



Monsoon Wind Power Project, Sekong and Attapeu Provinces, Lao PDR

Environmental and Social Impact
Assessment (Chapter 1-8)

28 March 2023

Project No.: 0598121

Document details	
Document title	Monsoon Wind Power Project, Sekong and Attapeu Provinces, Lao PDR
Document subtitle	Environmental and Social Impact Assessment (Chapter 1-8)
Project No.	0598121
Date	28 March 2023
Version	4.6
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Client Name	Monsoon Wind Power Company Limited (MWPCL)

Document history

Version	Revision	Author	Reviewed by	ERM approval to issue		Comments
				Name	Date	
1	1.1	As above	Kamonthip Ma-Oon, Sabrina Genter, Les Hatton, George Chatzigiannidis, Simone Poli, Aniket Jalgaonkar	Kamonthip Ma-Oon	18-02-22	Draft to IEAD
1	1.2	As above	As above	Kamonthip Ma-Oon	25-02-22	Draft to IEAD
1	1.3	As above	As above	Kamonthip Ma-Oon	23-03-22	Draft to IEAD and ADB
1	1.4	As above	As above	Kamonthip Ma-Oon	30-03-22	Draft to IEAD and ADB
1	1.4	As above	As above	Kamonthip Ma-Oon	21-04-22	Draft to IEAD and ADB
2	2.1	As above	As above	Kamonthip Ma-Oon	29-04-22	Final ESIA Report
2	2.2	As above	As above	Kamonthip Ma-Oon	03-05-22	Disclosure ESIA
3	3.1	As above	As above	Kamonthip Ma-Oon	08-07-22	Post-Disclosure ESIA
3	3.2	As above	As above	Kamonthip Ma-Oon	23-09-22	Final to IEAD
4	4.1	As above	As above	Kamonthip Ma-Oon	27-09-22	Final to ADB
4	4.2	As above	As above	Kamonthip Ma-Oon	19-10-22	Final to ADB for Disclosure

4	4.3	As above	As above	Kamonthip Ma-Oon	10-12-22	Final to ADB (high priority comments)
4	4.4	As above	As above	Kamonthip Ma-Oon	19-03-2023	Final to ADB
4	4.5	As Above	As above	Kamonthip Ma-Oon	22-03-2023	Revised
4	4.6	As Above	As above	Kamonthip Ma-Oon	28-03-2023	Revised

Signature Page

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Environmental and Social Impact Assessment (Chapter 1-8)



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Acronyms and Abbreviations

Name	Description
Aol	Area of Influence
ADB	Asian Development Bank
ALARP	As Low As Reasonably Practicable
ASEAN	Association of Southeast Asian Nations
BOD5	Five-day biochemical oxygen demand
CAPE	Convective available potential energy
CARE	Cooperative for Assistance and Relief Everywhere
CCRA	Climate Change Risk Assessment
CEMP	Construction and Environmental Management Plan
CESMMP	Construction Environmental and Social Management and Monitoring Plan
CF	Carbon fraction of dry matter
CIA	cumulative impact assessment
CLO	Community Liaison Officers
CO	Carbon Monoxide
COD	Commercial Operations Date
dBA	Decibels A
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
DFC	Development Finance Corporation
DMC	District Disaster Management Committees
DO	Dissolved Oxygen
DONRE	Department of Natural Resources and Environment
DTM	Digital Terrain Model
EAAA	Ecologically Appropriate Area of Analyses
EDL	The state power company Electricite du Laos
EHS	Environmental, Health and Safety
EIA	Environment Impact Assessment
EIB	European Investment Bank
EMMP	Environmental Management and Monitoring Plan
EP	Equator Principles
EPC	Engineering, Procurement and Construction
EPFI	Equator Principles Financial Institutions
EPSG	European Petroleum Survey Group
ERM	ERM-Siam Company Limited
ESCAP	Economic and Social Commission for Asia and the Pacific
ESHS	Environmental, Social, Health and Safety
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan

Name	Description
ESMS	Environmental and Social Management System
EVN	Vietnam Electricity
FGD	Focus Group Discussions
GAD	Gender and Development
GDP	Gross Domestic Product
GHG	Greenhouse gases
GII	Gender Inequality Index
GIIP	Good International Industry Practice
GL	Germanischer Lloyd
GLAD	German-Laos Association Development
GOL	Government of Laos
GOV	Government of Vietnam
GPG	Good Practise Guide
GPM	Global Precipitation Measurement
GW	Giga-Watt
GWP	Global warming potential
H&S	Health & Safety
HAWT	Horizontal Axis Wind Turbine
HCB	Hexachlorobenzene
HDI	Human Development Index
HH	Household
HIV	Human Immunodeficiency Virus
HSE	Health and Safety Executive
HSSE	Health, Safety, Security and Environment
IA	Impact Assessment
IAO	Institute of Acoustics
IBTrACS	Best Track Archive for Climate Stewardship
IEAD	Impact Energy Asia Development Limited
IEC	The International Electrotechnical Commission
IEE	Initial Environmental Examinations
IFAD	International Fund for Agricultural Development
IFC	International Finance Corporation
ILO	International Labour Organization
IOA	Institute of Acoustics
IP	Indigenous People
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
IUCN	International Union for Conservation of Nature
IWGIA	International Work Group for Indigenous Affairs
JICA	Japan International Cooperation Agency
KBA	Key Biodiversity Area

Name	Description
KII	Key Informant Interviews
LAeq	Equivalent Continuous Sound Level
LAK	Laotian Kip (Official national currency of Laos)
LCA	Life-Cycle Assessment
LCU	Landscape Character Unit
LDC	Least develop country
LMIC	Middle income country
LREMDP	Livelihood Restoration and Ethnic Minority Development Plan
LUC	Land Use Consultants
LWU	Lao Women's Union
MAB	Man and Biosphere
MLA	Multilateral Agencies
MONRE	Ministry of Natural Resources and Environment
MoU	Memorandum of Understanding
MPI	Multidimensional Poverty Index
MPN	Maximum Probable Number
MW	Megawatt
MWPCL	Monsoon Wind Power Company Limited
NA	Not Available/Not Applicable
NAPA	National Adaptation Programme of Action to Climate Change
ND	Not Detected
NDC	Nationally Determined Contribution
NDMC	National Disaster Management Committee
NGO	Non-Governmental Organisations
NGPES	National Growth Poverty Eradication Strategy
NOAA	National Oceanic and Atmospheric Administration
NTP	Notice to Proceed NTP
NSEDP	National Socio-Economic Development Plan
NSSL	National Severe Storm Laboratory
NT	Near threatened
NTFP	Non-Timber Forest Product
OCSC	Office of the Civil Service Commission
OESMMP	Operation Environmental and Social Management and Monitoring Plan
OH&S	Occupational Health And Safety
ORP	Oxidation Reduction Potential
PA	Protected Area
PAP	Project Affected People
PDA	Project Development Agreement
PDR	People's Democratic Republic
PHC	Primary Health Care
PM	Particulate Matter

Name	Description
POESMMP	Project Owners Environmental and Social Management and Monitoring Plan
RP	Resettlement Plan
PRF	Provider Relief Fund
PS	Performance Standards
PSAoI	Project Social Area of Influence
QC	Quality Control
RAMSAR	Convention on Wetlands of International Importance Especially as Waterfowl Habitat
RAP	Resettlement Action Plan
ROW	Right of Way
RPM	Revolutions Per Minute
SAR	Second Assessment Report
SEP	Stakeholder Engagement Plan
SPS	Safeguard Policy Statement
SRTM	Shuttle Radar Topography Mission
SUFORD	Scaling Up Participatory Sustainable Forest Management
SW	Surface Water
TCFD	Task Force on Climate-Related Financial Disclosures
TJ	Terajoule
TL	Transmission Line
TOR	Terms of Reference
TSP	Total Suspended Particulates
TSS	Total Suspended Solids
UCRSEA	Urban Climate Resilience in Southeast Asia
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
USGS	United States Geological Survey
UTM	Universal Transverse Mercator
UXO	Unexploded ordnance
VAWT	Vertical Axis Wind Turbine
VP	Vantage Point
VSR	Visual Sensitive Receptors
VU	Vulnerable
WBCSD	World Business Council for Sustainable Development
WBG	World Bank Group
WHO	World Health Organisation
WRI	World Resources Institute
WSDI	Wind Speed/Direction Indicator
WTG	Wind Turbine Generator

Name	Description
WWF	World Wide Fund
ZTV	Zone of Theoretical Visibility

1 EXECUTIVE SUMMARY

1.1 Introduction

Monsoon Wind Power Company Limited (MWPCL and/or the Project Proponent) is developing the Monsoon Wind Farm with an installed capacity of approximately 600 MW in Dak Cheung District of Sekong Province and Sanxai District of Attapue Province in Lao People's Democratic Republic (Lao PDR). The development also includes a 500 kilovolt (kV) transmission line, which connects to the grid in Vietnam ("the Project").

Impact Energy Asia Development Limited (IEAD) managed the initial development phase of the Project until the establishment of MWPCL in 2022. MWPCL is a joint venture between Impact Energy Asia Development Limited (IEAD) and SMP Consultation Sole Co., Ltd. (SMP). Hereafter IEAD will refer to as MWPCL.

IEAD signed a Memorandum of Understanding (MoU) with the Government of Lao PDR in 2011 to explore the possibility of developing a wind power project. Following the initial feasibility study, IEAD signed a Project Development Agreement (PDA) with the Government of Lao PDR on August 7, 2015 for the development of a wind power project with a capacity of 600 MW. The concession period for the Project is understood to be 25 years from the commercial operations date (COD). Construction is estimated to take approximately 30 months and COD is anticipated to be December 2025.

An Environment Impact Assessment (EIA) study for local Lao PDR permitting requirements was conducted in June 2014 (EIA 2014), and a second and third revision were conducted in May 2018 (EIA 2018), and September 2020 (EIA 2020), respectively. Innogreen Engineering Co., Ltd (Innogreen) on behalf of the Project Proponent has revised the local EIA (EIA 2020) due to significant changes in the Project design and the local EIA has approved by MONRE on 28 July 2022.

ERM-Siam Company Limited (ERM) was contracted by IEAD to conduct an Environmental and Social gap analysis of the local EIA against the Lenders' applicable standards including an initial biodiversity review (Phase 1). ERM completed Phase 1 and submitted the final gap analysis report to IEAD in March 2021. The Phase 1 report also recommended a Terms of Reference (TOR) to fill the gaps identified. Based on the results of Phase 1, ERM has developed an Environmental and Social Impact Assessment (ESIA) for the Project.

It is understood that part of the Project area is overlapping with a Bauxite mine concession area granted to Viet Phoung Group (VPG), which signed its concession with the Government of Laos (GOL) in 2018, therefore, the relocation of Project facilities in the overlapping areas is required. This includes a cluster of nine WTGs, the main 500 kV substation, and a short portion of the 500 kV transmission line route. The Project facilities will be relocated once the final design is completed.

Once the relocation areas are identified and the additional studies are complete, addendums to address the relocation will be prepared to complement the following documents:

- Environmental and Social Impact Assessment ("ESIA Addendum")
- Resettlement Plan ("RP Addendum")
- Cultural Heritage Management Plan ("CHMP Addendum")
- Community and Ethic Group Development Plan ("CEGDP Addendum")
- Stakeholder Engagement Plan ("SEP Addendum")

In addition, an updated Biodiversity Action Plan (BAP) will be prepared. The addendums will provide updates of the relocation of Project facilities, the additional survey results, the potential impacts, and additional mitigation measures and monitoring program that may be required. No pre-construction or construction work will be conducted at the proposed relocation sites until the required E&S assessments are completed and approved. The addendums will be available no later than 3 months after Financial Close. The new Project design will be aligned with the lenders' E&S requirements and not make any of

the E&S impacts materially worse than presented in the Final E&S documents, without the non-objection of the lenders.

Changes in impacts evaluation and mitigation measures will be reflected in the detailed Management Plans.

1.2 Legal and Institutional Framework

This ESIA has been undertaken with reference to the provisions of the requirements, standards, policies, laws, rules, guidelines, manuals, and international conventions and treaties. In addition, international standards and best practices on environmental and social safeguards were reviewed to identify all possible risks and impacts from project development and appropriate measures to minimize and mitigate the risks to the extent possible. The regulatory framework for this ESIA includes in the following.

- The Lao PDR legislation, policies, standards, and guidelines that have been ratified by Lao PDR and are applicable to the Project.
- The Project shall comply with the ADB Safeguard Policy Statement (2009), ADB Social Protection Strategy (2001), ADB Gender and Development Policy (1998), ADB Access to Information Policy (2018) and relevant World Bank / IFC EHS Guidelines / IFC PS / JICA ESC Guidelines.
- The Project will be undertaken to, as much as possible, comply with International Conventions including United Nations Convention on Biological Diversity (1996) and Coherence with Sustainable Developmental Goals and the Paris Climate Agreement as minimum.
- The Project shall comply with Lao environmental, social, labour, health and safety laws, or associated WBG EHS Guidelines, whichever is more stringent.

1.3 Project Description

1.3.1 Project Background and Objectives

MWPCL is developing a wind farm, with a total installed capacity of approximately 600 MW, and a 500 kV transmission line in Dak Cheung District of Sekong Province and Sanxai District of Attapue Province in Laos (the Project). The Project has been developed under an exclusive right granted by the GOL through a Memorandum of Understanding (MoU) and Project Development Agreement (PDA) executed in November 2011 and August 2015. This Project is also the first cross-border wind power project to be approved by the GOL and Government of Vietnam (GOV) in accordance with the MoU to supply power from Laos' projects to Vietnam Electricity (EVN).

The development also includes a 22 km 500 kV transmission line, which connects to the grid in Vietnam. The Right of Way (ROW) of the transmission line is 70 m (35 m on each side from the centre line). The generated electricity is expected to be sold to Vietnam Electricity (EVN).

1.3.2 Project Location

The Project is located in Dak Cheung District of Sekong Province, and Sanxay District of Attapeu Province in Laos (731355.38 m E, 1701111.82 m N). It lies approximately 560 km southeast of Vientiane, the capital of Laos, and approximately 48 km east of the provincial capital, Sekong.

The wind farm development area (excluding the transmission line) is approximately 70,828 hectares¹. The 500 kV transmission line runs northeast from the development area, across Dak Cheung District, to the Laos-Vietnam international border.

1.3.3 Project Facilities and Components

The major facilities and components of the Project are described in the following.

- Permanent facilities include wind farm, transmission lines and Project access road as described in the following.
 - A wind turbine is a device that captures the wind's kinetic energy and converts the energy into electricity using a generator. A total of 133 wind turbines of Envision will be used for the Project.
 - The Project includes the development of a 22 km 500 kV overhead transmission line to evacuate power generated from the wind farm and connect it to the Vietnam electricity grid. The Right of Way (ROW), comprising a width of 70 m (35 m horizontally on each side from the transmission centerline), is the area of land that will be used to locate, construct, operate, and maintain the transmission line. In addition, the Project includes the construction of underground and overhead 35 kV and 115 kV transmission cables to transfer electricity to the substation within the development area. The substation will be connected with a 500 kV transmission cable to transmit electricity to Vietnam. The Right of Way (ROW) of 35 kV and 115 kV transmission lines are 25 m (12.5 m on each side from the centre line) and 6 m (3 m on each side from the centre line) respectively.
 - The internal road system within the Project development area will be newly built connecting to turbine towers with the pavement width of 5.5-6.0 m, 1 m width of drainage will be built parallel each side of internal road; designed speed of 15 km/h. type of internal road is covered with crushed stone layer (thickness is 30 cm). Sediment controls will be installed to collect sediment. The mortar rubble drainage ditch and the reinforced concrete pipe culvert with a diameter of 1 m will be set up according to the actual situation on site.

¹ It should be noted that the Projects' concession area will be the land required to install and construct project facilities and ROW for related transmission line, which is around 1,050 ha.

The total length of new internal road that will be built is approximately 135 km and the total length of existing public road that will be upgraded is approximately 25 km. Therefore, the total length of internal road is approximately 160 km.

- Ancillary facilities include concrete batching plants, laydown areas, worker accommodation, spoil disposal areas. The ancillary facilities will be located in a flat and open area that is near the existing public road.
- Shared facilities of the Project have also been identified.

1.3.4 Project Associated and Related Facilities

Associated Facilities are defined in the ADB SPS as “*facilities that are not funded as part of the project (funding may be provided separately by the borrower/client or by third parties), and whose viability and existence depend exclusively on the project and whose goods or services are essential for successful operation of the project.*”

Associated Facilities are defined in the IFC PS “Associated facilities, which are facilities that are not funded as part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be viable”

There are no associated facilities identified for this Project. Other related facilities have been assessed as to whether these are associated facilities. However, these have **not** been considered as associated facilities as per ADB SPS definition as per the rationale provided below:

- The 500 kV Station of Vietnam (Thanh My Station) and the transmission line route in Vietnam. As mentioned in **Section 4.3.3**, this project is not funded by ADB or the Developer and is being conducted by ENV, which means that through funds sourced by EVN. In addition, the viability and existence of the project is not exclusively for successful operation of the project, but are also being developed for more than just the Project Associated Facilities. EVN plans to use the 500kV line for other imported power projects from Sekong province. The maximum capacity of this 500kV double-circuit is approximately 4,000MW. Based on Vietnam’s draft power development plan (PDP8), there is a planned 200MW hydro power project to connect to the Project substation and transmission line. In the agreed PPA and Concession Agreement, EVN and GOL, respectively, allow other Projects to connect to the transmission line and sell electricity to Vietnam.
- Road No. 16 B improvements that connecting Lao PDR, Thailand and Vietnam from west to east. This road will be used for the transportation of construction equipment. The upgrade of this road was completed in 2021 by the Government of Laos. As the road network will not be utilized for only this Project and is not funded by the developer or ADB, it cannot be considered an associated facility since the viability and existence does not depend exclusively on the project, but is develop for other uses as well. The development of Road No. 16B is part of a country-level program aiming at developing the southern provinces of Laos, especially the agriculture, tourism sectors and construction sector². Road No. 16B will be beneficial for Sekong and other corridors in the southern region and will be used as main transport route for material and equipment of large infrastructure projects (e.g. Sekong 4, Sekong 5, Sekaman 4). In addition, this will increase the visibility of tourism potentials in the Duk Chueng district.

² https://www.ide.go.jp/library/English/Publish/Reports/Brc/pdf/08_chapter2.pdf

1.3.5 Waste Management

Solid waste disposal and wastewater management can be recognized in **Table 1.1** Environmental and social management plans related to waste management will be developed and implemented. This may include waste management plan, hazardous material management plan, traffic management plan, spoil management plan, etc. The Project will comply with the requirements for waste management outlined in the environmental and social management plans.

Table 1.1: Waste Management

Topic	Phase	Estimated Volume	Details
Solid waste disposal	Construction Phase	<ul style="list-style-type: none"> The estimated waste generation rate of 0.8 kilogram/worker/day. For an average of 700 construction workers, the total volume of municipal wastes is estimated to 560 kilograms/day and is composed of food wastes, plastic bags and paper scraps (as per the EIA, 2020). The amount of solid waste will be depended on the actual situation of the project construction phase. 	<ul style="list-style-type: none"> The Project will establish a temporary storage area on the Project site for solid waste as the holding area pending regular collection (at least weekly) for transfer to the permanent solid waste management facility, and try to recycle solid waste to reduce the amount of solid waste. The Project will separate and classify solid waste on site in order to make the treatment easier. In the event that the permanent solid waste management facility is not in place and fully operational prior to the commencement of the generation of waste, a temporary facility will be established for the accumulated waste to be stored in a manner that it does not negatively impact the environment In accordance with the Project E&S requirements and the CA, solid waste will be treated in a dedicated solid waste management facility, the location of which will be agreed with the district administration.
	Operational Phase	<ul style="list-style-type: none"> The actual amounts of waste to be generated by the Project are currently not available. 	<ul style="list-style-type: none"> There is no waste generation from the production process. Waste generation will be from the consumption of employee. The solid waste generation will include food wastes, scrap papers and plastics that will be sent to the authorized agencies for further disposal. Papers, water bottles, glasses, metal and plastics will be recycled. The hazardous material will include diesel oil, paint, etc. A Waste Management Plan for construction and operation will be required including the estimated types, volumes, and disposal routes.
Wastewater	Construction Phase	<ul style="list-style-type: none"> Wastewater is mainly generated from the toilet used by construction workers that is equivalent to about 80% of the volume of consumption water or about 16 cubic meters/day. 	<ul style="list-style-type: none"> The project requires the contractor to provide mobile toilet tanks with sufficient storage tanks for use by workers.

Topic	Phase	Estimated Volume	Details
	Operational Phase	<ul style="list-style-type: none"> There is no water-use in the production process. Wastewater is mainly generated from the consumption of the estimated 53 employees, the volume of wastewater from consumption, washing and other activities is approximately 1 cubic meter/day (as per the EIA, 2020). 	<ul style="list-style-type: none"> The wastewater will be treated initially by waste water treatment tank before using the service of the septic service company for disposal.

1.3.6 Project Activities

Key activities to be conducted over the life of the Project are outlined in **Table 1.2**.

Table 1.2: Key Activities Throughout Project Life

Phase	Details	Schedule
Pre-construction Phase	<ul style="list-style-type: none"> All work will be conducted in accordance with the detailed master construction schedule, provided by the EPC Contractor. Prior to commencement of work, all contractors would be required to provide detailed site specific plans. No land take, or dispossession of assets and no ground clearance or project activities shall take place unless consent has been obtained from affected ethnic communities and land acquisition and compensation activities are completed for the project component following the Resettlement Plan and the Community and Ethnic Groups Development Plan which meet the International Lao regulatory framework and Lenders' policies and standards 	-
Construction Phase	<ul style="list-style-type: none"> The EPC Contractor will prepare the site for construction, erection, and installation of the Project facilities, which will include earthwork activities, such as site clearing and soil excavation. The construction, design, and testing will be undertaken in accordance with the appropriate construction standards and the Laos' Decision on National Environmental Standards (No. 81/GOV, 2017). The EPC Contractor, its subcontractors and service providers will also comply with the ADB 2009 Safeguard Policy Statement, internationally recognized core labor standards and IFC Performance Standards 	30 months
Operation, and Maintenance Phase	<ul style="list-style-type: none"> After the completion of the installation of wind turbines and the arrangement for the commencement of the production of electricity, there will be the officer to control, supervise, and maintain the wind turbine system in accordance with the agreement made with the manufacturer of the turbine. The frequency of the maintenance of 1 turbine generating electricity is approximately 2 times per year in order to verify the integrity of the hydraulic system, lubricants system, transformer and blade. 	25 years
Operational Phase	<ul style="list-style-type: none"> No information is currently available on the decommissioning of the Project. It is noted that decommissioning will need to be conducted under the prevailing laws and standards of Lao at the time of decommissioning activities 	-

1.3.7 Project Alternatives and Environmental and Social Considerations

This section provides an overview of the project alternatives considered for the project including alternative power generation, site selection, technology and locations. This data was provided by MWPCCL.

- No project alternative: The 'no project alternative' considers the consequences in case a decision not to proceed with the Project is made. In this scenario, the possible positive and negative impacts of the proposed activities on the receiving environment and social receptors would not occur.
- Alternative on wind turbine and facilities layout: from data provided by MWPC, it is noted that the turbine layout has been optimized from 240 turbines to 148 turbines and then further refined to 133 turbines, by considering the use of turbine technology that can generate more power per turbine, therefore reducing the total number of turbines required to achieve the desired power output. Numerous re-routing and micro-siting activities have been conducted for the ESIA including:
 - Re-routing of the access roads and internal transmission lines was conducted to avoid cemetery areas and biodiversity areas.
 - Relocating WTGs to avoid significant shadow flicker and noise impacts.
- Previously, Goldwind's technology (148 turbines) impacted a total of 246 HHs with a total loss of 130.47 ha of agricultural land (5.4 ha permanently affected and 125.07 temporarily affected) and 593.03 ha of NTFP collection area (153.05 ha permanently affected and 439.98 ha temporary affected) and overlap with 5 cemeteries and Phou Kounking Mountain.
- The layout recognized on to Envision's technology (133 turbines) has resulted in 378 affected HHs, 185.83 ha of agricultural land loss (29.31 ha permanently affected and 156.53 ha of temporarily affected), 535.48 ha NTFP collection area loss (150.79 ha permanently affected and 384.69 ha temporarily affected), 608.93 ha of communal land loss (160.37 ha permanently affected and 448.56 ha temporarily affected) and Phou Kounking Mountain. It is noted by the site team (Innogreen) that increased agricultural activities were observed during DMS survey in May – June 2022 compared to November – December 2021 when the asset registration survey was conducted. This may contribute to increased number of affected HHs and area of impacts despite the number of WTGs have been reduced from 148 to 133 WTGs.
- Envision layout also avoids impacts to all cemeteries; however, overhead transmission line will pass over Dak Bong cemetery. It is noted that the transmission line is 70 m above the ground and no physical impacts (e.g. land clearance, earthwork, etc.) will be made Dak Bong cemetery area. The consultation with Dak Bong village on 21 July 2022 suggested that cutting of trees within ROW in cemetery area to maintain the tree height under 3 m³ is allowed; however, the Project is required to provide budget for the village to prepare and perform specific rituals to seek permission from spirits for such activities.
- Alternative on transmission line route: prior to the decision to export the electricity to Vietnam, the Project considered a 230kV transmission line connecting to the Ban Lak 25 substation in Pakse, Champasak Province. However, once power supply to Vietnam was decided, a single transmission line route option was considered, connecting to a 500 kV station of Vietnam (Thanh My Station) with an overall length of 66 km (around 22 km in Laos). Due to the number of KBAs and their spatial orientation and extent in the region, complete avoidance was not possible (for example the geographical extent and orientation of the Song-Thanh KBA did not allow for complete avoidance). Complete avoidance of Dakchung Plateau KBA could not be realized fully for technical reasons pertaining to the feasibility of the project and positioning of WTGs where maximum power generation potential can be achieved to make the project viable.

In addition, through the ESIA process, re-routing of facilities has been conducted to reduce impacts on environmental and social receptors, this has included:

³ The Regulation on Safety for High Voltage Transmission Line and Substation, EDL/ 2013 prescribes that trees taller than 3 m are prohibited within the ROW area. Therefore, there is a need for the Project or relevant authority to maintain the height of trees under 3 m.

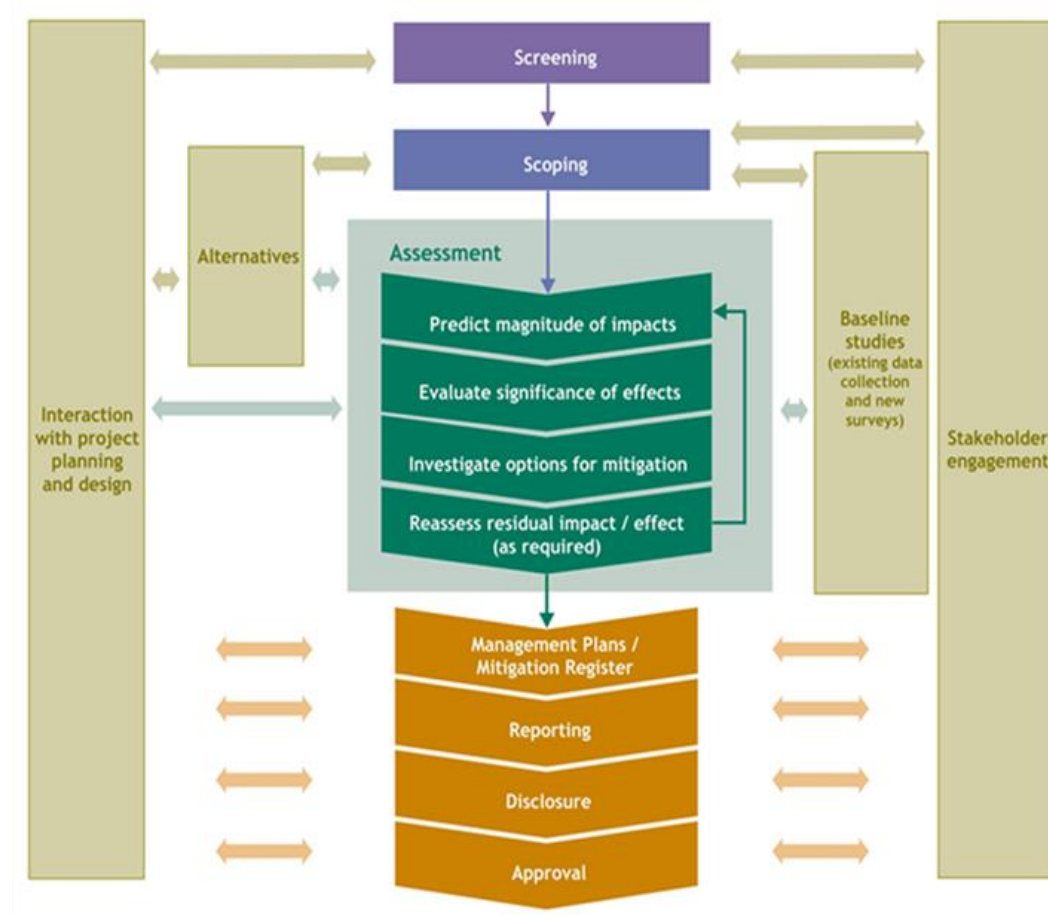
- Re-routing of the access roads and internal transmission lines was conducted to avoid cemetery areas (all cemetery area in the development area)
 - In July 2022, transmission line route and 500 kV substation have been slightly adjusted to avoid four (4) permanent residential buildings.
- Alternative on technology: A comparison of the wind turbine technologies in terms of axis of direction, efficiency, location, design complexity, safety, and noise generation of VAWT, HAWT, other technologies, are considered.
- Alternative on site selection: MWPCCL selected the site based on wind direction and speed in potential areas in Laos. The Wind Energy Resource Atlas of Southeast Asia conducted by the World Bank (World Bank, 2001), outlines the wind energy potential in the project location areas and the study areas (located in Dak Cheung District of Sekong province and Sanxay District of Attapeu Province). The site was selected prior to commencing the ESIA and as such, the alternatives assessment of the ESIA focuses on re-routing of facilities within the designated area.
- Alternative method of power generation: several alternatives including renewable energy alternatives as well as other alternatives for power generation such as conventional thermal power plants, are considered and compared.

1.4 Impact Assessment Methodology

This section presents the methodology used to conduct the Environmental and Social Impact Assessment (ESIA) for the Project. The Impact Assessment (IA) is undertaken following a systematic process that predicts and evaluates the impacts the Project could have on aspects of the physical, biological, social/ socio- economic and cultural environment, and identifies measures that the Project is planning to avoid, reduce, mitigate, offset or compensate for adverse impacts; and to enhance positive impacts where practicable.

The methodology has followed the approach illustrated in **Figure 1.1**

Figure 1.1: Overall Impact Assessment Approach



Source: ERM, 2019

This section also details the methodology used for the collection and analysis of primary and secondary data used in this report. Primary and secondary information from the Project Owner, government sources, non-governmental organisations (NGOs) and other Project-related stakeholders have been collected to support the preparation of this report.

Screening

The screening was conducted utilizing a high-level description of the Project and its associated facilities, including available information regarding the project design and existing environmental and social conditions, applicable regulatory framework for the Project etc. in order to provide a summary of initial findings on potential project impacts and to guide development of the ESIA.

Scoping

Scoping has been undertaken to delineate the potential Area of Influence for the Project (and therefore the appropriate Study Area) and to identify potential interactions between the Project and resources/receptors in the Area of Influence. It also helps in developing and selecting alternatives to proposed action and in identifying the issues to be considered in this ESIA. A scoping exercise was completed as part of the gap analysis undertaken by ERM.

Project Boundary and Area of Influence

In order to set out the scope of the Project features and activities, with particular reference to the aspects, which have the potential to impact the environment, a Project Description has been prepared. Details of the Project facilities' design characteristics, as well as planned and possible unplanned Project activities, are provided in **Section 4** of this ESIA Report. The Project Area of Influence (AoI) is also defined in **Section 8** of this ESIA Report.

Baseline Data Collection

To provide the context within which the impacts of the Project can be assessed, a description of physical, biological, social/socio-economic and cultural conditions that would be expected to prevail in the absence of the Project is presented. The baseline includes information on all resources/receptors that were identified during scoping as having the potential to be significantly affected by the Project.

The baseline takes into account current conditions, as well as those changing conditions apparent in the Baseline and takes into consideration other developments within the Project area, which are underway or certain to be initiated in the near future. These developments are considered in the assessment of cumulative impacts and effects.

Impact Assessment Process

Impact identification and assessment starts with scoping and continues through the remainder of the ESIA Process. The principal ESIA steps comprise:

- Potential Impact Prediction: to determine what could potentially happen to resources/receptors as a consequence of the Project and its associated activities;
- Impact Evaluation: to evaluate the significance of the predicted impacts by considering their magnitude and likelihood of occurrence, and the sensitivity, value and/or importance of the affected resource/receptor;
- Mitigation and Enhancement Measures: to identify appropriate and justified measures to mitigate potential negative impacts and enhance potential positive impacts; and
- Residual Impact Evaluation: to evaluate the significance of potential impacts assuming effective implementation of mitigation and enhancement measures.
- Cumulative Impact Assessment Process
 - In order to gain an understanding of the projects overall contribution to impacts, a cumulative impact assessment (CIA) was undertaken. Whilst total cumulative impacts due to multiple projects within a given area should be identified within government-led spatial planning efforts, the Project owner needs to determine the degree to which it is contributing to these overall cumulative impacts. The ESIA and CIA are prepared based on similar logical framework, analytical process and tools. Unlike the ESIA that centers on the Project as a source of impacts, the CIA focuses on VECs under influence from different projects. In a CIA, the overall resulting condition of the VEC and its related viability are assessed.
- Management, Monitoring, and Audit
 - The final stage in the IA Process is the definition of the basic management and monitoring measures that are needed to identify whether: a) impacts or their associated Project components remain in conformance with applicable standards/ guidelines; and b) mitigation measures are effectively addressing impacts and compensatory measures and offsets are reducing effects to the extent predicted.

Risk Assessment for Unplanned Events

To evaluate potential impacts from unplanned events, a risk-based approach is used to define: 1) the most likely unplanned events leading to environmental, social and/or community health impacts; and 2) those unplanned events with the most significant potential environmental, social and/or community health impacts overall. Impact significance for unplanned events is therefore determined by evaluating the combination of likelihood and consequence.

1.5 Stakeholder Engagement

The Project's information disclosure and consultation activities have been driven by the principles of meaningful consultation and Informed Consultation and Participation (ICP). The Project started to engage affected IPs in 2014 when the Project was initiated. PAPs and relevant participants such as governmental organizations and relevant Ministries were included in the stakeholder engagement activities. Such activities included consultation meetings at the village level (November 2014 and September 2020), district level (May 2016), and a meeting with technical personnel (July 2018).

During the ESIA preparation in November – December 2021, the engagements sought to update its understanding of project impacts, including perspectives of IPs and vulnerable groups such as women and youth through focus group discussions (FGDs). FGDs with livelihood groups, IPs, women, youth and vulnerable groups and key informant interviews (KIIs) with village head and healthcare representative were undertaken in 31 villages directly and indirectly affected by the Project. The consultations were two-way communications undertaken in atmosphere without coercion/intimidation whereby views of affected peoples were included in the Project design, ESIA and management plans. The consultations were conducted in Lao where the village head or Village Coordinator was present during the consultation to facilitate translation to Triang language, particularly for women and elderly who have limited capability in communication in Lao language.

In February 2022, the Compensation Committee arranged a meeting to consult village heads of 23 villages in Dak Cheung District, Sekong Province on compensation unit rates which were later approved on 31 March 2022. During 30-31 March 2022, the Compensation Committee consulted with five villages including Dak Nong, Dak Padou, Dak Samor, Dak Xeum, and Dak Yok on compensation unit rates which were later approved on 12 May 2022. It is noted that the Committee utilized this approach as a means to conduct market price survey for its consideration of determination of compensation unit rates.

Detailed measurement survey was conducted during 17 May to 21 June 2022 in Dak Cheung District, Sekong Province and 14-18 June 2022 in Sanxay District, Attapeu Province.

Following the completion of ESIA study and development of management plans (MPs), information related to ESIA findings, proposed mitigation measures and MPs were disclosed to PAPs in July 2022 in 16 villages through a presentation and disclosure booklet in Lao. The participants of the consultation include village heads and PAPs – women were ensured to participate in the sessions in all villages, Project developer (MWPC) and its local E&S consultant (Innogreen) and international E&S consultant (ERM), lenders' E&S representatives including ADB (and Artelia as its lender E&S advisor), DEG (also representing FMO), AIIB and JICA. After the presentation, the participants were also given opportunities to ask questions, share their concerns or needs to the Project developer or the E&S consultants. The participants were consulted after the information disclosure activity with focus on understanding villagers' beliefs towards the Phou Kounking (Kounking Mountain), villagers' concerns regarding Project development in Phou Kounking area and Dak Bong cemetery and villagers' requirements for such activities and their assessment on the impact of the project on their dignity, culture and community as defined by them. These consultations also served as venue for everyone to understand resettlement and compensation process and receive feedback on proposed livelihood restoration plan and community and ethnic group development plan (CEGDP).

The information disclosure and consultations were undertaken with the following villages in September 2022 with the same objectives and approach as those conducted in July 2022.

PAPs' Concerns and Project's Addressal of the Concerns

The PAP's concerns and how they have been addressed are summarized in **Table 1.3**.

Table 1.3: Summary of Consultations

Date	Location	Issues and Concerns	Considerations in the ESIA or Project Design/Actions Taken
12-21 Nov 2014	16 villages located in the Project area and nearby areas	<ul style="list-style-type: none"> ■ The Project should provide funding and assistance to improve water supply system (e.g., gravity-fed) to the villages and irrigation systems for rice paddies. 	<ul style="list-style-type: none"> ■ Information dissemination is considered in the ESIA and SEP. A SEP will be prepared for the Project including future and on-going engagement required to ensure stakeholders are provided sufficient information on the potential impacts.
7-26 Sep 2020	18 villages located in the Project area	<ul style="list-style-type: none"> ■ The Project should help to improve the access road to the village and within village and the access roads to production land e.g., rice, coffee, and cassava plantations. ■ The Project should provide funding and assistance to establish and improve school facilities, supplies and personnel. ■ The Project should provide funding and assistance to establish and improve dispensary and healthcare centres in the villages. ■ The Project should provide funding assistance to establish a village administrative office. ■ People in the potentially affected villages should be able to benefit (i.e., access to electricity generated by the Project). ■ The Project should provide reasonable and fair compensation to those households affected by land acquisition. ■ The Project should provide assistance to poor families in the affected villages. In addition, the Project should provide assistance for improvement of vocations in the villages and offer job opportunities for the village members to work on the Project. ■ Request for the Project to provide financial support to the villages/village fund/monthly tax to the villages. 	<ul style="list-style-type: none"> ■ The impact assessment including information on mitigation measures for the social receptors is provided in Section 9.5 of the ESIA Report. ■ Impacts to livelihoods and land use, including rice paddies, is included in Section 9.5.3 of the ESIA Report. This includes proposed mitigation measures. ■ Land and economic displacement is assessed in Section 9.5.3 of the ESIA Report. This includes proposed mitigation measures. The Project will ensure all required processes for land acquisition are conducted in conjunction with relevant stakeholders. ■ Impacts and processes for land acquisition are provided in Section 9.5.3 of the ESIA Report. Note that this is based on preliminary land and asset registration undertaken by Innogreen in November and December 2021. ■ Village heads will be informed prior to construction, this commitment is included in Section 10 (ESMP) of the ESIA Report.
November – December 2021	31 villages located in the Project area	The Project should minimise impacts to sensitive receptors and houses and paddy field as much as possible.	<ul style="list-style-type: none"> ■ The impact assessment including information on mitigation measures for the social receptors is provided in Section 9.5 of the ESIA Report. ■ Impacts were minimized by reducing the number of WTGs under a new design and avoiding houses and minimize impacts to paddy fields.

Date	Location	Issues and Concerns	Considerations in the ESIA or Project Design/Actions Taken
		The Project development will impact the cultivation land, particularly rice paddy field as suitable land for rice cultivation is highly limited due to mountainous terrain of the region.	<ul style="list-style-type: none"> Impacts to livelihoods and land use, including rice paddies, is included in Section 9.5.3 of the ESIA Report. This includes proposed mitigation measures.
		The Project should ensure that there will be no encroachment into villagers' land containing houses/dwellings.	<ul style="list-style-type: none"> Land and economic displacement is assessed in Section 9.5.3 of the ESIA Report. This includes proposed mitigation measures. The Project will ensure all required processes for land acquisition are conducted in conjunction with relevant stakeholders.
		Concern about nuisance from noise from wind turbines during operation.	<ul style="list-style-type: none"> Noise impacts (including from turbines) are assessed in Section 9.3.7 and Section 9.5.7 of the ESIA Report. This includes proposed mitigation measures. WTGs have been relocated to ensure distance from villages. The nearest WTG to village is located more than 500 m from the village
		Concern about nuisance from shadow flicker and negative impacts on agricultural productivity.	<ul style="list-style-type: none"> Shadow flicker impacts are assessed in Section 9.3.10 and Section 9.5.7 of the ESIA Report. This includes proposed mitigation measures. Impacts were minimized by reducing the number of WTGs under a new design and avoiding houses and minimize impacts to paddy field
		Concern that the Project development may impact cemeteries of the village.	<ul style="list-style-type: none"> Impacts to cemeteries and other cultural heritage are assessed in Section 9.5.9 of the ESIA Report. This includes proposed mitigation measures. Project layout has been optimized to avoid impacts to all cemeteries
		Some people expressed that they cannot articulate their concerns as they do not have sufficient information about the Project and its potential impacts	<ul style="list-style-type: none"> Information dissemination will be considered in the ESIA and SEP. A SEP (this document) has been prepared for the Project including future and on-going engagement required to ensure stakeholders are provided sufficient information on the potential impacts. Project Information disclosure and consultations were conducted in July 2022. Refer to Section 9.5.2 for more details.
		Concerns about unfair compensation for those impacted by land acquisition of the Project, and there will be no replacement land for cultivation and animal husbandry and therefore	<ul style="list-style-type: none"> Impacts and processes for land acquisition are provided in Section 9.5.3 of the ESIA Report. Note that this is based on preliminary land and asset

Date	Location	Issues and Concerns	Considerations in the ESIA or Project Design/Actions Taken
		people will lose their main source of livelihood.	<p>registration undertaken in November and December 2021.</p> <ul style="list-style-type: none"> RP and livelihood restoration programs have been developed.
		Concerns around safety of life and property and livestock of households nearby the wind towers and safety of those that conduct agricultural activities under the transmission line.	<ul style="list-style-type: none"> Impacts to community health and safety are assessed in Section 9.5.4 of the ESIA Report. This includes proposed mitigation measures.
		Prior to commencement of the Project construction, the village heads should be informed.	<ul style="list-style-type: none"> Village heads will be informed prior to construction, this commitment is included in Section 10 (ESMP) of the ESIA Report.
		The people in the affected villages were not sure if they can use electricity generated by the Project.	<ul style="list-style-type: none"> Household solar power systems will be provided to the affected villages. Priority will be given to the households affected by the Project's land acquisition, then poor households within the Project's affected communities, and finally the entire the affected villages if possible. Refer to Section 9.5.2 and CEGDP for more details.
		During construction and operation of the Project, there will be influx of workers and people from outside to the villages. There are concerns that these people may bring transactional sex to villagers, disrupt community dynamics, increase gender-based violence, and/or negatively impact on public infrastructure and resources.	<ul style="list-style-type: none"> Impacts from worker influx are assessed in Section 9.5.6 of the ESIA Report. This includes proposed mitigation measures.
		Concerns about the Project's impact on landslides	<ul style="list-style-type: none"> Impacts from unplanned events (including those impacts as a consequence of natural hazards) are assessed in Section 9.6.3 of the ESIA Report. This includes proposed mitigation measures.
		Concerns about the Project's impacts to forest resources as people are highly dependent on NTFP collection from the forests.	<ul style="list-style-type: none"> Impacts on communities' livelihoods associated with NTFPs are assessed in Section 9.5.3 of the ESIA Report. This includes proposed mitigation measures. Livelihood restoration programs and CEGDP have been prepared.
July 2022	16 villages	<p>Main concerns</p> <ul style="list-style-type: none"> Impacts to agricultural land Safety risks associated with transportation of Project components during construction. Wastewater and sedimentation from project construction activities will enter the water sources of the village Impacts of WTGs during operation 	<ul style="list-style-type: none"> Impacts to livelihoods and land use, including rice paddies, is included in Section 9.5.3 of the ESIA Report. This includes proposed mitigation measures. Land and economic displacement is assessed in Section 9.5.3 of the ESIA Report. This includes proposed mitigation measures. The Project will ensure all

Date	Location	Issues and Concerns	Considerations in the ESIA or Project Design/Actions Taken
		<p>to productivity of agricultural land.</p> <ul style="list-style-type: none"> Noise from WTGs Dust from construction activities Concerns about impact of Project land acquisition on rice paddies as currently they hardly have sufficient rice for consumption The Project must compensate for any impacts on land according to the laws Concerns related to influx <p>Proposals from Villages</p> <ul style="list-style-type: none"> Healthcare facility improvement and medical supplies and transportation to healthcare facility Support plantation of fruit trees such as pomelo, rambutan, etc. Support on education supplies and sport equipment The Project to ensure that the roads are not too dangerous where villagers can also use it Water supply and Irrigation system as the village experiences water shortage during dry season Village office with computers The Project to comply with village's Heet-Kong Scholarship for higher education Livelihood/Occupation/Vocational training Project employment Support on livestock raising and agriculture Water supply and irrigation system The Project to provide support on village office The Project to provide assistance to poor households 	<p>required processes for land acquisition are conducted in conjunction with relevant stakeholders.</p> <ul style="list-style-type: none"> Noise impacts (including from turbines) are assessed in Section 9.3.7 and Section 9.5.7 of the ESIA Report. This includes proposed mitigation measures. Impacts associated with shadow flickers are assessed in Section 9.3.8 of the ESIA report. This includes proposed mitigation measures. WTGs have been relocated to ensure distance from villages. The nearest WTG to the village is located more than 500 m from the village Impacts were minimized by reducing the number of WTGs under a new design and avoiding houses and minimize impacts to paddy field. Impacts on surface water quality is assessed in Section 9.3.6 of the ESIA report. This includes proposed mitigation measures. Impacts on air quality are assessed in Section 9.3.4 of the ESIA report. This includes proposed mitigation measures. Shadow flicker impacts are assessed in Section 9.3.10 and Section 9.5.7 of the ESIA Report. This includes proposed mitigation measures. Community Health and safety impacts are assessed in Section 9.5.4 of the ESIA report. This includes proposed mitigation measures. RP and Livelihood restoration plan have been prepared to minimize impacts to affected people from Project land acquisition. CEGDP has been prepared to reflect community needs. CHMP has been developed to ensure Project's compliance to villages' Heet-Kong. Village heads will be informed prior to construction. This commitment is included in Section 10 (ESMP) of the ESIA Report
September 2022	16 villages	<p>Main concerns <u>Community health and safety</u></p> <ul style="list-style-type: none"> Traffic/Road safety: the 	<p>Main concerns <u>Community health and safety</u></p> <ul style="list-style-type: none"> Proposed measures have been

Date	Location	Issues and Concerns	Considerations in the ESIA or Project Design/Actions Taken
		<p>transportation of construction materials by large vehicles may pose traffic safety risks/accident to particularly children, people with hearing disability and livestock.</p> <p>It is suggested that the Project shall implement the followings to minimize the risks:</p> <ol style="list-style-type: none"> 1) Notify the village in advance on the transportation activities in order for people to be aware and pay particular attention to the safety of their children and livestock during that period 2) Implement a speed limit in village area 3) The Project should provide traffic safety training to the villagers 4) The Project should avoid transportation activities during the time when students are going to and from the school and night time (disturb rest time of villagers) <ul style="list-style-type: none"> ■ Additionally, there is also concern regarding dust, noise disturbance and road damage associated with the Project's use of large vehicles for transportation <p><u>Labour Influx</u></p> <ul style="list-style-type: none"> ■ The influx of labour may bring infectious diseases to the communities including Covid-19. The Project should ensure that all workers and villagers are vaccinated against Covid-19. ■ The workers should reside at the workers' camps provided by the Project ■ Concern that the labours will be involved in drug use and selling drug to community members <p><u>Cultural Heritage</u></p> <ul style="list-style-type: none"> ■ The workers may trespass the forbidden areas of the villages ■ The Project should avoid impacts to cemetery area e.g., excavation work within the cemetery area ■ The Project should coordinate with the village prior to any works and comply with the villages' customs and traditions (especially Phou Koungking Mountain area for Dak Learn village) e.g., perform rituals or provide budget for villagers to perform rituals prior to construction works 	<p>added the Traffic Management Plan. Village notification protocols and timing should have been added to the SEP.</p> <ul style="list-style-type: none"> ■ Air Quality Management Plan and Noise and Vibration Management Plan will be developed and implemented by EPC Contractor. <p><u>Labour Influx</u></p> <ul style="list-style-type: none"> ■ The Community Health and Safety and Local Content and Influx Management Plan will be developed and implemented by EPC Contractor. ■ Worker's Camp Management Plan and Worker Code of Conduct will be developed to bound workers to reside in the camp and outline behaviours or the workers. ■ Local Content and Influx Management Plan (including Labour Management Plan and Local Procurement Management Plan) and Worker Code of Conduct will be developed to include prohibition of drug use by the workers. <p><u>Cultural Heritage</u></p> <ul style="list-style-type: none"> ■ Avoid impacts on cemetery area as per CHMP ■ Worker Code of Conduct, cultural awareness trainings and no-go zone will be established according to the CHMP ■ The Project will comply with villages' customs and traditions as outlined in the CHMP <p><u>Land Acquisition and Compensation</u></p> <ul style="list-style-type: none"> ■ Grievance mechanism has been established for affected people to lodge grievances related to land acquisition and compensation ■ The Project will inform the affected people of the compensation amount based on the impact and compensation unit rate. This is planned to take place in October – November 2022. ■ The RP outlines monitoring and reporting requirements (Section 11) which will serve as a mechanism to ensure that the Project complies with the laws and this Plan ■ The villagers will be compensated for according to the Entitlement Matrix (Table 6.1), the land shall

Date	Location	Issues and Concerns	Considerations in the ESIA or Project Design/Actions Taken
		<p><u>Land Acquisition and Compensation</u></p> <ul style="list-style-type: none"> ■ The DMS survey did not cover some certain areas, resulting some individuals were not included in the survey. ■ In the past, there was a case where the actual impact and the DMS survey result was not aligned because the landowner did not participate in the DMS survey conducted by the project and the local officials. ■ The Project should inform each affected individual on their compensation value ■ The Project should ensure that the compensation is carried out in accordance with the Laos laws and the Resettlement Plan ■ The villagers inquired on the compensation for land which has been used as a shifting cultivation, but taxes have not been paid for. ■ Additionally, the villagers also inquired on compensation for current inactive land (i.e., no agricultural activities) which may be cultivated in the next 3-4 years. <p>The Project representative answered that compensation will be provided according to the Entitlement Matrix and the cut-off date was 21 June 2022. The compensation committee may consider case by case if there are any grievances related to land acquisition and compensation.</p> <ul style="list-style-type: none"> ■ The affected land which is abandoned plantation with land titles/document should be fully compensated for. ■ Village public land should be compensated for. ■ If agricultural land of the people is affected, they should be compensated for. <p>Proposals from Villages</p> <p><u>Rural Electrification</u></p> <ul style="list-style-type: none"> ■ The Project should assist families/villages without electricity with installation of electricity, particularly poor family. This should include installation of the poles, grids and electricity meter. <p><u>Agriculture</u></p> <ul style="list-style-type: none"> ■ Animal husbandry training and provision of livestock to villages 	<p>be compensated for if the owners hold land title or land tax payment receipts and the crops/other assets attached to land should be compensated for regardless of the legal ownership to land.</p> <ul style="list-style-type: none"> ■ In the case that it is the public land of the village, the state will take it as a concession land and the project will compensate the state according to the concession contract. <p>Proposals from villagers</p> <p><u>Rural Electrification</u></p> <ul style="list-style-type: none"> ■ The CEGDP proposed to provide solar cells for households without grid connection/electricity. This is to ensure that there will be no electricity bill incurred to villagers, particularly poor households. <p><u>Agriculture</u></p> <ul style="list-style-type: none"> ■ CEGDP Thematic Area 2: Agriculture and Animal Husbandry includes training on livestock rearing, NTFP processing & strengthening market linkages, training on coffee plantation and processing techniques and methods, with a particular focus on enhancing soil quality ■ Access roads to agricultural land will be expended and improved to some extent with the construction of Project's internal roads accessing to the WTGs. ■ For additional village proposals (which are currently not within CEGDP), the CEGDP developed is further processed by the Joint Committee, with assistance of the Company, undertake broad and meaningful public consultations with villagers and their leaders to confirm their desired prioritization and utilization of available fund of the CDP, as stipulated as per CA Clause 4.18 <p><u>Health Support and Services</u></p> <ul style="list-style-type: none"> ■ The CEGDP Thematic Area 4: Health Support & Services includes water and sanitation related activities. <p><u>Education</u></p> <ul style="list-style-type: none"> ■ CEGDP Thematic Area 3: Education and Sponsorship

Date	Location	Issues and Concerns	Considerations in the ESIA or Project Design/Actions Taken
		<p>such as chickens, ducks, pigs, cows, buffalos, goats, etc.</p> <ul style="list-style-type: none"> ■ Training on agricultural methods/techniques which will allow the villagers to be able to cultivate in infertile soil as the villages are located in terrain areas with infertile soil and enhance the current agricultural practices ■ The Project should provide agricultural equipment to the villages such as mower, seedlings, barbed wires and meshes for gardens, and equipment for indoor garden cultivation ■ The Project should carry out land clearing and levelling for paddy fields and plantation to enable the villagers to cultivate on the lands. ■ The Project should construction irrigation for the paddy fields and other agricultural lands ■ The Project to construct or improve access roads for accessing to paddy fields and agricultural areas of the villagers ■ Provision of equipment for coffee cultivation such as hoes, shovels, barbed wires for constructing fences, coffee seedlings, fertilizers, bio-fertilizers for cultivating coffee and coffee processing machine. ■ The Project to pioneer terrace rice field as an alternative rice cultivation <p><u>Health Support and Services</u></p> <ul style="list-style-type: none"> ■ Construct a gravity-fed water supply/spring water supply system for households ■ The Project to assist on the drinking water in the village (water shortage during the dry season was reported) ■ Supply the villagers with materials for construction of toilets such as squat toilets, stone, mortar, bricks, galvanized roof etc. ■ Construction of village dispensary and provision of village doctors and nurse as well as sufficient medicine and equipment <p><u>Education</u></p> <ul style="list-style-type: none"> ■ The Project to construct additional educational facilities and supply educational equipment e.g., 	<p>Assistance include refurbish the education facilities, training of teachers in educational institutions and government certified teacher training modules will be further explored</p> <p><u>Livelihood Restoration</u></p> <ul style="list-style-type: none"> ■ The Project agreed to support the villages with education and healthcare facilities, employment and vocational training, agricultural improvement, and livestock, etc. (refer to CEGDP Section 7.5) <p><u>Job Opportunities</u></p> <ul style="list-style-type: none"> ■ Livelihood Restoration Plan (LRP) within this RP outlines Local Employment & Capacity Building <p><u>Community Infrastructure/ Village Land Use Planning</u></p> <ul style="list-style-type: none"> ■ For additional village proposals (which are currently not within CEGDP), the CEGDP developed is further processed by the Joint Committee, with assistance of the Company, undertake broad and meaningful public consultations with villagers and their leaders to confirm their desired prioritization and utilization of available fund of the CDP, as stipulated as per CA Clause 4.18 <p><u>Food sufficiency, Assistance to Poor Families</u></p> <ul style="list-style-type: none"> ■ CEGDP Thematic Area 2: Agriculture and Animal Husbandry will provide support initiatives which will increase food security such as support home vegetable garden to diversity income and food security, intercropping to enhance food sufficiency ■ Poor families and other vulnerable people will be prioritized to receive LRP and CEGDP.

Date	Location	Issues and Concerns	Considerations in the ESIA or Project Design/Actions Taken
		<p>uniforms, notebooks, pens.</p> <ul style="list-style-type: none"> ■ The Project should assist with ensure sufficient teachers <p><u>Livelihood Restoration</u></p> <ul style="list-style-type: none"> ■ Vocational training such as weaving/tailoring, agriculture, particularly for women so that they can generate additional income. Additionally, weaving/sawing machine should be provided. ■ The Project provides to provide assistance to the village's women union to have an occupation, support in the section of fundings, beauty, culinary, tailoring, repairing. <p><u>Job Opportunities</u></p> <ul style="list-style-type: none"> ■ The Project should prioritize employment opportunities for local labours from the villages. ■ The Project should assist to provide jobs for those who have obtained their higher and vocational education. <p><u>Community Infrastructure/ Village Land Use Planning</u></p> <ul style="list-style-type: none"> ■ Improvement and construction of roads/bridges within and connecting villages to other villages and accessing to agricultural lands ■ Construction of a new village office ■ The Project to install telephone signal station, as there are no signal in the area, causing difficulty in work coordination. ■ The Project to assist with land clearing for construction of new houses ■ Construction sport fields and provide sport equipment to the villages such as volleyball, football and Sepak Takraw ■ The Project to provide a motorbike to the village to be used for administration works. <p><u>Food sufficiency, Assistance to Poor Families</u></p> <ul style="list-style-type: none"> ■ Rice insufficiency was reported (3-6 months) due to low productivity and short season of rice farming. The Project should provide rice/food supply, particularly for poor families ■ Provide assistance to poor 	

Date	Location	Issues and Concerns	Considerations in the ESIA or Project Design/Actions Taken
		families, such as: families with a female-headed household, families that lack food, clothing or electricity.	

1.6 Environmental and Social Baseline Conditions

This chapter summarizes the existing physical, biological and social conditions in the Area of Influence (AOI), focusing on the resources/receptors that may be impacted by the Project. Information in this chapter is based on studies undertaken by the local EIA (Innogreen & Greener Consultant, 2022), a desktop review of publicly available information, and the additional noise, landscape and visual, biodiversity, and social baseline studies undertaken in 2021 to 2022 by Innogreen, with ERM's guidance, during preparation of this ESIA.

The environmental setting of the site is presented in **Table 1.4**.

Table 1.4: Summary of Environmental and Social Baseline Conditions

Receptor	Description
Topography	<ul style="list-style-type: none"> The Project Area is mostly on the slopes of hills and high mountainous area, the elevation ranges from about 1,000 – 1,200 m above sea level.
Geology and soil	<ul style="list-style-type: none"> Soil in Dak Cheung District, Sekong Province is divided into six soil groups and nine types of soil based on the original rocks, condition of the location, identified layer, and identified characteristics of the soils. The area is primarily composed of heavy clay, clay loam, and loamy sand Soil in Sanxay District of Attapeu Province is divided into six soil groups that is classified into 13 types of soil based on the original rocks, condition of the location, identified layer, and identified characteristics of the soils. The soil areas are primarily composed of clay loam, hard clay and loamy sand.
Climate and mereology	<ul style="list-style-type: none"> The weather condition of Dak Cheung District and Sanxay District is mostly cold and with light drizzling rain over almost the entire year. The rainy season is between March and July, whereas the dry season runs from August to October. Over the past five years, a slight change in the temperature has been observed, with an increase of about 1-2 degrees Celsius (EIA, 2020).
Ambient air quality	<ul style="list-style-type: none"> Based on the local EIA (EIA, 2022), parameters measured were in line with the Laos national air quality standards for all parameters. This indicates that the ambient air quality within and around the Project area is in good condition.
Ambient noise	<ul style="list-style-type: none"> Noise sampling conducted for the ESIA demonstrates that the four (4) monitoring locations met the World Bank Group (WBG) Criteria which is more stringent than Lao National Ambient Noise Standard for most of the monitoring duration in the daytime (07:00 – 22:00). The exceeded noise level measured in the night-time (22:00-7:00) were likely due to interference of the local activities such as household activities, the movement of in-used vehicles, and animal (chicken, dogs, and buffalo).
Surface water quality	<ul style="list-style-type: none"> Based on the local EIA (EIA, 2022), the parameters of SW01, SW02, and SW05 were within Laos regulations. The parameters of SW03 and SW04 were mostly within the standards except for measurements of phenol (C6H6O). The area consists of natural high and steep rock mountains, which may contain minerals underground. There is frequent rainfall that causes water to flow over various sources that may cause the water contamination. Surface water sampling conducted for the ESIA demonstrates that most of parameter were in line with the National Environmental Standards No.81/MONRE 2017 except COD at SW03-5 and Coliform Bacteria at SW03.
Landscape values and visual amenity	<ul style="list-style-type: none"> 19 viewpoints have been identified within the Study Area, in order to be exhaustive of different landscape components. These viewpoints are referred to as Visual Sensitive Receptors (VSRs). They represent points within the view shed from where people will

Receptor	Description
	<p>be able (or not) to see the Project, and where the quality of the landscape and visual resources of people could be affected by the presence of the Project.</p> <ul style="list-style-type: none"> When assessing the visual impact of the wind turbines, it is assumed that the largest horizontal component is the entire rotor, which would be a maximum of 165 m wide. The calculations suggest that the impact of a 165 m wide wind turbine rotor would reduce to be insignificant at about 3.8 km, as it would form less than 5% or 2.5° of the horizontal field of view.
Natural Hazards	<ul style="list-style-type: none"> The topographic conditions of the Project area and nearby area is composed mostly of hills and high mountains, and there are no large rivers that will cause flooding in this area. And according to global flood data there is no historical flood event is recorded for the Project area.^{4 5} There is no record of earthquake occurrence in the Project site or in Sekong and Attapeu provinces. However, the Project will be designed in accordance with standards so that the Project is capable of withstanding an earthquake. Attapeu and Sekong Province are identified as highly susceptible to landslides according to UNDP Support National Hazard Profile in 2020. Increasing incidence of landslides is being observed in the upper catchments of the Sedon and Sekong rivers, while increased flooding is being observed in the lower catchments and along the Mekong River.⁶ The Project is at least 30 km distance to Sekong River.
Biodiversity	<ul style="list-style-type: none"> Field data were collected to further inform the understanding of the important biodiversity values within the study area and this included A Rapid Ecological Assessment (REA). Monthly bird field survey campaigns across 12 months and covering all relevant seasons, five bat field survey campaigns covering dry and wet seasons, two mammal surveys, herpetofauna (reptiles and amphibians) and plant field survey campaigns in the wet season and dry season were undertaken based on the results of the REA. A Critical Habitat Assessment (CHA) was completed for the Project (Appendix T), in support of the Project's alignment with the applicable international standards, which include the Asian Development Bank's Safeguards Policy Statement (ADB SPS). The Project area has been described to be located in a mosaic of evergreen forest, shifting cultivation, shrub land and grassland, waterbodies, and built-up areas. In several areas, there has been extensive modification for agriculture and clearance of forests by local communities predominantly. The EAAAs assessed therefore contain both natural and modified habitat in terms of the ADB SPS definitions. Requirements in terms of natural habitat identified: there are a number of Project components that overlap with terrestrial and aquatic areas that are designated as 'natural habitat' and in these instances, the ADB SPS requires that the Project does not significantly convert or degrade areas of natural habitat, and mitigation measures are designed to achieve at least an overall <u>no net loss of biodiversity</u>. This information is detailed in the Initial Biodiversity Action Plan (BAP). Requirements in terms of critical habitat identified: the volant and non-volant species EAAAs both qualify as critical habitat, based on several of the ADB SPS critical habitat qualifying criteria, and therefore by association the entire Project area and planned development footprint (infrastructure/activities) is located within areas identified as critical habitat. Requirements in terms of legally protected areas: the project footprint does not overlap with any identified formally legally protected areas therefore the requirements under ADB SPS Paragraph 28 and 30 do not apply.
Population and Demographics	<ul style="list-style-type: none"> The Project area including wind turbine towers, transmission line, and access roads are located in the administrative boundaries of 24 villages in Dak Cheung District of Sekong Province and 8 villages in Sanxay District of Attapeu Province. Five ethnic groups were identified in the Project affected villages, namely Triang (89%), Yae (4%), Katu (4%), Ha Luk (2%) and Lao (1%). Triang makes up the majority

⁴ Global Flood Map, [Laos Flood Map | Map of Potential Flooding in Laos \(globalfloodmap.org\)](https://globalfloodmap.org/)

⁵ Reliefweb, [UNOSAT Training activities \(reliefweb.int\)](https://reliefweb.int/)

⁶ UNDP, [Project Document - Deliverable Description \(undp.org\)](#)

Receptor	Description
	<p>of the surveyed households, with the exception of Dak Rant village (Dak Cheung District) where Yae makes up 85.7% of the village population and Dak Xeum village (Sanxay District) where Ha Luk is the main population of the village.</p> <ul style="list-style-type: none"> ■ The majority (98%) of the population of the surveyed villages practice in animism and 2% practices Buddhism. ■ The average level of education for girls is 3rd to 4th year of secondary school (equivalent to years 8 and 9) and 4th year of secondary school (9 years of education) for boys. 53% or 1,472 people of the surveyed population have completed primary education, followed by 30% (745 people) attending secondary education. These figures are considerably lower compared to those of Sekong and Attapeu Provinces. ■ Migration is not high in the area
Livelihoods	<ul style="list-style-type: none"> ■ The main livelihoods are land-based livelihoods i.e. engagement in agricultural activities including rice farming, coffee and cassava cultivation, livestock and non-timber forest products (NTFPs) collection and processing. ■ Of the 2,302 surveyed population, 1,022 people (44%) have a second occupation, of which 735 people (31%) work are engaged in farming activities, 214 people (10%) work as day laborers, and 81 people (4%) are engaged in livestock. The remaining supplementary livelihoods include NTFPs collection, small businesses, handicraft productions, and others such as homemakers, carpenters, etc. ■ The communities are dependent on the forest resources for food, medicine, hunting, firewood, wood for construction of houses and cash income.. ■ The villagers experience rice and food deficiency, particularly during the months October to April as it is dry season, with low to no productivity. ■ The average monthly household income of surveyed households is LAK (Laotian Kip) 1,272,593 (approximately USD 110), and the average monthly income per capita (per person) is LAK 199,954 (approximately USD 18), which are lower than provincial and national average of LAK 1,200,000 per month (approximately USD 104) per capita ■ The average monthly expenditure of 443 surveyed households is LAK 8,740,498 (approximately USD 775) and the expenditure per capita is LAK 728,375 per month (approximately USD 65) – this is approximately 6.87 times higher than the average monthly household income (LAK 1,272,593) ■ Most people do not have land titles (only 15 land parcels out of 396 affected land parcels have land titles), only land use rights (i.e. land tax receipt) and booking land (a traditional system which is not recognized in Laos law).
Education, Health and infrastructure	<ul style="list-style-type: none"> ■ Most youths attend primary schools in their villages; however secondary schools are only available in some bigger villages including Xiengluang, Dak Cheung, and Dak Dor. Therefore, some students are required to travel from 4 to 10 km to secondary schools. The common means of travel include walking and biking. ■ Of the 23 surveyed villages in Dak Cheung District, 10 villages have healthcare centres located within the village. Local healthcare facilities usually have x-ray room, nativity room, and rehabilitation room and a doctor and nurses. For the villages without healthcare facilities, they have to travel to healthcare facilities in other villages or bigger cities such as Xiengluang Health centre, Dakdor Health Centre, Prao Health Centre, and Dakchueng Hospital. ■ The most common diseases in the surveyed villages are cold, diarrhoea particularly among children. Women experience endometritis and concerns around health risks related to giving birth. For the elderly, common diseases are kidney disease and gastritis. Other diseases identified include malaria, stomach pain and leucorrhoea.
Public Infrastructures and Utilities	<ul style="list-style-type: none"> ■ The main source of water identified across surveyed villages is gravity-fed water system which is sourced from streams and stored in common tank for water supply of households. . Rainwater is stored in tanks for drinking and domestic use during rainy season. It is noted that piped water supply system (Nam Papa) is not available in the surveyed villages (water is not pumped into homes). ■ All surveyed villages in Dak Cheung District have access to electricity, except Dak Dom village where the electricity grid is not available, and the village depends on dynamo generators. The main sources of electricity supply include transmission line and solar cells. Only three villages (i.e. Dak Yok, Dak Padou, and Nam Ngonnuea) in Sanxay District have access to electricity. The main source is power grid and solar cells.

Receptor	Description
	<ul style="list-style-type: none"> ■ Firewood is predominately used for cooking in the villages and is collected from the nearby forest areas. ■ There is no waste collection and disposal system in the surveyed villages; therefore, the village members' burn, bury, and throw waste around the house or into the forests as means of waste disposal. ■ Surveyed population indicated to have access to the internet ■ Dirt roads are available in all 32 surveyed villages. The means of transport of the locals include motorbike, walking, biking, and farm tractor. During rainy seasons, the (red soil) dirt roads get muddy from heavy rain and make it inconvenient to travel and increase travel times ■ In Dak Chueng District, markets are available in Dak Bong, Dak Cheung, and Ngon Don Villages. For the villages located far from the markets, there are occasional markets, 2-3 times per month. The people usually purchase or exchange products at retail shops available in the villages. In Sanxay District, Dak Nong, Dak Smor, Dak Sied, and Dak Xuem villages have access to markets, whereas the remainder do not have market access.
Cultural Heritage and Indigenous Peoples	<ul style="list-style-type: none"> ■ One of the core beliefs of animism is the belief of environmental spirits but in the case of the surveyed villages, ancestral spirits are worshiped as well. Cemeteries are considered sacred in all surveyed villages and mostly located in forested areas. ■ All ethnic groups have their own spoken languages. Triang, Yae, Katu and Ha Luk are classified under Mon-Khmer Linguistic Group while Lao ethnic group is Lao-Tai Linguistic Group. They believe in animism and worship ancestral spirits. They have traditional costumes, housing styles, ceremony and skill sets (ironsmith, bamboo handicrafts, and weaving). ■ Based on the site visit conducted in November 2021, the communities have absorbed cultures and ways of life from the mainstream Lao society as evidenced in their clothing, housing styles and celebrating mainstream Laos festivals and ceremonies.
Gender considerations	<ul style="list-style-type: none"> ■ The ratio remains roughly at 1:1 male to female across surveyed villages ■ Females have slightly lower average level of education than men. The average level of education for females is up to year 3-4 of secondary school, while for males it was identified that the average education is year 4-5 of secondary school. ■ The average age of women getting pregnant is 15-18 years old. Mostly, women give birth at home or at local healthcare centres. ■ Based on the FGDs and site visit observation, gender-based violence does not seem to be an issue in the villages within the Study Area. However, measures will be put in place to avoid GBV and other forms of exploitations such as a Worker Code of Conduct and grievance mechanism. The Worker Code of Conduct will incorporate IFC Emerging Good Practice for Private Sector for Addressing Gender-based Violence and Harassment.⁷ ■ Female-headed households and male-headed households have similar livelihoods. It is, however, noticeable that female-headed households, particularly if the rest of the family is composed of females, children or elderly, have a significant fewer cultivation land areas and smaller animals holding size. ■ Men and women usually have joint ownership of land. However, one women's group asserted that despite joint land ownership, most of land use certificates are in the husband's names. ■ Female support networks and organizations available in the surveyed villages include Lao Women's Union (LWU) and CARE International Laos in Dakchueng District, Sekong Province, and District Health Office ■ Mostly women and men jointly make decisions related to households finances ; however, in most cases women do not have their own bank accounts. Women are more dominant in making decisions related to household chores, e.g. cooking and daily expenditure, e.g. food consumption.

⁷ https://www.ifc.org/wps/wcm/connect/f1645167-7eff-439b-922b-7656c75320ab/GPN_AddressingGBVH_July2020.pdf?MOD=AJPERES&CVID=nddokiS

Receptor	Description
	<ul style="list-style-type: none">■ The FGDs with women groups have identified their main needs are improved healthcare and support on livelihoods.

1.7 Environmental and Social Impact Assessment

The impact assessment has been conducted of the potential environmental and social impacts attributable to the construction and operation phases of the Project. Qualitative and quantitative (where relevant) assessments of impacts have been presented, significance of each potential impact has been identified, and mitigation measures to recognize and reduce the impacts have been recommended. Cumulative impacts, particularly on community health and safety and biodiversity, have also been assessed. **Table 1.5** presents a summary of residual impact significance and **Table 1.6** presents a summary of risks from climate change. Refer to **Section 9 Impact Assessment** for full impact assessments.

Table 1.5: Summary of Residual Impact Significance

Impact Type	Residual Impact Significance	
	Construction	Operation
Physical Environment Impact Assessment		
Impacts on Topography	Moderate	Moderate
Impacts on Geology and Soil	Minor	Minor
Impacts on Air Quality	Minor	Scoped out of the assessment
Impacts on Noise	Minor	Minor
Impacts to Surface Water Quality	Minor	Negligible
Impact to Water Resources	Minor	Minor
Impacts to Landscape Values	Moderate	Moderate
Impacts to Visual	Negligible to Moderate	Moderate
Impacts Associated with Shadow Flicker	Not Applicable	Minor
Biological Environment Impact Assessment		
Physical destruction and/or disturbance of vegetation	Moderate	Not Applicable
Reduction in habitat for supporting key globally and/or nationally threatened species	Moderate	Moderate
Illegal hunting/poaching and collection of forest resources	Minor	Negligible
Bird & bat collisions with wind turbines resulting in injury or mortality	Not Applicable	Negligible
Bird & bat collisions with transmission lines resulting in injury or mortality		Negligible
Vehicular collisions with wildlife	Negligible	Negligible
Dust pollution caused by earthworks and vehicle/machinery operation	Negligible	Negligible
Water and soil pollution caused by potential accidental spills of hazardous substances	Negligible	Negligible
Soil erosion and sedimentation of watercourses	Negligible	Negligible
Disturbance and nuisance caused by increased noise, light and/or vibrations	Negligible	Negligible
Barriers or interference with species movement	Minor	Minor

Impact Type	Residual Impact Significance	
	Construction	Operation
Increased susceptibility of forest habitat to disturbance	Minor	Minor
Introduction of alien plant species and/or disturbance leading to invasion by alien plants and weeds	Minor	Minor
Reduced habitat connectivity caused by fragmentation of habitat	Minor	Minor
Loss of ecosystem services	Negligible	Negligible
Increased hunting/harvesting pressure due to enhanced accessibility to the area	Moderate	Moderate
Increased fire risk	Scoped out of the assessment	Scoped out of the assessment
Trophic cascade impacts	Scoped out of the assessment	Scoped out of the assessment
Social Impact Assessment		
Impacts on Economic Opportunities	Positive	Positive
Economic Displacement and Impacts to Livelihoods	Moderate	Moderate
Impacts on Community Health and Safety	Negligible	Not Applicable
Impacts on Occupational Health and Safety	Negligible	Negligible
Impacts Associated with Influx	Minor	Not Applicable
Impacts of Wind Farm Operation on Local Amenities	Not Applicable	Negligible to Moderate
Impact on Ethnic Groups (Erosion of Ethnic Culture)	Negligible	Not Applicable
Impact on Cultural Heritage (Tangible and Intangible)	Minor	Minor
Climate Change Risk and Impact Assessment		
Impacts on Climate Change	Negligible	Negligible
Unplanned Events		
Leakage and Spill Incidents	Minor	Minor
Traffic Accidents	Moderate for workers and communities Minor for communities (livestock)	Not Applicable
Unexploded Ordnances (UXOs)	Moderate	Moderate for workers and communities Minor for the environment
Fire and Explosion	Minor	Moderate for workers and communities Minor for the environment
Natural Hazards (Flood and Landslide)	Moderate	Moderate
Blade Ejection Failure	Not Applicable	Minor
Transmission Line Snapping and Transmission Pylon Collapse	Not Applicable	Moderate
Cumulative Impacts		
Cumulative Impact 1: <i>Avifauna collisions</i>	Not Applicable	Minor

Impact Type	Residual Impact Significance	
	Construction	Operation
Cumulative Impact 2: <i>Regional loss of important forest habitat</i>	Moderate	Not Applicable
Cumulative Impact 3: <i>Forest habitat fragmentation and reduced connectivity</i>	Minor	Minor
Cumulative Impact 4: <i>Regional loss of RDL species</i>	Minor	Moderate
Cumulative Impact 5: <i>Reduction in ecosystem services</i>	Minor	Minor
Cumulative Impact 6: <i>Impact on biodiversity offset receiving area</i>	Moderate	Moderate
Cumulative Impact 7: <i>Contribution to clean energy sector and move away from non-renewables (positive impact)</i>	Not Applicable	Positive

Table 1.6: Risks from Climate Change

Hazard Type	Hazard Level	
	2030	2050
Water Availability	Low	Low
Riverine Floods	None	None
Landslides	High	High
Extreme Heat	High	High
Cyclone and Wind Speed	High	High
Lightning	No direct projections	No direct projections

1.8 Environmental and Social Management Plan

The Environmental and Social Management Framework (ESMF) is prepared based on the Project understanding and the findings and recommendations of the ESIA. Each specific management plan will be developed based on this framework and be prepared by the EPC Contractor for those plans related to construction phase and by the O&M contractor for those related to operation phase. The Framework is prepared to meet lender and legal requirements and enable the Project to demonstrate the adequacy of the Project's E&S management system and management plan, preparation, review and approval process, implementation, and completeness during the compliance assessment by the Lenders' Technical Advisor (LTA).

MWPCL, as the Project Proponent, has ultimate responsibility for the project development, ensuring all project required mitigation measures are implemented, and that the Project conforms with ADB requirement and Government of Lao PDR standards

The purpose of the Environmental and Social Management Plan (ESMP) is to specify the standards and controls required to manage and monitor environmental and social impacts during construction and operation phase. The ESMP (in **Section 10**) will be part of the future construction and operational activities, and as the future construction and operational plans are prepared, these are expected to confirm how these commitments will be incorporated into the Project's Environmental and Social Management System. This implementation will be under the responsibility of the EPC (Engineering Procurement and Construction) Contractor and IEAD.

The ESMP covers all in built controls and additional mitigation measures proposed to reduce the impacts as well as a list of all required management plans. Monitoring will be required for the Project to ensure compliance. This will include regular auditing of the Project during construction and operation as detailed in **Section 10.8**.

Standalone management plans will be required for the Project. These will include:

- Community Health and Safety Management Plan
- Occupational Health and Safety Management Plan
- Traffic Management Plan
- Worker's Camp Management Plan
- Construction Material Sourcing Plan
- Air Quality Management Plan
- Water Quality Management Plan
- Hazardous Materials Management Plan
- Waste Management Plan
- Noise and Vibration Management Plan
- Spoil Management Plan
- Soil Erosion and Sediment Control Management Plan
- Site Restoration Management Plan
- Local Content and Influx Management Plan (including Labour Management Plan and Local Procurement Management Plan)
- Cultural Heritage Management Plan
- Emergency Preparedness and Response Plan
- Stakeholder Engagement Plan
- Resettlement Plan

- Community and Ethnic Group Development Plan
- Initial Biodiversity Action Plan
- Unexploded Ordinance Survey and Clearance Plan
- Baseline Soil Sampling Plan
- Biodiversity Monitoring and Evaluation Plan
- Invasive Species Management Plan

2 INTRODUCTION

2.1 Project Background

Monsoon Wind Power Company Limited (MWPCCL and/or the Project Proponent) is developing the Monsoon Wind Farm with an installed capacity of approximately 600 MW in Dak Cheung District of Sekong Province and Sanxay District of Attapeu Province in Lao People's Democratic Republic (Lao PDR). The development also includes a 22 km 500 kilovolt (kV) transmission line, which connects to the grid in Vietnam ("the Project"). The Project location including the wind farm and transmission line is provided in **Figure 2.1**.

Impact Energy Asia Development Limited (IEAD) managed the initial development phase of the Project until the establishment of MWPCCL in 2022. MWPCCL is a joint venture between Impact Energy Asia Development Limited (IEAD) and SMP Consultation Sole Co., Ltd. (SMP). Hereafter IEAD will refer to as MWPCCL.

IEAD signed a Memorandum of Understanding (MoU) with the Government of Lao PDR in 2011 to explore the possibility of developing a wind power project. Following the initial feasibility study, IEAD signed a Project Development Agreement (PDA) with the Government of Lao PDR on August 7, 2015 for the development of a wind power project with a capacity of 600 MW. The concession period for the Project is understood to be 25 years from the commercial operations date (COD). Construction is estimated to take approximately 30 months and COD is anticipated to be December 2025.

An Environment Impact Assessment (EIA) study for local Lao PDR permitting requirements was conducted in June 2014 (EIA 2014), and a second and third revision was conducted in May 2018 (EIA 2018), and September 2020 (EIA 2020), respectively. Innogreen Engineering Co., Ltd (Innogreen) on behalf of the Project Proponent has revised the local EIA (EIA 2020) due to significant changes in the Project design and the local EIA has approved by MONRE on 28 July 2022 (EIA 2022).

ERM-Siam Company Limited (ERM) was contracted by IEAD to conduct an Environmental and Social gap analysis of the local EIA against the Lenders' applicable standards including an initial biodiversity review (Phase 1) (**Appendix A**). ERM completed Phase 1 and submitted the final gap analysis report to IEAD in March 2021. The Phase 1 report also recommended a Terms of Reference (TOR) to fill the gaps identified.

It is understood that part of the Project area is overlapping with a Bauxite mine concession area granted to Viet Phoung Group (VPG), which signed its concession with the Government of Laos (GOL) in 2018, therefore, the relocation of Project facilities in the overlapping areas is potentially required. This includes the cluster of nine WTGs, the main 500 kV substation, and a short portion of the 500 kV transmission line route. The Project facilities will be relocated once the final design is completed.

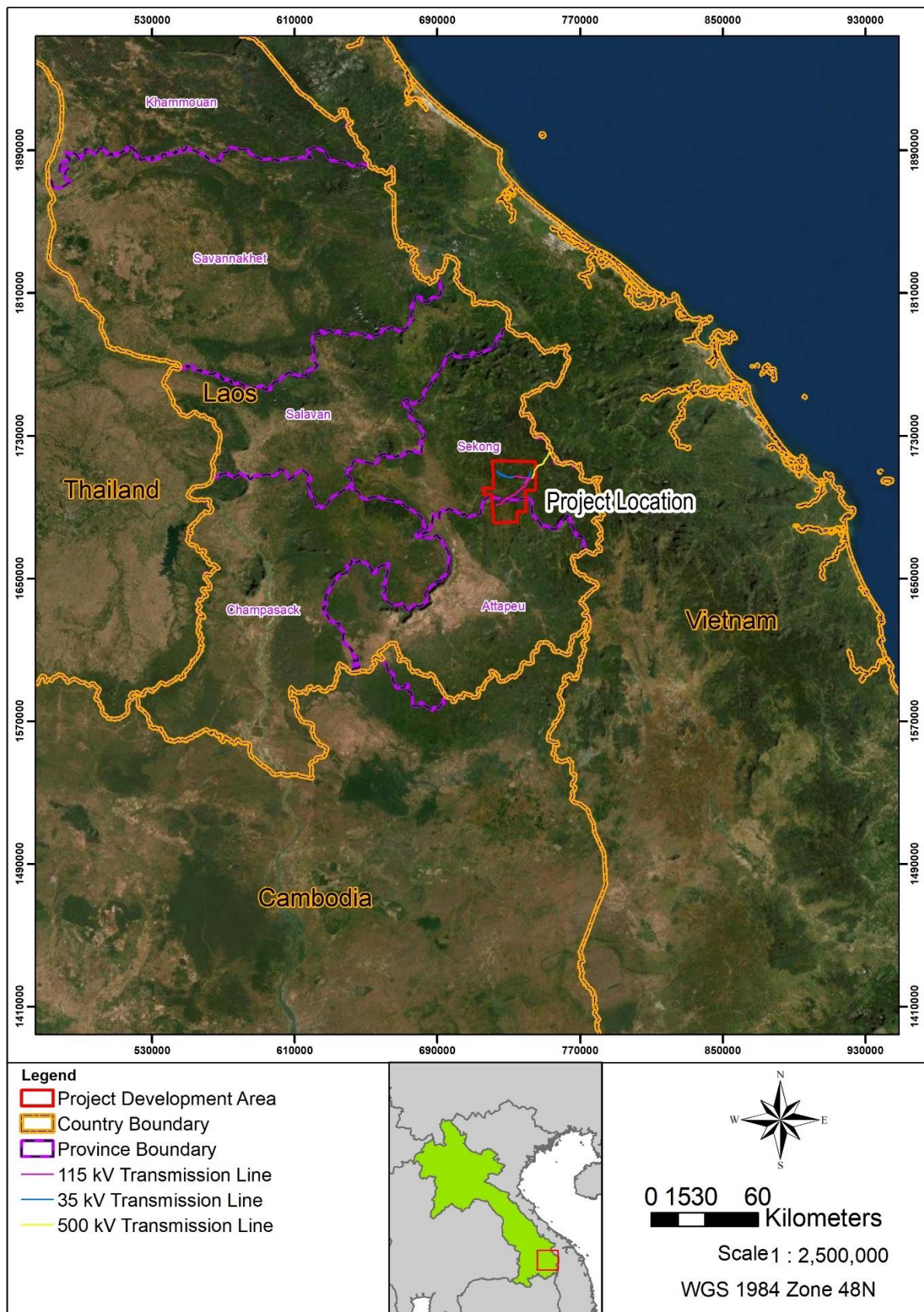
Once the relocation areas are identified and the additional studies are complete, addendums to address the relocation will be prepared to complement the following documents:

- Environmental and Social Impact Assessment ("ESIA Addendum")
- Biodiversity Action Plan ("BAP Addendum")
- Resettlement Plan ("RP Addendum")
- Cultural Heritage Management Plan ("CHMP Addendum")
- Community and Ethnic Group Development Plan ("CEGDP Addendum")
- Stakeholder Engagement Plan ("SEP Addendum")

The addendums will provide updates of the relocation of Project facilities, the additional survey results, the potential impacts, and additional mitigation measures and monitoring program that may be required. No pre-construction or construction work will be conducted at the proposed relocation sites until the required E&S assessments are completed and approved. The addendums will be available no later than 3 months after Financial Close. The new Project design will be aligned with the lenders' E&S

requirements and not make any of the E&S impacts materially worse than presented in the Final E&S documents, without the non-objection of the lenders.

