS Guidelines* and *EHS for Forest Harvesting Operations*. These guidelines provide additional, and in some cases more quantitative and / or industry specific requirements.

2.2.3 Emissions and Discharge Standards

Project emissions and discharge standards will be managed and monitored for compliance with the following, where applicable:

- Lao PDR *Agreement on the National Environmental Standards* (2009);
- *General EHS Guidelines* (IFC, 2007);
- *Ambient Air Quality Guidelines* (WHO, 2005); and
- *Guidelines for Drinking water quality 3rd edition* (WHO, 2008).

2.2.4 Forest Management Certification

TAFF requires that MTP is certified by a credible and independent third-party forest management certification organization within three years of formal Project acquisition. For this Project, TAFF has designated the FSC Forest Management certification for its operation. FSC certification requires adherence to its Principles and Criteria, annual independent auditing, and general adherence to industry best practices for environmental and social sustainability. The organisation has developed a series of standards, which specify obligations for prospective or certified plantation forestry operators in their *FSC Principles and Criteria for Forest Stewardship* (FSC-STD-01-001 V5), 2015 and associated documentation.

The environmental and social sustainability standards required for FSC certification are articulated within the following FSC Principles and Criteria:

- Principle 1: Compliance with Laws;
- Principle 2: Workers Rights and Employment Conditions;
- Principle 3: Indigenous Peoples' Rights;
- Principle 4: Community Relations;
- Principle 5: Benefits from the Forest;
- Principle 6: Environmental Values and Impacts;
- Principle 7: Management Planning;
- Principle 8: Monitoring and Assessment;
- Principle 9: High Conservation Values; and
- Principle 10: Implementation of Management Activities.

3 PROJECT DESCRIPTION AND ALTERNATIVES ANALYSIS

The Project commenced activities in 2003 and currently comprises short-rotation (7 – 10 year) Eucalyptus or Acacia plantations in a large number of small to moderate size plantations across the concession area in Bolikhamxay and Khammouane Provinces (refer to Figures 1-3). The Concession Agreement for Tree Plantations between the Government of Lao People's Democratic Republic and BGA Holdings Asia Limited (GOL, 1999a) provides the Project with a 50-year concession period, initiated four years after the signing of the CA (i.e. 2003 – 2052), with potential for extension of the CA for an additional 25 years, pending agreement from GOL and Project owners.

Existing plantations or unplanted concession areas are located within the boundaries of 133 villages (Project villages) across nine Districts in these two Provinces. The number of Project villages has been reduced from 147 to 133 as a result of village consolidation by the GOL, and relinquishment of a small portion of the concession area back to the State. The Project footprint (24,099 ha) covered by the CA comprises (refer to Figures 2 and 3):

- 17,903 ha of timberlands (active and potential Eucalyptus / Acacia plantations);
- 4,776 ha of seasonally flooded area that is not suitable for industrial Eucalyptus plantations;
- 1,422 ha of roads, streams, rocky outcrops and other areas that will not be planted.

Each of these are described below.

3.1 Timberlands

3.1.1 Planted concessions

BGA / LPFL planted all of the concession area (other than the 1,442 ha unsuitable for vegetation) with *Eucalyptus camaldulensis* and *Acacia mangium* and hybrids (e.g. *Eucalyptus camaldulensis* x *Eucalyptus deglupta* and *Acacia mangium* x *Acacia auriculariformis*), with 22 unique clones derived from Eucalyptus and Acacia species and hybrids.

Under the LPFL management regime; there was significant variability in the survival, growth, and yield across the plantation units that comprise the concession area. This may be attributed to one or more of the following:

- Fires that destroyed plantation;
- Seasonal inundation / flooding that killed or severely restricted growth;
- Poor management (lack of weeding, thinning, etc.); and / or:
- Pests / diseases.

As of 2017, approximately 17,903 ha of the 24,099 ha concession area have established Eucalyptus or Acacia plantations at varying stages of maturity, with at least 13,321 ha considered currently viable. With much of the planting conducted in 2008 – 2010; many have reached the intended rotation age, and are expected to be harvested when MTP is fully operational in the last quarter of 2018.

Commercial logging of mature plantation timber commenced in 2016. Salvage logging from fire damaged and seasonal flooding areas has also been conducted for more than 1,170 ha.

3.1.2 Unplanted concessions

MTP will plant its timberlands (currently unplanted concessions and next rotation units following harvest) with *Eucalyptus pelita*, *Eucalyptus brassianna*, *Eucalyptus urophylla* and various proven *Eucalyptus* clones (16 at this time).

Approximately 58% of the concession area (not including roads, rocky areas, and infrastructure) is not currently being managed, with plantations returning to fallow or seasonal wetland scrub pending their locations. Those areas suitable for industrial Eucalyptus operations will be brought into the active timberland production area.

Approximately 4,582 ha of the 17,903 ha timberlands are currently underperforming and are expected to be cleared and re-planted with Eucalyptus. Timberlands will be planted at a two by three metre spacing, with approximately 1,650 trees planted per hectare. MTP is currently evaluating its strategy for commercial or non-commercial thinning, therefore the stocking number at the end of rotation is not currently known.

Based on the operational plans currently being developed, it is anticipated that MTP will employ a more robust operational management strategy than its predecessor to maximise survival, growth, and yield,

3.1.3 Timberland Management

MTP plantation establishment and management operations are summarised as follows:

- Production of clonal seedlings at a new nursery in Songhong;
- Planning, construction, maintenance and / or repair of access roads;
- UXO survey / clearing (where applicable);
- Brush clearing;
- Ploughing;
- Fire protection and enhancement measures;
- Singling (pruning coppice sprouts to provide for one dominant stem);
- Staking and planting;
- Weeding;
- Thinning;
- Fertilising;
- Harvest; and
- Log transport.

3.1.4 Processing

Raw logs will be processed in Lao PDR by a third-party, with end products intended to include veneer, sawlogs, and woodchips / pellets, pending the quality of the timber.

MTP is currently evaluating options for external companies to process logs after initial harvest anticipated for the last quarter of 2018. There are currently no plans for developing MTP owned wood processing facilities, however MTP will continue to evaluate this option.

3.2 Commercial Cropping in Seasonal Wetlands

Approximately 4,776 ha of the concession area are inundated with floodwaters at a frequency that prohibits viable Eucalyptus plantation operation. MTP will utilise approximately 2,276 ha of this land for commercially viable crop(s) that can withstand seasonal flooding and achieve satisfactory yields. The Company intends to trial various crops on approximately 30 ha plots to identify the most suitable crop(s).

Once determined, the crop(s) will be planted throughout the remainder of the designated 2,276 ha area for non-Eucalyptus cropping. MTP has yet to determine which of its seasonally inundated units will be planted with commercial crops. Distance to processing facilities and access will likely be important determinants.

This ESIA has recommended and assumes the selection of areas isolated from adjacent moderate to high value natural habitat for this cropping area (which is consistent with access issues), as the remainder of the 4,776 ha of seasonally inundated area will be restored to natural habitat (refer to below) which should consider adjaccency with higher value habitat.

3.3 Restoration of Natural Habitat

MTP will restore approximately 2,500 ha of their seasonally inundated area to the natural vegetative communities that occupied the area prior to historic logging / vegetative removal for agricultural activity. Most of the seasonal inundation areas are considered likely to have been Semi-Evergreen Dipterocarp Forest / Deciduous Dipterocarp Forest, or potentially Dry Dipterocarp Forest toward the southern / south-eastern portion of the concession. This will likely require remnant plantation tree / stump removal, weed management, and some planting as dipterocarp species have not naturally regenerated very successfully in disturbed areas (e.g. in comparison to Mixed Deciduous Forest).

This ESIA recommends and assumes that flood prone areas will be selected for restoration where they are adjacent to protected areas, limestone mountains, semi-contiguous forest, or other moderate to high value habitat to provide connectivity or enhance overall habitat quality in the area.

3.4 Farmer Extension Program

The Project also includes the Farmer Extension Program (often referred to as an outgrower scheme). Throughout 2007-2010, LPFL encouraged farmers to participate in what is typically referred to as the 2+3 outgrower scheme: the farmer provides the land and labour (2) and the Company provides materials, technical advice, and an end market for sale of raw timber(3). LPFL and participating farmers signed agreements, whereby LPFL provided Eucalyptus or Acacia seedlings and assistance during the first year of plantation management and farmers are responsible for managing the plots. LPFL provided loans for Eucalyptus clones (Acacia were provided free of charge) and for plantation establishment (on a per hectare basis) that will be repaid (interest free) upon sale of the raw logs / formal plantation termination.

As of a 2016 survey, there were approximately 5,071 farmers managing 5,188 farmer extension units occupying approximately 5,028 cumulative ha (4,561 ha Eucalyptus and 465 ha Acacia) within the boundaries of approximately 272 villages or sub-villages in Bolikhamxay and Khammouane Provinces and an additional 34 plantations in Savannakhet, Xiengkhouang, and Vientiane Capital Provinces.

These plantations range from productive, well stocked plantations, to moderately well-established plantations, as well as many that have failed as a result of flood, fire, or other issues. When farmers pay back LPFL loans to MTP, they are no longer actively participating in the extension program. As of 2016, 87 farmers had paid back loans, and it is understood that approximately 150 have paid back loans; leaving approximately 4,921 farmers still active participants in the program.

The LPFL Farmer Extension Program has not yet provided the intended return on investment for farmers or LPFL/MTP Project owners. MTP is initiating the 'Outgrower Scheme (OGS) Phase 2 Program', with the aim to providing the intended benefits to respective participants of the program.

Table 3-1 Participation in the LPFL Farmer Extension Program

Province / District	No. Villages	No. of Farmers	No. of Plots	Plantation Area (ha)	Eucalyptus	Acacia
Bolikhamxay	**126**	**2,472**	**2,546**	**2,959**	**2,707**	**250**
Bolikhan	20	228	245	372	300	72
Khamkert	2	2	2	3	3	-
Pakkading	35	937	956	1,297	1,210	85
Paksan	46	901	919	751	735	15
Thaphabath	22	403	423	533	455	78
Viengthong	1	1	1	3	3	-
Khammouane	**146**	**2,345**	**2,386**	**1,825**	**1,640**	**185**
Boualapha	8	109	109	76	73	3
Hinboun	76	1,474	1,499	1,289	1,169	120
Mahaxay	34	418	426	237	200	37
Thakhek	27	334	342	218	193	25
Gnommalat	1	10	10	6	6	-
Other Provinces	**34**	**254**	256	243	214	29
Total	**306**	**5,071**	**5,188**	**5,028**	**4,561**	**465**

*Source: LPFL 2016

3.5 Roads and Ancillary Infrastructure

The Project will include the maintenance of roads and ancillary infrastructure associated with the plantations and timber harvesting.

MTP's current nursery and research and development (R&D) facility are located in Songhong Village in Hinboun District, Khammouane Province. The Company is in the process of upgrading the facility at the same location. The nursery will have the capacity to produce 2.1 million plants per year.

The primary facilities of the upgraded nursery will include:

- **Greenhouse and acclimatising areas** – A 1,920 m^2 greenhouse facility will be built, comprised of five individual greenhouses of approximately 10 m width by 40 m length. Greenhouses will be split into rooting areas and acclimatising areas.
- **Holding areas –** MTP will develop two holding bays for clones / seedlings following rooting / germination and acclimatisation. The Phase 1 holding area will be 142 m x 60 m (including 3 m wide roads), comprised of two units with a holding capacity of 29,160 trays (approximately 60 seedlings / tray). The Phase 2 holding area will be constructed to provide for the holding capacity requirements of the operation at full capacity (36,165 trays). The Phase 2 holding area will be a 66 m by 25 m facility capable of storing 6,540 trays.
- **Mother plant area** – the mother plant area will provide material for clonal production. At full capacity, the mother plant area will have a surface area of 2,698 m^2 comprised of five bays (9.6 m (W) by 56 m (L), with six tree rows per bay (53 m by 1 m each), and a total surface bed area of 1,590 m^2. The facility will be built in two phases. Phase 1 will develop five 9.6 m by 24 m bays, with 6 rows per bay. Phase 2 will extend the bays to 56 m in length.
- **Ancillary infrastructure** – the new facility will have:
  - A pump house to store water abstracted from the Nam Hinboun River (refer to below);

- A standalone chemical storage room;
- Road infrastructure comprised of perimeter roads around all facilities and the primary access road;
- The regional office adjacent the nursery area; and
- Stormwater channels and water holding ponds.

- **Water Abstraction facility** - the existing water abstraction facility will be utilised, with a pump in the Hinboun River conveying water to a holding pond approximately 1 km northeast of the nursery. A second pump moves water to a series of three tanks, two near the Songhong office and accommodation areas and the third at the nursery.

Work camps and regional offices associated with the Project will include:

- Regional Office in Paksan;
- Regional Office in Songhong; and
- Temporary work camps during plantation re-establishment and harvesting.

3.6 Research and Development

MTP will plant *Eucalyptus pellita*, *Eucalyptus brassiana*, and *Eucalyptus urophylla* in addition to a host of proven Eucalyptus clones of various origin. It is anticipated that the Company will trial new species and / or hybrids to optimise growth / yield, form, and disease resistance.

After initially establishing plantations with *Eucalyptus camaldulensis* and *Acacia mangium*, LPFL initiated trials for plantations comprised of hybrids (e.g. *Eucalyptus camaldulensis* x *Eucalyptus deglupta* and *Acacia mangium* x *Acacia auricularfornis*) to improve performance. The Company continues to trial additional hybrids / clones, with established plantations now utilising 22 unique clones derived from Eucalyptus and Acacia species and hybrids. It is not currently known whether MTP will utilise LPFL stock.

MTP will also initiate trials for commercially viable crops for a portion of their concession that is seasonally inundated, with conditions unsuitable for Eucalyptus plantations (as above). Trials will be conducted in 30 ha plots, comprised of as-yet undetermined commercially viable species to test their respective yield for eventual expansion into approximately 2,276 ha.

3.7 Decommissioning

MTP will develop a decommissioning plan approximately 10 years prior to the termination of its concession. There is some potential that the GOL and / or communities will want the asset(s), and some of the viable Eucalyptus plantations will remain. However, the Company will develop a plan to restore the site to the natural vegetative community it replaced.

The Eucalyptus clones utilised coppice sprout vigorously when harvested, with sprouts reaching 1-3 metres within a year of harvest. Unless actively removed, there is potential for monoculture non-native trees to dominate the canopy in perpetuity or for a long period of time. This long-term conversion of low quality habitat (for native terrestrial fauna) will be avoided (unless the areas are actively managed for ongoing plantation management). This will be achieved by:

- Removing Eucalyptus stumps following the last harvest or painting stumps with an appropriate herbicide to prevent re-establishment of Eucalyptus;
- Conducting annual herbicide applications for at least three years to kill coppice sprouts (e.g. from root mass, missed stumps) and manually removal of Eucalyptus and Acacia seedlings;

- Conducting annual herbicide applications for at least three years that target only non-native invasive plants, with application procedures having management regimes consistent with the ESMMP and Chapter 14, Hazardous and Non-Hazardous Materials;
- Planting the areas with a suitable mix of native species of local provenance; and
- Monitoring the sites annually to ensure successful establishment of a native vegetative community.

3.8 Consideration of Alternatives

The New Guidelines on ***Environmental and Social Impact Assessment Guidelines (2016)*** outlines assessment of alternatives that are realistic and feasible. Since the majority of the Project area has been established with ongoing operations and maintenance, the analysis of alternatives has been undertaken considering the following:

1. Silvicultural / horticultural production alternatives;
2. Timber processing alternatives; and
3. Terminating the Project.

Option 1: Silvicultural / horticultural production alternatives

MTP is keen to improve their plantation operations through R&D to identify the best silvicultural and agricultural methodologies for its operations. R&D is focused on the best outcomes for timber production and agricultural productivity in lands not suitable for industrial tree plantation.

Options for Eucalyptus and Acacia plantations

MTP could continue with the current mix of Eucalyptus and Acacia plantations in their next rotation. However, due to legacy issues with the Acacia plantations, MTP plan to concentrate solely on Eucalyptus species with an R&D program targeted at producing a number of fast-growing, pest and disease resistant cultivars suited to the different local conditions across the Project area.

Options for seasonally inundated areas

The Company is considering the use of approximately 2,276 ha of the 4,776 ha seasonally inundated areas for commercially viable crops suited to the soil moisture conditions and restoration of the remaining 2,500 ha to natural habitat as a biodiversity offset as per FSC requirements.

In summary, benefits and limitations associated with the usel of different crops and natural restoration measures in seasonal wetlands include:

- Enhancing the use of unsuitable land for industrial plantation with other crops that are tolerant to periodic flooding;
- Identifying alternative species that will enhance the financial viability of operations;
- Increase terrestrial habitats and potentially improved ecosystem services and resource collection for local communities; and
- Minor impact to fauna and flora arising from vegetation clearance for the re-establishment of crops on the existing seasonal flood areas due to clearance of fallow that has replaced failed plantations.