Figure 2.1: Project Location



2.2 Purpose and Objective of this ESIA

This Environmental and Social Impact Assessment (ESIA) Study includes the supplementary environmental, social and health studies (Phase 2) that have been conducted between April 2021 and February 2022 as identified during Phase 1. The purpose of this ESIA is to inform MWPC and their Project lenders (ADB and other potential lenders) of the environmental and social impacts associated with the Project. The ADB and potentially other lenders are considering financing the construction of the Project. The Project therefore needs to document conformance with their respective environmental and social policies. The ADB requires borrowers to conduct an environmental and social assessment of projects proposed for Bank support pursuant to its ADB Safeguard Policy Statement (SPS) (ADB 2009); other ADB social policies and requirements such as the Social Protection Strategy (2001) and Gender and Development Policy (1998) and relevant operations manuals, as applicable. This ESIA has been prepared to support the management of environmental and social (E&S) risks in accordance with international good practice, which include the ADB SPS, and relevant World Bank Group (WBG) Environmental, Health and Safety (EHS) Guidelines.

The objectives of the ESIA process are to:

- Provide a description of the Project;
- Establish the existing status of the physical, biological, socio-economic, and cultural environments of the Project area;
- Identify, evaluate, and manage the environmental and social risks and impacts of the Project in a manner consistent with the ADB SPS;
- Propose a mitigation measure to anticipate and avoid risks and impacts, where avoidance is not possible to minimize or reduce risks and impacts to acceptable levels, once risks and impacts have been minimized/reduced and mitigated, and where significant residual impacts remain, compensate for or offset them, where technically and financially feasible;
- Demonstrate commitment to applicable with national environmental and social institutions, systems, laws, regulations, and procedures in the assessment, development, and implementation of the Project, where applicable;
- Document project conformance with the ADB SPS and the WBG EHS Guidelines.

In order to document conformance with the Government of Laos' requirement and to obtain government authorization for the Project, several separate environmental documents have been submitted or are in the process of being prepared for submission to the government, including:

- Environmental and Social Impact Assessment Report, 600 MW Monsoon Wind Farm Project Dak Cheung District, Sekong Province and Sanxay District, Attapeu Province – This was prepared by Innogreen in 2020, to obtain early approval for the windfarm development. This is being updated to account for the current design of the Project;
- Environmental and Social Impact Assessment Report, 500 kV High Voltage Transmission Line Project of the 600 MW Monsoon Wind Farm Project Dak Cheung District, Sekong Province – This was prepared by Innogreen in 2020, to obtain approval for the transmission line component of the Project.

These documents have been prepared separately from this ESIA to meet Laos permitting requirements. A summary of the key findings of these documents have been integrated into this ESIA, with reference to the original report for further details, where relevant.

2.3 Limitations and Assumptions of this ESIA

This report has been prepared by ERM with all reasonable skill, care, and diligence within the terms of the Contract with the Client, and taking account of the resources devoted to it by agreement with the Client. Specific limitations and assumptions on this assessment are as follows:

- The COVID-19 pandemic presented a major challenge for undertaking field surveys where face to face interaction, and/or coming into close contact with the local community was required, for example, household surveys and FDGs/KIIs for the social baseline data collection. COVID-19 restrictions and clearances also resulted in multiple delays to the field visits and engagements. This resulted in an approximately five month delay in the baseline field data collection schedule. Environmental and social baseline data was collected as much as possible given that site access restrictions were still imposed during the time of writing this ESIA.
- ERM's findings are accurate and complete only to the extent that information provided to ERM was itself accurate and complete; and
- The information provided in this report is not to be construed as legal advice.

For this ESIA Study; the Project facilities include the following:

- Project facilities: Wind turbines and wind turbine boundary area (development area), 22 km 500 kV transmission line from the development area to the Laos/Vietnam international border, and Project site roads in the development area; and
- Ancillary facilities: Internal road, workers camps, laydown areas, spoil disposal areas, and batching plants within the development area.

The section of the transmission line to be developed within Vietnam that will run from the Laos/Vietnam international border to the Thanh My substation in Nam Giang District, Quang Nam Province, Vietnam is the responsibility of Vietnam Electricity (EVN) and is not part of the Project for ADB financing and therefore not part of the scope of this ESIA. This facility is being constructed for other energy projects in Vietnam and is not solely developed for the Project. As such, it is not considered an associated facility.

2.4 ESIA Report Structure

The structure of this report is as follows:

- **Section 1** Executive Summary
- **Section 2:** Introduction
- **Section 3:** Legal and Institutional Framework
- **Section 4:** Project Description
- **Section 5:** Project Alternatives and Environmental and Social Considerations
- **Section 6:** Impact Assessment Methodology
- **Section 7:** Stakeholder Engagement
- **Section 8:** Environmental and Social Baseline Condition
- **Section 9:** Environmental and Social Impact Assessment
- **Section 10:** Environmental and Social Management Plan
- **Section 11:** Conclusions and Recommendations

The supporting documents are inserted as Appendices, as follows:

- **Appendix A:** E&S Gap Analysis and Initial Biodiversity Review: Wind Farm in Lao PDR (Final Report)

- **Appendix B:** Noise Field Logs, Calibration Sheets, and Sampling Raw Data
- **Appendix C:** Surface Water Field Logs, Calibration Sheets, and Sampling Raw Data
- **Appendix D:** Landscape and Visual Field Logs, and Sampling Raw Data
- **Appendix E:** Turbine Coordinates
- **Appendix F:** Specifications of the Transmission Line
- **Appendix G:** Summary of EIA Consultation
- **Appendix H:** ESIA PowerPoint Presentation
- **Appendix I:** Summary of ESIA Consultation
- **Appendix J:** FGDs/KIIs Questionnaire
- **Appendix K:** Meeting Note, Sekong, 17 February 2022
- **Appendix L:** Meeting Note, Sekong, 31 March 2022
- **Appendix M:** Meeting Note, Attapeu, 30 March 2022
- **Appendix N:** Meeting Note, Attapeu, 12 May 2022
- **Appendix O:** Minute of Meeting and Registration of July 2022 Consultation
- **Appendix P:** Presentation July 2022 Consultation
- **Appendix Q:** Disclosure Booklet
- **Appendix R:** Minutes of meeting and attendee registration of September 2022 Consultation
- **Appendix S:** Biodiversity Baseline Survey Reports
- **Appendix T:** Critical Habitat Assessment
- **Appendix U:** Socio-economic Household Survey Database
- **Appendix V:** Shadow Flicker Field Logs, and Sampling Raw Data
- **Appendix W:** Human Right Impact Assessment (HRIA)

3 LEGAL AND INSTITUTIONAL FRAMEWORK

3.1 Overview

This ESIA has been undertaken with reference to the provisions of the requirements, standards, policies, laws, rules, guidelines, manuals, and international conventions and treaties as outlined in this Chapter. In addition, international standards and best practices on environmental and social safeguards were reviewed to identify all possible risks and impacts from project development and appropriate measures to minimize and mitigate the risks to the extent possible.

3.2 Lao PDR Legal and Institutional Framework

The Lao PDR legislation, policies, standards, and guidelines that have been ratified by Lao PDR and are applicable to the Project are described in the following sections.

3.2.1 National Laws and Regulations

3.2.1.1 Decision on the Pollution Control No. 1687/MONRE, 2021

The Decision prescribes the measures on control, monitoring, and inspection of pollution; the measures to control pollution in case of emergency; the designation of hazardous areas; and identification of pollution risks in order to minimize the impacts to the air, soil, water, and public nuisance and not to exceed the National Environmental Standard threshold. The Decision applies to the individual, enterprise, or organization of both domestic and overseas that perform activities in Laos.

The content on the Decision is outline below:

- Survey, Registration of the Pollution Sources, and Establishment of Plans for Pollution Control and Importation of Wastes and Hazardous Substances
 - The Office of the Natural Resources and Environment of the District, Municipality, and City is responsible for conducting a survey and registration of pollution sources of family business, including small scale agriculture, micro forestry, and handicraft business while the Department of Natural Resources and Environment of the Province and Capital work for agriculture, micro and mega forestry, industry, mining activities, and infrastructure projects. Collected information related to hazardous chemicals and wastes will be compiled by the Department of Pollution Control, Monitoring, and Inspection and reported to the Minister of Natural Resources and Environment. The information is utilized to develop pollution control plans.
- Management and Measures on Air Pollution Control

The individual, enterprise, and organization that operates any business shall comply with the primary measures regarding air or water pollution control to meet the National Environmental Standard. Business operators shall;

 - prepare air or wastewater treatment system to meet the National Environmental Standard
 - monitor the air emission or wastewater effluent on a regular basis
 - plant trees for the area that covers 10% of the total area or more in accordance with the environmental management and monitoring plans to prevent dust pollution
 - In case of air or water pollution caused by the business operator, the project investor or the operator shall be responsible for all the associated expenses and shall promptly report to the related local administrative bodies.
- Management and Measures on Soil Pollution Control
 - Application of substances, especially pesticides and fertilizers in agriculture and forestry shall comply with the related laws and regulations as well as the handbook for Agriculture and Forestry Sector

- Application of substances, especially cyanide and mercury in mining shall comply with the related laws and regulations as well as the handbook for Energy and Mining Sector
- The disposal, dumping, landfill, or destruction of contaminated and hazardous substances shall comply with the specific regulation and technical specification

■ Management and Measures on Water Pollution Control

The individual, enterprise, and organization that operates any business shall manage water pollution at source as follows:

- Establish wastewater treatment system at each industrial factories and service industries (e.g. hotels, accommodations, restaurants, hospitals, markets, etc. and ensure that discharged water complies with the National Environmental Standards
- Households located near natural waterbodies are to establish wastewater treatment system to treat wastewater before discharge to natural water bodies and discharged water should comply with the National Environmental Standards
- Use of chemicals such as pesticides and fertilizers in agricultural activities, it must be ensured that there is no leakage into natural waterbodies

In case of water pollution/contamination caused by the business operator, the project investor or the operator shall be responsible for all the associated expenses and mitigation measures.

■ Management and Measures on Nuisance Pollution Control

The individual, enterprise, and organization that operates any business shall ensure control of nuisances including noise, vibration, heat, light and odour at source. These entities are to be responsible for mitigation measures for nuisances. If the nuisances are not mitigated, the entities will be given warning and fined.

■ Preventive Measures and Pollution Control in case of Emergency and Identification of Hazardous Zones and Pollution Risks

The individual, enterprise, and organization that operates any business shall develop emergency preparedness and response plan for emergency incidents and be responsible for costs associated with emergency incidents including costs for evacuation of people and property, costs for remediation affected areas and costs for compensation.

■ Adoption of International Standards and Technical Inspection (in the case that a threshold for a pollutant is not proscribed in the National Environmental Standard, international standard will be adopted)

3.2.1.2 *Law on Electricity (amended), 2017*

The objective of this Law is to:

- Define the principles, regulations, and measures governing the implementation, operation, management, monitoring, and inspection of electricity activities to enable the electricity operations and business to become highly effective, conform with the potential in sustainable power generation, ensuring environment protection, and upgrading the living conditions of the multi-ethnic Lao people;
- Promote electricity generating activities and the use of advanced technology in the electricity generating activities, expanding transmission line network to cover all regions of the country, linking with international grid, ensuring expeditious and safe services, and beneficial use.

Article 6. Principles Relating to Electricity:

The operations and business in the power energy development shall be undertaken in accordance with the main principles as follows:

- Ensuring consistence with policy, strategy, laws, National Socio-Economic Development Plan, national defence, and public security activities in each period;
- Ensuring development of electricity generation along with environmental protection in line with green, clean and sustainable direction;
- Ensuring efficient and effective use of natural resources;
- Undertaking the production and supply of electricity energy in a stable, effective, open, transparent, and accountable manner and with reasonable price;
- Using the electricity economically and effectively.

Article 60. Social and Natural Environmental Impact Assessment:

The social and natural environmental impact assessment will help the electricity generating activities to be undertaken without affecting the environment and the livelihoods of the multi ethnic people and must comply with the specified regulations as follows:

- Assessing the damages, resettlement of the people, and preservation forest affected by the project development including the allocation of production land, compensation, protection of rights and interests of the affected people, and livelihood rehabilitation plan.
- Having measures to address or mitigate the adverse impact on environment, such as: impact on water source, land resource, eco-system, biodiversity, and habitat of wildlife and aquatic animals.
- Conducting other assessments and analysis as determined by the Natural Resources and Environment sector and the Energy and Mines sector.
- The Environmental and Social Impact Assessment shall be reviewed and approved by the Natural Resources and Environment sector in coordination with the Energy Sector and other sectors concerned.

Article 75. Use of Land for Power Project:

In order to ensure the management of land of the people, the use of land of the project developer shall be carried out in compliance with the policy, laws, and regulations of Lao PDR as follows:

- The project developer shall clearly define the scope of land use, conduct the study or explore the potential impact and measures for mitigating the impact on social and natural environment.
- All sectors concerned must coordinate and cooperate in conducting the land use planning in the granted concession area.
- The Natural Resources and Environment sector shall issue the document of assignment of land use right to the project company in accordance with the Law on Land upon receiving the authorization.
- If the power project activities have affected the social and natural environment, the sector concerned must assess the damages for reporting to the relevant local administration, and to the Government for consideration, as the case may be.

3.2.1.3 *Law on Land (amended) No. 70/NA, 2019*

The objective of this Law is to determine the regime of the management, protection, and use of land in order to ensure effectiveness, compliance with the objectives and with the laws and regulations, and to contribute to the enhancement of the national socio-economic development as well as to the protection of environment and territory of Laos.

Article 3 (amended) on Land Ownership specifies that the State holds ownership and manages land across the country through land use planning, land allocation, and land development. The State is able to grant land use rights to its citizens, as well as legal persons, collectives and organization of Lao citizens. Foreigners have the rights to lease, receive concession, or purchase land use rights (with an agreed timeline). Foreign organizations that have been established with the authorization of the State

have the right to lease or receive concession only. In case of infringement of laws or contract, the State has the right to revoke the land use rights without compensation to the land right users.

Article 6 on Land and Environmental Protection has specified that all individuals and organizations shall have the obligation to protect land in order to maintain it in a good condition, preventing erosion, sinking, degradation, maintaining the quality appropriately for each category of land, and not causing decrease of land area and land category without authorization. The use of land shall not cause an adverse impact to social and natural environment.

Article 28 specifies the conversion of land from one category to another category, which can be carried out by ensuring that it has no negative impact on social or natural environment and must receive prior approval from the relevant authority. In addition, Article 65 (new) defines land leasing or land concession periods for various projects investment and development.

3.2.1.4 *Law on Forestry (amended) No. 04/NA, 2019*

This Law on Forestry defines the fundamental principles, regulations, and measures relating to the management, protection, development, use and inspection of forest resources and forest land, promotion of the restoration, plantation and expansion of forest resources to ensure abundance and the increase of forest coverage; creation of tourism sites, and the sustainable sources of livelihood and use of the people: ensure the protection of the quality of land, water, air, and environment in line with the green and sustainable direction; and contribute to the national socio-economic development.

This law classifies forests into three categories: Protection Forests; Conservation Forests; and Production Forests. Protection Forests are classified for ecosystem services, Conservation Forests for nature and biodiversity protection and conservation, and Production Forests for the production of wood and forest products, and for the purposes of national socio-economic development as needed.

The project must comply with Articles 80, 82, 87 in this amended Forestry Law.

3.2.1.5 *Law on Land Transportation (No. 036/NA, dated 12 December 2012)*

This Law on Land Transportation specifies the maintenance of order and safety of land transportation, which shall be performed in accordance with the regulations and measures, management, follow-up, and inspection of land transportation operations in order to supervise the development of passengers and other transportation operations both inside the country and trans-border with the aim of making the transportation convenient, expeditious, timely, effectively, modernized, sustainable, and have no impact on social and natural environment, strengthen the international trade and international integration and promote the socio-economic development of the country.

Article 5 (new). Principles of Land Transportation:

- Ensuring consistence with the National Socio-Economic Development Plan; ensuring socio-economic efficiency and sustainability, national defence and public security and environmental protection;
- Ensuring the quality, convenience, comfort, rapidity, safety for life, health, property; ensuring the protection of the legitimate rights and interests of the service users and service providers;
- Ensuring transparency, fairness and politeness in the provision of services;
- Ensuring economic and technical norms, advanced technology, services standard relating to land transportation;
- Ensuring the coordination with various sectors, local administrations, and the participation of the public in the management and monitoring of land transport activities.

3.2.1.6 *Law on Water and Water Resources (amended), 2017*

This Law is comprised of 14 Parts and a total of 103 Articles. The objective of this Law is to determine the principles, regulations, and measures relating to the administration, management, protection, development, and use of water and water resources, prevention of loss from water, rehabilitation of affected area to ensure the quality, volume of water, and water resources to become sustainable with the aim of meeting the requirements for livelihood of the people and for agricultural, industrial production and services related to the protection of social and natural environment, and the green development linked with national security and international integration to contribute to the protection and the socio-economic development of the nation.

In each Article of this Law, it is required to control the use of water sources in the project area to ensure optimal benefits through the identification of strategies for the management, administration, and use of the water sources and water resources. In addition, the Law also emphasizes the survey, protection of water and water resources (management of area of protected water source, standards of waste water before discharging to the natural water source), the water and water resources use and services (goals and right of small, medium and large-scale water use), and water service operations. The Law also explains the protection of water sources against loss, the rehabilitation of water sources, including the prohibitions, dispute resolution, inspection, and management of water sources, and measures against violator of this Law in relation to projects.

3.2.1.7 *Law on Labour (No. 021/NA, 2013)*

The objective of this Law is to ensure the protection of labour, skill building, and development to increase the skill quality and the productivity of the workforce in the society to respond to the transformation toward industrialization and modernization, and to enable the protection of right of workers and employers. If foreign workers are to be employed, a labour unit must give the first priority to Lao workers. The rest time for workers must be determined in accordance with the policy of the State allowing the living condition of the workers to be improved gradually, contributing to the promotion of investment, socio-economic development, and international and regional integration.

Article 51 specifies that employees must determine the hours of work and rest time for the employees under their responsibility in conformance with the location of the labour unit and the actual conditions of the work. The normal hours of work of the employees in all labour units should not exceed six days per week and eight hours per day or forty-eight hours per week, and the rest time for taking lunch should not be less than 1 hour per day.

The determination of the minimum level of salary or wages must be in compliance with Article 108. The State is entitled to promulgate the minimum level of salary or wages in each period based on the outcome of tripartite consultation.

Article 68 (improved). Recruitment of Foreign Workers specifies that the employers shall have the duty to prepare the Labour Use Plan in their labour unit and give priority to Lao workers; however, in necessary cases due to the inability to recruit Lao workers to adequately meet the demand, they have the right to request for using foreign workers.

The proportion of the employment of foreign workers to work at the labour unit shall be as follow:

1. Fifteen percent of the total number of Lao workers in the labour unit, for workers with specialized skill who perform physical works; and
2. Twenty-five percent of the total number of Lao workers in the labour unit, for workers with specialized skill who perform intellectual works.

For large-scale projects and priority projects of the Government with a period of five years or less, the use of foreign workers shall be in accordance with the agreement between the project owner and the Government.

In case of professional workers who are able to move according to the cooperation framework with other countries, particularly South-East Asian countries, their use, if any, shall be in accordance with the specific regulations.

Foreign workers who come to work in Lao PDR shall be protected and administered in accordance with this Law and other relevant laws and regulations of the Lao PDR.

3.2.1.8 Prime Minister Decree on Occupational Health and Safety, No 22/GOL, dated 05/02/2019 in addition to the Amended Labour Law (2013)

To support and protect Lao PDR's workers, in February 2019, a new decree on Occupational Safety and Health (OSH) was promulgated, along with an amendment to the Prime Ministers Decree No. 68 on migrant workers abroad, in an effort to reduce workers' vulnerability to labour exploitation and human trafficking. The law requires employers to provide annual health check-ups for its employees, and reinforces that work accidents and occupational diseases need to be recorded and reported to the Labour Management Authorities. An employer or the social security organization is responsible for covering the cost of treatment, allowances, and compensation to victims of work accidents or occupational diseases.⁸

3.2.1.9 Law on Investment Promotion (No.02/NA, 2009)

The objective of the Law on Investment Promotion, for both domestic and foreign investment, aims at expanding the economic and trade development to rural areas through the determination of regulations and measures relating to the promotion and management of the investment, both domestic and foreign, in order to ensure the rights and interests of the investors as well as of the state and the peoples.

Article 4 of this Law specifies that the state promotes the investment in all sectors, including industrial, agricultural, and service sectors and other activities and in all regions throughout the country, except those zones and activities that are detrimental to national security and peace, have harmful impacts to the environment at present time and in the long run, to the public health and the fine culture of the nation.

3.2.1.10 Law on Wildlife and Aquatic Animals (No. 07/NA, 2008)

The Law on Wildlife and Aquatic Animals defines the principles, regulations, and measures governing the natural aquatic animals and wildlife in order to promote the raising, breeding, and use of the aquatic animals and wildlife by avoiding the impacts to the environment and habitats, limiting the decrease and extinction of the aquatic animals and wildlife, as well as mobilizing the people to be aware of the importance, raising the consciousness of love, care, cherishing and responsibly involving in the management, inspection, conservation, protection, development and use of wildlife and aquatic animals in a sustainable manner with the aim of ensuring the abundance of the ecosystem, contributing to the improvement of the living conditions of the multi-ethnic peoples and the potential in the national socio-economic development.

Article 25 of this Law defines protection of wildlife and aquatic animals as the safeguard of wildlife and aquatic animals of restricted, managed, and general categories to allow them to become abundant and sustainable; the protection and safeguard of animal habitats, preservation areas for aquatic animals, area for conservation of animal species; and the formulation of the protection measures to prevent the invasion and destruction from human action or from nature.

⁸ <https://documents1.worldbank.org/curated/en/713271609771956267/pdf/Environmental-and-Social-Management-Framework-ESMF-Lao-Landscapes-and-Livelihoods-Project-P170559.pdf>

3.2.1.11 *Law on Construction (No. 05/NA, 2009)*

The objective of the Law on Construction is to ensure the quality and conformance with the National Socio-Economic Development Plan, ensuring the development of infrastructure in a safe manner and not causing negative impacts to the social and natural environment as confirmed in Article 5 of this Law. This Article specifies that development shall be in conjunction with conservation, protection of cultural, historical and natural heritage, construction materials should meet required standards, construction of buildings, roads and public places must have the facilities for disabled persons, elderly persons, and for ensuring the health of the people. If the project development site cover individual's land or the people's land, it is required to contact the competent authority and reasonably pay the compensation.

Article 34. Maintenance of Safety:

The maintenance of safety, in general cases, consists of using measures as prescribed in the regulations of the concerned sector, particularly the installation of danger warning signs, fence around the construction site, labour safety equipment, such as: helmets, shoes, gloves, goggles.

In case of occurrence of force majeure during the construction stage, such as: flood, storm, fire, earthquake, land-slide, or other disaster that affect the works of the project construction, the contractor must timely take protecting and remedying measures as follows:

- Give the alarm in the construction site;
- Stop the construction work temporarily and use reasonable measures to resolve the incident in a timely manner to ensure safety for workers and to protect the property of the construction project; and
- Immediately report the incident to the project owner, relevant authority, local administration so that measures can be timely taken to deal with the incident.

3.2.1.12 *Law on Hygiene, Disease Prevention and Health Promotion (No. 08/NA, 2011)*

The development of construction projects shall be undertaken in accordance with laws, regulations, and measures on the maintenance of cleanliness, prevention of diseases that may occur from the project operations. The project owner must ensure health promotion to allow the people to have good health, good quality of life, and must raise the awareness on the importance of hygiene, protection of natural environment to allow it to become abundant and beautiful with the aim of reducing the rate of sickness, mortality and combating against various diseases.

Article 20 specifies the regulation on labour hygiene that employers must provide labour safety equipment to workers and shall ensure the hygiene of the workplace, which shall have sufficient light, ventilation and have temperature, humidity, vibration, noise, smell, and dust that are not exceeding defined standards provided in the relevant regulations. Workers and professionals, particularly in sectors and works that are hazardous to health, shall receive health protection, health check, treatment and care in accordance with the regulations.

3.2.1.13 *Environmental Protection Law (2012)*

The objective of the Environmental Protection Law is to define the regulations, principles, and measures related to environmental management, monitoring of protection, preservation, control, and rehabilitation. In addition, it also defines, with quality, the impacts of mitigation and pollution created by human or by nature, aiming to provide balance between social and natural environment, to protect and to sustain natural resources and public health, meanwhile also contributing to the national socio-economic development and reduction of global warming.

3.2.1.14 *Law on National Heritage (2021)*

The objective of the Law on National Heritage is to determine the regulations, principles, and measure for the protection, administration, conservation, use, restoration, and rehabilitation of the national heritage. It also determines the rights and duties of the State, individuals, and social organizations to preserve the value of the national cultural, historical, and natural heritage, aiming to educate citizens to love and treasure the national traditions of the country, as well as assuring the elements for the sustainability of the nation.

3.2.1.15 *Law on Social Security (2018)*

The Law on social security serves as principles, rules and provisions for the organization, implementation, management, monitoring and inspection of social security affairs. Its objective is to construct more systematic and effective protecting rights, as well as employers and employees who have a tight bond with social security by contributing to the fund and earning its benefits. The valid Law on social security leads to an improvement of livelihoods, social solidarity, and national social-economic growth. This law mainly covers security fund for medical expenses, maternity, abortion, loss of ability to work etc. The National Social Security Fund is managed by the government. Benefit calculation is based on insured income. Benefit calculation is based on insured income

3.2.1.16 *Amended Hygiene and Health promotion law, No. 73/NA date 22 November 2019*

The Law on Hygiene, Disease Prevention and Health Promotion prescribes the principles, regulations and measures associated with actions regarding hygiene, disease prevention and health promotion. The Law, moreover, functions as a foundation to maintain people's good health, well-being, and long life, which hence lead to preservation and development in a national scale.

In the context of construction and maintenance site, hygiene is the implementation of necessary measures and methods which should behave in the same way as the principles of hygiene in the construction of roads and buildings, including other activities, with an aim of preventing concerns that may severely jeopardize health or life of people both inside and outside the site.

3.2.2 *National Decisions and Decrees*

3.2.2.1 *Ministerial Decision No. 8056/MONRE, 17 December 2013*

The *Decision on the Endorsement and Promulgation of List of Investment Projects and Activities Requiring for Conducting the Initial Environmental Examination or the Environmental and Social Impact Assessment* (No. 8056/MONRE, dated on 17 December 2013) specifies a list of investment projects and activities that are grouped into two types based on the nature and scale of the projects / activities. Group 1 projects / activities shall prepare an Initial Environmental Examination (IEE), whereas Group 2 projects / activities shall prepare an Environmental Impact Assessment (EIA).

The investment projects and activities are divided into five types:

- Type I: Energy Sector;
- Type II: Agricultural and Forestry Sector;
- Type III: Industrial processing Sector;
- Type IV: Infrastructure and Service Sector; and
- Type V: Mineral Sector.

According to this Ministerial Decision, the Project falls into Group 2 and Type I Investment Projects and Activities (Energy Sector) relating to the wind power generation sector, using turbines of more than 10 units. Therefore, the Project is required to conduct an EIA.

3.2.2.2 Decree on Environmental Impact Assessment (No. 21/GOV, 2019)

This Decree supersedes the Ministerial Instruction on the *Process of Environmental and Social Impact Assessment of the Investment Projects and Activities* No. 8030/MONRE, dated on 17 December 2013. The objective of this Decree on Environmental Impact Assessment (No. 21/GOV, 2019) is to define the principles, methods, and measures relating to the management, monitoring, and inspection of the Environmental Impact Assessment (EIA) to enable the process to be implemented correctly, transparently, and consistently. The Decree aims to protect the natural environment and mitigate and address any negative impacts to the environment, ensuring reasonable compensation for damages and rehabilitation of livelihoods of affected peoples.

This Decree consists of 8 Parts and a total of 87 Articles. Part III, Section 2 details the rules, procedure, and review of the environmental impact assessment; and Section 4 specifies details of the required public participation. Article 36, Public Participation, specifies public participation is a process of consultation, provision of information and receipt of comments of all sections in the society on the investment projects and activities during the phases of formulation and review of the EIA report and the Environment Management and Monitoring Plan (EMMP) as well as during the monitoring and inspection of the implementation of the environment management activities in each phase of the investment projects and activities in order to ensure transparency, fairness and effectiveness.

- Public participation consists of the following phases:
- Project preparation and planning phase;
- Project construction and operation phase; and
- Project completion (ending) phase.

The Natural Resources and Environment sector that is responsible for investment projects and activities, the local administrations, and the Project owner shall have a joint-responsibility to ensure and create conditions to allow all stakeholders to participate in the environmental impact assessment process.

The project owner shall develop a Public Participation Plan for the environmental impact assessment in each phase and conduct the public participation with a focus on issues on related to ethnic groups, gender roles, vulnerable groups, and disadvantaged groups who are affected by the Project.

3.2.2.3 Decree on Criteria for Poverty Graduation and Development (No. 348/GOL, 2017)

This Decree on *Criteria for Poverty Graduation and Development* No. 348/GOL, dated on 16 November 2017, defines the criteria for the poverty graduation and development. It provide basic for defining goals for poverty reduction, focuses on building families, developing villages, making large village into towns in rural area and development of districts.

3.2.2.4 Decree on Poverty Graduation and Development Standards (No. 0830/MAF, 2018)

Decree on *Poverty Graduation and Development Standards* No. 0830/MAF, dated on 6 April 2018, provides the implementation guideline for Criteria for Poverty Graduation and Development (No. 348/GOL, 2017).

3.2.2.5 Ministerial Decision No. 2796.1/MONRE, 19 December 2016

The Decision on the *Endorsement and Promulgation of the Technical Guide to the Formulation of the Environmental and Social Impact Assessment Report* No. 2796/MONRE dated on 19 December 2016 provides advice to project owners and environment services providers in the formulation of the EIA report for projects in the Lao PDR in order to ensure that the EIA Report is conducted correctly, completely, and consistently.

3.2.2.6 Ministerial Decision No. 707/MONRE, 05 December 2013

The objective of the *Decision on the Endorsement and Promulgation of the Guide to Public Participation in the Process of Environmental Impact Assessment of the Investment Projects* No. 707/MONRE, dated on 5 December 2013, is to ensure that the implementation of public participation is conducted correctly, with transparent and comprehensive engagement, particularly the involvement of the affected peoples in the participatory process.

This Ministerial Decision aims to provide opportunities to the public to participate in planning and decision-making related to the investment projects as well as in dealing with the environmental and social impacts and the potential benefits from the projects in a fair manner in order to avoid or recognize any conflicts related to the investment projects. It also provides the opportunity to the public to present their opinions on the projects implementation as well as to learn and exchange lessons with relevant parties concerning the vocation development, local economy, and protection and management of natural resources.

3.2.2.7 Decision on National Environmental Standards (No. 81/GOV, 21 February 2017)

The Decision on *National Environmental Standards* No. 81/GOV, dated on 21 February 2017, is used as the reference for the monitoring of the environment and control of water, soil, air and noise pollution. This Decision consists of six Sections and a total of 18 Articles that specifies in detail the environmental standards, the pollution emissions standards, types of pollution, concentration ratio, concentration parameters and indicators in the measurement to be the standards to assist in the control of pollutants to be released to the environment that have the potential impact to the life, health of human, animals and ecosystem from the investment projects. The standards are listed in further detail in **Section 3.6**.

3.2.2.8 Decree on Compensation and Resettlement (No. 84/GOV, 2016)

This Decree on *Compensation and Resettlement of People Affected by Development Projects* (No. 84/GOV, 2016) defines the principles, regulations, and measures relating to the management, monitoring and inspection of the compensation for damages and the resettlement of the peoples. The aim is to allow affected people to receive the compensation, resettlement, assistance to build a stable occupation, improving living condition to a higher level or the previous level, as well as allowing the investment projects to contribute to socio-economic development.

Article 8. Implementation of Compensation Plan:

The compensation for damages from large projects development is related, in many cases, to lawful land use right and construction assets of individuals and legal entities. If a part of the land is affected and the remaining part becomes unusable, the project owner shall provide compensation for the entire holding, through the provision of land-to-land arrangement of equivalent replacement cost including the documents relating to land tenure and the payment for the cost for obtaining such documents. In cases where the land arranged for the replacement is not suitable or the replacement value is lower than the land value of the affected persons, the project owner must seek compensation through other forms based on the replacement cost. For damages caused to the infrastructure and facilities of the community, the project owner must undertake the repair to allow them to be in the same condition as before.

In cases where the affected people have no documents related to land use as specified above in this Article, they will not be entitled to receive compensation for the loss of such land, but will receive the compensation for the loss of construction structure, trees, and produce located in such land from the project owner according to the replacement value.

The affected people must be informed that all activities undertaken after the date of entitlement registration of the affected people (conducted for the Project) will not be eligible to receive compensation

from the project owner, except in case the Compensation Plan is not implemented on time as specified in Clause 2 of this Article:

- The project owner must complete the implementation of the Compensation Plan within twenty-four months from the officially approved date. If the project owner fails to complete the compensation within the specified time period, the project owner must submit the request for extension to the Provincial/Capital City Compensation and Resettlement Committee, which may be granted for not more than twelve months to enable the compensation to be completed. If the compensation is not completed within this extended period, it is required to make the reassessment of the compensation amount which is not completed;
- In case, through the assessment conducted by the Provincial/Capital City Compensation and Resettlement Committee, it is found that the compensation has not been implemented within twelve months after the date of entitlement registration of the affected persons, it is required to make a reassessment of the compensation amount which has not been implemented.

Article 9. Valuation and Assessment of Replacement Cost:

The project owner shall, in coordination with the relevant Compensation and Resettlement Committee, undertake the evaluation and assessment of the replacement cost for the land, construction structure, produce, livestock, and income which, are eligible to receive the compensation and shall hold the consultation and make consensus with the affected persons by identifying correct and reasonable options based on the estimate of state price, purchase, and sale price in market or the average price in the relevant period in each area, for each category and each locality.

Regarding the state price (reference price), it shall be determined in a specific regulation and the Ministry of Natural Resources and Environment shall be charged with the determination of such price in a correct and suitable manner.

3.2.2.9 The Resettlement Law and the National Assembly Promulgation (No. 45/2018)

The objective of this Resettlement Law and the National Assembly Promulgation defines the regulations, and management, monitoring and inspection of the compensation for damages and the resettlement of the Special Areas include border areas, Conservation and Protection Forests.

Article 15. Special Areas notes that these include national defense and security, border, Conservation Forest, Protection Forest, toxic or radio-active areas, and archaeological areas.

3.2.2.10 Decree on State Land Leasing or Concession (No. 135/PM, 2009)

The objective of this Decree is to define the principles, methods, and measures relating to the lease or concession of state land in order to ensure uniform practice in the whole country, allowing state land to be developed, converting land into capital, promoting investment in the production of commercial goods and services, as well as creating sources of revenue for state budget.

Article 37. Contents of State Land Lease or Concession Agreement:

The state land lease contract or land concession agreement must specify the purposes, term, conditions, rental charge, concession royalty; and shall also specify that in every five years, the rental charge or concession royalty shall be increased by not less than five percent of the rental charge or concession royalty of that year as in accordance with the contract form provided in the relevant law.

The implementation of the approved state land lease contract or concession agreement shall be subject to the preparation of report on the evaluation of the implementation in each phase of the activity submitted to the National Land Management Authority and concerned agencies for information.

Article 43: Calculation of Compensation for the People Affected by the Land Lease and Concession

If the area of state land lease and concession includes land owned by people who have a legal right to use it, compensation should be computed according to the following scenarios:

- In general, agricultural land for cultivating rice or annual crops should be kept for farmers, however in exceptional circumstances, compensation should be paid to the farmers by adding together the estimated value of the land and the estimated value of crops in a normal year, then multiplying the value by ten (10).
- Compensation for agricultural land used for orchard tree cultivation must be determined and paid by adding together the estimated value of the land and the estimated value of crops in a year, then multiplying the value by ten (10).
- Compensation for agricultural land used for the planting of industrial trees and medicinal plants must be determined and paid by combining the estimated value of the trees or other plants on a plot of land.
- Compensation for agriculture land used for livestock must be determined and paid by adding together the estimated worth of the land and the estimated value of the animals raised in a normal year, then multiplying the value by three (3).
- Paddy field areas should not be used for any other purposes. Authorization from the Land Management Authority and the Agricultural and Forestry Sector must be acquired, if necessary.
- Compensation must be computed by adding together the estimated worth of the land and the value of the structures and crops on the land, in the case of construction land.
- Compensation by the state will be given to the investor in the case that the land is used for the lease and concession of the public interest, to compensate for the loss of properties associated with the land, as specified in the Law on Investment Promotion.
- A written memo must be prepared and signed by all participants, specifically the line agencies, local administrative authorities, naiban, and the villagers involved, in order to estimate the compensation.

3.2.2.11 Decree on Protection Forest (No. 333/PM, 2010)

Protection forests are areas designated for the protection of Laotian natural resources, such as water, river ecosystems, soil quality, protection from natural disasters, and environmental conservation, i.e. for ecosystem services. The objective of this Decree is to define the principles, regulations, and measures relating to the management, protection and conservation, development, and use of protection forest in a sustainable manner in line with the provisions in the Forestry Law. Important points of the Decree are:

Article 19. Conversion of Protection Forest and Protection of Forest Land:

In case it is necessary to convert the protected forest to other purposes with optimal benefits to the country, it is required to perform as follows:

- The conversion of protected forest at national and provincial levels must be approved from the Standing Committee of the National Assembly upon the request by the Government;
- The conversion of the protected forest at district and municipality levels must be approved by the Government upon the request of the National Land Management Authority in agreement with the Ministry of Agriculture and Forestry; and
- The conversion of the protected forests at village levels must be approved by the Provincial or Capital City Administration upon the request by the Provincial/Capital City Land Management Authority in agreement with the Provincial/Capital City Department of Agriculture and Forestry.

Article 31. Performance of Obligations of the Projects:

Projects that create impacts to and/or have received benefits from the protected forest land directly and indirectly must contribute to the fund for the development of forest and forest resources as specified in the Project Development Agreement, and this fund shall be used in the management, maintenance,

and development of the protected forest and the protected forest land. The contribution relevant to this Project shall be performed as follows:

- Project developers in construction of road, transmission line route, and other development projects that cause permanent conversion of protected forest and protected forest land must contribute to the fund for forest rehabilitation and reforestation based on the size of the area which is directly affected.

3.2.2.12 *Climate Change Decree (2019)*

The Climate Change Decree (2019) was enacted in 2019 to provide an overarching legal framework for climate change adaptation and mitigation. It clarifies the legal mandates and reporting lines among relevant ministries and different administrative bodies in relation to climate change. The decree identifies sources of climate finance and the management of these funds. Moreover, the decree also specifies the responsibility of Ministry of Energy and Mine to develop strategy and **promote renewable energy** and technology to minimize the emission of GHG.

3.2.2.13 *Prime Minister's Decree No 15 Regarding Forest Clearance*

The Prime Minister's Decree No. 15 was enacted in 2016, where the objective is to strengthen the strictness of timber harvest management and inspection, timber transport and business. This means strengthening the implementation of forest management, timber harvest, timber business, timber trade, and timber processing, while strictly respecting the laws and regulations established by the Government in an effective manner, and also to prevent and address drawback phenomenon within forest sector, aiming to reduce and eliminate these drawbacks step by step.

3.2.2.14 *Decree on the establishment of the National Regulatory Authority for UXO Programme (No. 406 /PM, 2011)*

The decree on the establishment of the NRA to tackle the issue of unexploded ordnance (UXO) in Laos, by enhancing the effectiveness of the NRA as the governing authority in the UXO sector. The NRA's work specifically focuses on the clearance of UXO and accident victim assistance. Outputs of the National Regulatory Authority for UXO in 2011 includes the following:

- Better Mine Risk Education (MRE) approaches in Laos
- Better information and strategies for victim assistance in the Lao PDR
- Release of priority land for agriculture and development, coordinated and regulated in accordance with risk reduction and priority needs
- Effective coordination and regulation of the UXO Sector, integrated into the regular set-up of the Lao Government
- International Treaty Obligations under the CCM are met

3.2.2.15 *NRA Decision 04*

The decree characterizes the role, rights, position, organizational structure, duties, working principles and methods of the National Regulatory Authority (NRA) for UXO in Lao PDR. It is to be utilized as a legal reference for NRA to supervise and implements UXO activities countrywide in an effective and efficient conduct. Some of the duties listed in the decree include:

- Assisting the Ministry of Labour and Social Welfare in examining and converting policies, plans, strategies, projects and resolutions on UXO matters into fine projects and strategies
- Supervising the establishment of a database for UXO/Mine clearance operations and its wide dissemination

- Monitoring, inspecting and assessing all of UXO clearance Organization activities and reporting periodically

3.2.2.16 NRA 2009

The NRA introduced the National Strategic Plan for the UXO Sector called, “The Safe Path Forward II” (SPF), a strategy aiming to guide the implementation of important international declarations and conventions, such as the Convention on Cluster Munitions, the UNESCAP Declaration on the Decade of the Disabled, and the Convention of the Rights of People with Disabilities. The SPF has been established to achieve an end-state of people who were impacted to live free from UXO and landmines. 46 priority districts in 9 provinces, namely, Attapeu, Champassak, Huapahn, Khammuane, Luangprabang, Savannakhet, Saravane, Sekong, and Xiengkhuang are named as the most highly affected provinces. To reduce the number of UXO casualties’ major actions the government has taken include:

- Delivering risk education activities for the identified risk groups, raise awareness of UXO accidents and provide classroom-based education for school children in contaminated areas
- Providing aid to village volunteers who act as peer educators
- Promoting a timelier and coordinated response to prevent accidents by establishing mine risk education (MRE), clearance or Victim Assistance cooperation
- Developing and enforcing legislation

3.2.3 National Plans and Strategies

3.2.3.1 National Socioeconomic Development plan 2021-2025, with Vision to 2030

The goal of National Socioeconomic Development plan⁹ for the period 2021-2025, date on 26 March 2021, aims to translate the Resolution of the 11th Party Congress, as well as continue the implementation of the National Strategy on Socio-Economic Development 2025 and Vision 2030 of the Lao PDR.

This plan is sets out the fundamental direction for creating a new turning point in socio-economic development in the coming years, particularly ensuring quality establishment of the political ideological factors, the economic system and the material and technical basis; continuing to recognize economic development as the central task of the entire Party and all citizens, in conjunction with socio-cultural development, including the development of human resources, and strengthening of the existing structural elements such as public governance and administration, national defence, public security and foreign affairs.

3.2.3.2 National Pollution Control Strategy and Action Plan 2018-2025, with Vision to 2030

The Strategy on Environment Pollution Control¹⁰ is an indispensable component of Laos’ socio-economic development strategy and the sustainable development strategy. The Strategy presents the guiding views, vision, mission, principle, objectives, activities, and solutions to environmental pollution control, and priority programs to pursue sound environmental management, and provides a series of options for the Government of Laos (GOL) to implement their commitments to pollution prevention and control.

⁹ https://data.opendevlopmentmekong.net/library_record/9th-five-year-national-socio-economic-development-plan-2021-2025

¹⁰ <http://www.gms-eoc.org/uploads/resources/922/attachment/Laos-Pollution-Strategy-Plan-2018-2025-draft.pdf>

These action plans are grouped as short-term (2018-2020), medium-term (2021-25), and long-term (2026-30) based on their nature and importance. For each action, principle responsible agency and supporting agencies are also identified. The Strategy is seen as an extremely important guiding instrument for the country's environmental pollution control work.

3.2.3.3 *National Biodiversity Strategy and Action Plan 2016-2025*

The goal of National Biodiversity Strategy and Action Plan (NBSAP)¹¹ for the period 2016-2025 is to enhance the role of biodiversity as a national heritage and as a substantial contributor to poverty alleviation, as well as sustainable and resilient economic growth.

The key objectives to support the goal, which are also aligned to the global goals for biodiversity are:

- Institutionalize innovative multi stakeholder efforts to arrest the degradation and enhance conservation of ecosystems and biodiversity resources therein.
- Provide clear and enforceable guidance for the sustainable use of biodiversity resources to support poverty alleviation and sustainable economic growth.
- Establish practical mechanisms for ensuring fair and equitable sharing of benefits from the use of biodiversity resources.

NBSAP for the period 2016-2025 consist of five key strategies:

- NBSAP-Strategy 1: Protect the country's diverse and economically important ecosystems including the species and genetic diversity
- NBSAP-Strategy 2: Integrate the value of biodiversity to socio-economic decision making to ensure sustainable use and funding.
- NBSAP-Strategy 3: Strengthen the knowledge base for strategic decision making
- NBSAP-Strategy 4: Inspire and enable actions through better communication, education and public awareness.
- NBSAP-Strategy 5: Enable effective preparation and implementation of plans and programs.

The five key strategies with cross-cutting themes are proposed to support the goals and objectives of the NBSAP 2016-2025. These strategies and targets address the status and trends of change in biodiversity as well as gaps in the implementation of the first NBSAP. They are also designed to address key biodiversity issues/threats, as well as consider Lao PDR priorities and its commitments to the Aichi global targets set by Convention on Biological Diversity in 2010.

3.2.3.4 *National Strategy on Climate Change*

The National Steering Committee on Climate Change Strategy was established in 2008. The committee chaired by the Deputy Prime Minister began a critical policy process with formulation of climate change strategies, programmes and projects for Lao PDR.

As a result, a National Strategy on Climate Change was developed in 2010 with action plan for 2013-2020 with following objectives¹².

- The goals of the National Climate Change Strategy are aligned with vision of sustainable development, poverty reduction, enhanced quality of the natural environment, and strengthened public health for all Lao people.

¹¹ <https://www.cbd.int/doc/world/la/la-nbsap-v2-en.pdf>

¹² https://www.la.undp.org/content/dam/laopdr/docs/Reports%20and%20publications/2013/SNC_Eng.pdf

- The National Climate Change Strategy, realizing the high vulnerability to climate change of the country's physical, biological and socioeconomic development, has given special attention to climate change vulnerabilities and adaptations.
- State-supported precautionary programmes to manage climate risks should produce benefits at household and community levels in addition to reducing transitory poverty.

3.2.3.5 *Laos PDR's Draft Action Plan on Climate Change (2013-2020)*

To support the implementation of the National Climate Change Strategy¹³, the Action Plan on Climate Change (2013-2020) was drafted to set out climate change actions for the seven priority sectors in the National Climate Change Strategy. Priority climate change adaptation actions include: (i) climate resilient agriculture, land use change and forestry, (ii) water resource management; (iii) ecosystem based adaptation solutions, (iv) climate resilient transport and urban development and (v) adaptation in health sector. Priority climate change mitigation actions include: (i) increasing and maintaining national forest cover, (ii) increasing use of renewable energy sources and energy efficiency in rural electrification, (iii) emission reduction by developing public transport services.

The priority climate related adaptations actions identified, include:

- Climate resilient agriculture, land use change and forestry,
- Water resource management,
- Ecosystem based adaptation solutions,
- Climate resilient transport and urban development and
- Adaptation in health sector.

3.2.3.6 *Laos PDR's National Determined Contribution (NDC)*

Lao PDR's Nationally Determined Contribution (2015) (NDC)¹⁴ to the United Nations Climate Change Paris Agreement sets out adaptation and mitigation activities to be implemented over 2015-2030, including promotion of renewable energy. The Government of Lao PDR has also laid the foundations for the implementation a renewable energy strategy that aims to increase the share of small scale renewable energy to 30% of total energy consumption by 2030.

Lao PDR's Revised Nationally Determined Contribution (2021) (NDC)¹⁵ – sets forth increased transparency and consistency between quantitative targets, new short-term objectives for climate change adaptation towards a strengthened measurement, reporting and verification system, as well as the country's expression of interest to pursue voluntary cooperation to allow for higher ambition, in accordance with the Paris Agreement. The Government of Lao PDR aims to increase solar and wind energy to 1 GW total installed capacity (2020-2030) as part of 2030 Conditional mitigation scenario and targets towards net zero emissions 2050.

¹³ http://www.la.undp.org/content/laos_pdr/en/home/library/environment_energy/climate_change_strategy.html

¹⁴ Lao PDR First Nationally Determined Contribution (2015). Retrieved from: <http://extwprlegs1.fao.org/docs/pdf/lao186537.pdf>

¹⁵ Lao PDR Nationally Determined Contribution (NDC) (2021). Retrieved from: [https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Lao%20People's%20Democratic%20Republic%20First/NDC%202020%20of%20Lao%20PDR%20\(English\).%2009%20April%202021%20\(1\).pdf](https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Lao%20People's%20Democratic%20Republic%20First/NDC%202020%20of%20Lao%20PDR%20(English).%2009%20April%202021%20(1).pdf)

3.2.3.7 Draft Renewable Energy Development Strategy (2011)

Draft Renewable Energy Development Strategy (2011)¹⁶ seeks to increase the share of renewable energy within total energy consumption to 30% by 2025. The Government aims to develop around 50 MW of wind power by 2025.

3.2.3.8 The National Green Growth Strategy of the Lao PDR Till 2030 (2018)

The National Green Growth Strategy of the Lao PDR Till 2030 (2018)¹⁷ identifies six priority sectors/areas to support the country's vision of green growth: agriculture, forestry, urban development, transport, energy, and tourism. Wind energy development is one of the key focuses of the National Green Growth Strategy of the Lao PDR; the strategy will encourage and promote investments of the public sector and private sector in production of renewable energy – including wind energy, to meet the increasing demand for energy both inside the country and in foreign countries.

3.2.3.9 National Strategic Plan for Disaster Risk Management (2013)

The current National Strategic Plan for Disaster Risk Management identifies four key strategic objectives:

- Safeguard sustainable development and reduce the impacts and damages caused by natural and man-made disasters,
- Shift from relief to mitigation of disaster impacts to community, society and the economy, and preparedness before a disaster strikes with emphasis on hazards such as floods, drought, landslide and fire,
- Ensure that disaster management is a joint responsibility of both the government and the people through building community capacity, and
- Promote sustainable protection of the environment and the country's natural wealth such as forests, land and water resources¹⁸.

3.3 Relevant Thai Regulatory Framework

As essential materials and equipments including wind turbine components will be transported through Thailand, the following section outlines Thai regulatory framework related to transportation.

- Road Traffic Act B.E. 2522 (18 January 1979)
- Motor Vehicle Act B.E 2522 (8 May 1979)
- Transport Act B.E. 2522 (15 March 1979)
- Highway Act B.E. 2535 (2 April 1992)
- Protection for Motor Vehicle Victims Act B.E. 2535 (9 April 1992)

3.4 International Regulatory Framework

3.4.1 ADB Safeguard Policy Statement (2009)

ADB uses a classification system to reflect the significance of a project's potential environmental impacts. A project's category is determined by the category of its most environmentally sensitive component, including direct, indirect, cumulative, and induced impacts in the project's area of influence.

¹⁶ <https://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/laws/8161.pdf>

¹⁷ The National Green Growth Strategy of the Lao PDR (2018). Retrieved from: https://data.opendevelopmentmekong.net/dataset/e7db2aa8-c294-47dc-a2da-aa6e41493a12/resource/861b9f4c-cf6c-413b-aeff-e4f6b9346fd7/download/final_version_of_national_green_growth_strategy_english_feb_2019_.pdf

¹⁸ http://www.adpc.net/igo/category/ID1020/doc/2016-mQHT38-ADPC-CBDRR_Manual_Lao_PDR_.pdf

Each proposed project is scrutinized as to its type, location, scale, and sensitivity and the magnitude of its potential environmental impacts. Projects are assigned to one of the following four categories:

- **Category A.** A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment is required.
- **Category B.** A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An initial environmental examination is required.
- **Category C.** A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed.
- **Category FI.** A proposed project is classified as category FI if it involves investment of ADB funds to or through a FI (paras. 65-67).

According to the project's activity and impact, the project is classified as **Category A project for environment**. The Policy Delivery Section (Chapter VB, paras.53-64) lists general requirements that the ADB is obliged to follow in regard to: project screening and classification, information disclosure, consultation and participation, due diligence, monitoring and reporting, local grievance redress mechanism and the Bank's Accountability Mechanism.

In July 2009, ADB's Board of Directors approved the Safeguard Policy Statement (SPS) governing the environmental and social safeguards of ADB's operation. The SPS builds upon ADB's previous safeguard policies on the Environment, Involuntary Resettlement, and Indigenous Peoples, and combines them into one consolidated policy framework with enhanced consistency and coherence, and more comprehensively address environmental and social impacts and risks. The SPS also provides a platform for participation by including the effected people and other stakeholders into the Project design and implementation.

ADB adopts a set of specific safeguard requirements that are required to address environmental and social impacts and risks:

- Safeguard Requirement 1: Environment;
- Safeguard Requirement 2: Involuntary Resettlement;
- Safeguard Requirement 3: Indigenous Peoples;
- Safeguard Requirement 4: Special Requirements for Different Finance Modalities; and
- ADB's Prohibited Investment Activities List.

It should be noted that none of the project activities are included in ADB's list of prohibited activities.

3.4.1.1 General Requirements

The Policy Delivery Section (Chapter VB, paras.53-64) lists general requirements that the ADB is obliged to follow in regard to: project screening and classification, information disclosure, consultation and participation, due diligence, monitoring and reporting, local grievance redness mechanism and the Bank's Accountability Mechanism.

- **Project screening and classification:** The Policy stipulates that the ADB will undertake project screening as early as possible to i) determine the significance of adverse impacts; (ii) identify the level of assessment and institutional resources required; (iii) determine disclosure requirements (para.50).

- **Information disclosure:** In line with the ADB's Access to Information Policy, which requires that for environment Category A projects, draft environmental impact assessment must be posted on the ADB's website 120 days before project approval. For draft environmental assessment and review frameworks, draft resettlement frameworks and/or plans and draft Indigenous Peoples planning frameworks and/or plans, the Policy only stipulates that these documents must be provided by the borrower/client and posted on ADB's website before project appraisal, as follows: (i) final or updated environmental impact assessments and/or initial environmental examinations, resettlement plans, and Indigenous Peoples plans upon receipt (by the ADB) and ii) environment, involuntary resettlement and Indigenous Peoples monitoring reports submitted by borrowers/clients during project implementation upon receipt (by the ADB).
- **Consultation and participation:** The Policy states that the ADB "is committed to working with borrowers/clients to put processes of meaningful consultation and participation in place". Meaningful participation is defined as: (i) beginning early in the project preparation stage and being carried out on an ongoing basis throughout the project cycle; (ii) providing timely disclosure of relevant and adequate information that is accessible to affected people; (iii) being free of intimidation and coercion; (iv) being gender inclusive and responsive; and v) enabling the incorporation of all relevant views of affected people and other stakeholders in decision making (para.54). For projects with significant adverse environmental, involuntary resettlement, or Indigenous Peoples impacts, ADB project teams will participate in consultation activities to understand the concerns of affected people and ensure that such concerns are addressed in project design and safeguard plans.
- **Due diligence and review of safeguard assessments and plans:** Due diligence refers to the ADB's process of assessing safeguard issues through field visits and desk reviews as well as through examining relevant safeguard documents (such as environmental impact assessments, resettlement plans, Indigenous People's plans). Through its due diligence processes, the ADB confirms that all potential environmental and social risks are identified. If they cannot be avoided, it ensures that appropriate mitigation measures are identified (SPS, para.56).
- **Monitoring and reporting:** The monitoring obligations are merely required to be "commensurate with the project's risks and impacts". For highly complex and sensitive projects, the ADB requires the borrower/client to engage an independent advisory panel" (SPS, para.57)
- **Local grievance redress mechanisms:** The Policy requires the borrowers/ client to set up and maintain a grievance redress mechanism at project level (SPS, para.59). This mechanism does not replace the ADB's accountability mechanism, but is intended to solve grievances at the local level. Affected people can also take complaints to the ADB's Accountability Mechanism. The Accountability Mechanism Policy merely requires complainants to demonstrate that they have sought to address their complaint with management.

3.4.1.2 Environmental Requirements

The main Environmental Safeguard requirements are the followings:

- **Categorization and Information disclosure:** The Policy uses a categorization system to reflect the significance of a project's potential environmental impacts. "A project's category is determined by the category of its most environmentally sensitive component, including direct, indirect, cumulative and induced impacts in the project's area of influence" (SPS, para.50) (outlined above).
- **Assessment process:** The assessment process will be based on current information, including an accurate project description, and appropriate environmental and social baseline data. Environmental impacts must be determined in consultation with stakeholders including affected people and concerned non-government organizations (NGOs). For Category A projects, the borrower/client is required to undertake an assessment of options that looks at alternatives to the project's location, design, technology and components. The options assessment will also examine the "no project" alternative. The borrower/client must present the rationale for selecting the particular project details,

including a cost-benefit analysis that takes into account environmental costs and benefits of the various alternatives considered (SPS, Appendix 1, para. 4).

- **Type of impacts:** The types of impacts related to the environment include physical, biological and socioeconomic impacts. These can relate to occupational health and safety; community health and safety; vulnerable groups; gender issues; and impacts on livelihoods through environmental media and physical cultural resources (SPS, Appendix 1, para. 5). The environmental assessment will examine whether particular individuals and groups may be differentially or disproportionately affected by the project's potential adverse environmental impacts because of their disadvantaged or vulnerable status, in particular, the poor, women and children, and Indigenous Peoples. (SPS, Appendix 1, para. 6).
- **Project area of influence:** The project Area of Influence covered by the environmental safeguard provisions in the Policy is defined as: *"This area of influence encompasses (i) the primary project site(s) and related facilities that the borrower/client (including its contractors) develops or controls, such as power transmission corridors, pipelines, canals, tunnels, access roads, borrow pits and disposal areas, and construction camps; (ii) associated facilities that are not funded as part of the project (funding may be provided separately by the borrower/client or by third parties), and whose viability and existence depend exclusively on the project and whose goods or services are essential for successful operation of the project; (iii) areas and communities potentially affected by cumulative impacts from further planned development of the project, other sources of similar impacts in the geographical area, any existing project or condition, and other project-related developments that are realistically defined at the time the assessment is undertaken; and (iv) areas and communities potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location. The area of influence does not include potential impacts that might occur without the project or independently of the project. Environmental impacts and risks will also be analysed for all relevant stages of the project cycle, including preconstruction, construction, operations, decommissioning, and post closure activities such as rehabilitation or restoration"* (SPS, Appendix 1, para. 6).
- **Transboundary impacts:** The environmental assessment process must identify potential transboundary effects, such as air pollution and increased use or contamination of international waterways. It must also identify global impacts, such as the impact of greenhouse gases and impacts on endangered species and habitats (SPS, Appendix 1, para. 7).
- **Environmental planning and management:** If environmental impacts are identified, the borrower/client is required to prepare an environmental management plan describing how potential impacts and risks will be addressed (SPS, Appendix 1, para. 12).
- **Consultation and participation, grievance mechanism:** The consultation process and grievance mechanism process follows the same provisions as laid out in the general requirements (see above) (SPS, Appendix 1, paras. 19 and 20).
- **Reporting and monitoring:** The Policy states that "the extent of monitoring activities will be commensurate with the project's risks and impacts" (SPS, Appendix 1, para. 21). For Category A projects, the borrower/client is required to retain qualified external experts or qualified NGOs to verify its monitoring information. The minimum requirements are semi-annual reports during construction for Category B projects, and quarterly monitoring reports during construction for Category A reports. For projects with likely ongoing impacts during operation, annual monitoring is required. Monitoring reports must be posted in a location accessible to the public (SPS, Appendix 1, paras. 21 & 22).
- **Unanticipated environmental impacts:** If unanticipated impacts occur during project implementation, the borrower/client is required to update the environmental assessment and environmental management plan or prepare a new assessment and plan (SPS, Appendix 1, para.23).
- **Biodiversity conservation and sustainable natural resource management:** This section (SPS, Appendix 1, paras. 24 – 49) contains requirements regarding the following issues: modified habitats;

natural habitats; critical habitats; legally protected areas; invasive alien species; management and use of renewable resources; pollution prevention and abatement (resource conservation, energy efficiency, waste, hazardous materials, pesticide use and management, greenhouse gas emissions); health and safety (occupational health and safety and community health and safety); and physical cultural resources (SPS, Appendix 1, para. 24).

3.4.1.3 *Involuntary Resettlement Requirements*

ADB's Safeguard Requirements 2 (SR2) on involuntary resettlement apply to full or partial, permanent or temporary physical displacement (relocation, loss of residential land, or loss of shelter) and economic displacement (loss of land, assets, access to assets, income sources, or means of livelihoods) resulting from (i) involuntary acquisition of land, or (ii) involuntary restrictions on land use or on access to legally designated parks and protected areas. Resettlement is considered involuntary when displaced individuals or communities do not have the right to refuse land acquisition that results in displacement. This occurs in cases where (i) lands are acquired through expropriation based on eminent domain; and (ii) lands are acquired through negotiated settlements, if expropriation process would have resulted upon the failure of negotiation. (SPS, Appendix 2, para. 5).

If potential adverse economic, social, or environmental impacts from project activities other than land acquisition (including involuntary restrictions on land use, or on access to legally designated parks and protected areas) are identified, such as loss of access to assets or resources or restrictions on land use, they will be avoided, or at least minimized, mitigated, or compensated for, through the environmental assessment process. If these impacts are found to be significantly adverse at any stage of the project, the borrower/client will be required to develop and implement a management plan to restore the livelihood of affected persons to at least pre-project level or better. (SPS, Appendix 2, para. 6).

ADB's 2013 Operations Manual F1 (OMF1) on Safeguards provides guidance on categorization of projects based on its potential involuntary resettlement impacts. The involuntary resettlement impacts of an ADB – financed project are considered significant if 200 or more persons will be physically displaced from their homes, or lose 10% or more of their productive or income generating assets. (2013 ADB OMF1/OP, para 9)

Where projects involve involuntary resettlement of people, a resettlement plan is prepared that is commensurate with the extent and degree of the impacts, the scope of physical and economic displacement, and the vulnerability of the affected persons.

The Policy uses a categorization system to reflect the significance of a project's potential impacts related to involuntary resettlement. This includes:

- **Category A:** A proposed project is classified as Category A if it is likely to have significant involuntary resettlement impacts. A resettlement plan, including assessment of social impacts, is required.
- **Category B:** A proposed project is classified as Category B if it includes involuntary resettlement impacts that are not deemed significant. A resettlement plan, which includes assessment of social impacts, is required.
- **Category C:** A proposed project is classified as Category C if it has no involuntary resettlement impacts. No further action is required.
- **Categories FI:** A proposed project is classified as Category FI if it involves the investment of ADB funds to, or through, a financial intermediary.

ADB's SPS SR2 provides key requirements covering compensation, assistance and benefits for displaced persons, social impact assessment, resettlement planning, negotiated land acquisition, information disclosure, consultation and participation, grievance redress mechanism, monitoring and reporting, unanticipated impacts; and special considerations for indigenous peoples

3.4.1.4 Indigenous Peoples Requirements

ADB's Safeguard Requirements 3 (SR3) on Indigenous Peoples aims to design and implement projects in a way that fosters full respect for Indigenous Peoples' identity, dignity, human rights, livelihood systems, and cultural uniqueness as defined by the Indigenous Peoples themselves so that they (i) receive culturally appropriate social and economic benefits, (ii) do not suffer adverse impacts as a result of projects, and (iii) can participate actively in projects that affect them. (SPS Appendix 3, para 3). It is triggered if The Indigenous Peoples safeguards are triggered if a project directly or indirectly affects the dignity, human rights, livelihood systems, or culture of Indigenous Peoples or affects the territories or natural or cultural resources that Indigenous Peoples own, use, occupy, or claim as their ancestral domain. (SPS Appendix 3, para 9).

The impacts of an ADB-financed project on Indigenous Peoples is determined by assessing the magnitude of impact in terms of the following:

- Customary rights of use and access to land and natural resources;
- Socioeconomic status;
- Cultural and communal integrity;
- Health, education, livelihood and social security status; and
- The recognition of indigenous knowledge; and
- The level of vulnerability of the affected Indigenous Peoples community.

The ADB Safeguard Policy identified Project categories in term of Involuntary Resettlement is summarized below:

- **Category A:** A proposed project is classified as Category A if it is likely to have significant impacts on Indigenous Peoples. An Indigenous Peoples plan (IPP), including assessment of social impacts, is required.
- **Category B:** A proposed project is classified as Category B if it is likely to have limited impacts on Indigenous Peoples. An IPP, including assessment of social impacts, is required.
- **Category C:** A proposed project is classified as Category C if it is not expected to have impacts on Indigenous Peoples. No further action is required.
- **Category FI:** A proposed project is classified as Category FI if it involves the investment of ADB funds to, or through, a financial intermediary.

3.4.2 ADB Social Protection Strategy (2001)

The Social Protection Strategy was approved by ADB on September 13, 2001. It is defined as the set of policies and programs designed to reduce poverty and vulnerability by promoting efficient labour markets, diminishing people's exposure to risks, and enhancing their capacity to protect themselves against hazards and interruption/ loss of income.

The Social Protection Strategy spells out the scope of social protection and commitment of the ADB to develop priority interventions in five major elements:

- Labour market policies and programs designed to generate employment, improve working conditions and promote the efficient operations;
- Social insurance programs to cushion the risks associated with unemployment, ill health, disability, work-related injury and old age;
- Social assistance and welfare service programs for the vulnerable groups with inadequate means of support, including single mothers, the homeless, or physically or mentally challenged people;

- Micro and area-based schemes to address vulnerability at the community level, including micro insurance, agricultural insurance, social funds and programs to manage natural disasters; and
- Child protection to ensure the healthy and productive development of children.

At the project level, the following social protection requirements are applicable in the design and formulation of ADB projects,

- compliance with the internationally recognized core labour standards; and
- taking all necessary and appropriate steps to ensure that for ADB-financed procurement of goods and services, contractors, subcontractors and consultants will comply with the country's labour legislation (e.g., minimum wages, safe working conditions, and social security contributions, etc.) and the Core Labour Standards
- The Core Labour Standards include:
 - Elimination of all forms of forced or compulsory labour (Conventions 29 and 105)
 - Effective abolition of child labour (Conventions 138 on minimum age, 182 on worst form)
 - Freedom of association and effective recognition of the right to collective bargaining (Conventions 87 and 98)
 - Elimination of discrimination in respect of employment and occupation (Conventions 100 equal remuneration and 111 on discrimination)

3.4.3 *ADB Gender and Development Policy (1998)*

The ADB Gender and Development Policy, which was approved in 1998, is the guiding framework for gender and development activities. The Policy adopts gender mainstreaming as the key strategy for promoting gender equality and women's empowerment across the full range of ADB operations—from country partnership strategies to the design and implementation of gender-inclusive projects and programs. The key elements of ADB's policy include gender sensitivity, gender analysis, gender planning, mainstreaming, and agenda setting. To operationalize the policy, ADB's focus of activities will be to:

- Provide assistance to its developing member countries (DMCs) in the areas of policy support, capacity building, Gender and Development (GAD) awareness, and formulation and implementation of policies and programs directed at improving the status of women;
- Facilitate gender analysis of proposed projects, including program and sector loans, and ensure that gender issues are considered at all the appropriate stages of the project cycle, including identification, preparation, appraisal, implementation, and evaluation;
- Promote increased GAD awareness within ADB through training workshops and seminars, development of suitable approaches, and staff guidelines to implement the policy on GAD;
- Assist the DMCs in implementing commitments made at the Beijing World Conference on Women; and
- Explore opportunities to directly address some of the new and emerging issues for women in the region.

3.4.4 *ADB Access to Information Policy (AIP) (2019)*

The objective of the Access to Information (AIP) Policy is to promote stakeholder trust in ADB and to increase the development impact of ADB activities. The policy reflects ADB's commitment to transparency, accountability, and participation by stakeholders in ADB-supported development activities in Asia and the Pacific. It also recognizes the right of people to seek, receive, and impart information about ADB's operations.

- The policy applies to documents and information that ADB produces, requires to be produced by its borrowers or clients, or are produced and provided to ADB by other parties in the course of ADB operations. The policy will be implemented in accordance with detailed arrangements approved by ADB Management and made publicly available in accordance with ADB's normal procedures.
- The AIP outlines the following:
 - Policy Principles in which the AIP is based on, this includes, but not limited to, for example:
 - Clear, timely, and appropriate disclosure about its operations
 - Limited exceptions. The policy provides a limited set of exceptions that balances the rights and interests of various parties.
 - Proactive disclosure. ADB proactively shares its knowledge products and information about its operations in a timely manner to facilitate participation in ADB decision-making
 - Sharing of information and ideas. The AIP includes processes by which people may equally seek, receive, and convey information and ideas about ADB operations.
 - Providing information to project-affected people and other stakeholders.
 - Clear appeals process. A clear process to appeal an ADB decision not to disclose requested information is an important part of a meaningful disclosure framework
 - Continuous monitoring. ADB monitors the effectiveness of the policy, learns lessons from its successes and shortcomings, and stays abreast of new technologies and practices.
 - Information Requests and Appeals which outline the procedure and process for requests for ADV information and documents.
 - There is an Access to Information Committee (AIC) overseeing established to interpret, monitor, and review the policy and its implementation arrangements.

ADB has a two-stage appeals process that requesters can use when they believe that ADB has denied their request for information in violation of this policy.

3.4.5 World Bank / IFC EHS Guidelines / IFC PS / JICA ESC Guidelines

The WBG EHS Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). They are categorized by environment, occupational and community health and safety, and construction and decommissioning. The General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines, which provide guidance to users on EHS issues within specific industry sectors. The EHS Guidelines most relevant to the Project are identified below:

- WBG General EHS Guidelines (2012);
- WBG EHS Guidelines for Wind Energy (2015);
- WBG EHS Guidelines for Electric Power Transmission and Distribution (2007);
- WBG EHS Guidelines for Construction Materials Extraction (2007);
- IFC/EBRD Workers' Accommodation: Processes and Standards;
- IFC Guidance Note 6: Biodiversity Conservation and Sustainable Natural Resource Management (2007);
- JICA Guidelines for Environmental and Social Considerations (2010); and
- IFC Performance Standards on Environmental and Social Sustainability (2012).

3.5 International Conventions

3.5.1 *United Nations Convention on Biological Diversity (1996)*

Under this Convention, Lao PDR has agreed to:

- Develop the legislation for the protection of threatened species and population;
- Develop the national strategy for the conservation and sustainable use of biodiversity;
- Integrate conservation and sustainable use of the biological resources in the decision-making of the country; and
- Undertake the environmental impact assessment for development projects with a view to mitigating the negative impacts.

3.5.2 *Coherence with Sustainable Developmental Goals and the Paris Climate Agreement*

Due to the high exposure to extreme weather and climate change related disaster climate resilient development has become an integral part of development in Lao DPR over the past few years. The country's commitment towards climate resilient development is demonstrated through its various development related policies and planning frameworks.

The Disaster Risk Reduction (DRR) had been an integral part of National Social and Economic Development Plan since the 7th Plan of 2011-2015 with an aim of protection of development and investment processes from natural disasters and to preclude exacerbation or creation of new risks. The sectors in which DRR was considered highly relevant and mainstreaming DRR in policies has evolved over the past many years are agriculture and forestry, public work and transportation, water resources management and public health. DRR is also an integral part of 8th National Social and Economic Development Plan.

3.5.3 *Basel Convention*

Under the Basel Convention, Lao PDR is to aim to help decrease the number of transboundary movements and minimize the number of hazardous wastes, and to dispose and manage the wastes in an environmentally friendly manner. To achieve this, a few objectives need to be completed:

- Transboundary movements of wastes are reduced to a minimum consistent through environmentally friendly and efficient management, and any permitted transboundary movement is controlled under the terms of the Convention
- The amount and hazardousness of the wastes generated are minimized, and their environmentally sound management, which includes the treatment of the wastes, is ensured to be as close to their source of generation as possible
- Provide help to developing countries in environmentally sound management of hazardous and other waste they generate

3.5.4 *CITIES*

Annually, it is estimated that international wildlife trade is worth billions of dollars and includes hundreds of millions of plants and animal specimens. As levels of exploitation for some of these animal and plant species are high and destroying some of their natural habitats, Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITIES) was conceived to safeguard certain species from over-exploitation.

As a party of the CITIES, Lao PDR is to ensure that international trade does not threaten the survival of plants and animals in the wild. As of today, more than 37,000 species of animals and plants are under the protection of CITIES, to protect them from being traded as live specimens, dried herbs, or fur coats.

Even though CITIES is legally binding, it does not replace any national laws; it is rather used as a framework to be respected by each Party.

3.5.5 Kyoto Protocol

Under the Kyoto Protocol, Lao PDR is committed to limit and reduce greenhouse gases (GHG) emissions in accordance with the agreed individual targets. An important element of the protocol is the establishment of flexible market mechanisms. The mechanisms should encourage GHG abatement to start where it is most cost-effective; as long as emissions are removed from the atmosphere, it does not matter where it is reduced from. As a party to the Convention, Lao PDR has actively. The Convention has encouraged each Party to adopt policies and measure on mitigation, and as a party to the Convention, Lao PDR has actively been participating in the Convention process and even submitted its First National Communication (FNC) to the UNFCCC as part of its commitments.

Lao PDR is not a major contributor to climate change as of yet but is likely to be disproportionately affected. By ratifying the UNFCCC and Kyoto Protocol, it will build on the country's commitment to its climate change adaption efforts.

3.5.6 Ramsar Convention

The Convention has made possible for a wide variety of natural and man-made habitat types to be classified as wetlands. In particular, the Ramsar Convention encourages the designation of sites containing unique, representative, or rare wetlands that are important for biological diversity conservation. As a Party of this Convention, Lao PDR is to aim to put a pause to the loss of wetlands worldwide and to conserve those that remain through wise use and good management.

Under the Ramsar Convention on "Wetlands of International Importance", which covers every aspects of wetland wise use and conservation, Lao PDR has defined two wetland areas, namely Xe Champone in Savannakhet province and Beung Kiat Ngong in Champassak Province. The commitment from the Lao government to protect its important natural wetland resources comes at a crucial point in the nation's transformative and quick economic development.

3.5.7 International Labor Organization (ILO) No. 138

As a member under one of the ILO Conventions on child labor, Lao PDR has the obligation to respect, realize, and promote the abolition of child labor. The aim of ILO Convention No. 138 on Minimum Age and Convention is to effectively eliminate child labor by requiring country members to:

1. Establish a minimum age for entry into employment and work; and
2. Establish national policies to abolish child labor

Lao PDR ratified ILO Convention No. 138 on June 13, 2005 and has currently set its minimum working age to be 14 years old, where the range is between 14 and 16.

3.6 Environmental and Social Standards

The Project shall comply with Lao environmental, social, health and safety laws, or relevant GIIP Guidelines, whichever is more stringent. The relevant environmental standards for the Project is presented in **Table 3.1 - Table 3.5** The more stringent local or WBG EHS guidelines standards is presented in bold text in the tables.

Table 3.1: Ambient Air Quality Standards

Parameters	Averaging Period	Laos Standard ^{1,3}		WHO Air Quality Guideline ^{2,3}	
		(ppm)	(mg/m3)	(µg/m3)	(mg/m3)
Carbon monoxide	1 hour	30	31.0	35	35 ^{3/}

Parameters	Averaging Period	Laos Standard ^{1,3}		WHO Air Quality Guideline ^{2,3}	
		(ppm)	(mg/m3)	(µg/m3)	(mg/m3)
(CO)	8-hour	9	11.1	10	10 ^{3/}
Nitrogen dioxide (NO ₂)	1 hour	0.11	0.223	200	0.2
	1 year	0.02	0.0405	10	0.01
Sulphur dioxide (SO ₂)	10-minute	-	-	500	0.5
	1 hour	0.13	0.367	-	-
	24-hour	0.05	0.141	40	0.04
Total Suspended <100 micron (TSP)	24-hour	-	0.33	-	-
	1 year	-	0.10	-	-
Particulate Matter ≤10 micron (PM10)	24-hour	-	0.12	45	0.045
	1 year	-	0.05	15	0.015
Particulate Matter ≤2.5 micron (PM2.5)	24-hour	-	0.05	15	0.015
	1 year	-	0.015	5	0.005
Ozone (O ₃)	1 hour	-	0.20	-	-
	8-hour	-	0.14	100	0.1
Lead (Pb)	1 year	-	0.00015	-	0.0005 ³

Note:

¹ General Air Quality Standard. National Environmental Standard (No 81 NA). 21 February 2017.

² Environmental, Health, and Safety Guidelines. IFC. April 30, 2007.

³ World Health Organization. (2021). WHO global air quality guidelines: particulate matter (PM2.5 and PM10), ozone, nitrogen dioxide, sulphur dioxide and carbon monoxide. World Health Organization. <https://apps.who.int/iris/handle/10665/345329>. License: CC BY-NC-SA 3.0 IGO

³ Values in **bold text** represents the more stringent standard between local or WBG EHS guidelines standards that is applicable to the Project

Table 3.2: Ambient Noise Standards

Laos Standard ¹ (dBA)		Noise Level Guideline ^{2,3} One Hour L _{Aeq} (dBA)		
Parameter	Permissible Value	Receptor	Day Time 7:00-22:00	Night Time 22:00-7:00
Maximum Sound Level	115	Residential, institutional, educational	55	45
Leq 24hour	70	Industrial, commercial	70	70

Note:

¹ Ambient Noise Standard. National Environmental Standard (No 81 NA). 21 February 2017

² EHS Guidelines. IFC. April 30, 2007.

³ Values in **bold text** represents the more stringent standard between local or WBG EHS guidelines standards that is applicable to the Project

Table 3.3: Toilet Wastewater Discharge Standard

Parameters	Units	Toilet Wastewater Discharge Standard ^{1, 3}	Water Quality EHS Guidelines (Treated Sanitary Sewage Discharges) ^{2, 3}
pH	-	6-9	6-9
BOD ₅	mg/L	30	30
COD	mg/L	125	125
Total suspended solids	mg/L	50	50
Total Nitrogen	mg/L	10	10
Pheno	mg/L	2	-
Fats, Oil, Grease	mg/L	5	10
E.coli	mg/L	400	-
Faecal coliform bacteria	MPN/100 ml	-	400

Note:

¹ Water Pollution Control Standard for Toilet. National Environmental Standard (No 81 NA). 21 February 2007.

² EHS Guidelines. IFC. April 30, 2007.

³ Values in **bold text** represents the more stringent standard between local or WBG EHS guidelines standards that is applicable to the Project

Table 3.4: Domestic Wastewater Discharge Standard

Parameters	Units	Domestic Wastewater Discharge Standard ^{1, 3}	Water Quality EHS Guidelines (Treated Sanitary Sewage Discharges) ²
pH	-	5.5 - 8.5	6-9
Electro-conductivity	mg/L	2,000	-
Total Dissolved Solid	mg/L	1,300	-
BOD ₅	mg/L	30	30
Total suspended solids	mg/L	30	50
Per-manganese	mg/L	6.0	-
Hydrogen Sulphide	mg/L	1.0	-
Cyanide	mg/L	0.2	-
Fats, Oil, Grease	mg/L	5.0	10
Formaldehyde	mg/L	1.0	-
Phenol & Cresol	mg/L	1.0	-
Residual Cl	mg/L	1.0	-
Radioactive	mg/L	None	-
Colour & odour	mg/L	Not visible	-

Parameters	Units	Domestic Wastewater Discharge Standard ^{1, 3}	Water Quality EHS Guidelines (Treated Sanitary Sewage Discharges) ²
Tar	mg/L	None	-
Heavy metal			
Zinc	mg/L	5.0	-
Chromium Hexavalent	mg/L	0.3	-
Arsenic	mg/L	0.25	-
Copper	mg/L	1.0	-
Mercury	mg/L	0.005	-
Cadmium	mg/L	0.03	-
Barium	mg/L	1.0	-
Selenium	mg/L	0.02	-
Lead	mg/L	0.1	-
Nickel	mg/L	0.2	-
Manganese	mg/L	0.5	-

Note:

¹ Water Pollution Control Standard to Public Drainage. National Environmental Standard (No 81 NA). 21 February 2007.

² EHS Guidelines. IFC. April 30, 2007.

³ Values in **bold text** represents the more stringent standard between local or WBG EHS guidelines standards that is applicable to the Project

Table 3.5: Electric and Magnetic Fields Standards

Frequency	Electric Field (V/m ^a)	Magnetic Field (μT ^b)
50 Hz ^c	5000	100
60 Hz	4150	83

^a Volts per meter; ^b Micro tesla; ^c Hertz, Source: WBG EHS Guidelines – Electric Power Transmission and Distribution (2007)

4 PROJECT DESCRIPTION

4.1 Project Background and Objectives

MWPCL is developing a wind farm, with a total installed capacity of approximately 600 MW, and a 500 kV transmission line in Dak Cheung District of Sekong Province and Sanxay District of Attapeu Province in Laos (the Project). The Project has been developed under an exclusive right granted by the GOL through a Memorandum of Understanding (MoU) and Project Development Agreement (PDA) executed in November 2011 and August 2015. This Project is also the first cross-border wind power project to be approved by the GOL and Government of Vietnam (GOV) in accordance with the MoU to supply power from Laos' projects to Vietnam Electricity (EVN).

The development also includes a 22 km 500 kV transmission line, which connects to the grid in Vietnam. The Right of Way (ROW) of the transmission line is 70 m (35 m on each side from the centre line). The generated electricity is expected to be sold to Vietnam Electricity (EVN).

It is understood that part of the Project area is overlapping with a Bauxite mine concession area granted to Viet Phoung Group (VPG), which signed its concession with the Government of Laos (GOL) in 2018, therefore, the relocation of Project facilities in the overlapping areas is potentially required. This includes the cluster of nine WTGs, the main 500 kV substation, and a short portion of the 500 kV transmission line route. The Project facilities will be relocated once the final design is completed.

Once the relocation areas are identified and the additional studies are complete, addendums to address the relocation will be prepared to complement the following documents:

- Environmental and Social Impact Assessment ("ESIA Addendum")
- Biodiversity Action Plan ("BAP Addendum")
- Resettlement Plan ("RP Addendum")
- Cultural Heritage Management Plan ("CHMP Addendum")
- Community and Ethnic Group Development Plan ("CEGDP Addendum")
- Stakeholder Engagement Plan ("SEP Addendum")

The addendums will provide updates of the relocation of Project facilities, the additional survey results, the potential impacts, and additional mitigation measures and monitoring program that may be required. No pre-construction or construction work will be conducted at the proposed relocation sites until the required E&S assessments are completed and approved. The addendums will be available no later than 3 months after Financial Close. The new Project design will be aligned with the lenders' E&S requirements and not make any of the E&S impacts materially worse than presented in the Final E&S documents, without the non-objection of the lenders.

4.2 Project Location

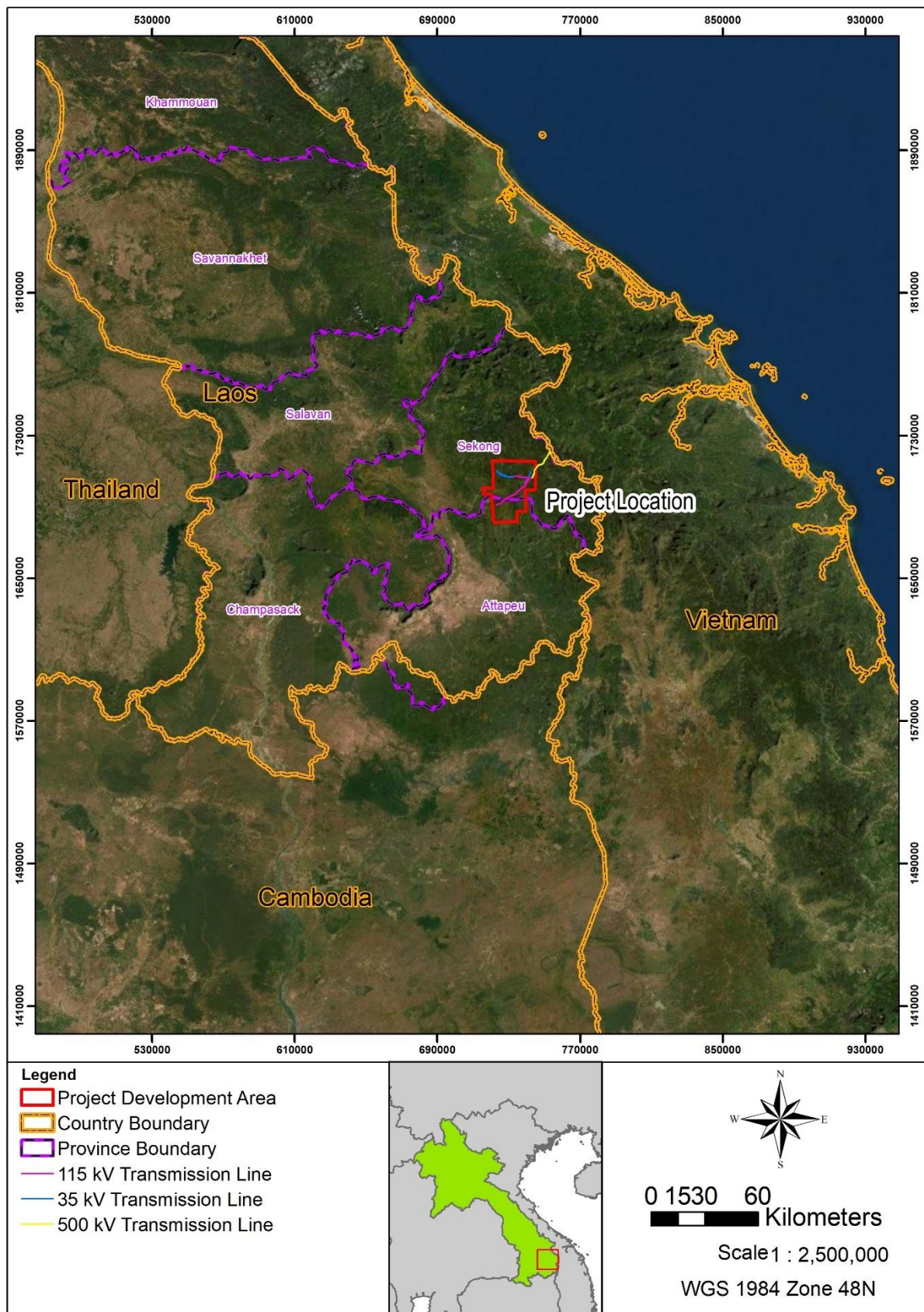
The Project is located in Dak Cheung District of Sekong Province, and Sanxay District of Attapeu Province in Laos (731355.38 m E, 1701111.82 m N). It lies approximately 560 km south east of Vientiane, the capital of Laos, and approximately 48 km east of the provincial capital, Sekong.