Option 2: Timber processing alternatives

Option 2a: Direct sale of raw timber to potential buyers

In the short term, selling raw timber to potential buyers is a promising alternative to maximise benefits from mature trees from both MTP and outgrower plantations. MTP is currently evaluating the market for (in descending order of preference): (i) veneer; (ii) sawlogs; and (iii) pulp / chips. Logs will be sold with different grades and prices. The higher quality logs could be sold to local veneer / plywood and furniture manufacturers while lower grade logs could be sold to processing factories for sawlogs and chipped wood. The anticipated benefits from selling timber would be significant for both MTP and outgrower farmers. The potential benefits include:

- Viability of industrial tree plantation operation with capability to produce the high quality of wood required for the Company to achieve operational sustainability;
- Company generating return on their investment;
- Employment opportunities for local people associated with harvesting activities;
- The opportunity for MTP to re-establish plantation areas where they were not successful;
- The provision of income for 2+3 farmers, thus enhancing livelihoods of participating communities, and ability to return the loans to MTP;
- Supply raw materials for local manufacturing plants, including sawmills, veneer and plywood mills; and
- Support national and local socio-economic development through extension of community / regional benefits.

Option 2b: Establishment and management of MTP wood manufacturing facilities

MTP may consider investing in its own wood manufacturing facilities such as veneer / plywood mills or a pulp mill. It is expected that mill operations could provide greater benefits for the entire MTP plantation Project as well as outgrower communities. An MTP owned mill could provide a sustainable market for all timber produced by the Project as well as increased production efficiency through better utilisation of raw materials from the harvested timber. Establishment of a pulp mill would also fulfil the objective of the CA. However, the development of large-scale mill would require significant infrastructural investment and expansion of existing plantation operations and a more viable medium-term option may be the establishment of one or more veneer / plywood mills.

Option 3: Project Termination Alternative

The 'Terminate Project' alternative would result in the removal of a large viable forestry plantation operation and small-scale farmer outgrower operations supporting end markets for timber products in Lao PDR. An initial assessment of the direct consequences for Lao PDR of terminating the Project is summarised as follows:

- Taxation and royalty benefits to Lao PDR from the Project would not be received;
- Loss of significant full-time and casual job opportunities and training or skills development associated with the Project;
- Improved infrastructure associated with the Project and associated benefits to local communities would not be realised;
- Community development initiatives associated with the Project would not proceed.

In the event of Project termination, ongoing or future impacts to environmental and social receptors may be avoided, such as:

- Land currently occupied by non-native trees would provide better habitat for terrestrial biodiversity and ecosystem services for local communities if natural habit were restored;
- Land that may otherwise be used for community / village farmer owned agriculture may be returned to communities;
- Any impacts to water quality (after mitigation and management) associated with the Project would incrementally cease to occur; and
- Potential cumulative impacts of the Project would not occur.

3.8.1 The Preferred Alternative(s)

Having undertaken a thorough analysis and careful consideration of the above alternatives, the following alternatives have been selected as the preferred options to ensure that the Company can meet its investment objectives while maximising local, regional and national economic benefits.

Option 1: Silvicultural / horticultural production alternatives

- MTP will discontinue production of Acacia species after the first rotation harvest and focus on development of genetically superior Eucalyptus species optimised for local conditions.
- MTP will proceed with plans to trial suitable commercially viable crops and eventually plant 2,276 ha of the seasonally inundated areas with the most suitbale crop(s) to maximise Company returns and local / regional / national economies from under-utilised Project areas.
- MTP will restore natural habitat on 2,500 ha of the seasonally inundated areas, focusing these efforts on applicable lease areas that are adjacent high value habitat to the extent practicable.

Option 2: Timber processing alternatives

- MTP will identify local and regional timber processors for the sale of raw timber from the first plantation rotation.
- MTP will continue to assess options for development of processing facilities in the medium to long term.

4 ESIA METHODOLOGY

Key components of the ESIA methodology for the Project included:

- Identification of the Study Area including the Project area of influence;
- Literature review and collation of secondary information;
- Baseline investigation studies including field surveys;
- Risk assessment;
- Impact assessment including assessment of current and potential future impacts;
- Identification of management and mitigation measures; and
- Stakeholder consultation and engagement.

Each of these aspects is explained in further detail in the sections below. Stakeholder consultation conducted as part of the ESIA is summarised in Section 8.

4.1 Study Area

The Study Area for this ESIA includes the Project footprint and the area of influence for the various physical, biological, or social components of the Project. Identification of area of influence required an understanding of current and planned Project activities, satellite imagery analysis, secondary information, and information provided through interviews, focus group discussions / local knowledge surveys; and evaluation of the relative importance and likelihood of Project influence beyond the Project footprint. The Project area of influence includes:

- The Project footprint, including the concession area (planted and unplanted), land with LPFL vegetation clearance permits awaiting concession approvals, associated road networks, nursery, and other ancillary infrastructure;
- Areas potentially indirectly impacted, such as through noise and dust emissions;
- Areas downstream of the Project footprint;
- Surrounding habitat or agricultural land;
- Settlements along the access routes; and
- Areas potentially subject to cumulative impacts associated with the Project.

4.2 Literature Review

Earth Systems collected and reviewed applicable literature and secondary information including:

- LPFL and MTP Project documentation, including previous EIA, and management plans;
- GIS Data and documentation from GOL agencies (e.g. Forest Inventory and Planning Division (FIPD); MAF, PAFO, DAFO, and MONRE);
- Published scientific papers and reports;
- ESIA conducted for other projects in the region (e.g. Nam Ngiep Hydropower Project, Theun Hinboun Expansion Project, Nam Theun 2 Hydropower Project); and
- International biodiversity databases (e.g. IUCN, WWF, and UNEP).

4.3 Baseline Investigation Studies

The baseline assessment was conducted for conditions for the area of influence for each parameter of interest. As the Project has been an active industrial plantation forestry operation for more than a decade (and an EIA developed for the original LPFL Project); baseline studies for this ESIA assess current conditions to evaluate risks and impacts which inform suitable management measures going forward. Pre-Project baseline was not considered (e.g. original vegetation clearance, land acquisition) unless considered relevant to current operations. Baseline assessment was both qualitative and quantitative (varying according to parameter of interest), with the following conducted:

Quantitative and qualitative surveys and assessment included:

- Evaluation of satellite imagery across the Project area of influence;
- Assessment of GOL Forest Inventory Planning Division (FIPD, 2012) land use maps;
- Detailed Local Knowledge Surveys for 46 Project villages;
- Biodiversity Focus Group Discussions for a subsample of 14 villages;
- Cultural Heritage Focus Group Discussions for a subsample of 14 villages;
- Phone surveys with Village authorities for 132 of the 133 villages;

Direct quantitative sampling included:

- Flora surveys within and adjacent plantations (14 plantations, multiple plots inside and outside plantations);
- Water quality monitoring and sampling for laboratory analyses;
- Noise monitoring in two settlements adjacent shared village / plantation access roads;
- Dust monitoring PM_{10} and $PM_{2.5}$ in one settlement adjacent a shared village / plantation access road.

Interviews with GOL representatives and secondary data collection, from the following sources:

- Applicable representatives from the District Government offices of Bolikhan, Boualapha, Gnommalat, Hinboun, Mahaxay, Pakkading, Paksan, Thakhek, and Thapabath;
- Applicable representatives from the Provincial Government offices of Bolikhamxay and Khammouane;
- Applicable representatives from Central MONRE, including DESIA;
- Dr. Thonglith Luangkhot – Director of Archaeological Division, Department of Heritage and Fine Art, Ministry of Information, Culture and Tourism;
- Central Department of Forestry representatives, including Mr. Somchai (DDG, DOF) and Mr. Sakhone (Planning Division, DOF).

Surface and groundwater hydrology was modelled using historic data from a number of sources (surface water hydrology, precipitation, evaporation, etc.), with SYMHYD modelling for surface and groundwater modelling.

4.4 Risk Assessment

This ESIA has utilised a risk-based approach to identify and assess potential impacts. It has considered risks and opportunities that may arise from the development of the Project, with the formal risk assessment evluating potential adverse risks associated with the Project. The methodology for this risk assessment is based upon ISO 31000 Risk management – Principles and Guidelines, 2018 and ISO 31010 Risk Management – Risk Assessment

Techniques, 2009. This assessment also takes into consideration the requirements of IFC Performance Standard 1 - *Assessment and Management of Environmental and Social Risks and Impacts* (2012).

The assessment first considers risks without implementation of management and mitigation to identify the most significant potential risks. These risks are assigned rankings in order of magnitude / probability, in the absence of mitigation. Once initial risks have been assessed and ranked, proposed controls are identified to avoid or reduce the anticipated impacts. Control measures focus on either reducing the likelihood of occurrence or on decreasing the magnitude of the consequence to reduce the residual risk ranking to acceptable levels. The expected residual risks are generally lower than the initial risk ranking by one or two orders of magnitude.

Where applicable, risks are categorised by the following phases:

- Plantation Establishment;
- Plantation Management; and
- Decommissioning.

In addition, risks have been classified by thematic areas (i.e. physical, biological and social). The risk assessment focuses on the potential impacts of the Project and does not assess alternatives that are no longer being considered.

Figure 4 shows how the risk assessment process fits within the overall Risk Management Process.

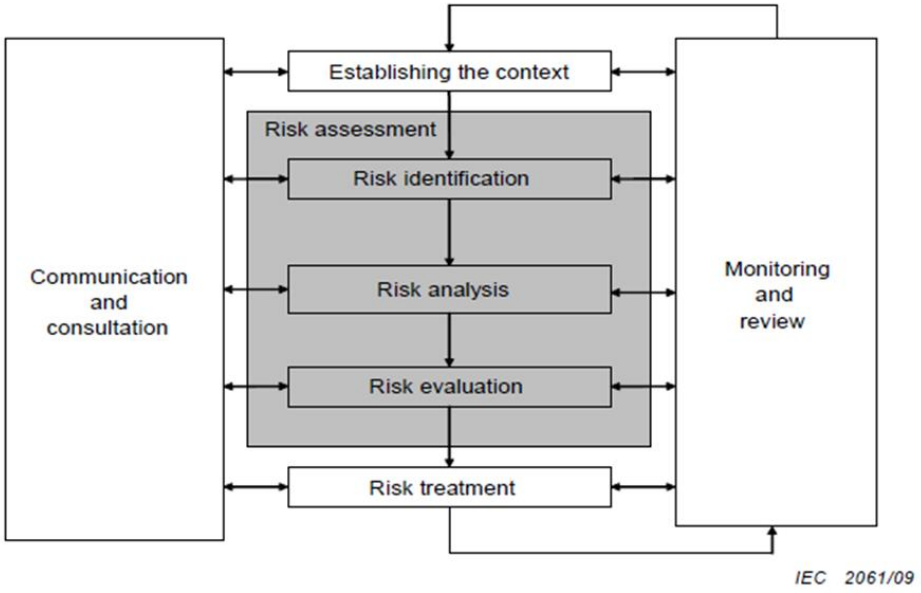

Figure 4: Risk Assessment Process (shaded) with the overall Risk Management Framework (ISO 31010)

4.5 Impact Assessment

The scope of the assessment included a review of potential impacts to baseline conditions for physical, biological, socio-economic, cultural and components in the Project area of influence. Detailed assessment focused on those components most at risk by the Project, identified during the risk assessment for the ESIA.

The impact assessment considered historic impacts from Project implementation and management versus anticipated impacts given the prescription of management and mitigation measures identified in the ESIA and ESMMP to provide anticipated residual impacts. In summary, the impact assessment included:

- **Area of Influence** - the geographic scope of the Project was evaluated to review potential direct, indirect, residual and cumulative impacts in the Project footprint, the catchments, downstream of the Project footprint, and ancillary facilities associated with Project influence;
- **Key stakeholders** – primary stakeholders were identified, with a focus on identifying social receptors (i.e. people / communities with potential for Project related benefits and impacts);
- **Temporal scale** – the impact assessment evaluated immediate, potentially ongoing, and long-term risks and impacts; identified those that are considered unavoidable and/or irreversible. The temporal scale of impact assessment for the ESIA considers: (i) current impacts; (ii) anticipated impacts derived over the life of the concession period; and (iii) the post-concession period.
- **Risk-based evaluation** - The impact assessment was conducted based on a risk-based approach. The detailed risk assessment was conducted for the physical, biological, socio-economic, and cultural components of the region with respect to the existing plantations, unplanted concessions areas, and for the regional context.

  Current design controls, and current management / mitigation measures were reviewed for their efficacy to inform the baseline as well as current risks and impacts.
- **Significance** - The risk assessment was utilised to help determine the level of significance for a potential impact. The risk assessment considered the likelihood and consequences of impacts with and without management and mitigation measures provided in the EISA / ESMMP, providing risks categories (significance) and informing the assessment of residual impact.

The risk based methodology informed the need for evaluation of potential impacts on physical, environmental, and social receptors in the Project area of influence. Once identified, key impacts were evaluated for Project-related impacts via:

- Assessment of satellite imagery;
- Surveys with potentially affected communities;
- Consultation with key Government of Lao authorities;
- Consultation with individuals having expertise in the region for a given issue;
- Site surveys; and
- Quantitative and qualitative assessment.

The methodology for baseline and impact assessment varied according to the parameter of interest. The detailed methodology for each issue is provided in the associated chapters of the ESIA (Volume B).

4.6 Management and Mitigation

Management and mitigation strategies were developed for those issues where potential for impacts to physical, biological, and social receptors was identified, with an emphasis on those aspects identified as having moderate to high risk rankings.

The specific management and mitigation measures provided take into account:

- Current management regimes and their efficacy in avoiding or minimising impacts;
- Anticipated changes to the management regime, based on discussion with MTP and their ongoing development of documents, forms, and databases that will comprise their Environmental and Social Management System (ESMS);
- Industry best practices for minimising impacts in the plantation forestry sector;

- Methods commonly and successfully implemented in Lao PDR; and
- National and international guidelines for avoiding and minimising impacts.

The conduct of the ESIA informed the development of the ESMMP, which is a standalone document (Volume C) that provides a greater level of detail for management and mitigation measures and identifies the monitoring and reporting framework that will be implemented to enhance environmental and social sustainability for MTP operations.

5 BASELINE CONDITIONS

5.1 Land and Assets

Land and land use will remain one of the fundamental challenges for MTP throughout the remainder of the Project concession period. Whilst LPFL / BGA acquired land in consultation with appropriate Government of Lao PDR authorities; communities / individuals that had traditionally used the land within their respective village boundaries lost the right to use this land. Direct impacts occurred during BGA or Oji LPFL Project tenure, but legacy impacts remain, which are likely to be incrementally more significant over time with population growth in Project villages.

As part of the 2007 *Amendment to the Joint Venture Agreement between the GOL and BGA*, LPFL set up a Farmer Extension Program, whereby individual farmers with land use rights signed contracts with LFPL for a 2+3 outgrower plantation program; whereby the farmer provides the land and labour (2) and the Company provides the materials, technical advice, and end market (3). There have been considerable issues with the program (most notably the lack of a market and LFPL not acquiring timber). The relevance of this issue to this chapter is that many participating farmers that were interviewed for this ESIA have indicated their preference for a different land use, but cannot convert this land until trees are harvested / sold and money owed to LPFL for seedlings and first year management are paid back.

5.1.1 Land Concessions for Industrial Uses

The GOL, as part of its aim to support economic growth and poverty alleviation under the United Nations Millennium Development Goals for 2020, determined that increasing revenues from land management is a vital initiative. Land and natural resources have attracted significant investment, both foreign and domestic over the last 20 years, and thus have contributed to generating national revenue. Lao PDR has evolved into a supplier of raw agricultural commodities, tree crops, minerals, and hydropower; leading to a significant increase in demand on land.

GOL policies and the regulatory framework for resource intensive investment over the last ~20 years has driven a rapid increase in the volume of land granted for development. The number of land deals has increased significantly in recent years, increasing fifty-fold from 2000 to 2009. (Schwongweger et al, 2012). The provision of concession and lease agreements was one of the main methods the GOL chose to attract foreign capital in the mining, agriculture and forestry sectors (Dwyer, 2007).

5.1.2 MTP Concession and Village Land Use

The MTP concessions area occurs within the village boundaries of 133 villages (not including the Farmer Extension Project). The comprehensive list of affected villages is provided in Chapter 4 of the ESIA.

The 24,099 ha Project footprint is State land that was deemed Forest Land under the *Land Law* (2003) and the *Forest Law* (2007). In practice, village land acquired for the LPFL Project was Communal Land for the respective villages;

no individuals or other concessionaires had formal land use rights to these lands which requires either formal concession / lease agreements with the GOL or individuals having land certificates (and associated payment of taxes) for an initial three years, followed by potential 'long-term' rights determined at district or municipal administration in coordination with village administrators.

Therefore, whilst individuals, families, village community member were utilising the land for shifting cultivation, livestock grazing, collection of timber and non-timber forest products, and / or other uses; the land was available for industrial uses under current national policy for land allocation (refer to Table 6-4).

The Ministry of Agriculture and Forestry and its line agencies at the Provincial and District level were tasked with finding degraded forest land for the BGA / LPFL Project. District authorities consulted with Village Authorities and some from affected communities attended briefing sessions before formal inclusion of village land into the BGA concession area. LPFL provided an infrastructure payment of $50 USD / ha planted for the 50 year concession period in the form of community development initiatives (called CSR). No annual land rent / land lease fees are currently paid to villages that ceded land to the Project.