The wind farm development area (excluding the transmission line) is approximately 70,828 hectares¹⁹. The area impact to topography will be mainly focus on the turbine base which is around 1 ha per turbine, the total area required for turbine base will be 133 ha. Area required for other facilities (Laydown area, potential batch plant, potential camp, potential crush stone production plant, potential stone resource point) is around 169 ha. Area required for access road is around 397.67 ha. Area required for pylon of

¹⁹ It should be noted that the Projects' concession area will be the land required to install and construct project facilities and ROW for related transmission line, which is around 1,050 ha.

500 kV is 1.20 ha, pylon of 115 kV is 1.63 ha and pylon of 35 kV is 1.05 ha. The 500 kV transmission line runs northeast from the development area, across Dak Cheung District, to the Laos-Vietnam international border. The overall Project location is shown in **Figure 2.1** .

Figure 4.1: Project Location



Source: MWPC, 2020 (modified by ERM)

4.3 Project Facilities and Components

This section briefly describes the major facilities and components of the Project. This includes: (i) the Project's three major components – wind farm, transmission lines and Project access road; and (ii) ancillary facilities (e.g. worker camps, concrete batching plant(s), laydown areas). Shared facilities of the Project have also been identified.

4.3.1 Permanent Facilities

The permanent facilities of the Project include: wind turbines, the 22 km 500kV, 39 km 115kV and 27 km 35 kV overhead transmission line, underground and aboveground collector transmission cables between the wind turbines, internal 33/115kV substations, 500kV substation, and internal access roads. The total length of new internal road that will be built is approximately 180 km and the total length of internal road including the existing road that will be expanded is approximately 200 km. The underground cables will be routed along the access roads and will form part of the permanent land use of the Project.

The layout of the Project's permanent facilities is shown in **Figure 4.2**.

4.3.1.1 Wind Turbines

A wind turbine is a device that captures the wind's kinetic energy and converts the energy into electricity using a generator. A total of 133 wind turbines will be used for the Project that all 133 turbines will be Envision EN 171-4.5 turbines.

A summary of the wind turbine specifications is provided in **Table 4.1**, with the exact location of each turbine presented in **Appendix E**.

Table 4.1: Main Wind Turbine Specifications

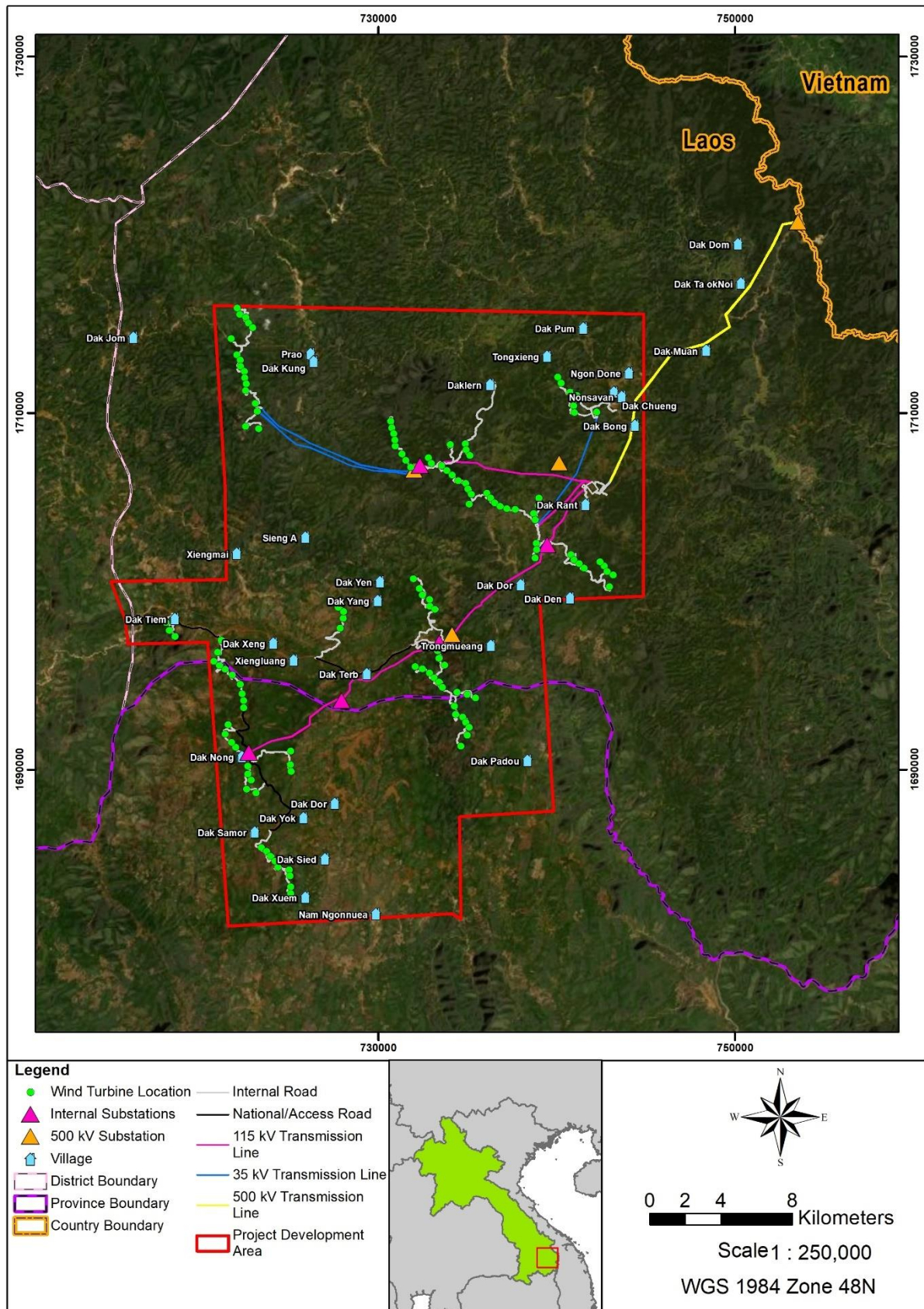
Item	Unit	Parameter (EN-171/4.5-MW)
Basic wind turbine data		
Rated power	kW	4,500
Rotor diameter	m	171
Hub height	m	110
Swept area	m ²	22,965
Design grade	-	IEC-S
Rated wind speed	m/s	10.5
Turbulence density	-	B/0.14
Cut-in wind speed	m/s	3
Cut-out wind speed	m/s	25
Maximum wind speed (10min average)	m/s	42.5
Operating temperature range	°C	Normal t type -10 to 40
Survival temperature range	°C	-20 to 50
Design life time	year	25

Item	Unit	Parameter (EN-171/4.5-MW)
Blade		
Number of blades	-	3
Blade length	m	83.9
Weight	t	20.5
Material	-	GFRP
Blade processing technology	-	Vacuum infusion
Blade root connection	-	Metal flange
Pitch system		
Pitch control	-	Electric pitch control
Pitch range	-	-5°~90°
Hub castings		
Material	-	EN-GJS-400-18
Type	-	Casting
Wind deflector		
Material	-	GFRP
Type	-	Split
Main bearing		
Type of spindle bearing	-	SRB
Lubrication of spindle bearing	-	Automatic lubrication
Gearbox		
Number of gear stages	-	3
Gearbox efficiency	-	>0.975
Gearbox cooling	-	Air cooled
Spindle-gearbox connection	-	Connection with expanding ring
Gearbox-generator connection	-	Flexible coupling
Nacelle baseplate		
Material	-	EN-GJS-400-18-LT
Baseplate type	-	Casting
Rear frame		
Material	-	Q355
Type of rear frame	-	Welding

Item	Unit	Parameter (EN-171/4.5-MW)
Yaw System		
Yaw concept	-	Electro-mechanical yaw
Type of yaw brake	-	Yaw ring gear + passive brake
Lightning Protection		
Design Standards	-	In accordance with GBT 33629-2017 Wind turbine lightning protection(IEC61400-24 2010)
Tower		
Type	-	Steel tower

Source: Envision, 2022

Figure 4.2: Layout of Permanent Facilities of Project



Wind Turbine Nacelle

The nacelle assembly consists of a drive chain system, a yaw system, nacelle housings and a nacelle structure system, etc. In addition, electrical components such as generators and control cabinets are also arranged in the nacelle.

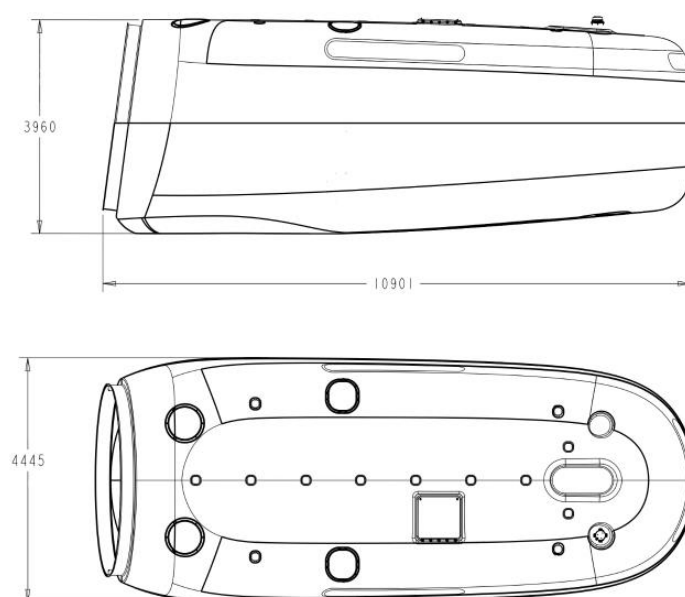
The nacelle structure is arranged at the top of the tower to provide support for the shafting, gearbox, generator, etc. The nacelle structure also supports the nacelle cover. The nacelle baseplate is connected to the rear frame with bolts. Nacelle Specifications is shown in **Table 4.2** and Nacelle and Hub Drawings and Size is shown in **Figure 4.3**.

Table 4.2: Nacelle Specifications

Component	Features and Specifications	
	Parameter	Value
Nacelle baseplate	Material	EN-GJS-400-18-LT
	Baseplate type	Casting
Rear frame	Material	Q355
	Type of rear frame	Welding

Source: Envision, 2022

Figure 4.3: Nacelle and Hub Drawings and Size



Source: Envision, 2022

The yaw system is for wind alignment and cable untwisting. The yaw system consists of yaw ring gears, yaw gearbox and yaw caliper. The yaw ring gear is arranged between the tower top flange and the yaw caliper, fixed on the flange with bolts. The yaw caliper and drives are bolted to the nacelle baseplate. By engaging the yaw ring gear with the yaw drive gear, the yaw caliper and the nacelle baseplate can slide relative to the yaw ring gear. Yaw System Specifications is shown in **Table 4.3**.

Table 4.3: Yaw System Specifications

Component	Features and Specifications	
	Parameter	Value
Yaw system	Yaw concept	Electro-mechanical yaw
	Type of yaw brake	Yaw ring gear + passive brake
	Material of yaw ring gear	42CrMo4

Source: Envision, 2022

Nacelle cover and the wind deflector are made of GFRP. There is an emergency escape hole at the tail of nacelle housing for emergency personnel to escape. The top of nacelle housing is equipped with a wind speed sensor and a skylight, through which people can reach the top of the nacelle from inside the nacelle.

Rotor Hub

The rotor hub consists of a three-bladed design with pitch system; it is attached to the main shaft via a two single-row tapered roller bearings. The rotor hub also holds the pitch system used for adjusting the blade pitch. The hub is a cast construction with a combination of star type and ball type. The nacelle elevation angle, cone angle and blade preflex are used to ensure that the minimum distance between blade tips and the tower meets safety requirements. The rotor structure and dimensions are shown in **Table 4.4**

Table 4.4: Rotor Dimension and Weight

Item	Unit	Parameter (EN-171/4.5-MW)
Material	-	EN-GJS-400-18
Type	-	Casting

Source: Envision, 2022.

Pitch System

Pitch system consists of two part; electrical and mechanical. The mechanical assembly for pitch system consists of a pitch gearbox, pitch bearings and its connecting parts. The electrical assembly for pitch system consists of a control cabinet, a motor and a backup power supply. The pitch system functions by adjusting the pitch angle of each blade, which changes the amount of airflow that the blades capture, therefore increasing or decreasing the rotation speed. This pitch system is used for optimising the power production under varying wind speed conditions, and also as a safety system when rotation speed is required to slow or stop. The Pitch System consists of a motor attached to the Rotor Hub, which then drives a tooth belt attached to the base of the blade to rotate it.

Blade

Each turbine is designed to have three rotor blades. The specifications of the blade for each wind turbine model is shown in **Table 4.5**.

Table 4.5: Blade Specifications

Item	Unit	Parameter (EN-171/4.5-MW)
Number of blades	-	3
Blade length	m	83.9
Weight	t	20.5
Material	-	GFRP
Blade processing technology	-	Vacuum infusion
Blade root connection	-	Metal flange

Source: Envision, 2022.

Generator

The generator includes, but is not limited to the following key components: stator, rotor, stator shaft, rotor shaft, permanent magnets, two single-row tapered roller bearings, and active air cooling system. The generator specifications for each wind turbine model is shown in **Table 4.6**.

Table 4.6: Generator Specifications

Item	Unit	Parameter (EN-171/4.5-MW)
Generator type	-	Doubly fed induction generator
Number of pole pairs	-	2 pairs of poles
Rated voltage	v	950
Cooling method	-	Air cooling
Rated efficiency of generator	%	97
Rated power	kW	4,700
Rated frequency of generator	Hz	50
Generator protection class	-	IP54
Protection class of rotor slip ring	-	IP23
Insulation class	-	F
Lubrication method	-	Lubricated with grease

Source: Envision, 2022.

4.3.1.2 Transmission Line

The Project includes the development of a 22 km 500 kV overhead transmission line to evacuate power generated from the wind farm and connect it to the Vietnam electricity grid. This transmission line will run from the Project's substation located within the Project development area, to the Laos-Vietnam international border, and continuing eastwards to connect to the Thanh My substation in Vietnam (refer to **Section 4.4** for further details on the Vietnam section of the transmission line). The Right of Way (ROW), comprising a width of 70 m (35m horizontally on each side from the transmission centerline), is the area of land that will be used to locate, construct, operate, and maintain the transmission line. Based on local regulations, no specific requirements on electric and magnetic fields but the project will comply with applicable requirement on electric and magnetic fields (from WBG EHS Guidelines – Electric Power Transmission and Distribution (**Table 3.5**)).

In addition, the Project includes the construction of underground and overhead 35 kV and 115 kV transmission cables to transfer electricity to the substation within the development area. The substation will be connected with a 500 kV transmission cable to transmit electricity to Vietnam. The Right of Way (ROW) for the transmission lines are provided in **Table 4.7**.

Table 4.7: Transmission Line ROW

Transmission Line	Project ROW	Laos ROW Requirement	IFC ROW Requirement
500 kV	70 m (35 m on each side from the centre line)	70 m	61 m
115 kV	25 m (12.5 m on each side from the centre line)	25 m	21 m
35 kV	8 m (4 m on each side from the centre line)	6 m	8 m

The majority of the transmission line is routed alongside the existing road, only the 35 kV line in the northwest region of Project development area and one 115 kV line in the middle-west of the Project development area that are not routed along existing road networks.

The details of the 500 kV transmission line are provided in **Table 4.8**.

Table 4.8: Characteristics of the 500 kV Transmission Line

Characteristic	Details
Level of voltage	500 kV
Starting point	115/500 kV station of the project, Ban Dak Bong, Dak Cheung District
Ending point of the route	500 kV station of Vietnam (Thanh My Station). <i>However, for the purposes of this ESIA, the scope covers up to the Laos / Vietnam Border.</i>
Total length (for this Project)	~22 km
Height of tower	58.7 m – 68.7 m
Type of tower	Steel lattice tower
Base (tower foundation)	Base is made with reinforced concrete

The total length of the overhead transmission line is approximately 105.92 km, where 22 km is for 500 kV, 49.79 km is for 115 kV, and 34.13 km is for 35 kV). Total length of 33 kV underground transmission line is approximately 280 km.

The specification of 35 kV, 115 kV and 500 kV transmission line is in **Appendix F**.

4.3.1.3 Project Site Roads

The internal road system within the Project development area will be newly built connecting to turbine towers with the pavement width of 5.5-6.0 m, 1 m width of drainage will be built parallel each side of internal road; designed speed of 15 km/h. type of internal road is covered with crushed stone layer (thickness is 30 cm). The total length of internal road that will be newly built is approximately 135 km and the total length of public road which shall be modified is approximately 25 km. So, the total length of internal road including modification of public road is approximately 160 km. Sediment controls will be installed to collect sediment. The mortar rubble drainage ditch and the reinforced concrete pipe culvert with a diameter of 1 m will be set up according to the actual situation on site.

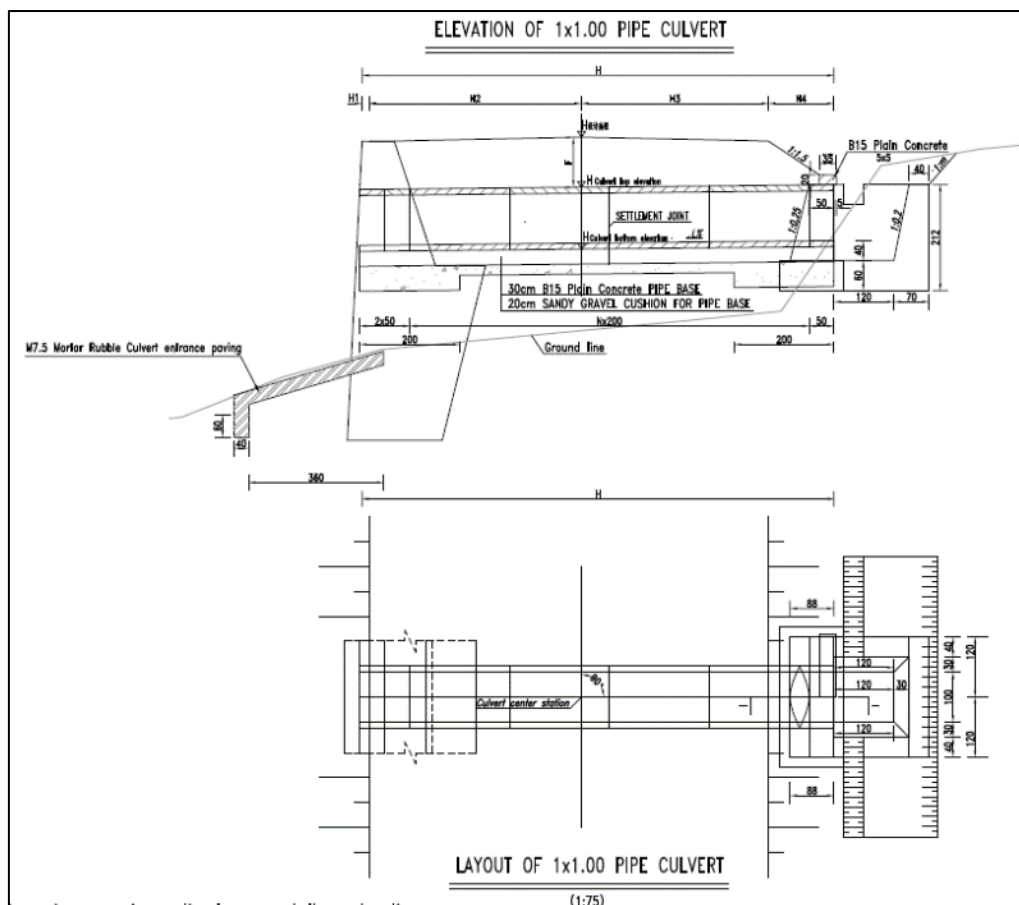
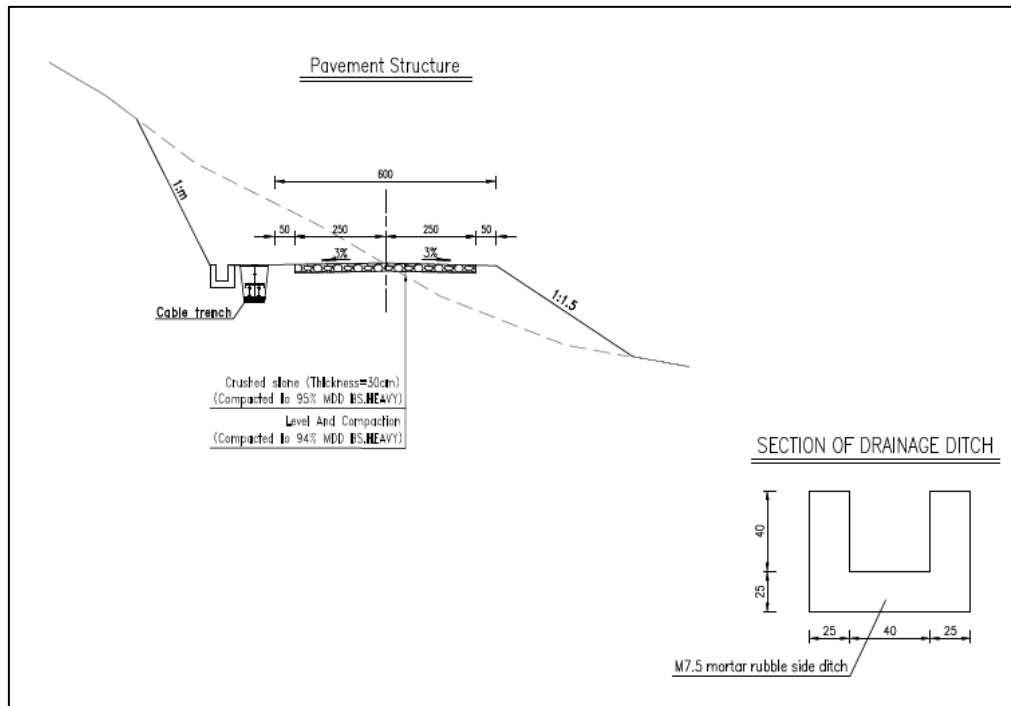
In order to reach all 133 wind turbine locations during construction, the Engineering, Procurement and Construction (EPC) contractor will construct site roads that will connect road no.16B to each wind turbine. However, following the completion of construction, the roads will be renovated and used for access during inspection and monitoring.

The Project will have mitigation measures regarding the drainage system and soil erosion management as follows:

- Construct an appropriate slope protection and suitable drainage system specifically in areas of high potential soil erosion;
- Undertake construction of a water drainage system at both sides of the access road to facilitate draining of water;
- Avoid earthworks during heavy rainfall to reduce erosion risk;
- Avoid earthworks at the sides of streams to reduce erosion and sedimentation risk to watercourses;
- Avoid digging and removal of stockpiling of soil at the sides of the stream or canal in order to prevent sedimentation and erosion into the water sources; and
- Monitoring / auditing conducted to inspect erosion control measures.

Drawing of the pavement structure and the drainage ditch can be found in **Figure 4.4**.

Figure 4.4: Pavement Structure and Drainage Ditch



Source: MWPC, 2021

4.3.2 Ancillary Facilities

A brief description of ancillary facilities are provided below. The ancillary facilities will be located in a flat and open area that is near the existing public road. The location of the ancillary facilities is shown in **Figure 4.5**.

4.3.2.1 Concrete Batching Plants

The Project will require a significant quantity of aggregate for concrete production during the construction. MWPCCL proposes to source the required aggregate locally and not from ecologically sensitive areas consistent with the IFC EHS guidelines for construction materials extraction. . The location of the sand and gravel sources are not yet identified—they will be mentioned in the Construction Material Sourcing Plan.(refer to Construction Material Sourcing Plan that will be developed). In the preliminary assessments conducted for the Project, three potential locations for the concrete batching plant were considered. However, two potential locations of concrete batching plant with an area of 70,000 m² were focused on for the ESIA (**Figure 4.5**). The sites consist of the main plant and auxiliary plant. The third potential concrete batching plant will have about 10,000 m² and its location has not been identified at the time of writing this Report.

The concrete volume for each wind turbine is approximately 750 m³ and the average concrete consumption will be approximately 500 m³/d. Access road length is approximately 200 km with 6 m width and 0.2 m depth of aggregate will require approximately 350,000 m³ of concrete.

The concrete batching plant will have a preliminary capacity of approximately 60-90 m³/hr each. The total minimum capacity is approximately 200 m³/hr (for three batching plants). Relevant materials obtaining (stone and water) should meet the general requirements of construction standards both local and international standards and follow all required mitigation measures if needed.

4.3.2.2 Laydown Areas

A laydown area with total area of 50 ha or 500,000 m² is mainly used for wind turbine parts, electrical equipment, and other raw material. The location of laydown area is shown in **Figure 4.5**.

4.3.2.3 Worker Accommodation

There are three potential camp sites located in the Project area with an area of 6 ha or 60,000 m². These include office and accommodation areas. The preliminary location is shown in **Figure 4.5**. Final locations of workers accommodation will be decided in consultation with ethnic groups in the villages and a workers code of conduct will be reviewed and agreed by the villagers.

4.3.2.4 Spoil Disposal Areas

Spoil disposal sites, also known as soil dumping ground, where the excavated soil that will not be used for backfilling underground cable and turbine foundation construction activities, are left permanently. The disposal sites have a total area of 126.40 ha. The spoil location is shown in **Figure 4.5**. However, the location of spoil disposal sites will be determined with local authorities before construction phase. Detail of environment and social aspect will be considered during the site selection for disposal site and MWPCCL will work with the relevant parties to ensure that the disposal sites meet both local and international standards. For more detail can be found in Waste and Spoil Management Framework.

4.3.3 Shared Facilities

In order to interconnect the electricity generated from the Wind Power Project to the National Power Grid System, and to export the electricity to interconnect with the 500 kV Station of Vietnam (Thanh My Station). It is necessary for the project to build the 500 kV transmission line system from the sub-station of the Wind Power Project in Dak Cheung District to the Laos / Vietnam border to interconnect with the 500 kV station of Vietnam (Thanh My Station) with a total distance of transmission line route of approximately 66 km. . It should also be noted that the 500 kV Station of Vietnam (Thanh My Station)

and the transmission line section in Vietnam are not funded by the Lenders and only the Lao section of the transmission line is included in this impact assessment.

The transmission line in Vietnam is double-circuit with maximum capacity of maximum approximately 4,000 MW which will be the responsibility of EVN. The EVN plans to utilize the transmission line for other imported power project from Sekong Province (Lao PDR). Based on Vietnam's draft power development plan (PDP8), there is a planned 200 MW hydropower project to connect to the Thanh My Station substation. In the negotiation of the PPA and Concession Agreement between the EVN and the Government of Lao (GOL), the two parties are focused on ensuring that other projects can also connect to the transmission line.

4.4 Project Associated Facilities

Associated Facilities are defined in the ADB SPS as “*facilities that are not funded as part of the project (funding may be provided separately by the borrower/client or by third parties), and whose viability and existence depend exclusively on the project and whose goods or services are essential for successful operation of the project.*”

Associated Facilities are defined in the IFC PS “Associated facilities, which are facilities that are not funded as part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be viable”

There are no associated facilities identified for this Project. The rationale is provided in **Section 4.5**.

4.5 Other Related Facilities

Other related facilities have been assessed as to whether these are associated facilities. However, they have **not** been considered as associated facilities as per ADB SPS and IFC PS definition as per the rationale provided below:

- *The 500 kV Station of Vietnam (Thanh My Station) and the transmission line route in Vietnam:* As mentioned in **Section 3.3.3**, this project is not funded by ADB or the Developer and is being conducted by EVN, which means that through funds sourced by EVN. In addition, the viability and existence of the project is not exclusively for successful operation of the project, but are also being developed for more than just the Project Associated Facilities. EVN plans to use the 500kV line for other imported power projects from Sekong province. The maximum capacity of this 500kV double-circuit is approximately 4,000MW. Based on Vietnam's draft power development plan (PDP8), there is a planned 200MW hydro power project to connect to the Project substation and transmission line. In the agreed PPA and Concession Agreement, EVN and GOL, respectively, allow other Projects to connect to the transmission line and sell electricity to Vietnam.
- *Road No. 16 B improvements that connecting Lao PDR, Thailand and Vietnam from west to east (Figure 4.6):* This road will be used for the transportation of construction equipment. The upgrade of this road was completed in 2021 by the Government of Laos. As the road network will not be utilized for only this Project and is not funded by the developer or ADB, it cannot be considered an associated facility since the viability and existence does not depend exclusively on the project, but is develop for other uses as well. The development of Road No. 16B will play key roles in the development of the southern provinces of Laos, especially the agriculture and tourism sectors. Road No. 16B will be beneficial for Sekong and other corridors in the southern region. In addition, this will increase the visibility of tourism potentials in the Duk Chueng district²⁰.

²⁰ https://www.ide.go.jp/library/English/Publish/Reports/Brc/pdf/08_chapter2.pdf

Figure 4.5: Ancillary Facilities Location

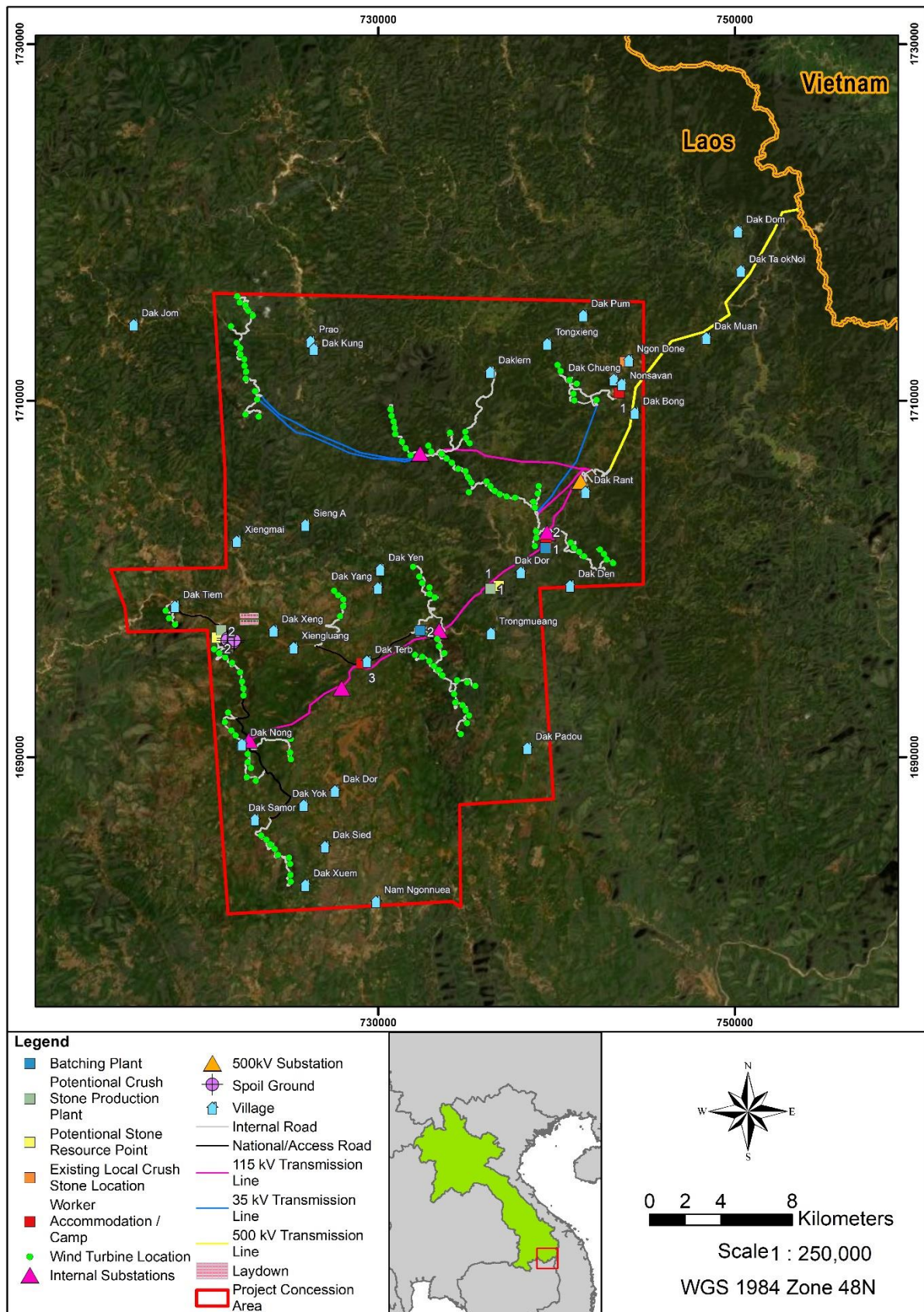
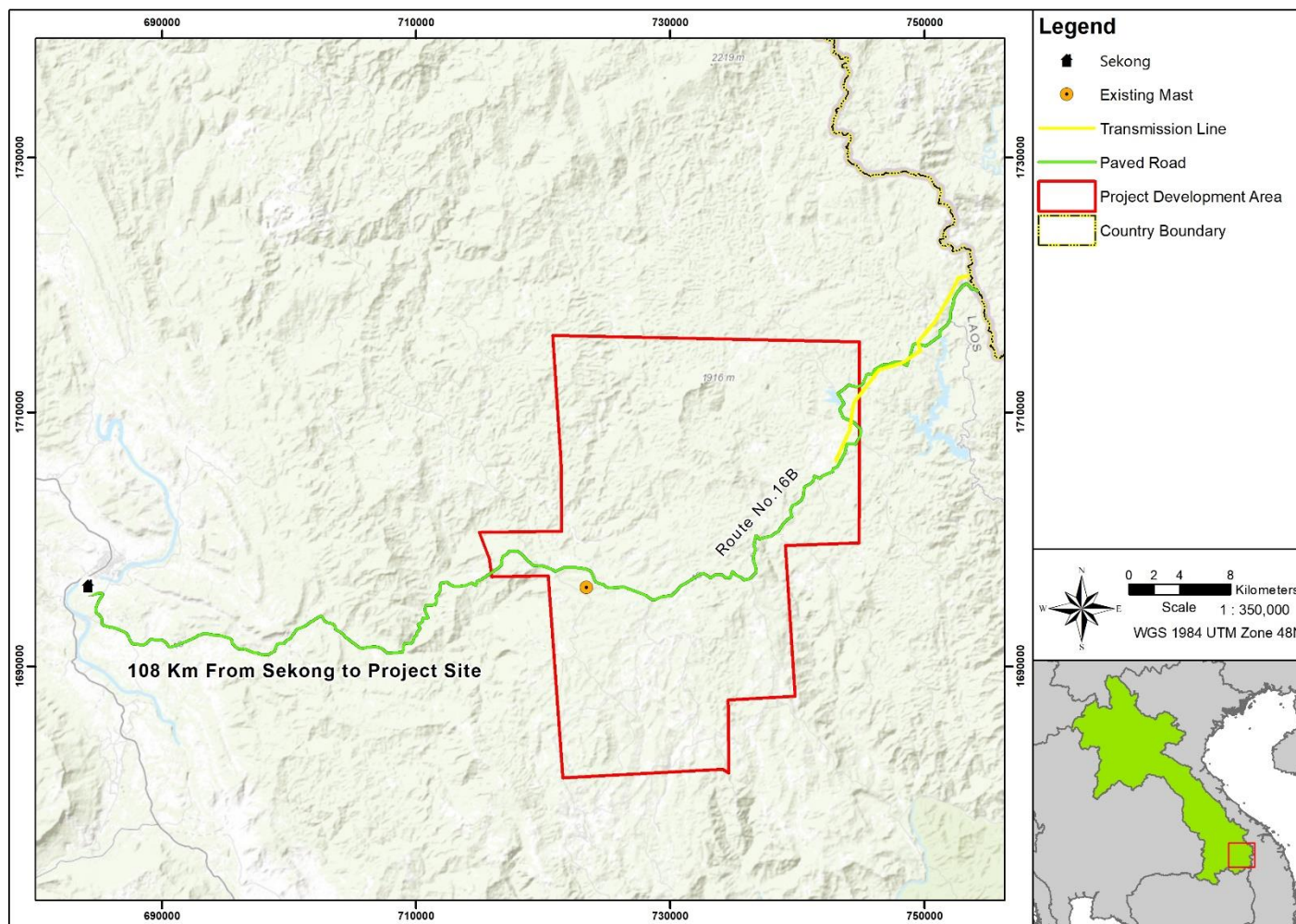


Figure 4.6: Transportation Route to the Project Area

Source: MWPCL, 2020 (modified by ERM)

4.6 Project Accessibility

4.6.1 Vehicle Access

The Project is accessible via Chong Mek Border via road No. 16W, 16E and 16 to Sekong Province and road No.16 B from the municipality of Sekong Province to Dak Cheung District with a total distance of 108 km which passes to the project area. It is an asphalted road and most of the villages in the project area are situated along this road. Another access is via the road from the municipality of Sanxay District to Dak Cheung District, which passes to the project area at Ban Dak Yoin of Dak Cheung District with a distance of about 100 km. It is unpaved road which passes across high mountain area of Sanxay District and may be travelled during both seasons, but there is difficulty in some places in the rainy season.

4.6.2 Airport Access

There is no airport in Sekong Province and transport in this area is mainly on land transport. However, the Government and Attapeu Province have constructed a new large airport at Ban Had Xanh and Ban Kaeng Nhai of Xaysettha District, Attapeu Province, which is the airport located nearest to the project area. The location of this airport is about 150 km from the Project area and is accessible via passing through Sanxay District of Attapeu Province to Dak Cheung District of Sekong Province to the project area at Ban Dak Yoin. The airport is no longer considered a commercial airport as it has been handed over to the Lao People's Liberation Air Force. The airport was officially shut down in 2017 because passenger numbers were low and flights were infrequent.

4.6.3 Railroad and Waterway Access

The Project is not near any railroads and the Project area is mostly hill and high mountain areas with no large rivers suitable for use as a commercial waterway. Therefore, neither of these methods can provide construction access to the Project site.

4.7 Waste Management

Solid Waste Disposal Additionally, the locations of disposal sites will be identified in consultation with communities and will avoid close proximity of sacred sites and water resources of local communities. This will be assessed in the Waste Management Plan (WMP) and the WMP will be prepared to set out responsibilities and the management practices associated with the management of waste during construction and operation phase of the Project. The management of waste generated by the project will ensure no off-site impacts that exceed international standards of international best practice. It is recommended that MWPCCL conduct a waste facility audit prior to construction. Waste facility management will be in the following.

- Firstly, to establish on the Project site a temporary storage area for solid waste as the holding area pending regular collection (at least weekly) for transfer to the permanent solid waste management facility, and try to recycle solid waste to reduce the amount of solid waste.
- Secondly, to separate and classify solid waste on site in order to make the treatment easier.
- In the event that the permanent solid waste management facility is not in place and fully operational prior to the commencement of the generation of waste, a temporary facility will be established for the accumulated waste to be stored in a manner that it does not negatively impact the environment
- Finally, in accordance with the Project E&S requirements and the CA, solid waste will be treated in a dedicated solid waste management facility, the location of which will be agreed with the district administration.

From the EIA, 2020, the estimated waste generation rate of 0.8 kilogram/worker/day. For a maximum of 1,400 construction workers, the total volume of municipal wastes is estimated to 1,120 kilograms/day and is composed of food wastes, plastic bags and paper scraps.

The hazardous waste will be stored in temporary storage area and disposed according to the requirement of the local regulations, CA and ADB SPS requirements. Locations for temporary facilities are not yet finalized at this stage but the locations will be compliant with local regulations, and ADB SPS requirements and have no E&S legacy issues.

The hazardous waste from the construction phase will be properly contained, collected and disposed of in compliance with applicable regulations and rules. No hazardous waste will be disposed of unlicensed hazardous waste disposal sites.

For spoil generated by the Project, there is a potential presence of POPs from the use of Agent Orange during the war in the Project area, the Project proposes to assess the risk of the potential presence of POPs (including PCBs, dibenzofurans, and dioxins), through conducting pre- construction soil sampling. If identified, the spoil will be treated as hazardous waste and will need to be managed and disposed of according to country requirements. For more details can be found in Spoil Management Plan

During the operation phase, there is no waste generation from the production process. There will be some waste from maintenance works generated such as waste oil, lubricant etc. This type of waste will be collected and disposed of in compliance with applicable regulations and rules as mentioned above. Waste generation will be from the consumption of employee. The solid waste generation will include food wastes, scrap papers and plastics that will be sent to the authorized agencies for further disposal. Papers, water bottles, glasses, metal and plastics will be recycled. The hazardous material will include diesel oil, paint, etc.

The actual amounts of waste to be generated by the Project are currently not available. As such, a Waste Management Plan for construction and operation will be developed required including the estimated types, volumes, and transportation and disposal/treatment. For more details can be found in the Waste Management Plan.

4.7.1 Wastewater

Wastewater will be generated from the toilet, ablutions, kitchens, concrete batching plants and concrete truck wash down. The project requires the contractor to provide mobile toilet tanks with sufficient storage tanks for use by workers. Detail of wastewater treatment and disposal process will be provided in relevant ESMF and subsequent MP that will be developed by EPC.

During the construction, the estimated number of construction workers is estimated to be maximum of 1,400 persons. Wastewater is mainly generated from the toilet used by construction workers that is equivalent to about 80% of the volume of consumption water or about 800 m³/day. The project requires the contractor to provide mobile toilet tanks with sufficient storage tanks for use by workers.

The estimated water use for batching plant is approximately 30 m³/hr for 3 batching plants that will be sourced either nearby surface water (e.g. rivers and lakes) or groundwater or outside resources. Water source obtaining and wastewater management from batching plant will meet the local requirements. In addition, the location of batching plants and design will consider the availability of water use. A water use/sourcing plan will be developed.

During operation of the WTGs, wastewater is mainly generated from the consumption of the employees. With estimated 53 employees during the project operation period, the volume of wastewater from consumption, washing and other activities is approximately 1 cubic meter/day (as per the EIA, 2020). The waste water will be treated initially by waste water treatment tank before using the service of the septic service company for disposal.

4.8 Safety

There is the potential for unplanned events to occur during the construction, operation or decommissioning phase of the project. The project will implement a good safety practice including Unexploded Ordnance, potential organic pollutants, safety inspection, fire prevention and emergency plan that can be described in the following.

4.8.1 Unexploded Ordnance

Risks of presence of Unexploded Ordnances (UXOs) should also be considered. UXO Clearance will be conducted after notice to proceed, it will be part of pre-site clearing activities. Based on its safety feature, UXO clearance will be the priority work and is the first activity to be undertaken in site preparation and that no other works can be implemented at a site until an UXO clearance certificate is issued for that specific area.

The UXO clearance is being undertaken by Sub-contractor namely “Silavan” (Lao company) and the UXO clearance certificate is approved by Ministry of Labour and Social Welfares and stamped by National Regulatory Authority.

The subcontractor will prepare procedures of the UXO Clearance Plan and conduct UXO clearance located on or in any part of the project including (i) surveying for; (ii) detecting; and (iii) where detected, taking appropriate protective action to safe the location that UXOs are detected. The protective action consists of removal and subsequent destruction and / or in situ destruction of the UXOs. For more information of UXO clearance will be found in UXO management plan that will be developed by EPC.

In addition, the project propose mitigation measures for UXO as mention in **Section 9.7 Unplanned Events**.

4.8.2 Persistent Organic Pollutant (POP)

Based on desktop research, during Vietnam War between 1962 and 1971, Agent Orange, a phenoxy-herbicide mixture, was primarily used for the destruction of forests and other foliage to prevent the movement of enemy troops in Vietnam and potentially in the Southern part of Laos²¹. However, the further desktop research found that the US Congress has funded activities for environmental remediation of Agent Orange and other herbicides sprayed over Vietnam, as they assumed responsibility of spraying over Vietnam²².

In addition, other color coded herbicides were also used during that period. A full assessment of the potential impacts of Agent Orange and other herbicides in Laos has not been conducted and there is little information known compared to Vietnam²³.

Based on desktop review, Agent Orange may have been sprayed around the southern part of Laos, which might overlap with the general Project's area. It is noted however, that annual reports issued by the Public Health Office of Dak Chang District from 2013-2021, District does not show signs of health defects of people in the project area suffering from Agent Orange-associated congenital birth defects, disabilities, cancers and other-related illnesses. The diseases that are mostly recorded are flu and respiratory disease, diarrhoea and malnutrition. The reports include detailed sections on the most concerning problems for the local population and established plans to improve the local health care system. No section in the reports is dedicated to Agent Orange related diseases, indicating that

²¹ Dioxin, Dibenzofuran, and Polychlorinated Biphenyl (PCB) Levels in Food from Agent Orange-sprayed and Non-sprayed Areas of Laos,

https://www.researchgate.net/publication/8929128_Dioxin_Dibenzofuran_and_Polychlorinated_Biphenyl_PCB_Levels_in_Food_from_Agent_Orange-sprayed_and_Nonsprayed_Areas_of_Laos

²² Congressional Research Service 2021. U.S. Agent Orange/Dioxin Assistance to Vietnam. Available at <https://sgp.fas.org/crs/row/R44268.pdf>

²³ Laos Agent Orange Survey, <https://agentorangerecord.com/laos-agent-orange-survey/>

it is not perceived as a significant factor by the local population. In addition, the interviewing of local villagers in the project area, during the socio-economic survey, indicated no clear evidence that the people have been potentially exposed to Agent Orange (also referred to as “yellow rain”).

To determine the potential presence of Agent Orange and prevent the potential risks to workers and local communities, pre- construction soil sampling will be conducted at 7 locations. Should the contaminants be found in the soils anticipated to be disturbed by the Project’s activities, mitigation measures are identified to avoid or minimize the potential future risks to human health.

A dedicated Baseline Soil Sampling Plan has been prepared and provides details on sampling plan, relevant standards and mitigation measures and procedures.

4.8.3 Safety Inspection

A safety officer and HSE team will be responsible for ensuring safety inspection during construction and operation, including the supervision of the compliance with safety rules and regulations. The safety officer will report any non-compliances to the construction / operation teams.

Considering HSE management team from EPC side, they plan to use 2-3 Chinese HSE managers/engineers, 3-4 lao HSE engineers, 1-2 other country HSE engineers (Pakistani or Vietnamese). Meanwhile, they also will assign their own HSE management team. If necessary, the HSE affairs will report to the local related government\clients\company head office and other related departments as requested.

4.8.4 Fire Prevention

The project will install fire protection equipment, such as: portable fire extinguishers, at various places in appropriate areas including control building and substation in accordance with the National Fire Protection Association (NFPA) standards and will have measures to inspect the fire protection equipment every three months to ensure they are in good condition and ready to use.

4.8.5 Emergency Plan

The project will have an emergency plan in order to control and address any emergency event and prevent the danger and damage. Depending on the scale of the emergency, this will be handled by the project’s Emergency Response Team or, where necessary, will be escalated to local / regional agencies. Further details will be provided in the Projects Environmental and Social Management Plan (**Chapter 9**).

4.9 Project Activities

Key activities to be conducted over the life of the Project are outlined in the following sections.

4.9.1 Pre-construction Phase

All work will be conducted in accordance with the detailed master construction schedule, provided by the EPC Contractor. Prior to commencement of work, all contractors would be required to provide detailed site specific plans related to:

- Equipment use;
- Excavation and backfilling management;
- Plan drawings of laydown, traffic flow, parking, trash storage, and recycling areas;
- Construction Material Sourcing Plan
- Site Restoration Management Plan;
- Soil Erosion and Sediment Control Management Plan;

- Spoil Management Plan
- Storm water pollution prevention plan;
- Air Quality Management Plan;
- UXO Management Plan
- Community Health and Safety Management Plan
- Occupational Health and Safety Management Plan
- Traffic Management Plan
- Worker's Camp Management Plan
- Local Content and Influx Management Plan
- Emergency Preparedness and Response Plan.

It is assumed that as a part of the mobilisation phase, the Project site including laydown areas, etc. will be fenced and a construction worker camp(s) will be located inside the Project boundary.

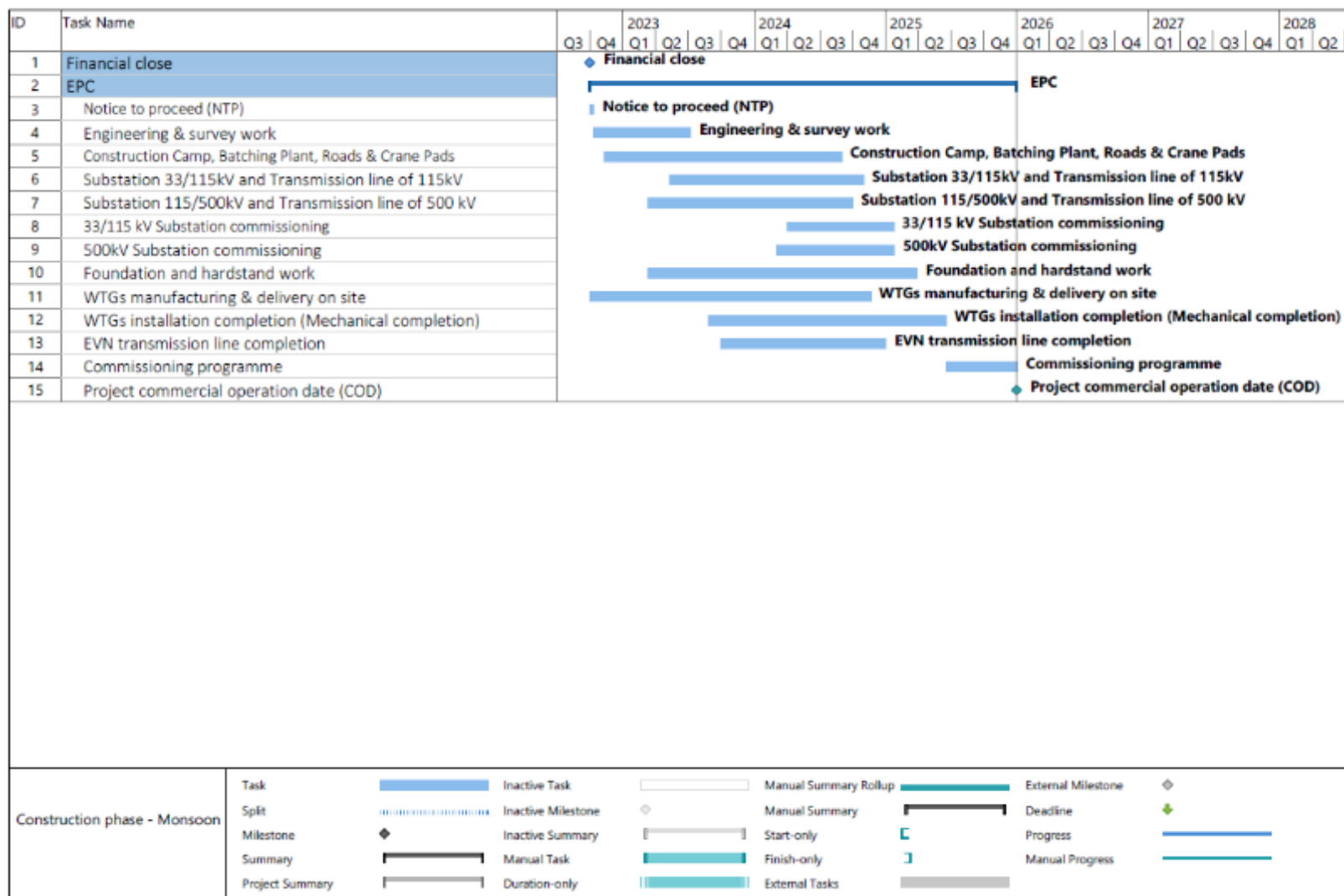
4.9.1.1 Construction Schedule

The Project's construction phase is expected to take approximately 30 months, with the wind turbines expected to take approximately 14 months, and the sub-station and transmission line are expected to take 17 months. COD is expected to be in December 2025.

The EPC Contractor will prepare the site for construction, erection, and installation of the Project facilities, which will include earthwork activities, such as site clearing and soil excavation. The construction, design, and testing will be undertaken in accordance with the appropriate construction standards and the Laos' Decision on National Environmental Standards (No. 81/GOV, 2017).

The project schedule is shown in **Figure 4.7**.

Figure 4.7: Project Schedule



4.9.1.2 Earthworks

Earth works will include clearing of vegetation and grading of Wind Turbine, Sub-station, and Transmission Line locations. It is anticipated that the subsoil, which will be stripped and removed, shall be utilised for levelling/ backfilling, it is also anticipated that the amount of soil due to excavation activities that will be excavated is 350,000 m³ and then backfilled is 150,000 m³, and therefore the remaining soil is approximately 200,000 m³ will be managed by transporting to spoil area. The spoil generated will be located close to the WTGs. At the time of writing this Report, this location was not confirmed. The potential risk from POPs is discussed in **Section 4.8.2** and in the Baseline Soil Sampling Plan that is being developed and has not finalized yet. Once finalized the Baseline Soil Sampling Plan, the soil sampling will be conducted prior to commencement of the ground disturbing activities.

Grading of the site will be conducted by the design team, considering sufficient height to protect the Project from potential flood damage. Such elevation will be studied further as part of the detailed design stage in order to confirm that the site elevation does not pose a flood threat to the surrounding areas. In addition, the Project will construct an appropriate slope protection and suitable drainage system specifically in areas of high potential soil erosion. Earthworks, digging and removal of stockpiling of soil at the sides of the stream or canal will be avoided in order to prevent sedimentation and erosion into the water sources.

4.9.1.3 Wind Turbine Construction

Once the construction of internal access roads have been completed to an extent that allow for access to the turbine location, construction of crane hardstand areas and turbine foundations will commence. The crane hardstand area should be used for main crane assembly and wind turbine erection. There will also be a crane and equipment lay down area at each of the turbine location. Lifting equipment will required for the turbine erection transported to the site via the access roads.

The wind turbines components will be assembled as follows:

- The tower will be dissembled and brought for assembling on the foundation by using cranes;
- The wind turbine body consist of electricity generation equipment, such as: generator which shall be assemble on the ground before lifting to install on the top of the tower by large crane;
- The blades and rotor hub will be lifted by large crane and installed on tower and nacelle. During the construction, the ground base to hold the crane must be prepared to withstand the weight of the crane.
- Other parts of the wind turbine will be assembled including the installation of electricity cable system and signal cables.
- Underground cables will connect the wind turbines to the substations which would be constructed within the Windfarm Site. It is expected that the underground cables will follow the internal road alignment and finally be connected to the substation.

4.9.1.4 Transmission Line Construction

For the construction of the transmission lines, the following will be conducted:

- Survey of transmission line route and locations of high-voltage power towers by selecting the points which are easily accessible and have minimum impact;
- After completing the survey, conduct the examination and boundary markings of the transmission line location;
- Test and analysis of the soil characteristics;
- Clearance of access road to the power transmission tower foundations;
- Cutting or clearance of the area of the transmission line route with a RoW of 70 m (35 m in each side the centre line) of the transmission route and land clearing and levelling;

- Tower foundation work that requires excavation of soil for making the reinforced concrete base;
- Erection of high-voltage power transmission towers;
- Installation and stringing of high-voltage electrical conductors;
- Final examination and inspection; and
- Test and hand-over to the project owner.

4.9.1.5 Project Site Road Upgrades

Access roads will be created within the development area and to the Highway for the Project. The road to the highway will be paved. The road will pass through the locations of 133 turbines to enable the construction and installation of the turbines. After completing the construction and installation of the turbines, the road will be renovated for using as access road for turbine inspection and maintenance.

4.9.1.6 Construction Traffic

The following vehicular frequency is expected during the construction phase:

- Transportation of construction materials and workers with a maximum frequency of 15 times/day via highway no.16 and Project's access road; and
- Transportation of components and machinery for installation of wind turbine generators consisting rotor blade, nacelle, and tower through a trailer truck with a maximum frequency 10 times / per one wind turbine (50 times/day) via highway no.16 and Project's access road.
- Transportation of concrete truck with frequency of approximately 100 times/day which will be used for foundation pouring.
- During construction, there are excavators, loaders, graders and compactors, which will be used in the road construction. Trailer trucks and different kind of cranes (approximately 15 times/day) will be used for erection and transportation work.

A schedule of the expected evolution of transport frequencies to assist identifying potential traffic issues will be developed in details within the Traffic Management Plan.

4.9.1.7 Construction Phase Workforce

The overall anticipated workforce during construction is shown in **Table 4.9**. The workforce for the wind turbine, sub-station, and transmission line is shown in **Table 4.10**.

Table 4.9: Anticipated Workforce during Construction

Workforce Origin	Average No. of Skilled Workers	Average No. of Semi-Skilled Workers	Average No. of Unskilled Workers	Total Average Workforce (per day)	Total Peak Workforce (per day)
Local Workforce	300	230	270	420	762
Migrant Workforce	200	70	30	280	515
Total	677	300	300	700	1,277

Note The number of workforce employed by MWPCCL is not included

Source: Annex II CA Annex W Labour Employment Requirement, October 2022.

Table 4.10: Anticipated Construction Workforce for each Project Facility

Project Facility	Local Workforce	Migrant Workforce	Total
Wind Turbine	60	40	100
Sub-station	600	400	1,000 ^{1/}
Transmission Line	180	120	300

Note: ^{1/} 1,000 workers will be required for all 5 substations

Source: MWPC, 2021.

4.9.1.8 Power Supply

During construction phase, power requirement will be sourced from Lao grid (EDL) and/or diesel generators as backup. The estimated electricity consumption during construction is 4,000 MWh/year used for site office, camp, batching plant, crush rock plant etc.

4.9.1.9 Water Supply

During the construction phase, water will be required for construction activity, such as during civil work, dust suppression, domestic use, etc., which will be sourced either nearby surface water (e.g. rivers and lakes) or groundwater or outside resources. The Project should prepare and implement a Water Use Plan. This plan must be communicated and agreed with the local people and with the District and Provincial Authorities. The estimated total water consumption during construction is 1,000 m³/day or 30,000 m³/month. The potential impact from water resource use is considered in **Section 9.3.6**.

For groundwater, the EPC contractor will have to manage it in order to not cause environmental concerns. The main water resource shall come from the surface of the ground and then seized properly using the pump system and water collection system. However, at this stage, the location of water resource has not been designated.

4.9.2 Operation, and Maintenance Phase

4.9.2.1 Project Operations

After the completion of the installation of wind turbines and the arrangement for the commencement of the production of electricity, there will be the officer to control, supervise, and maintain the wind turbine system in accordance with the agreement made with the manufacturer of the turbine. The frequency of the maintenance of 1 turbine generating electricity is approximately 2 times per year in order to verify the integrity of the hydraulic system, lubricants system, transformer blade including changing lubricating oil once a year.

Maintenance and cleaning work will also be required annually along the RoW area of the transmission line route. The project will maintain strict cleanliness of the area, commercial/residential buildings or villages cannot be built in this area for safety reasons. People cannot use the land above the underground cable because of the concrete structure. However, the project will not be restricting access, people can access the internal road.

4.9.2.2 Site Restoration

The portion of land subject to vegetation clearance and earthwork for the establishment of temporary facilities will be restored upon completion of the construction activities. The area subject to such activity will be quantified through assessment of Project's technical drawings and pre-clearance survey. A first estimate of this area is equal to 61.2 ha (Table 9.45) and presented in the Site Restoration Management Plan and a detailed calculation will be finalized upon completion of the pre-clearance survey. The aim of the restoration process is to restore the landscape to its original conditions as close as possible after the construction and installation of the Project components and ancillary facilities are completed. More

details on site restoration are discussed in the Site Restoration Management Plan. The outline of the ESMP can be found in **Section 10.7**.

4.9.2.3 Operation Phase Workforce

The total Project workforce employed during operation is estimated to be approximately 80 workers for operational, maintenance and administrative activities. The migrant workforce will be approximately 16 persons and the remaining will be local workforce. It is noted that this workforce figure is not inclusive of the workforce employed by MWPC. ²⁴

4.9.2.4 Power Supply

During operation phase, power requirements will be sourced from either electricity generated from the Project, or from Lao grid (EDL) or diesel generator as a backup. Electricity consumption during operation is 150 MWh/year or 400 kWh/day used for only O&M accommodation and warehouse.

4.9.2.5 Water Supply

During the operation phase, water will be required for domestic use and drinking water for operational workforce at the project site. Water will be sourced either nearby surface water (e.g. rivers and lakes) or groundwater or outside resources. The Project will obtain all necessary permits to utilize these water sources (if applicable). The estimated total water consumption during operation is 20 m³/day that will be 10 m³/day for domestic use and drinking water and 10 m³/day for the plants.

For groundwater, the EPC contractor will have to manage it in order to not cause environmental concerns. The main water resource shall come from the surface of the ground and then be properly used using the pump system and water collection system. However, at this stage, the location of water resource has not been designated.

4.9.2.6 Operational Traffic

During the operation phase, transportation of materials will not be required and the road usage will be limited to vehicular movement for 25 employees.

4.9.3 Decommissioning Phase

The draft Concession Agreement (CA) states that the Project is responsible for the feasibility and cost of all works required in connection with the rehabilitation and decommissioning of the Project Facilities at the end of the Concession Period (4.7 (t) (ii) and more detailed conditions in 21.7 Rehabilitation and Decommissioning.

The concession period of the Project is 25 years. No information is currently available on the decommissioning of the Project. At the time of writing the ESIA, the Annex H2 'Rehabilitation Works and Decommissioning Activities' of the CA is preparing. After the end of the concession period, Annex H2 states that detailed plans and procedures, including waste management, will have to be agreed with GOL two years prior to end of concession. It is noted that decommissioning will need to be conducted under the prevailing laws and standards of Lao at the time of decommissioning activities including a detailed impact assessment and decommissioning plan (repowering option, dismantling option) that should be developed prior to decommissioning.

²⁴ Annex II CA Annex W Labour Employment Requirement, October 2022

5 PROJECT ALTERNATIVES AND ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

5.1 Introduction

This section provides an overview of the project alternatives considered for the project including alternative power generation, site selection, technology and locations. This data was provided by MWPCCL.

5.2 No Project Alternative

The 'no project alternative' considers the consequences in case a decision not to proceed with the Project is made. In this scenario, the possible positive and negative impacts of the proposed activities on the receiving environment and social receptors would not occur.

Specific benefits of the no project alternative are considered to be the following:

- The constructing of the Project, including the construction of the batching plant, transmission lines and internal roads will have the adverse impacts on the environment e.g., dust emission, contamination of soil and surface water, and to biodiversity habitats e.g., permanent and temporary loss of habitats;
- The possible social disruption and health impacts arising from the construction and operational activities; e.g., impacts to health and safety of community, unplanned events, loss of land and structure, loss of ecosystem services which they depend on, and change of landscape, would be avoided;
- The land at the proposed sites would be unaltered and remain available for alternative use.

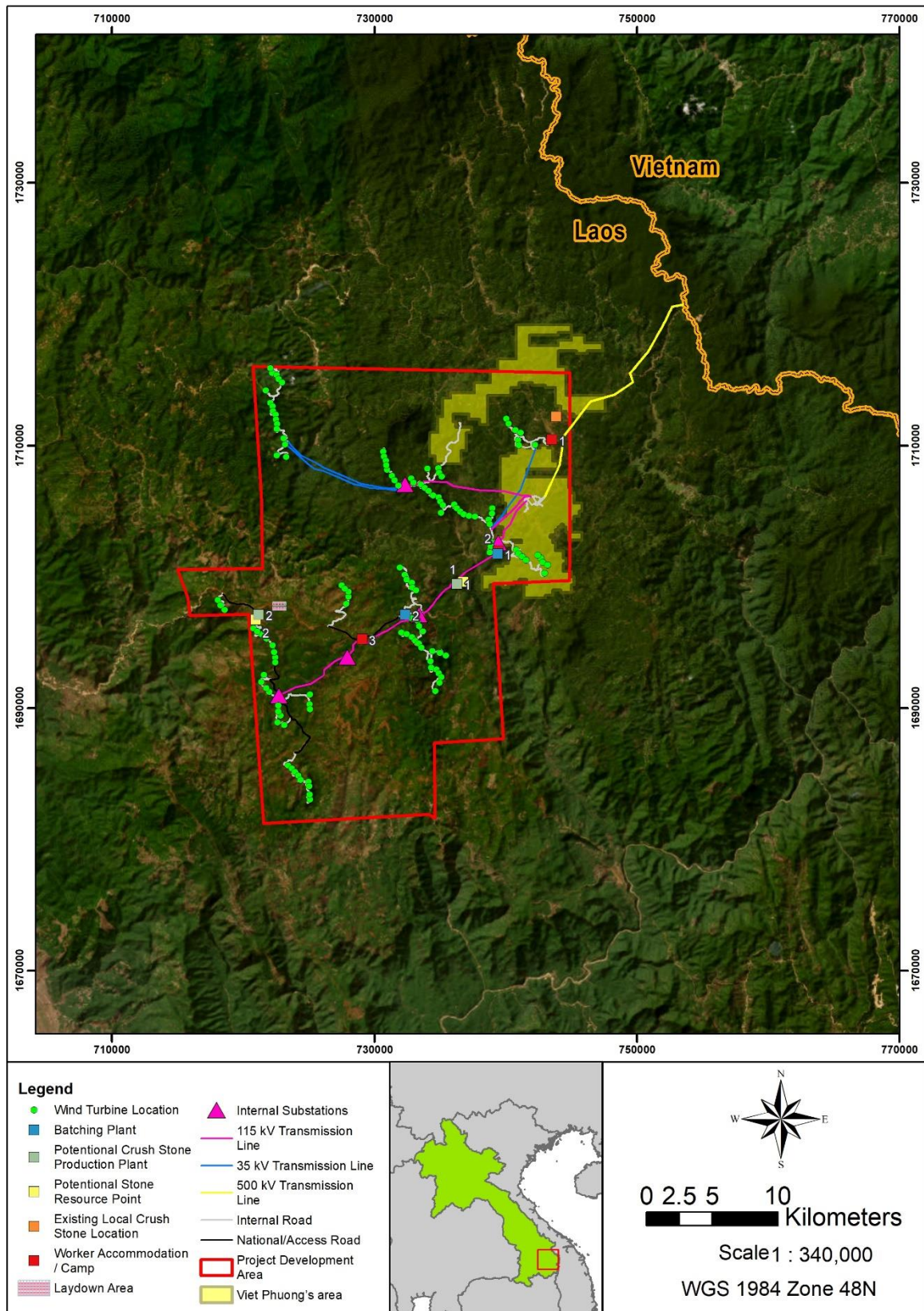
In case that the Project is not developed (No Project Scenario) there will be no impacts to villages within the Project boundary e.g. loss of land and structure, loss of ecosystem services which they depend on, change of landscape, etc.

Conversely, the disadvantages of the no project alternative are as follows:

It is noted that the Project area is located in a known potential mining area (as shown in **Figure 5.1**). However, all potential mining areas with the exception of Viet Phuong are in early stages of development and have not exceeded the MoU phase (pre-existing MOUs). There are no other pre-existing Concession Agreements in the area other than Viet Phuong. MWPCCL is working on the land lease agreement (Annex D1 of our Concession Agreement) which will grant the exclusive land use rights.

- Should the project not be developed, the Project Area could be used for mining which would have larger environmental and social impacts to the surrounding communities and environment. However, it should be noted that the development of the Project does not restrict the possibility of mining concessions in the neighboring areas outside of the Project Area.
- Development of local socio-economics and its positive benefits would not be realized e.g. increase in employment rate, and increased access to electricity, improved roads, improved facilities such as schools, healthcare facilities, clean water system and potential increase in tourism in the area due to wind farm development which is a novel development in Lao PDR.
- Not developing this Project may result in the need to establish alternative plants using other energy and fuel sources e.g., hydroelectric, gas-fired, or coal-fired. These alternatives would have greater adverse impacts from increased greenhouse gas emissions during operation phase of the Project.

Figure 5.1: Potential Mining Areas



5.3 Alternative Site Location

The wind direction and speed are taken into account as key factors in considering wind energy potential in the area. The Wind Energy Resource Atlas of Southeast Asia conducted by the World Bank (World Bank, 2001), outlines the wind energy potential in the project location areas and the study areas (located in Dak Cheung District of Sekong province and Sanxay District of Attapeu Province).

Three met masts were installed in 2012 in Sekong, Savannakhet and Khammouane Provinces to explore sites with a suitable wind speed.

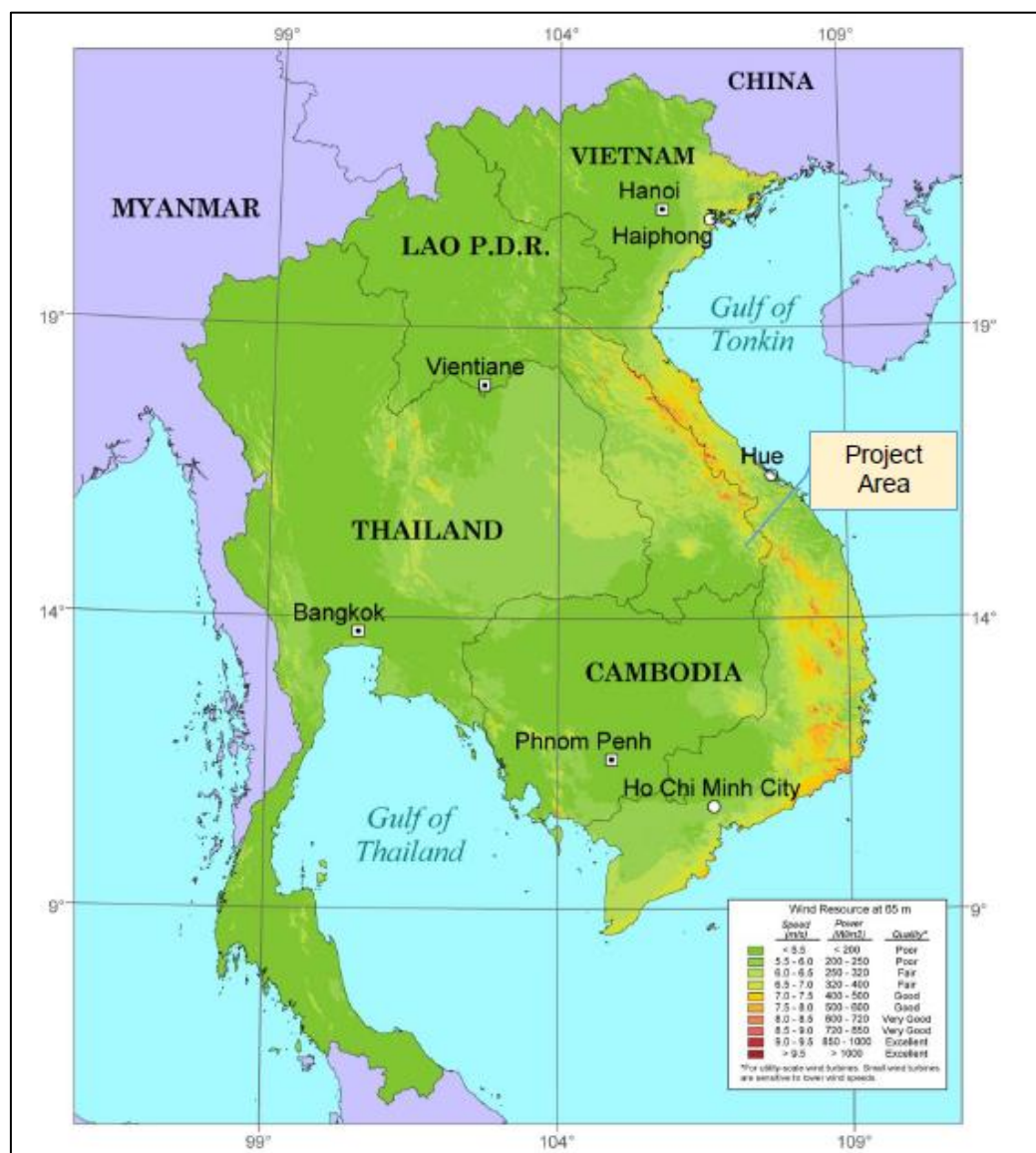
Dak Cheung District showed the highest wind resource potential as result of a 12-months monitoring of wind speed in 2013.

The recorded average wind speed of about 7.5 m/s is deemed sufficient to generate a profitable energy yield (**Figure 5.2**). The initial site assessment took into consideration various technical criteria, including topography, accessibility and grid availability to further narrow down the development area. Progressively, other constraints helped the drawing of the wind farm layout including: proximity to transmission lines; proximity to villages; proximity to existing roads; land use and vegetation coverage; site capacity as indicated by the area of land available; proximity to aircraft facilities; and terrain complexity. The process was based on a scoring system that aimed at providing a comprehensive evaluation of the potential development sites. Following the initial wind assessment, the project has conducted a more detailed study of wind energy potential by installing the wind measuring mast at 5 stations within the project site from July 2012 - present time. These wind measuring masts have a height of 140 meters and the record of data is using the equipment SecondWind Nomad², WindSensor P2546A and Vector w200P. The result of long term average wind speed at 110 m hub height is 6.47 m/s.

The ESIA study is helping MWPCCL to inform the the micro-siting process of the Project's facilities.

A detailed description of the site selection process is provided in the following section.

Figure 5.2: Annual Average Wind Energy Potential Countrywide with an Altitude of 65 meters



Source: World Bank, 2001

5.3.1 Detailed Description of Initial Site Selection

MWPCL commissioned an assessment of wind resources in Lao People's Democratic Republic (PDR) based on mesoscale and microscale wind speed modelling to support the evaluation and selection of a potential wind farm site with a desired capacity of between approximately 100 to 300 megawatts (MW) (Hassan 2011).

The assessment initially evaluated the wind resources across Lao PDR, which was based on using Mesoscale Compressible Community (MC2) computational model developed by Environment Canada at a meso-scale and then the Anemoscope MS-Micro models at the micro-scale. **Figure 5.3** shows the result of the assessment of the Lao wind resources, which indicate the best wind resources are located in the highlands in the southeast portion of Laos near the border with Vietnam.

The assessment also took into consideration various technical criteria, including:

- Proximity to transmission lines;

- Proximity to population centers;
- Potential site access based on proximity to existing roads;
- Land use and vegetation coverage;
- Site capacity as indicated by area of land available;
- Proximity to aircraft facilities; and
- Terrain complexity.

The criteria were focused on identifying suitable sites with sufficient wind resources that were in close proximity to desirable areas (e.g., near transmission lines) and away from undesirable areas (e.g., near towns or airports). Although physical, biological, and social criteria were not explicitly included, the initial siting did indirectly consider these features by giving lower scores to areas with slopes greater than 15 degrees, heavily vegetated areas, and population centers, respectively. **Figure 5.4** shows the results of the assessment integrating the prediction of wind resources with the site selection criteria, which indicates that the most highly rated areas are in the southeast portions of Laos.

Figure 5.3: Lao PDR Modelled Wind Speed Map

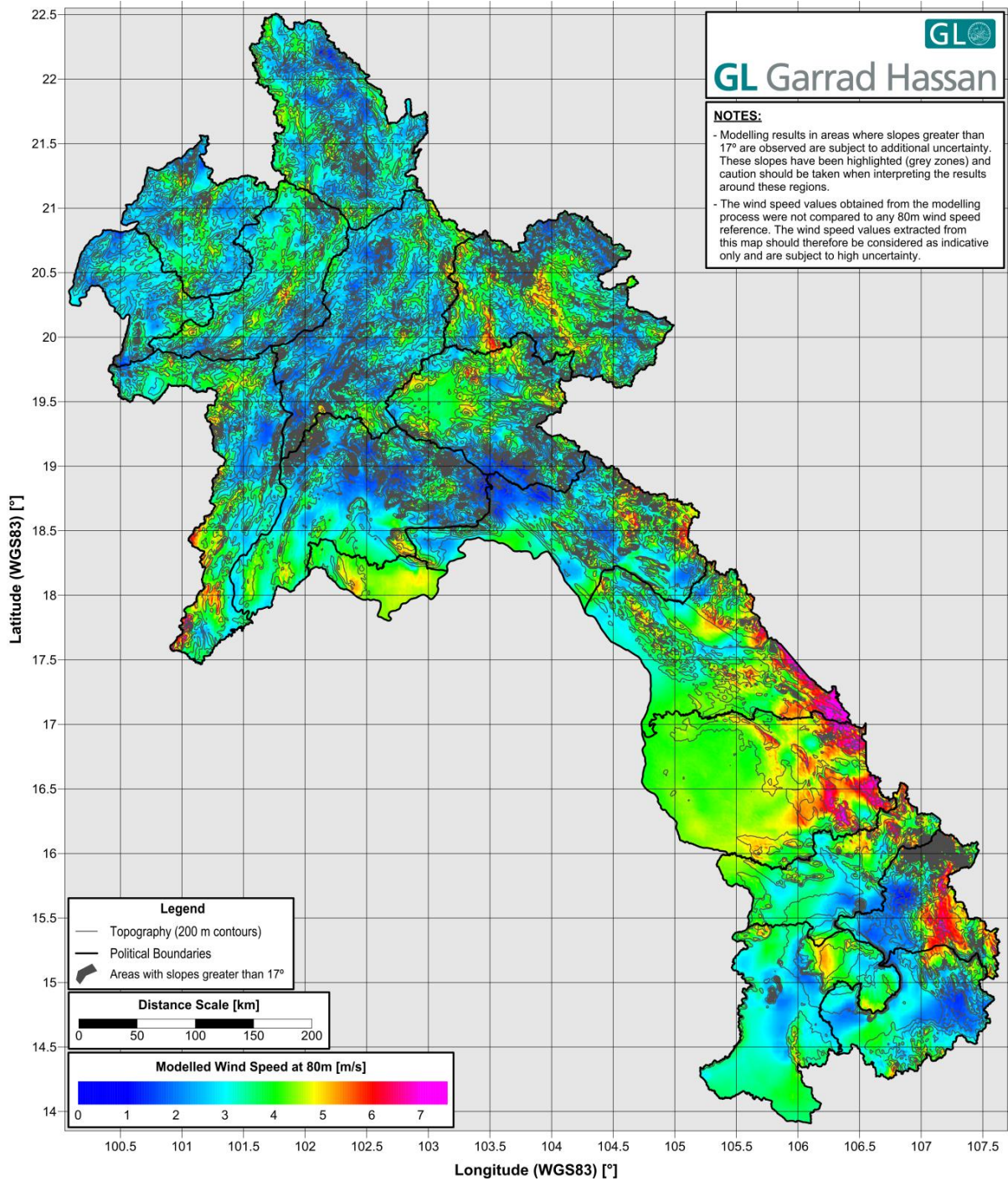
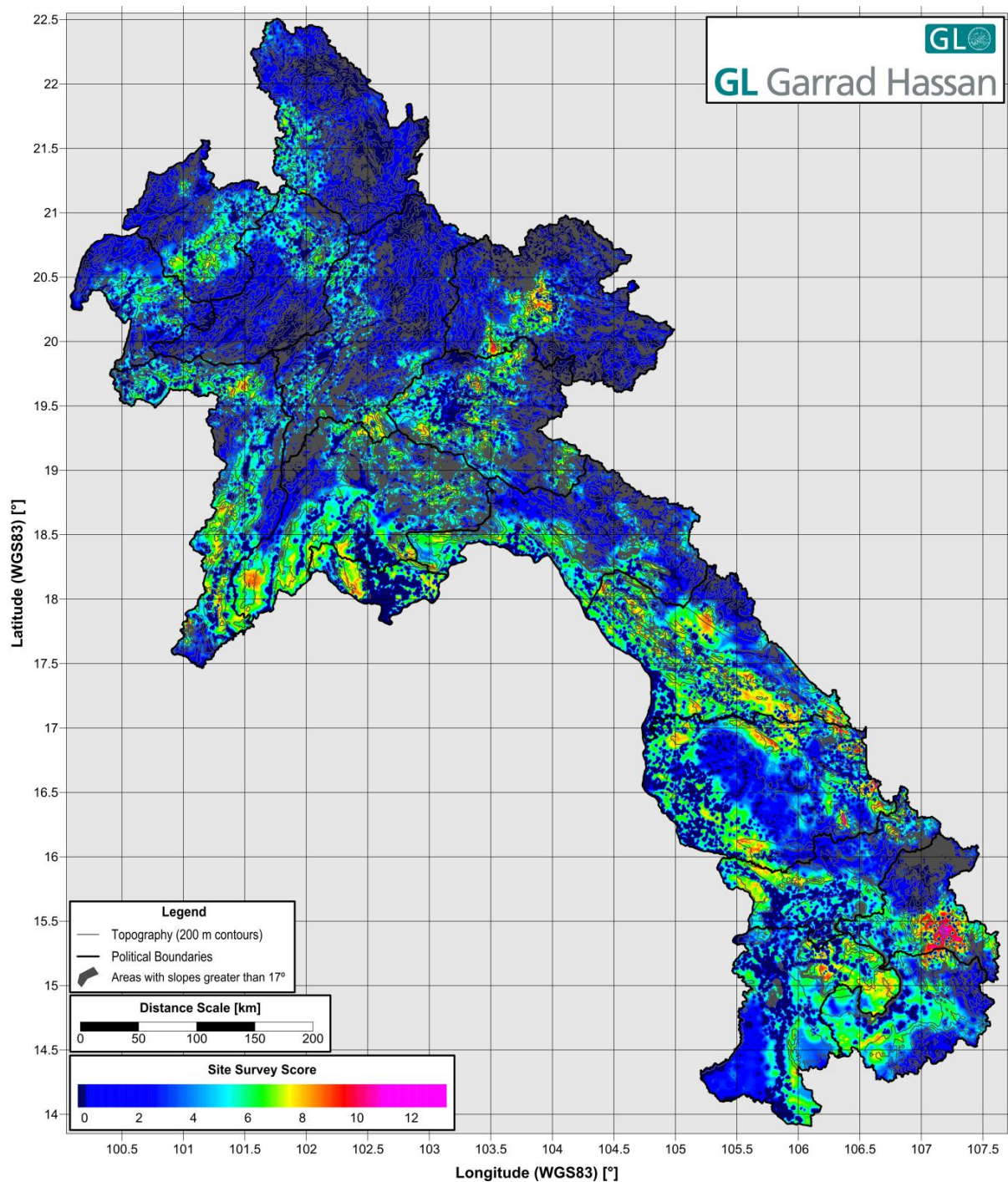


Figure 5.4: Lao PDR Site Scoring Map



The site selection process identified the seven highest rated sites (i.e. L1 to L7, see **Figure 5.5**). Although these were the highest rated sites, that does not mean that all of these sites were financially viable. There were other sites identified with high wind resources (see **Figure 5.3**), especially along the Vietnam border in Khammouane, Savannakhet, and Salvan provinces, but these areas did not rate high because of the extent of vegetative cover (e.g., presence of protected areas, KBAs – see **Figure 5.6**), and their proximity (or lack thereof) to existing roads and grid connection availability.