Table 5-1 MTP Concession Area and Project Villages by District

Province	District	Project Villages (#)^^	Population	Concession Area (ha)^
Bolikhamxay	Bolikhan	3	47,914	631
	Thaphabath	8	27,359	606
	Paksan	14	46,575	1,664
	Pakkading	20	51,958	5,728
Khammouane	Boualapha	4	31,663	669
	Hinboun	50	53,179	10,649
	Khounkham	3	22,163	96
	Mahaxay	10	21,323	1,464
	Thakhek	20	88,229	1,697
Total		**133**	**390,363**	**23,162**

^Not including land currently being negotiated for inclusion in the CA.

^^Project villages have been reduced due to government consolidation. The number of Project villages is preliminary, and will be confirmed via MTP consultation with the GOL and communities

Farmer Extension Program

As discussed in Section 3.4, approximately 5,071 farmers are managing approximately 5,188 ha of land for which they have land use rights to manage Eucalyptus or Acacia plantations. Average land allocation per farmer is approximately 1 ha, though a number of individuals are managing multiple plots.

Agricultural Land

Land allocation for agriculture is indicative of trends for the greater region, with rain-fed rice paddy production the dominant cropping practice, increasing use of irrigated rice paddies, and significantly less upland rice production than for other upland cultivation practices (refer to Table 5-2).

Table 5-2 Average Land Allocation for Cropping for Project Villages, by District

District	Surveyed villages (#)	House-holds (#)	Rain-fed rice		Irrigated rice		Upland rice		Other upland cultivation*	
			Area (ha)	Area / HH (ha)	Area (ha)	Area/HH (ha)	Area (ha)	Area/HH (ha)	Area (ha)	Area/HH (ha)
Bolikhamxay Province										
Bolikhan	3	3302	382	0.94	0	0.00	72	0.89	365	1.13
Paksan	13	13735	5174	3.00	81	0.55	0	0.00	1182	1.54
Pakkading	20	19075	4861	1.98	0	0.00	145	1.79	3605	2.11
Thaphabath	8	8638	1058	1.14	115	0.55	20	1.96	1089	1.79
Khammouane Province										
Hinboun	50	27211	5878	1.75	580	0.90	261	1.21	4141	2.12
Khounkham	3	4287	554	1.28	300	0.81	0	0.00	45	1.94
Thakhek	20	12510	3260	3.16	133	0.83	5	0.00	1401	1.38
Mahaxay	11	8088	1972	1.76	203	0.60	15	2.03	665	0.76
Boualapha	4	2145	785	2.60	0	0.00	3	1.42	9	0.00

*other cultivation crops include rubber plantations, banana and other fruit plantations, cassava, sugar cane, corn, beans, cucumber, chilies, and 'other' vegetables

Focus Group Discussions with a subsample of villages and Project-wide phone surveys found results were consistent with district averages. Villages are increasingly utilising land for paddy rice production, where feasible, and significantly reducing upland rice cultivation compared to historic production. The reasons provided for this included: many were producing enough rice using paddy cultivation; upland rice cultivation is labour intensive with comparatively lower rice yields; and other cash crops are providing for better livelihood generation than upland rice. In addition to typically grown fruit and vegetable cropping, a few villages indicated that small, farmer owned rubber plantations were providing at least twice the annual income than upland rice.

5.1.3 Topography and Agro-Ecological Zones

Mekong Corridor

The majority of the plantation units are located in the western portion of Hinboun and Pakkading Districts. This portion of the concession, along with plantation units in Thakhek District, the majority of Paksan District and lower elevation units in Thapabath District are collectively located along the flat to slightly undulating topography of the western plains of Lao PDR herein referred to as the Mekong Corridor. The concession area in the Mekong Corridor ranges in elevation from approximately 145 masl to 175 masl. Though largely flat / gently sloping topography, a north-south running ridge parallels the Mekong River, dividing the plain. The Phou Ngou range, some of which is now a Provincial Protection Forest reaches elevations of approximately 490 metres above sea level (masl) at its peak near Pakkading township, with the average ridgeline elevation ranging from approximately 240 masl – 320 masl.

As an agro-ecological zone, WTP (2013) describes the Mekong Corridor as that including "*the banks and floodplains of the Mekong River and the lower alluvial valleys of its tributaries. Altitudes range from 100-200 meters, annual rainfall is between 1,500-2,00 0mm, and the agricultural growth period ranges from 180-200 days. The landscape consists mainly of plain to modestly sloping areas. The original lowland forest cover has long been removed to make way for intensive crop production, particularly of lowland rain-fed rice, irrigated rice, and cash crops in the sloped areas. The region is the most densely populated area in the Lao PDR.*"

Western Annamite Range

The greater majority of the MTP concession is comprised of plantation units in Hinboun, Pakkading, and Thakhek Districts. The plantations located at the eastern side of the concessions in these Districts about the western edge of the Annamite Range, and in some cases, occur in the valleys between steep monoliths or ranges rising from the plain.

Most of these plantations are adjacent the Phou Hin Phou NPA or adjacent similar geomorphology to this conservation area. The western Annamite Range is comprised of limestone monoliths and associated karst formations (formed from the dissolution of the soluble rock), with associated caves and groundwater springs. These rocky outcroppings are vegetated with moderate to dense natural forest or shrub land. The plantations occur adjacent or between the outcroppings, in relatively flat valley features. The Project concession bordering and encroaching upon the fringes of the western Annamite Range is part of the Mekong Corridor Agro-Ecological Zone, as agricultural is limited to the plains between limestone formations, and the slightly elevated foothills of the few formations that lower gradient foothill slopes.

Vientiane Plain

The Vientiane Plain includes the higher plains and lower slopes of Vientiane, Bolikhamxay and Khammouane Provinces. Though the northern portion of the MTP concession is mapped as occurring in the Vientiane Plain Agro-Ecological Zone; the topography and land use practices are more consistent with that of the Mekong Corridor.

Foothill Positions

MTP has several plantation units that are located in foothill positions below more significant mountain ranges. These include:

- Plantations in southern foothills of the Phou Khao Khoay Mountain and NPA (up to 180 masl);
- Several plantations in Bolikhan, Paksan, and Khounkham Districts, predominately located on flatter topography, extend up into lower foothill positions in the southern Annamite Range / Khammouane Limestone (ranging to 240 masl).

With respect to agro-ecological zones, these areas are mapped by WPT as Vientiane Plain and Northern Lowland Agro-Ecological Zones, but elevation and landforms / geomorphology are more consistent with that described for the Mekong Corridor.

5.1.4 Protection Areas

In facilitating land acquisition for BGA / LPFL, the GOL granted concession area for plantation units that occur within the boundaries of several National Protected Areas (NPA). A significant number of plantations occur in Provincial Protection Areas (PPA) or District Protection Areas (DPA). It is important to note, that the majority of the landholdings in PPA (at least 1,150) were established before the Provincial Governor assigned the protection area status. All of the plantations were established before the promulgation of *the Decree of Protection Forest (PM/333*, 2010); therefore, formal conversion from protection area to plantation area was not required, as applicable GOL authorities were involved in consultations for these portions of the concession.

The vegetation on these land parcels was highly degraded from historic swidden agriculture and potentially historic logging, therefore District / Provincial authorities determined that plantations were a viable land use. On October 22, 2016, the Prime Minister formally approved the land concession agreement for 24,099.43 ha Project footprint, including areas that fall within protection or conservation areas (Ref. No. 09/PM).

Table 5-3 MTP Plantations located in protection areas

Protection Areas	Protection Status	Area (ha) with Boundary
Phou Khao Khoay	NPA – National Protection Area	41.1
Phou Hin Poun	NPA – National Protection Area	5.4
NBCA Total		**46.5**
Phou Ngou (Bolikhamxay)	Provincial Protection Area	29.7
Phoucoknok	Provincial Protection Area	293.3
Latdeua Latnhang / Phou Phaen	Provincial Protection Area	226.3
Phou Ngou	Provincial Protection Area	1072.7
Provincial Protection Area Total		**1622.0**
Phou Khoiy	District Protection Area	16.2
District Protection Area Total		**16.2**
Total Planation Land in Protection Area		**1,697.7**

5.2 Soils and Geomorphology

5.2.1 Landforms

The topography across the MTP concession area is fairly uniform with respect to topography for the majority of the concession. Topography and landforms have been divided into three categories for the purposes of describing the terrain for this ESIA, as follows (refer to Section 5.1.3):

- Mekong Corridor
- Western Annamite Range
- Foothill Positions

5.2.2 Soils

The Project footprint is dominated by Cambisols and Acrisols, both of which are divided into sub-categories (principal qualifiers) according to the FAO Taxonomic international soil classification system.

Soils in the region are typically derived from siliceous sedimentary formations, and are often mildly acidic, leached of nutrients including boron, and relatively enriched in aluminium (Eswaran et al., 2005). Topsoils have relatively low clay content, subsoils have low base saturation, resulting in low nutrient concentrations and water holding capacity. Soils are generally well leached by rainfall. Swidden agricultural land practices conducted in foothills and paddy rice production systems have altered soil character in much of the area.

Cambisols

Cambisols occupy most of the lowest topographic positions / elevation of the Project footprint. Cambisols are soils at an early stage of soil formation, with weak horizon differentiation. Cambisols in the Project area occur as a result of alluvial deposition and subsequent early phase soil generation. Cambisols are generally comprised of medium and fine-textured materials derived from a wide range of parent rock; with Project area Cambisols resulting from alluvial, colluvial and aeolian deposition.

Acrisols

Acrisols are formed on parent materials containing few basic cations, where precipitation exceeds potential evapotranspiration during a portion of most years. These soils are typically nutrient poor, erosion prone, with high aluminium concentrations that are found in many river valleys of tributaries to the Mekong River. Formation of Acrisols requires long periods of geomorphologic stability.

In the Project area, Acrisols dominate the ridges / undulating hills in the Mekong Corridor in Khammouane Province, and a larger proportion of Bolikhamxay Province, including the Nam Kading / Nam Theun River valleys, Nam Ngiep and Nam Xan River valleys and surrounding foothills and the foothills of the Phou Khao Khoay NPA in Thapabath District.

Acrisols have high relative clay content in subsoils, are acidic, with low base saturation (<50%). Water soluble nutrients are easily leached from Acrisols; thus, fertility is generally low.

5.2.3 Soil Productivity and Uses

Though soil conditions are generally not favourable for crop production, both the lowlands (including some of the flood-prone areas) and foothill positions throughout the Project region have been utilised for agriculture for many generations. Within the last 50 years, the majority of the semi-evergreen dipterocarp forest was harvested in this region and has largely been replaced with a host of crops, including upland / paddy rice, sugar cane, cassava, banana, rubber, eucalyptus, etc.

Cambisols for example have sustained agriculture for many centuries in the major river deltas of Asia have been used for paddy rice production throughout recorded history. The Acrisols that were likely dominated by Mixed Deciduous Forest prior to logging and shifting cultivation continue to provide arable land for upland rice, plantation trees, cassava, etc.

Plantation operators have incorporated soil conditioning into site establishment and management regimes, with dolomite or limestone to elevate pH and nutrient application to overcome deficiencies.

5.3 Terrestrial Ecology and Biodiversity

5.3.1 Terrestrial Flora

The majority of the Project footprint is situated in the Central Indochina Dry Forests ecoregion, which (prior to intensive disturbance) was largely dominated by deciduous dipterocarp forest (also referred to as semi-evergreen dipterocarp forest) in the lowland positions of the Mekong corridor with mixed deciduous forest on ridges of small hills in the plain and foothills to the east of the Mekong corridor.

The entire Project footprint is dominated by Modified Habitats. Habitats surrounding the Project footprint are also fragmented and many are degraded by human activities, particularly habitats not afforded protection. Deciduous and semi-evergreen forest located in the vicinity of the Project have been almost entirely degraded and a significant proportion has been converted to modified habitat types including cultivated land (i.e. rice fields). Natural regeneration of evergreen forest is slow / non-existent to the extent that high quality examples of this forest type in the is extremely limited. Mixed Deciduous Forest has also been highly disturbed throughout the greater Project region, but this forest community regenerates relatively rapidly following disturbance and through natural succession, and may meet the Lao definition of the forest community within a decade.

Limestone Forests, situated east of the Project footprint, are the only remaining forest community in the Project region that is relatively undisturbed and probably high-quality habitat as access to the upper reaches of these limestone formations is extremely difficult / restricted. Limestone formations are recognised as important ecosystems in Southeast Asia (MacKinnon and MacKinnon, 1986).

5.3.1.1 Highly Threatened and/or Unique Habitats

Threatened and / or unique habitats are typically irreplaceable or of high priority, are at risk of significantly decreasing in area or quality, with a small spatial extent and support a unique species assemblage including biome-restricted species (IFC, 2012). The only potential highly threatened or unique habitat according to IFC (2012) criteria occurring within or adjacent the Project footprint is Limestone Forest.

Limestone outcrops are recognised as important ecosystems in Southeast Asia (MacKinnon and MacKinnon 1986) and many of these formations function as biodiversity reservoirs and are associated with a high level of endemism (Schilthuizen, 2004). They are difficult to access by humans and as such support relatively undisturbed, high quality limestone forest and often support high species diversity and high levels of endemism. Quarrying is now regarded as the major threat to the survival of species inhabiting karst habitats in Southeast Asia (Sodhi and Brook, 2006). In Lao PDR, many of these massifs are afforded protection by Nationally Protected Area designations. For these reasons, the associated forest habitats (including limestone forests) may potentially quality as Highly Threatened and/or Unique Habitats and as such may qualify as Critical Habitat in accordance with Criterion 4 (IFC, 2012).

The majority of these vegetated limestone formation areas are located outside of the Project footprint. However, approximately 10 ha vegetated with limestone forest is situated immediated adjacent the Ban Phalaem plantation. This stand of limestone forest was inaccessible at the time of the baseline survey, hence the full floristic assemblage of this area of limestone forests is uncertain. The area is accessible, and thus high value timber is likely to have been selectively harvested but the presence of any endemic, restricted range, nationally or globally rare species is unknown due to restricted assess at the time of the survey.

5.3.1.2 Rare or Threatened Flora

The majority of the plant species found within and adjacent plantations are common to the region. Endemic, restricted range, nationally and globally rare or threatened species were not recorded in plantations during baseline habitat and flora survey. Fallow forests in unplanted concession areas near settlements and roads / tracks are unlikely to support globally rare and threatened trees as it is highly likely that most individuals will have been harvested.

Two globally rare and threatened species were recorded in habitats adjacent MTP plantations, namely *Hopea odorata* and *Anisoptera costata* (in village spirit forests / protected area). The IUCN Red List of Threatened Species (IUCN, 2017) categorise *Hopea odorata* as Vulnerable and the global population is significantly threatened by selective logging. This species is a medium-sized to large evergreen tree from the Dipterocarpaceae family and reaches heights of up to 45 m with the base of the trunk up to of 4.5 m in diameter. Native to eight countries, *H. odorata* is widespread throughout Lao PDR and usually occurs in lowland riparian forest on deep rich soils (IUCN, 2017). This species was recorded during baseline surveys in gallery forest near the Nam Pang River (in Bolikhamxai Province) in close proximity to the Project footprint.

A. costata is categorised by the IUCN (2017) as globally Endangered. *A. costata* is a large emergent tree (up to 65 m high) in the Dipterocarpaceae family. This tree species inhabits semi-evergreen dipterocarp, evergreen and humid lowland forest in Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam. *A. costata* was recorded adjacent to the Project footprint in degraded mixed deciduous forest during baseline habitat and botanical surveys in the Mahaxay district.

Several globally rare and threatened species are known to inhabit forests in Lao PDR (IUCN, 2017) and it is important to acknowledge that stands of forests located in the vicinity of the Project footprint may offer potentially suitable habitats to support these IUCN listed species. The likelihood of occurrence is potentially greater in protected areas and remote tracts of forest where habitat degradation is relatively lower than highly accessible areas of forest, particularly near settlements, agro-pastoral plant and plantations.

5.3.2 Terrestrial Fauna

Plantations

During the conduct of biodiversity focus group discussions and local knowledge surveys, people living in Project villages identified several terrestrial fauna species that may be found within plantation boundaries. The species composition varies according to location. In general, terrestrial fauna are only found in plantations that haven't been regularly weeded. The general consensus from these surveys, similar surveys conducted by Earth Systems for other Eucalyptus plantation forestry projects, and secondary information is that Eucalyptus stands provide poor habitat for terrestrial fauna outside its native range, with species composition and species richness far lower than even fallow or highly degraded natural forest in Southeast Asia.

Surrounding Vegetation

The relative abundance and species composition / diversity of terrestrial fauna in the region is directly correlated with the condition of the habitat (as above), accessibility for hunters, and distance from high value habitat (e.g. National Protected Areas).

During biodiversity focus group discussion, villagers identified 25 mammals, 11 birds, 13 reptiles, 11 amphibian species and several mollusc species that are seen with some regularity within or near village boundaries. This includes the Endangered (IUCN, 2017) Asian elephant (*Elephas maximus*), which regularly forages rice paddy land in three villages near the Phou Hin Poun NPA.