Figure 5.5: Suitable Windfarm Site Locations

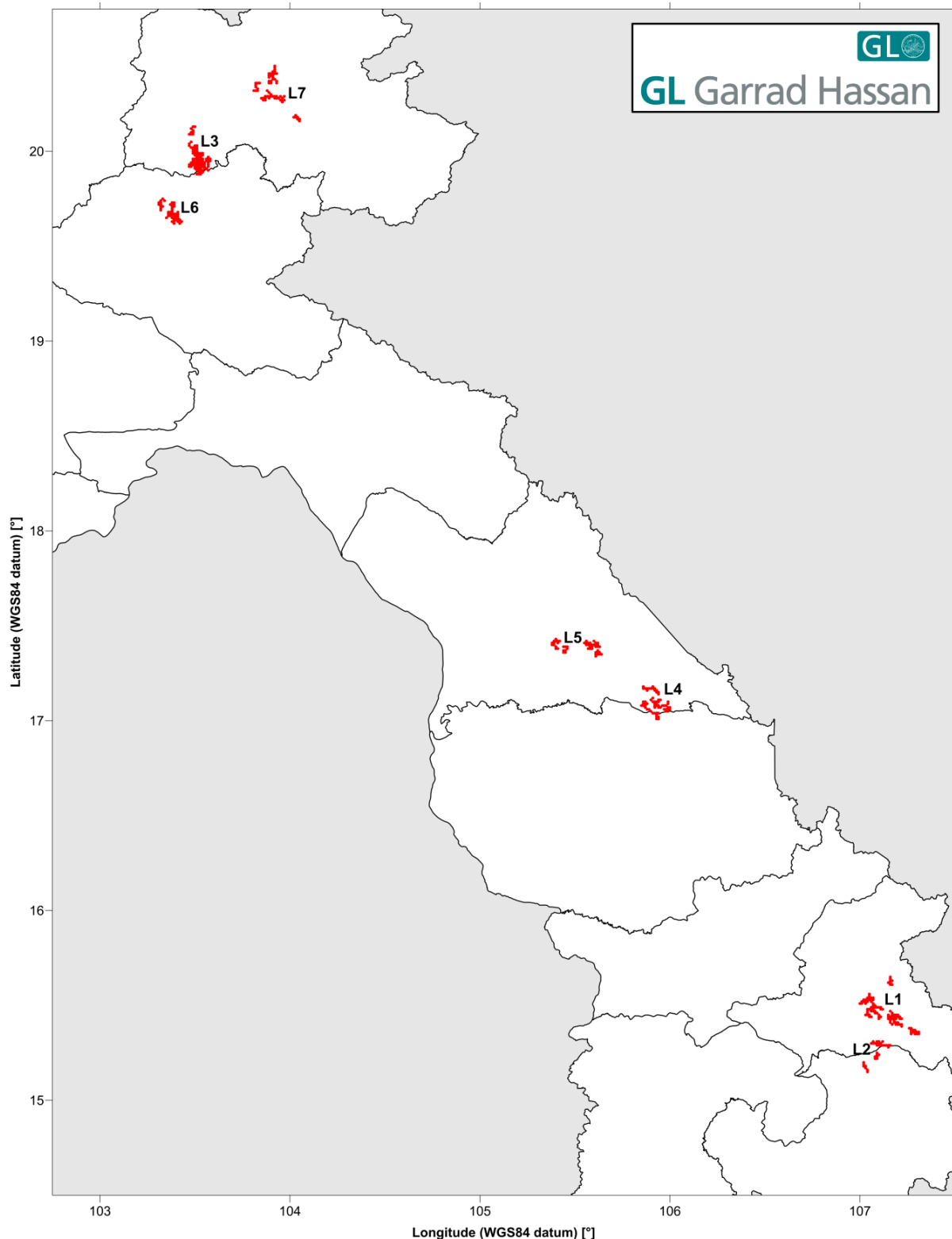
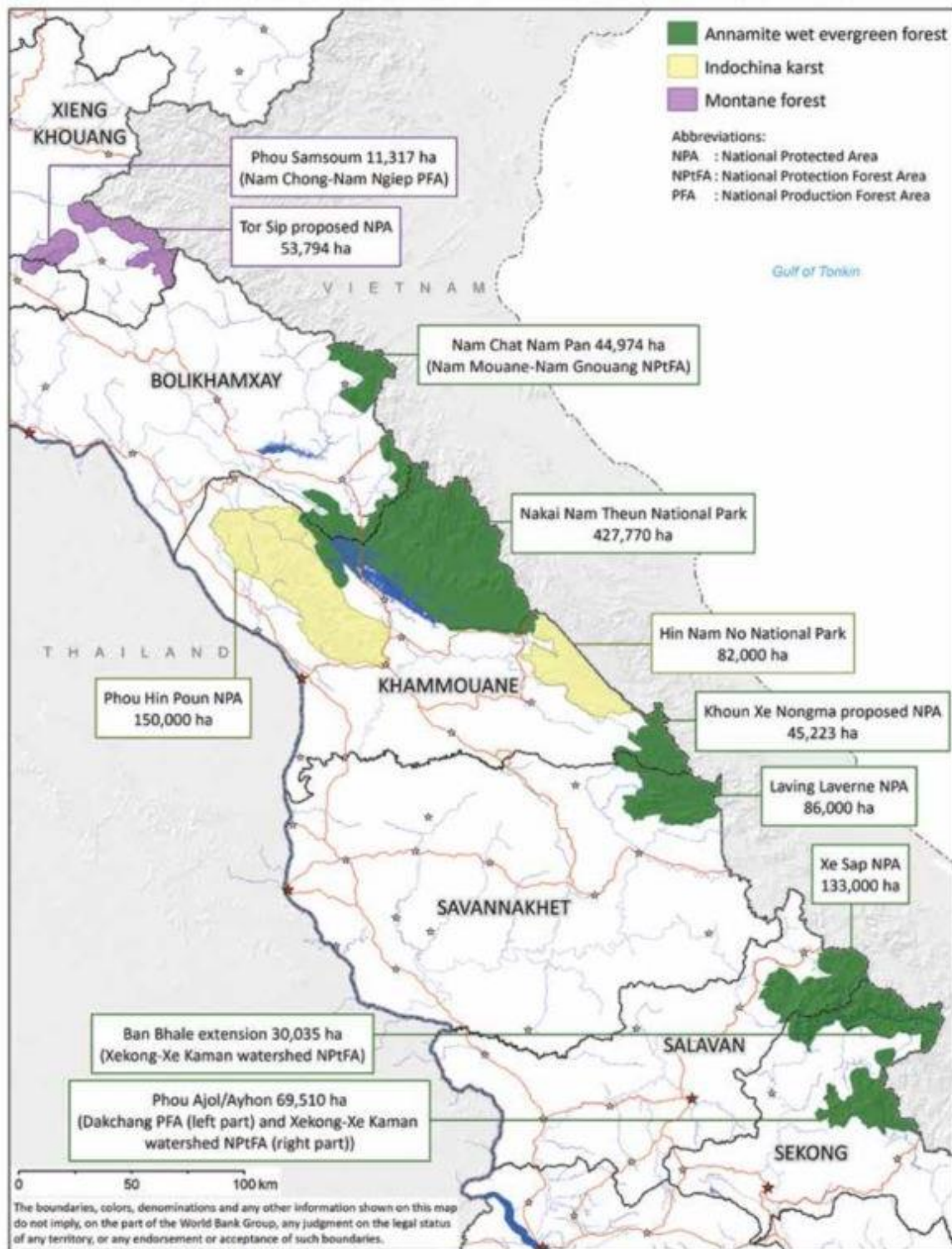


Figure 5.6: Priority Biodiversity Areas in Lao PDR



Source: Chanthavone Phomphakdy

As **Table 5.1** indicates, there is a wide variation (up to 35%) in the predicted wind resources (i.e. wind speed) across the seven highest rated sites, with Dak Cheung (L1) having the highest wind speed, and with Sites L4, L5, L6, and L7 having significantly lower scores.

Table 5.1: List of Potential Sites Identified through the Siting Criteria Process

Site #	L1	L2	L3	L4	L5	L6	L7
Name	Dakcheung	Sanxay	Viengthong	Boulapha	Mahaxay	Pek	Xamneua
Longitude [°]	107.06	107.11	103.525	105.975	105.59	103.39	103.91
Latitude [°]	15.495	15.295	19.965	17.085	17.4	19.675	20.29
Area [km ²]	163.3	52.7	143.5	104.1	82.4	77.4	104.2
Avg Elev [m]	1242	1169	1471	430	418	1710	1504
Avg. Total Score	10.3	9.8	8.3	8.4	8.3	8.2	8.5
Avg. score contribution	Wind Speed	4.5	3.8	3.4	3.1	3	2.9
	Trans. Network	3.7	3.7	3.5	3.8	3.4	3.8
	Road	2.8	2.9	2.2	2.9	2.8	2.4
	Pop. Places	-0.5	-0.5	-0.4	-1.3	-0.8	-0.7
	Aircraft Facilities	0	0	-0.1	0	0	0
	Land Cover	-0.1	-0.1	-0.2	-0.1	0	-0.3
	Slope	0	0	0	0	-0.1	0

In terms of environmental and social considerations, the 7 sites were screened against potential impacts to legally protected areas and key biodiversity areas (KBAs), with a portion of Site L1 within the Phou Ahyon KBA and Dak Cheung Plateau KBA; Site L2 within the Phou Kathong KBA and the Dak Cheung Plateau KBA; and Site L3 within the Phou Sabot and Phoungchong National Protected Area and the Nam Et KBA. Sites L4 – L7 were all near, but not within any protected areas or KBAs. It is also noted that proximity to transmission network, road access, populated places, land cover/vegetation density, and slope all indirectly measure potential physical, biological, and/or social impacts. Sites L3 and L6 had lower scores for road access, indicating a greater potential for additional land disturbance to construct new roads for site access. L4 had a significantly lower score for populated places, suggesting a greater potential for social impacts. Sites L6 and L7 had lower scores for land cover/vegetation density, suggesting the potential for the presence of higher quality and less disturbed habitat. There was little difference in scores among the sites for transmission network and slope.

So taking into consideration the overall total scores, the predicted wind resource, the presence of legally protected areas/KBAs, and the indirect physical, biological, and social criteria, MWPC considered Sites L1 (Dak Cheung), L2 (Sanxay), and L3 (Viengthong) to be the preferred sites that warranted further evaluation. Sites L4 – 7 did not have sufficient wind resources as well as having lower indirect physical, biological, and social criteria scores.

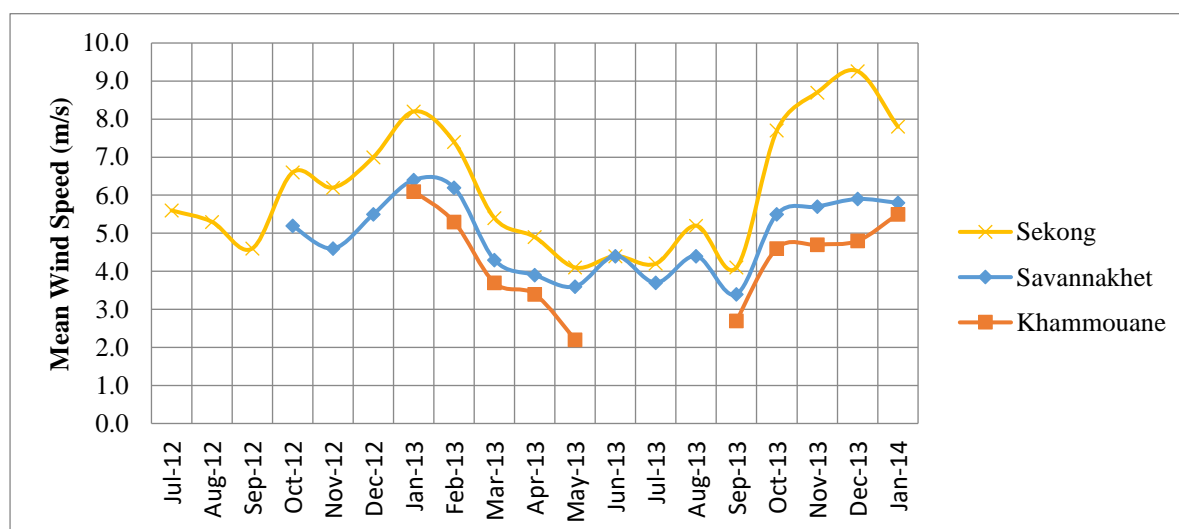
In general, the terrain in northern Laos make the development of large scale wind projects difficult, thus Site L3 was considered less desirable from an implementation perspective. Further, as indicated in the ESIA (Section 1.1), the project's energy generation will be transmitted to Vietnam. The Project has been developed under an exclusive right granted by the GOL through a Memorandum of Understanding (MoU) and Project Development Agreement (PDA) executed in November 2011 and August 2015. This Project is also the first cross-border wind power project to be approved by the GOL and Government of Vietnam (GOV) in accordance with the MoU to supply power from Laos' projects to Vietnam Electricity

(EVN). The Monsoon project area is preferred over Site L3 (Vienthong) as the Monsoon sites are much closer to the preferred cross-border interconnection. Site L3, while not including a KBA, is located in a more remote area and will likely result in more impacts to natural habitat, especially taking into consideration the much longer transmission line that would be required (over 100 km to Vietnam border vs only 22 km for the Monsoon site). For these reasons, Sites L1 and L2 are the preferred alternative sites for the Monsoon Project.

Based at least partially on the initial wind assessment, the Government of Lao granted IEAD (Impact Energy Asia Ltd, or IEA, at that time) an exclusive mandate to study the feasibility of a 600 MW wind farm in three provinces – Sekong (which includes Sites L1 and L2), Khammouane (which includes Sites L4 and L5), and Savannakhet (which did not include any of the seven sites identified in the initial assessment, but does have good wind energy potential).

Based on this mandate, IEA commissioned a pre-Feasibility Study (Pre-FS) for a 600 MW wind farm in these three provinces (*Wind Resource and Energy Analysis*, Hassan, 2014). The Pre-FS installed wind monitoring masts at sites in each of these three provinces, which collected data for 12 – 18 months. The wind monitoring campaign indicated that the Sekong Province site has the highest potential for wind development potential (**Figure 5.7**).

Figure 5.7: Comparison of Wind Trends over Three Potential Sites in Lao



Based on the results of the Pre-FS, IEA proposed two wind farms – one 150 turbine/300 MW farm in Sekong (which was a combination of Sites L1 and L2 from the original wind energy assessment, Hassan 2011) and another 150 turbine/300 MW windfarm in Savannakhet to the Government in early 2014. The wind energy potential in Khammouane was not sufficient to proceed with a windfarm at this time. The Government of Lao, however, only granted permission for development of a windfarm in Sekong Province, which became the Monsoon Windfarm Project.

MWPCL was able to increase the capacity of the Monsoon windfarm in Sekong to 600 MW with 240 turbines, which improved the project's economics. This 600 MW project was the basis for the subsequent Feasibility Study (FS) that was approved by the Government of Laos and included in the first EIA submittal in 2015. As a result of turbine technology improvements, MWPCL was subsequently able to maintain the project's 600 MW capacity, but reduce the number of turbines from 240 to 174 in 2016, to 148 turbines in 2021, and now 133 turbines in 2022. So the current proposed 600 MW capacity project has fewer turbines than the original 300 MW windfarm.

The current proposed gross output is at the minimum required under MWPCL's Power Purchase Agreement (PPA) with EVN and at the threshold for the Internal Rate of Return with lenders, so there is little flexibility to reduce the overall gross output.

As part of the turbine siting optimization process, MWPCCL has been able to avoid the impacts to the Phou Ahyon KBA and the Phou Kathong KBA that were part of the original L1 and L2 windfarm sites, although some turbines remain within the Dak Cheung Plateau KBA.

These reductions in the number of turbines will also have less habitat impacts due to reduced access road and turbine construction. The most recent reduction from 148 (2021) to 133 (2022) turbines primarily eliminated turbines within the Dak Cheung KBA, with 7 of the 15 eliminated turbines being from within the KBA (**Figure 5.8**).

Figure 5.8: Recent Reduction in Turbines within Dak Cheung KBA



5.4 Turbine Locations Alternatives

Two especially sensitive biodiversity areas have been identified – the Dak Cheung Plateau KBA and the ridge supporting the cluster of four turbines WA025 to WA028 (“Ridge”). An analysis was performed by Wind Pioneers that considered relocating the proposed four turbines from the Ridge and the 11 turbines from the Dak Cheung Plateau KBA (WA066-71, 74, 94-96, and 99) to alternative locations outside of the KBA and the Ridge (see **Figure 5.9**).

Figure 5.9: Proposed vs Alternative Turbine Locations



Table 5.2 shows the change in the net output and net capacity for the proposed 15 turbine locations vs the alternative turbine locations analysis.

Table 5.2: Proposed and Alternative Turbine Location Comparison

Turbine Name	Base Elevation		Net Output			Net Capacity Factor	
	Proposed	Alternative	Proposed	Alternative	Difference	Proposed	Alternative
Average	1341	1219	12.58	11.11	-12%	31.81	28.08
Total			188.7	166.6	-12%		
WA0250	1710	1200	16.30	10.91	-33%	41.22	27.59
WA0260	1610	1230	16.01	11.25	-30%	40.47	28.45
WA0270	1600	1230	15.47	10.68	-31%	39.11	27.00
WA0280	1550	1230	14.57	11.02	-24%	36.84	27.87
WA066	1290	1200	11.32	10.32	-9%	28.63	26.08
WA067	1260	1200	10.90	10.51	-4%	27.56	26.57
WA068	1260	1200	11.17	10.39	-7%	28.23	26.28
WA069	1290	1210	11.53	10.76	-7%	29.14	27.21
WA070	1300	1250	12.44	12.17	-2%	31.46	30.77
WA071	1290	1250	12.00	12.00	0%	30.33	30.34
WA074	1160	1210	11.24	11.52	3%	28.41	29.13
WA094	1190	1220	11.76	11.58	-1%	29.72	29.28
WA095	1230	1220	11.86	11.64	-2%	29.99	29.44
WA096	1200	1220	10.96	10.55	-4%	27.71	26.66
WA099	1180	1210	11.18	11.30	1%	28.27	28.56

On average, the new locations resulted in an average reduction in net energy of 12%. This reduction in net energy was then evaluated in the Project's financial model. This reduction in generation would negatively impact both the Project's Equity Internal Rate of Return (IRR) and the Debt to Equity ratio. The Equity IRR is reduced below the acceptable minimum established by the shareholders, making the project un-investable. The Debt to Equity Ratio (D:E Ratio) is reduced from 70:30 to 68:32, which increases the Project Sponsor's equity requirement by \$19M (up to \$305 M), which is above the sponsor's available equity commitments. This analysis confirms the importance of these 15 turbines to the Project economics.

The four turbines on the Ridge (Turbines WA025 – WA028) were among the highest net output turbines for the entire windfarm with an average of 15.58 GWh/a, whereas the alternative locations had an average net output of only 10.97 GWh/a, with a net reduction of output of 30%. The reduction of net output of 18.49 GWh/a (62.35 – 43.86) for these four turbines alone would reduce the overall project's net output to below that stipulated in the PPA.

The difference in the net output among between the 11 proposed turbine locations within the KBA versus the alternative locations outside the KBA ranged from –9% to +3%, with eight turbines having a reduction in net output, one having no change, and 2 having an increase in net output.

The 11 proposed turbines within the KBA are located in two clusters. The cluster of turbines 74, 94, 95, 96, and 99 are all located in modified habitat and alternative sites considered were predominantly in natural habitat (see **Table 5.3**).

Table 5.3: Comparison of Proposed vs Alternative Turbine Locations Habitat

Turbine	Habitat at Proposed Location	Habitat at Alternative Location
WA066	Mixed	Natural
WA067	Natural	Natural
WA068	Natural	Natural
WA069	Natural	Natural
WA070	Mixed	Natural
WA071	Mixed	Natural
WA074	Modified	Modified
WA094	Modified	Natural
WA095	Modified	Natural
WA096	Modified	Natural
WA099	Modified	Modified
Summary	3 natural/3 mixed/5 modified	9 natural/0 mixed/2 modified

The other cluster of six turbines (turbines 66 – 71) are located in natural and mixed habitats. They could arguably be relocated to alternative locations outside of the KBA with some biodiversity benefit. If we assume they are relocated to the six best (from a net output perspective) alternative turbine locations (alternative sites 70, 71, 74, 94, 95, and 99), there would only be a reduction in net output of 0.27 GWh/a. However, this ignores the fact that the proposed locations have been optimized by MWPC's wind consultant and EPC contractor and the alternative locations would incur additional costs in terms of construction, transmission, and substation costs.

5.5 Alternatives on Wind Turbine and Facilities Layout

From data provided by MWPC, it is noted that the turbine layout has been optimised from 240 turbines to 133 turbines. The number of turbines have been reduced due to new the use of turbine technology that can generate more power.

The following process has been conducted to refine the wind turbine layout for the Project:

- MWPC has been considering turbine layout based on turbine technology available since 2014. Total 240 WTGs (x2.5MW) with 139m hub height and 120m rotor diameter, was considered based on wind turbine technology available in 2014-2015. The layout was included in the feasibility study that was approved by Government of Laos and it was included in the first draft of local EIA submitted to the Government of Laos.
- Following this, a total of 174 WTGs (x3.45MW) with 157m hub height and 136m rotor diameter was selected in 2016 due to changes in the Project design.
- In 2020, a total of 113 WTGs (x5.3MW) with 141m hub height and 158m rotor diameter was considered. Larger WTGs were proposed to reduce the number of turbine units and reduce the ancillary infrastructure (i.e. road and civil foundation). However, the solution was considered infeasible and could not achieve targeted energy yields.
- In 2021, according to new technology available and achieving targeted economic return such as environment for physical& biodiversity, health, social aspects, the final selected layout included a total of 148 WTGs. This has been considered in this ESIA.
- In 2022, MWPC has changed layout from Goldwind's technology (148 turbines) to Envision's technology (133 turbines). Envision layout has reduced 15 turbines and 124 turbines out of the 133 turbines are in the same area. Only 9 turbines are planned to be relocated to Dak Nong Village,

which used to be the location for the 115kV transmission line and access road for Goldwind layout. The Goldwind and Envision's layout comparison is shown in **Figure 5.10**. Land cover data for comparing Goldwind and Envision's layout from secondary data sources for protected and key biodiversity areas and from the Regional Land Cover Monitoring System (RLCMS) that was developed by SERVIR-Mekong. This data was extrapolated to calculate the land cover in terms of land use categories. This data is provided in **Table 5.4**.

Option 2 was selected for the Project.

Table 5.4: Land Cover for Turbine Layout

Land Cover Category	Goldwind	Envision
	Area (sq.m.)	Area (sq.m.)
Agriculture/Aquaculture	1,963.50	0
Forest	253,290.81	239,546.27
Key Biodiversity Area	35,342.92	21,598.45
Protected Area	0	0
Shrub-land	0	0
Urban and Built Up	0	0
TOTAL	290,597.23	261,144.72

Source: RLCMS - (<https://www.landcovermapping.org/en/landcover/#>)

- Previously, Goldwind's technology (148 turbines) impacted a total of 246 HHs with a total loss of 130.47 ha of agricultural land (5.4 ha permanently affected and 125.07 temporarily affected) and 593.03 ha of NTFP collection area (153.05 ha permanently affected and 439.98 ha temporary affected) and overlap with 5 cemeteries and Phou Kounking Mountain.
- The layout optimisation to Envision's technology (133 turbines) has resulted in 378 affected HHs, 185.83 ha of agricultural land loss (29.31 ha permanently affected and 156.53 ha of temporarily affected), 535.48 ha NTFP collection area loss (150.79 ha permanently affected and 384.69 ha temporarily affected), 608.93 ha of communal land loss (160.37 ha permanently affected and 448.56 ha temporarily affected) and Phou Kounking Mountain. It is noted by the site team (Innogreen) that increased agricultural activities were observed during DMS survey in May – June 2022 compared to November – December 2021 when the asset registration survey was conducted. This may contribute to increased number of affected HHs and area of impacts despite the number of WTGs have been reduced from 148 to 133 WTGs.
- Envision layout also avoids impacts to all cemeteries; however, overhead transmission line will pass over Dak Bong cemetery. It is noted that the transmission line is 70 m above the ground and no physical impacts (e.g. land clearance, earthwork, etc.) will be made Dak Bong cemetery area. The consultation with Dak Bong village on 21 July 2022 suggested that cutting of trees within ROW in cemetery area to maintain the tree height under 3 m²⁵ is allowed; however, the Project is required to provide budget for the village to prepare and perform specific rituals to seek permission from spirits for such activities.

It should be noted that there is no change in the overall Project development area; all WTGs are located within this development area.

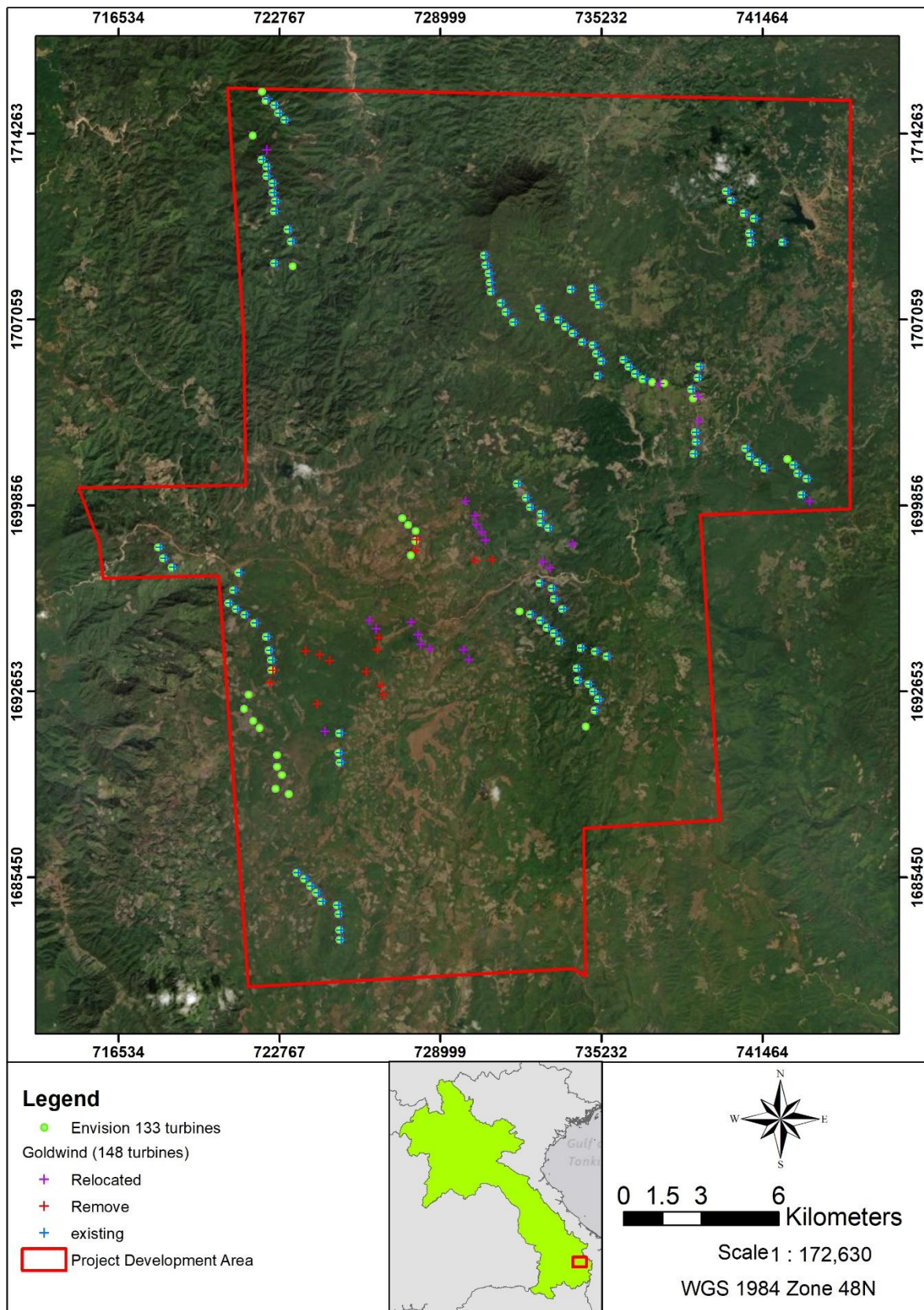
²⁵ The Regulation on Safety for High Voltage Transmission Line and Substation, EDL/ 2013 prescribes that trees taller than 3 m are prohibited within the ROW area. Therefore, there is a need for the Project or relevant authority to maintain the height of trees under 3 m.

In addition, through the ESIA process, re-routing of facilities has been conducted in order to reduce impacts on environmental and social receptors, this has included:

- Re-routing of the access roads and internal transmission lines was conducted to avoid cemetery areas (all cemetery area in the development area);

Relocating WTGs to avoid significant shadow flicker and noise impacts (Dak Yan and Dak Cheung Village) – WTGs moved from approximately 200m from village to over 1 km For information on the considerations given to the layout of the turbines in relation to the biodiversity and capacity requirements, refer to **Section 9.4.3**.

Figure 5.10: Goldwind and Envision's layout comparison



5.6 Alternatives on Transmission Line Route

5.6.1 Alternative Routing of Selected Alternative

Two alternatives on the selected transmission line are provided in the EIA for the 500 kV transmission line (Innogreen, 2020). The option considered included:

- **Option 1:** The transmission line route has a length of 21 km and is comprised of a total of 47 towers. The topographic characteristics consist of few high mountainous area and many plateau areas with favorable conditions for construction and maintenance, as route will extend along the side of the mountain and will facilitate the building of a shorter access road to the towers. This will reduce the overall area impacted by construction of access roads.

The transmission line route will pass through 5 km of protection forest and few areas of production land of the people. This area contains also some of the most intact Evergreen and Wet-Evergreen Forest which is also identified as critical habitat and part of the Phou Ayhon KBA which is an Alliance for Zero Extinction (AZE) site. There is no relocation of house and construction structure from the transmission line route. Only the cemetery area of Ban Dak Bong is located in ROW that the project agrees to perform the ceremony in accordance with the custom and tradition of the village.

- **Option 2:** The transmission line route has a length of 20 km and is comprised of a total of 42 towers. The topographic characteristics of the transmission line route are similar to Option 1, however, near the Vietnam / Lao border, the transmission line will extend to the left side of the road, which is difficult to access and requires a longer access road.

The transmission line route will also pass through 5 km of protection forest but will pass through the production area of the people more than in option 1. Access roads shall be built to the tower foundations which pass through a large production area (coffee plantation) in Ban Ngondon. This route will also cause resettlement impact due to relocation of 2 households in Ban Dak Bong from the transmission line route.

Although Option 1 is longer and requires more towers; the topographic conditions along the transmission line route of Option 1 are more convenient and will incur smaller access roads. Option 1 was therefore considered for the Project.

Due to the number of KBAs and their spatial orientation and extent in the region, complete avoidance was not possible (for example the geographical extent and orientation of the Song-Thanh KBA did not allow for complete avoidance). Complete avoidance of Dakchung Plateau KBA could not be realized fully for technical reasons pertaining to the feasibility of the project and positioning of WTGs where maximum power generation potential can be achieved to make the project viable.

In addition, through the ESIA process, re-routing of facilities has been conducted to reduce impacts on environmental and social receptors, this has included:

- Re-routing of the access roads and internal transmission lines was conducted to avoid cemetery areas (all cemetery area in the development area)
- In July 2022, transmission line route and 500 kV substation have been slightly adjusted to avoid four (4) permanent residential buildings.

This is discussed in **Section 8.4.3.7 'Residual Impacts to Biodiversity'** with further detail on the preliminary offset strategy contained in the initial **BAP: Biodiversity Action Plan**.

Figure 5.12 shows the transmission line in relations to the NTFP collection area.

Figure 5.11: Alternative Transmission Line Routing to Sub-Stations

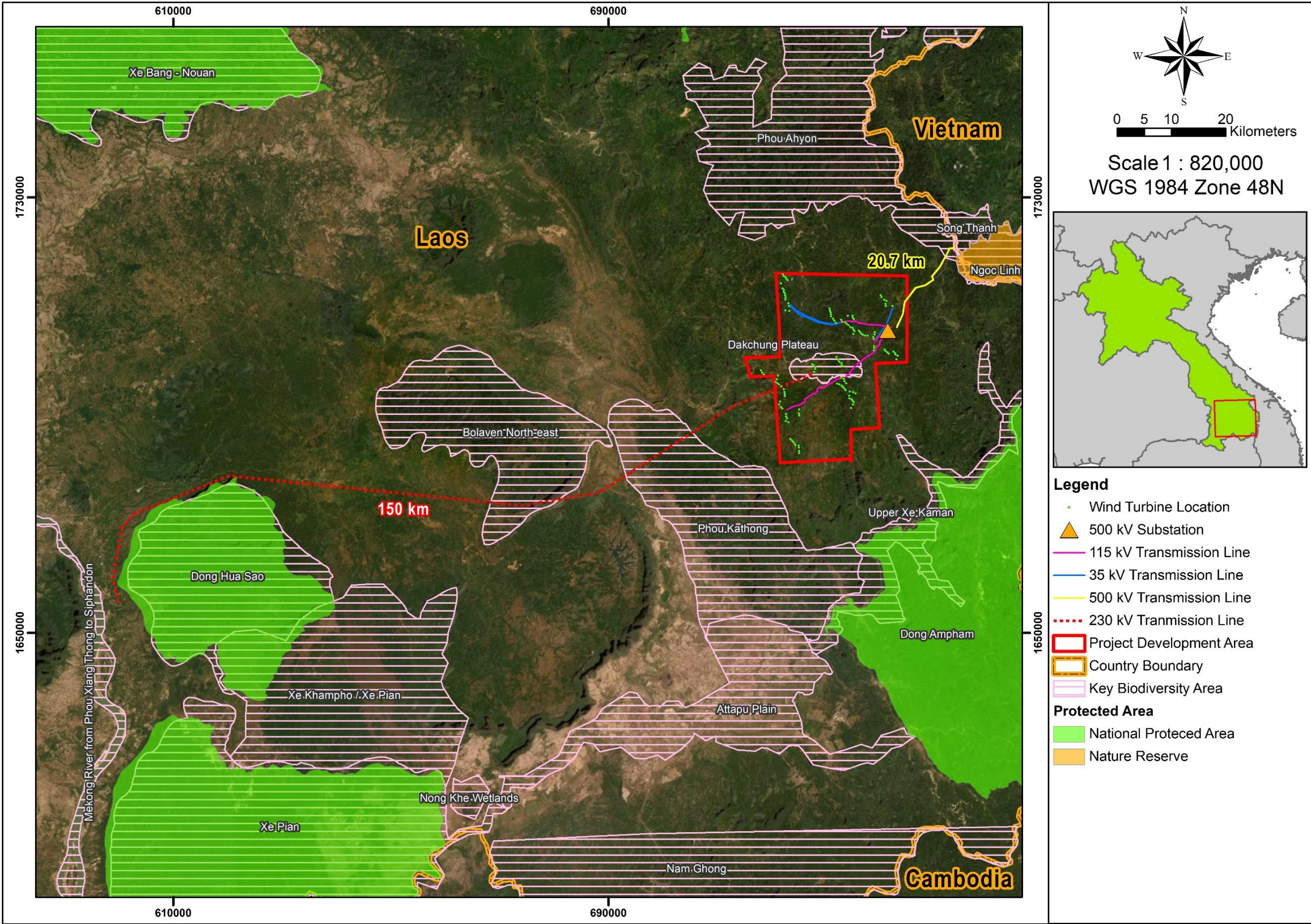
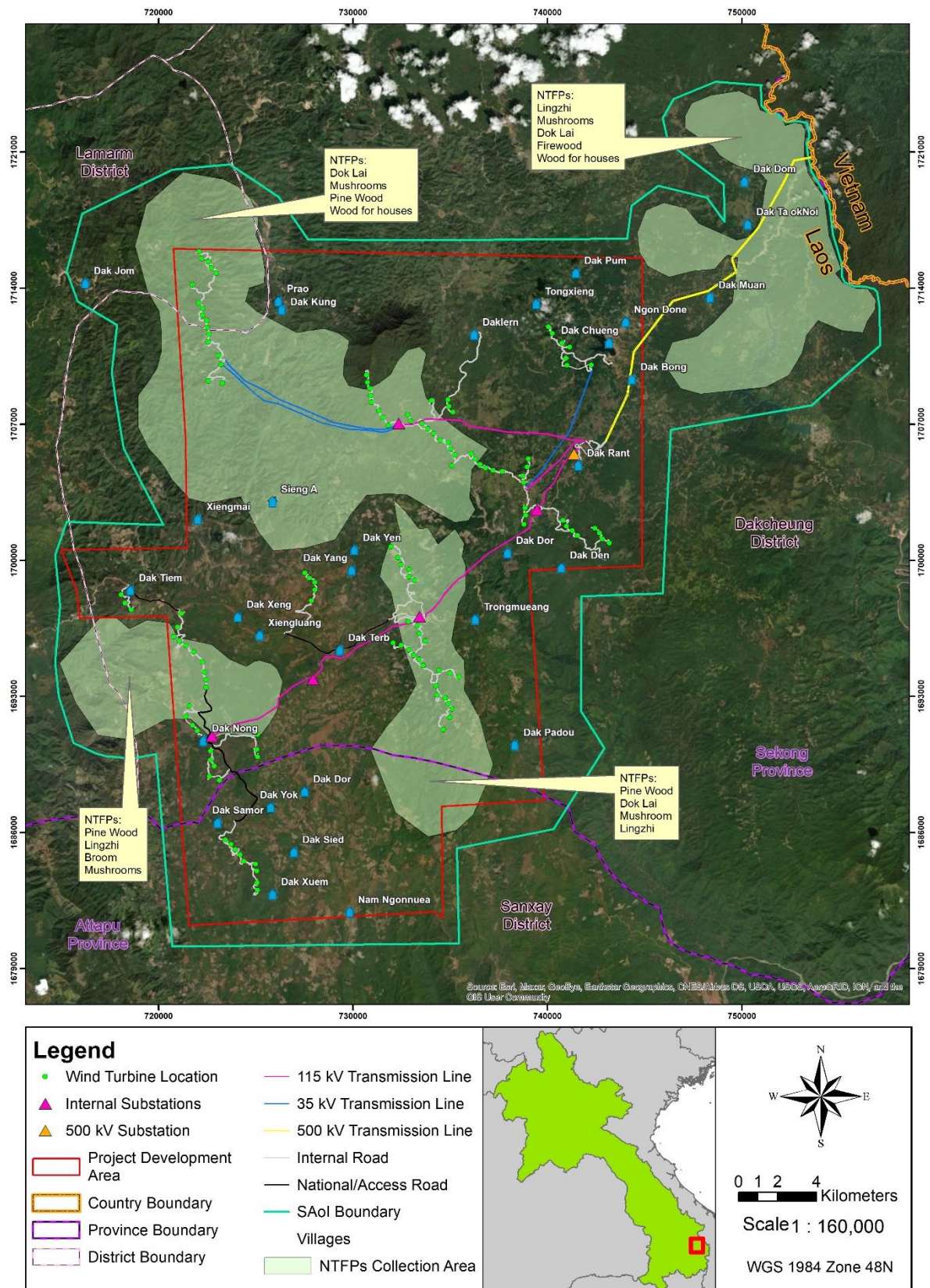


Figure 5.12: NTFP Collection Area



5.7 Alternatives on Technology

Within the wind farm industry, the following technology alternatives can be considered:

- Horizontal Axis Wind Turbine (HAWT); and
- Vertical Axis Wind Turbine (VAWT).

A comparison of the wind turbine technologies in terms of axis of direction, efficiency, location, design complexity, safety, and noise generation of VAWT and HAWT are described in **Table 5.5**.

In conclusion, horizontal axis wind turbines (HAWTs) dominate the majority of the wind industry. In large scale grid connected applications (such as for the Project), horizontal axis wind turbine concept is the preferred choice. The horizontal wind turbines are able to produce more electricity from a given amount of wind using lesser foot print.

The Project has selected to use the 3-blade horizontal wind turbine as this type is most widely used at present time as it has the highest energy conversion efficiency. This is the most common, mature and commercially proven wind turbine technology deployed in all large-scale wind farms across the world.

Table 5.5: Comparison of HAWT and VAWT Wind Turbine Alternatives

Topic	Horizontal Axis Wind Turbine (HAWT)	Vertical Axis Wind Turbine (VAWT)
Wind direction	HAWT needs the wind to flow at a perpendicular angle to the blades. To accommodate changes in wind direction, turbines are usually equipped with a yaw drive that rotates the unit's direction. However, the drive adapts slowly to changing directions because it must turn the entire turbine and propeller assembly.	VAWT runs in all possible wind directions, making it better-suited to urban areas with tall buildings. Additionally, the VAWT design allows it to operate on lower wind speeds than is possible with the horizontal turbine.
Efficiency	Overall, HAWT have a higher energy output than VAWT because their blades are positioned perpendicularly to wind direction. The larger blades with massive spans allow for a higher surface area that can capture wind and the three-blade standard allows air to spin through as the wind carries blade currents downwind before the next blade passes through. Under the same general wind conditions, two-bladed turbines are less efficient than three-bladed.	VAWT systems capture energy from the wind only on the front side; while winds can drag the system at the rear part of their rotation. The result is comparably reduced efficiency in power generation of VAWT in general compared to HAWT. Therefore, VAWT wind farm of a commercial scale would require more materials and space to generate a comparable amount of power compared to a farm equipped with horizontal-axis turbines leading to higher Cost of Electricity.
Location	HAWT's tall tower and long blades work extremely well in wide-open spaces.	VAWTs are generally better suited in compact locations, chiefly urban areas and rooftops
Design complexity	VAWTs are generally more complex to operate and maintain than HAWTs,	Due to HWT complexity; large commercial operations favor the HAWT technology more often than not.
Safety:	HAWT rarely collapse due to lateral stress.	VAWT asymmetrical front and rear design can create stress on their bearings.
Noise Generation:	The larger a HAWT gets, the quieter it becomes in proportion to its energy output (a 4.5MW wind turbine is only a dB or two noisier than a 1.5MW wind turbine).	Limited research is available on the noise generation of large scale VAWT wind farms.
Land Requirement	HAWT require a large area of land for their operation	VAWTs do not require a large area of land, and can be installed near each other, in between HAWTs and in urban areas ²⁶

²⁶ <https://www.adb.org/sites/default/files/publication/696291/adbi-wp1250.pdf>

5.8 Alternative Methods of Power Generation

This section describes several alternatives including renewable energy alternatives as well as other alternatives for power generation according to Lao's Power Development plan such as conventional thermal power plants.

A summary of the advantages and disadvantages of each power generation methods are shown in **Table 5.6**. Compared to most other traditional power generation methods, the wind power projects have a limited reversible impact on the environment and contribute to reducing the production and use of energy from fossil fuels, which causes the increase of greenhouse gas level and impacts on climate change. As such, wind energy is considered one of the most suitable alternatives of power generation.

Table 5.6: Comparisons between Power Generation Methods

System	Advantage	Disadvantage
Supercritical Thermal Power	<ul style="list-style-type: none"> ■ Large-scale production potential ■ Moderate gestation period Wider distribution potential ■ Provides cheap electricity to the consumer ■ Provide stable output and reliable electricity on the grid ■ Easily accessible and well established technology ■ Requires less land per Megawatt 	<ul style="list-style-type: none"> ■ High fossil fuel consumption ■ Large quantities of water required for cooling ■ High volume of emission from operation ■ Accumulation of fly ash (in case of coal powered installations) ■ Upstream impact from mining and oil exploration
Ultra Supercritical Thermal Power	<ul style="list-style-type: none"> ■ In addition to the above advantages: ■ Improved efficiency by reaching higher pressure and temperatures compared to supercritical boilers. ■ Reduced emissions, particularly of CO and mercury. ■ The general rule of thumb is that each percentage point of efficiency improvement yields 2–3% less CO. ■ Potentially lower operating costs 	<ul style="list-style-type: none"> ■ As above.
Biomass	<ul style="list-style-type: none"> ■ Abundant resource: from forests and croplands to waste and landfills ■ Biomass helps reduce waste ■ Biomass is a reliable source of power generation as biomass energy plants are dispatch-able, meaning they can easily be turned on or off 	<ul style="list-style-type: none"> ■ Additional costs associating extracting, transporting and storing of biomass prior to power production process ■ Space requirements ■ Can lead to deforestation and/or it may compete directly with food production (e.g. corn, soy) ■ Release pollutants into the air, such as carbon dioxide, nitrogen oxides, volatile organic compounds, and more.
Hydropower	<ul style="list-style-type: none"> ■ GHG emission estimated as low ■ Do not create any waste by-products during conversion process ■ Some hydropower facilities can quickly go from zero power to maximum output because hydropower plants can generate power to the grid immediately. They provide essential back-up power during major electricity outages or disruptions. 	<ul style="list-style-type: none"> ■ Site specific, dependent on reservoir/ river/ ■ Long gestation period ■ Alteration of river flow regime ■ Adverse social and ecological impacts due to inundation and downstream effects

System	Advantage	Disadvantage
Solar power	<ul style="list-style-type: none"> ■ Polluting levels are low ■ Inexpensive power generation ■ Inexhaustible solar resource ■ GHG emissions estimated as low 	<ul style="list-style-type: none"> ■ Large land requirement ■ Site-specific, dependent on solar insolation ■ Expensive installation ■ Electronic and hazardous waste after expired that require proper management
Wind power	<ul style="list-style-type: none"> ■ Pollution levels are low ■ Inexpensive power generation ■ Inexhaustible wind resources ■ GHG emissions estimated as low 	<ul style="list-style-type: none"> ■ Large land requirement ■ Site-specific, dependent on wind pattern ■ Expensive installation ■ Visual impacts and harm to bird species

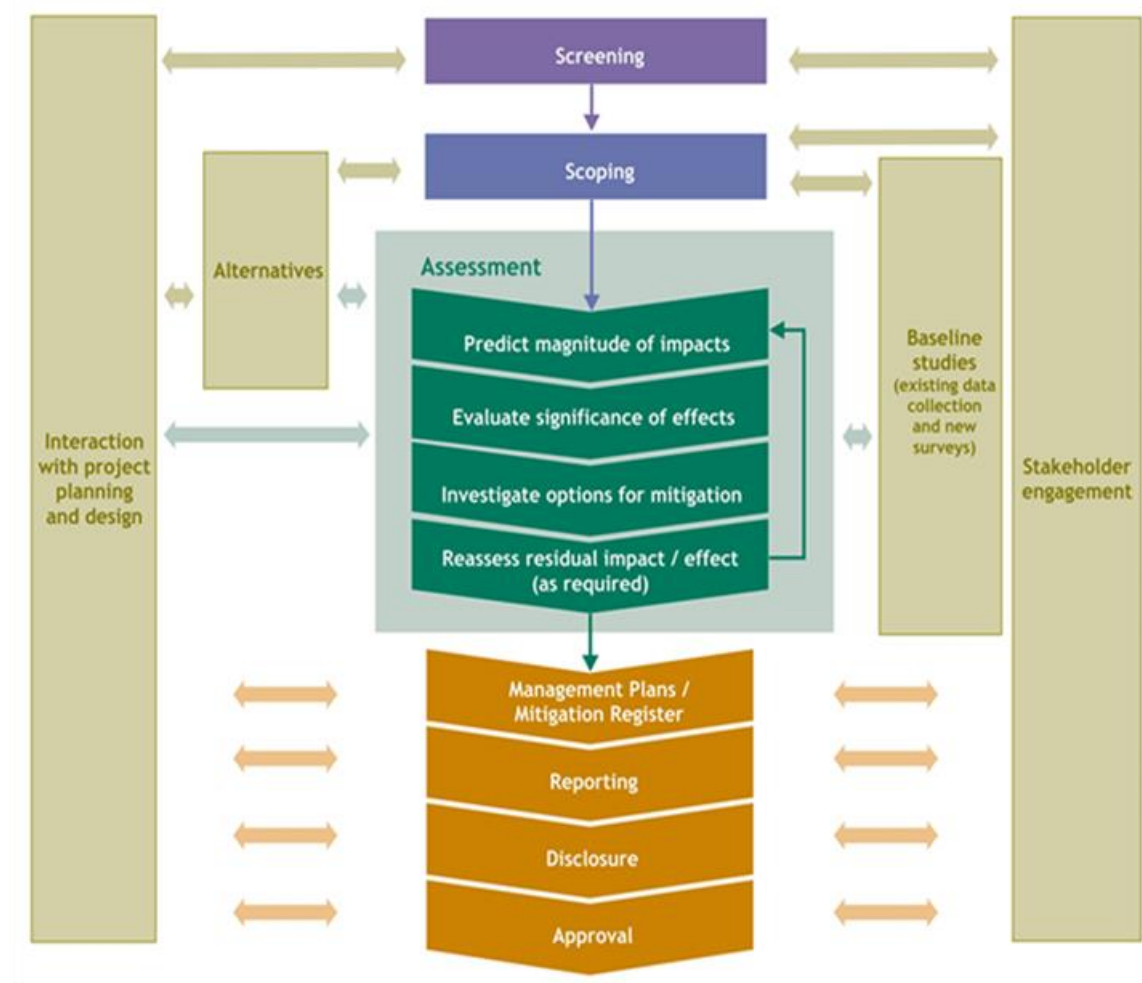
6 IMPACT ASSESSMENT METHODOLOGY

6.1 Introduction

This section presents the methodology used to conduct the Environmental and Social Impact Assessment (ESIA) for the Project. The Impact Assessment (IA) is undertaken following a systematic process that predicts and evaluates the impacts the Project could have on aspects of the physical, biological, social/ socio- economic and cultural environment, and identifies measures that the Project is planning to avoid, reduce, mitigate, offset or compensate for adverse impacts; and to enhance positive impacts where practicable.

The methodology has followed the approach illustrated in **Figure 6.1**.

Figure 6.1: Overall Impact Assessment Approach



Source: ERM, 2019

This section also details the methodology used for the collection and analysis of primary and secondary data used in this report. Primary and secondary information from the Project Owner, government sources, non-governmental organisations (NGOs) and other Project-related stakeholders have been collected to support the preparation of this report.

6.2 Screening

The screening was conducted utilizing a high-level description of the Project and its associated facilities, including available information regarding the project design and existing environmental and social conditions, applicable regulatory framework for the Project etc. in order to provide a summary of initial findings on potential project impacts and to guide development of the ESIA.

6.3 Scoping

Scoping has been undertaken to delineate the potential Area of Influence for the Project (and therefore the appropriate Study Area) and to identify potential interactions between the Project and resources/receptors in the Area of Influence. It also helps in developing and selecting alternatives to proposed action and in identifying the issues to be considered in this ESIA. A scoping exercise was completed as part of the gap analysis undertaken by ERM.

6.4 Project Boundary and Area of Influence

In order to set out the scope of the Project features and activities, with particular reference to the aspects, which have the potential to impact the environment, a Project Description has been prepared. Details of the Project facilities' design characteristics, as well as planned and possible unplanned Project activities, are provided in **Section 4** of this ESIA Report. The Project Area of Influence (AoI) is also defined in **Section 8** of this ESIA Report.

6.5 Baseline Data Collection

To provide the context within which the impacts of the Project can be assessed, a description of physical, biological, social/socio-economic and cultural conditions that would be expected to prevail in the absence of the Project is presented. The baseline includes information on all resources/receptors that were identified during scoping as having the potential to be significantly affected by the Project.

The existing and additional environmental and social baseline conditions of the Project are reported in **Section 8** of this ESIA Report.

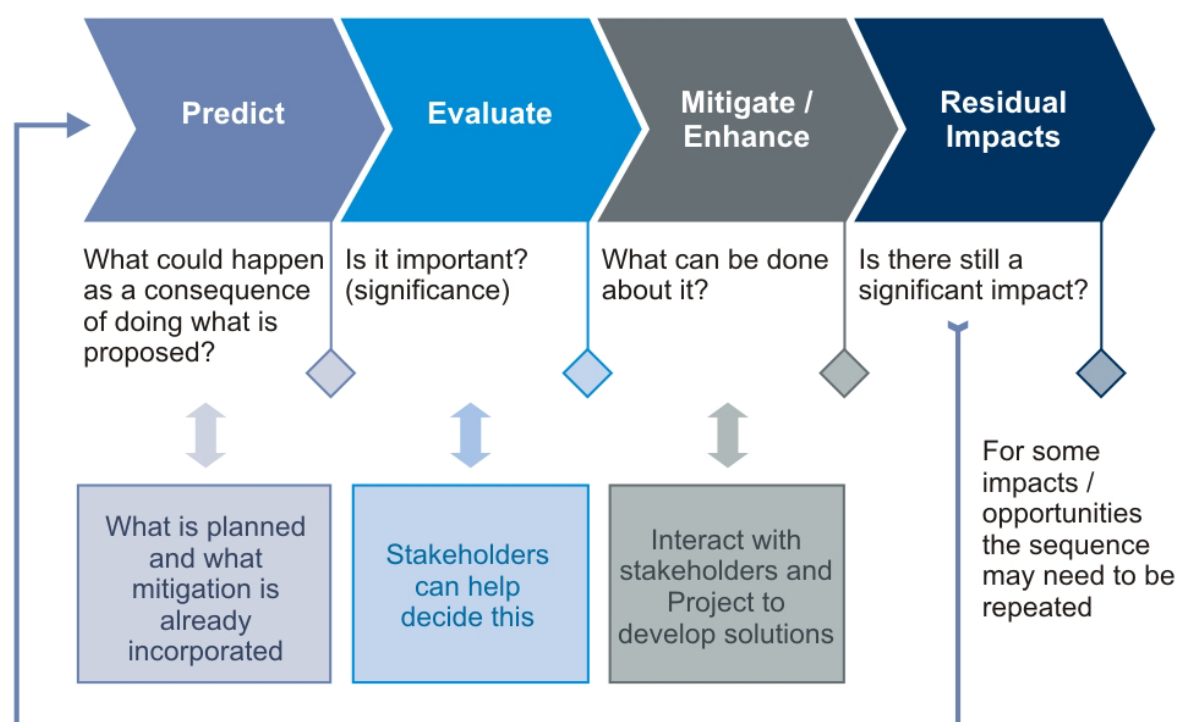
The baseline takes into account current conditions, as well as those changing conditions apparent in the Baseline and takes into consideration other developments within the Project area, which are underway or certain to be initiated in the near future. These developments are considered in the assessment of cumulative impacts and effects.

6.6 Impact Assessment Process

Impact identification and assessment starts with scoping and continues through the remainder of the ESIA Process. The principal ESIA steps are summarised in **Figure 6.2** and comprise:

- **Potential Impact Prediction:** to determine what could potentially happen to resources/receptors as a consequence of the Project and its associated activities;
- **Impact Evaluation:** to evaluate the significance of the predicted impacts by considering their magnitude and likelihood of occurrence, and the sensitivity, value and/or importance of the affected resource/receptor;
- **Mitigation and Enhancement Measures:** to identify appropriate and justified measures to mitigate potential negative impacts and enhance potential positive impacts; and
- **Residual Impact Evaluation:** to evaluate the significance of potential impacts assuming effective implementation of mitigation and enhancement measures.

Figure 6.2: Overall Impact Assessment Process



Source: ERM, 2019

6.6.1 Impact Prediction

Prediction of impacts is essentially an objective exercise to determine what is likely to happen to the environment as a consequence of the Project and its associated activities. From the potentially significant interactions identified in Scoping, the impacts to the various resources/receptors are elaborated and evaluated. The diverse range of potential impacts considered in the ESIA process typically results in a wide range of prediction methods being used, including quantitative, semi-quantitative and qualitative techniques.

6.6.2 Impact Evaluation

Once the prediction of potential impacts is complete, each potential impact is described in terms of its various relevant characteristics (e.g., type, scale, duration, frequency, extent). The terminology and designations used to describe impact characteristics are shown in **Table 6.1**.

Table 6.1: Impact Characteristics Terminology

Characteristic	Definition	Designations
Type	A descriptor indicating the relationship of the potential impact to the Project (in terms of cause and effect).	Direct Indirect Induced
Extent	The "reach" of the potential impact (e.g., confined to a small area around the Project Footprint, projected for several kilometres, etc.).	Local Regional International
Duration	The time period over which a resource / receptor is potentially affected.	Temporary Short term Long term

Characteristic	Definition	Designations
Scale	The size of the potential impact (e.g., the size of the area with the potential to be damaged or impacted, the fraction of a resource that could potentially be lost or affected, etc.).	[no fixed designations; intended to be a numerical value or a qualitative description of "intensity"]
Frequency	A measure of the constancy or periodicity of the potential impact.	[no fixed designations; intended to be a numerical value or a qualitative description]

The definitions for the *type* designations are shown in **Table 6.2**. Definitions for the other designations are resource/receptor-specific, and are discussed in the resource/receptor-specific impact assessment chapters presented later in this Report.

Table 6.2: Impact Type Definitions

Type	Definition
Direct	Potential impacts that result from a direct interaction between the Project and a resource/receptor (e.g., between occupation of a plot of land and the habitats which are affected).
Indirect	Potential impacts that follow on from the direct interactions between the Project and its environment as a result of subsequent interactions within the environment (e.g., viability of a species population resulting from loss of part of a habitat as a result of the Project occupying a plot of land).
Induced	Potential impacts that result from other activities (which are not part of the Project) that happen as a consequence of the Project (e.g., influx of workers resulting from the importation of a large Project workforce).

The above characteristics and definitions apply to planned and unplanned events. An additional characteristic that pertains only to unplanned events is *likelihood*. The *likelihood* of an unplanned event occurring is designated using a qualitative scale, as described in **Table 6.3**.

Table 6.3: Definitions for Likelihood Designations

Likelihood	Definitions
Unlikely	The event is unlikely but may occur at some time during normal operating conditions
Possible	The event is likely to occur at some time during normal operating conditions
likely	The event will occur during normal operating conditions (i.e., it is essentially inevitable)

Once impact characteristics are defined, the next step in the impact assessment phase is to assign each potential impact a 'magnitude'. Magnitude is typically a function of some combination (depending on the resource/receptor in question) of the following impact characteristics:

- Extent;
- Duration;
- Scale;
- Frequency; and
- Likelihood (for unplanned event).

Magnitude essentially describes the intensity of the change that is predicted to occur in the resource/receptor as a result of the potential impact. The magnitude designations themselves are universally consistent, but the definitions for these designations vary depending on the resource/receptor. The universal magnitude designations are:

- Positive;
- Negligible;

- Small;
- Medium; and
- Large.

In the case of a potential positive impact, no magnitude designation (aside from 'positive') is assigned. It is considered sufficient for the purpose of the ESIA to indicate that the Project is expected to result in a potential positive impact, without characterising the exact degree of positive change likely to occur.

In the case of potential impacts resulting from unplanned events, the same resource/receptor-specific approach to concluding a magnitude designation is utilised. However, the 'likelihood' factor is considered, together with the other impact characteristics, when assigning a magnitude designation.

In addition to characterising the magnitude of impact, the other principal impact evaluation step is definition of the sensitivity/vulnerability/importance of the impacted resource/receptor. There are a range of factors to be taken into account when defining the sensitivity/vulnerability/importance of the resource/receptor, which may be physical, biological, cultural or human. Other factors may also be considered, such as legal protection, government policy, stakeholder views and economic value. As in the case of magnitude, the sensitivity/vulnerability/importance designations themselves are universally consistent, but the definitions for these designations vary on a resource/receptor basis.

The sensitivity/vulnerability/importance designations used herein for all resources/ receptors are:

- Low;
- Medium; and
- High.

Once magnitude of impact and sensitivity/vulnerability/importance of resource/receptor have been characterised, the significance can be assigned for each impact. Impact significance is designated using the matrix shown in **Table 6.4**.

Table 6.4: Impact Significance

		Sensitivity/Vulnerability/Importance of Resource/Receptor		
		Low	Medium	High
Magnitude of Impact	Negligible	Negligible	Negligible	Negligible
	Small	Negligible	Minor	Moderate
	Medium	Minor	Moderate	Major
	Large	Moderate	Major	Major

The matrix applies universally to all resources/receptors, and all impacts to these resources/receptors, as the resource/receptor-specific considerations are factored into the assignment of magnitude and sensitivity/vulnerability/importance designations that enter into the matrix. **Box 6.1** provides a context for what the various impact significance ratings signify.

It is important to note that impact prediction and evaluation take into account any embedded controls (i.e., physical or procedural controls that are already planned as part of the Project design, regardless of the results of the ESIA Process). This avoids the situation where an impact is assigned a magnitude based on a hypothetical version of the Project that considers none of the embedded controls.

Box 6.1: Context of Impact Significances

An impact of **negligible** significance is one where a resource/receptor (including people) will essentially not be affected in any way by a particular activity or the predicted effect is deemed to be 'imperceptible' or is indistinguishable from natural background variations.

An impact of **minor** significance is one where a resource/receptor will experience a noticeable effect, but the impact magnitude is sufficiently small and/or the resource/receptor is of low sensitivity/vulnerability/importance. In either case, the magnitude should be well within applicable standards.

An impact of **moderate** significance has an impact magnitude that is within applicable standards, but falls somewhere in the range from a threshold below which the impact is minor, up to a level that might be just short of breaching a legal limit. Clearly, to design an activity so that its' effects only just avoid breaking a law and/or cause a major impact is not best practice. The emphasis for moderate impacts is therefore on demonstrating that the impact has been reduced to a level that is as low as reasonably practicable (ALARP). This does not necessarily mean that impacts of moderate significance have to be reduced to minor, but that moderate impacts are being managed effectively and efficiently.

An impact of **major** significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. An aim of ESIA is to get to a position where the Project does not have any major residual impacts, certainly not ones that would endure into the long-term or extend over a large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted (i.e. ALARP has been applied). An example might be the visual impact of a facility. It is then the function of regulators and stakeholder to weigh such negative factors against the positive ones, such as employment, in coming to a decision on the Project.

6.6.3 Identification of Mitigation and Enhancement Measures

Once the significance of a potential impact has been characterised, the next step is to evaluate what mitigation and enhancement measures are warranted. For the purposes of this ESIA, ERM has adopted the following Mitigation Hierarchy:

- **Avoid at Source, Reduce at Source:** avoiding or reducing at source through the design of the Project (e.g., avoiding by siting or re-routing activity away from sensitive areas or reducing by restricting the working area or changing the time of the activity);
- **Abate on Site:** add something to the design to abate the impact (e.g., pollution control equipment, traffic controls, perimeter screening and landscaping);
- **Abate at Receptor:** if an impact cannot be abated on-site then control measures can be implemented off-site (e.g., noise barriers to reduce noise impact at a nearby residence or fencing to prevent animals straying onto the site);
- **Repair or Remedy:** some impacts involve unavoidable damage to a resource (e.g. agricultural land and forestry due to creating access, or materials storage areas) and these impacts can be addressed through repair, restoration or reinstatement measures; and
- **Compensate in Kind, Compensate Through Other Means:** where other mitigation approaches are not possible or fully effective, then compensation for loss, damage and disturbance might be appropriate (e.g., planting to replace damaged vegetation, financial compensation for damaged crops or providing community facilities for loss of fisheries access, recreation and amenity space).

The priority in mitigation is to first apply mitigation measures to the source of the potential impact (i.e., to avoid or reduce the magnitude of the potential impact from the associated Project activity), and then to address the resultant effect to the resource/receptor via abatement or compensatory measures or

offsets (i.e., to reduce the significance of the effect once all reasonably practicable mitigations have been applied to reduce the impact magnitude).

6.6.4 *Residual Impact Evaluation*

Once mitigation and enhancement measures are declared, the next step in the ESIA Process is to assign residual impact significance. This is essentially a repeat of the impact assessment steps discussed above, considering the implementation of the proposed mitigation and enhancement measures.

6.6.5 *Cumulative Impact Assessment Process*

According to IFC 2013, “Cumulative impacts (CI) are those that result from the successive, incremental, and/or combined effects of an action, project, or activity when added to other existing, planned, and/or reasonably anticipated future ones”. According to the IFC (IFC 2013), the assessment and management of cumulative impacts is necessary when the Project and other developments under consideration could contribute to generating cumulative impacts on valued environmental and social component.

In order to gain an understanding of the projects overall contribution to impacts, a cumulative impact assessment (CIA) was undertaken. Whilst total cumulative impacts due to multiple projects within a given area should be identified within government-led spatial planning efforts, the Project owner needs to determine the degree to which it is contributing to these overall cumulative impacts. In this regard, the objectives of the CIA are twofold:

- Determine if the cumulative impacts caused by the Project and other existing or predictable future projects would threaten the sustainability of valuable environmental component (VEC) in the area; and
- Develop mitigation measures to prevent unacceptable conditions of VECs. The measures could include additional mitigation measures for Project and additional mitigation measures for other existing or predictable future projects in the area.

The ESIA and CIA are prepared based on similar logical framework, analytical process and tools. Unlike the ESIA that centers on the Project as a source of impacts, the CIA focuses on VECs under influence from different projects (**Figure 6.3**). In a CIA, the overall resulting condition of the VEC and its related viability are assessed.

This CIA closely follows the six (6) steps of the IFC Guidance (IFC 2013), as shown in **Figure 6.4**.

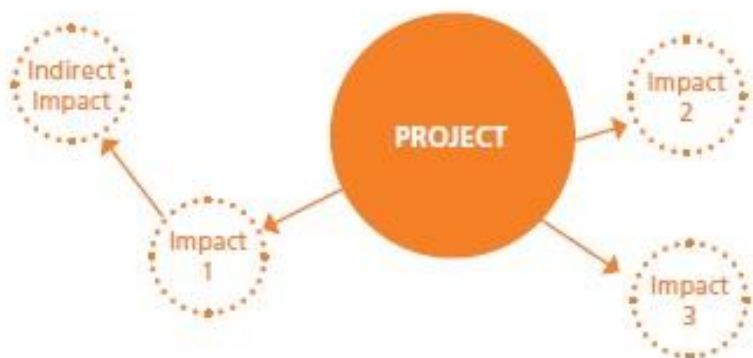
IFC Guidance takes into consideration the limitations that a private developer may face carrying out a CIA as part of an ESIA, or difficulties encountered in compiling such information. The limitations applicable to this CIA include:

- Incomplete information about other projects and activities (e.g. the information is not available in the public domain);
- Uncertainty with respect to the implementation of future projects; and

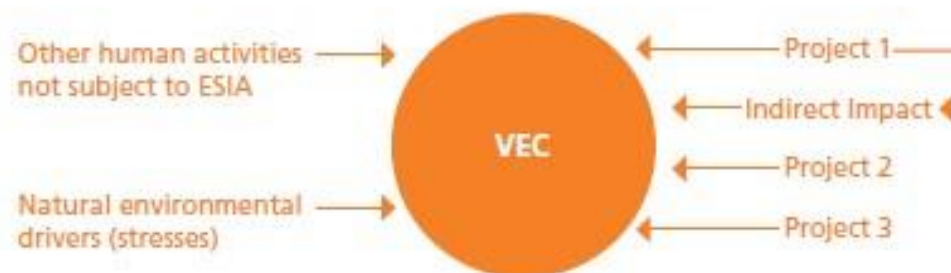
Difficulty in establishing thresholds or limits of acceptable change for VECs, and therefore the significance of cumulative impacts.

Figure 6.3: Comparing an ESIA and a CIA

ESIA: Project-Centered Perspective

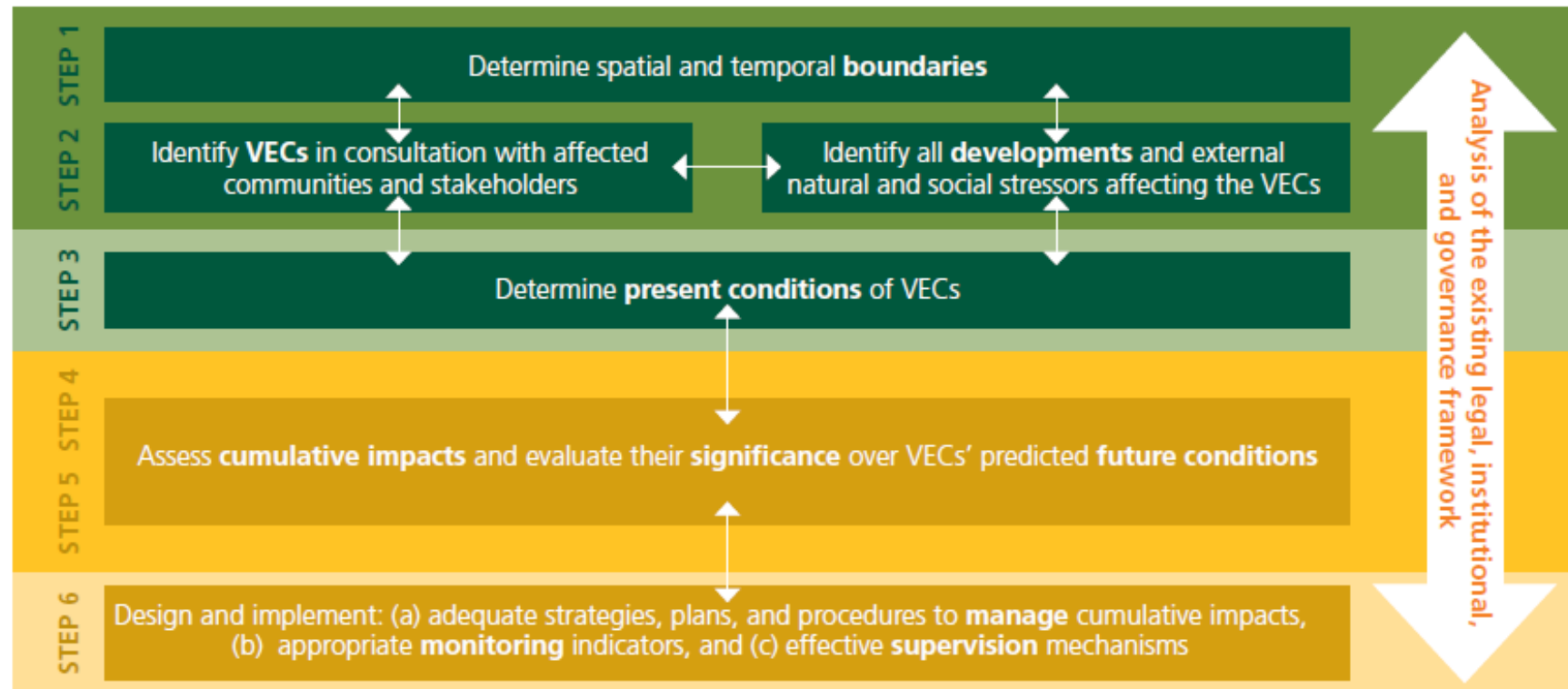


CIA: VEC-Centered Perspective



Source: IFC, 2013

Figure 6.4: Conceptual CIA Process



Source: IFC, 2013.

6.6.6 Management, Monitoring, and Audit

The final stage in the IA Process is the definition of the basic management and monitoring measures that are needed to identify whether: a) impacts or their associated Project components remain in conformance with applicable standards/ guidelines; and b) mitigation measures are effectively addressing impacts and compensatory measures and offsets are reducing effects to the extent predicted.

6.7 Risk Assessment for Unplanned Events

To evaluate potential impacts from unplanned events, a risk-based approach is used to define: 1) the most likely unplanned events leading to environmental, social and/or community health impacts; and 2) those unplanned events with the most significant potential environmental, social and/or community health impacts overall. Impact significance for unplanned events is therefore determined by evaluating the combination of likelihood and consequence.

6.7.1 Assess the Scale of Consequence

Indicative levels of consequence for potential impacts from unplanned events can be defined for the physical, biological, and social environment as provided in **Table 6.5**.

Table 6.5: Indicative Levels of Consequence for Potential Impacts from Unplanned Events

	Incidental	Minor	Moderate	Major	Severe
Physical Environment	Impacts such as localised or short term effects or environmental media, meeting all environmental standards	Impacts such as widespread, short-term impacts to environmental media, meeting all environmental standards	Impacts such as widespread, long-term effects on environmental media, meeting all environmental standards	Impacts such as significant, widespread and persistent changes in environmental media OR Exceedance of environmental standards	Exceedance of environmental standards and fine/ prosecution
Biological Environment	Impacts such as localised or short term effects on habitat or species	Impacts such as localised, long term degradation of sensitive habitat or widespread, short-term impacts to habitat or species	Impacts such as localised but irreversible habitat loss or widespread, long-term effects on habitat or species	Impacts such as significant, widespread and persistent changes in habitat or species	Impacts such as persistent reduction in ecosystem function on a landscape scale or significant disruption of a sensitive species.
Social Environment	Slight, temporary, adverse impact on a few individuals	Temporary (<1 year), adverse impacts on community which are within international health standards	Adverse specific impacts on multiple individuals that can be restored in <1 year OR One or more injuries, not lost-work injuries.	Adverse long-term, multiple impacts at a community level, but restoration possible. OR One or more lost-work injuries to a member of the public including permanently disabling injuries.	Adverse long-term, varied and diverse impacts at a community level or higher – restoration unlikely. OR Fatalities of public.

6.7.2 Assess the Likelihood

For the purposes of assessment, the likelihood of an unplanned event occurring can be classified as follows:

1. Remote, not known in the industry;
2. Very unlikely, known of in the industry;
3. Unlikely, may occur once or more in life of the Project;
4. Likely, may occur once or twice per year;
5. Expected, may occur more than twice per year.

6.7.3 Assess the Significance

The consequences and likelihood of potential unplanned events are combined to determine the overall impact significance using the risk matrix shown in **Table 6.6**.

For potential impacts that are determined to have an impact significance of Moderate or Major, risk reduction measures are identified; these can include measures that reduce the likelihood of the event from occurring (i.e., preventive barriers), those that reduce the consequences on sensitive receptors/resources if the event were to occur (i.e. mitigation or recovery measures), and those that affect the likelihood and consequence.

Table 6.6: Risk Matrix for Potential Unplanned Events

		Likelihood of Occurrence				
		Incidental	Minor	Moderate	Major	Severe
Consequence	Incidental	Negligible	Negligible	Negligible	Negligible	Negligible
	Minor	Negligible	Minor	Minor	Minor	Moderate
	Moderate	Minor	Minor	Moderate	Moderate	Major
	Major	Moderate	Moderate	Major	Major	Major
	Severe	Major	Major	Major	Major	Major

7 STAKEHOLDER ENGAGEMENT

The section provides the stakeholder engagement and public consultation activities conducted during the EIA and Supplemental ESIA process until December 2021. It is also noted that these activities will be mentioned in a Stakeholder Engagement Plan (SEP).

7.1 Stakeholder Identification and Mapping

7.1.1 Stakeholder Identification

ADB defines stakeholders as “individuals or groups or institutions who can or are likely to (i) influence (promote, support, disrupt, or stop) the course of a program or project; and/or (ii) be affected (favourably or adversely) by the program or project”²⁷

IFC defines stakeholders as “persons or groups who are directly or indirectly affected by a project, as well as those who may have interests in a project and/or the ability to influence its outcome, either positively or negatively. Stakeholders may include locally affected communities or individuals and their formal and informal representatives, national or local government authorities, politicians, religious leaders, civil society organizations and groups with special interests, the academic community, or other businesses.”²⁸

Based on ADB’s and IFC’s definition of stakeholders described above, the Project defines stakeholders to include workers, local communities affected by the project, national and local authorities, neighbouring projects, and/or nongovernmental organizations.

Stakeholder identification for the Project was initiated during preparation of the EIA in 2014 and was further developed and refined during the supplementary ESIA process. The results of the preliminary stakeholder identification process are presented in **Table 7.1** and the stakeholder mapping results are presented in **Figure 7.1**.

The stakeholder list as well as stakeholder analysis and mapping will continue to be revised according to the ongoing receipt of comments and input from stakeholders directed to the Project. This will be provided in the SEP.

²⁷ADB (2019). Guidance Note on Stakeholder Communication Strategies for Projects in South Asia.

<https://www.adb.org/sites/default/files/institutional-document/512211/stakeholder-communication-strategies-guidance-note.pdf>

²⁸ IFC (2007) Stakeholder Engagement A Good Practice Handbook for Companies Doing Business in Emerging Markets.

https://www.ifc.org/wps/wcm/connect/affbc005-2569-4e58-9962-280c483baa12/IFC_StakeholderEngagement.pdf?MOD=AJPERES&CVID=jkD13-p

Table 7.1: Preliminary Identification of Project Stakeholders

Stakeholder Group	Interest and Role in the Project	Description and Relevant Stakeholders
Project Affected Persons (PAPs)		
Affected Population	<p>Individuals, households and businesses that may be impacted by construction and operation of the Project.</p> <p>The impacts may include:</p> <ul style="list-style-type: none"> ■ Economic displacement (loss of agriculture land) due to Project land acquisition; ■ Noise and dust from construction activities; ■ Noise and shadow flicker impacts from the wind turbines; ■ Community safety; ■ Loss of forest and NTFP collection resources; ■ Restricted access to natural resources and agricultural land; ■ Increased traffic risks and congestion; and ■ Increased demand on local infrastructure and public services due to influx of Project construction labours. <p>Stakeholders may include, but are not limited to:</p> <ul style="list-style-type: none"> ■ Individuals and households (including non-title holders) that will be affected by the land acquisition process for the Project ■ The villages, households, and individuals affected by Project construction and operation including safety buffer and shadow flicker, noise, visual, stormwater, etc ■ People who make their livelihoods on land which will be affected by land acquisition of the Project; ■ Individuals and households that will have restricted access to natural resources due to the Project footprint. These stakeholders may include, for example, villagers who collect herbs, food, and firewood for livelihood; ■ People affected by the construction and operation of the ancillary facilities and workers' camps; ■ People affected by the construction and operation of the transmission line; 	<ul style="list-style-type: none"> ■ Households affected by the Project's land acquisition: <ul style="list-style-type: none"> ○ 340 HHs in Sekong (2 permanently affected HHs, 168 temporarily affected HHs and 170 permanently and temporarily affected HHs) ○ 38 HHs in Attapeu (3 permanently affected HHs, 2 temporarily affected HHs and 33 permanently and temporarily affected HHs) ■ Households in 24 villages in Dak Cheung District, Sekong Province and 8 villages in Sanxay District, Attapeu province. ■ Individuals and households of nearby villages who may be make livelihood on affected lands and/or have restricted access to natural resources due to the Project footprint ■ Individuals and households who are located within and/or nearby to the Project development area. These include: <ul style="list-style-type: none"> ○ Residents of Dak Cheung District, Sekong Province ○ Residents of Sanxay District, Attapeu Province ■ Vulnerable groups in the affected villages

Stakeholder Group	Interest and Role in the Project	Description and Relevant Stakeholders
	<ul style="list-style-type: none"> ■ People affected by the construction and operation of the access road and internal roads; ■ Those areas located within the Project's footprint or area of disturbance such as air or noise emission and shadow flicker. 	
Cumulative Impacted Population	<ul style="list-style-type: none"> ■ Individuals or groups located within the PSAoI, who may not be included in the affected population discussed above, however they may experience, for example, increased noise emissions, increased costs of living, and/or decreased forest resources due to the cumulative impact of neighbouring wind farm projects. 	<p>Individuals and organisations located within the Cumulative Area of Influence which has been defined in Section 9.1.1 as follows:</p> <ul style="list-style-type: none"> ■ Several villages (24 villages in Dak Cheung district of Sekong province, and 8 villages in Sanxay district of Attapeu province) likely to be affected by impacts to local livelihoods; and ■ The administrative boundaries of Dak Cheung and Sanxay districts, as representative of all areas that could be indirectly affected by changes in ecosystem goods and services.
Central, Provincial, District Government Agencies/Related Organisations		
Central and Provincial Government Agencies	<ul style="list-style-type: none"> ■ Government agencies responsible for environmental approvals for the Project, and relevant Ministries responsible for making technical decisions/assessment and recommendations on the development of the Project, ensuring that all technical, social, financial and legal requirements are strictly met. ■ Government agencies responsible for construction permits and licenses, land acquisition and resettlement, and other activities required for the Project development and operation. 	<p>Key relevant agencies:</p> <ul style="list-style-type: none"> ■ Ministry of Natural Resources and Environment (MONRE). ■ Provincial Department of Natural Resources and Environment (PONRE) ■ Ministry of Energy and Mines ■ Ministry of Planning and Investment ■ Other relevant Ministries
District Administration Offices	<ul style="list-style-type: none"> ■ Government agencies at the District level who are responsible for planning and implementation of the Resettlement Plan, construction licenses and permits. ■ Traditional leadership at district and village levels who represent the interest of the PAPs throughout Affected Population. ■ Have potential for the Project to utilise as an information disclosure channel. 	<p>Government offices at the District level such as:</p> <ul style="list-style-type: none"> ■ Dak Cheung District Administration Office ■ Sanxay District Administration Office ■ District Land Department ■ District Agriculture and Forestry Department ■ District Office of Natural Resources and Environment ■ Village leaders of the 32 affected villages (including 24 villages in Dak Cheung District and 8 in Sanxay District)

Stakeholder Group	Interest and Role in the Project	Description and Relevant Stakeholders
Aviation Operation/ Airport	<ul style="list-style-type: none"> The siting of the wind turbines will have to take into consideration of aviation/airport operation because of the physical size, in particular their height, wind farms can have an effect on aviation (e.g. interfere with aviation radar), especially when placed too close to aerodromes and flight routes.²⁹ 	<ul style="list-style-type: none"> Laos airport (Pakse International Airport located 140 km from the Project) Vietnam Airport (Da Nang International Airport and Phu Bai Airport located 115 km and 105 km from the Project)
Other Interested Parties		
Electricity Off taker	<ul style="list-style-type: none"> The EVN will be the off taker of electricity produced by the Project 	<ul style="list-style-type: none"> Vietnam Electricity (EVN)
Operators of meteorological radar and communication system (radio, TV, mobile-telephone network sites and relay antennas)	<ul style="list-style-type: none"> Wind turbines in line-of-sight of a weather radar can have a negative impact on the weather forecast radar's measurements and aviation radar. 30 31 Presence of wind farm can potentially impact telecommunication systems³² 	<ul style="list-style-type: none"> Operators of meteorological radar and communication system online of sight of the wind turbines
Non-Governmental Organisations and Community Groups	<ul style="list-style-type: none"> May have interest in the Project in the area of land acquisition and involuntary resettlement, environmental protection and human rights (such as cultural heritage, ethnic minorities/indigenous peoples, biodiversity management, forced labour, etc.). May be interested in the Project mitigation plan and development opportunities such as potential partners in the livelihood restoration programs, community health and safety awareness programs, etc. May have interest in protection and conservation of forests, wildlife and biodiversity in the regions that the Project located in. 	<ul style="list-style-type: none"> Primarily community groups, but not limited to: Youth Union Lao Front for National Development Lao Women Union Lao Youths Revolutionary Union Care International Service Fraternel d'Entraide (SFE) International Fund for Agricultural Development (IFAD) World Food Program (WFP) German-Lao Association for Development (GLAD) Projahnmo Research Foundation (PRF) World Wide Fund (WWF) Human Rights Watch

²⁹ Andrej NOVÁK (2009). Wind Farm and Aviation

³⁰ Lars Norin (2017) Wind turbine impact on operational weather radar I/Q data: characterization and filtering

³¹ M. Brenner et al. (2008) Wind Farm and Radar

³² I. Angulo et al. (2014) Impact analysis of wind farms on telecommunication services

Stakeholder Group	Interest and Role in the Project	Description and Relevant Stakeholders
		<ul style="list-style-type: none"> ■ BirdLife International ■ Wildlife Conservation Society (WCS) ■ International Union for Conservation of Nature (IUCN)
Nearby Developments	<ul style="list-style-type: none"> ■ Other developments in the Project's vicinity. 	<ul style="list-style-type: none"> ■ 115 kV Transmission line of Nam Emoon Hydropower project. ■ Transmission line of Xekamarn 3 Hydropower ■ National road running from Dak Cheung District to Sanxay District ■ Mining projects
Educational and Training Institutions (Academia)	<ul style="list-style-type: none"> ■ Those who may be interested in the Project mitigation plan and development opportunities, such as potential partners in the livelihood restoration programs, educational and training initiatives. ■ Have potential for the Project to utilise as an information disclosure channels. 	<ul style="list-style-type: none"> ■ Schools and training educations in in Sanxay District and Dak Cheung District ■ Ban Nam Ngon Neua
Health Institutions	<ul style="list-style-type: none"> ■ Those who may be interested in the Project mitigation plan and development opportunities, such as potential partners in the livelihood restoration programs, community health and safety awareness programs, etc. ■ Have potential for the Project to utilise as an information disclosure channels to disclose information of the Project. 	<ul style="list-style-type: none"> ■ Community Hospital of Dak Cheung District ■ Sanxay District Hospital ■ Xieng Luang Dispensary, Dak Dor Dispensary and Dak Run Dispensary in Dak Cheung District ■ Dak Samor Dispensary and Nam Ngon Neua Dispensary in Sanxay District
Local Officials and Elected Officials ³³	<ul style="list-style-type: none"> ■ Interested in priority development project in their jurisdiction Represent the interest of the PAPs. 	<ul style="list-style-type: none"> ■ Village heads of all 32 affected villages ■ District heads of Dak Chueng and Sanxay Districts ■ Governor of Sekong and Attapeu Provinces
Local Services and Businesses	<ul style="list-style-type: none"> ■ May be interested in the Project mitigation plan and development opportunities such as Project procurement programs, business training opportunities (i.e., accommodation providers, service providers). 	<ul style="list-style-type: none"> ■ Retail shops ■ Industrial factories such as rice mill, automobile repair shops, drinking water factory, ice-making factory, and furniture factory

³³ The village authorities (village heads or "Nai Baan" and their deputies are elected by villages, while other officials at district and provincial level are appointed. Also, the members of the National Assembly are chosen by nationwide elections.

Stakeholder Group	Interest and Role in the Project	Description and Relevant Stakeholders
Media	<ul style="list-style-type: none"> ■ May have an interest in the priority development projects in Lao PDR, particularly in the area of human rights risks and impacts 	<ul style="list-style-type: none"> ■ Local media ■ Social media such as Facebook
Financiers	<ul style="list-style-type: none"> ■ Provide funding for the costs associated with the technical advisory and program management of the Project. ■ Ensuring the Project manages environmental and social risks and impacts according to plans through a due diligence process. 	<ul style="list-style-type: none"> ■ Equator Principles Financial Institutions (EPFIs) ■ Asian Development Bank (ADB) ■ Japan International Cooperation Agency (JICA) ■ Asian Infrastructure Investment Bank (AIIB)
Foreign Government Multilateral Agencies	<ul style="list-style-type: none"> ■ May be interested in the priority development projects, particularly in the area of human rights risks and impacts. 	<ul style="list-style-type: none"> ■ Government of Vietnam ■ International Union for Conservation of Nature (IUCN) ■ World Health Organisation (WHO) ■ International Labour Organization (ILO) ■ The United Nations Educational, Scientific and Cultural Organization (UNESCO)
Internal Stakeholders	<ul style="list-style-type: none"> ■ Includes but not limited to: supervision consultants, suppliers, Construction Contractors and Contractor's workforce, sub-contractors, etc. who take part in the planning approval, construction, and operation of the Project, who are responsible for fulfilling the contractual obligations to ensure overall success of the Project. 	<ul style="list-style-type: none"> ■ MWPC ■ EPC Contractor ■ O&M Contractor ■ Consultants ■ Workers

7.1.2 Stakeholder Mapping

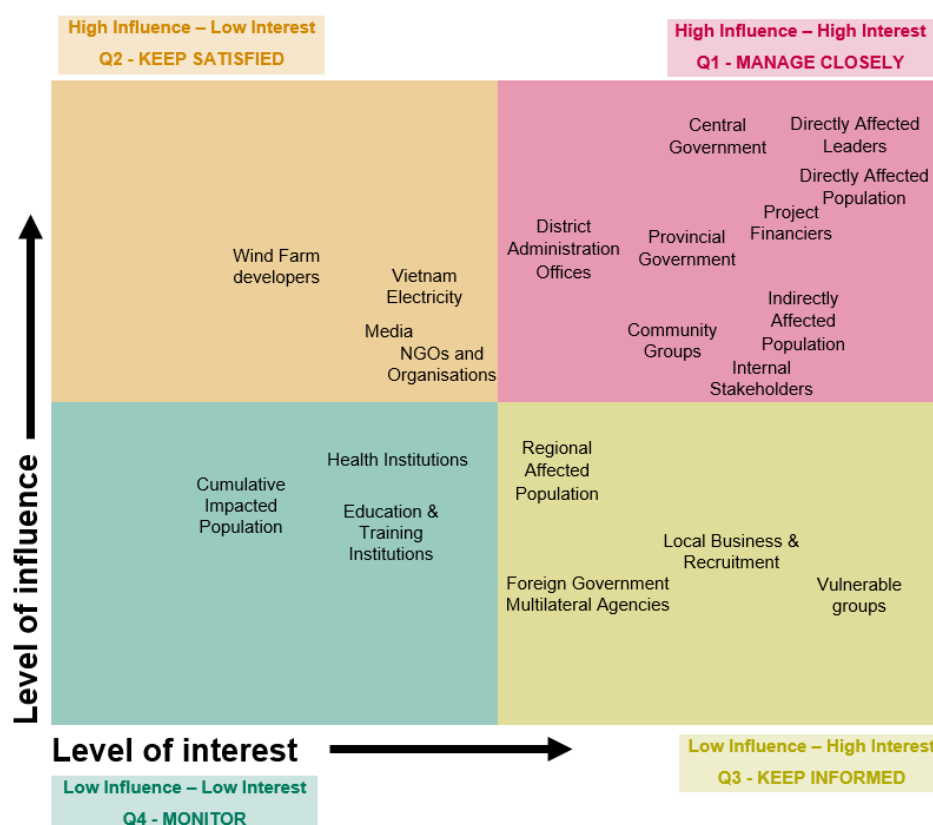
A stakeholder mapping exercise was undertaken to identify and prioritise the Project stakeholders as well as identify issues likely to be of concern to each of the different stakeholders. The matrix presented in **Figure 7.1** categorises stakeholders based on their interest in and influence over the Project.

- **Influence:** Refers to the power stakeholders have over a project, including the ability to affect or influence decisions and facilitate its implementation.
- **Interest:** Refers to the priority given by the company to considering and accommodating the stakeholder's needs and interests.