During the conduct of focus group discussions, villagers identified an additional three species which may be of conservation significance in Lao PDR (Duckworth, 1999), including the Leopard Cat / Sua meo (*Prionailurus bengalensis*) (IUCN LC), To yueng (*Capricomis milneedwardsii*), and Ngen hang kho (*Arctits binturong*) which have not been assessed by the IUCN.

Secondary information review and database searches identified as many as 76 terrestrial fauna species that are listed as Critically Endangered, Endangered, or Vulnerable according to the IUCN Red List of Threatened Species (IUCN, 2017) that are considered potential candidates for inhabiting or transient inhabitation of plantation areas. Whilst there is potential for each to visit the plantation area, most are considered unlikely to be found within or adjacent the plantation units that comprise the concession area due to aversion to areas with anthropogenic activity and / or dependency on higher value habitat for food, shelter, protection, and reproduction. Some of the more likely candidates for transient inhabitation are as follows:

RTE Mammals

Species considered potential candidates for transient inhabitation of Project plantations or adjacent land include:

- Sunda pangolin (*Manis javanica*), a Critically Endangered mammal known to inhabit primary and secondary forest in Lao PDR, but occasionally observed in modified habitats;
- Asian elephant (*Elephas maximus*), an Endangered mammal known to seasonally visit Project village lands near the Phou Khao Khoay NBCA;
- Binturong (*Arctictis binturong*), Sambar (*Cervus unicolor*), Greater Slow Loris (*Nycticebus coucang*) and Pygmy Slow Loris (*Nycticebus pygmaeus*); each of which are listed as Vulnerbale by the IUCN, which were identified by villagers during biodiversity focus group discussions as known to inhabit the greater region; and
- Chinese Serow (*Capricornis milneedwardsii*), Eurasian Otter (*Lutra Lutra*) and Black Giant Squirrel (*Ratufa bicolor*); Near Threatened species according to IUCN that were similarly identified during focus group discussion with villagers who have seen these mammals in the greater Project region.

Based on published data and analysis of satellite imagery, habitats in the region of the Project may potentially support the following species considered at-risk in Lao PDR:

- Critically Endangered: Northern white-cheeked gibbon (*Nomascus leucogenys*; PARL);
- Endangered: Dhole (*Cuon alpinus*; ARL); and
- Vulnerable: Northern pig-tailed macaque (*Macaca leonine*; PARL), binturong (*Arctictis binturong;* ARL), large-spotted civet (*Viverra megaspila*; PARL); sambar (*Rusa unicolor*; PARL) and gaur (*Bos gaurus*).

RTE Birds

Several RTE bird species are known to inhabit the region, but are largely restricted to habitat not occurring in or near the MTP Project footprint. The possible exception includes:

- Endangered – Yellow-breasted bunting (*Emberiza aureola*) is a migratory and congregatory bird that breeds in Europe and migrates to a small region in South and Southeast Asia, including Lao PDR where they overwinter, forming large flocks in cultivated areas, rices fields and grasslands, preferring scrubby dry-water rice fields for foraging and reed beds for roosting (IUCN, 2017).

RTE Reptiles

Based on population distribution data, data from biodiversity focus group discussion for this ESIA, and some of species' acclimatisation to human activity, seven RTE reptiles may occur in or near MTP plantations:

- Critically Endangered - Indochinese box turtle (*Cuora galbinifrons*);
- Endangered - Yellow pond turtle (*Mauremys mutica*) and Chinese stripe-necked turtle (*Ocadia sinensis*); and
- Vulnerable - King cobra (*Ophiophagus Hannah*), impressed tortoise (*Manouria impressa*), Mekong snail-eating turtle (*Malayemys subtrijuga*) and Southeast Asian box turtle (*Cuora amboinensis*).

5.4 Invasive Plants

Each of the Eucalyptus and Acacia (species, crosses, etc.) that LFPL planted are not native to Southeast Asia, and thus in the absence of suitable management, are potentially invasive plants. Additional plants being considered for commercial application may be invasive weeds, and will need to be evaluated as part of this decision-making process.

Several non-native and potentially invasive plants were identified during 2017 surveys of plantations and adjacent vegetation for this EISA. Each of these species are very invasive and now a common or dominant component of species composition in disturbed landscapes throughout much of Lao PDR. The most commonly identified non-native, invasive plants identified during Project surveys included:

- *Chromolaena odorata;*
- *Imperata cylindrica;*
- *Mimosa pudica;*
- *Mimosa pigra*.

Two of these four species are considered highly invasive weeds, *Chromolaena odorata* and *Imperata cylindrica,* while the *Mimosa spp*. are less dominant / less of a threat to native plant establishment.

Echinochloa colonm and *Echinochloa crusgalli* are invasive weeds common to lowland / rice production fields in Lao PDR (Pallewatta et al. 2003). These plants were not identified during field surveys for this ESIA, but are considered likely to occur in lower topographic positions of the Project Area.

5.5 Fire Regime

Fire is a commonly used tool for agricultural site preparation in Lao PDR and is also used for hunting to a lesser extent. Natural forested areas in Lao are not prone to intense large-scale wildfire, as opposed to many Australian species, including Eucalyptus and Acacia which are prone to intensive wildfire if ignigted. Communities / individuals may be unaware of the severity of wildfires from these plantation species, given the lesser intensity fires typical in native vegetation of the region.

Eucalyptus and Acacia forests are prone to intense wildfire when ignited. Most of these species have evolved to depend on fire for reproduction and competitive advantage. The leaves produce a highly combustible oil; leaf litter and bark often decay slowly due to concentrations of phenolic, providing additional highly combustible material. Crowns are not dense, allowing sub-canopy plant establishment (additional fuel loading) in the absence of weed control.

LPFL plantations have been susceptible to fire damage since the inception of the Oji LPFL Project, with potential causes ranging from accidental spread from agricultural site preparation / hunting activities, to arson (reportedly).

5.6 Hydrology

Surface waters in Bolikhamxay and Khammouane Province include the Mekong River and some of its first order tributaries (e.g. Nam Ngiep, Nam Kading, and Nam Xebangfai Rivers) as well as many smaller perennial, seasonal and ephemeral streams and wetlands. With the geology of the eastern sections of these Provinces comprising large area of limestone mountains with karst formations, springs are abundant, thus many small streams are perennial regardless of catchment area.

Central Lao PDR is subjected to heavy seasonal rains from approximately May – late September each year, with a pronounced dry season from approximately October – April. Surface and groundwater hydrology in Bolikhamxay and Khammouane Province varies accordingly; with seasonal wetlands, intermittent, ephemeral, and seasonal streams flowing, perennial streams / rivers at their highest, and seasonal wetlands inundated during the height of the rainy season. Flow in perennial streams dissipates and seasonal streams / wetlands dry at varying times throughout the dry season.

MTP plantations occupy variable positions with respect to topography, and thus hydrology. Those on the Mekong Plain are more likely to have fully saturated soils (i.e. wetlands) during the rainy season, though most are situated on slight rises above the floodplain. Foothill position plantations have faster soil moisture drainage and thus less wetlands, but are commonly dissected by seasonal or perennial streams.

5.7 Water Quality

Water quality in Bolikhamxay and Khammouane Provinces varies according to topography / relative position in the catchment, the distance from upstream industry and nature of industry, the extent and nature of agricultural activity, etc. In higher elevations, water quality is generally good for aquatic biodiversity and most domestic water use, although pathogens (e.g. total coliform, faecal coliform, E. Coli) are common, thus drinking water is now typically sourced from bottled water or stream / groundwater is boiled.

The primary tributary rivers of the Mekong River that pass through the Project area Provinces, (Nam Ngiep, Nam Kading, and Nam Xebangfai) are impounded upstream of the Project footprint for hydropower projects, with water quality regularly tested. Elevated levels of some water quality parameters have been detected, but for the most part, primary inputs to water quality is suspended sediment, measured as turbidity or total suspended solids.

In-situ field water quality sampling conducted for this study (October 2017) for a number of streams and rivers throughout both Provinces identified surface water having near neutral pH (ranging from 6.0 – 7.2), low to moderate turbidity (0.7 – 24.4 NTU)) moderate to dissolved oxygen concentrations (ranging from 6 – 7.5 ppm), variable electrical conductivity (55 – 158 µ/cm), and fairly consistent temperatures (23.6 – 27.9 °C).

Extensive laboratory analyses for samples obtained from a seasonal stream adjacent the LPFL Songhong Nursery, found identified generally very good water quality, with a large suite of parameters tested including nutrients, heavy metals, organophosphate and organochlorine pesticides, and common water quality parameters (e.g. pH, TSS, TDS, EC, etc.) all either below applicable national / international ambient and / or discharge water quality guidelines.

The only notable exception identified during water quality analyses for this ESIA were elevated levels of pathogens (in the case measured as 1,600 MPN/100 mL) total coliform and 33 MPN/100 mL E, Coli) upstream of the Songhong nursery.

5.8 Hazardous and Non-Hazardous Materials

LFPL utilised several hazardous materials and generated hazardous waste (collectively referred to as hazardous materials) and generates non-hazardous waste at its nursery and work camps. Current hazardous materials utilised include:

- Pesticides (herbicides and fungicides);
- Rooting hormones;
- Hydrocarbons;
- Waste products from the above (e.g. excess / spent materials, containers); and
- Sewage at its workforce accommodation facility.

Non-hazardous waste is generally confined to refuse / packaging etc. at plantation (during operation activities), the nursery, offices, and accommodation facility.

MTP is currently evaluating its chemical application regime for the nursery. A suite of herbicides, fungicides, and a rooting hormone will be required, which will be consistent with national statutory requirements and international guidelines.

Herbicide application at plantations will comprise Glyphosate spraying in specified plantations.

5.9 Aquatic Ecology and Biodiversity

The Project area of influence includes the Mekong River and some of its first order tributary rivers (Nam Ngiep, Nam Kading, and Nam Xebangfai) as well as many perennial streams, seasonal and ephemeral streams, and wetlands. This aquatic habitat hosts an abundance and diverse composition of fish, amphibians, reptiles, macroinvertebrates, aquatic flora etc., many of which are extremely important sources of protein and / or income for people living in the Project area.

Some of the fish species are known to be migratory, with migration tending to follow rain distribution. Applicable fish move up the Mekong River into its tributaries during the wet season to spawn in rivers, streams, floodplains, and flooded rice fields (depending on the species) and head back down river to estuaries or the ocean at varying times late in the wet season or early in the dry season.

Some of the species known to inhabit Project area aquatic habitat are considered nationally rare or are rare, threatened, or endangered (RTE) species according to IUCN, most of which are fish (likely due to the more extensive

study than for other aquatic species). Given the number of new species / endemic species identified during the conduct of recent intensive fish studies in the region, it is likely that considerably more species diversity, endemism, and perhaps threatened species occur throughout the region. For example, studies conducted from 1996-2012 (Kottelat, 2015) recorded 25 species in the Nam Xe Bangfai and Nam Kading drainages and nine species in the Nam Xe Bangfai thought to be endemic to the system, and 21 species thought to be endemic to the Nam Theun (which discharges to the Nam Kading).

The Nam Ngiep River supports a number of globally rare and threatened fish species, namely: the yellow tail brook barb (*Poropuntius deauratus*; IUCN 2017 listed Endangered), mrigal carp (*Cirrhinus cirrhosus*; Vulnerable); *Scaphognathops bandanensis* (Vulnerable) and *Yasuhikotakia splendida* (Vulnerable). The mud carp (*Cirrhinus molitorella*) and *Mekongina erythrospila* are also present and have been categorised as Near Threatened by the IUCN Red List of Threatened Species (IUCN, 2017).

Respondents to the biodiversity focus group discussion identified 18 fish species known to the region, including one RTE fish species known to occur in the region, *Mystus bocourti / Heterobagrus bocourti.*

5.10 Ecosystem Services

Ecosystem services / natural resources are a very significant contributor to the daily lives of people in rural Lao PDR for both provisioning and supporting services. Vegetated communities provide edible plants, medicinal plants, firewood, construction materials, habitat for commonly hunted fauna, etc. Vegetation also stabilises soil, minimising losses of topsoil to erosion and sediment transport and replenishing soil fertility.

Agriculture remains the most important source of nutrition and income generation throughout rural Lao PDR, thus may be considered the most important ecosystem service in the region. However conversion of vegetation to agricultural production comes at the expense of other provision services (NTFP and TFP) and is of little benefit to local people when implemented for large-scale industrial operations.

Streams provide water for a host of beneficial domestic uses and habitat for fish and other aquatic fauna that are caught and consumed.

Many of these non-timber forest products (NTFP), timber forest products (TFP), cropping activities, and fishing activities comprise important primary or secondary income generating activities, particularly in rural areas and the regulating services that they provide support the ongoing quality of ecology for the beneficial uses.

Natural habitat for ecosystems services has declined in quality and quantity throughout much of the Project region, particularly in the Mekong Corridor. Primary forests (with the exception of Limestone Forest area) were harvested long ago, and the degraded or rehabilitating forests that still provide the priority ecosystems services identified during local knowledge surveys for the ESIA are rapidly being converted to agricultural land in much of the Mekong Corridor.

There is significant variability in the conditions of natural habitat throughout the Project concession area, as follows:

- Natural forest areas in the southeast, east, and northwest portion of the greater concession region providing regulating and supporting services for local residents, water quality, soil, quality, etc.
- Forests that remain in the Mekong corridor are primarily confined to fallow forest regenerating to Mixed Deciduous Forest on the ridges and rolling hills in the Mekong corridor, which provide varying levels of ecosystems services;
- Flatlands, primarily converted from Deciduous Dipterocarp Forest decades ago has not regenerated successfully, and has been replaced by agricultural land or wetland scrub vegetation that provides some value, but lesser quality than that above;
- Fallow forest in the northeast portion of the concession area that is regenerating to Mixed Deciduous Forest (in the absence of continued swidden agriculture) that provide some regulating and supporting services;

- In the industrialising region of the Mekong Plain, natural resources are still important, but the trend toward a more cash based economy in some villages means that natural resources become more supplementary in nature. Many people are purchasing what they don't collect;
- In most of the Project area, rice production is via paddy rice. Swidden agriculture is not practiced in many or most of the Project villages. Instead, degraded uplands are being used more often for rubber plantations, agarwood, banana, etc.;
- Drinking water is sourced almost exclusively from bottles in Lao PDR in recent times. Surface water is still a primary source for other domestic uses, some small-scale hydropower, etc.;
- Fishing is an important livelihood activity, primarily for direct consumption, but is an important livelihood generating activity for people living in proximity to key rivers / streams;
- The importance of hunting is reportedly decreasing, potentially a result of resource decline; and
- Livestock is an important livelihood generator for many of the Project villages.

5.11 Socio-Economic Conditions and Livelihoods

5.11.1 Regional Setting

Bolikhamxay and Khammoune Provinces are located in central Lao PDR and cover a total area of14,863 km^2 and 16,315 km^2 respectively. The Project footprint runs along the west side of the two provinces, close to Mekong River that forms the border with Thailand. The National Route 13 highway runs through the Project area north to south, and provides connectivity between the two Provincial Centres (Paksan and Thakhaek).

The majority of Project concession areas are located in the lowland zone along the Mekong Corridor within nine districts - Bolikhan, Thapabath, Paksan and Pakkading Districts in Bolikhamsay Province and Thakhek, Hinboun, Khounkham, Boualapha and Mahaxai Districts in Khammoune Province.

The region is characterised by high population growth, a growing cash economy, commercialised agriculture, rapid industrial growth, and increasing competition for land resources.

Population density in the Project Districts varies widely and is particularly high in the capital districts of Paksan and Thakhek. The region has developed relatively quickly in the last decade, with most districts having experienced decreased incidences of poverty. Most district family poverty rates are below the national average, with the exception of Boulapha District where many villages are located in mountainous plateau areas with less accessibility to markets and infrastructure.

Topography in the Project Districts varies from mainly flat areas in Paksan District to mountain plateau areas in Bolikhan District, flood plains and undulating hills within Mekong Corridor (Thakek, Hinboun, Khounkham and Mahaxai Dsitrict) and foothill areas in Khounkham and Boualapha Districts. Land use and associated livelihood systems reflect this, varying widely across the districts.

Key agricultural areas are located in Paksan, Hinboun and Thakek District where approximately 25%, 75% and 15.3% of land respectively is used for growing rice and cash crops. Large forested areas are more common in Pakkading, Thapabath and Mahaxai districts (70%, 80% and 57% of land area respectively) where two large national protected areas (Nam Kading and Phou Khao Khouay) are located. The limestone mountain region is a key feature of the Project Districts, particularly in Khounkham District.

5.11.2 Population and Demographics

The majority of current Project concession areas are located in lowland areas within Hinboun district, Thakhaek district and Pakkading district, with the lowest number in Bolikhan district and Khounkham district.

Project concession areas are generally located in villages having medium population density, located within relatively easy access of district centres (1-2 hours). Surveyed Project villages vary in population size, ranging from 2,743 people in Ban Namdeua in Pakkading district to136 people in Ban Naheuang in Hinboun district, with an average village size of 750 people per village. Average household size is 5.3 persons per household and overall gender ratio is 0.99 (female to male).

Population density is greater in villages in Pakkading, Hinboun and Thakek districts, particularly along the National Highway 13. Villages in more rural district such as Mahaxay and Boulapha have largely lower population densities.

Further information on demographic indicators in the Project Area is presented in Table 5-4.

Table 5-4 Demographic indicators of surveyed Project Villages

Province / District	Number of villages surveyed	Population in surveyed villages				Average village size	Average Number of HH per village	Average HH size	Sex ratio (males to females)
		No. Households	No. Families	Population	Females				
Borikhamxay Province									
Bolikhan	3	652	778	3,302	1,635	1,101	217	4.24	1.02
Paksan	13	2,582	2,813	13,735	7,230	1,057	199	4.88	0.9
Pakkading	20	3,545	3,907	19,075	9,146	954	177	4.88	1.09
Thaphabath	8	1,582	1,597	8,638	4,358	1,080	198	5.41	0.98
Khammouane Province									
Hinboun	50	5,090	5,813	27,211	13,727	544	102	4.68	0.98
Khounkham	3	870	937	4,287	2,106	1429	290	4.58	1.04
Thakhaek	20	2,390	2,418	12,510	6,304	626	120	5.17	0.98
Mahaxay	11	1,574	1,569	8,088	4,024	735	143	5.15	1.01
Boualapha	4	413	446	2,145	1,119	536	103	4.81	0.92
All surveyed villages	**132**	**18,698**	**20,278**	**98,991**	**49,649**	**750**	**142**	**5.29**	**0.99**

Source: ES Phone Survey, 2017

5.11.3 Regional Economy

Key economic indicators for Project Districts are presented in Table 5-5 below. Most districts have a relatively high GDP with the exception of Mahaxay District. Being the two capital districts of the Project Provinces, Paksan and Thakhek Districts have the highest GDP in the Project Area. Overall, agriculture remains the primary economic activity, although the region is transitioning to more market based economies, particularly in the Vientiane Plains, the Mekong Corridor and areas along the National Highway 13.

The region is also experiencing a growing industry sector, especially in Project Districts in Khammoune Province. This has been attributed to the establishment of the Special Economic Zones/Areas near the capital district (Thakhek) and the development of the East-West link where the Thakhek Friendship Bridge was built in 2011.

The primary livelihood activities in the Project Districts include a combination of subsistence based and commercial agriculture, livestock raising, industry plantations, natural resource harvesting and cottage industry (e.g handicrafts). The key cash crops include rice, maize/sweet corn, cassava and sugar cane. Industry plantations include rubber, eucalyptus, teak and agarwood trees.

Table 5-5 Economic activity across the Project Region – District level

Province/Districts	GDP (Bill. LAK)	GDP / Person / Year (Mill. LAK)	GDP Growth (%)	Sector Contribution (%)		
				Agriculture	Industry	Service
Borikhamxay						
Bolikhan	391.07	8.70	8.02	40.00	28.00	32.00
Paksan	650.00	14.84	9.00	36.00	39.00	25.00
Pakkading	N/A	N/A	N/A	N/A	N/A	N/A
Thaphabath	374.00	13.39	11.00	51.00	36.00	13.00
Khammouane						
Hinboun	352.37	6.98	10.70	69.89	23.17	6.97
Khounkham	126.80	5.72	5.64	23.19	38.69	38.12
Mahaxay	38.40	0.77	9.00	56.68	17.00	26.32
Thakhek	1,242.00	14.08	12.73	N/A	N/A	N/A
Boualapha	161.10	5.51	8.50	70.20	18.20	11.60
Mean (District)	**416.97**	**8.75**	**9.32**	**57.83**	**33.34**	**25.50**

Sources: BLX DPI, 2015 and KM DPI, 2015

5.11.4 Local Economies and Livelihood Systems

Lowland areas, particularly in the Mekong Corridor where the majority of Project concession areas are located are characterised by high populationd growth, a growing cash economy, commercialised agriculture, rapid industrial growth, and increasing competition for land resources. These factors are resulting changing livelihood profiles of Project Villages.

Livelihood systems in the Project area are based on lowland rice cultivation, animal husbandry, fishing in nearby rivers and streams, collection of NTFP, TFP and a variety of non-agricultural activities.

The diversity of livelihood systems varies across the Project Villages, with some villagers being more dependent on land based livelihoods whilst others, particularly in the fast growing areas adjacent to the National Road 13 have had the opportunity to diversify their livelihood base with a number of wage employment and non-agricultural activities. Livelihood systems in the Project Area include:

- Villages that are less dependent on land based subsistence and have had the opportunity to diversify their livelihood strategies through off-farm activities such as salaried employment, small business (e.g shops, restaurants), factory work and other industry related employment. Whilst natural resources are collected, this is mainly for consumption or limited sale. Some of these villages also engage in commercial or market orientated agriculture, particularly in the fertile areas of the Mekong Plains;
- Villages whose residents are largely dependent on land based subsistence livelihoods and have little other livelihood or employment opportunities available. Livelihoods in these villages are also constrained by declining availability of land and natural resources, particularly forested areas usually used for the collection of forest products; and
- Villagers who are largely dependent on land based subsistence livelihoods, with abundant natural resources available in the vicinity of the village. Livelihood systems are relatively unconstrained in these areas.

5.11.5 Agriculture

Consistent with regional trends, agriculture is a dominant livelihood activity in the Project Area, with residnets of more than 70% of villages surveyed indicating that agriculture ranked as the primary or second most importance source of income. The main agricultural systems practiced in the Project Area include:

- Lowland Rice Cultivation – typical of villages in lowland areas, this is practiced by nearly all 132 villages surveyed, with the proportion of households engaged ranging from 6% - 100%. The average area of land managed per household is 1.96 ha. Approximately 80% of the 23,924 ha of rainfed rice paddies is located along the Mekong River in the Paksan, Pakkading, Hinboun, and Thakhek districts. The villages with the largest areas of rainfed rice paddies are Bauvaengkham in the Paksan district with an area of 1,356 ha and Phong in the Hinboun district with an area of 1,240 ha. The districts with the least amount of rainfed rice paddies are Bolikhan, Khounkham, and Boualapha, which are all located further away from the Mekong River.
- Irrigated rice – This is slightly less common in the Project area, with nearly a third of surveyed villages cultivating approximately 1,412 hectaires. Villages with a high proportion of households cultivating irrigated rice were mainly located in Hinboun and Thakhek Districts. The average area of land managed per household is 0.7 ha.
- Upland Cultivation – with villages in the region shifting away from swidden agriculture and the fact that many Project Villages are located in lowland areas where upland cultivation is not practiced, this agricultural system is much less common in the Project area. Villages surveys indicated that 36 villages practice some form of upland cultivation, mostly in western Hinboun District, closer to the foothill areas. The proportion of households per village engaged in upland rice cultivation ranged from 1% (e.g. in Ban Nongkoun and Ban Elan) to 31% (e.g. in Phonsoung). The average area of upland cultivated land per household is 1.6 ha. The village with the largest area of upland cultivation is Ban Thasaart in the Pakkading district with 91.5 ha.
- Permanent upland production of other crops - this is more common in the Project Area, with 113 of the surveyed villages engaged. A variety of crops are cultivated including rubber trees, corn, cassava, banana, and vegetables. In 11 villages, permanent upland agriculture is the main agricultural system, with 100% of households engaged. The largest area of other (non-rice) upland cultivation is in Pakkading and Hinboun districts with the average cultivated area per household approximately 1.6 ha.

Table 5-6 – Village total agriculture land use allocation for rice production and upland cultivation in target districts

No	District	# Surveyed villages	# of Households	Rain-fed rice paddies		Irrigated rice paddies		Upland cultivation		Other Upland cultivation	
				Area (ha)	%HHs	Area (ha)	%HHs	Area ha	%HHs	Area ha	%HHs
Borikhamxay Province											
1	Bolikhan	3	652	382	63	0	0	72	13	365	30
2	Paksan	11	2209	5174	82	81	6	0	0	1182	52
3	Pakkading	19	3399	4861	86	0	0	145	2	3605	54
4	Thaphabath	6	1164	1058	83	115	18	20	1	1089	66
Khammouane Province											
5	Hinboun	48	4953	5946	67	602	17	261	5	4143	41
6	Khounkham	3	870	554	59	300	46	0	0	45	17
7	Thakhek	20	2390	3260	87	133	11	5	0	1403	44
8	Mahaxay	9	1382	1972	83	203	18	15	2	660	50
9	Boualapha	3	292	785	100	0	0	3	1	3	0
Total		**122**	**17311**	**23992**	**78**	**1434**	**12**	**521**	**3**	**12494**	**46**

Source: ES (2017) - Phone Survey

5.11.6 Local Infrastructure

Over the last decade, the Government has more than doubled the percentage of villages with critical infrastructure across the country - including grid electricity, water supply infrastructure, road access, health facilities and primary schools. This has been facilitated through both infrastructure development and administration consolidation (with a 25% reduction in the number of villages).

LPFL has provided approximately $1,376,347 USD to construct / upgrade roads, electricity, schools, temples and additional village infrastructure in Project villages. Local infrastructure in surveyed villages reflects the regional trends. Nearly all of the 132 surveyed villages are connected to the grid, the majority of which have a primary school and year-round road access. Fewer villages have a secondary schools and health centres.

5.11.7 Transport and Accessibility

The Project Area is serviced by National Highway 13 and various Provincial and District roads. National and Provincial roads are sealed (i.e. concrete, asphalt or tarred).

Project associated road improvements and constructed bridges (where applicable) have provided improved access for some local villages near Project concession areas. This has facilitated improved accessibility, although during focus group discussions it was reported that some roads built by the Project require maintenance.

The majority of villages in the Project area have year around access to road infrastructure, with 25% of villages, mainly in Hinboun District only have seasonal access. Most villages also have easy access to district centres, with travel times of 1-2 hours.

5.11.8 Water Use

Local surface and ground water resources (rivers, streams, lakes, wetlands, aquifers etc.) play a significant role in the day to day lives of people living in rural areas. Many households also depend on nearby water resources for drinking, washing, bathing, swimming and collection of aquatic resources. For households without access to improved water sources, mountain water sources were most commonly accessed.

Surveyed villagers utilise water from a wide variety of sources including rivers (e.g. Nam Ngiep, Nam Lin, Nam Kading, and Nam Xebangfai) and their tributaries and streams; ground water wells, gravity flow water systems; and freshwater springs. These sources are utilised for drinking, fishing, laundry, cooking, and bathing. The dominant form of domestic water supply throughout the Project region is open wells.

Table 5-7 Access to water resources in surveyed Project Villages

No	District	# Surveyed villages	Water Supply (Domestic water) - % of households with access						
			Pipe Scheme	Gravity Fed System/ Nam Lin	Closed borehole	Open well	River/ Stream	Natural spring collection	Other
Borikhamxay Province									
1	Bolikhan	3	31%	0%	20%	47%	2%	0%	0%
2	Paksan	13	27%	0%	11%	63%	0%	0%	0%
3	Pakkading	20	4%	4%	18%	69%	3%	0%	0%
4	Thaphabath	8	16%	2%	32%	24%	0%	0%	0%

Khammouane Province									
5	Hinboun	49	7%	0%	30%	48%	12%	0%	1%
6	Khounkham	3	87%	0%	0%	13%	0%	0%	0%
7	Thakhek	20	8%	0%	31%	58%	3%	0%	0%
8	Mahaxay	10	0%	19%	35%	25%	14%	0%	0%
9	Boualapha	4	28%	0%	7%	1%	71%	0%	0%
All surveyed villages		**130**	**23%**	**3%**	**21%**	**39%**	**12%**	**0%**	**0.2%**

5.11.9 Gender

Livelihoods and Employment

Similar to most of Lao PDR, rural economies in the Project area have a gendered division of labour and a gendered division of the income and benefits of labour. Some roles are traditionally undertaken by men (e.g. hunting and fishing) and some roles are traditionally undertaken by women (e.g. handicraft, and livestock rearing). Women undertake most household duties (i.e. cooking and cleaning), including the collection of water for household consumption or usage, and the collection of firewood or fuel and taking care of small livestock.

In the surveyed villages, both men and women reportedly play a role in agriculture. Men are generally more involved in the agriculture works, however women also help with the rice paddies. Women undertake the marketing and sale of their agriculture and livestock products, including selling rice, cassava, vegetables, fish, and livestock, which contributes to household income in combination with handicrafts, undertaking petty trade, and wage labour. Handicraft is also one of the main duties of women in the project area, which includes weaving, and making brooms, sticky rice boxes, and bamboo fences.

Secondary to agriculture, men also sell their labour to provide / supplement household income. The labour generally comprises construction works, agricultural work, and mining. In villages near the major city of Pakxan, such as Ban Thongyai and Phonemoungkhoun, both men and women work for the government of Lao.

Education

There is a literacy gap between men and women in the Project area with male literacy rates reportedly between 68% to 95% across the districts and female literacy rates between 43% to 70%. The district with the largest gender gap in the project area is Bolikhan with a male literacy rate of 95% and a female literacy rate of 43%.

Education has a lesser gender related gap. In all the Project districts the percent of school-aged females enrolled in school is between 40-60% from pre-school up to upper secondary level.

Child Labour

As the Company will contract labourers from affected villages or nearby communities, there is inherent risk for child labour. Due to the nature of farming in Lao PDR, many children younger 14 or 14 – 17 (each of which have implications for hiring) actively work family farms or conduct other livelihood generating activities. During the conduct of the *Environmental and Social Due Diligence Assessment of the LPFL Project* (Earth Systems, 2015), it was identified that LPFL had hired underaged casual labourers for light duties. This issue will require careful management and due diligence for MTP.

Legacy Issues

During consultations, village surveys and field investigations conducted for this ESIA, a number of legacy issues relating to livelihoods and community perception of Project benefits were identified, which if not effectively managed or mitigated by MTP, may affected the Project and local communities, going forward.

During consultation with villagers and District authorities, a number of issues were raised regarded historical land acquisition for the Project, including: (i) lack of free, prior, and informed consent as Village Authorities were often the only representatives included in the process; (ii) loss of resources in village lands (e.g. non-timber forest products, timber forest products) impacting livelihoods and food security; and (iii) clearance areas extending well beyond demarcated zones, with moderate to high value forested areas cleared in some villages and in a number of National, Provincial, and District Protection Areas.

As part of the Concession Agreement and associated amendments, BHA LPFL was required to pay $50 USD / ha for the fifty-year lease period ($1USD / actual planted concession land ha / year for 50 years). The Company spent approximately $1,454,630 for approximately 24,000 ha of planted land, which was used for various community development initiatives (e.g. access road upgrades, school construction, temple construction, electricity, etc.). LPFL has favoured road construction / upgrades (~35% of lease fees). Roads require recurring maintenance (reportedly not conducted), thus community development activities have often provided short-lived benefits.

Whilst community development was conducted in accordance to the Concession Agreement, a lack of transparency during implementation was reported by many affected villages, leading to: (i) perceptions of underpayment or lack of payment for cleared land, (ii) lack of consideration for community development priorities identified during consultation, (iii) and a number of community development promises reportedly unfulfilled.

Participation in LPFL's outgrower forestry scheme has been fairly significant since its inception in 2005, with as much as 5,028 cumulative ha planted. LPFL's previous inconsistent approach to implementing this scheme has created uncertainty and apprehension for participants, as well as significant community dissatisfaction. Very little technical advice has been provided to participants, the nature of contracts and existence of contracts in some cases is unclear, and the proposed compensation arrangements are not well-defined.

Many of the plantations have reached the intended rotation age (7+ years) and LPFL has reportedly not responded to inquiries regarding the timing of harvest. LPFL was also nearing a breach of contract which states that the company will buy the timber from the outgrowers when they reach 5 – 7 years of age.

The greater majority of participants would like to harvest their plantations to move back to upland farming and / or to achieve the financial gains from selling the timber. Participants are apprehensive regarding market demand for the timber and LPFL's intent for these operations.

In addition, a number of outgrower plantations have been lost to fire or disease or are of sub-optimal quality and participants are concerned over their potential inability to pay back loans for the scheme.

5.12 Archaeological and Cultural Heritage

5.12.1 Archaeology

The region surrounding the Project is thought to have a rich archaeological record, although very few archaeological investigations have been conducted in the region. Part of the Project Area and associated plantations in the eastern edge of the concession abut or are within the western edge of the Annamite Range, with steep limestone monoliths or regolith rising from the plain (e.g. concessions in the north-eastern edge of Thakhek District, eastern Hinboun and Pakkading Districts). A number of archaeological artefacts have been discovered in the caves of the Annamite Range, including a number of Buddhist statues and other artefacts dating from the Lan Xang period (13th century) as well as finds of human remains.

The significance of limestone karst as a source of archaeological deposits is documented by Vermeulen and Whitten (1999). They identify limestone regions as important ancient and modern cultural heritage sites which harbour some of the earliest evidence of human culture. Colani (1932) also discovered evidence of a Neolithic population in the limestone caves of Khammouane Province.

Whilst most discoveries in the region are recent, the Project location likely has a rich archaeological history. Due to its location near the Mekong River – a known thoroughfare for millennia, it is anticipated that archaeological discoveries like those recently discovered in northern Lao PDR would be applicable, given significant study.