The outcome helps determine the level of engagement and the types of tools that will be used to consult with different stakeholders/stakeholder groups. The mapping exercise categorises stakeholders as follows:

- The stakeholders that appear in the top right quadrant (i.e. in Quadrant 1) are those that need to be managed closely (i.e. the stakeholders that need to be proactively engaged on a regular basis and engagement efforts should be focused on this group). This is because these are the stakeholders that are most interested in the Project and have the potential to influence its outcome (i.e. the ability of the Project to go ahead).
- The stakeholders that appear in Quadrant 2 and Quadrant 3 need to be kept informed – i.e. provided information and consulted on issues of interest to the stakeholders.
- Stakeholders in Quadrant 4 need to be monitored – i.e. informed of key Project aspects. It is important to track if their level of interest or influence changes.

Figure 7.1: Preliminary Stakeholder Mapping Results



Different stakeholder engagement strategies are employed based on the categorisation of the stakeholders; whereby stakeholders with higher levels of influence and interest will be engaged to a greater extent (**Table 7.2**).

Table 7.2: Stakeholder Engagement Strategies

Q4 - Monitor	Q3 - Keep Informed	Q2 - Keep Satisfied	Q1 - Manage Closely
<ul style="list-style-type: none"> Inform via public communications (for example through the Project website and press communications) Respond to direct requests for further information and conduct engagement if the stakeholders ask to be consulted Monitor for feedback. 	<ul style="list-style-type: none"> Make use of interest by informing in low risk areas Inform and consult in interest areas Respond to direct requests for further information. 	<ul style="list-style-type: none"> Keep engaged and consult regularly Seek to obtain their support and technical guidance, where relevant Be proactive in communication, provide information and seek views at regular intervals. 	<ul style="list-style-type: none"> Inform and consult in interest areas by formal communications such as meetings, letters, written documents Involve in governance and decision-making, as appropriate Maintain ongoing engagement and work collaborative on areas of mutual interest.

The stakeholder list as well as stakeholder analysis and mapping will continue to be revised and incorporated into the SEP revisions according to the ongoing receipt of comments and input from local, national, and international stakeholders directed to the Project.

7.2 Past Consultation and Disclosure

This section provides a summary of stakeholder engagement activities that were undertaken as part of the Planning and Approval phase of the Project.

7.2.1 Local EIA Consultation

Stakeholder engagement activities were undertaken as part of the local EIA report preparation (as detailed in **Chapter 7— Public Consultation and Participation**). Stakeholder engagement activities aimed to inform and receive feedback on the Project, understand and explain the Project's potential social and environmental impacts, and provide updates on the progress.

PAPs and relevant participants such as governmental organizations and relevant Ministries were included in the stakeholder engagement activities. Such activities included consultation meetings at the village level (November 2014 and September 2020), district level (May 2016), and a meeting with technical personnel prior to endorsement of the EIA (July 2018).

Local EIA stakeholder engagement is summarised in **Table 7.3**.

Key stakeholder issues and concerns raised, and feedback received during the consultations included:

The Project should provide funding and assistance to improve water supply system (e.g., gravity-fed) to the villages and irrigation systems for rice paddies.

- The Project should help to improve the access road to the village and within village and the access roads to production land e.g., rice, coffee, and cassava plantations.
- The Project should provide funding and assistance to establish and improve school facilities, supplies and personnel.
- The Project should provide funding and assistance to establish and improve dispensary and healthcare centres in the villages.
- The Project should provide funding assistance to establish a village administrative office.
- People in the potentially affected villages should be able to benefit (i.e., access to electricity generated by the Project).
- The Project should provide reasonable and fair compensation to those households affected by land acquisition.
- The Project should provide assistance to poor families in the affected villages. In addition, the Project should provide assistance for improvement of vocations in the villages and offer job opportunities for the village members to work on the Project.
- Request for the Project to provide financial support to the villages/village fund/monthly tax to the villages.

Refer to **Appendix G** for detailed summary of EIA consultation.

Table 7.3: Summary of Local EIA Stakeholder Engagement

Date	Objectives	Location	Location and Participants	Issues / Concerns / Expectations	Considerations in the ESIA and/ or Project Design
12-21 Nov 2014	Dissemination of information and consultation at village level	16 villages located in the Project area and nearby areas ³⁴	Direct and indirect PAPs	<ul style="list-style-type: none"> ■ The Project should provide funding and assistance to improve water supply system (e.g., gravity-fed) to the villages and irrigation systems for rice paddies. 	<ul style="list-style-type: none"> ■ Information dissemination is be considered in the ESIA and SEP. A SEP will be prepared for the Project including future and on-going engagement required to ensure stakeholders are provided sufficient information on the potential impacts.
7-26 Sep 2020	Dissemination of information related to change of location and boundaries of wind turbine towers, benefits, and potential impacts of the Project. In addition, conducted consultation at village level	18 village located in the Project area ³⁵	Direct and indirect PAPs	<ul style="list-style-type: none"> ■ The Project should help to improve the access road to the village and within village and the access roads to production land e.g., rice, coffee, and cassava plantations. ■ The Project should provide funding and assistance to establish and improve school facilities, supplies and personnel. ■ The Project should provide funding and assistance to establish and improve dispensary and healthcare centres in the villages. ■ The Project should provide funding assistance to establish a village administrative office. ■ People in the potentially affected villages should be able to benefit (i.e., access to electricity generated by the Project). ■ The Project should provide reasonable and fair compensation to those households affected by land acquisition¹ 	<ul style="list-style-type: none"> ■ The impact assessment including information on mitigation measures for the social receptors is provided in Section 9.5 of the ESIA Report. ■ Impacts to livelihoods and land use, including rice paddies, is included in Section 8.5.3 of the ESIA Report. This includes proposed mitigation measures. ■ Land and economic displacement are assessed in Section 9.5.3 of the ESIA Report. This includes proposed mitigation measures. The Project will ensure all required processes for land acquisition are conducted in conjunction with relevant stakeholders. ■ Impacts and processes for land acquisition are provided in Section 9.5.3 of the ESIA Report. Note that this is based on preliminary land and asset registration undertaken by Innogreen in November and December 2021. ■ Village heads will be informed prior to construction, this commitment is included

³⁴ Due to changes to Project design and layout over time, some of the villages previously consulted are not the same as the current 32 villages that were considered in the ESIA.

³⁵ Ibid.

Date	Objectives	Location	Location and Participants	Issues / Concerns / Expectations	Considerations in the ESIA and/ or Project Design
				<ul style="list-style-type: none"> ■ The Project should provide assistance to poor families in the affected villages. In addition, the Project should provide assistance for improvement of vocations in the villages and offer job opportunities for the village members to work on the Project. ■ Request for the Project to provide financial support to the villages/village fund/monthly tax to the villages. 	in Section 10 (ESMP) of the ESIA Report.
May 2016	Consultation at district level	District Administration Office of Dak Cheung District	Deputy Chief of Dak Cheung District and Sanxay District, Deputy Provincial of Department of Natural Resources and Environmental of Sekong Province and Attapeu provinces, and other participants, totaling to 70 persons	<ul style="list-style-type: none"> ■ The general opinions show agreement and consensus with the construction and development of the 600 MW Monsoon Wind Farm Project. ■ Request to have the Environmental Management and Monitoring Plan including the Socio-Economic Development Plan and budget of this investment project. ■ Request to conduct detailed study of data on impacts to the peoples and to closely coordinate with the locality to clearly determine compensation for production land of the peoples; and to ensure the coordination and consultation in each level to create awareness and understanding about this project development plan. Request to increase the technical information of the project to allow to know the risks and impacts and avoid the anxieties relating to the construction of the project. ■ Request to conduct the study on the impacts in each phase of the project and the activities of the project in a 	<ul style="list-style-type: none"> ■ The impact assessment including information on mitigation measures for the social receptors is provided in Section 9.5 of the ESIA Report ■ Impacts to livelihoods and land use, including rice paddies, is included in Section 9.5.3 of the ESIA Report. This includes proposed mitigation measures. ■ Impacts to community health and safety are assessed in Section 9.5.4 of the ESIA Report. This includes proposed mitigation measures. ■ Information dissemination will be considered in the ESIA and SEP. A SEP will be prepared for the Project including future and on-going engagement required to ensure stakeholders are provided sufficient information on the potential impacts. ■ Land and economic displacement are assessed in Section 9.5.3 of the ESIA Report. This includes proposed mitigation measures. The Project will ensure all required processes for land acquisition are conducted in conjunction with relevant stakeholders

Date	Objectives	Location	Location and Participants	Issues / Concerns / Expectations	Considerations in the ESIA and/ or Project Design
				<p>detailed and clear manner and make comparison of the data of the environmental standards values in the project area.</p> <ul style="list-style-type: none"> ■ Request to contribute to assist in the construction and improvement of infrastructure, improvement of livelihood of the people in the project area to ensure public participation in various activities of the project. 	–
July 2018	Consultation Meeting at Technical Level to endorse the EIA report (dated September 2020)	Meeting room of the Provincial DONRE if Sekong Province	General Director of DONRE Policy, Deputy Director of Provincial DONRE of Sekong and Attapeu Provinces, and participants from other agencies of central, provincial and district levels, totaling to 63 participants	<ul style="list-style-type: none"> ■ The opinions and proposals of the participants of this meeting may be summarized as follows: ■ The study on risk of impacts shall separate and analyze to allow to clearly see the direct impacts and indirect impacts, such as: ■ Impact on production land. ■ Impact on area which is overlapping with the area of other development project located nearby. ■ Plan of the access road to the tower foundations. ■ Budget for environmental management activities. ■ Plan of road use for transport of materials to the project. ■ Wastes and wastewater management. ■ Supervision of workers. ■ Plan of management and restoration of borrow pits. ■ Prohibitions of the project relating to the environmental management, such as: hunting, logging, fishing, etc. ■ Impact on forests; and 	<ul style="list-style-type: none"> ■ Impacts to livelihoods and land use, including rice paddies, is included in Section 9.5.3 of the ESIA Report. This includes proposed mitigation measures ■ The impact assessment including information on mitigation measures for the social receptors is provided in Section 9.5 of the ESIA Report. ■ Impacts and processes for land acquisition are provided in Section 9.5.3 of the ESIA Report. Note that this is based on preliminary land and asset registration undertaken by Innogreen in November and December 2021. ■ Land and economic displacement are assessed in Section 9.5.3 of the ESIA Report. This includes proposed mitigation measures. The Project will ensure all required processes for land acquisition are conducted in conjunction with relevant stakeholders.

Date	Objectives	Location	Location and Participants	Issues / Concerns / Expectations	Considerations in the ESIA and/ or Project Design
				<ul style="list-style-type: none"> ■ Impact on birds. ■ In order to ensure clear analysis of the risk of impacts on each aspect, it is required to make more detailed and clearer analysis, such as: ■ The impact assessment shall be based on each activity of the project and shall be summarized in the table that show the impacts in full. ■ Data of the project development plan to allow to see the overall picture of the project development plan. 	
July 2018	Consultation meeting at Provincial/Central level	Information has not been included in the EIA	Information has not been included in the EIA	<ul style="list-style-type: none"> ■ The general opinions show agreement and consensus with the construction and development of the 600 MW Monsoon Wind Farm Project. ■ Request to have the Environmental Management and Monitoring Plan including the Socio-Economic Development Plan and budget of this investment project. ■ Request to conduct detailed study of data on impacts to the peoples and to closely coordinate with the locality to clearly determine compensation for production land of the peoples; and to ensure the coordination and consultation in each level to create awareness and understanding about this project development plan. Request to increase the technical information of the project to allow to know the risks and impacts and avoid the anxieties relating to the construction of the project. 	<ul style="list-style-type: none"> ■ The impact assessment including information on mitigation measures for the social receptors is provided in Section 9.5 of the ESIA Report ■ Impacts to livelihoods and land use, including rice paddies, is included in Section 9.5.3 of the ESIA Report. This includes proposed mitigation measures. ■ Impacts to community health and safety are assessed in Section 9.5.4 of the ESIA Report. This includes proposed mitigation measures. ■ Information dissemination will be considered in the ESIA and SEP. A SEP will be prepared for the Project including future and on-going engagement required to ensure stakeholders are provided sufficient information on the potential impacts. ■ Land and economic displacement are assessed in Section 9.5.3 of the ESIA Report. This includes proposed mitigation measures. The Project will ensure all required processes for land acquisition

Date	Objectives	Location	Location and Participants	Issues / Concerns / Expectations	Considerations in the ESIA and/ or Project Design
				<ul style="list-style-type: none"> ■ Request to conduct the study on the impacts in each phase of the project and the activities of the project in a detailed and clear manner and make comparison of the data of the environmental standards values in the project area. ■ Request to contribute to assist in the construction and improvement of infrastructure, improvement of livelihood of the people in the project area in order to ensure public participation in various activities of the project. 	are conducted in conjunction with relevant stakeholders

Source: ESIA dated September 2020

7.2.2 ESIA, RP and CEGDP Consultations

7.2.2.1 Consultations in November and December 2021

Consultation for the supplementary ESIA was conducted in November and December 2021 with focuses on:

- Disclosing updated Project information and development status to the 32 potentially affected communities and other stakeholders including the supplementary ESIA studies, the risks, impacts, and opportunities for the Project.
- Providing the affected communities and stakeholders with opportunities to express their views on Project risks, impacts, and mitigation measures.
- Soliciting stakeholders' ideas, opinions, and recommendations on various alternatives.
- Assessing the level of stakeholder interest and support for the Project and enable stakeholder views to be taken into account in Project design and environmental and social mitigation measures as well as development of benefits and opportunities.
- Undertaking extensive stakeholder engagement for land acquisition and resettlement.

Consultation was planned to be carried out in a village meeting format that was appropriate to the cultural norms of the potentially affected communities. Consultation was also planned to be provided as part of focus group discussions (FGDs) with women, youth, and ethnic community members in the PAPs. However, due to the COVID-19 pandemic, government restrictions were imposed on the provinces where the Project is located, for the majority of the duration in the second half of 2021. As such, the Project was not able to undertake consultation in large group, and FGDs in small groups were conducted instead. The local villagers were also hesitant to engage in group activities due to the risk of spreading COVID-19. The Project team was apprehensive of potential risks associated with the undertaking of the consultation plan, so a modification to the plan was implemented with an aim to fill the consultation gaps while respecting the needs to have a COVID-19-safe field operation during the pandemic.

Accordingly, modification of the consultation plan consisted of:

- Consultation with individuals during the household socio-economic surveys of the affected population.
- Consultation during key informant interviews with village leaders, teachers, healthcare workers, religious leaders, and others; and
- Consultation (FGD) with representatives of women groups, youth groups, livelihood groups, ethnic minority groups.

A total of 345 people were consulted during the process through FGDs and Key Informant Interview (KIIs), in which 181 were women, 76 were ethnic group representatives and 75 were youth representatives. As prior engagements suggest that most of the local communities can communicate in Laos, the engagement was therefore conducted in Laos and translated to Triang language with the help of the Project's village coordinators or in some meetings by village heads. **Figure 7.2** illustrates how FGDs were carried out while ensuring COVID-19 safety measures i.e., face masks for all participants and social distancing while conducting FGDs.

Prior to conducting FGDs and KIIs, information related to the Project was provided to the participants to ensure that the following consultations will be meaningful and informed. In Dak Tiem village (the first village engaged), presentation about the Project was provided to group of participants as shown in **Figure 7.3**. This approach in particular was able to provide visual information which facilitated the participants' understanding of the Project impacts. COVID-19 safety measures ensured the safety for all participants with face masks handed out to all participants before joining the session. Due to Covid-19 outbreak situation, it was not possible to carry out this approach in the remaining villages.

Alternatively, brief Project information was given in smaller groups to all FGD groups prior to the start of FGD and a banner providing Project information (**Figure 7.5**) was displayed in the villages. The information on the banner included Project location, Project components, example visual of wind farm project and Project's number for the villagers to contact in case of any questions or concerns arise. This grievance channel was also informed to people during FGDs/KIIs.

Figure 7.2: FGDs Activities



FGD with women group in Dak Dom Village



FGD with women group in Dak Ta-ok Noi Village



FGD with Youth representative in Dak Yen Village



FGD with Youth representative in Dak Yang Village



FGD with livelihood group in Dak Xeum Village



FGD with livelihood group in Dak Nong Village

Figure 7.3: Project Information Disclosure



Project information disclosure at Dak Tiem Village on 8 November 2021

The Project information that was disclosed during the consultation include:

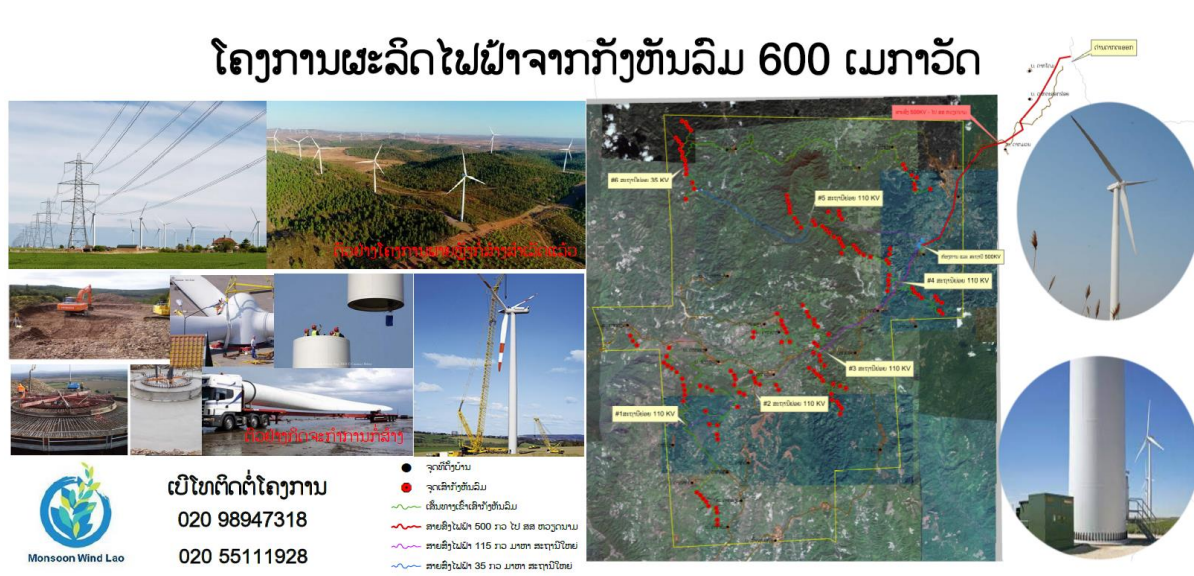
- Project Location, Project lifecycle, and Project Components (WTGs, Transmission Lines, Sub-stations, etc.)
- Project schedule and Project activities in each phase
- Potential Physical, Biological and Social Impacts of the Project
- Potential Project land acquisition impact (requirement of land for WTG construction, internal road, transmission line, etc.)
- Land acquisition and compensation process
- Visuals to demonstrate Project activities
- Potential Physical, Biological and Social Impacts of the Project
- Potential benefits and opportunities for the villagers
- The Project Owner's policy

Example of PowerPoint presentation used for Project information disclosure is provided in **Figure 7.4** and the full PowerPoint presentation to **Appendix H**.

Figure 7.4: Project Information Disclosure Material (PowerPoint)



Figure 7.5: Project Information Disclosure Material (Banner)



A summary of supplementary ESIA consultation is provided in **Table 7.4** and further detailed in **Appendix I** and the questionnaire guide for FGDs/KIIs is provided in **Appendix J**. Key stakeholder issues and concerns raised and feedback received during the consultation include are included in **Table 7.5**.

Table 7.4: Summary of Supplemental ESIA Stakeholder Engagement

Date	Objectives	Participants	Location	Outcomes
06 Oct - 23 Nov 2021	<ul style="list-style-type: none"> ■ Dissemination of information ■ Consultation at village level (through FGDs and KIIs) ■ Social baseline data collection through socio-economic HH survey and FGDs and KIIs 	Direct and indirect PAPs	23 villages located in Dak Cheung District, Sekong Province	<ul style="list-style-type: none"> ■ Collect socio-economic data to update the social baseline ■ Consult with PAPs on the Project development and obtain opinions, suggestions and concerns of affected households and communities (Refer to Table 7.5).
	○ KIIs with local authorities	23 village heads of the affected villages		
	○ FGDs with livelihood groups	69 farmers, livestock, laborers, NTFPs collection		
	○ FGD with women groups	82 women		
	○ FGD with ethnic groups	56 ethnic group representatives (41 Triang; 4 Katu; 9 Yae; and 2 Lao)		
	○ FGD with youth groups	57 youth		
	○ KIIs with healthcare personnel	9 healthcare personnel		
	○ NGO (CARE)	1 CARE representative ³⁶	Dak Cheung District	<ul style="list-style-type: none"> ■ Consult with NGO representative on community needs, active NGOs, and their programs in local communities (Refer to Table 7.5).
06 - 10 Dec 2021	<ul style="list-style-type: none"> ■ Dissemination of information ■ Consultation at village level (through FGDs and KIIs) 	Direct and indirect PAPs	8 villages located in Sanxay District, Attapeu Province	<ul style="list-style-type: none"> ■ Collect socio-economic data to update the social baseline

³⁶ Representative of CARE, an NGO active on gender, food security, livelihood and assistance to vulnerable groups was present in Dak Cheung District for the KII. The programs that they have been implemented in Dak Cheung District include:

- In department of health CARE and partnership run Reproductive Maternal New-Born Child and Adolescent Health (RMNCH) in all health centre and hospital;
- CARE have farmer work of Gender Equality and Women's Empowerment by support the coffee cultivation and make women's group;
- Another that CARE Foods security program and assistance to valuable people.

Other existing NGOs in Dak Cheung District include Promotion of Family Health Association (PFHA) focus on health promotion, Service Fraternel d'Entraide (SFE) and World Food Program.

However, it was noted that these NGOs do not have working unit/representative stationed in Dak Cheung District, they would come to the District to implement/monitor their programs annually, once in two years or once in 3-4 years.

Date	Objectives	Participants	Location	Outcomes
	<ul style="list-style-type: none"> ■ Social baseline data collection through socio-economic HH survey and FGDs and KIIs 			<ul style="list-style-type: none"> ■ Consult with PAPs on the Project development and obtain opinions, suggestions and concerns of affected households and communities (Refer to Table 7.5).
	<ul style="list-style-type: none"> ○ KIIs with local authorities 	8 villages heads of the affected villages		
	<ul style="list-style-type: none"> ○ FGDs with livelihood groups 	20 farmers, livestock, laborers and NTFPs collection		
	<ul style="list-style-type: none"> ○ FGD with women groups 	17 women		
	<ul style="list-style-type: none"> ○ FGD with ethnic groups 	20 ethnic group representatives (17 Triang and 3 Ar Luk)		
	<ul style="list-style-type: none"> ○ FGD with youth groups 	18 youth		
	<ul style="list-style-type: none"> ○ KIIs with healthcare personnel 	3 healthcare personnel		
May – July 2022	<ul style="list-style-type: none"> ○ Conduct DMS survey 	Affected households from Project land acquisition	32 villages in the Project development area	<ul style="list-style-type: none"> ■ Conduct DMS to collect data on Project's land acquisition impact

Source: FGDs and KIIs undertaken by Innogreen in November and December 2021

Table 7.5: Key Stakeholder Concerns and Relevance for the Supplemental ESIA and Various Management Plans

Stakeholder Concerns/ Expectations	Relevant ESIA and Management Plan Considerations	Actions Taken
The Project should minimise impacts to sensitive receptors and houses and paddy field as much as possible.	The impact assessment including information on mitigation measures for the social receptors is provided in Section 9.5 of the ESIA Report.	Impacts were minimized by reducing the number of WTGs under a new design and avoiding houses and paddy fields. WTGs have been relocated to ensure distance from villages. The nearest WTG to village is located more than 500 m from the village
The Project development will impact the cultivation land, particularly rice paddy field as suitable land for rice cultivation is highly limited due to mountainous terrain of the region.	RP and livelihood restoration programs have been developed The Project will follow land acquisition procedure and implement livelihood restoration programs as outlined in the RP	Impacts were minimized by reducing the number of WTGs under a new design and avoiding houses and paddy field
The Project should ensure that there will be no encroachment into villagers' land containing houses/dwellings.	The Project will not impact residential houses.	Impacts were minimized by reducing the number of WTGs under a new design and avoiding houses and paddy field
Concern about nuisance from noise from wind turbines during operation.	Noise impacts (including from turbines) are assessed in Section 9.3.7 and Section 9.5.7 of the ESIA Report. This includes proposed mitigation measures.	WTGs have been relocated to ensure distance from villages. The nearest WTG to village is located more than 500 m from the village
Concern about nuisance from shadow flicker and negative impacts on agricultural productivity.	Shadow flicker impacts are assessed in Section 9.3.10 and Section 9.5.7 of the ESIA Report. This includes proposed mitigation measures.	WTGs have been relocated to ensure distance from villages. The nearest WTG to village is located more than 500 m from the village
Concern that the Project development may impact cemeteries of the village.	The Project will not affect cemeteries.	Impacts were minimized by re-routing of transmission line and access road to avoid all cemeteries
Some people expressed that they cannot articulate their concerns as they do not have sufficient information about the Project and its potential impacts	Information dissemination will be considered in the ESIA and SEP. A SEP (this document) has been prepared for the Project including future and on-going engagement required to ensure stakeholders are provided sufficient information on the potential impacts.	Project Information disclosure and consultations were conducted in July 2022. Refer to Section 7.2.2.3 for more details.
Concerns about unfair compensation for those impacted by land acquisition of the Project, and there will be no replacement land for cultivation and animal husbandry and therefore people will lose their main source of livelihood.	RP and livelihood restoration programs have been developed. The Project will follow land acquisition procedure and implement livelihood restoration programs as outlined in the RP	N/A
Concerns around safety of life and property and livestock of households	Impacts to community health and safety are assessed in Section 9.5.4	N/A

Stakeholder Concerns/ Expectations	Relevant ESIA and Management Plan Considerations	Actions Taken
nearby the wind towers and safety of those that conduct agricultural activities under the transmission line.	of the ESIA Report. This includes proposed mitigation measures.	
Prior to commencement of the Project construction, the village heads should be informed.	Village heads will be informed prior to construction, this commitment is included in Section 10 (ESMP) of the ESIA Report.	N/A
The people in the affected villages were not sure if they can use electricity generated by the Project.	Household solar power systems will be provided to the affected villages. Priority will be given to the households affected by the Project's land acquisition, then poor households within the Project's affected communities, and finally the entire the affected villages if possible. Refer to Section 9.5.2 and CEGDP for more details.	During the consultation with villages in July 2022, it was clarified to the villagers that they will be provided with solar power system, not electricity generated by the Project
During construction and operation of the Project, there will be influx of workers and people from outside to the villages. There are concerns that these people may bring transactional sex to villagers, disrupt community dynamics, increase gender-based violence, and/or negatively impact on public infrastructure and resources.	Impacts from worker influx are assessed in Section 9.5.6 of the ESIA Report. Local Content and Influx Management Plan and Worker Code of Conduct will be developed.	N/A
Concerns about the Project's impact on landslides	Impacts from unplanned events (including those impacts as a consequence of natural hazards) are assessed in Section 9.6.3 of the ESIA Report. This includes proposed mitigation measures.	NA
Concerns about the Project's impacts to forest resources as people are highly dependent on NTFP collection from the forests.	Impacts on communities' livelihoods associated with NTFPs are assessed in Section 9.5.3 of the ESIA Report. This includes proposed mitigation measures. Livelihood restoration programs and CEGDP has been prepared to address impacts to livelihood due to loss of NTFP collection area.	NAThe reduction in number of WTGs from 148 to 133 reduced impacts to NTFP collection area by 57.55 ha

The general opinions of stakeholders engaged in FGDs and KIIs show that the majority of the people agree with the development of the Project. This is because they perceive various benefits associated with the Project, particularly economic opportunities. They believe that the Project will create more job opportunities for the people in the villages, new developments will come with Project development such as improved road connections and other facilities, the opportunity to increase tourism due to the wind farm being a new tourist attraction.

In addition to the main concerns provided in **Table 7.5**, the stakeholders engaged in FGDs and KIIs also provided suggestions to the Project which reflect communities' needs:

- The Project should provide support and assistance to improve agriculture and livestock to increase productivity.
- The Project to provide support to improve and enhance coffee plantations and coffee market linkage, coffee initiatives to promote coffee product development, factory, and store for coffee products.

- The Project should provide electricity for those households that currently do not have access to the grid and public infrastructure (e.g., schools, healthcare centres) should also have access to electricity from the Project.
- The Project should help improve marketing and trading of agricultural products such as coffee, rice and fruits and create road connection to the markets.
- The Project should provide assistance to improve health facilities.
- The Project should provide assistance to improve education such as building school facilities and providing school supplies.
- The Project should provide assistance to poor households.
- The Project should have programs to improve nutrition and food sufficiency of the villages.
- The Project should improve infrastructure in the villages including water supply system, irrigation, and telephone signal.
- The Project should create new employment opportunities for the villages such as recruitment of local labours to work in the Project development.
- The Project should provide training opportunities for youth in the affected villages as this will help them in accessing job opportunities.

7.2.2.2 *Consultations Conducted by the Compensation Committee on Unit Compensation Rates*

Dak Cheung District, Sekong Province

On 17 February 2022, Dak Cheung District Governor and Department of Natural Resources and Environmental and other relevant authorities, the Project developer and its local E&S consultant, and village heads from 23 villages in Dak Cheung District. Total participants of 61 people (of which 12 were women)

The meeting agreed on the affected area from the Project land acquisition—total affected area of 748.88 ha (136.7 ha permanently affected and 612.18 ha temporarily affected). Of this affected land 139.31 ha are agricultural land (6.45 permanently affected and 132.86 temporarily affected). The impact is from land acquisition for 128 WTGs, access roads, 4 substations, 115 kV and 35 kV transmission line and one 500 kV substation.

The meeting agreed that the Project land acquisition impacts 23 villages in Dak Cheung Province. A total of 242 households are to be affected (138 households will be impacted from WTGs and 104 households will be impacted from 500 kV transmission line)

The meeting agreed for the Provincial Compensation Committee undertaken determination compensation unit rates

It was recommended for the Project developer to participate with the Provincial, District and Village authorities to undertake DMS which should be approved by affected households and village heads. Thereafter, compensation costs should be calculated for affected households.

After compensation costs are calculated, the authorities suggested that the Project developer organize a meeting to inform affected households of compensation amount in all villages, including calculation methods. Following this, the Provincial and District Committee, together with the Project developer will notify the affected households of final compensation costs and obtain their signature prior to compensation payment.

Minute of meeting of this meeting (refer to ESIA **Appendix K**)

On 31 March 2022, the Vice Governor of Sekong and the relevant provincial and district, and Project developer and its E&S consultant (total 28 participants, of which 3 are female) to approve compensation unit rates for 600 MW wind farm project and 500 kV transmission line.

The Provincial Compensation Committee presented draft compensation unit rates to the meeting, the meeting consulted regarding the compensation unit rates and agreed on the followings:

The meeting agreed and approved the draft compensation unit rates

The Compensation Committee should include comments and recommendations from this meeting to revise the compensation unit rates. The determination of compensation unit rates should be based on the standard price outlined by relevant department (e.g., land department and forestry and agriculture department) and to confirm the price with these respective departments. In addition, the compensation units should also reflect the current market price.

The Compensation Committee to complete unit compensation rates revision by 18 April 2022 to be presented to the District Governor.

Minute of meeting of this meeting (refer to ESIA **Appendix L**).

Sanxay District, Attapeu Province

The Committee conducts a market price survey of affect assets and consults with project affected villages unit compensation rates for various types of assets on 30 March 2022 with five villages including Dak Nong, Dak Padou, Dak Samor, Dak Xeum, and Dak Yok with the District Committee. It was observed that at the end of each minute of meetings, presented a list of compensation unit rates discussed with the village representatives. Minute of meeting of this meeting (refer to ESIA **Appendix M**)

On 12 May 2022, the meeting was held to report on the consultation on compensation unit rates with village head and affected households conducted in March-April 2022 and approve compensation unit rates.

During 30-31 March and 1-2 April 2022, Provincial, District and Village Compensation Committee agreed on compensation unit rates. A total of 8 villages within Sanxay District will be impacted, summary of impact and compensation unit rates are as follows:

Dak Nong Village: Impacts from 115 kV transmission line and 2 WTGs. Communal land and agricultural land are impacted. The Compensation Committee presented the compensation unit rates to land and crops to the village head and one affected household. The meeting agreed on the followings with the village head and affected households:

- Coffee (less than 2 years old) 15,000 LAK and improved the price for coffee plants older than 2 years
- Small coffee 90,000 LAK and large coffee 100,000 LAK
- Cost for Heet-Kong (in Triang language Heet-Kong means inherited traditions or ritual practices and Kong meaning social norms, customs, or guidelines) of the village 3,3400,000 LAK
- Additionally, the village requested the Project to provide scholarship for students, water supply, vehicles for the village, village office (e.g., computer) and toilets.

Dak Samor Village: 3 WTGs impacts productive and communal forests and access road impacts 6 households and 7 land parcels. The Committee presented compensation unit rates for land and crops to affected households and village heads and the units were agreed by the village head and affected households. In addition, the Project should provide 1,670,000 LAK for Heet-Kong of the village. The village also requested the Project to support on water supply (Nam Lin) and provide electricity for new houses.

Dak Yok Village: Communal land will be impacted by 2 WTGs. The Committee presented compensation unit rates for land and crops to village head and the units was agreed by the village head. In addition,

the Project should provide 1,060,000 LAK for Heet-Kong of the village. The village also requested the Project to help with water supply (dug well) and village office.

Dak Xuem Village: Communal land is impacted by 6 WTGs. The Committee presented compensation unit rates for land and crops to village head and the units was agreed by the village head. In addition, the Project should provide 4,500,000 LAK for Heet-Kong of the village.

Dak Padou Village: land will be impacted by 9 WTGs, the meeting agreed on the compensation unit rates for land and crops as follows:

Recommendations from village head and affected households:

- Coffee (less than 2 years) 150,000 LAK/tree
- Coffee (3-5 years, no productivity) 350,000 LAK/tree
- Coffee (3-5 years, productivity) 400,000 LAK/tree
- Coffee (productivity) 450,000 LAK/tree
- Coffee (Noi) large size in productivity 525,000 LAK/tree

The village suggested the Project to perform ritual according to villages' Heet-Kong which costs approximately 2,134,000 LAK.

Dak Xied, Dak Dor and Namgnonnuea villages are not impacted by Project land acquisition. The Provincial Compensation Committee, Project developer and village heads agreed to perform ritual according to villages' Heet-Kong.

Minute of meeting of this meeting (refer to **Appendix N**)

7.2.2.3 Consultation and Project Information Disclosure in July and September 2022

Following the completion of ESIA study and development of management plans (MPs), information related to ESIA findings, proposed mitigation measures and MPs are disclosed to PAPs in 16 villages. The participants of the consultation include village heads and PAPs – women were ensured to participate in the sessions in all villages, Project developer (MWPCCL) and its local E&S consultant (Innogreen) and international E&S consultant (ERM), lenders' E&S representatives including ADB (and Artelia as its lender E&S advisor), DEG (also representing FMO), AIIB and JICA. The participants were asked to sign registration form as evidence of participation in the information disclosure activity (refer to **Appendix O**). The summary of July 2022 consultation is provided in **Table 7.6** and the minutes of meeting is provided in **Appendix O**.

The Project information was disclosed through presentation of ESIA study findings and proposed mitigation measures and management plans in basic Laos given by Innogreen. During the presentation, the affected people were given the opportunity to ask questions related to topics discussed, particularly women. The presenter would ask questions to the participants from time to time to ensure their understanding of topic discussed. Village coordinator and village head assisted with translating to Triang language (where needed) to facilitate the discussions and understanding of the affected people. **Figure 7.6** presents photos of information disclosure and consultation activities and **Figure 7.7** presents disclosure materials utilized and disseminated during the activities.

The presentation covers key findings of the ESIA study and proposed mitigation measures and management plan (refer to **Appendix P**), including:

- Key Project components (with photos to give clear illustration to the participants). Information on land requirements for WTGs and TLs, area of restriction within ROW including activities allowed and not allowed within the ROW.
- Project activities including construction and installation of WTGs and transmission line and transportation activities

- Key environmental impacts include topography and landscape impact, shadow flicker impact and impact to water quality during construction activities
- Key biological impacts include reduction in forest area and increased hunting and poaching associated with improved access roads
- Social impacts include land acquisition impacts, impacts to cultural heritage resources, community health and safety impact and, impacts associated with influx

Resettlement Plan:

- Village specific land requirement impacts
- Cut-off date and eligibility and entitlement
- Proposed livelihood restoration programs
- Seek to understand process and involvement of the affected people in resettlement process e.g., consultation by compensation committee on compensation unit rate
- Compensation unit rates
- Next steps to be undertaken for resettlement and compensation process

CEGDP:

- Understand community needs for CEGDP
- Proposed community and ethnic group development initiatives and programs
- Feedback from the affected people on community needs and proposed initiatives and programs

CHMP:

- Proposed mitigation measures
- Feedback from communities on village requirements for the Project to comply with villages' culture, traditions, customs

Grievance Mechanism with contact details

In addition to the presentation, disclosure booklet/handbook in Laos language (refer to **Appendix Q**) was also distributed during the consultation. The booklet covers similar key contents as the presentation but with more details for PAPs to refer to.

After the presentation, the participants were also given opportunities to ask questions, share their concerns or needs to the Project developer or the E&S consultants. The participants were consulted after the information disclosure activity with focuses on:

- Better understand the villagers' beliefs towards the Phou Koungking Mountain and the spirit that inhabits the mountain and Dak Bong cemetery.
- Solicit villagers' concerns regarding Project development in Phou Koungking area and Dak Bong cemetery.
- Understand conditions and requirements from the villagers in order for the Project to enter and develop Project components within Phou Koungking area and Dak Bong cemetery, such as particular ceremonies or rituals that should be undertaken by the Project according to the villagers' beliefs.
- To assess the impacts of project activities within the Phou Koungking and Dak Bong cemetery area against ADB's criteria for the application of BCS and IFC's criteria for the application of FPIC and to confirm that affected villages do not object to such project activities.
- Better understand needs and priority of villages for community development programs.

- Understand the general perception of villagers towards the Project and if any concerns or recommendations for the Project
- Understand resettlement and compensation process undertaken to date and participation of affected people in determination of compensation unit rates

Figure 7.6: Information Disclosure and Consultation Activities



Meetings with District and Provincial Authorities, 18 July 2022



Dak Tiem Village, 19 July 2022



Prao Village, 19 July 2022



Dak Terb, 19 July 2022



Dak Lern Village, 19 July 2022



Dak Rant Village, 19 July 2022



KII in Dak Lern, 20 July 2022



KII in Dak Lern, 20 July 2022 (Project's village coordinator (on the right) was present to facilitate translation to Tirang)

Figure 7.7: Disclosure Materials



PowerPoint Presentation and a large map



Project Information Booklet (in Laos language)

Information disclosure and consultations were undertaken with the remaining 16 villages in September 2022 with the same objectives and approach as those conducted in July 2022. The summary of July-September 2022 consultation is provided in **Table 7.6**. Minuts of meeting (in Laos and English) and attendee registration of September 2022 consultation are provided in **Appendix R**.

It was observed that the majority of the participants are in agreement with the development of the Project and no opposition to the Project was expressed. Concerns over impacts (e.g., road safety due to transportation of large project components, siltation of water supplies, and influx of workers and disturbance of cemeteries) were expressed but they were also cooperative with providing suggestions on mitigation measures to address these impacts. The communities also suggested for the Project to improve their conditions (e.g., provision of scholarships, improvement of public infrastructure and support for farm productivity) which indicates that the affected communities see the Project as a partner in local development.

Table 7.6: Summary of Consultation in July and September 2022

Date	Time	Action/Location/Participants	Key Findings/Summary	How issues or concern was addressed in Project Design or E&S Documents
Monday 18 July 2022	13:00-17:00	<p>Meetings with District and Provincial Authorities</p> <p>Location: Department of Natural Resources and Environment of Sekong Province</p> <p>Participants:</p> <ul style="list-style-type: none"> ■ Sekong governor ■ Attapeu governor ■ Dak Cheung district officers ■ Sanxay district officers 	<ul style="list-style-type: none"> ■ The provincial and district authorities are in favour of the Project and indicated to have been working with the Project developer since 2014 ■ Innogreen will provide the provincial authorities with the final DMS data by 29 July 2022 or early August, thereafter the provincial authority will proceed with issuance of official cut-off date. It was agreed that the last day of DMS survey will be used as cut-off date i.e., 21 June 2022 for Dak Cheung District and 18 June 2022 for Sanxay District. ■ Compensation Committee consisting provincial and district authorities and Project developer was established. The Committee consulted affected people on compensation unit rates in the process of determining compensation unit rates ■ The authority is working with MWPCL to identify replacement land. However, replacement land for particularly paddy field is limited in this area. Livelihood restoration plans such as livestock raising, or improved agriculture will need to be in place to ensure the livelihood and quality of life of affected people are equal or better than pre-land acquisition impact. ■ For transmission line, area within ROW (e.g., 70 m for 500 kV) annual crops and livestock are allowed. Structures and tall trees (trees should not be taller than 3 m) are not allowed. 100% compensation for structure, rice paddy compensation for 10 years of affected productivity. Compensation for trees that have to be cut. ■ It is noted that most people in this area do not have legal title to land because it is a remote area and land titling activity has not covered this area yet. For Attapeu province, land will be compensated between 25,000 – 50,000 LAK/m² depending on the type of land. <p>The resettlement and compensation process involves the following committees:</p> <ul style="list-style-type: none"> ■ Compensation committee ■ Livelihood restoration committee ■ Monitoring Committee 	<ul style="list-style-type: none"> ■ Information has been included in RP and CEGDP

Date	Time	Action/Location/Participants	Key Findings/Summary	How issues or concern was addressed in Project Design or E&S Documents
			<ul style="list-style-type: none"> With regards to grievance mechanism, if PAPs are not satisfied with compensation costs, the relevant authorities will work with PAPs on how to satisfy them. This may involve creating new occupations or sustainable livelihood restoration programs such as planting other commercial crops, cattle, tourism, etc. 	
Tuesday, 19 July 2022	09:00-12:00	<p>Consultation with Dak Tiem, Dak Xeng and Xiengluang villages</p> <p>Location: Dak Tiem School</p> <p>Participants: Village heads and villagers of Dak Tiem, Dak Xeng and Xiengluang villages (total X people)</p>	<p>Main concerns include:</p> <ul style="list-style-type: none"> Impacts to agricultural land Safety risks associated with transportation of Project components during construction. Wastewater and sedimentation from project construction activities will enter the water sources of the village Impacts of WTGs during operation to productivity of agricultural land. Noise from WTGs Dust from construction activities <p>CDP Needs and priority (Dak Tiem Village)</p> <ul style="list-style-type: none"> Healthcare facility improvement and medical supplies + transportation to healthcare facility Support to plantation of fruit trees such as pomelo, rambutan, etc. Support on education supplies and sport equipment The Project to ensure that the roads are not too dangerous and villagers can also use these Water supply and Irrigation system as the village experiences water shortage during dry season Village office with computers The Project to comply with village's Heet-Kong (Heet (long inherited traditions) and Kong (social norm, custom or guidelines)) Scholarship for higher education Livelihood/Occupation/Vocational training CDP Needs and priority (Xieng Luang Village) Irrigation system for rice paddies The Project to comply with village's Heet-Kong 	<p>Impacts to livelihoods and land use, including rice paddies, is included in Section 9.5.3 of the ESIA Report. This includes proposed mitigation measures.</p> <p>Land and economic displacement are assessed in Section 9.5.3 of the ESIA Report. This includes proposed mitigation measures. The Project will ensure all required processes for land acquisition are conducted in conjunction with relevant stakeholders.</p> <p>Noise impacts (including from turbines) are assessed in Section 9.3.7 and Section 9.5.7 of the ESIA Report. This includes proposed mitigation measures.</p> <p>Impacts associated with shadow flickers are assessed in Section 9.3.8 of the ESIA report. This includes proposed mitigation measures.</p> <p>WTGs have been relocated to ensure distance from villages. The nearest WTG to the village is located more than 500 m from the village</p> <p>Impacts on surface water quality is assessed in Section 9.3.6 of the ESIA report. This includes proposed mitigation measures.</p>

Date	Time	Action/Location/Participants	Key Findings/Summary	How issues or concern was addressed in Project Design or E&S Documents
			<ul style="list-style-type: none"> ■ Request for machinery for agriculture <p>CDP Needs and priority (Dak Xeng Village)</p> <ul style="list-style-type: none"> ■ Concerns about impact of Project land acquisition on rice paddies as currently they hardly have sufficient rice for consumption ■ Support on coffee plantation ■ The Project to comply with village's Heet-Kong ■ Support for education and scholarships for students ■ Water supply and irrigation system <p>CDP Needs and priority (Women)</p> <ul style="list-style-type: none"> ■ Healthcare facility improvement and medical supplies ■ Educational supplies ■ Support for poor facilities ■ Water supply e.g., dug well for dry season <p>CDP Needs and priority (Youth)</p> <ul style="list-style-type: none"> ■ Improve education facilities and supplies ■ Sport facilities and equipment ■ Scholarship for higher education ■ Livelihood/Vocational training ■ Project employment <p>Overall, the villagers are happy to support the Project, and that the Project will provide satisfactory compensation and cater to the village needs.. The Project should ensure compensation at market rates and compensation for booking land. In addition, the Project must consult and inform the villages prior to any activities.</p>	<p>Impacts on air quality are assessed in Section 9.3.4 of the ESIA report. This includes proposed mitigation measures.</p> <p>Shadow flicker impacts are assessed in Section 9.3.10 and Section 9.5.7 of the ESIA Report. This includes proposed mitigation measures.</p> <p>Community Health and safety impacts are assessed in Section 9.5.4 of the ESIA report. This includes proposed mitigation measures.</p> <p>RP and Livelihood restoration plan have been prepared to minimize impacts to affected people from Project land acquisition.</p> <p>CEGDP have been prepared to reflect community needs. For additional village proposals (which are currently not within CEGDP), the CEGDP developed is further processed by the Joint Committee, with assistance of the Company, undertake broad and meaningful public consultations with villagers and their leaders to confirm their desired prioritization and utilization of available fund of the CDP, as stipulated as per CA Clause 4.18.</p> <p>Village heads will be informed prior to construction, this commitment is included in Section 10 (ESMP) of the ESIA Report</p>
	09:00-12:00	<p>Consultation with Prao Village</p> <p>Location: Prao Village</p> <p>Participants:</p>	<ul style="list-style-type: none"> ■ The project has to inform the village head and villagers before construction to consider the location of camp in relation to cemetery location. 	<p>Impacts on surface water quality is assessed in Section 9.3.6 of the ESIA report. This includes proposed mitigation measures.</p>

Date	Time	Action/Location/Participants	Key Findings/Summary	How issues or concern was addressed in Project Design or E&S Documents
		Village heads and villagers of Prao, Seing A and Dak Kung Villages	<ul style="list-style-type: none"> ■ The ritual should be performed before the construction and objects to be prepared for the ritual are e.g., rice, water, sweets, etc. ■ Entry to the high elevation of Phou Koungking is not prohibited but it is difficult to access the top of Phou Koungking. Some villagers can access different elevations of Phou Koungking for NTFP. ■ Phou Koungking is the main area for NTFPs for Prao and Dak Kung villages <p>Main concerns include:</p> <ul style="list-style-type: none"> ■ Some people expressed their concerns about the water source due to road construction. ■ The Project must compensate for any impacts on land according to the laws ■ The villagers would like to know about the compensation unit rate and understand how the rates were determined <p>CDP Needs and priority</p> <ul style="list-style-type: none"> ■ The Project to provide support on village office ■ The Project to support on water supply (Nam Lin) ■ The Project to provide material support for village office ■ Request for 10 solar panels ■ The Project to build 1 school building for middle school ■ The Project to conduct detailed survey of Project impacts prior to construction <p>CDP Needs and priority (Dak Kung)</p> <ul style="list-style-type: none"> ■ The Project to support on water supply (Nam Lin) ■ The Project to develop access road to the village ■ The Project to provide assistance with land tax payment ■ The Project to consider compensation for at least 3 years for impacted land ■ The Project to assist family without toilet <p>CDP Needs and priority (Seing A)</p> <ul style="list-style-type: none"> ■ The Project to support water supply (Nam Lin) ■ The Project to support irrigation system 	<p>Village heads will be informed prior to construction, this commitment is included in Section 10 (ESMP) of the ESIA Report</p> <p>Impacts to livelihoods and land use, including rice paddies, is included in Section 9.5.3 of the ESIA Report. This includes proposed mitigation measures.</p> <p>Land and economic displacement are assessed in Section 9.5.3 of the ESIA Report. This includes proposed mitigation measures. The Project will ensure all required processes for land acquisition are conducted in conjunction with relevant stakeholders.</p> <p>Impacts on surface water quality is assessed in Section 9.3.6 of the ESIA report. This includes proposed mitigation measures.</p> <p>RP and Livelihood restoration plan have been prepared to minimize impacts to affected people from Project land acquisition.</p> <p>CEGDP has been prepared to reflect community needs. For additional village proposals (which are currently not within CEGDP), the CEGDP developed is further processed by the Joint Committee, with assistance of the Company, undertake broad and meaningful public consultations with villagers and their leaders to confirm their desired prioritization and utilization of available fund of the CDP, as stipulated as per CA Clause 4.18.</p>

Date	Time	Action/Location/Participants	Key Findings/Summary	How issues or concern was addressed in Project Design or E&S Documents
			<ul style="list-style-type: none"> ■ The Project to build/improve access road from Dak Lern and Seing A ■ The Project to provide scholarships to students and assist with employment opportunities 	<p>CHMP has been prepared in order to minimize impacts to cultural heritage resources</p> <p>Village heads will be informed prior to construction, this commitment is included in Section 10 (ESMP) of the ESIA Report</p>
	13:00-17:00	<p>Consultation with Dak Terb Village</p> <p>Location: House of Dak Terb's village head</p> <p>Participants: Village heads and villagers of Dak Terb Village</p>	<ul style="list-style-type: none"> ■ The villagers have experienced land acquisition for existing TL; therefore, they are well aware of activities allowed and not allowed within TL ROW. ■ The villagers indicated that they have never been to Phou Koungking as it is located far away from the village. They usually collect NTFP in forest nearby the village. ■ One representative from the village participated in compensation unit rate consultation with the compensation committee. Some outstanding items of unit rate compensation include Agarwood and bamboo. <p>Main concerns include:</p> <ul style="list-style-type: none"> ■ Sedimentation may enter streams which the people are dependent on for drinking and domestic water sources as a result of Project activities. (Innogreen clarified that the Project will avoid construction activities during rainy season to minimize sedimentation and erosion impact to the water courses) <p>CDP Needs and priority:</p> <ul style="list-style-type: none"> ■ Households are quite poor, they do not have sufficient income ■ Water supply and irrigation system e.g., Nam Lin ■ Some families have sufficient land but not sufficient labor to work on the land e.g., this young mother has a young child that she must tend to and therefore is not able to work on the land. The Project may provide support on livestock e.g., chickens and pigs to enable the mother to have additional income while taking care of the child at home 	<p>Impacts on surface water quality is assessed in Section 9.3.6 of the ESIA report. This includes proposed mitigation measures.</p> <p>CEGDP has been prepared to reflect community needs. For additional village proposals (which are currently not within CEGDP), the CEGDP developed is further processed by the Joint Committee, with assistance of the Company, undertake broad and meaningful public consultations with villagers and their leaders to confirm their desired prioritization and utilization of available fund of the CDP, as stipulated as per CA Clause 4.18.</p>
	13:00-17:00	<p>Dak Lern Survey and KIs (Key Informant Interviews)</p> <p>Location: Dak Lern Village</p>	<ul style="list-style-type: none"> ■ Most households in Dak Lern use timber and non- timber forest products (NTFPs) (mushroom, bamboo shoot, honey, ginseng, orchid, rattan, tiger grass etc.) from the hill of Phou Koung King. 	<p>The information has been included in the RP as baseline of livelihood and income</p>

Date	Time	Action/Location/Participants	Key Findings/Summary	How issues or concern was addressed in Project Design or E&S Documents
		Participants: Village head/ assistant village heads	<ul style="list-style-type: none"> Bamboo and tiger grass can be sold as a raw material or processed as an added value product Timber and non- timber forest products (NTFPs) collection is main income of household due to villagers collect and sell to merchant from Vietnam. 	
Wednesday, 20 July 2022	09:00-12:00	<p>Consultation with Dak Rant Village</p> <p>Location: Dak Rant School</p> <p>Participants Village heads and villagers of Dak Rant and Dak Dor villages</p>	<ul style="list-style-type: none"> The majority of attendees have been fully vaccinated (mostly 3 doses) Land acquisition for substation will affect active rice paddy and inactive rice paddy of 13 owners from Dak Bong and Dak Cheung villages. Most people have rice paddy between 1.5 – 2 ha and average production is approximately 3 tons. The villagers indicated that they have never been to Phou Koungking as it is located far away from the village. They usually collect NTFPs in forest nearby the village. To get permission to enter or construction activities in Phou Koungking, the Project must consult with Dak Lern and Prao villages. In general, the villagers indicated they have no belief around Phou Koungking (refer that we need to ask Prao and Dak Lern villages). One elderly believed that Phou Koungking is the place of origin of Dak Cheung people. However, such belief was not shared by other village members. Representative from Dak Rant village participated in compensation unit rate consultation with compensation committee, while Dak Dor representative did not. The consultation discussed compensation unit rate for coffee and cassava. Outstanding items include communal land. The villagers have not seen compensation unit rates prior to this consultation Dak Dor village identified streams near WA131 and WA132 (Huay Nong and Huay Yerng) Dak Rant village identified streams near WA048 and WA049 (Huay Rong) <p>Main concerns include:</p> <ul style="list-style-type: none"> Sedimentation may enter streams which the people are dependent on for drinking and domestic water sources as a result 	<p>Impacts on surface water quality is assessed in Section 9.3.6 of the ESIA report. This includes proposed mitigation measures</p> <p>Impacts to livelihoods and land use, including rice paddies, is included in Section 9.5.3 of the ESIA Report. This includes proposed mitigation measures.</p> <p>Land and economic displacement are assessed in Section 9.5.3 of the ESIA Report. This includes proposed mitigation measures. The Project will ensure all required processes for land acquisition are conducted in conjunction with relevant stakeholders.</p> <p>Noise impacts (including from turbines) are assessed in Section 9.3.7 and Section 9.5.7 of the ESIA Report. This includes proposed mitigation measures.</p> <p>Impacts associated with shadow flickers are assessed in Section 9.3.8 of the ESIA report. This includes proposed mitigation measures.</p> <p>WTGs have been relocated to ensure distance from villages. The nearest WTG to village is 500 m from the village</p> <p>Community Health and safety impacts are assessed in Section 9.5.4 of the ESIA report. This includes proposed mitigation measures.</p>

Date	Time	Action/Location/Participants	Key Findings/Summary	How issues or concern was addressed in Project Design or E&S Documents
			<p>of Project activities. (Innogreen: construction activities will be avoided during rainy season)</p> <ul style="list-style-type: none"> ■ Concerns about agricultural land being affected from internal road e.g., materials or waste from Project vehicles fall on their crops ■ Noise and shadow flicker impact (Innogreen: clarified that impacts will be minor) ■ Traffic safety: the Project should inform the villages on number and timing of vehicles, notify the villages in advance of transportation activities, install traffic safety signs, speed limit, avoid transportation activities during peak hours where children are travelling to and from school, training/workshop for villagers on traffic safety. ■ Concerns related to influx: inform the village of number of workers, who and where they are from, where will their accommodation be. The village will develop Village Code of Conduct outlining what activities are allowed and what not in the village area. Moreover, the village also ask to review Project's worker Code of Conduct. The Project to install signs indicating no entry to sacred area in the village such as cemetery. ■ During funeral or ceremonies, the villagers do not work and help each other preparing for such ceremony. The Project should ensure that local hired workforce is able to take a day off (with normal pay) for village ceremony and ensure that there will be no sanction for missing workdays due to village ceremonies. <p>CDP Needs and priority</p> <ul style="list-style-type: none"> ■ The Project should also provide access roads to agricultural land for the villagers ■ Vocational training for youth ■ Project employment (it was noted that there are youth in the village who graduated from college and engineering from university that will have the capacity to work for the Project) ■ Livestock raising e.g., pigs and chickens ■ Vegetable gardens (need budget and training on how to improve productivity and quality of vegetable garden) ■ Computer and desks for village office 	<p>Labour Management Plan have been prepared to include HR management that reflect local traditions of local employees</p> <p>RP and Livelihood restoration plan have been prepared to minimize impacts to affected people from Project land acquisition.</p> <p>CEGDP have been prepared to reflect community needs. For additional village proposals (which are currently not within CEGDP), the CEGDP developed is further processed by the Joint Committee, with assistance of the Company, undertake broad and meaningful public consultations with villagers and their leaders to confirm their desired prioritization and utilization of available fund of the CDP, as stipulated as per CA Clause 4.18.</p> <p>Village heads will be informed prior to construction, this commitment is included in Section 10 (ESMP) of the ESIA Report</p> <p>Code of Conduct will be developed by the Project and provide opportunity for the village to review</p>

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			<ul style="list-style-type: none"> Water supply and irrigation Before the Project conduct any activities, it must consult with the villages The Lenders recommended that CEGDP should include programs for implementation during Construction Phase which may include broader development projects e.g., improvement of water supply and health center. Currently the CEGDP is proposed to be implemented during Operation Phase which will start after 3 years. The communities will end up disappointed for not receiving any assistance within the 3 years of construction activities. 	
	13:00-17:00	FGD (Focus Group Discussions) in Dak Lern Village Vice deputy, belief leader, other village representatives	<p>Access to Phou Koungking Mountain</p> <ul style="list-style-type: none"> Phou Koungking Mountain, both high and low elevation areas, are not prohibited from access. The higher elevation portion of Phou Koungking Mountain is difficult to access because of difficult route and not many people know the way to access higher elevation portion of the mountain Usually, people from Dak Lern village do not access the high elevation because they are afraid of poisonous animals such as snakes. Only the Belief Leader ("Tao Kae Naew Home" which is translatable as an elderly who can/have the power to gather/assemble all villagers together or spiritual center of all villagers) identified to frequently access to the top of the mountain, where village border between Prao and Dak Lern lies, in order to monitor NTFP collection. <p>Belief Around Phou Koungking Mountain</p> <ul style="list-style-type: none"> The FGD suggested that people are not afraid of entering high elevation area because of spirits, but rather poisonous animals such as snake The FGD indicated that the belief in spirit such as 'Phi Bang Bot' is not strong nor common within villagers as it has been a long time since someone encountered spirits and there has been no evidence to prove. The people, however, believe that when entering the forest/mountain, Heet (long inherited traditions) and Kong (social norm, custom or guidelines) must be followed¹. For instance, an 	The information related to Phou Koungking and local belief and mitigation measures have been included in the CHMP and CEGDP.

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			<p>offering must be performed prior to entering the forest for NTFP Collection.</p> <ul style="list-style-type: none"> ■ Sacredness of Phou Kounking Mountain ■ It is noted that Phou Kounking Mountain is not regarded as a 'sacred' place (considered holy and deserving respect/worship). Cemetery, on the other hand, is considered a highly sacred place by the villagers. If the Project impacts cemetery, a higher level of ritual is required. Such ritual involves sacrificing of a puppy and use its blood to spread across affected cemetery area. <p>Permission to Access Phou Kounking Mountain</p> <ul style="list-style-type: none"> ■ Different rituals are required prior to entering the mountain based on the purposes. The Project must consult with Prao and Dak Lern Villages and comply with the village requirements. ■ For NTFP Collection, 6 grain of rice, tobacco and incense are required to be offered under a large tree in the forest ■ For Project construction activities, the project is required to provide budget for the village to perform ritual. The ritual involves a pig, a jar of rice whisky and a copper bracelet. A pig will be sacrificed while the blood is flowing over the copper bracelet, it is highlighted that everyone in the village must touch the blood of the pig. Thereafter, the pig will be cooked, and all villagers must eat the pork and drink rice whisky from the jar. The copper bracelet will be left there where the ritual is performed. The ritual is usually performed in the village in the evening. It is noted that by performing this ritual, it covers asking for permission from all spirits that the people believe in including village spirit, forest spirit, mountain spirits, etc. ■ The people believe that if the rituals are not carried out correctly, it will result in illness and depression of people in the village. However, such mistake in the rituals can be repaired/amended by correcting the exact step that went wrong. <p>Belief Leader</p> <ul style="list-style-type: none"> ■ Belief leader in the village is known as "Tao Kae Naew Home" which means an elderly who can/have the power to gather/assemble all villagers together. Tao Kae Naew Home is usually someone who are well educated of Heet-Kong and have extensive experience in performing rituals that can guide the villagers. 	

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			<p>Cemetery/Spirit/Sacred in Triang's Belief (Kil with village coordinator from Dak Tiem Village)</p> <ul style="list-style-type: none"> Environmental spirits are spirit that are naturally there e.g., forest spirit, river spirit and mountain spirit, etc. This is different from spirits in the cemeteries which are spirits of the dead. Belief in environmental spirits is subjective and differs per village and individuals—usually people would follow the belief leaders of their villages. The interviewee regarded cemetery as a highly sacred place as their parent who passed away are resting there. Activities to disturb resting of their ancestors such as chopping of wood or loud noise are prohibited—he feared if his parent are woken up from their resting by disturbing activities, the parent spirits will be angry at him for not protecting them and let them rest in peace after death. Phi Bang Bot (literal translation as cover the eyes) is a ghost that has the power to blind people. There has been no evidence of people encounter such spirit/ghost, but rather when someone got lost in a forest, they would likely blame it on Phi Bang Bot for blinding their eyes and causing them to get lost in the forest. 	
21 July 2022	09:00-12:00	<p>Consultation with Dak Cheung, Ngon Don, and Dak Muan Villages</p> <p>Participants Village heads and villagers of Dak Cheung, Ngon Don, and Dak Muan Villages</p>	<p>Villager Concerns</p> <ul style="list-style-type: none"> If the road cuts off all of the land that they own. Safety of the transport vehicle. There is risk of spreading COVID/other diseases from the workers to the villagers. <p>Villager Suggestions</p> <ul style="list-style-type: none"> Inform village head on date of transportation Have set times on when the transport vehicles can pass through school areas. Teaching techniques for better efficiency in agriculture (mainly coffee) Fertiliser for the village, soil is not fertile. Equipment for village office Provide capability training for youth in the communities to be able to work with the Project and other electricity generating projects 	<p>Community Health and safety impacts are assessed in Section 9.5.4 of the ESIA report. This includes proposed mitigation measures.</p> <p>CEGDP have been prepared to reflect community needs. For additional village proposals (which are currently not within CEGDP), the CEGDP developed is further processed by the Joint Committee, with assistance of the Company, undertake broad and meaningful public consultations with villagers and their leaders to confirm their desired prioritization and utilization of available fund of the CDP, as stipulated as per CA Clause 4.18.</p>

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			<ul style="list-style-type: none"> ■ Training in tailoring for women to create jobs ■ Create a landfill for disposing of waste ■ Development of farming areas for villagers in need ■ A safety inspection to prevent the spread of any contagious diseases from the workers. ■ Management of waste by the workers <p>Other Information</p> <ul style="list-style-type: none"> ■ Villagers like the idea of having a road next to their land for easier access. ■ Some villagers bring their own water to their farms/garden, some rely on water sources nearby. ■ Each village has their own foraging grounds, do not usually forage in other villages' territory 	
21 July 2022	13:00-16:00	<p>Consultation with Dak Bong, Dak Pum and Dak Seing A</p> <p>Participants Village heads and villagers of Dak Bong, Dak Pum and Dak Seing A Villages</p>	<p>Villager Concerns</p> <ul style="list-style-type: none"> ■ Compensation unit rates are low compared to the market value (for some crops) ■ Will the organization pay the compensation cash themselves or will a third party (government official) do it. <p>Villager Suggestions</p> <ul style="list-style-type: none"> ■ Education equipment (for teaching and learning). ■ Coffee trees and cows (Bringing animals and coffee saplings). ■ Create an area for farming for the villagers (using villagers' existing land). ■ Compensate people and families before any development. ■ Respect village traditions and comply with them before development. ■ If project fails to comply with village demand, the project will not move forward. ■ Transmission lines over the cemetery requires cash paid upfront as compensation given to the village in order to fix any damages (trees cut to reduce height) ■ Improvement in clothes, village office 	<p>RP and Livelihood restoration plan have been prepared to minimize impacts to affected people from Project land acquisition.</p> <p>CEGDP have been prepared to reflect community needs. For additional village proposals (which are currently not within CEGDP), the CEGDP developed is further processed by the Joint Committee, with assistance of the Company, undertake broad and meaningful public consultations with villagers and their leaders to confirm their desired prioritization and utilization of available fund of the CDP, as stipulated as per CA Clause 4.18.</p> <p>CHMP have been prepared to address impacts to cultural heritage and proposed appropriate mitigation measures.</p>

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22 July 2022	09:00-12:00	<p>Consultation with Dak Nong, Dak Samor and Sak Yok Villages</p> <p>Participants Village heads and villagers of Dak Nong, Dak Samor and Sak Yok Villages</p>	<p>Villager Concerns</p> <ul style="list-style-type: none"> Noise caused from the wind turbine <p>Villager Suggestions</p> <ul style="list-style-type: none"> Create a source of water from nearby lakes. Fix roads as some parts cannot be crossed during rainy season, road is cut off. Villagers want animals (cows, buffalos, chickens, etc). Medicine and other health facilities. Waste issue, landfill area for village. Toilet facilities for better hygiene. <p>Other Information</p> <ul style="list-style-type: none"> Villagers use nearby water sources when at their farms (Huai Sek, Huai Peep) All three villages participated in the meeting on unit rates with the compensation committee 	<p>Noise impacts (including from turbines) are assessed in Section 9.3.7 and Section 9.5.7 of the ESIA Report. This includes proposed mitigation measures.</p> <p>Impacts on surface water quality is assessed in Section 9.3.6 of the ESIA report. This includes proposed mitigation measures.</p> <p>RP and Livelihood restoration plan have been prepared to minimize impacts to affected people from Project land acquisition.</p> <p>CEGDP have been prepared to reflect community needs. For additional village proposals (which are currently not within CEGDP), the CEGDP developed is further processed by the Joint Committee, with assistance of the Company, undertake broad and meaningful public consultations with villagers and their leaders to confirm their desired prioritization and utilization of available fund of the CDP, as stipulated as per CA Clause 4.18.</p>
9 Sept 2022	14:00-15:30	<p>Consultation with Trong Mueang Village</p> <p>Location: Dak Yoi Primary School</p>	<p>Village Concerns:</p> <ul style="list-style-type: none"> Safety concern over the transportation of materials, particularly for children and livestock. In order to solve the concerns about this issue, the project shall practice as follow: <ul style="list-style-type: none"> Notify the village 1 week in advance of the transportation activities including the time of arrival, number and size of transport trucks, materials/equipment being transported so that the villagers are informed in advance and prepare village safety measures particularly for children and livestock Implement a speed limit. Implement guidance cars in front and behind the transportation. 	<p>Community Health and safety impacts are assessed in Section 9.5.4 of the ESIA report. This includes proposed mitigation measures.</p> <p>Add measures in the Traffic Management Plan. Village notification protocols and timing should be stated in the SEP.</p> <p>Impacts on surface water quality is assessed in Section 9.3.6 of the ESIA report. This includes proposed mitigation measures.</p>

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			<ul style="list-style-type: none"> - If possible, the transportation to be at night or in weekends, not to be during school time. ■ The villagers reported water shortage issue during dry season. The villagers use the gravity-fed water system, and the water source is 8 km away from the village. ■ The villagers were concerned on the compensation for village land. The Project representative has clarified that the compensation for land under the State management will be included in the concession land arrangement and will be compensated according to the State regulations. <p>Village Suggestions</p> <ul style="list-style-type: none"> ■ Assist the village with domestic and drinking water ■ Assistance regarding the toilet construction equipment and materials: mortar, galvanized roof, bricks, squat toilet, toilet ■ The land of the affected person that is an abandoned garden land that have the land title/documents to be fully compensate 100%. ■ Promote the education for the people in the village to study and improve and construct a school for the village. ■ Construct a permanent school ■ Construct a dispensary/small hospital ■ Construct access roads to production areas ■ Promote alternative methods of cultivation and animal husbandry ■ Construct village office ■ Construct gravity-fed water supply system ■ If the Project activities affect the village's sacred ground, the Project must comply with villages' custom and tradition. <p>Other information:</p> <p>The village representatives did not participate in consultation on compensation unit rate with governmental authorities</p>	<p>RP and livelihood restoration plan have been prepared to minimize impacts to affected people from Project land acquisition.</p> <p>CEGDP has been prepared to reflect community needs and suggestions. For additional village proposals (which are currently not within CEGDP), the CEGDP developed is further processed by the Joint Committee, with assistance of the Company, undertake broad and meaningful public consultations with villagers and their leaders to confirm their desired prioritization and utilization of available fund of the CDP, as stipulated as per CA Clause 4.18.</p>

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10 Sept 2022	10:20-12:20	Consultation with Dak Den Village	<p>Village Concerns:</p> <ul style="list-style-type: none"> ■ Loss of forest areas and associated use of the forests ■ Concerns on safety during strong wind which may cause the WTGs to spin at a high rate. The Project representative clarified that the WTGs will have in place automatic brake in order to control the speed of the blade, therefore, the WTGs spin rate will not exceed the safety limit. ■ Some people were not happy that land without tax payment receipt will not receive compensation ■ The Project should avoid impact to cemetery areas ■ Yar stream (Yoon) is used by the villagers and located nearby the WTGs ■ The village representative participated in the compensation unit cost consultation with relevant government authorities; however, to date they still do not know the determined price ■ Safety concern over the transportation of materials, particularly for children. The Project should notify the village on transportation activities and implement speed limit. ■ The villagers would like to know the compensation for public land under the management of the government <p>Village Suggestions:</p> <ul style="list-style-type: none"> ■ The Project should also provide assistance for access roads to rice fields and plantations ■ Gravity-fed water system is inconvenient, the Project should provide assistance ■ The Project should provide assistance in supplying equipment for toilets ■ According to the plan, the previous field survey does not reach some certain points, resulting in some certain individuals were not included in the survey. ■ The Project should notify regarding the compensation value for each PAP ■ The Project should ensure the compensation is paid appropriately according to the plan and announcement. 	<p>Biodiversity impact assessment is conducted in Section 9.4.3 and mitigation measures are provided.</p> <p>Community Health and safety impacts are assessed in Section 9.5.4 of the ESIA report. This includes proposed mitigation measures</p> <p>RP and livelihood restoration plan have been prepared to minimize impacts to affected people from Project land acquisition.</p> <p>Grievance mechanism for community has been established to address concerns/issues related to the Project including land acquisition and resettlement related issues</p> <p>The Project design avoids impact to all cemeteries. Impacts on surface water quality is assessed in Section 9.3.6 of the ESIA report. This includes proposed mitigation measures</p> <p>Add measures in the Traffic Management Plan. Village notification protocols and timing should be stated in the SEP.</p> <p>CEGDP has been prepared to reflect community needs and suggestions. For additional village proposals (which are currently not within CEGDP), the CEGDP developed is further processed by the Joint Committee, with assistance of the Company, undertake broad and meaningful public consultations with villagers and their leaders to confirm their</p>

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			<ul style="list-style-type: none"> ■ The Project should ensure that plans and programs proposed in the LRP and CEGDP are implemented ■ The Project to provide equipment for agriculture such as hoe, shovel, tractor, etc. ■ Would like assistance regarding the cultivation technique (coffee cultivation), agricultural techniques, animal husbandry training ■ The road condition is poor. During rainy seasons the roads may become inaccessible. The Project to provide assistance with the road improvement and access road to agricultural lands ■ The Project to avoid impact to cemetery area. <p>Other information: The village representatives participated in consultation on compensation unit rate with governmental authorities; however, the compensation unit rates are not yet known.</p>	<p>desired prioritization and utilization of available fund of the CDP, as stipulated as per CA Clause 4.18.</p> <p>The Project carried out consultation with the PAPs on the compensation agreement form with all PAPs to inform them on the affected asset and compensation cost in October for Sanxay District and November for Dak Chueng District</p> <p>Monitoring requirements are outlined in the RP and CEGDP to ensure implementation of such plans</p>
11 Sept 2022	9:00-11:00	<p>Consultation with Nonsavan Village</p> <p>Location: House of Nonsavan Village Head</p>	<p>Village Concerns:</p> <ul style="list-style-type: none"> ■ In the past, there have been inconsistency in impact assessment and the actual impacts. Therefore, the Project to re-inspect to prevent this incident. ■ Safety concern over the transportation of materials. Concern that roads may be damaged due to heavy vehicles and suggested the Project to have separate road for transportation to avoid village roads if possible. <p>Village Suggestions:</p> <ul style="list-style-type: none"> ■ Training on animal husbandry for the people and agriculture as the soil in Dak Cheung area is infertile, resulting in ineffective farming ■ Provide vocational skills training to the women, such as: tailoring work for women <p>Other Information</p> <ul style="list-style-type: none"> ■ The village participated in compensation unit rate consultation with relevant authorities ■ Some villagers collect mushroom in Phou Kounking Mountain area. There is a belief, as in the previous year, there was a story that someone disappeared during NTFP collection and rituals was conducted to retrieve the person from the mountain. 	<p>Community Health and safety impacts are assessed in Section 9.5.4 of the ESIA report. This includes proposed mitigation measures</p> <p>Traffic Management Plan will be developed and implemented.</p> <p>RP and Livelihood restoration plan have been prepared to minimize impacts to affected people from Project land acquisition.</p> <p>CEGDP has been prepared to reflect community needs and suggestions such as agricultural and animal husbandry training. For additional village proposals (which are currently not within CEGDP), the CEGDP developed is further processed by the Joint Committee, with assistance of the Company, undertake broad and meaningful public consultations with villagers and their leaders to confirm their</p>

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				desired prioritization and utilization of available fund of the CDP, as stipulated as per CA Clause 4.18.
11 Sept 2022	-	Consultation with Dak Pum Village Location: Dak Pum Village Primary School	<p>Village Concerns:</p> <ul style="list-style-type: none"> ■ Safety concern over the transportation of materials. <p>Village Suggestions:</p> <ul style="list-style-type: none"> ■ Construct a new village office ■ Supply barbed wires, fence and construction equipment ■ Provide training on agriculture and weaving ■ Supply livestock, such as: duck, chicken, goat, cow, buffalo to the people, so that villagers can raise and sell to the market to generate income for the family ■ Supply coffee seedlings to the people ■ Solve drinking water and domestic water issue ■ The Project to supply materials for toilets whilst the villagers can carry out construction work <p>Other Information</p> <ul style="list-style-type: none"> ■ None of the villages have accessed to Phou Kounking Mountain as the area is difficult to enter ■ The village did not participate in compensation unit rate consultation with relevant authorities 	<p>Community Health and safety impacts are assessed in Section 9.5.4 of the ESIA report. This includes proposed mitigation measures</p> <p>Traffic Management Plan will be developed and implemented</p> <p>RP and livelihood restoration plan have been prepared to minimize impacts to affected people from Project land acquisition.</p> <p>CEGDP has been prepared to reflect community needs and suggestions. For additional village proposals (which are currently not within CEGDP), the CEGDP developed is further processed by the Joint Committee, with assistance of the Company, undertake broad and meaningful public consultations with villagers and their leaders to confirm their desired prioritization and utilization of available fund of the CDP, as stipulated as per CA Clause 4.18.</p>

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11 Sept 2022	9:30-11:30	Consultation with Dak Lern and Tong Xieng Villages Location: Dak Lern Kindergarten-Primary School	<p>Village Concerns:</p> <ul style="list-style-type: none"> ■ Concern over transportation activities may pose safety risks, especially to children and livestock. The Project to strictly abide the traffic regulations, implement a speed limit and notify the village before the transportation enter the village ■ Concerned that they may trespassing into the forbidden areas. Therefore, the Project should have in place worker code of conduct to regulate workers' behaviours, ■ Concern regarding diseases from outside, such as: Covid-19 associated with the influx of workers, ■ Concern that there may be drugs use/sell in the village brought about by influx of workers <p>Village Suggestions (Tong Xieng Village):</p> <ul style="list-style-type: none"> ■ Assist the poor families, as previously the poor families' houses caught in a fire, therefore, would like the project to assist them. ■ Provide training on agriculture to the people ■ Provide training on tailoring to women and tailoring equipment to them ■ Assistance regarding the gravity-pull/spring water for household consumption as currently there is a shortage of water ■ Assistance regarding the healthcare, which is: toilet, bathroom construction equipment ■ Level the paddy field land for the people or supply tractor to the people ■ Coordinate with the village prior to any works in order not to cross the custom of the village ■ Construct the teacher's office for the school of the village. ■ Supply livestock to the people, such as: chicken, duck, pig, goat, cow, buffalo, etc. <p>Village Suggestions (Dak Lern Village):</p> <ul style="list-style-type: none"> ■ Repair the road accessing the village and road accessing to the dry season rice fields, gardens and paddy fields of the people ■ Clear and level the paddy field land of the people ■ Assistance on the drinking water 	<p>Community Health and safety impacts are assessed in Section 9.5.4 of the ESIA report. This includes proposed mitigation measures</p> <p>Traffic Management Plan will be developed and implemented. Add measures in the Traffic Management Plan. Village notification protocols and timing should be stated in the SEP.</p> <p>Local Content and Influx Management Plan will be developed and implemented. This will include measures to control potential spread of infectious issues by workers influx.</p> <p>Worker Code of Conduct will prohibit workers from associated with drugs in any forms and ramifications should be in place where instances of drug use/sell are found.</p> <p>A Worker Code of Conduct (governing no-go zones and prohibits drug use) will be developed by the Project and provide opportunity for the village to review</p> <p>Community Health and Safety Plan and Occupational Health and Safety Plan will be developed</p> <p>RP and livelihood restoration plan have been prepared to minimize impacts to affected people from Project land acquisition.</p> <p>CEGDP has been prepared to reflect community needs and suggestions. For additional village proposals (which are currently not within CEGDP), the CEGDP</p>

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			<ul style="list-style-type: none"> ■ The Project to prioritize local labor as the village labor would like to work with the project ■ Provide technical training on agriculture to the people ■ The Project to comply with the custom and traditions of the village if the Project work will be undertaken in the village area, especially Kung King Mountain area. <p>Other Information The village did not participate in compensation unit rate consultation with relevant authorities</p>	<p>developed is further processed by the Joint Committee, with assistance of the Company, undertake broad and meaningful public consultations with villagers and their leaders to confirm their desired prioritization and utilization of available fund of the CDP, as stipulated as per CA Clause 4.18.</p> <p>The Project will comply with measures outlined in the CHMP to comply with villages' customs and traditions</p>
12 Sept 2022	14:00-16:00	<p>Consultation with Dak Jom Village</p> <p>Location: House of Dak Jom Village Head</p>	<p>Village Concerns:</p> <ul style="list-style-type: none"> ■ Concerns on employment but payment was not received (as experienced in previous projects) ■ Safety concern over the transportation of materials, particularly for children. The Project should notify the village on transportation activities and implement speed limit. <p>Village Suggestions:</p> <ul style="list-style-type: none"> ■ Assistance regarding health care or supply toilet materials: for toilets. ■ Provide a training regarding textiles weaving, modern cloths weaving. ■ Assistance in constructing a new village office. ■ The Project to comply with custom and traditions for management land of the village before construction ■ The Project to help improve water supply system ■ Provide electricity to families that still lack electricity ■ The Project to level and clear the paddy field land in order for the people to farm. ■ Assistance with irrigation system to the paddy field ■ Provide training on agriculture and equipment such as: mower, seedlings, etc. ■ Improve the road conditions 	<p>RP and Livelihood restoration plan have been prepared to minimize impacts to affected people from Project land acquisition.</p> <p>Grievance mechanism for community has been established to address concerns/issues related to the Project including land acquisition and resettlement related issues</p> <p>Community Health and safety impacts are assessed in Section 9.5.4 of the ESIA report. This includes proposed mitigation measures</p> <p>Traffic Management Plan will be developed and implemented</p> <p>CEGDP has been prepared to reflect community needs and suggestions. For additional village proposals (which are currently not within CEGDP), the CEGDP developed is further processed by the Joint Committee, with assistance of the Company, undertake broad and meaningful public consultations with</p>

Date	Time	Action/Location/Participants	Key Findings/Summary	How issues or concern was addressed in Project Design or E&S Documents
			<ul style="list-style-type: none"> ■ Improve healthcare facilities including nurse and medicine ■ Provide teachers to the school and improve education facilities <p>Other information:</p> <ul style="list-style-type: none"> ■ The village representatives participated in consultation on compensation unit rate with governmental authorities ■ There are water resources in the village but not located near construction area 	<p>villagers and their leaders to confirm their desired prioritization and utilization of available fund of the CDP, as stipulated as per CA Clause 4.18.</p> <p>Impacts on surface water quality is assessed in Section 9.3.6 of the ESIA report. This includes proposed mitigation measures.</p>
13 Sept 2022	9:20-11:30	<p>Consultation with Dak Ta-ok Noi Village</p> <p>Location: Dak Ta-ok Noi Village Primary School</p>	<p>Village Concerns:</p> <ul style="list-style-type: none"> ■ Safety concern over the transportation of materials, particularly for children. The Project should notify the village on transportation activities and implement speed limit. <p>Village Suggestions:</p> <ul style="list-style-type: none"> ■ Assistance with insufficient rice for consumption particularly during dry season ■ Assistance regarding the equipment, pipes to be used for irrigation to the paddy field. ■ The Project to supply toilet construction equipment, such as: squat toilets, mortar, brick ■ Provide training on tailoring, modern textiles weaving to women ■ The Project to repair the road accessing the village and install a drainage pipe to avoid flooding of the road ■ The Project to give priority to hiring local labours of the village ■ Construct a dispensary and make available a village doctor ■ The Project to supply telephone signal station, as there are no signal in the area, causing difficulty in work coordination <p>Other Information</p> <ul style="list-style-type: none"> ■ The village did not participate in compensation unit rate consultation with relevant authorities ■ There are Xe Kaman river and Dak Yae stream. However, Dak Yae stream is not used and Xe Kaman river flow is too turbulent to be used 	<p>Community Health and safety impacts are assessed in Section 9.5.4 of the ESIA report. This includes proposed mitigation measures</p> <p>Traffic Management Plan will be developed and implemented. Add measures in the Traffic Management Plan. Village notification protocols and timing should be stated in the SEP.</p> <p>RP and livelihood restoration plan have been prepared to minimize impacts to affected people from Project land acquisition.</p> <p>CEGDP has been prepared to reflect community needs and suggestions. For additional village proposals (which are currently not within CEGDP), the CEGDP developed is further processed by the Joint Committee, with assistance of the Company, undertake broad and meaningful public consultations with villagers and their leaders to confirm their desired prioritization and utilization of available fund of the CDP, as stipulated as per CA Clause 4.18.</p>

Date	Time	Action/Location/Participants	Key Findings/Summary	How issues or concern was addressed in Project Design or E&S Documents
				Impacts on surface water quality is assessed in Section 9.3.6 of the ESIA report. This includes proposed mitigation measures.
13 Sept 2022	13:00-14:30	Consultation with Dak Dom Village	<p>Village Concerns:</p> <ul style="list-style-type: none"> ■ Safety concern over the transportation of materials, particularly for children. The Project should notify the village on transportation activities and implement speed limit. <p>Village Suggestion:</p> <ul style="list-style-type: none"> ■ Construct access road to the village ■ Provide electricity for those households currently without ■ Provide village dispensary ■ Supply bathroom and toilet construction equipment ■ Provide vocational skills training in order to generate more income for the village, such as: textile weaving, silk weaving, agriculture. Supply textile weaving/pressing machines. ■ The Project should also provide assistance for access roads to rice fields and plantations ■ Provide assistance on irrigation system ■ Provide more teachers and education facilities. ■ Provide gravity-fed water system/spring water as there is insufficient water for household consumption during dry period ■ Provide barbed wires and meshes for garden, and equipment for indoor cultivation ■ The Project should provide employment opportunities and prioritize local labours which are young people in the village. <p>Other information:</p> <ul style="list-style-type: none"> ■ The village representatives participated in consultation on compensation unit rate with governmental authorities ■ There are no water resources in the village 	<p>Community Health and safety impacts are assessed in Section 9.5.4 of the ESIA report. This includes proposed mitigation measures</p> <p>Traffic Management Plan will be developed and implemented. Add measures in the Traffic Management Plan. Village notification protocols and timing should be stated in the SEP.</p> <p>RP and livelihood restoration plan have been prepared to minimize impacts to affected people from Project land acquisition.</p> <p>CEGDP has been prepared to reflect community needs and suggestions. For additional village proposals (which are currently not within CEGDP), the CEGDP developed is further processed by the Joint Committee, with assistance of the Company, undertake broad and meaningful public consultations with villagers and their leaders to confirm their desired prioritization and utilization of available fund of the CDP, as stipulated as per CA Clause 4.18.</p>
15 Sept 2022	-	Consultation with Dak Padou Village	<p>Village Concerns:</p> <ul style="list-style-type: none"> ■ There is Dak Ju stream and Nam Yard stream that is near the project area 	Impacts on surface water quality is assessed in Section 9.3.6 of the ESIA report. This includes proposed mitigation measures.

Date	Time	Action/Location/Participants	Key Findings/Summary	How issues or concern was addressed in Project Design or E&S Documents
		Location: House of Dak Padou Village Head	<ul style="list-style-type: none"> ■ No concerns regarding labours if they reside in provided workers' camp ■ Safety concern over the transportation of materials, particularly for children. The Project should notify the village on transportation activities and implement speed limit. Also concern on dust associated with transport activities. ■ There are about more than 20 families still do not have electricity. They need to depend on other families, and then share the electricity bills. <p>Village Suggestion:</p> <ul style="list-style-type: none"> ■ The project to construct road accessing the village and the road to Sanxay-Trong Muang. ■ The Project to assist with land clearing and levelling for construction of new houses ■ Construct a new village office ■ Construct a dispensary for the village ■ Assist the village in solving the water insufficiency issue ■ Supply motorbike to the village to serve administration works ■ Supply squat toilet ■ Construct a school inclusive of a nursery level and provision of teachers ■ Provide assistance about the sport equipment to the village, such as: volleyball, football, basketball. ■ The Project to give priority to the labour of the village ■ Provide vocational skills training for the people. <p>Other information: Mostly collected at Kong Lu Mountain, the products collected are: flower pattern mushroom (Dok Laiy), forest ginseng, orchid, small Linzhi</p>	<p>Community Health and safety impacts are assessed in Section 9.5.4 of the ESIA report. This includes proposed mitigation measures</p> <p>Traffic Management Plan will be developed and implemented. Add measures in the Traffic Management Plan. Village notification protocols and timing should be stated in the SEP.</p> <p>The CEGDP includes provision of electricity (Section 6.3.1 Thematic Area 1: Rural Electrification)</p> <p>RP and livelihood restoration plan have been prepared to minimize impacts to affected people from Project land acquisition.</p> <p>CEGDP has been prepared to reflect community needs and suggestions. For additional village proposals (which are currently not within CEGDP), the CEGDP developed is further processed by the Joint Committee, with assistance of the Company, undertake broad and meaningful public consultations with villagers and their leaders to confirm their desired prioritization and utilization of available fund of the CDP, as stipulated as per CA Clause 4.18.</p>

Date	Time	Action/Location/Participants	Key Findings/Summary	How issues or concern was addressed in Project Design or E&S Documents
15 Sept 2022	14:00-15:40	Consultation with Nam Ngon Neau Village Location: Nam Ngon Neau Village Meeting Room	<p>Village Concerns:</p> <ul style="list-style-type: none"> ■ Safety concern over the transportation of materials, particularly for children and livestock and loud noise. ■ If there is a construction in Kong Lu Mountain, it may affect the livelihood area of the people <p>Village Suggestion:</p> <ul style="list-style-type: none"> ■ Improve the road from Sanxay district to the village area ■ Provide assistance regarding the food supply to families with insufficient food ■ Assistance in solving water shortage issue, particularly during April-May ■ Improve healthcare facilities including having a doctor available and sufficient medicine and equipment for treatment ■ Provide electricity for households without electricity <p>Other information:</p> <p>There is a stream flowing down from Kong Lu Mountain that is use for drinking when going to the forest. There is Yoon stream. In the village area, gravity-pull/spring water is used.</p>	<p>Community Health and safety impacts are assessed in Section 9.5.4 of the ESIA report. This includes proposed mitigation measures</p> <p>Traffic Management Plan will be developed and implemented.</p> <p>Impacts on surface water quality is assessed in Section 9.3.6 of the ESIA report. This includes proposed mitigation measures</p> <p>CEGDP has been prepared to reflect community needs and suggestions. For additional village proposals (which are currently not within CEGDP), the CEGDP developed is further processed by the Joint Committee, with assistance of the Company, undertake broad and meaningful public consultations with villagers and their leaders to confirm their desired prioritization and utilization of available fund of the CDP, as stipulated as per CA Clause 4.18.</p> <p>RP and livelihood restoration plan have been prepared to minimize impacts to affected people from Project land acquisition.</p> <p>Impacts on surface water quality is assessed in Section 9.3.6 of the ESIA report. This includes proposed mitigation measures.</p>

Date	Time	Action/Location/Participants	Key Findings/Summary	How issues or concern was addressed in Project Design or E&S Documents
16 Sept 2022	10:20-12:00	<p>Consultation with Dak Dor, Dak Xied and Dak Zuem village</p> <p>Location: Dak Xied Village School</p> <p>Participants Village heads and villagers of Dak Dor, Dak Xied and Dak Zuem village</p>	<p>Village Concerns:</p> <ul style="list-style-type: none"> ■ Safety concern over the transportation of materials, particularly for children. The Project should notify the village on transportation activities and implement speed limit and no transport activity after 8 pm as it will disturb rest time of villagers. ■ Covid-19 vaccines should be provided to all workers and villagers ■ Food insufficiency in some years <p>Village Suggestion (Dak Xuem):</p> <ul style="list-style-type: none"> ■ Construct access road (asphalt) to the village ■ Assistance in connecting gravity-fed water system/spring water pipes to each house. ■ Provide assistance to poor families, such as: families with female-headed households, families that lack food, electricity, clothing, etc.. ■ Construct a village dispensary ■ Construct a sport field and sport equipment, such as: football, volleyball, Sepak Trakaw ■ Training for women, such as: textiles weaving and assist to train women to have the knowledge, skills and promote the development of women, such as: agricultural business. ■ Land clearing and levelling to prepare land for paddy fields ■ Assistance in land clearing and levelling in village area in order to be able to construct new houses. ■ Provide livestock: duck, chicken, buffalo, pig ■ Provide rice supply to alleviate food insufficient issues ■ Provide funding to the village and motorbike to each village head <p>Village Suggestion (Dak Dor):</p> <ul style="list-style-type: none"> ■ Repair the road accessing the village, Nam Ang falls and Nam ang bridge. ■ Construct a permanent school and provide educational equipment ■ Provide the local labours with employment opportunity ■ Supply the toilet construction materials, such as: stone, mortar, squat toilet, etc 	<p>Community Health and safety impacts are assessed in Section 9.5.4 of the ESIA report. This includes proposed mitigation measures</p> <p>Traffic Management Plan will be developed and implemented. Add measures in the Traffic Management Plan. Village notification protocols and timing should be stated in the SEP.</p> <p>Occupational Health and Safety Plan and Local Content and Influx Management Plan will be developed</p> <p>Impacts on surface water quality is assessed in Section 9.3.6 of the ESIA report. This includes proposed mitigation measures</p> <p>CEGDP has been prepared to reflect community needs and suggestions. For additional village proposals (which are currently not within CEGDP), the CEGDP developed is further processed by the Joint Committee, with assistance of the Company, undertake broad and meaningful public consultations with villagers and their leaders to confirm their desired prioritization and utilization of available fund of the CDP, as stipulated as per CA Clause 4.18.</p> <p>Impacts on surface water quality is assessed in Section 9.3.6 of the ESIA report. This includes proposed mitigation measures.</p>

Date	Time	Action/Location/Participants	Key Findings/Summary	How issues or concern was addressed in Project Design or E&S Documents
			<ul style="list-style-type: none"> ■ Assistance in installing electricity in the village ■ Assistance in solving the water shortage in the village <p>Village Suggestion (Dak Xied):</p> <ul style="list-style-type: none"> ■ Supply toilet construction materials to the people ■ Supply construction materials for village office ■ Supply livestock to the village: small animals (chicken, duck), large animals (cow, buffalo) ■ Provide assistance to poor families that lack food and housing ■ Construct a road from Salermxay to Dak Dor, Dak Xied, Xieng Luang village and avoid the cemetery area. ■ Construct roads accessing the dry season rice field and plantation ■ Pioneer in constructing the terrace rice field for the people ■ Assistance in healthcare facilities and treatment ■ Assistance with the kitchen equipment of the village women's union <p>Other information:</p> <ul style="list-style-type: none"> ■ The village representatives participated in consultation on compensation unit rate with governmental authorities ■ The villagers collect NTFPs in forest area around the village, mostly collect vegetable, Dok Lhai mushroom Tome fruit, cardamom, Khaem fruit ■ Shortage of water during dry season is reported ■ Ban stream located near WTGs. This stream is used for bathing, and as a gravitational/spring water. 	

8 ENVIRONMENTAL AND SOCIAL BASELINE CONDITIONS

8.1 Introduction

This chapter summarizes the existing physical (**Section 8.3**), biological (**Section 8.4**) and social (**Section 8.5**) conditions in the Area of Influence (AOI), focusing on the resources/receptors that may be impacted by the Project. Information in this chapter is based on studies undertaken by the local EIA (Innogreen & Greener Consultant, 2020), a desktop review of publicly available information, and the additional noise, landscape and visual, biodiversity, and social baseline studies undertaken in 2021 to 2022 by Innogreen, with ERM's guidance, during preparation of this ESIA.

8.2 Defining the Study Limits

8.2.1 Project Area

The Project area refers to the land that is used for Project facilities and activities across all project phases. This includes land being used on both a permanent and temporary basis. The full description of Project facilities and activities is presented in **Section 4.3**, **Section 4.9**, and summarised in **Figure 8.1**. This includes the wind farm site boundary, the 22 km transmission line, and the access roads within the wind farm site boundary.

8.2.2 Area of Influence

Under the ADB SPS, the Area of Influence (Aol) encompasses:

“(i) the primary project site(s) and related facilities that the borrower/client (including its contractors) develops or controls, such as power transmission corridors, pipelines, canals, tunnels, access roads, borrow pits and disposal areas, and construction camps;

(ii) associated facilities that are not funded as part of the project (funding may be provided separately by the borrower/client or by third parties), and whose viability and existence depend exclusively on the project and whose goods or services are essential for successful operation of the project;

(iii) areas and communities potentially affected by cumulative impacts from further planned development of the project, other sources of similar impacts in the geographical area, any existing project or condition, and other project-related developments that are realistically defined at the time the assessment is undertaken;

(iv) areas and communities potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location.”

This Project's Aol includes the following:

- The wind farm area (concession area), internal access roads, and transmission line route to the Vietnam border;
- The distribution of potential sensitive shadow flicker receptors within 2 km from any wind turbine, i.e. 12 clusters consisting of a variable number of properties/buildings (from 7 to 140) across seven villages, based on a desktop analysis of local settings, and preliminary modelling of shadow flicker to understand potential receptor distribution in the vicinity of the wind turbines. The shadow analysis was conducted without define a radius of influence (such for example the most widely adopted standard Clarke's (1991) approach of setting 10 times the rotor diameter) so as not to exclude the occurrence of flickering shadows beyond the defined area;

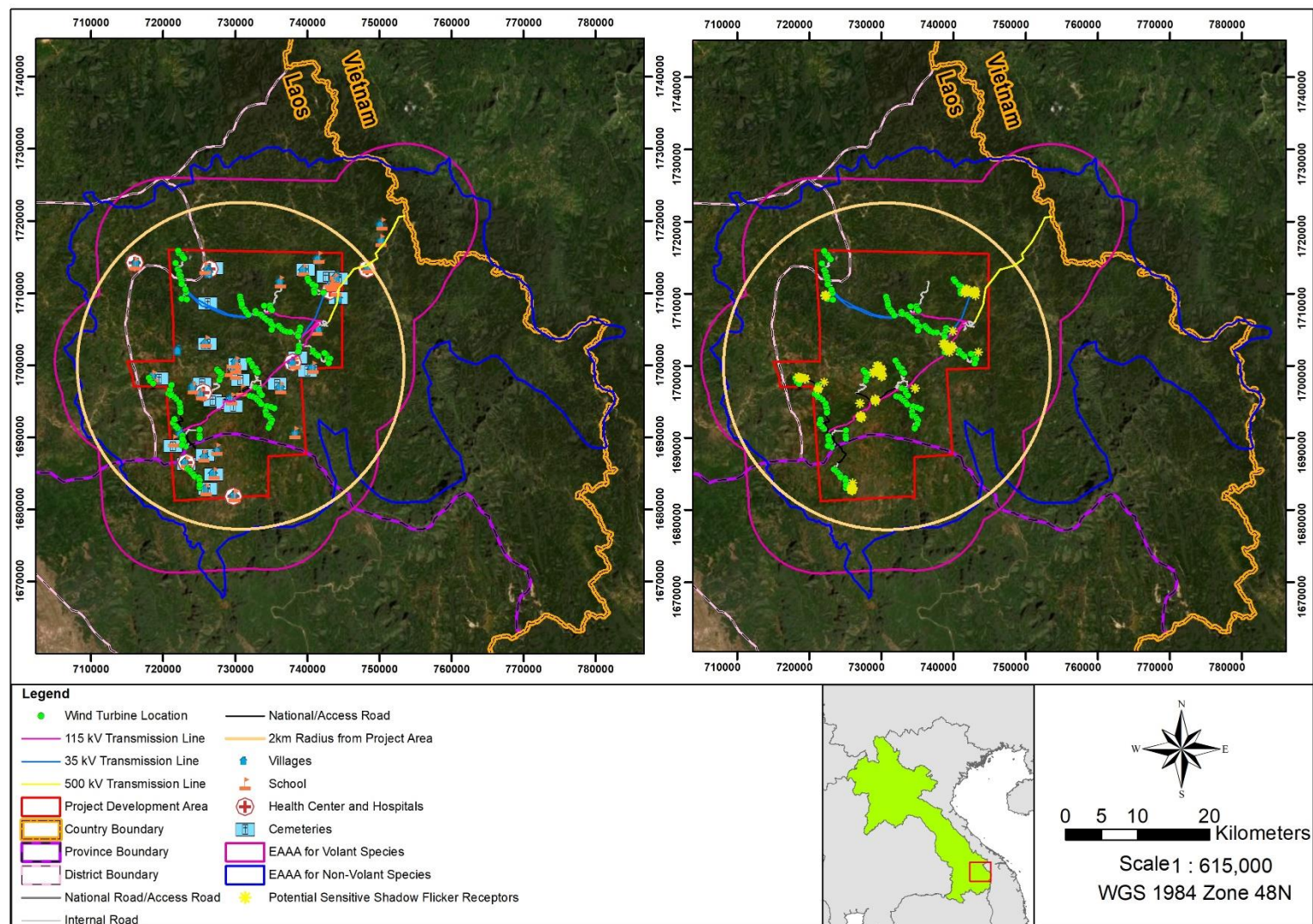
- The distribution of potential sensitive noise receptors within 2 km from any wind turbine, which has been selected based on good practice considerations³⁷;
- 23 villages in Dak Cheung district of Sekong province, and 8 villages in Sanxay district of Attapeu province affected by permanent land acquisition, permanent land use restrictions, temporary access agreements, and/or impacts to livelihoods and community health, safety and security;
- The administrative boundaries of Dak Cheung and Sanxay districts as representative of all areas that could be indirectly affected by changes in ecosystem services, community health, or linked to by local cultural heritage; and
- The Ecologically Appropriate Area of Analyses (EAAAs) which were delineated to account for species and/or ecosystems that regularly occur in the general area that may be affected by the Project. Two EAAAs were identified for volant (flying) species, and non-volant (non-flying) species, respectively. The approach taken to delineate the EAAA boundaries is presented in Section 2 of **Appendix S**. The Project's Aol is presented in **Figure 8.1**.

8.2.3 Study Area

The study area is defined to ensure that the baseline is adequately characterised to facilitate understanding of the potential interactions between the Project and resources/receptors within the Aol. The Project's study area encompasses both the Project area and Aol as described in **Section 8.2.1** and **Section 8.2.2**, and are clearly defined for each resource/receptor in subsequent sections, **Section 8.3**, **Section 8.4** and **Section 8.5**.

³⁷ Information provided in guidelines such as the World Bank Group's Environmental, Health and Safety (EHS) Guidelines for Wind Energy (IFC, 2015) was considered when delineating the Project's Aol.

Figure 8.1: The Project's Area of Influence (Aoi)



8.3 Physical Environment Baseline

8.3.1 Introduction

This section provides an overview of the physical environment baseline conditions within the Project Study Area, including topography, geology and soil, climate and meteorology, air quality, noise, surface water quality, land cover, landscape values and visual amenity, and natural hazards.

Some information in this section is from baseline studies undertaken in 2021 by Innogreen, including noise (**Appendix B**), surface water (**Appendix C**), landscape values, and visual amenity (**Appendix D**).

Other information is based on studies undertaken from the local EIA, and published and publicly available information, including topography, geology and soil, climate and meteorology, air quality, wind speed monitoring, and natural hazards.

8.3.2 Topography

The Project is located in Dak Cheung District of Sekong Province and Sanxay District of Attapeu Province. Dak Cheung District is located in the eastern side of Sekong Province and has a total area of 2,732 km² (34.64% of the total provincial area), with the average elevation of approximately 1,200 m above sea level (the lowest point is 529 m and the highest point is 1,397 m above the sea level). Dak Cheung District is adjacent to Kaleum District in the north, Sanxay District of Attapeu Province in the south, Tai Yang and Nam Yang of Quang Nam Province and Dak Lai of Kon Tum Province of Vietnam in the east and, Lamarm District of Sekong Province in the west.

Generally, the topography comprises hills and high steep mountains (high mountainous area covers 95% and hill area covers 5%). The hills and mountains have complex features that are separated by numerous rivers and streams.

Sanxay District is located in the eastern side of Attapeu Province and has a total land area of 3,648 km². Sanxay District is adjacent to Dak Cheung District and Lamarm District of Sekong Province in the north, Phouvong District in the south, Dak Lai, Kon Tum Province of Vietnam in the east, and Saysettha District in the west. Sanxay District is divided into two types of areas, with 5% consisting of plain areas and 95% with high mountain areas. The elevation in this District ranges from 200 m to 1,600 m above sea level and has approximately 50% forest coverage of the total area.

The Project Area is mostly on the slopes of hills and high mountainous area, the elevation ranges from about 1,000 – 1,200 m above sea level (**Figure 8.2**).

Figure 8.2: Topography of the Project Area



8.3.3 *Geology and Soil*

According to the soil survey result and classification of agricultural and forest areas in Dak Cheung District, Sekong Province (2020), six soil groups and nine types of soil based on the original rocks, condition of the location, identified layer, and identified characteristics of the soils that is described as follows:

- The area is primarily composed of heavy clay, clay loam, and loamy sand.
- The depth of the soil layer is mostly comprised of very deep soil layer (D) > 100 cm from the soil surface, the moderately deep soil layer (M) between 75-100 cm, shallow soil layer (S) between 30-50 cm, and thin soil layer (T) between 50-75 cm from the soil surface.

Soil in Sanxay District of Attapeu Province is divided into six soil groups that is classified into 13 types of soil based on the original rocks, condition of the location, identified layer, and identified characteristics of the soils that is described as follows:

- The soil areas are primarily composed of clay loam, hard clay and loamy sand.
- The depth of the soil layer is mostly comprised of very deep soil layer (D) > 100 cm from the soil surface; next is the shallow soil layer between 30 and 50 cm and the smallest is the thin soil layer between 50 and 75 cm from the soil surface.

It is noted that soil sampling was not undertaken as part of the baseline because no significant soil impacts from Project activities were expected; however, soil monitoring is required to be conducted prior to construction commencement for the POPs (refer to **Section 9.3.3** and **Section 10.8** for pre-construction soil monitoring requirements).

8.3.4 Climate and Meteorology

The weather condition of Dak Cheung District and Sanxay District is mostly cold and with light drizzling rain over almost the entire year. The rainy season is between March and July, whereas the dry season runs from August to October. Over the past five years, a slight change in the temperature has been observed, with an increase of about 1-2 degrees Celsius (EIA, 2020).

8.3.4.1 Temperature

Based on meteorological data from Meteorology Station of Dak Cheung District – the nearest station to the Project, the average annual temperature in 2015 – 2019 is between 20.1 and 21.3 °C (**Table 8.1**). The maximum average temperature was 25.6°C in October 2016, and the minimum average temperature is 14.1 °C in January 2015. Dak Cheung District is situated in high mountain area and is influenced by the monsoon winds. This results in high water vapour and humidity.

Table 8.1: Average Temperature from the Meteorology Station

Year/Month	Average Temperature (°C)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
2015	14.1	17.3	20.9	22.6	23.5	22.8	21.3	22.8	22.4	21.1	20.1	18.7	20.6
2016	18.6	16.5	20.6	24.0	23.1	22.8	22.4	22.5	22.7	25.6	19.9	16.6	21.3
2017	17.5	17.4	20.4	22.3	22.7	23.0	21.6	22.8	23.1	20.4	18.7	15.9	20.5
2018	16.7	16.8	19.1	21.4	22.7	22.0	21.3	21.1	22.7	20.1	19.8	18	20.1
2019	16.8	20.9	22.7	23.6	23.5	23.9	22.3	21.6	21.3	20.9	18.3	16.1	21.0
Min	14.1	16.5	19.1	21.4	22.7	22.0	21.3	21.1	21.3	20.1	18.3	15.9	20.1
Max	18.6	20.9	22.7	24.0	23.5	23.9	22.4	22.8	23.1	25.6	20.1	18.7	21.3

Source: Meteorology Station of Dak Cheung District

8.3.4.2 Rainfall

Based on rainfall data from the Meteorology Station of Dak Cheung District, the nearest station to the Project, the total annual rainfall from 2015-2019 ranged from 1,135-1,796 mm (**Table 8.2**). The maximum annual rainfall was 1,796 mm (in 2018) and the minimum annual rainfall was 1,135 mm (in 2015). The maximum rainfall recorded was 371.6 mm in September 2019. The minimum annual rainfall was 0 mm in March 2016 and February 2019. The months with the heaviest precipitation in 2015-2019 are May to November.

Table 8.2: Annual Rainfall from the Meteorology Station

Year/Month	Annual Rainfall (mm)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2015	17.2	45.5	34.8	110.8	70.9	219.4	156.4	139.2	170.9	88.5	74.3	6.8	1,135
2016	31.1	1.5	0	64.1	241.7	191.1	226.6	173.6	320.6	174.9	196	117.5	1,739

Year/Month	Annual Rainfall (mm)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2017	53.4	29.7	40.3	62.8	160	83.2	296.5	71.8	120.9	200.3	306.1	64.4	1,489
2018	44	19.8	140.4	155.7	253	166.7	291.1	284.7	263.4	63.1	32.1	81.9	1,796
2019	30.3	0	57.9	142.8	275.2	128.2	140.4	361.4	371.6	110.9	89.5	14.1	1,722
Min	17.2	0	0	62.8	70.9	83.2	140.4	71.8	120.9	63.1	32.1	6.8	1,135
Max	53.4	45.5	140.4	155.7	275.2	219.4	296.5	361.4	371.6	200.3	306.1	117.5	1,796

Source: Meteorology Station of Dak Cheung District

8.3.4.3 Humidity

The Project is located in a mountainous area that is covered mostly with forests. The weather condition is influenced by tropical winds from Vietnam that result in high humidity during the morning and cloud cover during the evening, along with evaporation along the mountain ridges.

8.3.4.4 Wind Speed

Wind speed was measured by MWPCCL between 2012 and 2021. Wind measurement masts with a length of 110 m were installed and the data was recorded using Second Wind Nomad 2, Wind Sensor P2546A, and Vector w200P. The monthly wind speed and direction are shown in **Table 8.3**. The average wind speed for 2012-2021 was 6.474 m/s, the maximum average wind speed was 11.069 m/s; recorded in December, and the minimum average wind speed was 4.099 m/s; recorded in May.

Table 8.3: Average Wind Speed Measurement in the Project Area for 2012- 2019

Months	Wind speed at 110 m (m/s)	Direction (degree)
January	8.458	62.7
February	7.760	61.7
March	5.907	70.5
April	5.702	75.9
May	4.099	210.0
June	5.137	216.3
July	5.338	239.9
August	5.473	232.6
September	4.382	226.2
October	7.160	61.0
November	9.595	53.6
December	11.069	59.1
Average	6.474	65.1

Source: Impact Energy Asia Development Limited

8.3.5 Air Quality

Based on the local EIA (EIA, 2022), air quality surveys were undertaken for three continuous days from 17-19 September 2020 by Innogreen, in collaboration with Phanthamit Analytical Lab Co., Ltd. It should be noted that September is at the end of the rainy season when air quality is generally much better than towards the dry season, when large areas of the country are impacted by slash-and-burn agriculture in preparation for rice planting, which is part of the shifting cultivation practiced in the region. As such, this seasonal variability should be taken into account during the monitoring of the air emissions from the project scheduled to run throughout 2023 and 2024. The sampling locations are as follows (and shown in **Figure 8.3**):

- A1: Ban Xiengluang, Dak Cheung District, Sekong Province (72°43'87N, 16°96'54.1E (UTM WGS 1984 Zone 48N)); and
- A2: Ban Dak Run, Dak Cheung District, Sekong Province (741488N, 1704935E (UTM WGS 1984 Zone 48N)).

Two air monitoring locations have been selected given that the Project is located within remote areas and it is assumed that the air parameters (TSP, PM₁₀, PM_{2.5}, CO, SO₂, NO₂) will be relatively low and homogenous across the site. There is limited industrial or anthropogenic inputs in the AoI that would lead to variations in air quality. Based on the nature and scale of the Project, impacts from air emission are considered of low significance.

The parameters were based on the national environmental standards of 2017 that include particulate matter 2.5 microns in size (PM-2.5), particulate matter not exceeding 10 microns (PM-10), total suspended particulates (TSP), carbon monoxide (CO), sulphur dioxide ambient air (SO₂), and nitrogen dioxide ambient air (NO₂).

Air monitoring results from the local EIA (EIA, 2022) are presented in **Table 8.4**. The air quality monitoring data showed that all parameters were within Laos regulations, Environmental, Health, and Safety Guidelines for IFC and WHO for Air Quality Guidelines. This indicates that the ambient air quality within and around the Project area is in good condition.

Table 8.4: Air Quality Monitoring Result (Local EIA, 2022)

No.	Parameters	Unit	Monitoring Result						Laos Standard ^{1/}	International Guideline ^{2/}
			A1: Ban Xiengluang			A2: Ban Dak Run				
			17/09/2021	18/09/2021	19/09/2021	21/09/2021	22/09/2021	23/09/2021		
1	PM-2.5	mg/m³	ND	ND	ND	ND	ND	ND	0.05	0.015
2	PM-10	mg/m³	0.005	ND	0.008	0.022	0.022	0.006	0.12	0.045
3	TSP	mg/m³	0.012	0.006	0.007	0.024	0.026	0.022	0.33	-
4	CO 1 hr	ppm	0.01-0.09	0.02-0.09	0.01-0.07	0.07-0.19	0.20-0.39	0.17-0.29	30	30.552
	CO 8 hr (average)	ppm	0.055	0.06	0.04	0.15	0.31	0.21	9	8.729
5	SO ₂ 1 hr	ppm	0.000-0.007	0.000-0.007	0.000-0.007	0.000-0.011	0.001-0.006	0.002-0.010	0.13	-
	SO ₂ 24 hr (average)	ppm	0.003	0.003	0.003	0.004	0.003	0.005	0.05	0.015
6	NO ₂ 1 hr	ppm	0.001-0.01	0.001-0.008	0.001-0.009	0.000-0.002	0.000-0.002	0.000-0.009	0.11	0.106
	NO ₂ 24 hr (average)	ppm	0.005	0.003	0.004	0.000	0.000	0.004	0.02	0.005

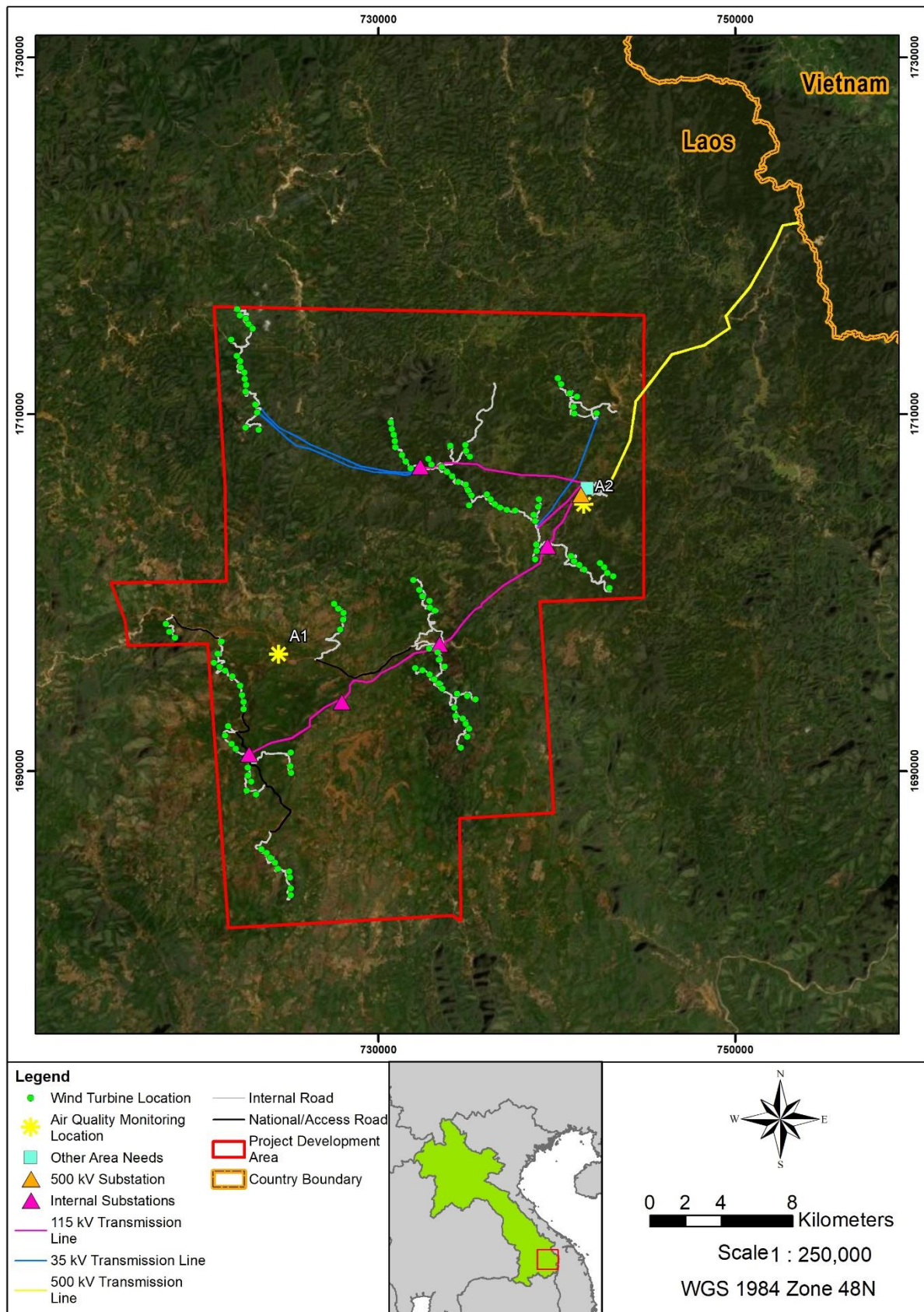
Source: EIA, 2022

Note:

^{1/} General Air Quality Standard. National Environmental Standard (No 81 NA). 21 February 2017, ND = Not Detected (Limit of detection is 0.002 mg/m³)

^{2/} World Health Organization. (2021). WHO global air quality guidelines: particulate matter (PM2.5 and PM10), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide. World Health Organization. <https://apps.who.int/iris/handle/10665/345329>. License: CC BY-NC-SA 3.0 IGO

Figure 8.3: Air Sampling Locations



8.3.6 Noise

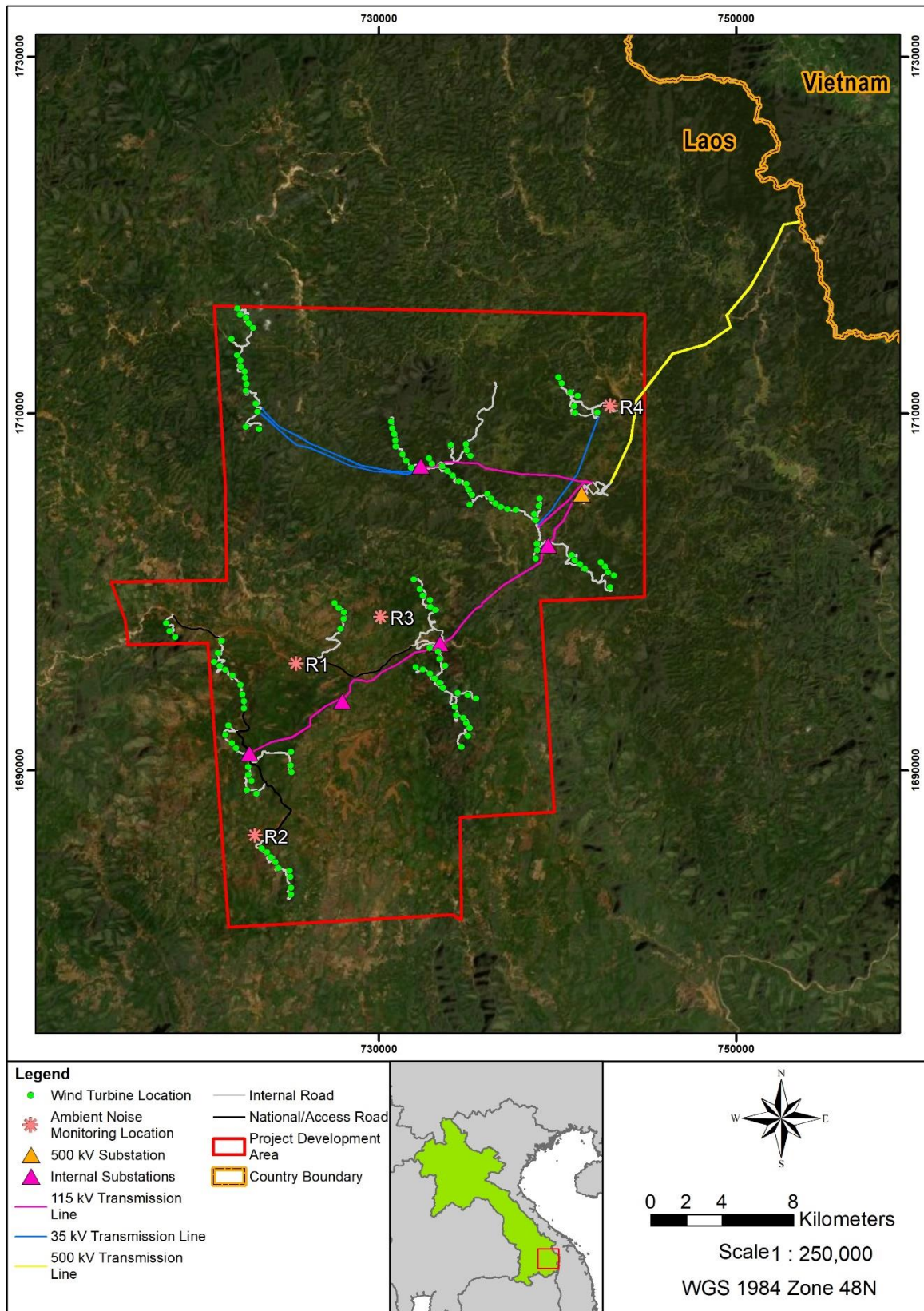
In order to establish wind farm noise limits, background noise monitoring is required to establish the pre-existing environment as a function of wind speed. As wind speed increases generally the background noise levels at most receptors also increases, as natural sources, such as the wind through the trees, begin to dominate. The variation of background noise with wind speed is usually quite site specific and related to various physical characteristics, such as topographic shielding and the extent and height of exposed vegetation.

Background noise measurements have been carried out by Innogreen at four representative monitoring locations in the vicinity of the Project site. The monitoring locations are described in **Table 8.5** and are illustrated in **Figure 8.4**. Background noise measurements were carried out between August-November 2021 (13-16 Aug, 28-31 Oct, 1-2 Nov and 9-12 Aug).

Table 8.5: Noise Sampling Locations

Location	General location	Coordinates	Parameters	Monitoring Frequency and Duration
R1	Monitoring point located at the school of Xiengluang village, wind turbine W110 located c.1km southeast of the monitoring point, and health center located c.0.3km northeast of the monitoring point.	15°19'49.83"N 107° 5'56.35"E	L _{eq} 1hr L _{eq} 24hr L _{eq} L _{max}	Frequency: Once Duration: Over 3 consecutive days
R2	Monitoring point located in the Daksamor village, c.0.5km from internal road, wind turbine W142 located c.0.7km southeast of the monitoring point, the health center located c.0.2km northeast of the monitoring point, and the school located c.0.3km northeast of the monitoring point.	15°14'37.23"N 107° 4'35.88"E	L _{min} L ₁₀ L ₉₀	
R3	Monitoring point located in the Dakbrang village, wind turbine W095 located c. 0.4km northeast of the monitoring point, and the school located c.0.2 km north of the monitoring point.	15°21'13.47"N 107° 8'36.42"E		
R4	Monitoring point located in the Dakcheung village, wind turbine W154, located c.8km southwest of the monitoring point, and the hospital located c.0.2km southeast of the monitoring point.	15°27'33.65"N 107°15'51.33"E		

Figure 8.4: Noise Monitoring Locations



8.3.6.1 Noise Monitoring Procedure

The noise monitoring procedure was undertaken in accordance with ISO 1996 - 1:2016, which specifies that noise monitoring should be carried out using a Type 1 or 2 sound level meter as per IEC standards³⁸. A sound level meter 1.5 m above the ground and no closer than 3 m to any reflecting surface (e.g., wall) was deployed at each station. A portable weather station was positioned close to each sound level meter to simultaneously measure the wind speed (in a series of 10-minute intervals).

Noise levels were measured continuously for 72 hours with data logging every 10 minutes. Weather conditions (e.g., wind speeds), existing industrial condition and noise contribution from other noise sources at the monitoring locations were recorded and used for noise analysis. Field logs for all survey work, noting the date and time of the survey, equipment used, and a record of all activities and observations, calibration sheets, and noise monitoring raw data can be found in **Appendix B**.

Regression analyses of the background noise data and the hub height wind speed data were carried out to determine a line of 'best fit' from the baseline noise measurements, from which the noise impact assessment criteria have been established as a function of wind speed.

8.3.6.2 Wind Speed Monitoring

The data was recorded in 10-minute intervals and this data was converted to provide the average wind speed at a nominal hub height of 110 m. The conversion applied an extrapolation based on a log law method, as set out in Section 2.1.5 of the Institute of Acoustics (IOA) Good Practise Guide (GPG) Supplementary Guidance Note 4: Wind shear³⁹. The shear factors used in the calculation were extracted from the vertical speed profile wind model.

The IAO GPG describes the derivation of noise limits based on a 'standardized' wind speed at a height of 10 m. Wind turbine sound power levels in the past have been reported with reference to the 'standardized' wind speed at 10 m height. However, the 3rd Edition (2012) of IEC61400-11^{3,40} mainly requires sound power levels to be stated in relation to the hub height wind speed. As such, wind speed at a nominal hub-height of 110 m has been selected as the preferred reference wind speed for this analysis.

8.3.6.3 Noise Monitoring Results

Noise level (equivalent continuous sound pressure level with 'A' frequency weighting - LAeq) measured at the four (4) monitoring locations met the World Bank Group (WBG) Criteria which is more stringent than Lao National Ambient Noise Standard for most of the monitoring duration in the daytime (07:00 - 22:00). The exceeded noise level measured in the night-time (22:00-7:00) were likely due to interference of the local activities such as household activities, the movement of in-used vehicles, and animal (chicken, dogs, and buffalo). Noise monitoring results for each monitoring location are shown in **Figure 8.5** to **Figure 8.8** and discussed in detail below.

- **R1 located at the school of Xiengluang village:** Day and night time noise levels are below the equivalent WBG noise standards. The main sources of noise were from road users (truck, car, and motorbike) as well as noise from community and farm animals.
- **R2 located in the Daksamor village:** Noise levels at this location exceeded the day time and night-time WBG criteria. The main sources of noise were from local communities / domestic noise, dogs, and music.

³⁸ International Finance Corporation (2017). *Environmental, Health, and Safety (EHS) Guidelines*. World Bank Group. <https://www.ifc.org/wps/wcm/connect/4a4db1c5-ee97-43ba-99dd-8b120b22ea32/1-7%2BNoise.pdf?MOD=AJPERES&CVID=nPtgwZY>

³⁹ Institute of Acoustics (2014). *A good practice guide to the application of ETSU-R-97 for the assessment and rating of wind turbine noise – Supplementary guidance note 4: Wind Shear*

⁴⁰ International Electrotechnical Commission (2012). IEC 61400-11 Edition 3.0 2012-11. *Wind turbines – Part 11: Acoustic noise measurement techniques*

- **R3 located in the Dakbrang village:** Noise levels during daytime at receptor R3 were on average below the WBG daytime criteria. During night-time, noise levels generally exceeded the WBG night-time criteria. The main sources of noise were from local communities / domestic noise, and farm animals.
- **R4 located in the Dakcheung village:** During day and night time, measured noise levels at R4 are generally within the WBG night time noise criterion of 45 dB(A). R4 is an isolated receptor far from roads or many residential properties.

Figure 8.5: Noise Monitoring Result at R1

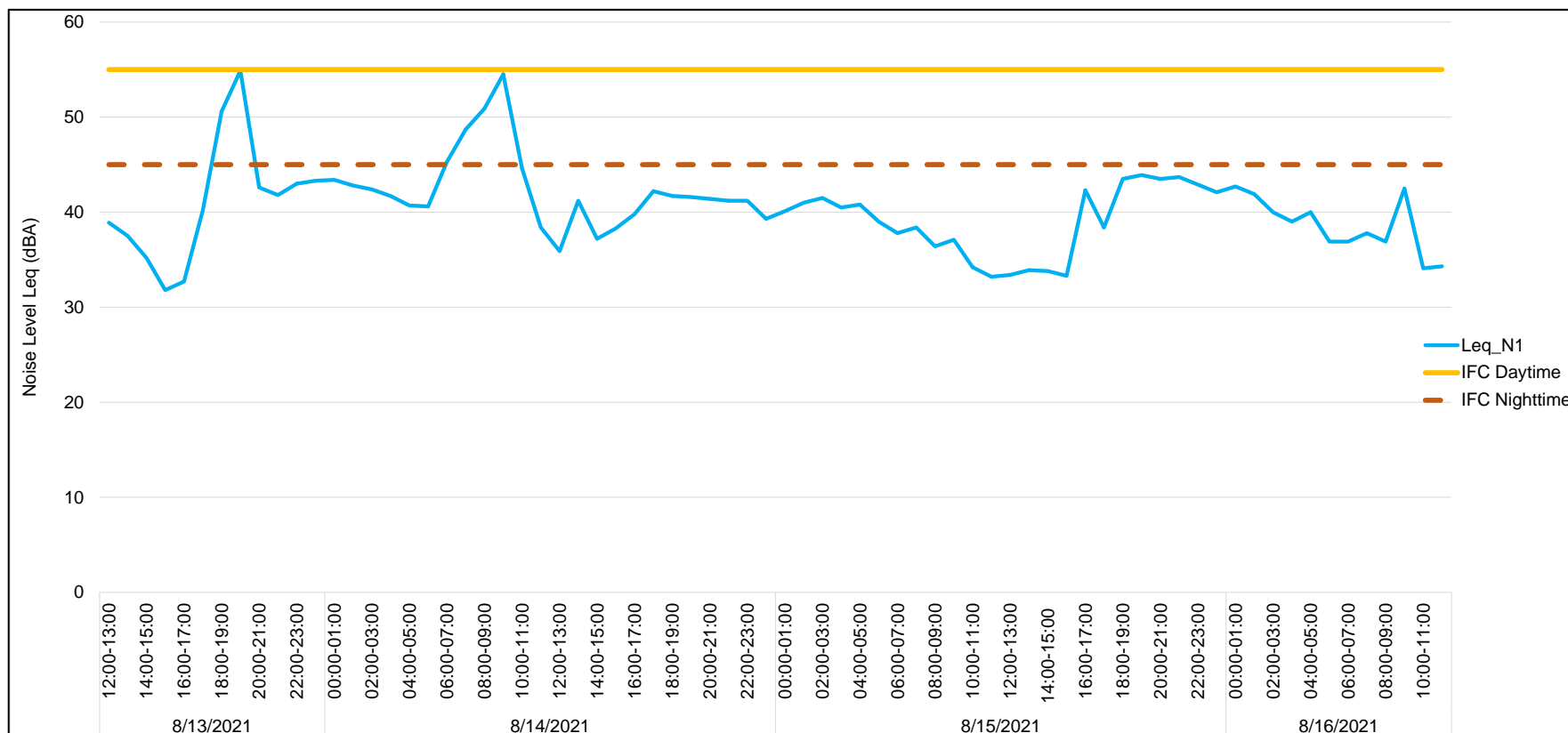


Figure 8.6: Noise Monitoring Result at R2

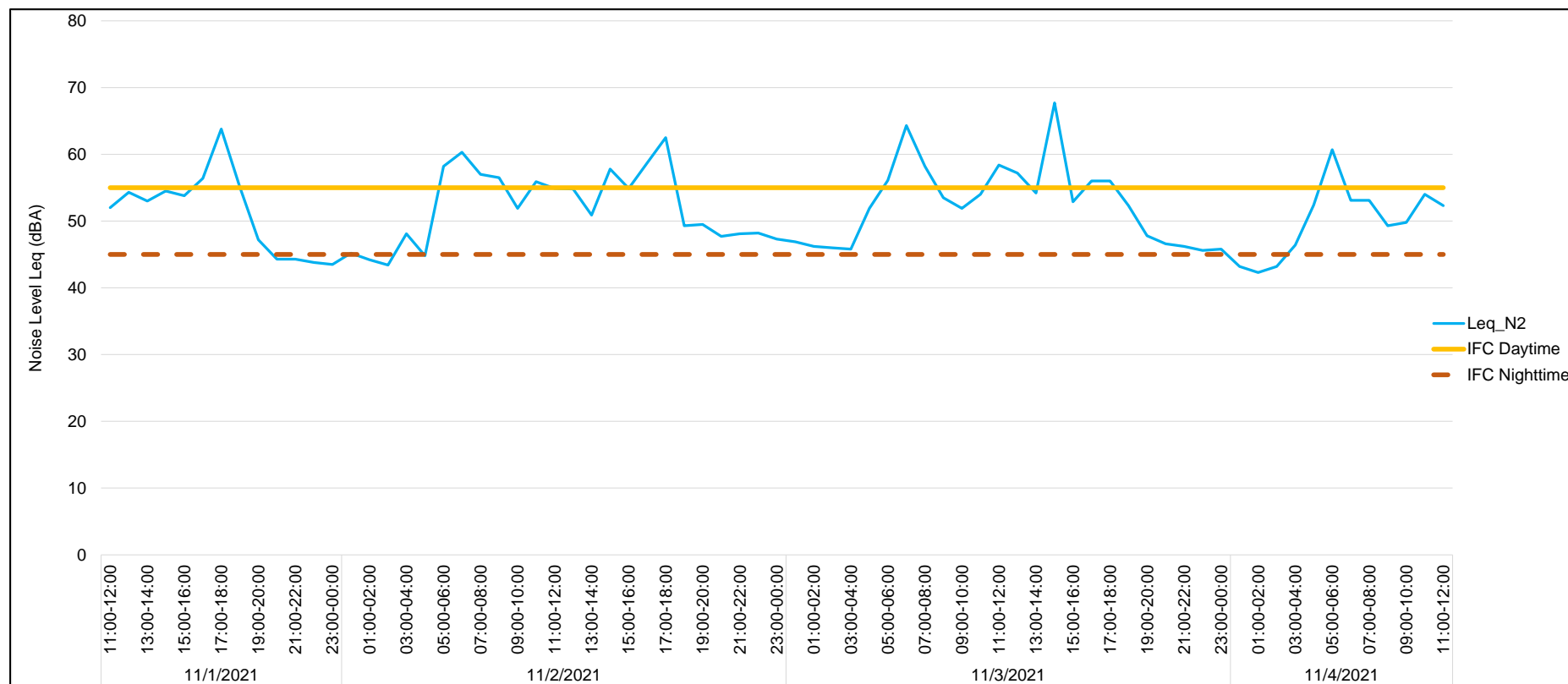


Figure 8.7: Noise Monitoring Result at R3

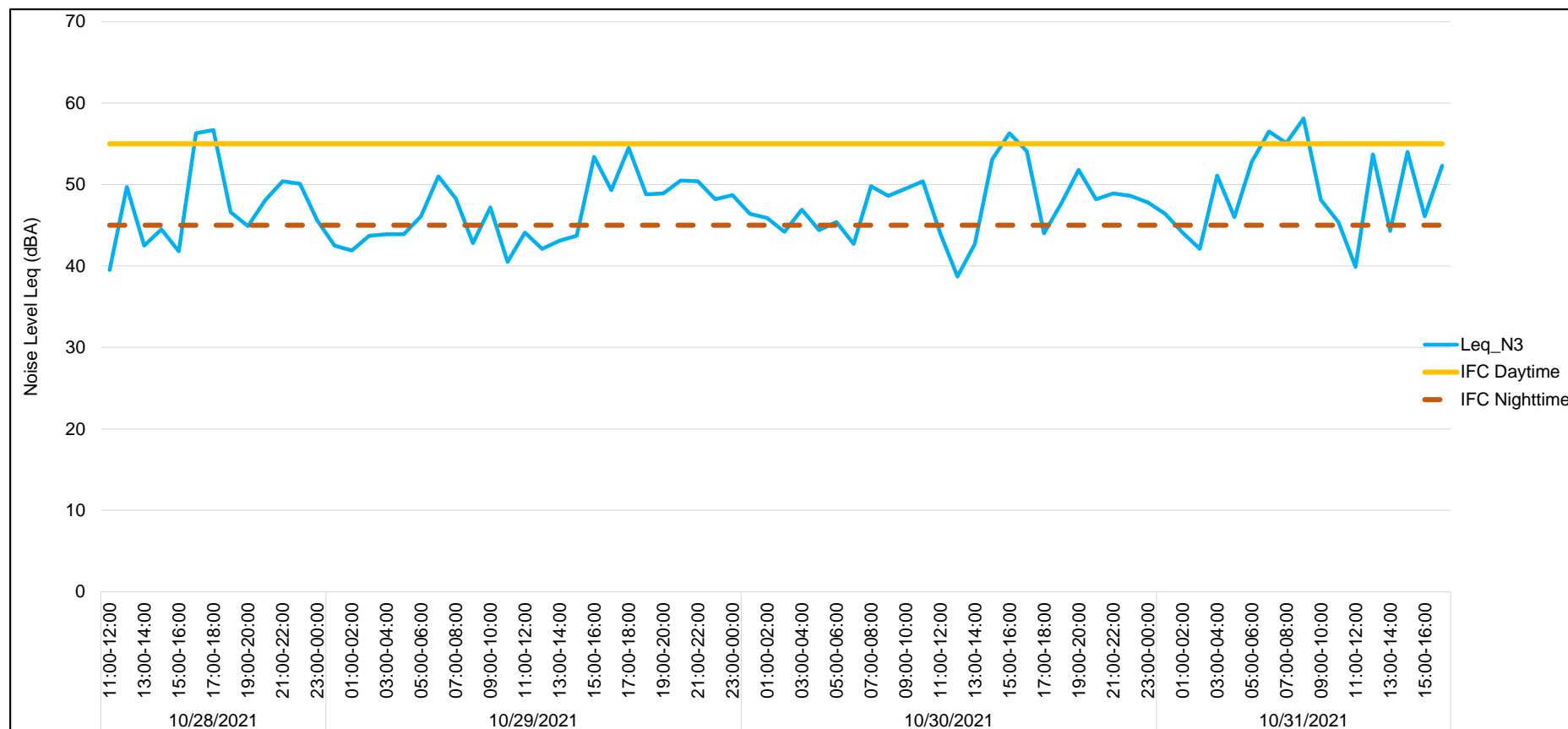
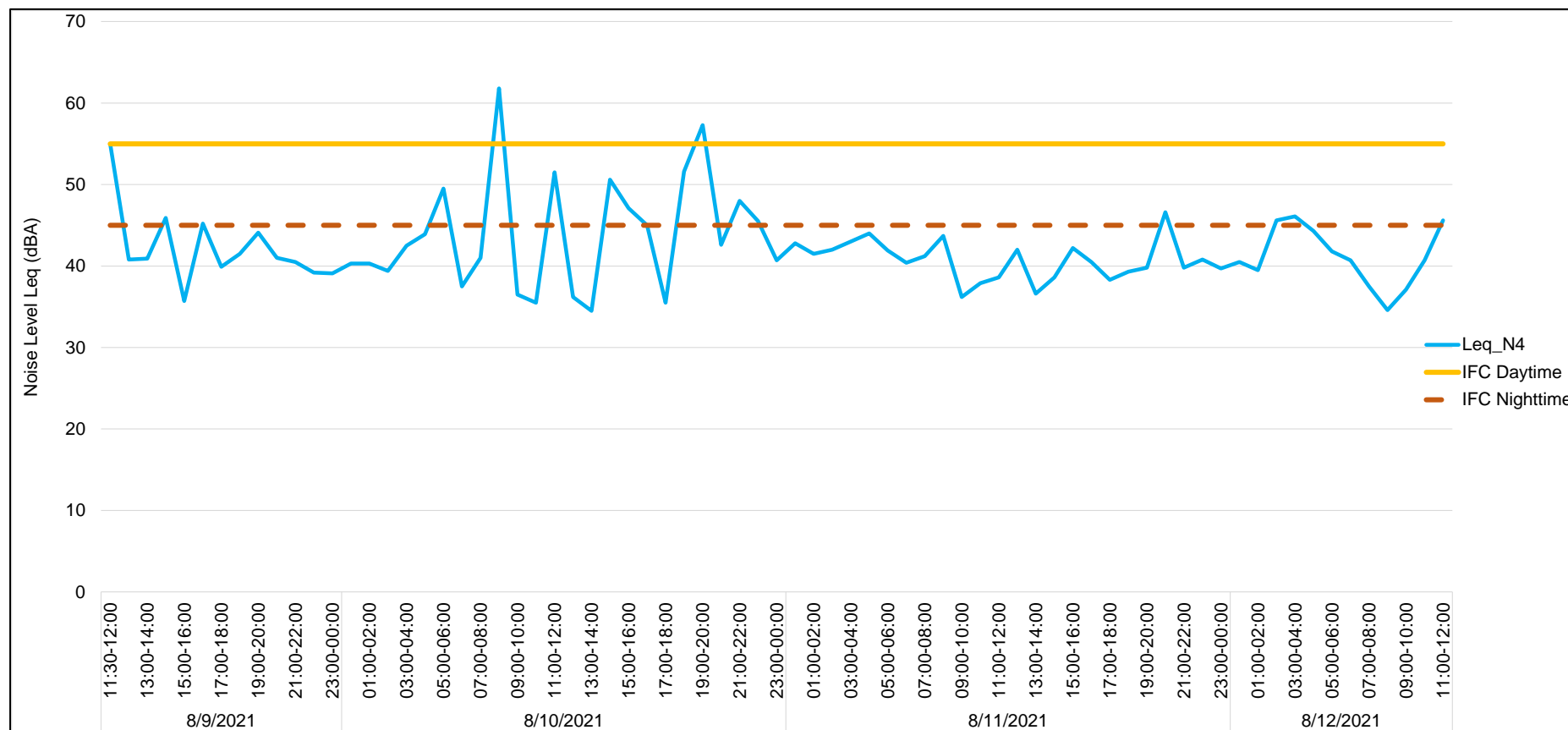


Figure 8.8: Noise Monitoring Result at R4



8.3.6.4 Background Noise Analysis

Limited rainfall was observed during the three day measurement period at each receptor. The noise data during rainfall over the 10-min intervals were excluded from the data analysis.

The existing acoustic environment is mainly driven by noise sources related to human activities, such as traffic or power generators, which probably lead to increased noise levels during night-time.

Despite the expectation, a weak correlation has been found between wind speed and noise level, meaning that some other factors were influencing the measurements.

Table 8.6 summarizes the total, excluded, remaining valid, day, and night 10-min periods for each location.

Table 8.6: Time Periods for Noise Measurements Occurred Every 10-Min

Location	Number of Points				
	Total	Excluded	Remaining Valid	Day time	Night time
R1	433	26	407	245	162
R2	439	0	439	277	162
R3	469	15	454	298	156
R4	433	21	412	255	159

The measured existing background noise levels based for the different wind speeds are presented in **Table 8.7**.

Regression has been made for both 24 hours and the day/night period to accomplish both the requests of Lao PDR national criteria and WBG criteria.

Table 8.7: Background noise level at Monitoring Location

Location	Time period	Background Noise Level L90 (dBA) at 110m height wind speed (m/s)							
ID		3	4	5	6	7	8	9	10
R1	24 hours	40	40	40	40	40	40	40	40
	Day-time	41	41	42	42	43	43	44	44
	Night-time ⁽¹⁾	40	40	40	39	39	38	38	38
R2	24 hours	45	45	45	45	45	45	45	45
	Day-time	46	47	47	48	49	49	50	50
	Night-time	44	45	45	45	46	46	46	47
R3	24 hours	43	44	45	46	47	48	49	50
	Day-time	42	44	45	46	47	48	49	50
	Night-time	44	45	45	46	47	48	49	49
R4	24 hours	39	39	39	39	40	40	40	41
	Day-time ⁽¹⁾	37	37	37	37	37	37	37	37
	Night-time	40	40	40	40	40	40	40	41

Notes:

¹ Weak regression

A weak correlation has been found on receptors R1 and R4 between wind speed and noise levels. Background noise level typically increases with the increase of wind speed, because of wind-induced noise generated around objects or vegetation (**Figure 8.9- Figure 8.12**). The line of best fit for the data set is determined using a linear trend line, which provides a correlation between wind speed and background noise level.

It can also be seen that night time noise levels at location R3 and R4 are greater than day time. ERM assumes this is a result of either due to insect noise or the operation of power generators.

As the data do not provide a clear correlation between wind speed and measured noise level on R1 and R4; the absolute criteria of WBG has been considered for the assessment purpose in comparison with the predicted model noise.

Figure 8.9: Background Noise Measurements against Wind Speed for R1

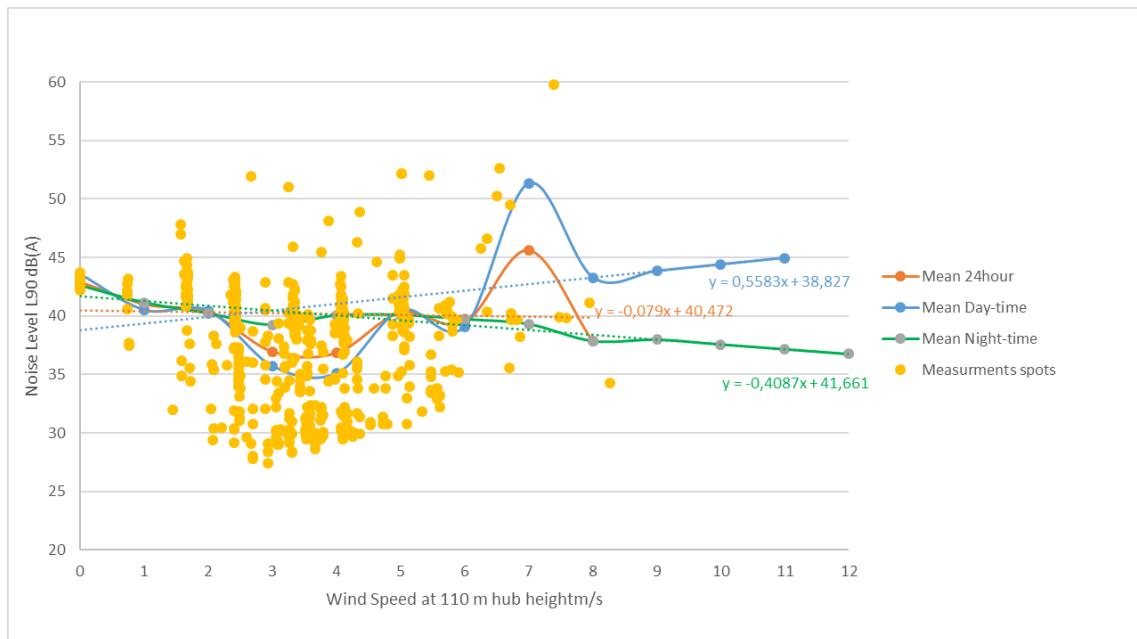


Figure 8.10: Background Noise Measurements against Wind Speed for R2

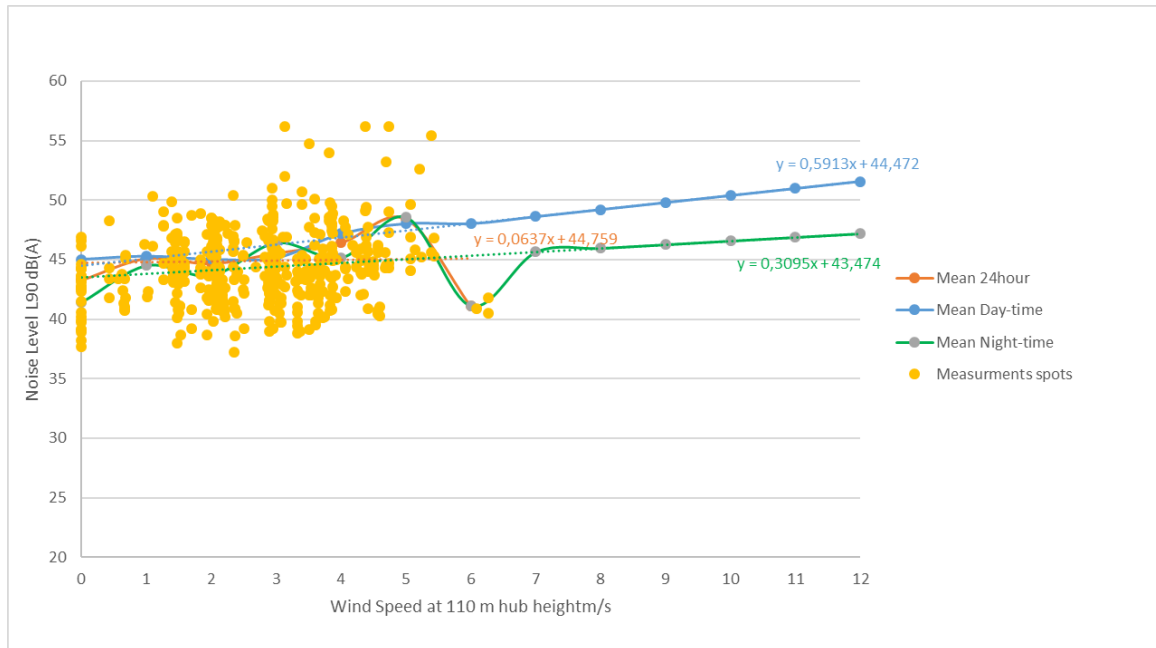


Figure 8.11: Background Noise Measurements against Wind Speed for R3

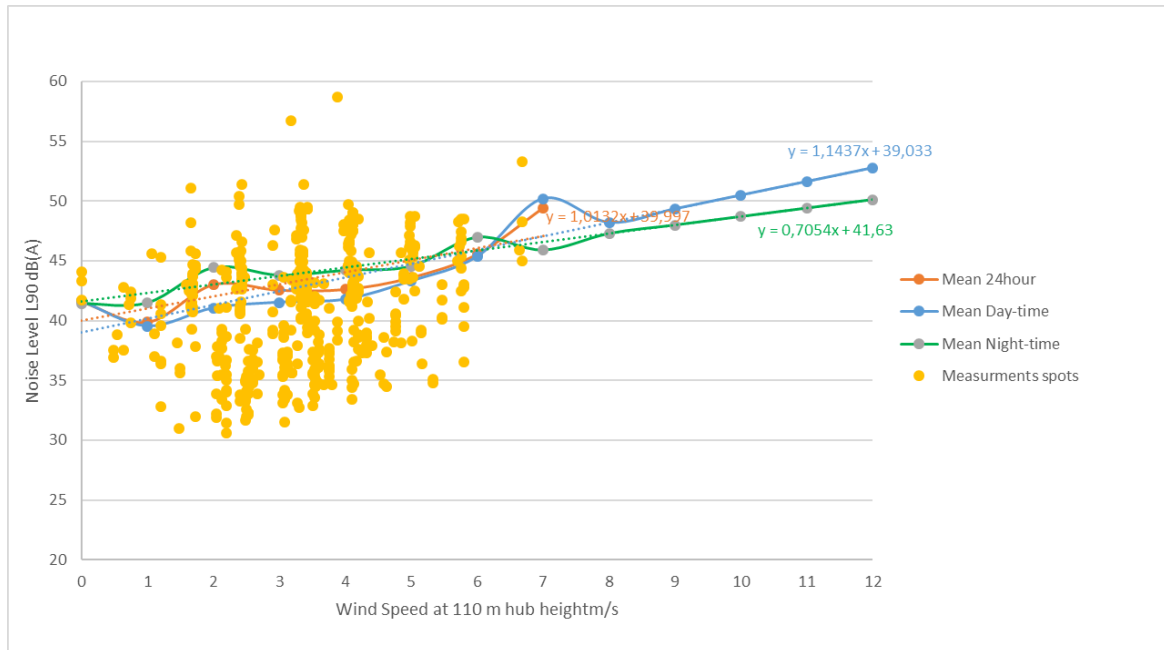
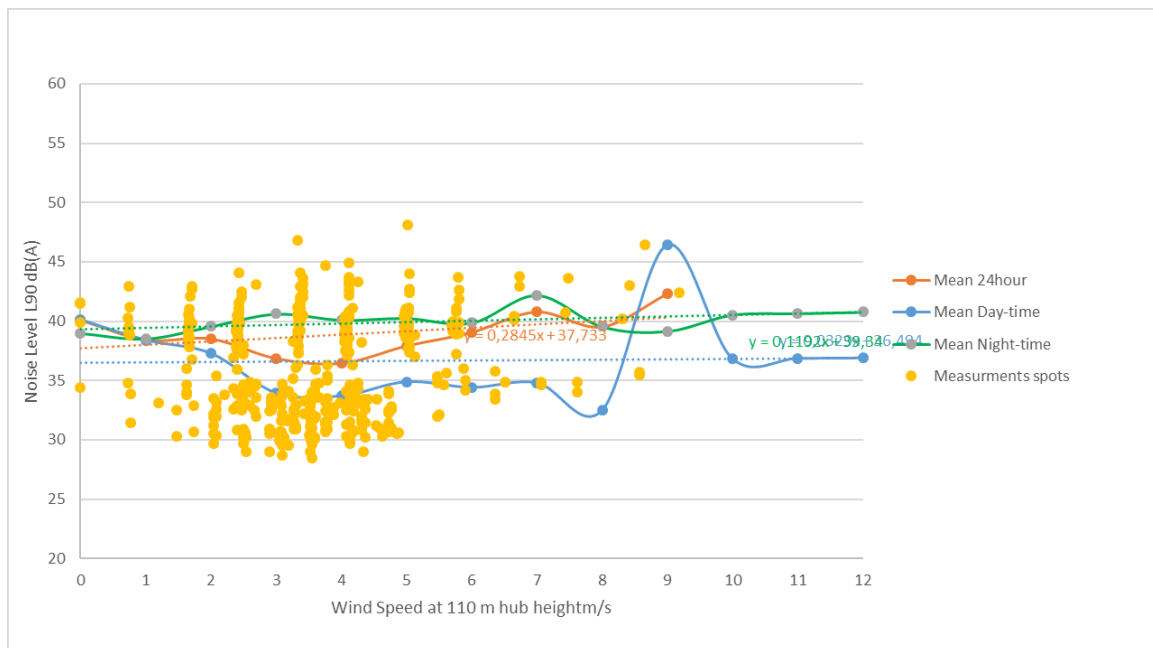


Figure 8.12: Background Noise Measurements against Wind Speed for R4



8.3.7 Surface Water Quality

8.3.7.1 Surface Water Monitoring – Reference from the local EIA

The people have mainly used water from the streams. The water flow direction depends on the topographic characteristics of the area. Important water sources in the study area, such as Houay Nuan, Houay Lo, Houay Bouat, Houay Ang, Houay Hok, Houay Air, Houay Preed, Houay Joon, Houay Nam Ngon and Houay Nheun. The characteristics of these streams are similar, such as large streams have water all year round, and most small streams have less water during the dry season.

Baseline data collection for surface water was undertaken on 23 September 2020 by Innogreen, in collaboration with Phanthamit Analytical Lab Co., Ltd, based on the ESIA. The parameters were based on the National Environmental Standards No. 81/GOV, 2017. It is to be noted that water quality will vary with seasonal influences, therefore a single sampling event will not capture the range of the water quality experienced by the streams being surveyed.

The sampling locations included (as shown in **Figure 8.13**):

- SW01: Houay Nam Ngon River in Ban Nam Ngon, Sanxay District, Attapeu Province (73°10'03N, 16°84'39.9E (UTM WGS 1984 Zone 48°N));
- SW02: Houay Joon River in Ban Dak Padou, Sanxay District, Attapeu Province (736057N, 1690997E (UTM WGS 1984 Zone 48N));
- SW03: Houay Preed River in Ban Xiengluang, Dak Cheung District, Sekong Province (722427N, 1692294E (UTM WGS 1984 Zone 48N));
- SW04: Houay Air River in Ban Sieng Mai, Dak Cheung District, Sekong Province (722309N, 1701964E (UTM WGS 1984 Zone 48N)); and
- SW05: Houay Nheung River in Ban Dak Dor, Dak Cheung District, Sekong Province (738037N, 1700351E (UTM WGS 1984 Zone 48N));

Surface water monitoring results from the local EIA (EIA, 2022) are presented in **Table 8.8**. The parameters of SW01, SW02, and SW05 were within Laos regulations. These monitoring locations are natural streams along the valley, covered with trees and some land area used for agricultural production, such as; cassava cultivation, upland crop cultivation along the slope of the mountain, and a small area is used for rice cultivation.

The parameters of SW03 and SW04 were mostly within the standards except for measurements of phenol (C₆H₆O). SW03 is in the area of Ban Xiengluang at Houay Preed, the boundary area connecting to Ban Dak Dor. The area near the stream consists of unstocked forest, agricultural land, and a fruit-tree plantation company. Phenol is an important industrial product that is used as a basic chemical in many kinds of products, primarily used in plastic synthesis and related materials, and as chemical in herbicide products. As such, the presence of the industry in the area may be the cause of the high value of Phenol in the water. SW04 is in the area of Ban Sieng Mai, Houay Air and has quite a large stream. There are villages located at the upper bank of the stream, including a rice field area, and cultivation area for crops. The area consists of natural high and steep rock mountains, which may contain minerals underground. There is frequent rainfall that causes water to flow over various sources that may cause the water contamination.

Figure 8.13: Surface Water Sampling Locations

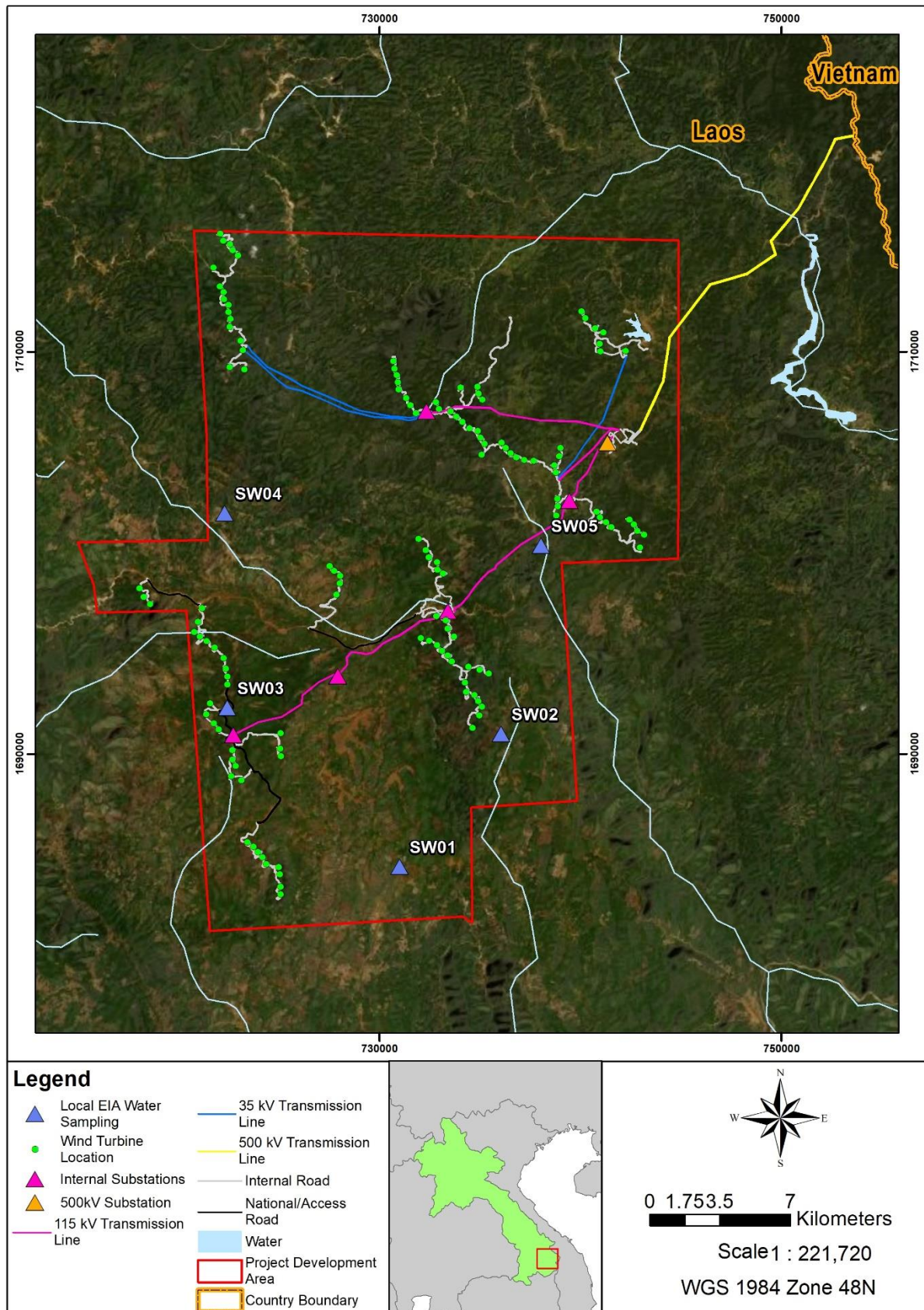


Table 8.8: Surface Water Monitoring Result

No.	Parameter	Unit	Surface Water Monitoring Result					Water Quality Standards ^{1/}				
			SW01	SW02	SW03	SW04	SW05					
			23/09/20 (10.45 am)	23/09/20 (02.25 pm)	23/09/20 (11.45 am)	23/09/20 (10.25 am)	23/09/20 (01.15 pm)					
			Village Name									
			Nam Ngon	Dak Padou	Xiengluang	Sieng Mai	Dak Dor					
			Stream Name									
			Nam Ngon	Houay Jool	Houay Preed	Houay Air	Houay Nheung	1	2	3	4	5
1	Odor	-	Odourless	Odourless	Odourless	Odourless	Odourless	-	-	-	-	-
2	Color (Field work)	-	Orange	Clear	Clear	Dark yellow	Grey			Colourless		
3	Color	-	23.9	14	5.56	28.8	17.7	-	-	-	-	-
4	Water temperature	°C	21	23	20.8	20.5	24	-	-	-	-	-
5	pH	-	7.4	7.1	6.4	7.1	7.1	6.0-8.0	6.0-8.0	5.0-9.0	5.0-9.0	-
6	DO	mg/L	8.50	8.90	7.25	8.80	8.25	>7	6.0	>4.0	2.0	<2
7	Conductivity	ms/cm	18.8	22.8	9.90	21.6	24	<500	≤1000	≤2000	≤4000	>4000
8	COD	mg/L	6.30	ND	ND	ND	1.89	>5	5-7	7-10	10-12	<12
9	TSS	mg/L	20	8.95	ND	34.4	11	>10	≥25	≤40	≥60	<60
10	As	mg/L	ND	<0.0020	ND	<0.0020	ND	0.01	0.01	0.01	0.01	-
11	Cd	mg/L	ND	ND	ND	ND	ND	0.003	0.003	0.003	0.003	-
12	Cu	mg/L	ND	ND	ND	ND	ND	1.5	1.5	1.5	1.5	-
13	Cr ⁺⁶	mg/L	ND	ND	ND	ND	ND	-	-	-	-	-
14	CN ⁻	mg/L	<0.020	<0.020	<0.020	<0.020	<0.020	0.07	0.07	0.07	0.07	-

No.	Parameter	Unit	Surface Water Monitoring Result					Water Quality Standards ^{1/}				
			SW01	SW02	SW03	SW04	SW05					
			23/09/20 (10.45 am)	23/09/20 (02.25 pm)	23/09/20 (11.45 am)	23/09/20 (10.25 am)	23/09/20 (01.15 pm)					
			Village Name									
			Nam Ngon	Dak Padou	Xiengluang	Sieng Mai	Dak Dor					
			Stream Name									
			Nam Ngon	Houay Jool	Houay Preed	Houay Air	Houay Nheung	1	2	3	4	5
15	Pb	mg/L	ND	ND	ND	ND	ND	0.01	0.01	0.01	0.01	-
16	Mn	mg/L	0.04	<0.03	<0.03	0.09	0.05	1.0	1.0	1.0	1.0	-
17	Hg	mg/L	ND	ND	ND	ND	ND	0.001	0.001	0.001	0.001	-
18	Ni	mg/L	ND	ND	ND	ND	ND	0.1	0.1	0.1	0.1	-
19	NO ₃ -N	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	5.0	5.0	5.0	5.0	-
20	Phenol	mg/L	ND	ND	<u>0.031</u>	<u>0.016</u>	0.008	0.005	0.005	0.005	0.005	-
21	PO4	mg/L	<0.46	<0.46	<0.46	<0.46	<0.46	>0.1	0.5	1.0	2.0	<2.0
22	Zn	mg/L	ND	ND	ND	ND	ND	1.0	1.0	1.0	1.0	-
23	NH ₃ -N	mg/L	0.28	0.20	0.30	0.25	0.42	0.5	0.5	0.5	0.5	-
24	NH ₄ ⁺	mg/L	0.36	0.26	0.39	0.32	0.54	≤0.5	≤1.5	≤3	≤4	4

Source: ESIA, Sept 2020

Note: ^{1/} National Environmental Standards, No. 81/GOV, 2017 (Underlined value: exceed the standard)

- Type 1: This is a natural water resource or ambient river, the raw water does not pass any treatment process and the water is not mixed with any chemical from industries and other activities.
- Type 2: This is a water source will be used for consumption, but requires treatment. This water source is suitable for aquatic life conservation, fish farming and others.
- Type 3: This is a water source will be used for consumption, but requires treatment. This water source is suitable for agriculture, livestock farming and others.
- Type 4 This is a water source will be used for consumption, but requires treatment. This water source is suitable for industrial activities, as receiving water body of wastewater discharge from the town or communities and others
- Type 5 The water source is useful for communication, transportation and as receiving water body of wastewater discharge from the town and others
- ND = not detected

8.3.7.2 Surface Water Monitoring – Supplementary Sampling

Surface water quality sampling was conducted on 12th August 2021 by Innogreen. Six (6) samples were taken in the Project area to analyze water quality parameters and compare against Laos Standards. An overview of the surveys and their results are presented in this section.

8.3.7.2.1 Surface Water Monitoring Locations

ERM recommended moving some of the original sampling locations proposed by Innogreen to a new location based on revisions to the site layout, identification of watercourses that have the potential to be impacted by the Project (e.g., turbines, site roads, watercourse crossings), and a set of comparable control sites, which are unlikely to be affected by any aspect of the development for the duration of the Project.

Surface water samples were collected at six (6) locations. A description for each of the sampling locations is shown in **Table 8.9** and the locations of each sampling site are shown in **Figure 8.14**.

Table 8.9: Supplementary Surface Water Sampling Locations

Sampling Station ^{1,2}		General location	Coordinates ³	Parameters
No.	Type			
SW1	Control site, upstream of potentially affected site	Sampling point (Huaiy Pen River) to be located upstream of site road that intersects river and connects wind turbines WH153 to WH133	15°20'16.64"N 107° 3'34.42"E	<ul style="list-style-type: none"> ■ Observations: ■ Odour ■ Colour ■ Turbidity ■ In-situ measurements: ■ pH ■ ORP (Oxidation Reduction Potential) ■ DO (Dissolved Oxygen) ■ Conductivity ■ Salinity ■ TDS (Total Dissolved Solids) ■ Water Temperature ■ Water depth ■ Laboratory analysis: ■ Calcium ■ Magnesium ■ Sodium ■ Potassium ■ Total Hardness (CaCO₃) ■ Alkalinity (CaCO₃) ■ Sulfate ■ Chloride ■ Total Suspended Solids ■ Total Coliform Bacteria ■ Oil and Grease ■ Total Nitrogen
SW2	Potentially affected site	Sampling point (Huaiy Pen River) to be located downstream of site road that intersects river and connects wind turbines WH153 to WH133	15°20'9.88"N 107° 3'43.34"E	
SW3	Control site, upstream of potentially affected site	Sampling point (Huaiy Keung River) to be located upstream of site road that intersects river and connects to wind turbines WH056 to WH065.	15°23'27.09"N 107°14'16.41"E	
SW4	Potentially affected site	Sampling point (Huaiy Keung River) to be located downstream of site road that intersects river and connects to wind turbines WH056 to WH065.	15°22'56.71"N 107°14'11.11"E	
SW5*	Potentially affected site	Sampling point (Huaiy Puang River) to be located downstream from existing site road but upstream of transmission line development area	15°27'10.79"N 107°16'9.83"E	

Sampling Station ^{1,2}		General location	Coordinates ³	Parameters
No.	Type			
SW6	Control site, upstream of potentially affected site	Sampling point (Huay Puang River) to be located downstream of both SW5 and transmission line development area	15°27'27.15"N 107°16'54.51"E	<ul style="list-style-type: none"> ■ Total Phosphorus ■ Ortho-Phosphorus ■ Ammonia ■ Biological Oxygen Demand (BOD) ■ Chemical Oxygen Demand (COD) ■ Mercury ■ Cadmium ■ Arsenic ■ Iron ■ Aluminum ■ Manganese ■ Lead ■ Zinc ■ Copper ■ Nickel ■ Nitrate ■ Nitrite ■ Pesticides ■ Other related measurements: ■ Ambient temperature

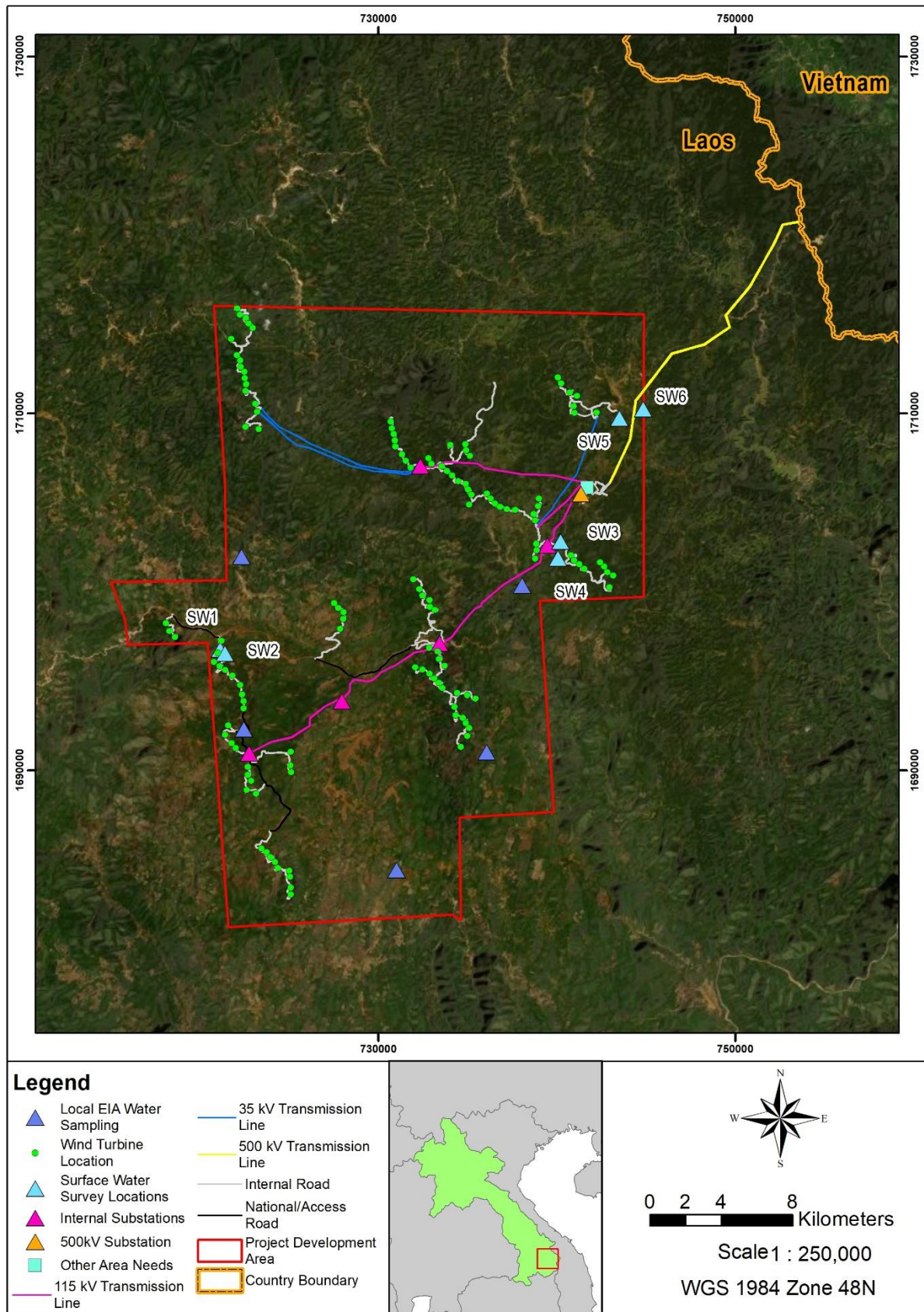
Notes:

¹ Sampling locations indicated with a star (*) were originally recommended by Innogreen.

² This does not include Quality Control (QC) samples such as blanks, and duplicates that were also collected by Innogreen.

³ Coordinates are given in WGS84 datum and provided as guidance only; exact locations should be taken on-site using a hand-held Global Positioning System (GPS).

Figure 8.14: Supplementary Surface Water Sampling Locations



8.3.7.2.2 Surface Water Monitoring Methodology

Surface water sampling was conducted on 12 August 2021. In-situ testing was conducted by Innogreen. Grab water samples were collected for physio-chemical, bacteriological, and pesticide tests onsite, and samples were sent for laboratory testing. The sampling was conducted in strict accordance with recognized standard procedures or referring to the recommendation of the United States Environmental Protection Agency (U.S. EPA).⁴¹ Field logs for all survey work, noting the date and time of the survey, equipment used, and a record of all activities and observations, can be found in **Appendix C**.