Examples of archaeological finds identified during the focus group discussions and field verifications in targeted villages include:

- Bronze pottery in good condition (35 cm height and width, 3 kg weight) found in Tham Pha (Buddha Cave) near Phalaem village;
- Human bones reportedly dating back to the 14th Century, ancient blessing stones and 114 Buddha statues found in Tham Pha (Buddha Cave) near Ban Thami village;
- Seven bronze Buddha statues found near Phabath village; and
- Bronze Buddha statue (60 cm height, 9 kg weight) found in 2014 in Tham Tadyong (small cave) near Ban Yangkheua village. It has since been stored in the temple in Ban Phonengam (neighbouring village)

5.12.2 Cultural Heritage

Numerous sites of local cultural heritage or significance are found within and surrounding Project Villages including temples, cemeteries, statues, spirit forests and natural areas (springs, caves, streams, etc.) that are culturally significant for the communities.

Spirit Sites

Each of the ethnic groups in the surveyed villages reportedly believe in spirits that control various aspects of the cosmos and explain causality, including accidents, sicknesses, death and incomprehensible phenomena. Each spirit is associated with a certain location and power. The most important powers in the spirit world are reportedly the Territorial Spirits (Phi Ban) that govern large areas and are important considerations when granting industrial concessions or relocating villages. Territorial and mountain spirits receive offerings that belong to the particular situation of the village (e.g. pigs or chickens, along with alcohol and other items prior to the commencement of the marriage, constructing a new house, or other significant events). The origin of these spirits is often a legendary person/founder of the village.

Most villages in the Project Area likely have some form of spirit site. Within the villages targeted during the focus group discussions, most villages had one spirit site, generally a forest or a cave, although two villages did not report any spirit sites. Most of the spirit forests identified during the focus group discussions cover an area approximately 1 to 5 ha, although some are considerably larger (e.g. 15 or 30 ha).

Specific examples of sites include:

- Mahesack or Phimeuang – Kavak village - a 15 ha forest. Annual offerings are made as well as additional offerings when there is an activity that may impact the village or forest.
- Pha Done Hor or Hor Phi Ban – Thongkouang village - a small cave established as a spirit site by an ancestor. Annual offerings consist of four chickens and four jars of alcohol.
- Ban Phalaem and Ban Phone Ngam (Thakhek District) share spiritual forest which is known as Pa Done Hor (Done Hor cliff). It has the total area of approximately 1 ha. Villagers prepare offerings to the spirit every year;

- Ban Nong Hoy (Hinboun District) has Nam Pakan spiritual area which is located along the Nam Pakan River. Villagers believe that there are sacred spirit in the cave along the river and offerings are made twice a year. The area is reported to be approximately 300 m from the LPFL plantation area; and
- There are two spiritual forests in Ban Phonesaart (Hin Boun district), approximately 2 ha and 2.5 ha in size. These spirit forests are located approximately 1 km and 300 m from the village respectively. These were reported to have valuable timber and NTFP. They were also reported to be located approximately 100 m from the LPFL plantation area.

Religious Sites

The 132 Project villages surveyed for this ESIA identified 159 temples occurring within their respective village boundaries. During the focus group discussions in targeted villages, it was indicated that some of the temples are approximately 200 or 300 years old, while most were built in the last century. The temples vary in size, with the largest recorded measuring 8000 m^2. Some of the temples house monks and novices.

Cemeteries

During the conduct of focus group discussions, it was reported that all the villages visited had at least one cemetery. Most of the cemeteries cover an area approximately 1 to 2 ha, although some are considerably larger. These were mostly located at least 1 km from LPFL plantations and within 1 km of the village centre, although one particular village that was visited indicated that a cemetery was located within 100 m of the LPFL plantation area.

Different rituals are undertaken in the cemeteries by local villages. In most cases, residents require permission from village authorities to cut down timber in these areas.

Intangible Cultural Heritage

The main ceremonies and festivals celebrated each year include:

- Annual Festival
- Khao Phansa (Buddhist Lent)
- Khaopadabdin
- Khaosalaak
- Orkphansa (End of Buddhist Lent)
- Bounkongkhao
- Boun Phravet or Pravet festival.

These festivals are commonly celebrated throughout Lao PDR.

5.13 Noise

Baseline ambient noise conditions (measured as dB(A) for this study, were found to vary considerably across the Project concession area. Villages situated along National Road 13 and National Road 9, as well as those near limestone quarrying operations and other industrial activity, experience considerably elevated ambient noise emissions during the day with moderate noise at night.

The villages located to the east, southeast and northwest portions of Project footprint experience ambient noise conditions more typical of rural Lao PDR, with emissions well below national and international emissions standards. Noise emissions during monitoring were consistent with that expected from vehicle use, livestock, and social activity (music, talking, etc.).

Ambient noise conditions within plantations is likely very low given the typical distance from settlements and major arterial roads.

5.14 Air Quality

Due to its distance from major population centres, the baseline air quality in the MTP Project areas is considered good for the majority of the year. Sources of ambient air pollution in the Project area include dust from unsealed roads, particulates from vegetation burning activities associated with site preparation for agricultural plots, vehicle exhaust emissions along the heavily trafficked Highway 13, and emissions from some industrial activities.

The primary factor impacting air quality in the area is windblown fugitive dust. Regional burning of vegetation in the dry season may also result in enhanced particulate concentrations from smoke and ash, above health criterion levels. Baseline particulate concentrations in the wet season are anticipated to be generally very low due to natural suppression by the regular rainfall and the lack of biomass burning during this period. Project contribution to existing vehicle emissions (SO_2, NOx, CO and particulates) from nearby roads are currently estimated to be negligible due to the low volume of vehicle transit in the vicinity of the Project, relative to other vehicle movements.

Ambient air quality was monitored for 3 days (72 hours) in Ban Nonsomboun. The results are provided in Table 5-8.

Table 5-8 Baseline dust concentrations (24 hr, micrograms/m^3)

Parameter	Nonsomboun Mean	Laos Guidelines	WHO Guidelines
Total Suspended Particulates (TSP)*	-	330	n/a
Particulate Matter <10 microns (PM10)	219	120	50
Particulate Matter <2.5 microns (PM2.5)	-	n/a	25

*TSP = detection below 15 micrometres in size.

Monitoring at Ban Nonsomboun (conducted along the shared village / plantation access road near social receptors), found average PM_{10} concentrations exceeded Lao and WHO guidelines. With monitoring conducted during the dry season, when road dust is generated and burning for agricultural site preparation; the air quality monitored is considered 'worst-case' conditions.

6 RISK ASSESSMENT OUTCOMES

The implementation of proposed management and mitigation measures outlined in the ESMMP (Volume C) is expected to reduce the anticipated residual level of overall risk exposure for the majority of the identified risks. The risk assessment (Chapter 5, ESIA Volume B) identified two High and 15 Moderate residual risks post-mitigation. These risks and impacts are discussed in Section 7. No Extreme risks were identified.

Table 6-1: Summary of High and Moderate residual risks after mitigation

Aspect	Likely Primary Cause	Summary Management Measures	Residual Risk
Land use and community dissatisfaction - Allocation of village land to LPFL; resulting reduced availability of land for natural resource collection and agricultural expansion	Land allocation for the Project; Population expansion; Real or perceived lack of FPIC during LPFL land acquisition due to community wariness of complaints to government	• Implementation of international standard Grievance Redress Mechanism • Provision of employment programs for Project affected villages; • Targeted application of the MTP Community Investment Program for vulnerable communities.	High
Forest resources - Loss of forest resources (i.e. TFP, NTFP, terrestrial habitat) due to establishment/re-establishment of plantations and other land conversion			High
Adverse impacts on downstream water quality	Erosion of unsealed roads and plantation land following vegetation clearing	• Progressive implementation of robust stormwater, erosion, and sediment control on unsealed roads as they are upgraded	Moderate
Loss or degradation of plantations / outgrower plots due to significant storm events and flooding that exceeds typical annual inundation	Typhoons or significant storm events exceeding typically rainy season rains / flooding (i.e. 1:100 yr storm events)	• Avoid planting in areas not suitable for industrial plantations (including outgrower plantations). • Consider other species tolerant of seasonal inundation / soil oxygen depletion during the rainy season	Moderate
Wildfire and associated impacts to environmental and social receptors	Vegetation burning from adjacent agricultural plots, controlled burns in plantations, arson.	• Implementation of fire prevention and response management plans; • Ongoing community consultation and implementation of Grievance Redress Mechanism	Moderate
Loss of habitat for terrestrial biodiversity	Implementation of monoculture cropping (low value habitat) on approx. 17,900 ha. Robust weed management to eliminate shrub and herbaceous vegetation	• Biodiversity offset of 2500 ha of native habitat; • Incorporate 5 m buffers on each side of seasonal streams and 10 m buffers on each side of perennial streams; • Restore concession to natural habitat following decommissioning	Moderate
Dissatisfaction of participants in the Farmer Extension Program	Lack of communication and support by LPFL; Lack of an end market for timber.	• Development and implementation of the MTP Outgrower Scheme Phase 2; • Purchase timber or find suitable vendor	Moderate
Increased pressure on village forest resources	Population expansion; Land allocation to LPFL; Other concessions.	• Provision of seasonal labour to Project affected villages; • Targeted application of the MTP Community Investment Program for vulnerable communities.	Moderate

Aspect	Likely Primary Cause	Summary Management Measures	Residual Risk
Planned 'Community Investment Program' may not benefit communities that are in less favourable locations for business development (and tend to be more disadvantaged).	Community investment programs potentially favour centrally located villages that already have significant employment opportunity. The poorest are less accessible and may be less likely to be selected for business development.	• Tailor engagement to vulnerable / poorer villages to the extent practicable; • Implement local employment policies for seasonal plantation work; • Consider support programs that benefit vulnerable groups / villages. • International standard Grievance Redress Mechanism and social monitoring.	Moderate
Serious injury during vegetation clearing, site maintenance, nursery work	Climate, Unsuitable use of heavy machinery or chemicals, inadequate training, lack of PPE, unmaintained equipment	• Workers trained in operations / equipment procedure, equipment maintenance and upkeep, • Emergency response planning, • Provision of first aid equipment and training, • Provision of and strict use of PPE.	Moderate
Serious injury during harvesting activities	Lack of training. Unsuitable staffing selection. Improper use of PPE. Unmaintained equipment.	• Specific training for high risk activities (e.g. chainsaw) and use of qualified people. • Emergency response planning. • Provision of first aid equipment and training. • Provision of and strict use of PPE.	Moderate
Injury or death from UXO	Moderate to High UXO risk in south-eastern portion of the concession area. Lack of robust UXO survey and clearance by LFPL	• Risk assessment for each plantation regarding UXO • UXO survey and removal by certified operator.	Moderate
Community health and nutrition issues	Population increase and land allocation to LPFL potentially leading to food insecurity	• Implement local employment policies for seasonal plantation work; • Consider support programs that benefit vulnerable groups / villages. • International standard Grievance Redress Mechanism and social monitoring.	Moderate
Community health and safety issues	MTP vehicle transport through villages; Shared access roads; Child labour	• Transport safety measures (e.g. speed limits through villages / on village access roads); • Workforce training and education; • Safety policies and protocols in place; • Child Labour Policy and diligent management.	Moderate
Uncertainty regarding crop selection for 2,276 ha of concession. Potential for introduction of invasive plant or difficulty eradicating crop during decommissioning, hindering restoration.	Improper species selection	• Careful evaluation of potential crops for trialling / implementation; • Selection of a non-invasive crop common to the region; • Consideration of utilising native species	Low - Moderate

7 IMPACT ASSESSMENT

Key Project impacts and opportunities are summarised below, and the approach to management and monitoring is summarised in Section 9.

7.1 Socioeconomic Conditions and Livelihoods

Benefits

To date, two thirds of the villagers surveyed reported that the LPFL Project had contributed to some level of improvement in the village through employment during Project implementation and improved infrastructure through community development initiatives. However the villagers also reported that the loss of land due to the Project from the establishment of the plantations had some adverse impacts.

The main economic benefits of the Project moving forward will be at the National and Provincial level as the GOL is a minority owner of the Project and will receive dividends (refer to Section 1.2.4). The Project will also provide the GOL with taxes, increased direct foreign investment in the county; and potentially new employment opportunities. These benefits may also flow on to the local level via GOL investment in services and infrastructure.

Other key socioeconomic and livelihood benefits of the Project at the local level will include livelihood benefit via the Phase 2 Outgrower Schemen (Farmer Extension Program) and benefits from employment and training opportunities that are expected to be provided to local villagers (i.e. villages that have the plantation within their boundaries) on a rotational basis.

The Project currently employs 92 full time staff across operations including management, office staff, nursery and forestry operations personnel. The Company also contracts labour for seasonal operational activities, including harvesting, planting, thinning, pruning, weeding, etc. (in addition to its full-time staff). MTP also currently employs 110 Village Assistants as the primary conduit for consultation between the Company and the Project Village. MTP is currently developing a Community Work Contract and Incentive Scheme (CWCIS) that will be trialled in 2018 in a select number of communities. If successful, the CWSIS will replace the Village Assistant program, with a system that distributes expenditure more widely throughout communities by providing further work opportunities and incentives for protecting the plantation.

There will also be livelihood benefits via MTP's new "Community Investment Program" (CIP) being developed which aims to identify potential linkages between MTP's business needs and the what communities can offer, and then invest in community-based initiatives to help create those linkages.

Additional benefits that will support improved livelihoods and socioeconomic conditions for local villages may include improved accessibility associated with road maintenance for operational activities, as well as the rehabilitation of at least 10% of the Concession Area (approximately 2500 ha) for conservation purposes as part of the Project. The rehabilitation of this area will partially offset reduced availability of non-timber forest resources for those villages with land selected for restoration.

Impacts

The most significant adverse socio-economic impact of the Project to local communities are expected to result from the continued long-term loss of access to use land due to allocation for the Project. MTP plantations account for an average of 1.91% - 15.41% of total village land area, though for some villages as much as 30% - 65% of village land was allocated to LPFL. This impact is significant given the Project occurs in a region experiencing increasing pressure from population growth, industrial development, commercial agriculture and other factors. The local communities will not receive lease fees for the use of this land from MTP. Socio-economic and livelihood impacts of this land loss will include:

- Loss of income due to reduced land available for agricultural expansion;
- Reduced food security due to reduced availability of forest resources such as NTFP and TFP; and
- Loss of income from the collection of forest resources in most Project Villages.

The severity of the impacts of Project-related loss of ability to use this land is expected to vary from Minor - High in significance for Project Villages depending on the livelihood strategies of the village and the remaining available land resources. The impacts for each village will also be influenced by the success of the livelihood mitigation measures implemented by MTP as community development initiatives constituded a once-off payment of $50 USD per planted ha, with no continued lease / rent fees. The overall impact of long-term loss of rights to use land for the Project is considered of Moderate-High significance overall.

There may be increased impacts on food security for vulnerable groups that are not able to benefit from employment activities or other Project initiatives, particularly due to the reduced availability of forest resources. To ensure benefits are maximized it will be important to address the legacy issues of previous Project implementation. A key challenge will be ensuring that net beneficial outcomes for local communities (including the development of a viable outgrower scheme) are distributed across affected villages with a focus on more vulnerable communities. Land loss may well be an increasingly important issue as competition for land and forest resources in the Project area has intensified through population growth, industrial development and other factors; a trend which is expected to continue.

Regular monitoring through community consultations and socio-economic surveying will assist MTP in understanding the impacts (positive and negative) of the Project and ensure the effectiveness of management and mitigation measures as the Project moves forward.

7.2 Land and Land Use

The most significant land use impact of the Project moving forward will be the continued long-term loss of access to land for agricultural expansion and natural resource collection for the duration of the Project, adding cumulatively to the loss of available land for villages in the region for other activities (particularly industrial rubber plantations).

The legacy impacts from communal land allocation to the Project remains for MTP, with many affected villagers currently unhappy with the proportion of village land allocated to plantations. With population increasing at rates above the national average (for most Project villages), direct and indirect impacts have become incrementally worse – a trend that is expected to continue throughout the concession period.

The extent of impacts on land use to date has varied considerably between Project villages. Those with abundant natural resources within a reasonable distance from settlement, arable land available for agricultural expansion, and access to employment / industry indicated very little impact – with several indicating net benefit, resulting from community development associated with the CSR funding for land allocation. On the other extreme; villages without abundant natural resource, land for agricultural expansion, or access to employment opportunities are disproportionally impacted. Each of the Project villages will fall somewhere within this range.

The Project Concession Area includes approximately 46.5 ha of land within two National Protected Areas (Phou Khao Khoay and Phou Hin Poun NPAs). There is some risk for Company reputation with encroachment into NPA areas. However, this land was allocated to LPFL due to repeated degradation of habitat through swidden agriculture at the fringe of the NPAs. According to Central DOF, District authorities in consultation with the MAF and DONRE / PONRE determined that plantations would be an acceptable land use for these areas given repeated vegetation removal from farmer activity. MTP's plan to restore approximately 2,500 ha of its concession area to natural forest communities for conservation purposes will serve to offset impacts to degraded land within NPAs if implemented effectively.