8.3.7.2.3 Surface Water Monitoring Results

The chemical oxygen demand (COD) measurement at SW03-5 ranged from 11.7-21.5 mg/L, which exceed the 5-7 mg/ L limit and Coliform Bacteria at SW03 is 11,000 MPN/100 mL which exceed 5,000 MPN/100 mL according to the National Environmental Standards No.81/MONRE 2017. All other parameters are found to be within the Lao standards. When the COD levels are higher, there is a greater demand for oxygen. This means that there is likely more oxidizable organic material in water with high COD levels. However, no corresponding decrease was observed in Dissolved Oxygen (DO) concentrations (which were above the 6 mg/L standard). The high coliform bacteria levels usually correspond to human or animal waste / sewage in water (as observed in SW03). The surface water analysis results are shown in **Table 8.10** (refer to **Appendix C** for more detailed results).

⁴¹ United States Environmental Protection Agency (EPA), National Primary Drink Water Regulations & National Secondary Drinking Water Regulation.

Table 8.10: Surface Water Sampling Results

No.	Sampling point		SW01	SW02	SW03	SW04	SW05	SW06	National Environmental Standards No.81/MONRE 2017
	Date		12/8/2021	12/8/2021	12/8/2021	12/8/2021	12/8/2021	12/8/2021	
	Time		17:40	17:05	14:45	15:30	14:00	15:50	
	Village		Daktiem	Daktiem	Dakrun	Dakrun	Dakbong	Dakbong	
	Observations	Unit							
1	Oder		Non	Non	Non	Non	Non	Non	
2	Color		Clear	Clear	Clear	Clear	Clear	Clear	
3	Turbidity		light	light	light	light	light	light	
	On Site Parameters								
1	Temperature	°c	22.4	22.3	22	21.4	26.4	26.4	-
2	pH		7.9	7.9	7.3	7.4	7.4	6.3	6 – 8
3	DO	mg/L	9.7	8.3	9.1	9.4	9	10.8	6.0
4	Conductivity	ms/cm	7	7.4	27.7	41	25	26.4	≤ 1000
5	Salinity	ppt	0	0	0.01	0.02	0.01	0.01	-
6	TDS	ppm	3.5	3.7	13.9	20.7	13.6	13.2	-
	Laboratory Analysis								
8	Ammonia	mg/L	ND	ND	ND	ND	ND	ND	-
9	BOD	mg/L	<1.00	ND	<1.00	ND	<1.00	ND	-
10	COD	mg/L	5.53	ND	21.5	12.9	11.7	ND	5 – 7
11	Chloride	mg/L	ND	ND	ND	ND	ND	ND	-

No.	Sampling point		SW01	SW02	SW03	SW04	SW05	SW06	National Environmental Standards No.81/MONRE 2017
	Date		12/8/2021	12/8/2021	12/8/2021	12/8/2021	12/8/2021	12/8/2021	
	Time		17:40	17:05	14:45	15:30	14:00	15:50	
	Village		Daktiem	Daktiem	Dakrun	Dakrun	Dakbong	Dakbong	
12	Hardness	mg/L	<10.0	<10.0	10.9	17.6	11.4	10.9	-
13	Fe (Iron)	mg/L	0.3	0.13	0.33	0.15	ND	0.44	-
14	Alkalinity	mg/L	<10.0	<10.0	16.8	24	16.8	14.4	-
15	Nitrate	mg/L	ND	ND	ND	ND	ND	1.5	-
16	Nitrite	mg/L	ND	ND	ND	ND	ND	ND	-
17	Oil & Grease	mg/L	ND	ND	ND	ND	ND	ND	-
18	Sulfate	mg/L	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	-
19	TSS	mg/L	<2.50	3.70	7.2	6.2	6.1	7.1	≤ 25
20	Ortho Phosphate	mg/L	ND	ND	ND	ND	ND	ND	-
21	Coliform Bacteria	MPN/100mL	2,200	2,100	11,000	3,900	4,900	2,100	5,000
22	Phosphorus	mg/L	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	-
23	Total Nitrogen	mg/L	<5	<5	<5	<5	<5	<5	-
24	ORP	mV	-63.7	-40.8	0.4	26.1	24.7	27.6	-
25	Aluminium	mg/L	0.19	0.21	0.15	0.17	0.22	0.26	-
26	Arsenic	mg/L	ND	ND	ND	ND	ND	ND	0.01
27	Cadmium	mg/L	ND	ND	ND	ND	ND	ND	0.003
28	Calcium	mg/L	<1.00	<1.00	1.90	4.02	2.31	2.16	-

No.	Sampling point		SW01	SW02	SW03	SW04	SW05	SW06	National Environmental Standards No.81/MONRE 2017
	Date		12/8/2021	12/8/2021	12/8/2021	12/8/2021	12/8/2021	12/8/2021	
	Time		17:40	17:05	14:45	15:30	14:00	15:50	
	Village		Daktiem	Daktiem	Dakrun	Dakrun	Dakbong	Dakbong	
29	Mercury	mg/L	ND	ND	ND	ND	ND	ND	0.001
30	Copper	mg/L	ND	ND	ND	ND	ND	ND	1.5
31	Lead	mg/L	ND	ND	ND	ND	ND	ND	0.01
32	Magnesium	mg/L	<1.00	<1.00	1.76	1.95	1.47	1.41	-
33	Sodium	mg/L	1.26	1.12	1.65	1.49	1.4	1.22	-
34	Potassium	mg/L	1.15	<1.00	<1.00	2.41	<1.00	1.03	-
35	Zinc	mg/L	ND	<0.03	ND	ND	ND	ND	1
36	Manganese	mg/L	<0.03	0.2	0.1	0.03	<0.03	<0.03	1
37	Nickel	mg/L	ND	ND	ND	ND	ND	ND	0.1
	Pesticides Organochlorine Group								
38	Aldrin	µg/L	ND	ND	ND	ND	ND	ND	0.1
39	α-BHC	µg/L	ND	ND	ND	ND	ND	ND	0.02
40	α-Endosulfan	µg/L	ND	ND	ND	ND	ND	ND	-
41	β-BHC	µg/L	ND	ND	ND	ND	ND	ND	-
42	Dicofol	µg/L	ND	ND	ND	ND	ND	ND	-
43	β-Endosulfan	µg/L	ND	ND	ND	ND	ND	ND	-
44	Dieldrin	µg/L	ND	ND	ND	ND	ND	ND	0.1
45	cis-Chlordane	µg/L	ND	ND	ND	ND	ND	ND	-
46	Endosulfan Sulfate	µg/L	ND	ND	ND	ND	ND	ND	-
47	Endrin	µg/L	ND	ND	ND	ND	ND	ND	-

No.	Sampling point		SW01	SW02	SW03	SW04	SW05	SW06	National Environmental Standards No.81/MONRE 2017
	Date		12/8/2021	12/8/2021	12/8/2021	12/8/2021	12/8/2021	12/8/2021	
	Time		17:40	17:05	14:45	15:30	14:00	15:50	
	Village		Daktiem	Daktiem	Dakrun	Dakrun	Dakbong	Dakbong	
48	Y-BHC	µg/L	ND	ND	ND	ND	ND	ND	-
49	HCB	µg/L	ND	ND	ND	ND	ND	ND	-
50	Heptachlor	µg/L	ND	ND	ND	ND	ND	ND	0.2
51	Heptachlor-exo-epoxide	µg/L	ND	ND	ND	ND	ND	ND	0.2
52	Methoxychlor	µg/L	ND	ND	ND	ND	ND	ND	-
53	o,p'-DDT	µg/L	ND	ND	ND	ND	ND	ND	-
54	o,p'-DDE	µg/L	ND	ND	ND	ND	ND	ND	-
55	o,p'-DDD	µg/L	ND	ND	ND	ND	ND	ND	-
56	p,p'-DDD	µg/L	ND	ND	ND	ND	ND	ND	-
57	p,p'-DDE	µg/L	ND	ND	ND	ND	ND	ND	-
58	p,p'-DDT	µg/L	ND	ND	ND	ND	ND	ND	-
59	Total DDT	µg/L	ND	ND	ND	ND	ND	ND	1
60	trans-Chlordane	µg/L	ND	ND	ND	ND	ND	ND	-
61	Anilofos	µg/L	ND	ND	ND	ND	ND	ND	-
62	Azinphos-ethyl	µg/L	ND	ND	ND	ND	ND	ND	-
63	Azinphos-methyl	µg/L	ND	ND	ND	ND	ND	ND	-
64	Chlorfenvinphos	µg/L	ND	ND	ND	ND	ND	ND	-
65	Diazinon	µg/L	ND	ND	ND	ND	ND	ND	-
66	Dichlorvos	µg/L	ND	ND	ND	ND	ND	ND	-
67	Dicrotophos	µg/L	ND	ND	ND	ND	ND	ND	-

No.	Sampling point		SW01	SW02	SW03	SW04	SW05	SW06	National Environmental Standards No.81/MONRE 2017
	Date		12/8/2021	12/8/2021	12/8/2021	12/8/2021	12/8/2021	12/8/2021	
	Time		17:40	17:05	14:45	15:30	14:00	15:50	
	Village		Daktiem	Daktiem	Dakrun	Dakrun	Dakbong	Dakbong	
68	Dimethoate	µg/L	ND	ND	ND	ND	ND	ND	-
69	EPN	µg/L	ND	ND	ND	ND	ND	ND	-
70	Ethion	µg/L	ND	ND	ND	ND	ND	ND	-
71	Ethoprophos	µg/L	ND	ND	ND	ND	ND	ND	-
72	Etrimfos	µg/L	ND	ND	ND	ND	ND	ND	-
73	Fenitrothion	µg/L	ND	ND	ND	ND	ND	ND	-
74	Fenthion	µg/L	ND	ND	ND	ND	ND	ND	-
	Organophosphate Group								
75	Malathion	µg/L	ND	ND	ND	ND	ND	ND	-
76	Methamidophos	µg/L	ND	ND	ND	ND	ND	ND	-
77	Methidathion	µg/L	ND	ND	ND	ND	ND	ND	-
78	Mevinphos	µg/L	ND	ND	ND	ND	ND	ND	-
79	Monocrotophos	µg/L	ND	ND	ND	ND	ND	ND	-
80	Omethoate	µg/L	ND	ND	ND	ND	ND	ND	-
81	Parathion-methyl	µg/L	ND	ND	ND	ND	ND	ND	-
82	Phosalone	µg/L	ND	ND	ND	ND	ND	ND	-
83	Phosphamidon	µg/L	ND	ND	ND	ND	ND	ND	-
84	Pirimiphos-ethyl	µg/L	ND	ND	ND	ND	ND	ND	-
85	Pirimiphos-methyl	µg/L	ND	ND	ND	ND	ND	ND	-
86	Profenofos	µg/L	ND	ND	ND	ND	ND	ND	-

No.	Sampling point		SW01	SW02	SW03	SW04	SW05	SW06	National Environmental Standards No.81/MONRE 2017
	Date		12/8/2021	12/8/2021	12/8/2021	12/8/2021	12/8/2021	12/8/2021	
	Time		17:40	17:05	14:45	15:30	14:00	15:50	
	Village		Daktiem	Daktiem	Dakrun	Dakrun	Dakbong	Dakbong	
87	Prothiofos	µg/L	ND	ND	ND	ND	ND	ND	-
88	Terbufos	µg/L	ND	ND	ND	ND	ND	ND	-
89	Triazophos	µg/L	ND	ND	ND	ND	ND	ND	-

Source: Innogreen, 2021.

Note: Underlined values exceed the limit

8.3.8 *Landscape Values and Visual Amenity*

This section provides a summary of the existing environmental conditions within the Project study area.

The local environmental setting was determined through desktop analysis and photos from fieldwork (performed in October 2021) to gain a general understanding of the site visual context and landscape setting. The field survey landscape assessment sheet can be found in **Appendix D**.

8.3.8.1 *Landscape Baseline*

The landscape is characterized by different components: topography, land use and potentially sensitive areas relating to landscape (e.g., cultural heritage sites), and according to the presence of common elements. Therefore, the proposed assessment has been developed according to the following tasks:

- Definition of the landscape study area;
- Description of the baseline landscape and topography in the study area;
- Mapping and description of Landscape Character Unit (LCUs);
- Landscape character; and
- Landscape value.

8.3.8.1.1 *Study Area*

The landscape study area of the Project was identified as a buffer of 25 km from each turbine to understand the wider landscape setting and context and where it is assumed that most of the potential impacts will occur.

8.3.8.1.2 *Topography*

The topography of Laos is largely mountainous, with the Annamite Range in the northeast and east and the Luang Prabang Range in the northwest, among other ranges typically characterized by steep terrain. Elevations are typically above 500 meters with narrow river valleys and low agricultural potential. This mountainous landscape extends across most of the north of the country, except for the plain of Vientiane and the Plain of Jars in the Xiangkhoang Plateau (EIA, 2020).

The southern "panhandle" of the country contains large level areas in Savannakhét and Champasak provinces that are well suited for extensive paddy rice cultivation and livestock raising. Much of Khammouan Province and the eastern part of southern provinces are mountainous. Together, the alluvial plains and terraces of the Mekong and its tributaries cover about 20% of the land area.

The landscape of the Project Area and topography are shown in **Figure 8.15** and **Figure 8.16**, respectively.

Figure 8.15: Landscape Study Area

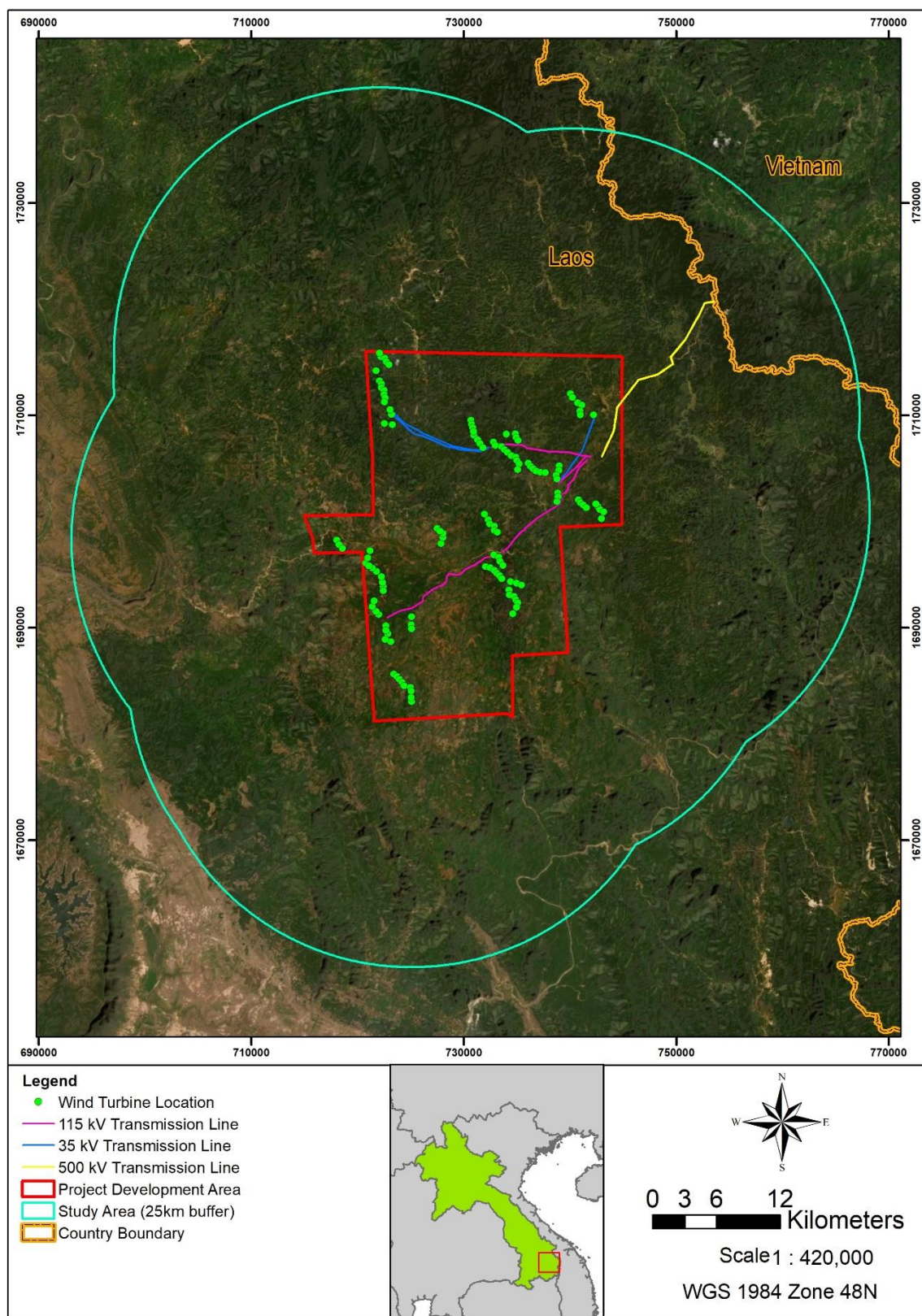
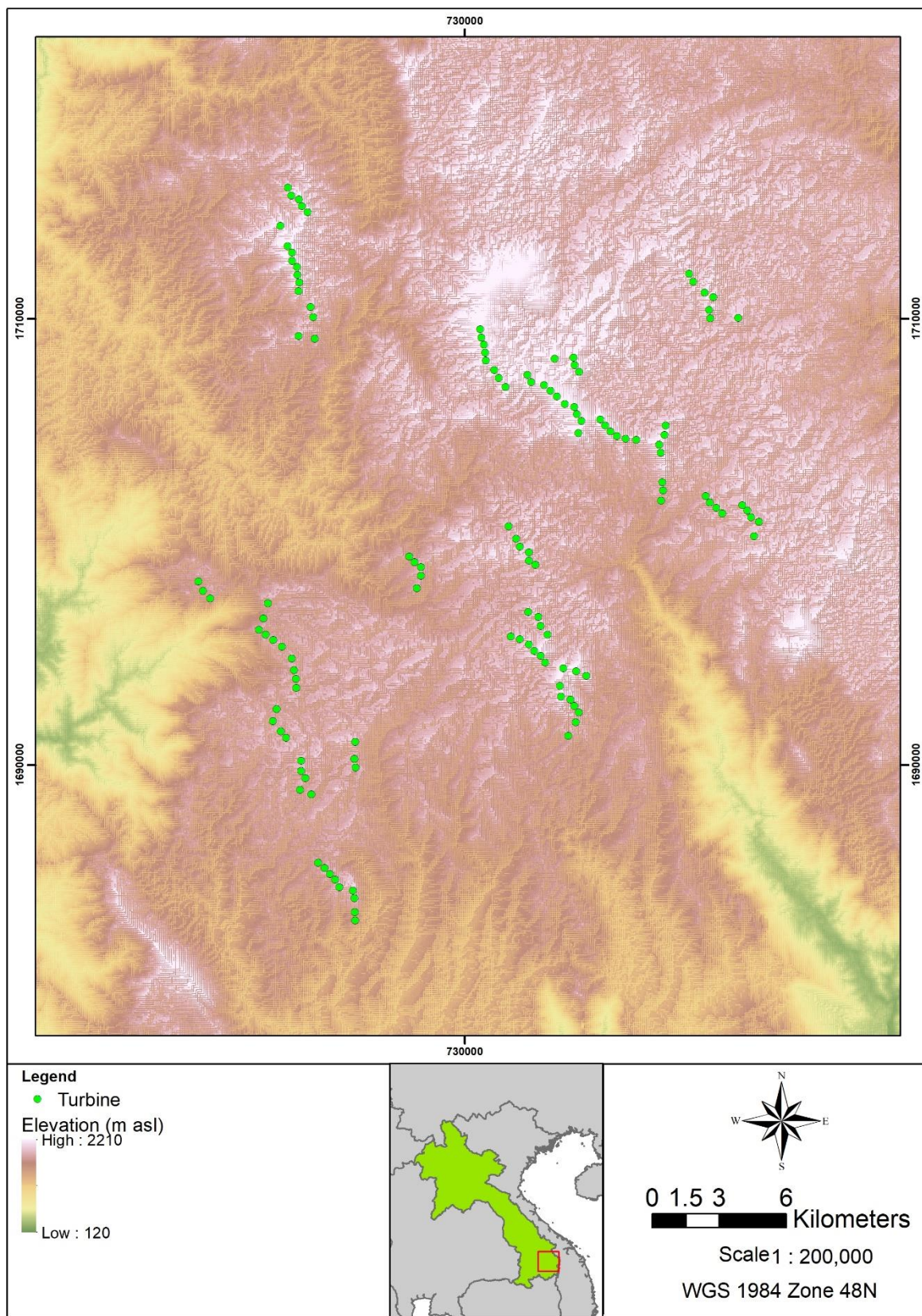


Figure 8.16: Topography of Project Area



8.3.8.1.3 Hydrology of Area

The water streams in the project area are considered the main sources of water that the locals depend on for consumption. The areas in which there are important water sources include: Houay Nuan, Houay Lo, Houay Bouat, Houay Ang, Houay Hok, Houay Air, Houay Preed, Houay Joon, Houay Nam Ngon, and Houay Nheun. Surface water within the project area is shown in **Figure 8.17**. The streams are located near the villages, which have made people use the water for agricultural production, domestic use, and livelihood. The streams in the project area and in Dakcheung District are small and have a high slope, making it unable to be used for navigation. As for the transmission line route of the project, the route passes through Xekaman River, as well as the streams. Since the pre-construction phase only consist of the survey, planning, and design of the transmission line, no hydrological impact will be caused to the water sources in the project area.

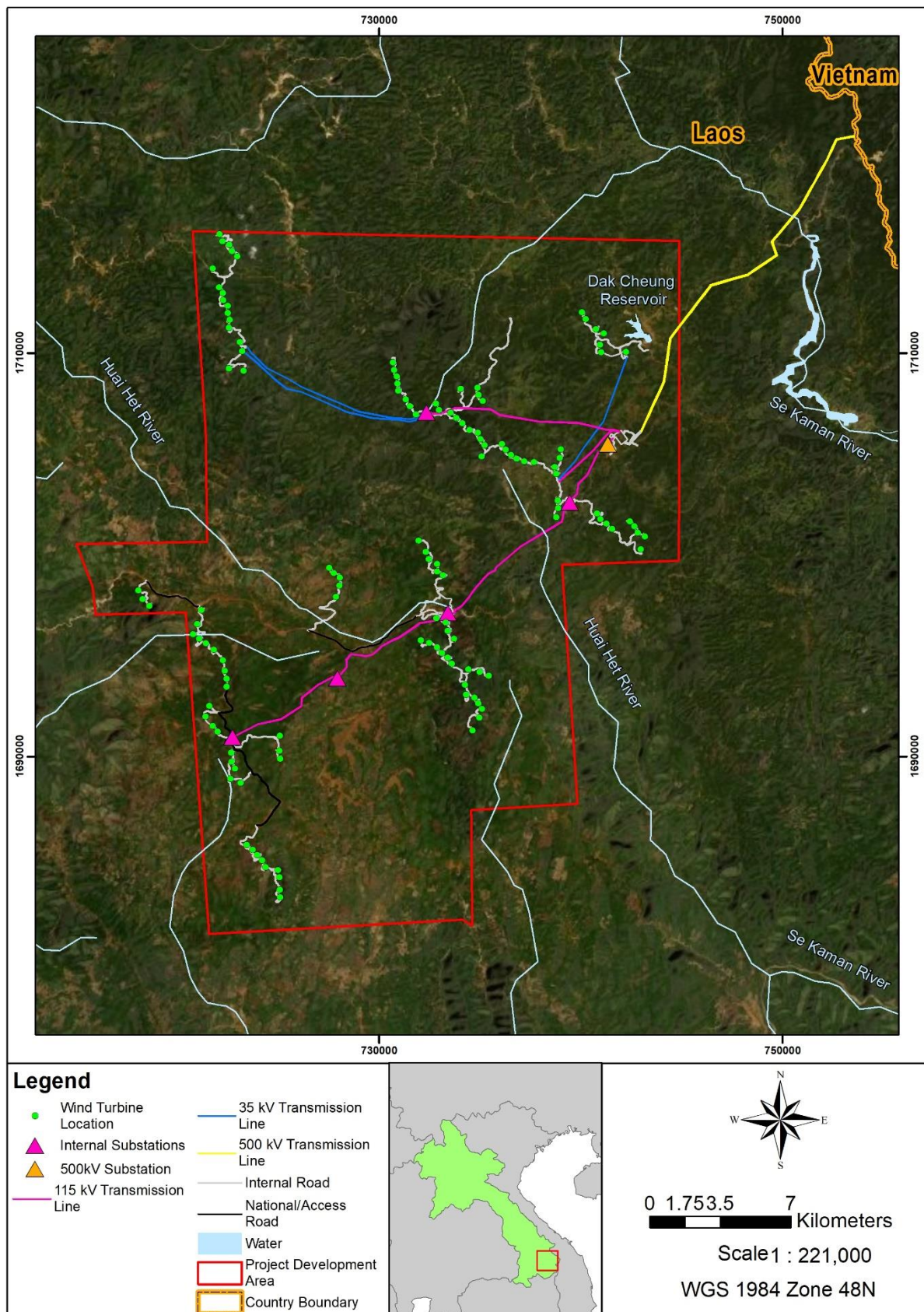
In terms of the potential impacts, the Project will have no impact on the water sources or on the hydrological flow of the water sources, as the operational process and activities of the project are not related to the water resources. The proposed project will be installed on the mountain range, making it not relate to and have no impact on the hydrologic flow of the water in the area. As for the transmission line route, if the tower is to be place along the stream or on the slope of the stream, the tower location must be above the highest level of past flood water to avoid obstruction of water flow and ensure stability.

Despite the wind farm not having any impact on the water sources in the area, the construction project components should proceed with caution, especially during the rainy season. Soil that is dug out and removed from the construction site should be used for earthfilling, rather than piled along the sides of the canal or in places which would obstruct the flow of water. On a rainy day, earthwork must not be active. For the transmission line, since it passes through the Xekaman River at one point and through the streams, the project must not build the transmission line tower on the river. There will be no hydrological impact to the water sources in the project area if the tower locations stretch the wires over the river/stream without obstructing it.

However, in case the Project requires water from streams, rivers, lakes, and groundwater in the Project area, the Project will prepare and implement a water use plan. This plan must be communicated and agreed with the local people and with the District and Provincial Authorities. Additionally, the Project will comply with the requirements outlined in the sub-plan in the ESMF and the EPC's Water Quality Management Plan.

For each of water sources, a hydrological assessment will be undertaken in water to demonstrate that there will not be any adverse impact on other users and the water resource (e.g. significant reduction in water levels in rivers/lake, depletion of aquifers, depriving other users of water).

Figure 8.17: Surface Water within the Project Area



8.3.8.1.4 Landscape Characteristic Unit (LCU)

The World Wildlife Fund (WWF) has classified areas into “key ecoregions” (**Figure 8.18**). Ecoregions are defined as large unit of land or water containing a geographically distinct assemblage of species, natural communities and environmental conditions⁴². Each ecoregion is characterized by distinct landscape characteristics.

The Project is located within a single ecoregion *Southern Annamites montane rain forests*. This area extends along the greater Annamite Range from central Vietnam and southwards to the Bolovens Plateau of Laos and the Central Highlands of Vietnam. It covers a region of high biodiversity. The terrain ranges from wet lowland forest to evergreen hardwood and conifer montane rain forest. Strong climatic gradients of rainfall and temperature are present within the ecoregion. There is a short dry season centred on January–February, but fog and dew are common throughout the year and support a lush forest.

It consists of a highly variable forest structure. At 600-900 m evergreen trees are present, dominated by species of Fagaceae, Myrtaceae, and Lauraceae, and above 900 m elevation montane hardwood forest are present that change their composition according to moisture and geological substrate. A number of significant endemic species are present, including *Pinus dalatensis* and *Pinus krempfii*.

Given the general homogeneity of the area where the Project will be located, a single Landscape Characteristic Unit (LCU) is proposed (**Figure 8.18**).

Factors affecting the sensitivity of change for landscapes are:

- Importance and rarity of special landscape elements;
- Ability of the landscape to accommodate change;
- Significance of the change in the local and regional context; and
- Maturity of the landscape.

Figure 8.19 provides photos from the site showing some of the main features of the landscape.

⁴² <https://www.worldwildlife.org/biomes>

Figure 8.18: Landscape Characteristic Unit (LCU)

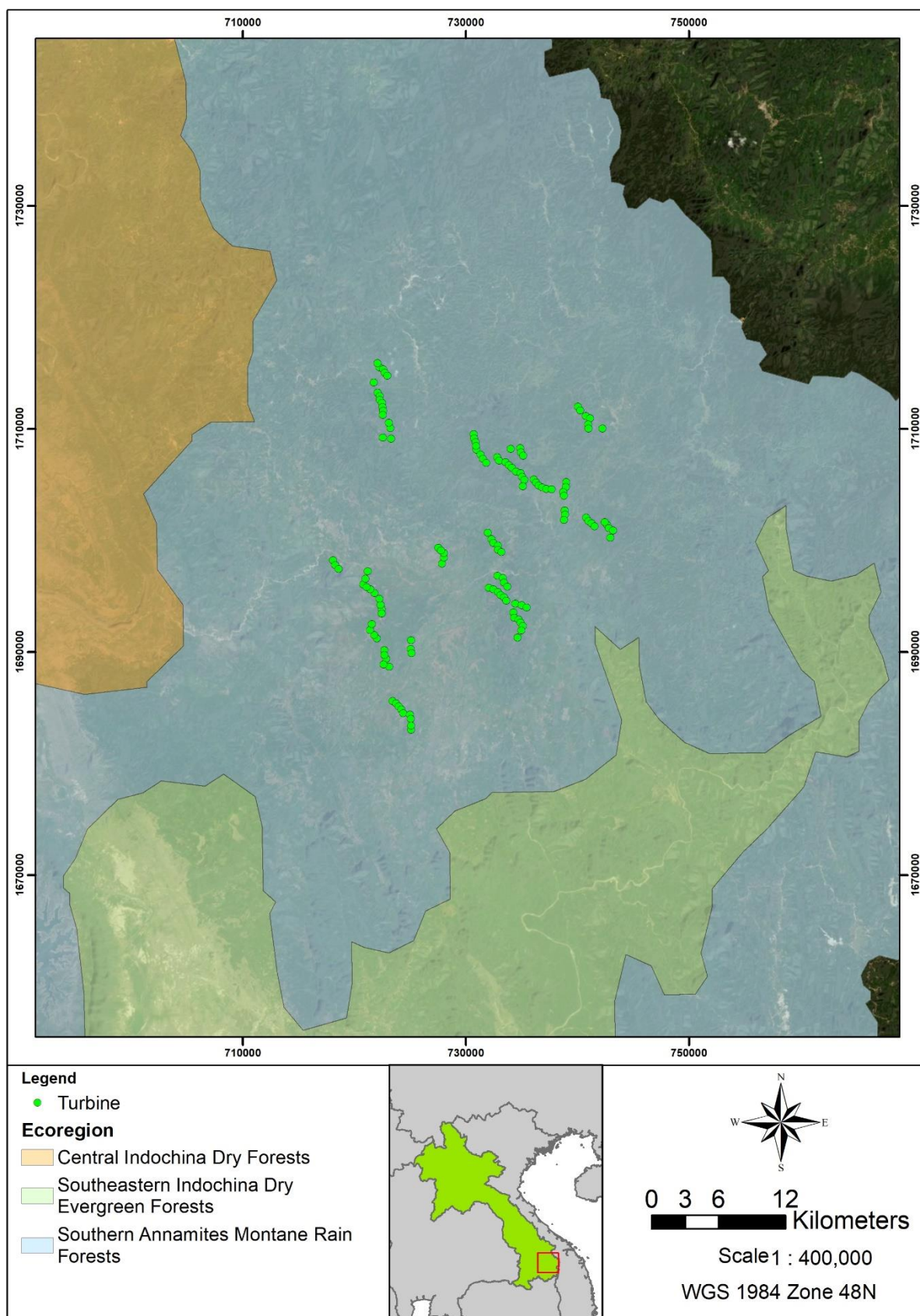


Figure 8.19: Photo of Nearby Landscape



8.3.8.1.5 Protected landscape

During the desktop baseline review, the following national and international protected areas have been considered:

- National parks, reserve forests and other locally protected areas;
- BirdLife International Important Bird Areas (IBA) and Endemic Bird Areas;
- International Union for Conservation of Nature (IUCN) Protected Areas;
- RAMSAR⁴³ Wetlands of International Importance;
- United Nations Educational, Scientific and Cultural Organization (UNESCO) Man and Biosphere (MAB) Reserves;
- World Heritage Sites; and
- World Commission on Protected Areas.

Based on the outcomes of the desktop review, the 25 km buffer of the Project Area intersects with two relevant protected areas, Dong Ampham (Laos) a National Protected Area, and Song Thanh (Vietnam) a nature reserve. These are shown in **Figure 8.20**.

Dong Ampham

Dong Ampham National Biodiversity Conservation Area is a national protected area which covers the northeastern part of Attapeu Province and southeastern part of Sekong Province in the southeast corner of Laos on the border with Vietnam.⁴⁴ The Dong Ampham IBA is also located within Dong Ampham Protected Area. The area is located 15 km from the wind turbine boundary and 25 km from the transmission line of the Project.

It consists of around 200,000 ha covered by a heavily forested area and it forms one of the National Protected Areas of Laos. National PAs established since 1993 are afforded the highest level of protection and are the only managed, national-level areas devoted to conservation in Laos PDR, with Provincial and District PAs having no national legal framework and variable provincial legislative framework and there has been almost no assistance or development of provincial and district PAs ⁴⁵.

⁴³ The Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat

⁴⁴ BirdLife International, <http://datazone.birdlife.org/site/factsheet/dong-ampham-iba-laos>

⁴⁵ Lao PDR has a hierarchy of three types of protected areas classified, including (1) National Protected Areas (NPAs), (2) Provincial PAs and (3) District PAs. National PAs (legal establishment since 1993) are the only managed, national-level areas devoted to conservation and are founded based on 2 key principles (ICEM, 2003):

Protection needs to be provided to the full range of ecosystems and species communities occurring within the country; and

The total area under protective management needs to be adequate to prevent or minimise species extinctions.

Although National Parks are enabled in the NPA Regulations (2001), none have been nominated. There are no separate national parks, national wildlife sanctuaries, or similar areas (ICEM, 2003). National-level Conservation Forests (forest land set aside for the purposes of conservation of

fauna, flora, nature, and various things of historical, cultural, touristic and environmental value and for scientific study and research) are included in the NPAs under the Forestry Law (1996).

There are a variety of Provincial and District Protected Areas. Some 276 areas have been designated as conservation or protection forests at provincial and district level. Provincial protected areas (including Provincial Conservation Forests) have no national legal framework and variable provincial legislative framework and there has been almost no assistance or development of provincial and district PAs. As with their provincial counterparts, District Protected Areas have no national legal status and there appears to be no central compilation of their condition. The best known are more accurately described as community protected areas.

The area was established on 29 October 1993 and contains areas of lowland and tropical forests. Rivers flowing through the park include Xe Kaman River and Xe Xou River. The wetlands are home to populations of Siamese crocodiles and elephants, and large cats are known to inhabit the park.

Dong Ampham is also classified as an IUCN 'Category VI' National PA, a category of PA which include protection and sustainable use of natural resources as mutually beneficial actions as a *means* to achieve nature conservation, together and in synergy with other actions more common to the other categories (Dudley, 2008⁴⁶).

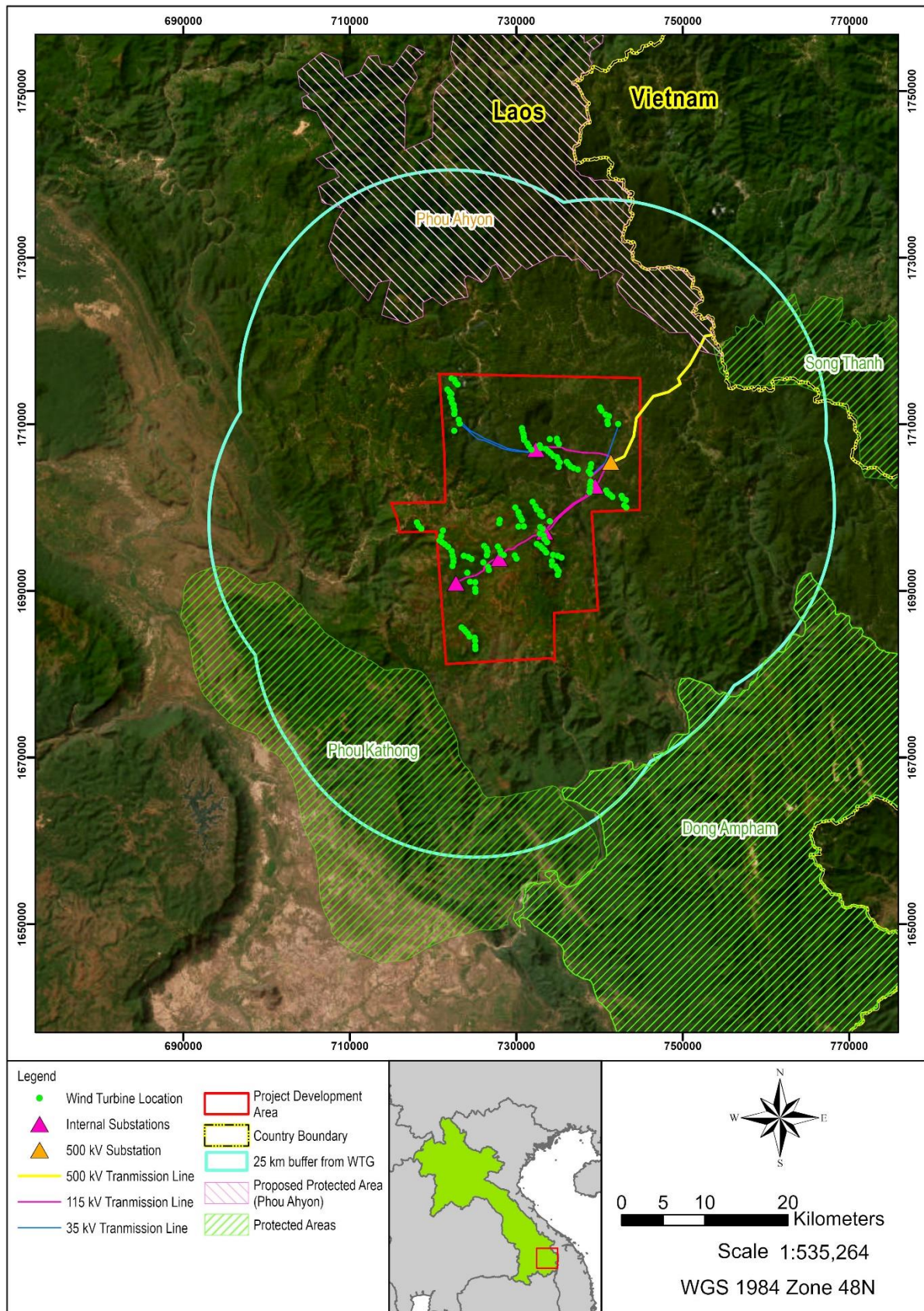
Song Thanh

Song Thanh Nature Reserve is located in Southwest Quang Nam province with a total area of 76,964 ha and it was designated in October 2000. Song Thanh Nature Reserve is recognized as a Key Biodiversity Area (KBA) because of the importance of its mammal fauna, and is also a globally important conservation corridor. The area is located 11 km from the wind turbine boundary and right next to the transmission line of the Project.

Species of conservation importance recorded include three mammals endemic to this landscape; Owston's civet *Chrotogale owstoni*, the Annamite striped rabbit *Nesolagus timminsi*, and the large-antlered muntjac *Muntiacus vuquangensis*. The last one is listed as Critically Endangered (IUCN, 2018) and it is one of the highest priority species in the Annamites.

ICEM (International Centre for Environmental Management), 2003. *Lao PDR National Report on Protected Areas and Development*. Review of Protected Areas and Development in the Lower Mekong River Region, Indooroopilly, Queensland, Australia. 101 pp. Available online at: https://icem.com.au/documents/biodiversity/pad/lao_pdr_nr.pdf
46 Dudley, N. (Editor) (2008). *Guidelines for Applying Protected Area Management Categories*. Gland, Switzerland: IUCN. x + 86pp. WITH Stolton, S., P. Shadie and N. Dudley (2013). *IUCN WCPA Best Practice Guidance on Recognising Protected Areas and Assigning Management Categories and Governance Types*, Best Practice Protected Area Guidelines Series No. 21, Gland, Switzerland: IUCN. xxpp. Available online at: <https://portals.iucn.org/library/sites/library/files/documents/pag-021.pdf>

Figure 8.20: Protected Areas



8.3.8.2 Visual Baseline

Visual interferences may occur when new elements are introduced into a landscape or existing elements are altered or removed leading to a change in the way that stakeholders' perceive or experience landscape resources.

The proposed visual baseline has been developed according to the following tasks:

- Study area definition;
- View-shed analysis; and
- Viewpoint and sensitive receptor identification.

8.3.8.2.1 Study Area Definition and View-shed

The visual study area is defined as the area within which the Project could be discernible by the human eye and could interfere with the main sensitivities identified in the local context.

To identify the study area, the Zone of Theoretical Visibility (ZTV) has been determined through computer analysis of topographical mapping to establish the theoretical distance from which the wind turbines could be visible in each direction.

The wind turbines are the major visual element of the proposed development and may visually impact the surrounding areas. As the viewer moves further away from these structures the visual impact decreases until it is no longer visible. However, before the point of non-visibility is reached, the wind turbines have reduced in scale such that they no longer have a significant visual impact.

Table 8.11 explains how a view-shed is defined and identified depending on the horizontal and vertical field of views.

Table 8.11: Field of View

Field of View	Diagram
<p>A. Horizontal Field of View</p> <p>For most people, the horizontal central field of view covers an angle of between 50° to 60°. Within this angle, both eyes observe an object simultaneously but from a slightly different angle. This creates a central field of greater magnitude than that possible by each eye separately. This central horizontal field of view is termed the 'binocular field' (see green zone). Within this field images are sharp, depth perception occurs and color discrimination is possible. Research suggests that the visual impact of a project component will vary according to the proportion the binocular field it occupies. Project components that occupy 5%/2.5° or less of the horizontal central binocular field of vision are usually perceived as insignificant objects, whereas components that occupy 30° are considered to be visually dominating.</p>	<p>The diagram illustrates the horizontal field of view. It shows a profile of a human head with a dashed line representing the central axis. Two large blue sectors represent the 'Visual Limit Of Left Eye' and 'Visual Limit Of Right Eye', both labeled as '104° to 94°'. A green sector in the center represents the 'binocular field' with a range of '50° - 60°'. A small red sector at the very center represents the central field of view, labeled '5°'.</p>
<p>B. Vertical Field of View</p> <p>The vertical central field of view has a similar set of parameters. The vertical binocular field is normally 25° above the vertical and 30° below the vertical. When project components exceed the 50° upper visual limit of the eye, they are considered to dominate the vertical central field of view. When project components occupy 0.5° they are not considered dominant, nor are they usually perceived as a significant change to the existing baseline condition when they are located within an anthropogenically modified landscape.</p>	<p>The diagram illustrates the vertical field of view. It shows a profile of a human head with a dashed line representing the central axis. A large blue sector represents the 'Visual Limit Of Eye' with a range from '50°' to '70°'. A green sector represents the 'Limit Of Colour Discrimination' with a range from '25°' to '30°'. A red sector represents the 'Normal Line Of Sight' with a range from '0°' to '15°'. Labels also include 'Normal Sight Line Whist Standing' at 0° and 'Normal Sight Line Whist Seated' at 15°.</p>

Field of View	Diagram
<p>C. Horizontal Versus Vertical Visibility Over Distance</p> <p>As a person moves further away from a project component, the visibility of the vertical dimension tends to reduce more significantly than the visibility of the horizontal dimension.</p>	

The wind farm is comprised of a number of individual turbines of the same dimensions (110 m hub height and 171 m rotor diameter), with large separation distances between each individual turbine, about 300 m. When assessing the visual impact of the wind turbines, it is assumed that the largest horizontal component is the entire rotor, which would be a maximum of 171 m wide.

As shown in **Table 8.12**, calculations suggest that the impact of a 171 m wide wind turbine rotor would reduce to be insignificant at about 3.8 km, as it would form less than 5% or 2.5° of the horizontal field of view (physical parameters are illustrated in **Table 8.13**).

Table 8.12: Horizontal field of view

Horizontal Field of View	Impact	Distance from Observer to 171 m Turbine Rotor
<2.5° of view	The development will take up less than 5% of the central field of view. The development, unless particularly conspicuous against the background, will not intrude significantly into the view. The extent of the vertical angle will also affect the visual impact.	>3.9 km
2.5° – 30° of view	The development will usually have a moderate impact that may not be noticeable at the greatest distance of this range.	296 m to 3.9 km
>30° of view	Developments that fill more than 50% of the central field of vision will always be noticed and only sympathetic treatments will mitigate visual effects.	< 296 m

Source: taken from *Guideline for landscape and visual impact assessment, Third Edition (GLVIA3)*, Landscape Institute and IEMA 2002 and Horner + MacLennan and Envision (2006) *Visual representation of windfarms: good practice guidance*, Inverness. Scottish Natural Heritage

A similar analysis can be undertaken based upon the vertical field of view for human vision. **Table 8.13** shows the relationship between impact and the proportion that the development occupies within the vertical line of sight.

Table 8.13: Vertical field of view

Vertical Line of Sight	Impact	Distance from Observer to a 195.5 m Turbine
< 0.5° of vertical angle	A thin line in the landscape.	>22 km
0.5° – 2.5° of vertical angle	The degree of visual intrusion will depend on the development's ability to blend in with the surroundings.	4.5 – 22 km

Vertical Line of Sight	Impact	Distance from Observer to a 195.5 m Turbine
> 2.5° of vertical angle	Usually visible, however the degree of visual intrusion will depend on the width of the object and its placement within the landscape.	<4.5 km

Source: taken from Guideline for landscape and visual impact assessment, Third Edition (GLVIA3), Landscape Institute and IEMA 2002 and Horner + Maclellan and Envision (2006) Visual representation of windfarms: good practice guidance, Inverness. Scottish Natural Heritage

Based on the above, it is reasonable that distances greater than 22 km would result in an insignificant magnitude of visual impact from the wind turbines, as a fully visible wind turbine would be an insignificant element within the landscape.

Generally, the more conservative or worse-case distances form the basis for the assessment of visual impacts. Therefore, for this Project the greater impacts would be associated with the vertical field of view and so it is proposed to extend the view shed to 25 km for the wind farm.

Arc Map 10.8 was used to determine the ZTV for the Project. The current visibility within the ZTV will vary depending on the presence of intervening local topography and other features, such as vegetation and buildings. The present view shed analysis has been based solely on topography and did not take into account the potential screening granted by the local vegetation patches, which would further reduce the actual view shed. Moreover, it should be highlighted that a typical view shed assessment does not take typical meteorological conditions into account that can result in changes to real visibility. For example, rainfall and other atmospheric conditions (e.g., sand transported by the wind) will alter the visibility of the Project. The diminution of visual clarity brought about by atmospheric conditions also increases with distance, and cloudy days can result in a natural attenuation of the visibility of the Project.

Three different view shed analyses were undertaken at different heights to provide a better understanding of the degree of visibility. These mapping outputs illustrate the number of wind turbines potentially visible from within the Study Area for the different turbine visibility elements.

Figure 8.21 and **Table 8.14** show the range of visibility options that have been mapped for turbines in the following GIS based analysis and **Figure 8.22**, **Figure 8.23**, and **Figure 8.24** show the ZTV mapping.

Table 8.14: Mapping Turbine Visibility Elements

Zone	Extent That Wind Turbines Are Visible
Zone A	One or more wind turbines in their entirety
Zone B	The entire path of the blades of one or more wind turbines
Zone C	At least half of the path of one or more wind turbines
Zone D	Any part of the wind turbine blades of one or more wind turbines

Figure 8.21: Turbine Visibility Elements

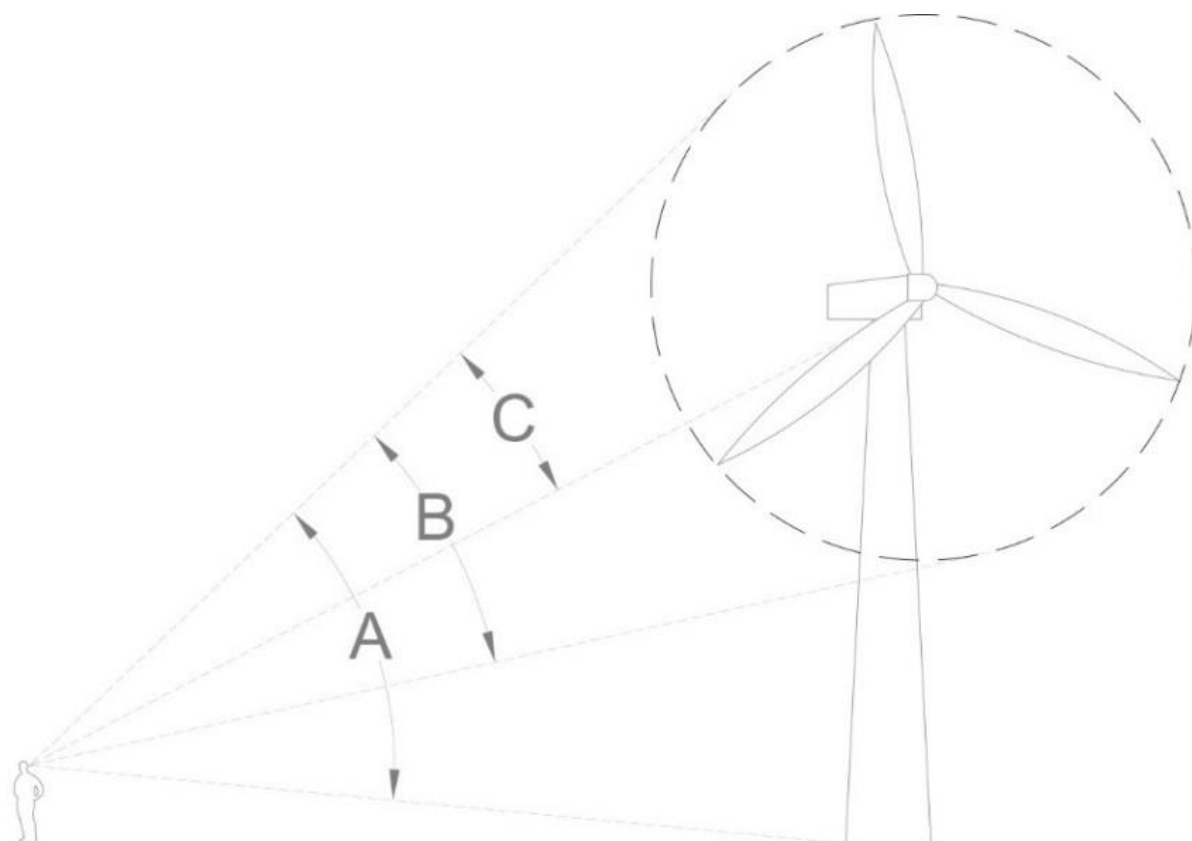


Figure 8.22: View Shed Zone A: One or More Wind Turbines in Their Entirety

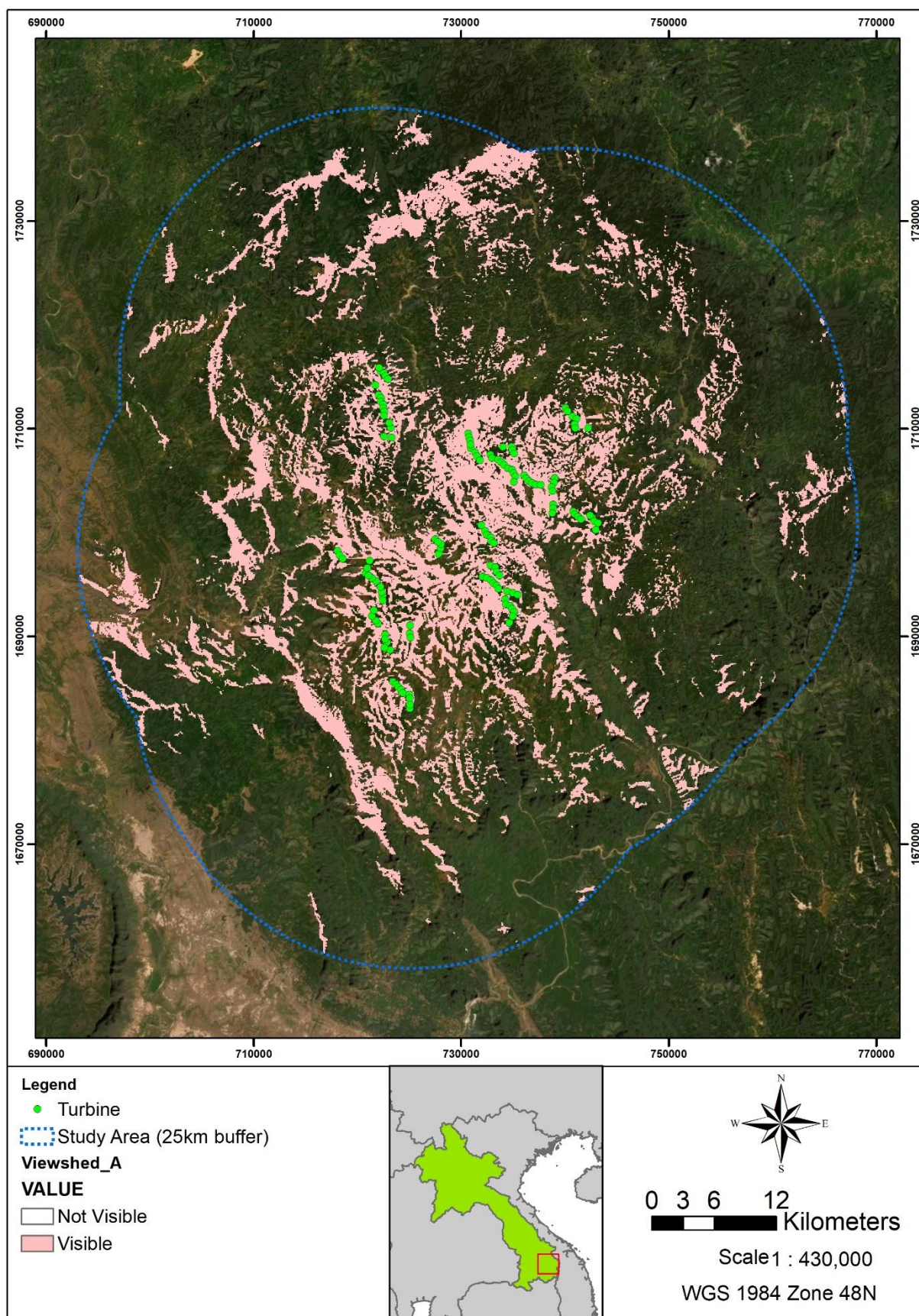


Figure 8.23: View Shed Zone B: The Entire Path of the Blades for One or More Wind Turbines

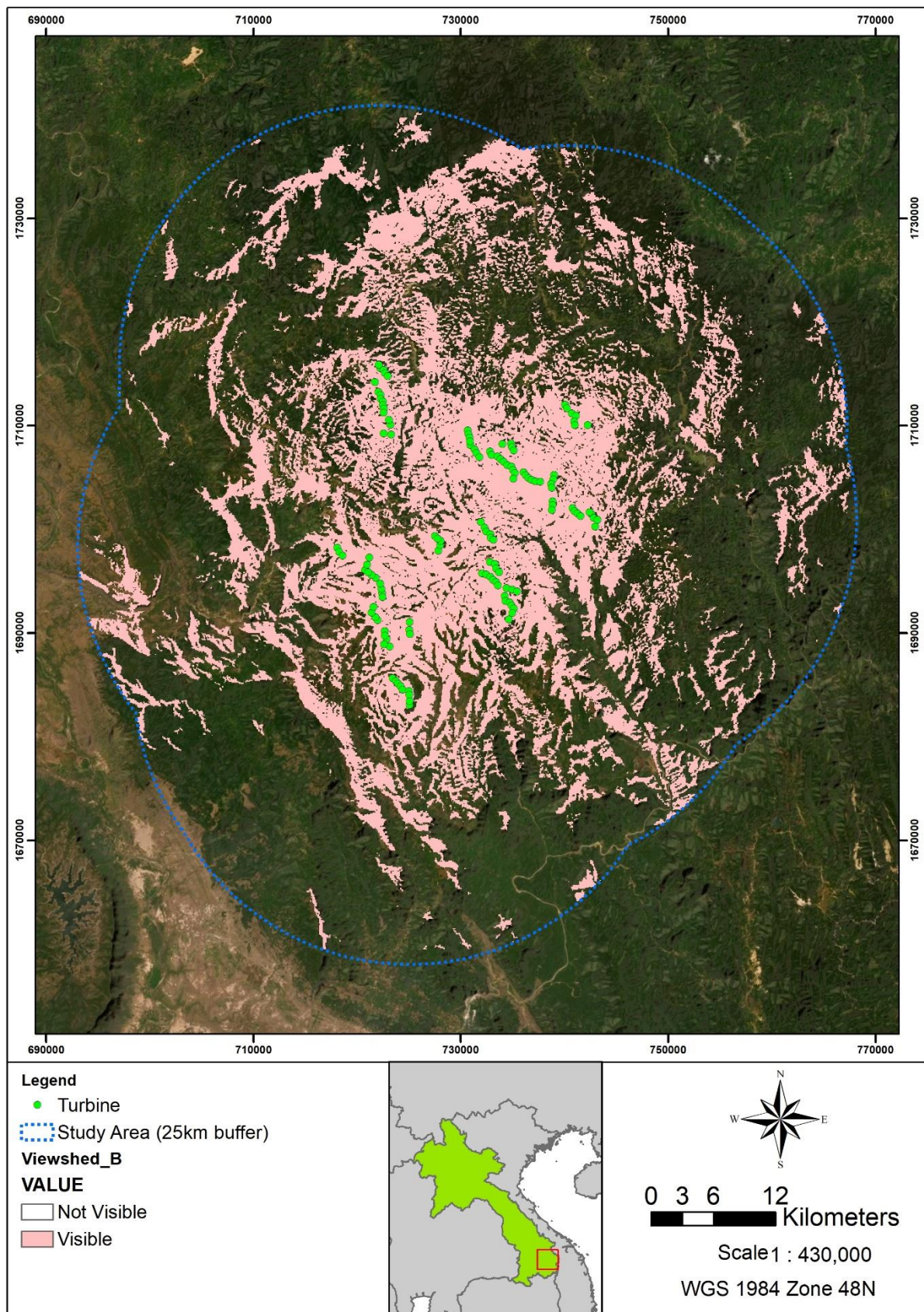
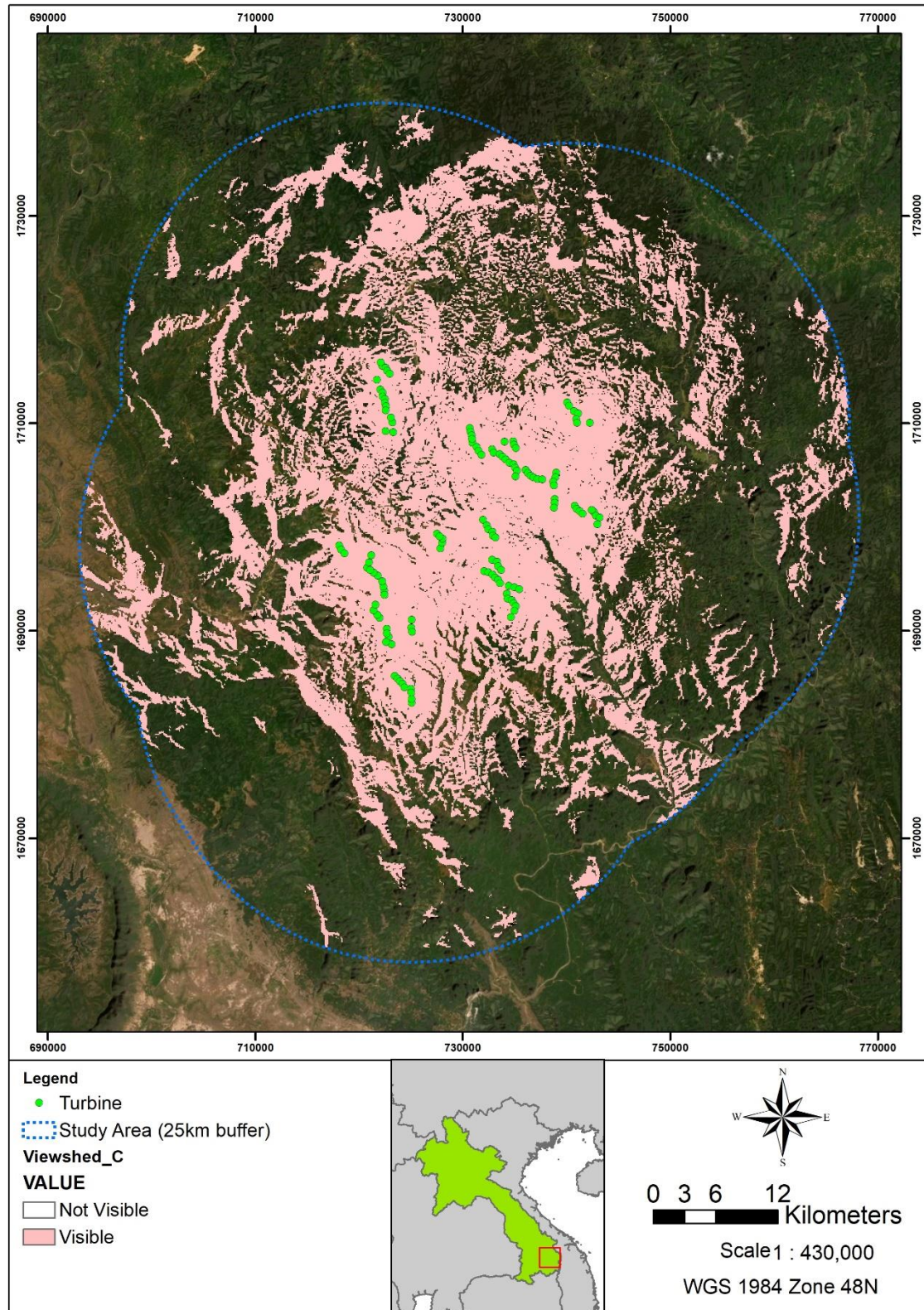


Figure 8.24: View Shed Zone C: At Least Half of the Path of One or More Wind Turbines



The results of the view shed assessment show that the visibility is strongly influenced by the morphology of the area. The roughness of the terrain makes the chance to see the wind turbines highly variable, both in their entirety and partially.

It should be emphasized that intervening vegetation is not included in this mapping and is likely to significantly reduce the visibility of wind turbines, in whole or in part, and therefore reduce the impact identified.

Regarding the potential visibility from local communities, wind turbines, either in whole or in part, will be visible from main residential areas, such as Ban Daktrab and Dakchueng. In addition, several settlements spread over the communes inside the Study Area, may be able to see the turbines.

8.3.8.3 Viewpoints Identification

In order to assess the visual baseline, 19 viewpoints have been identified within the Study Area, in order to be exhaustive of different landscape components. These viewpoints are referred to as Visual Sensitive Receptors (VSRs). They represent points within the view shed from where people will be able (or not) to see the Project, and where the quality of the landscape and visual resources of people could be affected by the presence of the Project.

It should be noted that, in order to screen the potential sensitive receptors, the following criteria have been used to assess the sensitivity of the VSRs:

- Value and quality of existing views;
- Type and estimated number of receiver population;
- Duration of frequency of view; and
- Degree of visibility.

Table 8.15 and **Figure 8.25** show the locations of the VSRs as representative of the general landscape character of the area, from locations within the Study Area varying in distance and elevation.

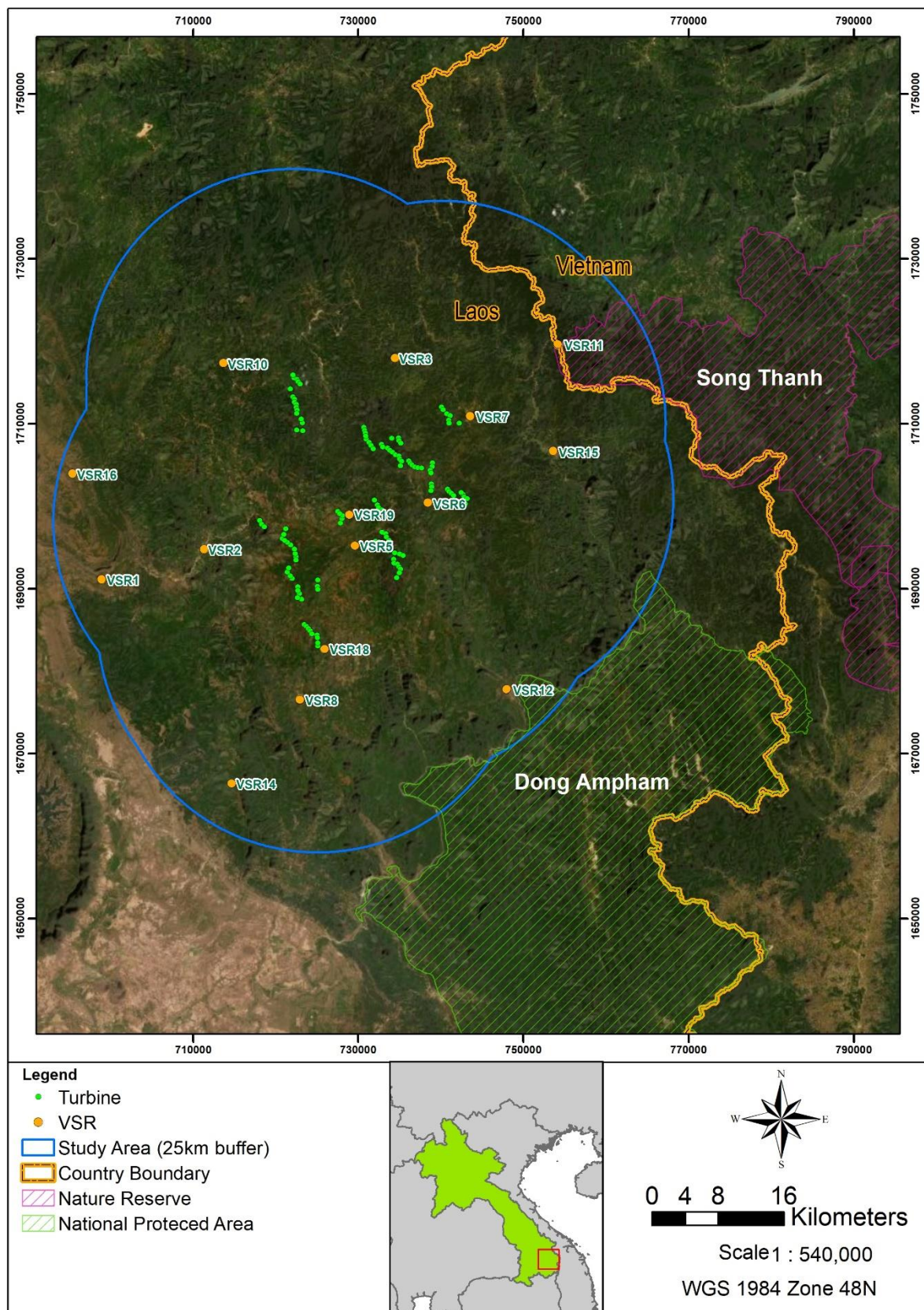
Table 8.15 provides the coordinates of the points and their distance from the closest turbine. The coordinates are expressed in WGS 1984/UTM Zone 48N (EPSG: 32648).

Table 8.15: Location of the proposed VSRs

VSR ID	X (East)	Y (South)	Type of Receptor
VSR01	698,867	1,691,144	Near village, along the road
VSR02	711,489	1,709,838	Near village
VSR03	710,714	1,694,729	Near village, along the road
VSR04	740,409	1,734,426	Near village
VSR05	706,005	1,720,205	Near village
VSR06	734,096	1,718,292	Near village
VSR07	723,632	1,726,066	Near village
VSR08	707,168	1,730,290	Near village
VSR09	718,416	1,704,511	Near village
VSR10	713,683	1,717,358	Near village – not accessible during the survey
VSR11	729,600	1,695,145	Near info centers and protected area, along the road and the national boundary
VSR12	729,412	1,705,295	Closed to protected area and lake
VSR13	738,352	1,700,353	Near village, along the road
VSR14	714,606	1,666,434	Near village – not accessible during the survey

VSR ID	X (East)	Y (South)	Type of Receptor
VSR15	727,631	1,734,549	Near village, close to the dam
VSR16	695,587	1,704,560	Mountain
VSR17	718,596	1,698,390	A school near the village
VSR18	725,898	1,682,732	Near village
VSR19	728,863	1,699,044	Near village

Figure 8.25: Location of the proposed VSRs



8.3.9 Natural Hazards

Based on the local ESIA (Sept 2020), natural disasters that are the most dangerous challenges to the Project development are floods, earthquakes, and landslides. The secondary data of natural disasters are summarized in the following points:

8.3.9.1 Floods

The topographic conditions of the Project area and nearby area is composed mostly of hills and high mountains, and there are no large rivers that will cause flooding in this area. And according to global flood data there is no historical flood event is recorded for the Project area.^{47 48}

In 2019 during August and September, Meteorology Station of Dak Cheung District recorded the maximum rainfall during the historical five (5) years (**Table 8.2**). In 2020 after two consecutive tropical storms lashed the region earlier September, Kaluem District (Jing, Songkhone, and Loy Villages) and Dakchung District (Darkdin Village) in Sekong province experienced the flooding of around 3,000 people were affected, and two people had lost their lives⁴⁹. Increased flooding is currently being observed in the lower catchments and along the Mekong River.⁵⁰

8.3.9.2 Earthquakes

Lao PDR is located in the central part of the Indochina Peninsular between latitude: 13°54' - 22°30' N and longitude: 100°05' - 107°59' E, which is not located on an area of the tectonic plate boundaries. Consequently, it has low record of earthquake occurrences.

According to data from the Meteorological and Earthquake Network Division, Department of Meteorology and Hydrology, Ministry of Natural Resources and Environment (as summarised in the EIA, 2020), earthquake events have occurred in Lao PDR is in 2007 in Xayaboury Province. The latest earthquake occurrence was in 2019 in the area of Hongsa District of Xayaboury Province. For Sekong Province, Attapeu Province, and the proposed Project area, there is no record of an earthquake occurrence since ever record in the history.⁵¹ However, the design of the turbines considers standards relevant for earthquakes.

There is no record of earthquake occurrence in the Project site or in Sekong and Attapeu provinces. However, the Project will be designed in accordance with standards so that the Project is capable of withstanding an earthquake.

8.3.9.3 Landslides

Rainfall is the main cause of landslides (soil erosion). Other factors include the slope of the soil, rock conditions and improper land use activities, dam construction, pumping of sand and gravel for using in construction work. Based on the local EIA (EIA, 2022), it is observed that they are mainly caused by the land use activities of the people, particularly agricultural activities that require regular soil digging, turning, harrowing that cause the erosion of soil into the water sources, especially during the rainy season.

According to the soil survey result and classification of agricultural and forest areas in Dak Cheung District, Sekong Province (2020), the soil in Dakcheung District is divided into six soil groups (ARENOSOLS, ACRISOLS, ALISOLS, REGOSOLS, LUVISOLS and CAMBISOLS), and is classified into 9 types of soil based on the original rocks, condition of the location, identified layer and identified characteristics of the soil. The soil area are primarily composed of heavy clay, clay loam and loamy

⁴⁷ Global Flood Map, [Laos Flood Map | Map of Potential Flooding in Laos \(globalfloodmap.org\)](https://globalfloodmap.org/)

⁴⁸ Reliefweb, [UNOSAT Training activities \(reliefweb.int\)](https://reliefweb.int/)

⁴⁹ Reliefweb [MDRLA007dfr.pdf \(reliefweb.int\)](https://reliefweb.int/mdr/la007dfr.pdf)

⁵⁰ UNDP, [Project Document - Deliverable Description \(undp.org\)](https://undp.org/project-document-deliverable-description)

⁵¹ United States Geological Survey (USGS), <https://earthquake.usgs.gov/>

sand. The soil in Sanxay District is divided into six soil groups (ACRISOLS, ALISOLS, ARENOSOLS, CAMBISOLS, FLUVISOLS, LEPTOSOLS, LUVISOLS and REGOSOLS), and is classified into 13 types of soil based on the original rocks, condition of the location, identified layer and identified characteristics of the soil. The soil areas are primarily composed of clay loam, hard clay and loamy sand. Attapeu and Sekong District are identified as highly susceptible to landslides according to UNDP Support National Hazard Profile in 2020. The climate impacts on rural roads are mainly related to flooding and landslides given some of the road in both Provinces are unpaved. Increasing incidence of landslides is being observed in the upper catchments of the Sedon and Sekong rivers.⁵² The Project is at least 30 km distance to Sekong River. Landslide susceptibility within study area is reported to vary between Medium to Very High. This indicates that the project area is susceptible to landslides owing to factors such as land cover, soil type, and slope. Moreover, the landslide hazard map indicate the hazard due to landslides triggered by precipitation to vary between Low-High within Study area.

8.3.9.4 Cyclones

Cyclones (also known as hurricanes or typhoons) occur frequently in Lao PDR, being classified as a high hazard level natural disaster according to Think Hazard and information that is presently available. On average, it occurs approximately eight (8) times a year, with Xiangkhoang, Attapeu, and Salavan being the hardest hit regions. The cyclone season usually begins in April and ends in November, with the most severe cyclones usually occurring in August and September.

Unlike many of neighboring countries, Lao PDR has not been susceptible to typhoons as typhoons rarely impact the country with their full potential as they lose momentum while travelling inland, and the mountainous topography further protected the country along the Vietnam border. However, the past decade has had some notable events which have impacted Laos PDR—the most impact from typhoons in Laos is from the sustained intense rainfall causing flooding, flash floods and landslides and placing infrastructure (dams, roads, houses etc) at risk.⁵³ The recent events include Typhoon Noru in October 2022 caused flooding and flash floods in four main provinces of Southern Laos: Saravane, Sekong, Champasack and Attapeu. Thousands of people were affected by the tropical storm, with power lines being down, main roads and houses covered by waters.⁵⁴ In 2018, the storm Son-Tihn caused heavy rainfall and breached Xe pien-Xe Nam Noy hydropower in Attapeu causing flash flooding (Government of Lao PDR, 2018). Over 600,000 people in 90 districts were affected by the events. The most notable typhoon events in the past decade include the Typhoon Ketsana in 2009 and Haima in 2011—the typhoons were reported to cause damage to roads, irrigation networks and public infrastructure and affected 180,000 people and 90,000 people, respectively.⁵⁵

8.3.9.5 Lightning

One of the most common features of every rainy season in Laos is lightning and thunder. Although not as prevalent as the other natural hazards in Laos, lightning is a common event during thunderstorms. Most lightning events do not affect the people, animals, or possessions, directly, but when it does, people, animals, or possessions are affected, causing some socioeconomic losses. One main concern is that many houses or buildings in Laos are not equipped with lightning protection, and with the rising trajectory of oceanic temperatures due to climate change, storm intensity and frequency is likely to increase.⁵⁶

⁵² UNDP, [Project Document - Deliverable Description \(undp.org\)](#)

⁵³ UNDRR and adpc (2019). Disaster Risk Reduction in Lao PDR Status Report 2019

⁵⁴ World Vision (2022). Tropical Storm Noru Situation Report #2

⁵⁵ UNDRR and adpc (2019). Disaster Risk Reduction in Lao PDR Status Report 2019

⁵⁶ The Lao Times. Fierce Lightning, International Coverage Ignites Concern in Capital - <https://laotiantimes.com/2016/09/05/fierce-lightning-international-coverage-ignites-concern-in-capital/>

8.4 Biological Environment Baseline

8.4.1 Introduction

This section provides an overview of the baseline conditions in the biodiversity baseline study area, i.e. the EAAAs as depicted on the map that appears in **Figure 8.1**. Included is a description of the identified legally protected areas and areas with recognized high biodiversity values (**Section 8.4.2**), habitats and species that occur in this area, and the important biodiversity values associated with the Project area. Information was compiled and evaluated from desktop studies, field surveys, and consultation with key experts and other stakeholders, to support a comprehensive understanding of the biodiversity values that are present in the EAAAs.

Desktop studies considered global biodiversity datasets, as well as published and publicly available information. Key information sources included:

- The Integrated Biodiversity Assessment Tool (IBAT), which draws from:
 - The IUCN (International Union for Conservation of Nature) Red List of Threatened Species;
 - Key Biodiversity Area (KBA) database; and
 - The World Database on Protected Areas which encompass nationally and internationally recognised sites, including IUCN management categories I-VI, Ramsar Wetlands of International Importance (Ramsar site), and the United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage sites.
- The IUCN Red List of Ecosystems.

Field data were collected to further inform the understanding of the important biodiversity values within the study area, and the findings are described in detail in **Appendix S**. This included:

- A Rapid Ecological Assessment (“REA”) (conducted between December 2020 and January 2021) to: (i) help ground truth the aerial habitat mapping, by identifying the main types of habitat and dominant vegetation at pre-selected survey points in each of the main turbine areas and transmission line; and (ii) provide an overview of the actual and likely species present, which in turn helps inform priority survey areas for the main wet and dry season follow up surveys;
- Monthly bird field survey campaigns across 12 months and covering all relevant seasons (December 2020 – November 2021);
- Five bat field survey campaigns, of which three campaigns were undertaken in the dry season (February and March 2021), and two campaigns were undertaken in the wet season (June and July 2021); and
- Two mammal, herpetofauna (reptiles and amphibians) and plant field survey campaigns in the wet season (July – August 2021), and dry season (November - December 2021) were undertaken based on the results of the REA [findings contained in the unpublished Biodiversity Assessment Report compiled by Phiapalath *et al.* (2022)⁵⁷].

To meet ADB SPS requirements, a Critical Habitat Assessment (CHA) was undertaken to identify the presence and extent of the important biodiversity values (i.e. natural habitat-associated values, critical habitat-qualifying values and other values of conservation and/or stakeholder concern) in the EAAA that could result in the categorization of the Project area as critical habitat. A summary of the approach and findings of the CHA is provided in **Section 8.4.5**, with the full details of the CHA presented in **Appendix T**.

⁵⁷ Phiapalath, P., Khotpathoom, T. and Souladeth, P. (2022). Biodiversity Assessment of Monsoon Windfarm Power Project. Unpublished report compiled for Environmental Resources Management (ERM), Thailand. Final draft report, January 2022.

8.4.2 *Legally Protected Areas and Areas with Recognized High Biodiversity Values*

Legally Protected Areas (“PAs”) include areas that are legally designated or officially proposed for biodiversity protection and conservation.

For this ESIA, areas with recognized high biodiversity values include KBAs, AZEs, UNESCO World Heritage sites, Ramsar sites. These areas are defined as follows:

- **KBA⁵⁸** - Key Biodiversity Areas are sites that contribute significantly to the global persistence of biodiversity and being applicable to terrestrial, freshwater, and marine ecosystems. Sites qualify as global KBAs if they meet one or more of eleven criteria, grouped into the following five categories: threatened biodiversity, geographically restricted biodiversity, ecological integrity, biological processes, and irreplaceability. KBAs typically include:
 - Important Bird and Biodiversity Areas (“IBA”) identified by the BirdLife International Partnership;
 - Alliance for Zero Extinction sites (“AZE”) containing 95% or more of the remaining population of one or more species listed as Endangered (EN) or Critically Endangered (CR) on the IUCN Red List;
 - KBAs identified through hotspot ecosystem profiles supported by the Critical Ecosystem Partnership Fund; and
 - A small number of other KBAs such as Important Plant Areas (“IPA”), and KBAs covering multiple taxonomic groups in freshwater, marine, and terrestrial systems.
- **UNESCO World Heritage site** – a site selected by UNESCO as having cultural, historic, scientific or other forms of significance. These areas are legally protected by international treaties and demarcated by UNESCO as protected zones.
- **Ramsar site** – wetlands of ‘international importance’ identified under the International Convention of Wetlands, called the Ramsar Convention, which is an intergovernmental treaty that provides the framework for the conservation and use of wetlands and their resources.

Three legally protected areas⁵⁹, and six areas with recognised high biodiversity values overlap with, or are located within the EAAAs for volant and non-volant species, defined for the Project. One of the KBAs, Phou Ahyon, is also a designated AZE, with the trigger for the AZE status and designation being one species, *Leptobrachium xanthops* (Yellow-eyed Spadefoot Toad, globally Endangered). According to the AZE website, the Phou Ahyon AZE hosts the entire known population of *L. xanthops*, which is considered a rare, restricted range species with an Extent of Occurrence (EOO) of 1,225 km² according to the IUCN online database of threatened species. Very little is currently known about this species other than it thought to inhabit swift, rocky streams in wet montane evergreen forest, based on the first records from 2011.

The species is currently known with certainty only from four locations in Laos where it was recorded between 17-19 May 2011, at an altitude ranging from 1,450m to 1,500 m a.m.s.l. (Stuart *et al.*, 2012). These locations are clustered within 400m of each other and positioned within a mountain stream associated with the Phou Ayon Mountain, located approximately 22 km north of the Monsoon WF. The planned 500 KV transmission line is located within a small portion of Phou Ahyon KBA and it is estimated that the line will traverse approximately 2.5 km of the AZE, well away from the initial (2011) recorded locations of *L. xanthops*. Whilst no formal modelling has been done for the species, based on the presence of similar Wet Evergreen Forest habitat, the potential for this species to exist at this location was considered in light of the local elevations as well using a Digital Elevation Model (DEM).

⁵⁸ IUCN Species Survival Commission and IUCN. A Global Standard for the Identification of Key Biodiversity Areas - https://portals.iucn.org/union/sites/union/files/doc/a_global_standard_for_the_identification_of_key_biodiversity_areas_final_web.pdf

⁵⁹ Phou Ahyon is a proposed protected area.

The portion of the TL within the Phou Ayon KBA is at altitudes of between 1,075m and 1,175m, which is roughly 300m lower than the lower altitudinal range for this species as per IUCN. That being said, there is the possibility that this species could exist at lower altitudes as is still unknown whether *L. xanthops* is truly an altitudinally restricted-range species based only on the 4 location records that are now over a decade ago. In the absence of detailed information on this species, the potential exists for the amphibian to occur at lower altitudes within Wet Evergreen Forest associated with the Phou Ayon KBA and AZE, and on this basis, ERM made a decision to include *L. xanthops* as a potential critical habitat qualifying species as part of the CHA.

Given the possibility for *L. xanthops* to occur within the broader Phou Ahyon KBA, aligning the ESIA and BAP (Biodiversity Action Plan) with the AZE conservation objectives for *L. xanthops* will be important. This is particularly relevant in light of the fact that one stream crossing was identified within the AZE associated with the transmission line route alignment and given the documented affinity for *L. xanthops* to occur in higher altitude near swiftly flowing rocky streams, the habitat at the stream crossing may be important for the species (albeit that existing village infrastructure and access roads have already impacted on the stream, with multiple existing access roads crossing the stream).⁶⁰

These are summarised in **Table 8.16**, and shown on the map in **Figure 8.26**.

⁶⁰ Stuart, B.L., Phimmachak, S., Seateun, S. and Sivongxay, N. (2012). A new *Leptobrachium* (Anura: Megophryidae) from the highlands of southeastern Laos. *Zootaxa* 3155: 29-37, DOI: 10.5281/zenodo.212443. Available online at: <https://www.biotaxa.org/Zootaxa/article/view/zootaxa.3155.1.3>

Table 8.16: Legally Protected Areas and Areas with Recognized High Biodiversity Values identified in the EAAAs

Name	Designation ¹	Overlap with the EAAAs	Overlap with Project footprint?	Details ²
Dak Cheung Plateau	KBA, IBA	Yes	Yes	<p>Coordinates: 15.356353, 107.135328</p> <p>IUCN Category: -</p> <p>Area Coverage: 51 km²</p> <p>Species of conservation importance:</p> <ul style="list-style-type: none"> ■ Black-crowned Barwing (<i>Actinodura sodangorum</i>), NT (Near Threatened) ■ Asian Elephant (<i>Elephas maximus</i>), EN (Endangered) ■ Pygmy Slow Loris (<i>Nycticebus pygmaeus</i>), EN (Endangered) ■ Tiger (<i>Panthera tigris</i>), EN (Endangered) ■ Impressed Tortoise (<i>Manouria impressa</i>), EN ■ Siamese Fireback (<i>Lophura diardi</i>), LC ■ Yellow-billed nuthatch (<i>Sitta solangiae</i>) (NT)
Ngoc Linh	KBA, IBA, AZE	Yes	No	<p>Coordinates: 15.324767, 107.725319</p> <p>IUCN Category: IV</p> <p>Area Coverage: 297 km²</p> <p>Species of conservation importance:</p> <ul style="list-style-type: none"> ■ <i>Brachytarsophrys intermedia</i>, LC (Least Concern) ■ Thorny Tree Frog (<i>Gracixalus lumarius</i>), EN (Endangered) ■ Appleby' Leaf-litter Toad (<i>Leptobrachella applebyi</i>), EN (Endangered) ■ <i>Leptobrachium banae</i>, LC ■ Chinese Edible Frog (<i>Quasipaa spinosa</i>), VU (Vulnerable) ■ Annam Flying Frog (<i>Rhacophorus annamensis</i>), LC (Least Concern) ■ Misty Moss Frog (<i>Theloderma nebulosum</i>), EN (Endangered) ■ Black-crowned Barwing (<i>Actinodura sodangorum</i>), NT (Near Threatened) ■ Golden-winged Laughingthrush (<i>Trochalopteron ngoclinhense</i>), EN (Endangered) ■ Dhole (<i>Cuon alpinus</i>), EN (Endangered) ■ Stump-tailed Macaque (<i>Macaca arctoides</i>), VU (Vulnerable) ■ Northern Pig-tailed Macaque (<i>Macaca leonina</i>), VU (Vulnerable) ■ Red-cheeked Gibbon (<i>Nomascus gabriellae</i>), EN (Endangered)

Name	Designation ¹	Overlap with the EAAAs	Overlap with Project footprint?	Details ²
				<ul style="list-style-type: none"> ■ Tiger (<i>Panthera tigris</i>), EN (Endangered) ■ Red-shanked Douc Langur (<i>Pygathrix nemaeus</i>), CR (Critically Endangered) ■ Poilane's Catkin Yew (<i>Amentotaxus poilanei</i>), VU (Vulnerable) ■ Eagle Wood (<i>Aquilaria crassna</i>), CR (Critically Endangered) ■ Mann's Plum Yew (<i>Cephalotaxus mannii</i>), VU (Vulnerable) ■ <i>Cinnamomum balansae</i>, EN (Endangered) ■ <i>Dipterocarpus baudii</i>, VU (Vulnerable) ■ <i>Knema saxatilis</i>, VU (Vulnerable) ■ <i>Knema sessiflora</i>, VU (Vulnerable) ■ <i>Madhuca pasquieri</i>, VU (Vulnerable) ■ <i>Schefflera kontumensis</i>, EN (Endangered) ■ Crested Argus (<i>Rheinardia ocellata</i>), CR ■ Yellow-billed nuthatch (<i>Sitta solangiae</i>) (NT)
Phou Kathong	KBA, PA	Yes	No	<p>Coordinates: 15.059711, 106.994783</p> <p>IUCN Category: -</p> <p>Area Coverage: 1,080 km²</p> <p>Species of conservation importance:</p> <ul style="list-style-type: none"> ■ Asian Elephant (<i>Elephas maximus</i>), EN
Phou Ahyon	KBA, IBA, AZE, PA ⁶¹	Yes	Yes	<p>Coordinates: 15.761714, 107.131703</p> <p>IUCN Category: -</p> <p>Area Coverage: 339 km²</p> <p>Species of conservation importance:</p> <ul style="list-style-type: none"> ■ <i>Leptobrachium xanthops</i>, EN (Endangered) ■ Vietnamese Cutia (<i>Cutia legalleni</i>), NT (Near Threatened) ■ Indochinese Fulvetta (<i>Fulvetta danisi</i>), LC (Least Concern) ■ Black-hooded Laughingthrush (<i>Garrulax milleti</i>), LC (Least Concern) ■ Necklaced Barbet, (<i>Psilopogon auricularis</i>), LC (Least Concern)

⁶¹ Phou Ahyon is a proposed protected area.