Diligent application of management and mitigation measures described in the ESIA will be required to minimise future land use impacts, and offset impacts where practicable. The planned changes to the Farmer Extension Program (i.e. OGS Phase 2) will be a significant opportunity to regain some of the trust lost during Oji LPFL management of the outgrower scheme. By improving the model and finding a market for plantations ready for harvest, it is expected that MTP will be able to provide benefit to many of the affected villagers and improve the Company's social license to operate throughout the region.

7.3 Ecology and Biodiversity

Clearance of natural habitats associated with the Project occurred at Project commencement with the original establishment of the plantation areas was assessed in the original EIA conducted for the LPFL Plantation Forestry Project by Chareun & Associates in March 2010. While detailed information on existing habitat conditions was not provided, this impact is expected to have been of Low to Moderate significance depending on the prior condition of the vegetation.

The key impact for ecology and biodiversity will be the ongoing management of a monoculture crop on more than 17,900 ha for Eucalyptus and more than 2,200 ha for cropping of an additional crop. Monoculture cropping will have implications for terrestrial and potentially aquatic fauna. Fauna biodiversity in plantations is generally poor and limited to common, widespread and disturbance-tolerant species (i.e. a variety of birds, small mammals including rodents, larger mammals e.g. common palm civets and wild pig). Plantations that are subjected to a strict weeding regime are unlikely to provide refuge to a high diversity and abundance of disturbance tolerant mammals, and are likely to be devoid of medium to large sized mammals due to the exposed nature of the plantation understory. The plantations are not expected to provide habitat for significant populations of rare, threatened, or endangered species.

There will also be numerous unavoidable minor impacts on fauna and flora throughout all phases of the Project such as those associated with noise from work activities, dust impacts, risk of collision with fauna and increased access from road construction and upgrades.

One plantation directly abuts very high value habitat (Ban Phalaem plantation), and several are adjacent / slightly encroaching upon NPA areas and their buffer zones. It will be extremely important to avoid road extension in these areas, to avoid increasing accessibility for natural resource exploitation (i.e. harvesting, hunting, gathering).

While no significant impacts on hydrology are expected that will affect aquatic habitat and species, the Project will result in some minor impacts on aquatic fauna, macrophytes and benthic habitats primarily from additional input of suspended sediments generated from unsealed access roads and earthwork activities into local waterways. These impacts can be minimised via diligent implementation of erosion control measures, but impacts are still expected to occur. The quality of habitat in seasonal streams that intersect plantations likely support a range of commonly occurring fish species that seasonally inhabit these smaller drainages. It is also likely that some of these waterbodies provide habitat for endemic and globally rare and threatened fish species given the high level of endemism and global rarities in the region. Riparian habitat retention and inclusion of seasonal streams in the program will enhance water quality and aquatic habitat.

At least 10% of the Concession Area (approximately 2500 ha) will be rehabilitated for conservation purposes to restore the natural habitat that existed prior to pre-Project tree harvesting, ongoing shifting cultivation, and / or plantation establishment in areas unsuitable for industrial Eucalyptus plantations. This will serve to partially offset the biodiversity impacts of the Project. The extent of the biodiversity benefits from the rehabilitation works will depend on the success of the planning and implementation of these activities.

7.4 Health / Safety and Fire Risk

Given the widespread use of burning for agricultural site preparation in nearby areas, the use of fire for plantation preparation, and the volatility of Eucalyptus trees, the risk for wildfire cannot be entirely mitigated and will remain a key management issue over the Project life. MTP will need to ensure that training, communication protocols, fuel reduction management, and firefighting equipment and additional management measures identified in the ESMMP are implemented to minimise risks.

MTP will develop an ***Emergency Preparedness and Response Plan*** that will provide specifications and formal protocols for prevention, preparation, and response to wildfire. The EPRP must be updated to account for communication requirements throughout the expanding plantation footprint. Community involvement in fire prevention management will also be a key measure. The risks associated with wildfire will remain high over the Project life, but sound application of management measures will greatly reduce the risks to community and occupational health and safety and ecological values, with potential for impacts considered of Moderate significance.

Forestry operations are inherently hazardous activities which inevitably pose some risks to the health and safety of local communities, as well as OHS risks for plantation workers. Risks associated with uncontrolled fire in plantation areas, transport safety and risks of accidents, chemical exposure and UXOs are the main community health and safety risks for the Project. Community health and safety risks will vary in villages across the Project area and at different times during the plantation cycle. The most significant risks to worker health and safety include physical hazards associated with machine and equipment use, vehicle use and risk of accidents, and UXO risks in some of the plantation areas. The use of child labour (e.g. under 14), for less labour-intensive work provides additional OHS risk for individuals that cannot legally be hired for this work in Lao PDR.

Whilst OHS risks associated with work on plantations cannot be entirely avoided, the implementation of the above measures including an international standard health and safety management system, UXO Management Plan and Transport Management Plan (within the ESMMP) will help ensure that the likelihood of OHS risks will be reduced to an acceptable level. MTP will implement a Child Labour Policy, enforcing Lao labour laws for children under 14, and those between 14-17.

As most the workforce will be sourced from local villages, safety related training will be of particular importance. Requirements for training, including the need for personal protective equipment and good working environments will need also need to be more robust for the casual workforce. Regular monitoring and reporting of OH&S incidents and the development of effective corrective actions is necessary to ensure measures remain relevant and applicable to plantation establishment and management over the life of the Project.

Regular monitoring of community health and safety issues in Project Villages through community consultation and the grievance redress mechanism will be important to ensure measures remain effective over the life of the Project. The implementation of the UXO Management Plan and additional UXO surveys and clearance activities in at risk plantation areas will also help minimise community safety risks and provide community benefit through safer access to land.

7.5 Other Project Baenefits and Impacts

Other lesser impacts associated with the Project will include:

- **Greenhouse Gas Sequestration Benefits -** The greenhouse gas assessment conducted for the ESIA found that the impact of the Project's emissions when at full operations would sequester carbon over time and contribute to a reduction in the country's emissions (approximately 0.3% of the country's 2000 emissions). The Project's yearly average carbon sequestration potential is estimated at 177,186 tCO2e. This figure far exceeds the emissions the Project is expected to generate, thereby making the Project a carbon sink. This

assumes that the timber produced by the plantation is utilised in a long-term end use application, and does not return to the natural carbon cycle.

- **Ecosystem Services -** The most significant impact on ecosystem services associated with the Project is expected to be on the availability of provisioning services such as timber and NTFPs due in the region to the long-term loss of rights to use land associated with the establishment of new plantations and re-establishment/clearing of the existing plantations for the Project, adding cumulatively to the impacts of other projects in the region. The supporting services provided by habitats will also experience minor-to-moderate impacts as result of the establishment and re-establishment of monoculture Eucalyptus plantations. There will also be some minor benefits of the Project on provisioning services due to the rehabilitation of 2500 ha of land for the Project and benefits for regulating services associated with increased carbon sequestration and storage.
- **Child labour** – MTP will hire casual labour (contract labour) from affected villages. Children under the legal age for industrial work (<14 years old) or those that can only work under specific conditions (14-17 years old) commonly work their family farms or conduct other livelihood generating activities. Further, women are known to sometimes work with infants strapped to their backs. MTP will need to be diligent in its hiring practices to avoid potential for inadvertent hiring of children younger than the working age.
- **Water quality -** The Project is expected to result in minor to moderate impacts on water quality primarily due to erosion and sediment transport, particularly from the road network and during land clearance / harvesting activities. MTP will need to implement robust stormwater, erosion, and sediment control facilities as roads are progressively maintained throughout operations. Impacts from MTP will not be significant with respect to volume, but the Company will contribute to cumulative impacts that are affecting water quality in some catchments within Bolikhamxay and Khammouane Provinces, with potential impacts to aquatic habitat, aquatic biodiversity, beneficial uses of water, and visual amenity (a key consideration given the current and potential tourism activity in the region). Significant impacts from hazardous materials and hazardous and non-hazardous waste are considered unlikely with the implementation of management measures in the ESMMP.
- **Invasive Plants -** The primary risk associated with invasive plants is the potential for Eucalyptus to dominate plantation areas at the end of the concession period, given the species' ability to coppice sprout and regenerate quickly. Active removal of Eucalyptus stumps and follow up invasive plant management will be required to maximise the success of rehabilitation efforts. There is some potential of translocation of invasive plants between MTP plantation sites within the region, however several invasive plants dominate the region and Project activities are not expected to contribute to their further spread. Monitoring and management will be required to minimise the chance for translocation to areas that have not yet been subjected to a specific invasive plant or plants. The management of invasive species in forest areas to be rehabilitated is expected to be a challenge for the Project given the abundance of invasive species currently inhabiting the Project Footprint. Even with a high level of management effort to control invasive species in these areas, it is expected to have a Moderate impact on the success of the rehabilitation program.
- **Hydrology and Flooding-** A review of available hydrologic data and hydrological modelling indicates that clearing of plantation areas is likely to increase runoff slightly, but this effect is likely to be of Minor significance and less than the variations expected due to the natural local climate and annual rainfall. Increased flow rates during clearing are likely to result in minor increases in flow velocity and therefore erosion. Diligent implementation of mitigation measures to minimise erosion and sedimentation will be required to minimise impacts on downstream water quality. Due to the regular occurrence of floods in the region, minor impacts to plantations and associated infrastructure such as roads from seasonal floodwaters are expected to occur. Impacts of flooding on roads can be minimised via measures such as designing any roads and bridges established or upgraded by MTP for additional storm flow.
- **Cultural Heritage and Archaeology –** To date there is no evidence that the Project has resulted in impacts on known sites of international, national or regional archaeological or cultural heritage significance. Villagers report that LPFL has avoided direct impacts on local sites through its practice of consultation with

communities during land acquisition. Whilst many of the concession units have already been cleared and planted, the Project has the potential to impact cultural or archaeological sites that are currently unknown through additional land clearing and site preparation activities that will be undertaken. Ongoing consultation with local villagers will be required to continue to ensure direct impacts on cultural sites are avoided. The region surrounding the Project is thought to have a rich archaeological record which increases the likelihood of future chance finds. The establishment and effective implementation of a Chance Find Procedure will be required to ensure the preservation of sites or items that are yet to be discovered.

- **Noise -** The primary noise related impacts from the Project will be nuisance level noise generated from MTP vehicles occasionally passing through settlements. Background noise levels in most local villages are quite high as they have trucks, tractors, motorcycles, etc. passing through their villages regularly. Due to the nature of plantation operations, traffic volumes associated with the Project will generally be relatively low. Implementation of traffic management measures such as enforcement of speed limits through village settlements will reduce noise impacts for residents. Plantation operations (ploughing during site preparation, chainsaw operations during thinning / harvesting) will emit high decibel noise emissions. In the absence of appropriate hearing protection, workers are likely to be subjected to potentially harmful noise impacts. MTP will need to ensure that staff have appropriate PPE, particularly seasonal staff that are unlikely to bring their own. Restricting noisy work to daylight hours is also expected to minimise impacts to a level acceptable for surrounding stakeholders.
- **Air quality and dust** - Unmitigated risks to air quality from the plantations and construction of the nursery and accommodation will be limited to infrequent and short duration events. Potential impacts are therefore expected to be low. The primary air quality issues associated with the MTP Project is likely to be dust impacting residents of communities that share access roads with MTP. Combustion gases (SO_2, NOx, CO and VOCs) will similarly be emitted by vehicles passing through villages, but with low traffic volumes expected the impact on community health is expected to be negligible. Burning of slash for plantation establishment will provide short-duration impacts to air quality from particulate emissions during the dry season.

  The risks of air quality impacts to workers at the nursery are potentially significant, with storage / application of chemicals that may be toxic if inhaled or may react with each other, potentially creating noxious fumes. Significant impacts are expected to be avoided through careful evaluation of MSDS / product labels and provision of PPE that is commensurate with the toxicity of the materials used / applied.
- **Cumulative Impacts -** The MTP Project adds cumulatively to the impacts of other current and planned projects / activities in the Project region including agricultural expansion (cropping and plantations), hydropower, natural forest harvesting, mining, expansion of settlement and industrial areas, and transportation infrastructure development. The major cumulative impact is associated with the extensive land footprint of the Project in a region where population and land pressure are increasing. The Project can also contribute cumulatively to the social and economic development of the area through employment and cash inputs into the region. The Project will not significantly affect the viability of any other Projects in the region.

8 STAKEHOLDER CONSULTATION AND PUBLIC INVOLVEMENT

8.1 Consultation Process and History

Lao legislation defines stakeholders as "*any person, legal entity or organisation who / which are interested in, involved in or have interests in an investment project, in an activity or a manner (related to the project) because they are involved in or (are likely to be) affected by the investment project*" (MONRE, 2013).

The following key stakeholder groups have been identified for the Project:

Project Affected Villages

A total of 133 villages across two Provinces have LPFL management units within their respective boundaries, and MTP will continue to operate throughout its concession area. Initial consultation activities with Project affected villages is summarised in Table 8-1 and 8-3. The GOL has recently been consolidating villages throughout Lao PDR, including throughout the Project Area. LPFL plantations originally existed in more than 147 villages, which appear to have been reduced to 133, according to the results for consultations with village authorities. MTP will need to work with the GOL to identify the new boundary locations to accurately identify plantation area (hectares) within each of the current Project villages.

Farmer Extension Program participants

Approximately 5,071 farmers have participated in the LPFL Farmer Extension Program. Approximately 4,921 are still actively participating. These farmers have planted LPFL clones / seedlings on their agricultural land, and are considered stakeholders in the Project as LFPL provided loans for seedling / plantation establishment and the Company was intended to ensure raw logs were processed.

Several participants in the LPFL Farmer Extension Program were consulted during the conduct of the Environmental and Social Due Diligence Assessment for the Oji Lao Plantation Project (Earth Systems, 2015) and during the conduct of focus group discussions for this ESIA in November 2017.

Government of Lao PDR

Government of Lao PDR stakeholders include:

- District government and line offices: Bolikhan, Thapabath, Paksan, Khounkham, Pakkading, Hinboun; Gnommalat, Mahaxay, and Thakhaek.
- Vientiane Province government and line departments (Bolikhamxay and Khammouane Provinces);
- Central Government line agencies.

Other Stakeholders

Other stakeholders identified for the Project include:

- Key international organisations (e.g. World Bank / IFC, FAO, IUCN, and UNDP);
- Forest Stewardship Council (FSC);
- Non-Governmental Organisations (e.g. Oxfam, WWF, Village Focus International, and INFO Network);
- Private companies near the Project area; and
- Other villages near the Project area and likely transport routes.

8.2 Summary of Consultation Activities

Initial Consultation

A series of initial consultations were conducted during the ESIA period (refer to Table 8-1). These include meetings with Central, Provincial and District level representatives and relevant line agencies; phone surveys and in-situ community consultation in Project affected villages; consultation with scientists and government officials in their respective fields of expertise. The purpose of these engagements was to introduce the Project; collect information on the Project area; and seek feedback from key stakeholders.

At each consultation, a brief description of the Project was provided using the Project information sheet. Participants were given an opportunity to provide comments, advice and information relevant to the Project. Standard forms were used to record discussions.

Additional consultations will be undertaken as part of the ESIA process following submission of the Draft ESIA to the DESIA (refer to Section 8.4).

Table 8-1: Summary of Consultation Activities Conducted during the ESIA

Date	Consultation	Stakeholders / Description	
Kick-Off Meeting			
14th July 2017	Central meeting (ESIA kick-off)	Department of Environmental and Social Impact Assessment, Ministry of Natural Resources and Environment	
Initial ESIA / Scoping Study Consultations			
26th July 2017	Provincial Meeting	Khammouane Provincial Cabinet Office, Provincial Department of Agriculture and Forestry	
25th – 28th July 2017	District Meetings	District Governors, District Administration Office, District Office of Planning and Investment, District Office of Natural Resources and Environment, District Agriculture and Forestry Office, District Education and Sport Office, District Health Office, District Security Office, District Labour and Social Welfare Office.	
7th – 14th August 2017	Village level meetings and distribution of Project information sheets, posters, and village survey forms.	133 villages including village authorities and other village representatives.	
ESIA Field Studies			
Date	**Study**	**District**	**Villages**
10th Aug. – 7th Sept.2017	Phone Surveys	All 133 Project villages in nine Districts of two Provinces have been contacted and 132 interviewed for collection of village level information.	
10th – 20th October 2017	Focus Group Discussions (separate male and female consultations) and Village Survey with village authority	Pakkading	Ban Phonemoongkhoon; Ban Somseun;
		Paksan	Ban Nalouang; Ban Kenglouang; Ban Phonethong; Ban Phonengam; Ban Laonay; Ban Parkbeng; Ban Pakpang
		Hinboun	Ban Nongvaengkham; Ban Thongyai; Ban Namtek
		Bolikhan	Ban Yangkheua; Ban Palay;
		Mahaxay	Ban Nongboua; Ban Khamkeo; Ban Nateuy; Ban Nongdong; Ban Mainampakanh; Ban Naheuang; Ban Laokha; Ban Phonemenh; Ban Phadeng; Ban Donedou; Ban Danhi; Ban Paktheuk; Ban Kataeb; Ban Thami; Ban Nonghoy; Ban Phonesaart; Ban Phonedy; Ban Houaydeua (Vangmonh + Xang);
		Khounkham	Ban Elan; Ban Kachamnoy; Ban Veunh; Ban Kavak; Ban Thongkouang;

Date	Consultation	Stakeholders / Description	
		Thakhek	Ban Phaxang; Ban Nakha
7th November		Thaphabath	Ban Nangeo; Ban Nakaikhia; Ban Koktong; Ban Khokhet; Ban Phalaem; Ban Phone Ngam;
7th – 8th November 2017	Biodiversity Focus Group Discussions (and field surveys) Cultural Heritage and Archaeology Focus Group Discussions	Bolikhan	Ban Phabath, and Ban Yangkheua
6/10/17		Pakkading	Ban Parkbeng;
30th September – 6th October 2017		Paksan	Ban Somseun (field survey)
		Thaphabath	Ban Yangkheua; Ban Bartphonseun
		Hinboun	Ban Nonghoy; Ban Thami; Ban Phonesaart; Ban Phonedy; Ban Houaydeua
		Mahaxay	Ban Kavak; Ban Thongkouang;
		Khounkham	Ban Nakha
		Thakhek	Ban Phalaem; Ban Phone Ngam
Technical Investigations			
	Department of Forestry		
	Department of Heritage		
Draft ESIA Formal Consultations			
TBD	Village level consultations	Presentation of the ESIA and invitation for feedback and comments.	
TBD	District level consultations	District consultation meeting to present findings of the ESIA and invite feedback / comment	
TBD	Central / Provincial level consultations	Central level consultation meeting to present findings of the ESIA and invite feedback / comment	

*100% of villages contacted to conduct the phone survey. Two villages chose not to participate.

8.3 Results of Consultation to Date

Formal consultation with Central, Provincial, and District GOL authorities and potentially affected villages will be conducted following the submission of the Draft ESIA, with respective comments listed and indications of how issues raised are addressed (in the Final ESIA).

The results of initial consultation with Central MONRE are provided in Table 8-2, and comments provided by Provincial and District Government in Table 8-3.

Table 8-2: Key Comments from MONRE

Comment	How this is addressed in the ESIA	ESIA / ESMMP Report Section Reference
DESIA agreed that the LPFL's Project ESMMP needs to be updated since it was already out-of-date two years ago (according to current ESIA Guidelines). The ESIA and ESMMP Updates need shall reflect the current environmental and social conditions of the Project.	The ESIA and ESMMP Update will meet current ESIA Guidelines (2016) and information presented will be based on current environmental and social conditions of the Project.	ESIA Report (Volume B), and ESMMP
The Assessment shall focus on new areas (villages) that were not included in the previous EIA assessment (total area ~1,400 ha).	The assessment will cover all Project area while technical studies will be conducted in selected villages.	ESIA Report (Volume B)
Upon submission of the ESIA and ESMMP documents, DESIA needs to go through a formal review process and require public involvement as per the Guidelines.	LPFL will coordinate with DESIA upon submission of ESIA and ESMMP documents for formal review and public involvement activities.	ESIA Report (Volume B), and Chapter 23 (this Chapter).

The total area to be covered in the ESIA Update is ~24,000 ha which LPFL acquired land concession approval from GOL.	ESIA and ESMMP Update will cover approximate 24,000 ha	ESIA Report (Volume B), Chapter 3, and ESMMP.
DESIA requested that the ESMMP shall consider the practicability by identifying only key potential E&S impacts and prescribe them in detail in management and monitoring plan;	The ESMMP needs to be comprehensive to meet international guidelines	ESMMP

Table 8-3 Provincial and District Government – Key comments and relevant ESIA actions related to LPFL's plantation operations

Comment	How this is addressed in the ESIA	ESIA Report Section Reference
Lack of coordination and communication between LPFL and Bolikhan District authorities since the last few years and this should be addressed.	MTP will be expected to continue coordination and communication with local authorities as the Project carries out plantation management and operations.	ESIA Report (Volume B), Chapter 23, ESMMP (the Stakeholder Engagement and Community Relations Plan).
District authorities have received many complaints and requests from outgrower farmers to help coordinate with LPFL in order to find market for their woods.	MTP is seeking market for its concession plantation timbers as well as outgrower plantations.	ESIA Report (Volume B), Chapter 23, and ESMMP
Boualapha District would not allow any expansion of eucalypt or acacia plantation in new area, and has urged MTP to improve and maintain the existing plantation operations to higher quality.	The main intention of MTP is to manage and improve existing plantations to higher value assets.	ESMMP
District and Provincial Committees play active roles and responsibilities during land acquisition and plantation establishment. However, these committees have not been supported by LPFL adequately in recent years for plantation management and operations.	MTP will maintain communication more effectively with local authorities throughout Project operations.	ESMMP
Many villages in Hinboun District requested LPFL and local authorities to return the land to communities where considered unsuitable for industrial plantation due to seasonal floods. These villages include Ban Nongdong, Ban Nateuy, Ban Xang, Ban Songkhone, and Ban Paktheuk.	LPFL has returned some of its unsuitable land for plantation to communities. MTP currently has approximately 4,500 ha of seasonally inundated areas that are unsuitable for plantations. MTP will retain approximately 2,500 ha for natural rehabilitation with native forest species and will use 2,000 ha for trial with some commercial species.	ESIA Report (Volume B), Chapter 3, ESMMP
The need to improve coordination and communication between LPFL and District authorities on the implementation and monitoring of community development initiatives or CSR activities.	Ongoing consultation with government agencies involved in CSR activities.	ESMMP
Many plantations occur in national, provincial and district protection / protected forest areas. These include Phou Ngou PPA, Phou Nok Kok NPA, and Phou Khiew PPA.	LPFL acknowledged this issue and has acquired relevant government approvals. All LPFL's plantations that occur in NPA, PPA and DPA have been implemented prior to the official establishment of such protection areas. However, LPFL has obtained agreements and endorsement from local and central governments as well as National Assembly on this regard.	ESIA Report (Volume B), Chapter 7, and ESMMP.

8.3.1 Socio-Economic Survey and Other Specialist Studies

During village level socio-economic surveying, village leaders and other village representatives were provided with an opportunity to express their thoughts regarding the Project. Feedback from these initial consultations and relevant ESIA actions are summarised in Table 8-4

Table 8-4 Summary of Village Level Feedback

Feedback / Queries	How this is addressed in the ESIA	ESIA Report Section Reference
• Employment opportunities did not meet community expectations as articulated during land acquisition; • LPFL engaged contractor from outside to harvest timber last year. They should hire local villagers to involve in logging activities so that people can get benefits from the Project. The logging contractor used village road which caused significant damage due to the use of heavy trucks, but they did not repair it; • Daily wage should be increased to reflect the current living costs and attract labours to work in LPFL plantation activities.	• MTP has been informed of these issues and community development plan is included in ESMMP.	ESMMP (Volume D), Thematic Plans.
• Farmers are calling LPFL to purchase timber or otherwise find market for 2+3 extension farmers. Many people want to utilize the land for other purposes that can provide more benefits including grazing land, cassava, rubber, and other cash crops. • Can people use timber from 2+3 plantations for their household purposes?	• MTP has been informed on these issues and has assigned a team to communicate with the participating farmers.	ESIA Report (Volume B), Chapter 18.
• Local people should be allowed to collect residual forest resources (i.e. Mai Tiew) prior to the conduct of land clearance, so that people can benefit from using or selling this to white charcoal factory.	• Ongoing consultation with local authorities and village people.	Not applicable
• More information on benefits and adverse impacts from the eucalypt plantation should be delivered to communities.	• Ongoing consultation with local authorities and village people.	ESIA Report (Volume B), Chapter 23, ESMMP (Volume D).
• Comment on the use of chemical for weeding that should be restricted and use manual labours instead as this is a way to engage people in plantation management.	• MTP has been informed of this issue.	ESIA Report (Volume B), Chapter 13, and ESMMP
• Requests LPFL to provide additional support on community development initiatives including water supply, road maintenance, (in many villages); • LPFL should provide support on agriculture development initiatives during dry season.	• MTP has been informed of this issue.	ESIA Report (Volume B), Chapter 18, and ESMMP
• Queries regarding unplanted concession land that is unsuitable for industrial plantation – the villagers want to use this land for rice paddy development if LPFL allows.	• MTP has been informed of this issue.	ESIA Report (Volume B), Chapter 7, and ESMMP
• Village authorities requested LPFL to provide additional land survey and land concession documents as formers village authorities had lost them all.	• MTP will follow up on this point through ongoing consultation with local authorities.	ESIA Report (Volume B), Chapter 23, ESMMP (Volume D).

Source: Earth Systems 2017

8.4 Continuing Consultation

MTP and Earth Systems will continue formal and informal consultation with stakeholders throughout the ESIA process.

The *Public Consultation and Disclosure Plan* (Volume C) provides the framework for consultation and information disclosure for the implementation of the MTP ESIA processes and throughout operations. The PCDP has been developed using international best practice, which provides methods of communication as well as roles and responsibilities for information dissemination.

Procedures for grievance management throughout the Project life have been outlined in the ESMMP (Volume C) that are designed to provide an open and transparent channel for communication between the community and the Company.

8.5 Grievance Management

The ESMMP describes the MTP Grievance Redress Mechanism for affected communities / individuals and MTP employees. This procedure is designed to provide open and transparent (or confidential) channels for communication between the full-time or casual employee or affected community members with the Company or through direct engagement or with the Government of Lao PDR.

The MTP grievance management process will be refined significantly from the LPFL model to ensure compliance with national requirements and applicable international guidelines. The Company Grievance Redress Mechanism will need to be communicated to all staff and potentially affected communities to ensure that they are aware of the updated protocols.

9 MANAGEMENT AND MONITORING

9.1 Environmental and Social Management System

The ESIA has outlined the current and likely environmental and social impacts based on the Project operations to date and has outlined a management and monitoring program consistent with Lao PDR legislation and international industry best practices for industrial tree plantation operations. The proposed management strategy during plantation establishment, plantation management, and decommissioning phases of the Project has been documented in the ***Environmental and Social Management and Monitoring Plan***, a separate stand-alone document (Volume C). In accordance with regulatory requirements, it is expected that the ESMMP will be updated as required to incorporate any significant changes during the life of the Project.

A number of key aspects will require careful management to ensure impacts are minimised for the Project:

- The Farmer Extension Program will have to be changed to ensure sustainability and relevance (as MTP intends), and end markets for plantations that have reached rotation age need to be identified as soon as possible;
- Management of fire risk including appropriate planning and preparation in case of an emergency situation;
- Careful evaluation of which proportion of the approximately 4,776 ha of seasonally inundated areas will be allocated to natural restoration (2,500 ha) versus cropping (2,276ha), and which species are selected for cropping in this area;
- Ensuring UXO risk management in Moderate to High risk areas to minimise OHS risks and provide community benefits;
- Management of road infrastructure and key operation areas to protect from erosion and general water quality impacts;
- Careful management of the "Community Work Contract and Incentive Scheme" (CWCIS) and 'local first' hiring policy, as well as the "Community Investment Program" (CIP), to ensure that the most vulnerable villages and households are targeted and can receive benefit from the Project;
- Ongoing consultation and engagement with effected communities will be critical, particularly due to the legacy of poor communications and unresolved grievances from the previous attempts to implement the Farmer Extension Program; and
- Planning for decommissioning to ensure that Eucalyptus does not dominate that landscape upon cessation of the concession period, and restoration to natural habitat or alternative productive purposes is achieved.

9.1.1 Monitoring

The implementation of an appropriate monitoring strategy as part of the ESMMP is important to ensure that existing management measures are effective, and to identify the need for improved or additional measures. The environmental monitoring program for the Project will include seven categories of monitoring:

- **UXO monitoring** – The Sustainability Department will conduct risk assessment for the concession area to determine where UXO surveys are conducted. Where risks for UXO are significant enough to require UXO surveys; the Sustainability Department will monitor when sites have been cleared and certified for ground disturbing activity;
- **Site preparation / plantation establishment monitoring** – The Sustainability Department will survey areas planned for vegetation removal for plantation development prior to ground disturbing activities to ensure that vegetation retention areas are appropriately delineated and marked. The monitor will conduct follow-up monitoring to confirm that vegetation clearance and controlled burns are conducted according to Company obligations;
- **Operations monitoring** – The MTP Sustainability Department will monitor key operational activities (e.g. thinning, fertilising, weeding, harvesting, etc.) to ensure management and mitigation measures are implemented and are achieving their desired results;
- **Routine monitoring** – Plantations, work camps, regional offices, and the tree nursery will be routinely monitored to ensure that Company commitments are implemented are effectively mitigating potential environmental, social, and occupational / community health and safety impacts;
- **Community engagement and social monitoring** – The MTP Sustainability Department will routinely engage potentially affected communities and will conduct biennial socio-economic monitoring;
- **Post decommissioning surveys** – The Sustainability Department will ensure that the Company is meeting commitments for decommissioning sites to provide for conditions conducive for conversion to desired end land uses (identified by the GOL and / or affected community); and
- **Investigation monitoring** – Investigation monitoring will be conducted when routine monitoring identifies potential non-compliance issues or affected communities provide complaints via the Grievance Mechanism.

9.1.2 Reporting

The MTP Sustainability Manager will develop Quarterly Monitoring Reports for submission to senior management and an Annual Environmental and Social Monitoring Report that records the results of monitoring and identifies adaptive management strategies, where required for submission to MONRE.

Non-compliances identified during any of the above monitoring will trigger the development of an internal Non-Compliance Report that identifies the issue, provides corrective actions to remedy the issue, a timeline for completion, and person / people responsible for corrective actions.

9.2 Budget for Environmental and Social Monitoring

MTP has committed to providing sufficient resources to ensure the successful implementation of the environmental and social management and monitoring of the Plantation Project as identified in the ESMMP. A conceptual Environmental and Social Management and Monitoring Budget is outlined in the ESIA including capital, operating, and decommissioning costs.

10 CONCLUSIONS

The ESIA investigations have identified that the MTP Project has the potential to result in a variety of benefits for local communities and Lao PDR as a whole, but there are historic impacts and a potential for ongoing legacy impacts to remain. Ultimately the outcomes of the Project will be dependent on the success of the implementation of the management and mitigation measures identified for the Project as outlined in this ESIA and ESMMP.

Acquisition of the former LPFL Project by TAFF, and management under MTP will provide significant opportunities to improve environmental and social sustainability of the Project due to MTPs commitment to managing the Project consistent with international standards such as the International Finance Corporation's (IFC) Performance Standards and their goal to achieve certification by the Forest Stewardship Council (FSC).

Key benefits and opportunities associated with the Project moving forward will include:

- Economic benefits at the National level via foreign investment into the sector for improved operational management, as well as provision of taxes, royalties and fees;
- A biodiversity benefit with the commitment from MTP to rehabilitate at least 10% of the Concession Area (approximately 2500 ha) for conservation purposes;
- Livelihood benefit via the Farmer Extension Program, if the revised program is successfully implemented by MTP.;
- Benefits from employment and training opportunities expected to be provided to local villagers on a rotational basis. The extent of benefits for local villagers will be dependent on the employment policies implemented. This will include the "Community Work Contract and Incentive Scheme" (CWCIS) to improve local employment outcomes and a 'local first' hiring policy for some of the plantation work conducted;
- Benefit to community of UXO clearance if the Company clears Moderate to High risk areas;
- Significant opportunity to improve the social and environmental management of an existing project that has had a variety of issues historically, and will now seek to improve management standards to meet the requirements for IFC compliance and achieve FSC certification;
- Significant opportunity to improve communications with Project Villagers through the implementation of the PCDP including a robust Grievance Redress Mechanism; and
- Potential for improved accessibility associated with road maintenance for operational activities.

Significant risks / uncertainties associated with the Project will include:

- Long term loss of community access to use land associated with the allocation of village land to the Project, adding cumulatively to the loss of available land for villages in the region;
- Socio-economic impacts from loss of potential income due to reduced land available for agriculture, and potential impacts on food security and incomes due to reduced availability of forest resources (provisioning services);
- Ecology and biodiversity impacts associated with long-term habitat loss from the establishment of ~17,900 ha of monoculture Eucalyptus plantations with a robust weeding regime (poor habitat quality), cropping of 2,276 ha, and removal of up to 4,582 ha of regenerating fallow forest for the establishment of new plantations;
- Increased fire risk (from promoting Eucalypt species) leading to increased risk to ecological and safety values;
- Challenges associated with managing the legacy impact regarding fulfilment of Company obligations with farmers currently participating in the LPFL Farmer Extension Program, as well as uncertainties regarding the potential for success of the MTP Outgrower Scheme Phase 2 (OGS Phase 2). The success of the program will

depend on the ability of MTP to design and implement OGS Phase 2 in a manner which achieves intended outcomes for farmers and the Company; and

- Uncertainty regarding the species that will be selected for cropping 2,276 ha of seasonal wetland. Careful evaluation of potential risks is required to avoid introduction of invasive plants or new pests / diseases to the region, and minimise potential for difficulties in decommissioning at the end of the concession period.

If mitigation and management measures identified in the ESMMP and PCDP (refer Appendix C) are implemented diligently and successfully, the Project is expected to result in benefits for Lao PDR at the national, regional and local level and to improve current social and environmental outcomes associated with the Project.