Name	Designation ¹	Overlap with the EAAAs	Overlap with Project footprint?	Details ²
				<ul style="list-style-type: none"> ■ <i>Yellow-billed Nuthatch (Sitta solangiae)</i>, NT (Near Threatened) ■ <i>Stump-tailed Macaque (Macaca arctoides)</i>, VU (Vulnerable) ■ <i>Red-shanked Douc Langur (Pygathrix nemaeus)</i>, CR (Critically Endangered) ■ <i>Crested Argus (Rheinardia ocellata)</i>, CR

Name	Designation ¹	Overlap with the EAAAs	Overlap with Project footprint?	Details ²
Song Thanh	KBA, PA	Yes	No	<p>Coordinates: 15.473311, 107.650292</p> <p>IUCN Category: Not Reported</p> <p>Area Coverage: 890 km²</p> <p>Species of conservation importance:⁶²</p> <ul style="list-style-type: none"> ■ Stump-tailed Macaque (<i>Macaca arctoides</i>), VU (Vulnerable) ■ Northern Pig-tailed Macaque (<i>Macaca leonina</i>), VU (Vulnerable) ■ Red-cheeked Gibbon (<i>Nomascus gabriellae</i>), EN (Endangered) ■ Pygmy Slow Loris (<i>Nycticebus pygmaeus</i>), EN (Endangered) ■ Tiger (<i>Panthera tigris</i>), EN (Endangered) ■ Red-shanked Douc Langur (<i>Pygathrix nemaeus</i>), CR (Critically Endangered) ■ Eagle Wood (<i>Aquilaria crassna</i>), CR (Critically Endangered) ■ <i>Dalbergia balansae</i>, VU (Vulnerable) ■ <i>Dipterocarpus grandiflorus</i>, EN (Endangered) ■ <i>Dipterocarpus retusus</i>, EN (Endangered) ■ <i>Dipterocarpus turbinatus</i>, VU (Vulnerable) ■ <i>Hopea hainanensis</i>, EN (Endangered) ■ <i>Hopea odorata</i>, VU (Vulnerable) ■ <i>Hopea siamensis</i>, EN (Endangered) ■ <i>Hydnocarpus annamensis</i>, VU (Vulnerable) ■ <i>Knema pierrei</i>, VU (Vulnerable) ■ <i>Knema saxatilis</i>, VU (Vulnerable) ■ <i>Madhuca pasquieri</i>, VU (Vulnerable) ■ White Seraya (<i>Parashorea stellata</i>), VU (Vulnerable) ■ Indochinese Box Turtle (<i>Cuora galbinifrons</i>), CR (Critically Endangered)

⁶² Key Biodiversity Area, Song Thanh, Vietnam. Available at: <https://www.keybiodiversityareas.org/site/factsheet/21875>

Name	Designation ¹	Overlap with the EAAAs	Overlap with Project footprint?	Details ²
Upper Xe Kaman	KBA, IBA	Yes	No	<p>Coordinates: 15.083333, 107.283333</p> <p>IUCN Category: -</p> <p>Area Coverage: 297 km²</p> <p>Species of conservation importance:</p> <ul style="list-style-type: none"> ■ Masked Finfoot (<i>Heliopais personatus</i>), CR (Critically Endangered) ■ Siamese Fireback (<i>Lophura diardi</i>), LC

Name	Designation ¹	Overlap with the EAAAs	Overlap with Project footprint?	Details ²
Dong Ampham	PA	No	No	<p>Coordinates: 14.920751, 107.405011</p> <p>IUCN Category: -</p> <p>Area Coverage: 2000 km²</p> <p>Species of conservation importance:</p> <ul style="list-style-type: none"> ■ <i>Hylarana attigua</i> LC ■ <i>Kurixalus baliogaster</i> LC ■ <i>Leptobrachium banae</i> LC

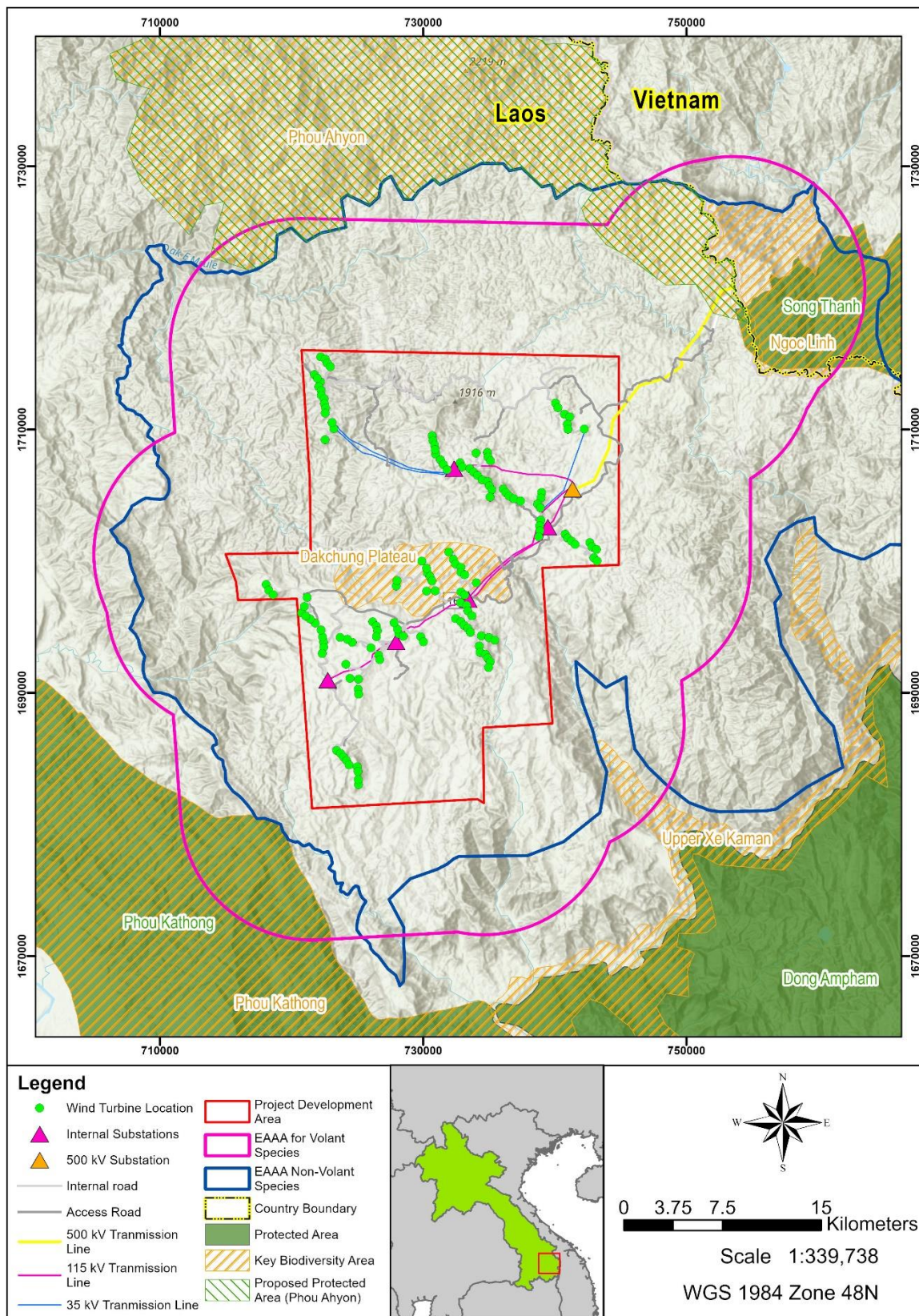
Key to table:

¹ KBA = Key Biodiversity Area, IBA = Important Bird Area, AZE = Alliance for Zero Extinction site, PA = Legally Protected Area

² CR = Critically Endangered, EN = Endangered; VU = Vulnerable; NT = Near Threatened; LC = Least Concern

Source of information: IBAT (2020)

Figure 8.26: Legally Protected Areas, and Areas with Recognized High Biodiversity Values within and Overlapping the EAAAs



8.4.3 Land Cover and Land Use

Several land cover and distinct land use types occur in the study area, including evergreen montane forest, wet evergreen forest, a mosaic of shifting cultivation, shrub land and grassland, waterbodies, and modified built-up areas.

Due to the high elevations and steep topography that characterises the ecoregion, the human population density is considered moderate, however anthropogenic impacts are pervasive in the form of regular burning to create open woodlands and shifting cultivation on the upper slopes. Wildlife poaching and excessive harvesting of forest products are also particularly threatening to the biodiversity of the region and according to the WWF, more than 75% of the ecoregion's natural habitat has been converted or degraded (WWF, 2021a).

A combination of remote sensing and field investigations (refer to the REA presented in **Appendix S**) were used to identify the distribution of land cover types within the EAAAs. The full approach to identify and map land cover classes within the EAAAs is described in **Section 2.5 of Appendix T**.

The land cover and land use classes present in the EAAAs are further described in **Table 8.17**, and their extent and distribution is shown spatially on the map in **Figure 8.27**.

Table 8.17: Land Class Descriptions and Areas

Land Cover / Land Use Type	Description	EAAA Land Cover	Project Footprint Land Cover (ha)
Montane Forest	<p>Montane (evergreen) Forest represents the dominant land cover and evergreen forest type in the EAAAs. This forest type occurs in mountainous areas, at elevations of more than 1,000 m amsl (above mean sea level), receiving higher rainfall. These forests vary in structure and composition depending on geological substrate and moisture availability, best represented by species of Fagaceae and typically having tall forest canopies reaching up to about 30m height, with epiphytes and orchids forming a notable part of the biodiversity.</p> <p>The majority of the EAAAs are heavily degraded and fragmented due to access, farming and harvesting activities by local communities, with patches of better condition montane forest found in the north-eastern section of the EAAA, close to the Lao-Vietnam border and forming part of the Southern Annamite Mountain range n forest, and in the northern central and western sections of the Project area.</p>	<p>Approximately 30.4% of the EAAA for Non-Volant Species (81,262.1 ha) is comprised of this habitat type.</p> <p>Approximately 28.7% of the EAAA for Volant Species (69,712.4 ha) is comprised of this habitat type.</p>	<p>Approximately 42.8% of the Project Development Area (30,218.3 ha) is comprised of this habitat type.</p>

Land Cover / Land Use Type	Description	EAAA Land Cover	Project Footprint Land Cover (ha)
Wet Evergreen Forest	<p>Wet Evergreen Forest has a similar forest structure and composition as montane forest but receives less precipitation. This habitat type typically comprises mixed stands of semi-evergreen forest / coniferous forest, with varying compositions of broad-leaved trees and <i>Pinus</i> species. Dominated by species of Fagaceae, Myrtaceae, and Lauraceae, with high overall species richness. Existing disturbance, particularly habitat fragmentation caused by access roads, is noted for these forest areas.</p> <p>This type has been mapped as occurring along the valley to the north-east close to the Lao-Vietnam border and overlapping the EAAAs.</p>	<p>Approximately 10.4% of the EAAA for Non-Volant Species (27,732.1 ha) is comprised of this habitat type.</p> <p>Approximately 7% of the EAAA for Volant Species (17,040.8 ha) is comprised of this habitat type.</p>	<p>Whilst this habitat type is not present within the Project Development Area itself, the transmission line towards Vietnam includes an area of Wet Evergreen Forest.</p>
Agricultural-Shrub Land-Grassland Mosaic	<p>Given the shifting agricultural pattern that characterises the study area, it was inherently difficult to classify many of the smaller, fragmented patches of open, transitional herbaceous and low-wooded vegetation amongst the broader contiguous forest communities. This habitat type has therefore been broadly mapped as a shrub land-grassland mosaic, comprised of the following sub-communities:</p> <ul style="list-style-type: none"> ■ Agricultural land is used by local communities for rotational agricultural cropping, and to a lesser extent for commercial crop production such as coffee, sugarcane, and maize (ADB, 2016⁶³; CEIC, 2021). Rice is cultivated in upland areas for mainly subsistence purposes (Alexander <i>et al.</i>, 2018). ■ Shrub land is scattered across the EAAAs where anthropogenic influences have modified the structural integrity of the area. This habitat type comprises small patches of vegetation that represent transitional evergreen/semi-evergreen forest-shrub areas that have been subject to degradation, forest regeneration and/or natural succession. ■ Grassland is typically a fire-adapted vegetation and habitat type found scattered throughout the EAAA, and in 	<p>Approximately 58.7% of the EAAA for Non-Volant Species (156,798.4 ha) is comprised of this habitat type.</p> <p>Approximately 63.8% of the EAAA for Volant Species (154,916.5 ha) is comprised of this habitat type.</p>	<p>Approximately 56.3% of the Project Development Area (39,760.9 ha) is comprised of this habitat type.</p>

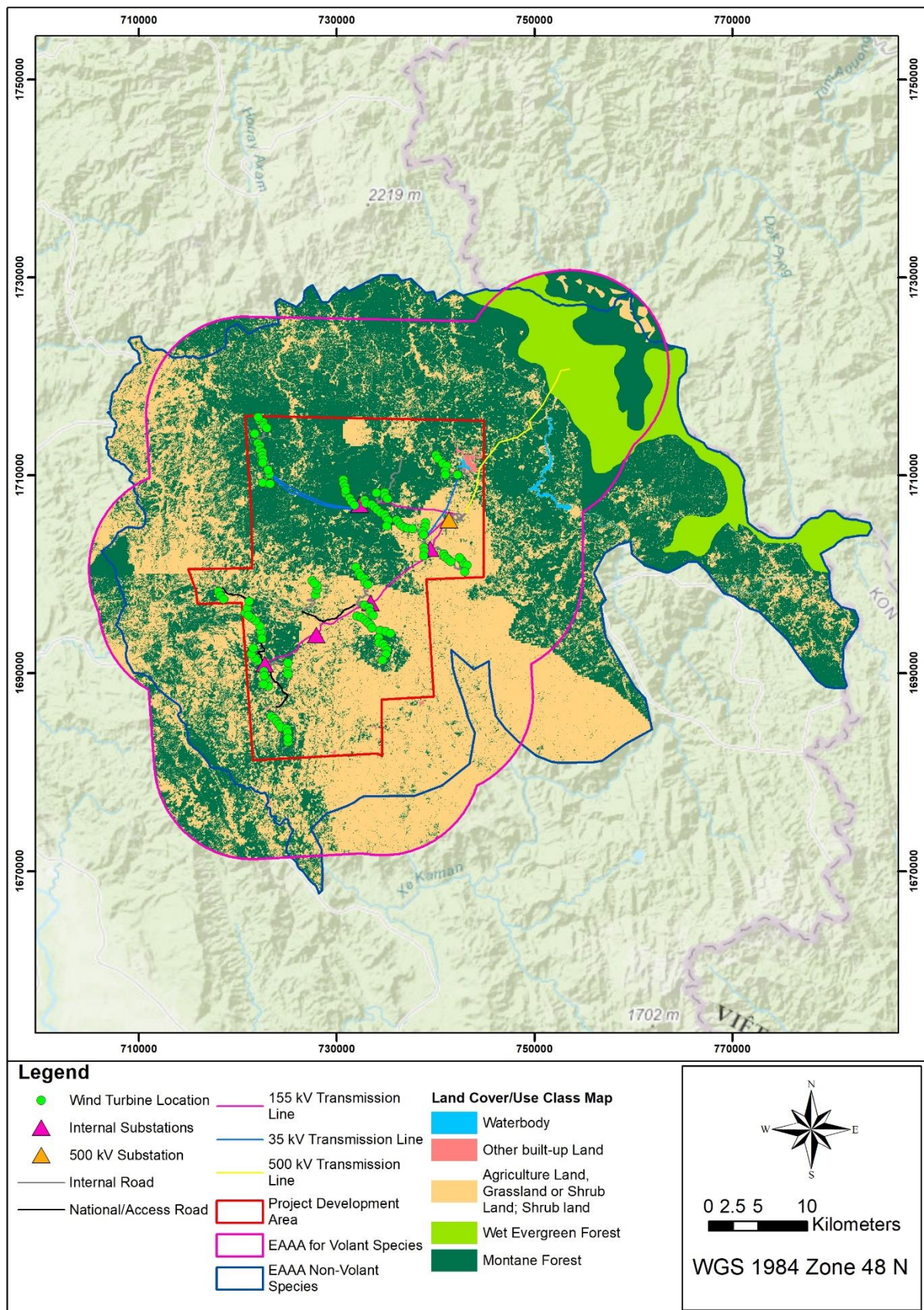
⁶³ Asian Development Bank: additional financing (2016). Proposed Administration of Grant. Lao People's Democratic Republic: Greater Mekong Subregion Biodiversity Corridors Project. Draft for submission to FIP Committee. Project Number: 40253. March 2016. Available online at: https://climateinvestmentfunds.org/sites/default/files/meeting-documents/fip-lao_pdr-004a-adb-protecting-forests-for-sustainable-ecosystem-services-annex12345678.pdf

Land Cover / Land Use Type	Description	EAAA Land Cover	Project Footprint Land Cover (ha)
	the southern and central sections of the Project area. Such land cover is often due to herbivore activity or fire on plateaus such as on the Dak Cheung Plateau. Large native trees are systematically removed and key ecological processes are disrupted.		
Water Body	Rivers and streams occur at topographic low points in the landscape and along drainage lines throughout the Project area (Innogreen Engineering Co. Ltd. and Greener Consultant Co. Ltd, 2020), and wider EAAAs. Located within the Sekong River catchment area, this area is generally recognised for being ecologically unique due to the presence of unique habitats at high elevation and slopes (Meynell, 2014 ⁶⁴). Of note, rivers and streams at Dak Cheung plateau appear to face relatively few impacts, except when in the vicinity of development works (Kottelat, 2011 ⁶⁵).	Approximately 0.3% of the EAAA for Non-Volant Species (671.7 ha) is comprised of this habitat type. Approximately 0.3% of the EAAA for Volant Species (697.1 ha) is comprised of this habitat type.	Approximately 0.1% of the Project Development Area (79.5 ha) is comprised of this habitat type.
Built-up and Related Land	Artificial / man-made land use has removed most or all ecosystem attributes. Built-up land use in the Project area comprises residential buildings and basic infrastructure (e.g., roads, hospital, and school) (Innogreen Engineering Co., Ltd. and Greener Consultant Co., Ltd, 2020). These areas are located mainly in the north-east but smaller structures and roads are scattered throughout the landscape.	Approximately 0.2% of the EAAA for Non-Volant Species (491.8 ha) is comprised of this habitat type. Approximately 0.2% of the EAAA for Volant Species (590.6 ha) is comprised of this habitat type.	Approximately 0.8% of the Project Development Area (556.7 ha) is comprised of this habitat type.

⁶⁴ Meynell, P. (2014). The Sekong River in Viet Nam, Lao PDR: and Cambodia: An Information Sourcebook for Dialogue on River Flow Management. Bangkok, Thailand: IUCN. 139pp. Available online at: <https://portals.iucn.org/library/sites/library/files/documents/2014-081.pdf>

⁶⁵ Kottelat, M. (2011). Fishes of the Xe Kong drainage in Laos, especially from the Xe Kaman. Co0management of freshwater biodiversity in the Sekong Basin. October 2011. Available online at: https://wwfint.awsassets.panda.org/downloads/fishes_of_xe_kaman_2011.pdf

Figure 8.27: Land cover / Land Use in the EAAAs and Project area



Source of information: ERM (2022).

8.4.4 Birds

The sections below present a summary of the methodology and key findings of the bird field surveys undertaken for the Project. Further details are presented in **Appendix S**.

8.4.4.1 Methodology

Detailed knowledge of bird distribution and flight activity is necessary in order to predict the potential effects of the wind farm on birds. Feedback from Multi-Lateral Agency (“MLA”) consultation that took place between 22 August 2017 and 29 September 2017 identified bird surveys to international standards as survey priorities, with the peak bird migration season⁶⁶ being particularly important for survey. Data were collected using standard protocols, which were based on internationally-recognised Scottish Natural Heritage (now NatureScot) guidance. Bird Vantage Point (“VP”) and transect surveys were therefore undertaken monthly from December 2020 – Nov 2021 (except for April and May 2021 when COVID-19 pandemic lockdown restrictions prevented surveys from taking place) to capture the annual seasonal variation expected at the Project area. **Figure 8.28** presents the locations of the bird VP and transect surveys undertaken.

8.4.4.1.1 Vantage Point Surveys

Given the extent of the Project area, it was not possible to undertake VP surveys for the entire wind farm. A sampling approach was therefore adopted that allows a representative proportion of the turbines in each of the main wind farm clusters to be surveyed. This approach enabled differences in species and collision risk between turbine clusters to be assessed, while providing for an overall collision risk determination across the entire windfarm. Data were collected using standard protocols, which were based on internationally-recognised Scottish Natural Heritage (now NatureScot) guidance^{67,68}.

Due to the large size of the wind farm and the evolving design changes a sampling approach was taken that considered a representative sample of the project area using a maximum of 14 Vantage Points (VPs). The approach followed identified the area of original turbine locations and split these into discrete arrays. VP surveys used SNH guidance for recording both focal and secondary species. Minimum survey requirements were exceeded, as all VP’s used 12 hours per VP per month, in most cases for 12 months. This allowed for an estimation of aerial density derived from the area watched (the 2km view shed, as shown on the map in Figure 8.28), number of birds recorded, and the survey effort. Each array was treated as a separate wind farm, and the cumulative risk of all arrays assessed in combination. In all cases aerial density was found to be extremely low (at all arrays), and this reflects the findings that there is little or no evidence of significant migratory movement through the concession area, nor a large population of species such as raptors or other soaring birds likely to interact with the turbines. Based on a maximum visibility range of 2km and 180 degree arc coverage for each of the VPs (see map in Figure 8.28), VP surveys are estimated to cover at least 75 of the 133 turbines planned, which is >56% of turbines. Although the locations of turbines may have changed over the course of the surveys in response to project alternatives and relocation of turbines for various reasons, the findings of the VP

⁶⁶ The migration season in Southeast Asia generally begins in late September through into November, with a peak in October. Local bird experts have also indicated that in Laos, migration extends through to December. The East Asian - Australasian Flyway (EAAF) (which leads through Lao) stretches from the Russian Far East and Alaska, southwards through East Asia and South-east Asia, to Australia and New Zealand and encompasses 22 countries. Over 50 million migratory waterbirds, including 8 million waders, use the route annually.

⁶⁷ Scottish Natural Heritage August 2014. Recommended bird survey methods to inform impact assessment of onshore wind farms. Retrieved from <https://www.nature.scot/sites/default/files/2018-06/Guidance%20Note%20-%20Recommended%20bird%20survey%20methods%20to%20inform%20impact%20assessment%20of%20onshore%20windfarms.pdf>

⁶⁸ Scottish Natural Heritage. 2000. Wind farms and birds: Calculating a theoretical collision risk assuming no avoiding action. Retrieved from <https://www.nature.scot/sites/default/files/2017-09/Guidance%20Note%20-%20Windfarms%20and%20birds%20-%20Calculating%20a%20theoretical%20collision%20risk%20assuming%20no%20avoiding%20action.pdf>

survey are habitat based and, given the similarity of results from all the VPs, it is reasonable to extrapolate these findings to turbines in similar habitat. The detailed technical memo (ERM: January 2021) explains the aerial density findings, concluding that no significant risk to higher risk (VU or NT) species recorded, with aerial occupancy levels being too low to justify running a CRM (Collision Risk Model) as this would be of no added value to the project. However, a full model was run for the known migratory and potentially near threatened grey-faced buzzard.

A table has been included below which indicates VP survey alignment with the SNH (2017) guidance document. In summary, all guidance recommendations were fulfilled in VP survey design, apart from the following:

- The VPs and transects were positioned to cover a representative area of the project area, given the large size of the site;
- Suitable control sites were not determined or surveyed;
- Bird surveys were initially planned to cover a 12-month period, however April and May 2021 months could not be surveyed due to Covid-19 lockdown measures which prevented fieldwork at the time; and
- Monthly surveys would cover peaks in migrations, with the exception of the April 2021 survey which could not be completed due to Covid-19 lockdown restrictions in place at this time.

The SNH guidance indicates that *"Where bird survey methods differ from those outlined in this guidance, a clear rationale for using a different approach must be set out"*. Given the large and discontinuous area occupied by the arrays, and uncertainties over specific turbine locations, a sampling rather than complete survey approach was adopted. Still, a representative portion of the habitats and site was covered and all the initial planned WTGs were included in the VP coverage. The survey could not account for all possible potential changes to WTG layout, and whilst an attempt was made to accommodate potential changes this could ultimately not be predicted with 100% accuracy, and as pragmatic an approach as possible was adopted. Whilst control monitoring sites were not surveyed initially, the use of suitable control sites can still be considered for the operational monitoring plan to be developed and implemented, taking into consideration other development planned for the region (e.g. Xekong WF and bauxite mining).

Recommended Bird Survey Methods (Scottish Natural Heritage, 2017)	Comments on VP Survey Approach for Monsoon WF Project
1 Appropriately skilled and experienced observers are essentially.	Third-party, independent and skilled bird experts with specialist experience in abundance and VP surveys were contracted.
2 In the absence of adequate existing information (e.g. none available, data greater than 5 years old, etc.), information must be gathered on site to ascertain the likely bird interest.	Latest available data from IBAT (IUCN), outcomes of the site REA (Rapid Ecological Assessment) and consultation with local bird experts was incorporated into survey design and the early identification of key bird species of interest.
3 The survey programme should retain flexibility to adapt to situations where one or more species (especially ones not typically chosen as a target or secondary species) unexpectedly present an issue (e.g. particularly high presence on the site).	A flexible survey programme was implemented to adapt to changes in layout and target species.

Recommended Bird Survey Methods (Scottish Natural Heritage, 2017)	Comments on VP Survey Approach for Monsoon WF Project
<p>4 The survey area and design must adequately cover the entire development area, i.e. the largest possible layout, all the alternative layouts and ancillary structures and works. This includes access tracks; borrow pits, electrical substations and grid connections (both underground and overhead).</p>	<p>The VPs and transects were positioned to cover a representative area of the project area, given the large size of the site. A total of 14 VPs were selected to provide sampling coverage over the habitats associated with the different array areas, covering the turbine positions and included 2 VPs to survey the high voltage transmission line alignment to the Lao border with Vietnam in the east. The survey could not account for all possible potential changes to WTG layout, and whilst an attempt was made to accommodate potential changes this could ultimately not be predicted with 100% accuracy, and as pragmatic an approach as possible was adopted</p>
<p>5 The main breeding and wintering bird survey areas should extend at least 500m beyond the development/planning application boundary.</p>	<p>Considering a maximum 2km visibility range for each VP, the VP positioning covers the turbine arrays and extends a distance of at least 500m from each turbine in most instances.</p>
<p>6 Where there are adjacent or overlapping wind farm proposals being surveyed simultaneously we strongly recommend that the developers and consultants cooperate with each other over access and coordination of survey. Agreement to share data for the overlap area where appropriate or a revised survey schedule that avoids overlapping visits should be sought.</p>	<p>This was not a concern for the survey as no other similar survey work was not planned during the course of the baseline bird surveys.</p>
<p>7 All bird species have varied seasonal and within day activity patterns. Survey design should be based around the times when birds are likely to be most active.</p>	<p>Bird activity for most species is considered at its peak in the early morning and late evening. The surveys covered 12 hours between sunrise and sunset at each VP, thus covering peak activity periods.</p>
<p>8 Survey work should span all times of the year when the target species are present.</p>	<p>Bird surveys were planned to be undertaken on a monthly basis over a period of 12 months, from December 2020 to November 2021 inclusive to cover all relevant seasons when target and secondary bird species could be present. The survey team completed all the visits to all VP's in every month except April and May 2021, when Covid-19 lockdown restrictions prevented surveys taking place.</p>
<p>9 We recommend survey for a minimum of two years to allow for variation in bird use between years, unless it can be demonstrated that a shorter period of survey is sufficient.</p>	<p>The bird surveys were restricted to a period of 1 year. Variations in bird activity between years could therefore not be ascertained.</p>

Recommended Bird Survey Methods (Scottish Natural Heritage, 2017)	Comments on VP Survey Approach for Monsoon WF Project
10 Where post-construction monitoring is a condition of consent, it is recommended that a comparable control or reference site is selected and surveyed at the time of the initial surveys. It is acknowledged that on a practical level it can be difficult to find suitable sites.	Suitable control sites were not determined or surveyed. Whilst control monitoring sites were not surveyed initially, the use of suitable control sites can still be considered for the operational monitoring plan to be developed and implemented, taking into consideration other development planned for the region (e.g. Xekong WF and bauxite mining).
11 Breeding bird surveys should cover the whole breeding season and be done between 8:30 hours and 18:00 hours. They should be carried out in a wind of Beaufort force 4 or less, and in dry weather.	Bird surveys were initially planned to cover a 12-month period, however April and May 2021 months could not be surveyed due to Covid-19 lockdown measures which prevented fieldwork at the time. Surveys were planned to coincide with suitable weather conditions as far as possible and where predictable.
12 All survey visits should be undertaken in the same season; splitting survey visits between years is not acceptable	All surveys were completed within the relevant seasons over the year-long survey period.
13 Where new above-ground grid connections are planned, the proposed connection route should be covered by VP observations to assess potential collision risk.	Survey design included 2 VPs to survey the cover voltage transmission line alignment to the Lao border with Vietnam in the east.
14 VP survey must not take place simultaneously with any other fieldwork on the site, that may cause disturbance and invalidate the VP survey results.	VP surveys were done separate to other fieldwork.
15 Detectability of birds to human observer's declines with distance. Potential detectability issues should be borne in mind when selecting VP locations to ensure they are as appropriate as possible for the species to be surveyed. It is very important that VPs are chosen to achieve maximum visibility with the minimum number of points. When selecting VPs, the aim should be to cover all of the flight activity survey area such that no point is greater than 2km from a VP. As detection of flight activity will decrease with distance, VPs should be located as close to the survey area as possible.	A maximum visibility distance of 2 km from each VP was factored into survey design, together with terrain effects on visibility, to ensure complete coverage of all WTGs and TLs.
16 The VP locations and associated viewsheds referred to in the environmental statement must be those used in the field.	VP locations referred to in the ESIA were those used in the field.
17 VPs should cover the defined survey area encompassing the proposed turbine envelope if known, or the maximum extent of potential turbine layouts. This should extend to 500m beyond the outermost proposed turbines to deal with inaccuracies of position for flight line observations.	VPs cover all WTGs known at the time and extending beyond the outermost proposed turbines to account for potential changes in layout as far as possible.

Recommended Bird Survey Methods (Scottish Natural Heritage, 2017)	Comments on VP Survey Approach for Monsoon WF Project
18 Where VPs are located within the survey area, they should not be used simultaneously with other VP locations which overlook them as the presence of an observer either sitting at or moving to/from the VP will probably affect bird behaviour.	VP surveys were done individually and separately to avoid disturbance from other observers.
19 Recommend scanning an arc of up to 180 degrees from each VP. Larger arcs cannot be scanned efficiently.	An arc of 180 degrees from each VP was used as the visual survey area.
20 The number of observers required to undertake watches will vary depending on the levels of target bird activity. If activity is predicted to be high and involves several target species, judgement should be exercised as to whether more than one observer may be required, in order that all activity of target species can be recorded.	This was factored into survey design.
21 Watches should be tailored to the ecology of the target bird species involved. This should provide a spread over the full daylight period available (from official local sunrise to sunset times) which will vary depending on the time of year. Observations should be collected between official sunrise and official sunset time.	VP surveys were undertaken from official local sunrise to sunset.
22 Watches should be spread across all calendar months when the species is present or likely to be so. The watches should be stratified according to the ecology of the target species present and should give a representative sample of site use.	All surveys were completed within the relevant seasons over the year-long survey period.
23 Migration watches should take account of key periods for the target species to be surveyed, and reference should be made to known peaks in their migration and weather patterns that can produce larger scale movements.	All surveys were completed within the relevant seasons over the year-long survey period. Monthly surveys would cover peaks in migrations, with the exception of the April 2021 survey which could not be completed due to Covid-19 lockdown restrictions in place at this time.
24 Watches should be taken under conditions of good ground visibility (>2km) and can be undertaken on showery days providing showers are not too frequent or prolonged.	VPs were coordinated with periods of good visibility.
25 The longer the overall survey period of VP survey, the more accurate and precise the sample of flight behaviour. We recommend a minimum of 72 hours per VP location divided between seasons (36 hours breeding and 36 hours non-breeding) per year, as a standard for species where vantage point survey is required. Where proposed effort is less than 72 hours, this should be fully justified.	The total survey time at all VP's was 120 hours (12 hours per VP per month, over a period of 10 months, with April and May 2021 excluded due to Covid-19 lockdown restrictions). The exception was VP's 12, 13, and 14 which were added a month after initial surveys started in response to layout changes, and where survey time was 108 hours. The recommended guideline of a minimum survey period of 72 hours per VP location was still attained.

Recommended Bird Survey Methods (Scottish Natural Heritage, 2017)	Comments on VP Survey Approach for Monsoon WF Project
26 Where a high level of migration movements are considered likely, or are known, to occur, sampling within this period should be stratified to ensure adequate data collection across the spring and autumn periods.	High levels of migration movements were not predicted and surveys confirmed that migration is not a major factor to account for in the project area and survey approach. All migrant species are IUCN LC, and most recorded flight times at collision risk height would not generate sufficient time at collision risk height to have a statistical probability of a collision within the lifetime of the wind farm.
27 Within each season, each part of the wind farm should be watched for at least 36 hours.	This was accomplished through the timing and spacing of VPs which allowed for each part of the WF to be observed for at least 36 hours in each season.
28 We recommend that VP watches are conducted as a series of watches each of not more than 3 hours' continuous duration at a time. They are designed to form a representative sample of bird flight activity and a sample of, for example 12 x 3 hour watches is better than fewer longer watches.	This was implemented as far as possible.
29 There should be suitable breaks of at least 30 minutes between watches to minimise observer fatigue.	Breaks were implemented
30 Watches can be suspended and then resumed to take account of changes in visibility.	This was implemented where necessary on a case-by-case basis.
31 The area in view is scanned until a <i>target species</i> is detected at which point it is followed until it ceases flying or is lost from view. The time the target bird was detected and the flight duration are recorded. The bird's flight height is estimated at the time of detection and then at 15 second intervals thereafter, using, for example, a count-down timer with an audible alarm. A 15 second interval is recommended as a practical compromise that aims to minimize dependency within data while maximizing the sample of observations.	This standard method was used: time detected and flight height recorded in 15 second intervals.
32 Flight heights should be classified into height bands, i.e. below the rotor- swept area, the rotor-swept area and above the rotor-swept area, allowing for observer error.	The recommended flight bands (below the rotor-swept area, the rotor-swept area and above the rotor-swept area) were used to record and classify flight heights based on turbine design information provided by MWPCCL.
33 Observation of target species takes priority over recording of secondary species.	Target species observations were given priority. Three species with higher IUCN conservation status were identified during the VP surveys. These were the great hornbill (VU), the mountain hawk-eagle (NT), and the rufous-bellied eagle (NT).

Recommended Bird Survey Methods (Scottish Natural Heritage, 2017)	Comments on VP Survey Approach for Monsoon WF Project
34 Static and flying birds should be recorded separately. Observers should record perched birds and birds on water bodies once only on arrival at the VP, and the area or site used marked on a map.	Static and flying birds were recorded separately where relevant, as were perched birds.
35 Where bird survey methods differ from those outlined in this guidance, a clear rationale for using a different approach must be set out.	Given the large and discontinuous area occupied by the arrays, and uncertainties over specific turbine locations, a sampling rather than complete survey approach was adopted. Still, a representative portion of the habitats and site was covered and all WTGs were included in the VP coverage..

Expert ornithologists tracked and mapped birds throughout the turbine area, recording species, numbers, and estimating flight height during timed watches at a total of fourteen VPs to collect data to quantify the flight activity levels and species distribution across the Project area. Twelve of the VPs were selected to provide a representative sample coverage of the habitats associated with the different turbine arrays, while the remaining two VPs were dedicated to monitoring flight activity associated with the proposed transmission line from the windfarm area to the Lao-Vietnam border (VPs 9 and 10). **Table 8.18** presents the VP locations with respect to turbine arrays and the transmission line.

Table 8.18: Vantage Point (VP) Relationship to Turbine Arrays and the Transmission Line^{4.4}

Location	Vantage Points
East Central Arrays	1a, 3a, 2, 4
Southeast Array	5, 7a, 8
Ban Dakdonna Array	6, 11
Dak Cheung village Array	12
Northwest Array	13
Southernmost array	14
Transmission line	9 & 10

In line with GIIP for WF development project assessment, the VP surveys recorded a subset of species, comprising migratory species, large soaring birds, raptors, flocking species and heavy-bodied birds with limited maneuverability and included resident species of high conservation status (i.e. globally threatened species as per the IUCN Red List of threatened species, that includes (inter)nationally-recognised high conservation concern species within the country). . Birds that entered the windfarm boundary were tracked and their height estimated at 15 second intervals. Three bands based on the Project's turbine hub height and rotor length specifications were used to estimate flight height⁶⁹:

- **30 m or below**, allowing for the effect of downdraft and compensates for potential height estimation difficulties over undulating terrain;

⁶⁹ Note that the turbine design and operational specifications were revised after commencing the bird VP surveys. Collision risk modelling calculations therefore factored in these changes where needed. This is described in further detail in **Section 9.4** of this ESIA.

- **30 m to 150 m**, which was considered as the height at which there is a collision risk with turbine blades; and
- **150 m or above**, which was considered as the area that is above the collision risk height.

VP surveys included 12 hours survey time per VP, per month. Total survey time at each VP was estimated to be 120 hours, with the exception of VP 12, 13, and 14 which were added a month after surveys started in response to layout changes, and where survey time was 108 hours.

8.4.4.1.2 Transect Surveys

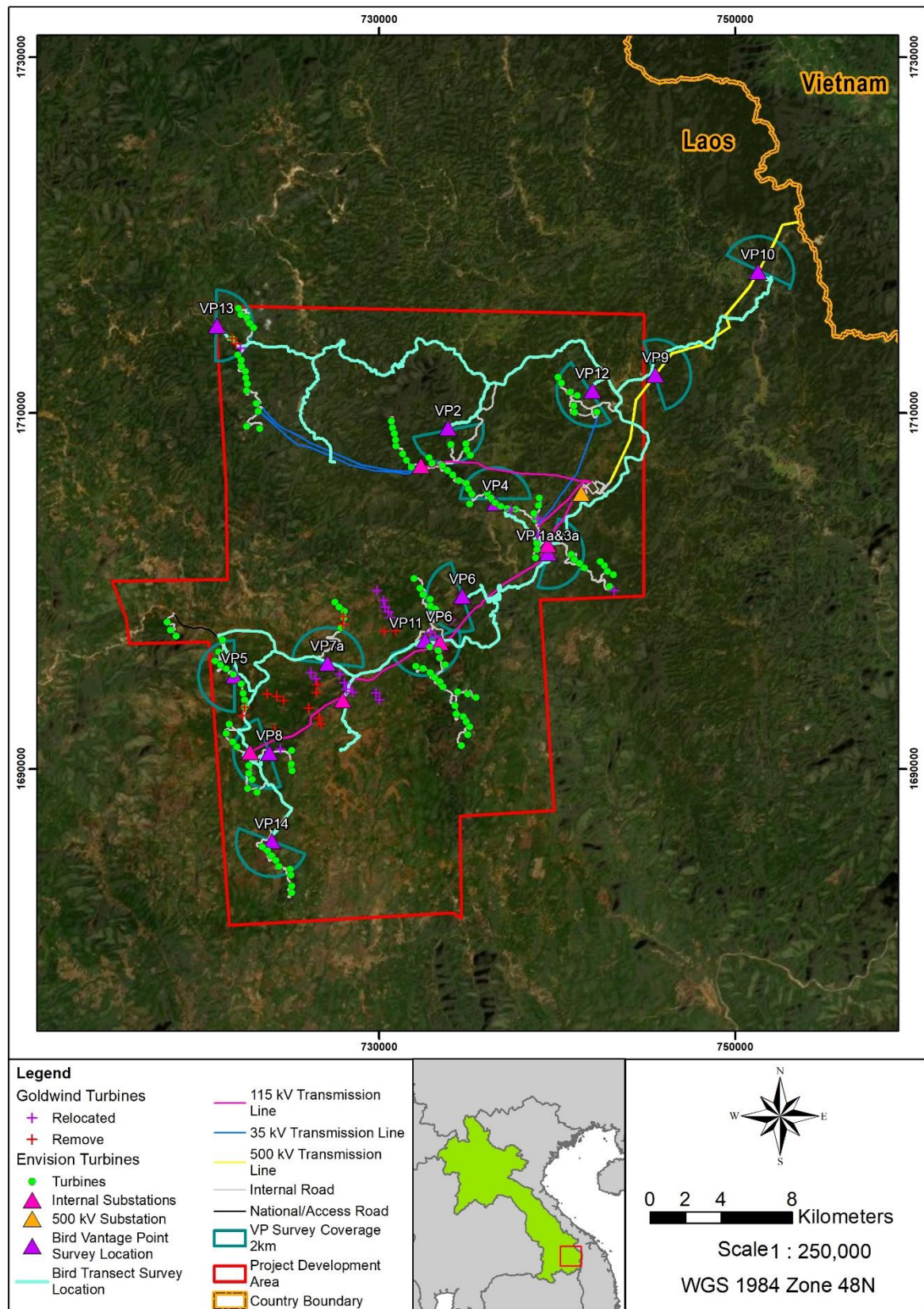
Transect surveys were conducted to record the variety of birds present in the Project area. Fourteen transect survey routes were selected based on the field surveyor's walking route from the nearest road to the VP. Surveys were undertaken twice in a day, during the morning and afternoon, prior to, and after each VP survey.

These transect surveys were designed to focus on identifying potential high priority species highlighted during expert consultation and an initial screening against the critical habitat criteria, which revealed that three restricted-range bird species are considered as potential high priority species (refer to **Appendix T**). These include:

- Chestnut-eared Laughing thrush (*Garrulax konkakinhensis*);
- Black-crowned Barwing (*Actinodura sodangorum*);
- Golden-winged Laughing thrush (*Garrulax ngoclinhensis*).

Given that these species are primarily understorey or ground dwellers that may be elusive, playback of recorded bird songs at intervals of 500m along each transect was also performed during the field surveys to increase the probability of encountering and confirming the presence of these particular species.

Figure 8.28: Map Showing VP and Transect Locations for the Bird Survey Relative to Planned WF Infrastructure



8.4.4.2 Survey Findings

8.4.4.2.1 Vantage Point (VP) Survey Findings

The VP surveys recorded a total of 24 species (excluding three flights of two unspecified species). Of the species recorded, all were raptors with the exception of two heron species (Chinese Pond Heron, *Areola bacchus* and Cinnamon Bittern, *Ixobrychus cinnamomeus*), a wader (Red-wattled Lapwing, *Vanellus indicus*) and the Greater Hornbill, *Buceros bicornis*.

All but three of the species recorded were of LC (Least Concern) conservation/threat status, with two NT (Near Threatened) and one VU (Vulnerable) species recorded.

The majority of species are confirmed resident bird species (13), although eleven species are confirmed migrants. These proved to be broad-front migrants, which is unsurprising given that there are no IBAs designated for migratory and/or congregatory species identified within the EAAAs (refer to **Section 8.4.9** for further information).

Table 8.19 indicates the list of twenty-four species, and their total flight time at all heights and collision risk height, from December 2020 to November 2021.

Table 8.19: Bird Species Recorded during VP Surveys with Corresponding Flight Times at all Heights / Collision Risk Height

Bird Species Recorded <i>(conservation-important / RL species indicted in 'bold')</i>		IUCN RL ^{1,2}	Resident/ Migratory (based on IUCN)	Vantage Point (VP) <i>(*species presence recorded indicated by an 'x')</i>																	Flight Time	
Common Name	Scientific Name			1	2	3	4	5	6	7	8	9	10	11	12	13	14	1a & 3a	7a	Flight Time Total (seconds)	Flight Time at Collision Risk height (seconds)	
Besra	<i>Accipiter virgatus</i>	LC	Altitudinal migrant	x		x	x		x		x		x	x					415	270		
Black Baza	<i>Aviceda leuphotes</i>	LC	Migrant					x											120	30		
Black Eagle	<i>Ictinaetus malaiensis</i>	LC	Resident	x	x	x	x	x	x	x		x	x	x	x	x		x	x	8 262	3 450	
Black-winged Kite	<i>Elanus caeruleus</i>	LC	Resident				x										x		600	300		
Changeable Hawk-eagle	<i>Nisaetus cirrhatus</i>	LC	Resident	x	x														72	0		
Chinese Pond Heron	<i>Aredola bacchus</i>	LC	Migrant									x							90	0		
Cinnamon Bittern	<i>Ixobrychus cinnamomeus</i>	LC	Migrant					x											120	0		
Crested Goshawk	<i>Accipiter trivirgatus</i>	LC	Resident	x	x	x		x	x		x	x			x	x			1 506	465		
Crested Serpent Eagle	<i>Spilornis cheela</i>	LC	Resident	x	x	x	x	x	x	x		x	x	x	x	x		x	x	5 105	975	
Eastern Buzzard	<i>Buteo japonicas</i>	LC	Migrant														x		120	120		
Eurasian Kestrel	<i>Falco tinnunculus</i>	LC	Migrant						x	x	x					x			610	90		
Eurasian Sparrowhawk	<i>Accipiter nisus</i>	LC	Migrant					x			x					x			150	15		
Great Hornbill	<i>Buceros bicornis</i>	VU	Resident										x						135	15		
Grey-faced Buzzard	<i>Butastur indicus</i>	LC	Migrant		x	x	x	x	x	x					x	x			3 829	2 190		

Bird Species Recorded <i>(conservation-important / RL species indicted in 'bold')</i>		IUCN RL ^{1,2}	Resident/ Migratory (based on IUCN)	Vantage Point (VP) <i>(*species presence recorded indicated by an 'x')</i>																Flight Time	
Common Name	Scientific Name			1	2	3	4	5	6	7	8	9	10	11	12	13	14	1a & 3a	7a	Flight Time Total (seconds)	Flight Time at Collision Risk height (seconds)
Japanese Sparrowhawk	<i>Accipiter gularis</i>	LC	Migrant			x	x												90	45	
Jerdon's Baza	<i>Aviceda jerdoni</i>	LC	Resident	x			x	x	x			x	x			x			915	450	
Mountain Hawk-Eagle	<i>Nisaetus nipalensis</i>	NT	Migrant		x		x												300	120	
Northern Goshawk	<i>Accipiter gentilis</i>	LC	Migrant										x						82	45	
Oriental Hobby	<i>Falco severus</i>	LC	Migrant	x				x	x		x			x			x	x	924	375	
Oriental Honey Buzzard	<i>Pernis ptilorhynchus</i>	LC	Migrant	x	x	x	x		x			x		x	x	x		x	2 310	1 110	
Osprey	<i>Pandion haliaetus</i>	LC	Migrant											x					600	375	
Red-wattled Lapwing	<i>Vanellus indicus</i>	LC	Resident							x									30	0	
Rufous-bellied Eagle	<i>Lophotriorchis kienerii</i>	NT	Resident		x		x												180	60	

Bird Species Recorded <i>(conservation-important / RL species indicted in 'bold')</i>		IUCN RL ^{1,2}	Resident/ Migratory (based on IUCN)	Vantage Point (VP) <i>(*species presence recorded indicated by an 'x')</i>															Flight Time	
Common Name	Scientific Name			1	2	3	4	5	6	7	8	9	10	11	12	13	14	1a & 3a	7a	Flight Time Total (seconds)
Shikra	<i>Accipiter badius</i>	LC	Migrant	x	x	x	x	x	x	x	x	x		x	x	x	x		1 288	180 Resident / migrant status of birds in Table 7.19 was reviewed using the latest IUCN information and corrections have been made.

Key to table:

VU = Vulnerable; NT = Near Threatened; LC = Least Concern

8.4.4.2.2 Transect Survey Key Findings

The transect surveys recorded a total of 256 bird species, the majority of which are of LC status species (249 species), with six species being NT and one VU species recorded.

■ Bird species with higher IUCN conservation status were identified as follows:

- Black-crowned Barwing, *Actinodura sodangorum* (NT),
- Blossom-headed Parakeet, *Psittacula roseata* (NT),
- Grey-headed Parakeet, *Psittacula finschii* (NT),
- Red-breasted Parakeet, *P. alexandri* (NT),
- Rufous-bellied Eagle, *Lophotriorchis kienerii* (NT),
- Wreathed Hornbill, *Rhyticeros undulatus* (VU), and
- Yellow-billed Nuthatch, *Sitta solangiae* (NT).

Of the four endemic bird species identified as potential high priority species of the Project, none were recorded during field surveys.

Table 8.20 lists the species of conservation importance recorded during the transect surveys in alphabetical order.

For a comprehensive list of bird species recorded, the reader is referred to the baseline report contained in **Appendix S**.

Table 8.20: Bird species with Elevated Threat Status Recorded during Transect Surveys

S/N	Common Name	Scientific Name	Transect No.	Status	IUCN RL Status
1.	Black-crowned Barwing	<i>Actinodura sodangorum</i>	4	Resident, restricted-range	NT
2.	Blossom-headed Parakeet	<i>Psittacula roseata</i>	1a & 3a	Resident	NT
3.	Grey-headed Parakeet	<i>Psittacula finschii</i>	1a & 3a, 4	Resident	NT
4.	Red-breasted Parakeet	<i>Psittacula alexandri</i>	5	Resident	NT
5.	Rufous-bellied Eagle	<i>Lophotriorchis kienerii</i>	2, 4	Resident	NT
6.	Wreathed Hornbill	<i>Rhyticeros undulatus</i>	6	Resident	VU
7.	Yellow-billed Nuthatch	<i>Sitta solangiae</i>	10	Resident	NT

Key to table:

VU = Vulnerable; NT = Near Threatened

8.4.5 Bats

8.4.5.1 Methodology

The baseline assessment for bats comprised a desktop review, followed by passive and active sampling for bats within the Project area. Both published and unpublished records of bats from southern Lao PDR (specifically from Saravan, Sekong, Champasak and Attapeu provinces) were reviewed prior to the field survey. Surveys across a total of five bat field survey campaigns were undertaken, which included three campaigns in the dry season (February and March 2021), and two campaigns in the wet season (June and July 2021).

Field survey methods included Key Informant Interviews (“KIs”), roost surveys, live-sampling with harp traps and mist nets, and acoustic sampling using ultrasound detectors:

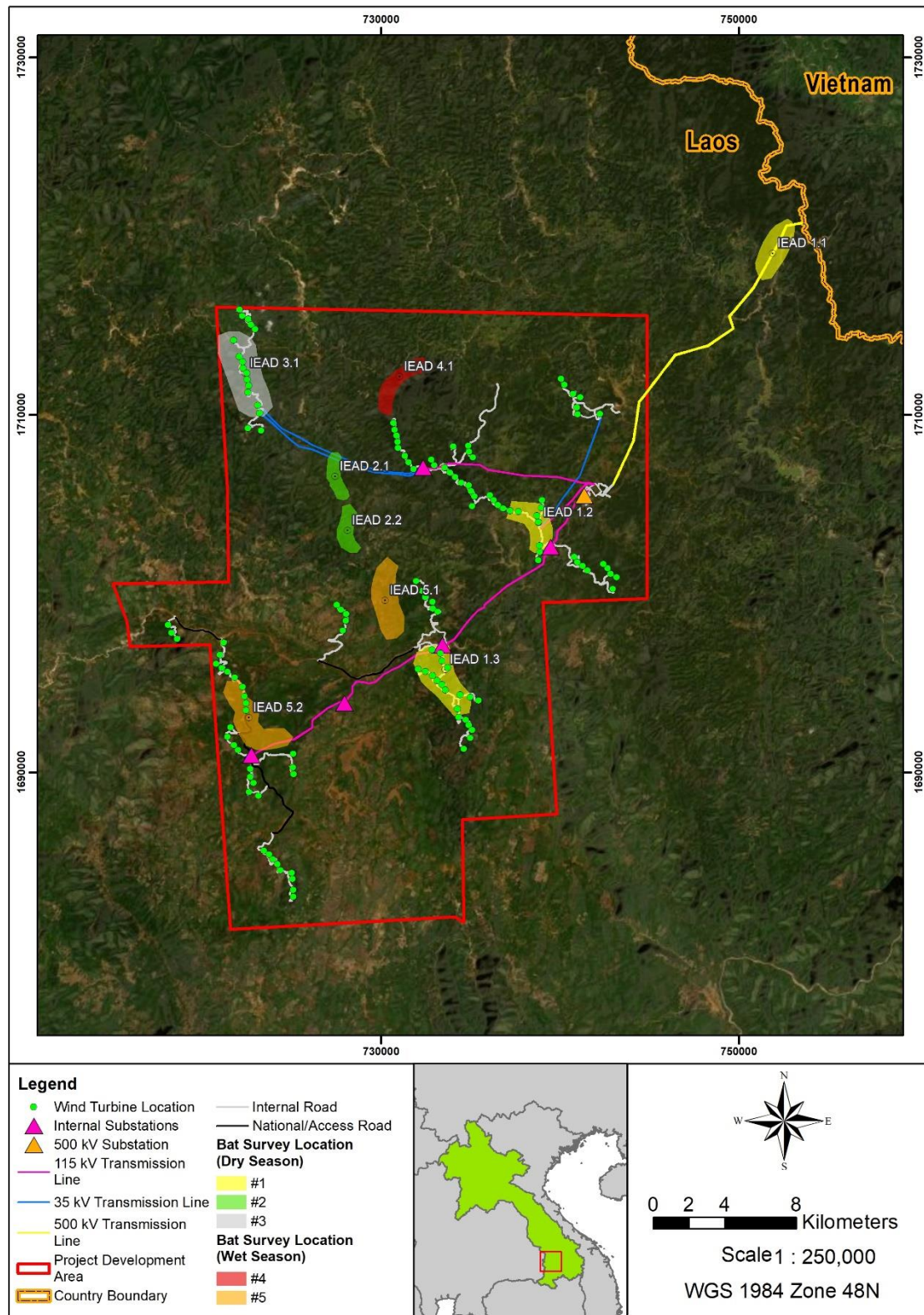
- KIs were undertaken to determine location of significant bat colonies (> 100 individuals) within or in the vicinity of the Project area, with a specific focus on cave roosts and flying fox (*Pteropus* spp.) colonies. These were undertaken with 22 residents with a combined total of 625 years of local experience.
- Mist nets and harp traps were employed for live captures in 55 locations in the Project area, and five locations along the proposed transmission line route. All captured bats were measured, photographed, and identified in the field using the appropriate guides/monographs. They were subsequently released at the site and night of capture.
- Acoustic sampling using Song Meter 4 full spectrum (SM4) bat detectors (Wildlife Acoustics, USA) and 10 AudioMoth full spectrum (AM) bat detectors (Open Acoustic Devices, UK) were deployed each survey night to record insectivorous bat calls. SM4 detectors were deployed in a new location each night, while AMs were deployed at static locations to maximize coverage of representative habitats in each survey zone. Phonically distinct bat species were identified to the lowest possible taxonomic level possible based on the calls recorded.

Figure 8.29 that follows and **Table 8.21** presents the bat survey locations and itinerary for field surveys undertaken in the Project area.

Table 8.21: Itinerary for Bat Field Surveys

Survey Dates	Season	Sampling Nights	Survey Zone
3–7 February 2021	Dry season	4	Bat 1.1
7–11 February 2021		4	Bat 1.2
11–15 February 2021		4	Bat 1.3
23 February – 1 March 2021		6	Bat 2.1
1–7 March 2021		6	Bat 2.2
16–28 March 2021		12	Bat 3.1
17–29 June 2021	Wet season	12	Bat 4.1
14–20 July 2021		6	Bat 5.1
20–26 July 2021		6	Bat 5.2

Figure 8.29: Map Showing the Locations of Bat Surveys (Wet and Dry Seasons) Relative to Planned WF Infrastructure



Source of information: ERM (2022).

8.4.5.2 Survey Findings

8.4.5.2.1 Literature Review and Interview Findings

The literature review revealed that although a total of 56 bat species are known to the southern Lao PDR to date based on records (defined here as the Salavan, Champasak, Sekong and Attapeu provinces), only two species have been documented in Sekong Province (where >80% of the project area is located) prior to the survey.

All but two of the 56 species are currently recognised as species of Least Concern (LC) by the IUCN (2021), the exceptions being, *Hypsugo dolichodon* and *Murina walstoni* (DD: Data Deficient).

Consistent with key informant interviews and observations throughout the survey, the review also revealed that limestone karst outcrops, significant cave bat roosts (>100 bats) and flying fox colonies are unlikely to occur in the Sekong portion of the project area.

8.4.5.2.2 Trapping and Acoustic Survey Findings

During the field surveys undertaken, a total of 468 bats representing 29 species, arranged in five families, were captured in live traps. An additional six species were recorded during the acoustic surveys conducted. All species are Least Concern (LC) in terms of conservation / threat status with the exception of *Rhinolophus francisi* (NE: Not Evaluated).

The findings included ten bat species which are the first records for southern Lao PDR, and two first country records for Lao PDR (see **Table 8.22** below).

For the comprehensive list of bat species recorded, the reader is referred to the baseline report contained in **Appendix S**.

Table 8.22: New Records for Bat Species in Southern Lao PDR and Lao PDR

S/N	Common Name	Scientific Name	Capture Method	IUCN Red List Status	First Record for Southern Lao PDR	First Record for Lao PDR
1.	Horsfield's Fruit Bat	<i>Cyanopterus horsfieldii</i>	Trapping	LC	X	
2.	Blanford's Fruit Bat	<i>Sphaerias blanfordi</i>	Trapping	LC	X	
3.	Long-tongued Fruit Bat	<i>Macroglossus sobrinus</i>	Trapping	LC	X	
4.	Francis's Woolly Horseshoe Bat	<i>Rhinolophus francisi</i>	Trapping and Acoustic detecting	NE	X	X
5.	Thai Horseshoe Bat	<i>Rhinolophus siamensis</i>	Trapping and Acoustic detecting	LC	X	
6.	Wall-roosting Mouse-eared Bat	<i>Myotis muricola</i>	Trapping and Acoustic detecting	LC	X	
7.	Elery's Tube-nosed Bat	<i>Murina eleryi</i>	Trapping	LC	X	
8.	Fiona's Tube-nosed Bat	<i>Murina fionae</i>	Trapping	LC	X	

S/N	Common Name	Scientific Name	Capture Method	IUCN Red List Status	First Record for Southern Lao PDR	First Record for Lao PDR
9.	Formosan Golden Tube-nosed Bat	<i>Harpiola isodon</i>	Trapping	LC	X	X
10.	Lesser Hairy-winged Bat	<i>Harpiocephalus harpia</i>	Trapping	LC	X	

Key to table:
NE = Not Evaluated; LC = Least Concern

8.4.6 Land Mammals (non-volant species)

8.4.6.1 Methodology

Through interviews with the local villagers in the area, the survey team attained a good indication of the locations of opportune areas for encountering or observing signs of terrestrial (land) mammal activity. This informed the sampling design, with a focus on including key habitats in survey transects.

Transect surveys were conducted to record animals present in the Project area. These surveys took place in the morning, from 07:30 to 11:30 and in the afternoon to early evening from 13:30 to 17:30. Evidence such as tracks, calls, scat, scratch marks on trees, hollows, roosting sites, feeding sites were recorded. Spotlighting surveys were undertaken at night from 19:30. Key sites such as mineral licks, along stream channels and drainage lines, and beneath fruit trees were the focus of observations and all evidence found was photographed and collected where necessary. Listening posts were also conducted in the mornings from 05:30 to 08:00 to monitor gibbon activity by listening for their calls.

Camera traps (30 units) were deployed for a period of 5 months from late April to September 2021, resulting in a total of 3 233 trapping days. 20 camera trap units were installed in the Project area, with the remaining 10 units installed along the route of the Transmission Line to the north-east. Cameras were not installed systematically along a particular grid system, but rather at key locations where mammal activity was estimated to be significant and at an appropriate height to maximize the likelihood of recording priority small and larger mammal species.

A summary of the total survey effort for mammal surveys is included in the Table below.

Table 8.23: Summary of Mammals Surveys Effort

Method	Purpose	Number	Timing	Effort	Total effort
1 Transect Surveys	Slow transect walk through forest habitat to detect animals directly, by calls and any other evidence such as footprint, tracks, scratch, droppings	5 survey blocks	7.30am to 11.30am and late afternoon from 1.30pm to 5.30pm	8 hours per day, 3-4 days per survey block	120 – 160 hours per season (wet season and dry season: total = 240 – 320 hours)
2 Gibbon listening Posts	To record gibbon calls and record activity	8 listening posts	5.30am to 11.30am	4 hours per post day	32 hours

Method	Purpose	Number	Timing	Effort	Total effort
3 Camera traps	Camera traps set at different heights to record nocturnal activity and targeting both large and small mammal species	30 camera traps installed but only 29 successful	5 months (Jul-Dec)	29 nights	3,233 days

8.4.6.2 Survey Findings

A total of 59 mammal species were reported as being potentially present in the Project area (based on the desktop survey and available species records), with 44 species confirmed through the field surveys conducted. The majority were directly confirmed in the field with evidence from the field assessment (both direct observations and indirect evidence of activity obtained from identifying tracks, droppings and feeding sites, and the results of camera trapping).

Most of the mammal species identified were considered to have low populations in the area, with the exception of Pangolins and Chinese Serow. The low estimated population of almost all the important mammal species was based on the species encounter rate per effort expressed per number of days survey effort (transect walks, camera traps and Gibbon listening posts) and distance covered on foot (km) of the survey team. This was also supplemented by anecdotal accounts from local villagers interviewed during consultations. Per species of mammal: Gibbon (6 records, 0.04km/group), Douc (5 records, 0.02km/group), Sambar (6 records, 0.04km/animal), Great Hog Badger (2 records, 0.02km/animal), Pig-tailed Macaque (2 records, 0.01km/group) Otter (1 record), Spotted Linsang (1 record).

The several pieces of quantitative, semi-quantitative and qualitative sampling information gained from the survey work and interviews with community members is considered reasonable and adequate to provide an estimate of mammal population size. This is aligned with the approach to estimating biological populations based on sampling a reasonable representative selection of habitats and projecting this over the broader areas. Estimates of the size of biological populations have traditionally been derived from standardized methods such as distance sampling within representative habitats (Marsden et al., 2016⁷⁰; Carbone et al., 2001⁷¹; Kühl et al., 2008⁷²). Marsden et al. (2016) demonstrated the relationship between estimated population size/abundance and species encounter rate for bird species through sampling and the suitability of using encounter rate with a reasonable level of confidence such that species encounter rate can be used as a viable surrogate for estimating species abundance. Similarly, Carbone et al. (2001) earlier identified a similar relationship between density and rates of camera-trap capture for tigers, and despite its limitations, the method was welcomed by researchers as a useful tool for abundance estimation in various species, from large carnivores and

70 Marsden, S.J., Loqueth, E. Takuo, J.M., Hart, J.A., Abani, R., Ahon, D.B., Annorabah, N.N.D., Johnson, R. and Valley, S. 2016. Using encounter rates as surrogates for density estimates makes monitoring of heavily-traded grey parrots achievable across Africa. *Oryz*, 2016 (50 (4): pp 617-625. Doi:10.1017/S0030605315000484. Available online at: https://www.researchgate.net/publication/281777653_Using_encounter_rates_as_surrogates_for_density_estimates_makes_monitoring_of_heavily-traded_grey_parrots_achievable_across_Africa

71 Carbone, C., Christie, S., Conforti, K., Coulson, T., Franklin, N., Ginseberg, J.R., N., Ginsberg, J.R. et al., 2001. The use of photographic rates to estimate densities of tigers and other cryptic mammals. *Animal Conservation*, 4. 75-79. Available online at: https://www.researchgate.net/publication/231743535_The_use_of_photographic_rates_to_estimate_densities_of_tigers_and_others_cryptic_mammals

72 Kühl, H., Maisels, F., Ancrenaz, M. and Williamson, E.A., 2008. Best Practice Guidelines for Surveys and Monitoring of Great Ape Populations. Gland, Switzerland: IUCN SSC Primate Specialist Group (PSG). 32 pp. Available online at: http://apes.eva.mpg.de/eng/pdf/guidelines/Best_Practice_Surveys_Monitoring_Great_Apes_ENGLISH_march09.pdf

forest ungulates to ground-dwelling birds. According to Marsden et al. (2016), species encounter rates have long been used in conservation ecology but more recently have become less favorable often because of bias associated with variation in detectability across species and habitats, and the need for actual population estimates. There are of course several issues and factors producing noise in the relationship between population density and species encounter rate and ideally abundance estimates for species of conservation importance should derive from high-quality data collected during standardized surveys over long time periods, allowing for the accumulation of sufficient numbers of records to facilitate precise density estimation and should account for uncontrollable variables such as differences in detectability across sites and species, patchy distributions, variable abundance, cryptic habitats, species mobility, external threats, topographic variations, vegetation and altitudinal differences (Marsden et al., 2016). Hindering such efforts is the lack of the necessary expertise to design and execute the surveys, and analyse the resulting data, a lack of economic resources and logistical difficulties of surveying large and remote areas. An encounter rate method can still be a useful tool, in this case for assessing species abundance in situations where economic resources and/or distance sampling skills are lacking. Under-predicting density using the surrogate method is also not as great a problem in conservation compared to mistakenly predicting high density.

A number of

Table 8.24 and include several CR (4 species), EN (7 species) and VU (10 species

Table 8.24 also includes species reportedly occurring in the area based on information obtained from villagers (particularly local hunters who suggested that they had recently hunted the species), however their presence could not be confirmed with confidence through during the field survey work undertaken the expert opinion of the biodiversity team who completed the mammal survey and reviewed by Dr. Rob Timmins (Senior Biologist of WCS/Independent Researcher) who was consulted as an external expert. The full 'List External Experts for Consultations' is provided in Annexure 10 of the Biodiversity Assessment Report (Phiapalath et al., 2022) contained in **Appendix S.**

The species of conservation importance are primarily forest-dwelling species, associated with primary and secondary tropical and subtropical montane evergreen and semi-evergreen forests in broadleaf and mixed broadleaf-coniferous forest types (IUCN Red List: online at <https://www.iucnredlist.org/>). The exceptions in this case include the Chinese and Sunda Pangolin which occur in a wider range of habitats, including primary and secondary forests, broad-leaf and coniferous forests, shrub lands, grasslands and agricultural fields. Owston's Civet and Greater Hog Badger also typically utilize a variety of habitats and the Smooth-coated Otter requires a source of freshwater (rivers, streams, wetlands, etc.).

In Lao PDR, the Chinese Serow (*Capricornis milneedwardsii*, VU) is thought to be widely distributed in mountainous regions, although data on population size and trends is lacking. According to Thuc *et al.* (2014⁷³), the species typically inhabits hilly or rugged mountainous areas with steep slopes and rocky outcrops, preferring secondary forests to primary forest and is likely to tolerate moderately degraded forest habitat.

As a result of forest habitat fragmentation, land claims for animal ranching, subsistence hunting and other human pressures, the land mammal group is considered to be under considerable threat in Laos PDR, possibly significantly higher than the other faunal groups (Phiapalath *et al.*, 2022). There is however evidence to suggest that some of the larger mammal species that have disappeared from the surrounding region may still occur within the protected 'Sacred Forest' of Phou Kounking identified, where these species can take refuge away from human pressures due to local beliefs and superstitions preventing ordinary access to this forest habitat (Phiapalath *et al.*, 2022). Refer also to the findings of

⁷³ Thuc, P.D., Baxter, G., Smith, C. and Hieu, N. (2014). Population status of the Southwest China Serow *Capricornis milneedwardsii*: A case study in Cat Ba Archipelago, Vietnam. In Pacific Conservation Biology Vol 20 (4): 385-391. Available online for download at: https://www.researchgate.net/publication/265848893_Population_status_of_the_Southwest_China_Serow_Capricornis_milneedwardsii_A_case_study_in_Cat_Ba_Archipelago_Vietnam

the social survey for more information on the ‘Sacred Forest’ appearing in **Chapter 8** of the ESIA, specifically **section 9.5.8** ‘Impact on Cultural Heritage’).

Note that bat species (also mammals) have been discussed separately as a component of the volant (flying) species documented in **section 8.4.5**.

For the comprehensive list of mammal species recorded, the reader is referred to the baseline biodiversity assessment report contained in **Appendix S**.

Table 8.24: Mammals with Elevated Threat Status

Common Name	Scientific Name	IUCN Red List Status	Confirmed species (surveyed)	Credible accounts (villagers): medium confidence	Reported by villagers but presence unlikely: low confidence
Bengal Slow Loris	<i>Nycticebus bengalensis</i>	EN		X	
Pygmy Slow Loris	<i>Nycticebus pygmaeus</i>	EN		X	
Stump-tailed Macaque	<i>Macaca arctoides</i>	VU			X
Northern Pig-tailed Macaque	<i>Macaca leonina</i>	VU	X		
Northern Buff-cheeked gibbon	<i>Nomascus annamensis</i>	EN	X		
Silver langur	<i>Trachypithecus sp.</i>	EN		X	
Red-shanked Douc Langur	<i>Pygathrix nemaeus</i>	CR	X		
Annamite Striped Rabbit	<i>Negolagus timminsi</i>	EN		X	
Black Giant Squirrel	<i>Ratufa bicolor</i>	NT	X		
Chinese Pangolin	<i>Manis pentadactyla</i>	CR	X		
Sunda Pangolin	<i>Manis javanica</i>	CR	X		
Dhole	<i>Cuon alpinus</i>	EN			X
Binturong	<i>Arctictis Binturong</i>	VU		X	
Owston's Civet	<i>Chrotogale owstoni</i>	EN	X		
Smooth-coated Otter	<i>Lutrogale perspicillata</i>	VU	X		
Asiatic Black Bear	<i>Ursus thibetanus</i>	VU	X		
Sun Bear	<i>Ursus malayanus</i>	VU	X		
Greater Hog Badger	<i>Arctonyx collaris</i>	VU	X		
Chinese Serow	<i>Capricornis milneedwardsii</i>	VU	X		

Common Name	Scientific Name	IUCN Red List Status	Confirmed species (surveyed)	Credible accounts (villagers): <i>medium confidence</i>	Reported by villagers but presence unlikely: <i>low confidence</i>
Sambar Deer	<i>Cervus unicolor</i>	VU	X		
Chinese Goral	<i>Naemorhedus gresseus</i>	VU			X
Large-antlered muntjac	<i>Muntiacus vuquangensis</i>	CR		X	

Key to table:

CR = Critically Endangered; EN = Endangered; VU = Vulnerable; NT = Near Threatened

8.4.7 Herpetofauna

8.4.7.1 Methodology

Data collection was comprised of both field surveys and interviews with local villagers. Field surveys were conducted during both the day and night, with a focus on the wet season sampling when activity is considered highest. Daylight surveys were undertaken both in the morning, from 08:00 to 11:30, and the afternoon from 14:00 to 17:30 in the early evening. Attention was given to micro-habitats such as fallen logs, amongst leaf litter on the forest floor, trees, burrows, and tree hollows which in turn were situated around focal habitats such as waterbodies and wetlands. Nocturnal surveys utilised a direct encounter method and were conducted from 19:00 to 22:00. Unfamiliar species were captured for photographing, detailed identification, and DNA sampling.

8.4.7.2 Survey Findings

The numerous small streams in the Montane Forest habitats at altitudes exceeding 1000m amsl are likely to host some important and endemic herpetofauna species (i.e. amphibians and reptiles). A combined total of 71 species of herpetofauna (amphibians and reptiles) were recorded through field surveys conducted, of which 30 reptile species and 41 amphibian species were identified.

Several reptile species with elevated global threat status according to IUCN were recorded through the field surveys conducted, including:

- Red River Krait (*Bungarus slowinskii*, VU), a venomous species of snake endemic to mainland SE Asia (Laos and Vietnam);
- Impressed Tortoise (*Manouria impressa*, EN), a terrestrial forest-dwelling species and resident of SA Asia;
- Asiatic Softshell Turtle (*Amyda cartilaginea*, VU), a semi-aquatic species common to inland freshwater ecosystems;
- Chinese Softshell Turtle (*Pelodiscus sinensis*, VU), a semi-aquatic species common to inland freshwater ecosystems;
- Tiny Bubble-nest Frog (*Gracixalus supercornutus*, NT), a forest dwelling, semi-aquatic frog known from Lao PDR and Vietnam; and
- Firth's Litter Toad (*Leptobrachella firthi*, EN), a forest dwelling frog closely associated with small, shallow rocky streams within montane evergreen forest and particularly where riparian vegetation is absent.
- These are primarily forest-dwelling species, confined to secondary or primary evergreen forest in the mountainous regions of SE Asia, with several species (i.e. frogs and turtles) requiring freshwater

habitats either to survive or complete their life-cycles (IUCN Red List: online at <https://www.iucnredlist.org/>) (refer also to **Table 8.25**)

Local records were also documented for several additional EN and VU species of snake, tortoise and turtle, also listed in **Table 8.25**, although these species were not encountered during the field surveys undertaken. The full list of local records and least concern species recorded through field surveys and interactions with local villagers is contained in Annexure 3b of the 'Biodiversity Assessment Report' (**Appendix S**) and a review of species status revealed that none of these are endemic species to Laos PDR, with most species occurring also in neighbouring Viet Nam and Cambodia.

Herpetofauna are considered to be one of the least-known or documented groups of vertebrates in Lao PDR, with several species records considered previously unknown to science. Four species identified during field surveys (not appearing on the IUCN RDL) are also considered first records for Lao PDR (**Table 8.25**), 2 reptile species were second records of Laos and 2 species have not been described yet and could possibly be new to science, including *Rhacophorus sp.* and *Quasipaa sp.* (previously undiscovered potentially requiring further investigation⁷⁴), which could also be local endemic species potentially. In addition the individual of *Xenophrys cf maosonensis* is currently classified as species complex but it is likely that it will be split as a new species in the future.

Table 8.25: Herpetofauna with Elevated Threat Status, First Records for Lao PDR or Potential New Species to Science

Class	Common Name	Scientific Name	Evidence	IUCN Red List Status	Comments
REPTILES	Red River Krait	<i>Bungarus slowinskii</i>	Field observation	VU	Not endemic
	King cobra	<i>Ophiophagus hannah</i>	Local record	VU	Not endemic
	Black and White Spitting Cobra	<i>Naja siamensis</i>	Local record	VU	Not endemic
	Burmese Python	<i>Python bivittatus</i>	Local record	VU	Not endemic
	Elongated Tortoise	<i>Indotestudo elongata</i>	Local record	EN	Not endemic
	Impressed Tortoise	<i>Manouria impressa</i>	Field observation	EN	Not endemic
	Keeled Box Turtle	<i>Cuora mouhotii</i>	Local record	EN	Not endemic
	Asiatic Softshell Turtle	<i>Amyda cartilaginea</i>	Field observation	VU	Not endemic
	Chinese Softshell Turtle	<i>Pelodiscus sinensis</i>	Field observation	VU	Not endemic
	-	<i>Acanthosaura prasina</i>	Field observation	-	First record for Lao PDR
AMPHIBIANS	Tiny Bubble-nest Frog	<i>Gracixalus supercornutus</i>	Field observation	NT	Not endemic
	-	<i>Rhacophorus sp.</i>	Field observation	-	First record for Lao PDR &

74 There is considerable uncertainty at this stage for previously undescribed species potentially new to science, unless specimens are analyzed as candidate new species. *Rhacophorus sp.* is certainly undescribed species, and as for the *Xenophrys maosonensis*, this is a complex species and the one found will be split as a new species in the near future.

Class	Common Name	Scientific Name	Evidence	IUCN Red List Status	Comments
					possibly 'new species to science'
		<i>Xenophrys cf maosonensis</i>	Field observation	-	Not endemic. Species complex ⁷⁵
	-	<i>Quasipaa sp.</i>	Field observation	-	Not endemic, possibly 'new species to science'
	Spinyback Torrent Frog	<i>Amolops spinaepectoralis</i>	Field observation	LC	First record for Lao PDR, Not endemic
	-	<i>Limnonectes poilani</i>	Field observation	LC	
	Firth's Litter Toad	<i>Leptobrachella firthi</i>	Field observation	EN	
	Truong DSon Bug-eyed Frog	<i>Theioderma truongsone</i>	Field observation	LC	

Key to table:

EN = Endangered; VU = Vulnerable; NT = Near Threatened; DD = Data Deficient; LC = Least Concern

For a comprehensive list of herpetofauna (reptiles and amphibians) recorded, the reader is referred to the baseline biodiversity assessment report contained in **Appendix S**.

8.4.8 Ichthyofauna (fish)

8.4.8.1 Methodology

For fish species, existing databases and IBAT results were screened to determine the potential for conservation important fish species to occur within the study area. This was supplemented by fish surveys conducted on the small streams above SB1 and SB2 using a standard fish netting approach (catch and release).

8.4.8.2 Desktop Survey Findings

Fish species that are endemic to Lao PDR and/or with elevated conservation/threat status that were assessed at a desktop level in terms of their likelihood of occurrence in the area of study are listed below in

⁷⁵ The specimen found will likely be split as a new species in future.

Table 8.26. Based on the desktop assessment, only two endemic fish species of Least Concern are predicted to possibly occur in the study area, including *Schistura Imitator* and *Schistura Clatrata*.

Table 8.26: Endemic Fish Species Assessed at a Desktop Level

Common Name	Scientific Name	IUCN Red List Status	Likelihood of Occurrence	Comments
-	<i>Poropuntius bolovenensis</i>	EN	Unlikely	This species is an upland species found only on the Boloven Plateau, Paksong District, Champasak Province, southern Lao PDR. Consultations with a regional fish expert suggests that the Bolaven Plateau is unlikely to be hydrologically connected with the Dakchung Plateau and its surrounding area (M.Kottelat pers. comm., October 11, 2021).
	<i>Schistura bolavenensis</i>	EN	Unlikely	Same comment as above.
-	<i>Poropuntius lobocheiloides</i>	EN	Unlikely	Same comment as above.
-	<i>Poropuntius solitus</i>	EN	Unlikely	This species is only known from tributaries of the Xe Kong River on the eastern half of the Bolaven Plateau, Lao PDR. Consultations with a regional fish expert suggests that the Bolaven Plateau is unlikely to be hydrologically connected with the Dakchung Plateau and its surrounding area (M.Kottelat pers. comm., October 11, 2021).
-	<i>Poropuntius consternans</i>	EN	Unlikely	Same comment as above.
-	<i>Devario salmonatus</i>	DD	Unlikely	Same comment as above.
-	<i>Serpenticobitis octozona</i>	DD	Unlikely	This species is found in the Sekong drainage in Lao PDR. Consultation with a regional fish expert revealed that the most recent (and likely only) field survey of the area was briefly undertaken in 2011 (Kottelat, 2011). This species was not detected during surveys then. (M.Kottelat pers. comm., October 11, 2021). While endemic to the Sekong drainage, no other information reviewed suggests that suitable habitat does not occur across this species' range.

Common Name	Scientific Name	IUCN Red List Status	Likelihood of Occurrence	Comments
-	<i>Schistura imitator</i>	LC	Possible	This species has only been recorded from the Sekong basin, southern Lao PDR. Consultation with a regional fish expert revealed that the most recent (and likely only) field survey of the area was briefly undertaken in 2011 (Kottelat, 2011). This species was not detected during surveys then (M.Kottelat pers. comm., October 11, 2021). In accordance with the precautionary principle, as the EAAA for the Project comprises more than 10% of the species' range (c.15.8%), and limited surveys have been located within the Se Kong basin, it is possible that this species could occur.
-	<i>Schistura clatrata</i>	LC	Possible	Same comment as above.

Key to table:

EN = Endangered; DD = Data Deficient; LC = Least Concern

8.4.8.3 Field Survey Findings

Sampling of the small streams above SB1 and SB2 identified a total of 9 species of fish, most being species of least concern and common resident species. There were endemic fish recorded upstream of the project site and at high elevation belonging to the following genera: *Schistura*, *Annamia*, *Vamanenia* and *Poropuntius*. Given the location at high elevations above the project area and potential area of impact of the project, further analysis of fish species was considered not relevant to the project. This desktop information is reflected in Annexure 8 of the 'Biodiversity Assessment Report' (Phiapalath *et al.*, 2022) located in **Appendix S**.

8.4.9 Flora

8.4.9.1 Methodology

To carry out vegetation surveys within the classified forest habitats, 30 sample plots (10mx10m quadrats) measuring 100m² were identified, with six plots sampled per Survey Block (5 survey blocks in total). Additional smaller plots were surveyed for tree saplings (5x5m quadrats, 25m²), and for communities dominated by herbs and grasses, 2mx2m (4m²) quadrats were used. The average elevation of these plots was 1,312m above sea level; ranging from 1,029m above sea level to 1,615m. Plant species were identified and listed, with their frequency of occurrence and densities assessed and species grouped according to their respective family, number of seedlings recorded, and undergrowth vegetation described (e.g. moss, herbs, ferns, etc.). Where possible and necessary, samples of fruit/leaves were collected to aid in the identification of plants that could not be easily or readily identified in the field.

Some species that were found just adjacent to the relevant sample plots were also recorded to provide a comprehensive list of plants in the survey area. Non-tree species were counted to obtain a biodiversity baseline but excluded from the forest habitat analysis.

8.4.9.2 Survey Findings

Five survey blocks in total were sampled, with the vegetation communities and habitats encountered being primarily Wet Evergreen Forest at the lower altitude, with Montane Evergreen Forest occurring at higher altitudes (typically above 1000m amsl). Some of the forest communities were found to be degraded as a result of agricultural activities in the area.

Structurally, the forest communities were found to be relatively open, having little to no emergent layer in the sub-canopy, which was occupied instead by fallen trees, moss, rocks and lichens. Shrub layers were short and included younger trees, wild gingers and weeds. A relatively high tree density and canopy cover was encountered, with mean canopy height estimated to range from 14m to 35m from ground level and with a mean canopy cover of 85 - 90%. The forests sampled at lower elevations exhibited 3 layers of forest structure (canopy, understorey and shrub layer), with the higher elevation forests missing the emergent understorey layer)

A total of 626 plants, representing 538 species from 178 families were recorded, of which some 250 tree species belong to 58 families.. The Rubiaceae, Lauraceae and Fagaceae, Annonaceae and Fabaceae were the dominant tree families sampled within the forest habitats, with 83 species recorded in total within the forest habitats sampled.

Two globally threatened species of flora were recorded, including:

- *Zingiber mellis* (EN), a rhizomatous herb common to higher-altitude, broad-leaved moist montane evergreen forest; and
- Soum dok-noi (*Pittosporum pauciflorum*, VU), a small tree / shrub species confined to areas of mixed montane forest (IUCN Red List: online at <https://www.iucnredlist.org/>).

In addition, the following 3 Near-Threatened (NT) species were recorded in the area:

- Phaya mai (*Nageia fleuryi*), a tree (conifer);
- Peak habai (*Pinus dalatensis* var. *bidoupensis*), a sub-montane and montane pine tree, endemic to Indonesia and China (IUCN Red List: online at <https://www.iucnredlist.org/>); and
- Kor langbian (*Quercus langbianensis*), an uncommon oak tree species.

Globally, these tree species have a relatively large distribution and are not yet considered as globally threatened species. That being said, despite limited information on population trends for these species, their respective habitats are under threat from agricultural activities, logging and wood harvesting activities which could potentially shift their threat status to VU in the future (IUCN Red List: online at <https://www.iucnredlist.org/>).

Findings of the flora survey are also considered significant to the scientific community, since 10 plant species were listed as rare or possibly new species to science and 29 first recoded plant records of Lao PDR.

Table 8.27: Plants with Elevated Threat Status

Family	Common Name	Scientific Name	IUCN Red List Status	Survey Block (1-5)
Podocarpaceae	Phaya mai	<i>Nageia fleuryi</i>	NT	2, 5
Pinaceae	Peak habai / Dalat pine	<i>Pinus dalatensis</i> var. <i>bidoupensis</i>	NT	2
Pittosporaceae	Soum dok-noi	<i>Pittosporum pauciflorum</i>	VU	4, 5
Fabaceae	Kor langbian)	<i>Quercus langbianensis</i>	NT	4

Family	Common Name	Scientific Name	IUCN Red List Status	Survey Block (1-5)
Zingiberaceae	-	<i>Zingiber mellis</i>	EN	3

Key to table:

EN = Endangered; VU = Vulnerable; NT = Near Threatened

For a comprehensive list of flora recorded, the reader is referred to the baseline biodiversity assessment report contained in **Appendix S**

8.4.10 Summary of the Critical Habitat Assessment

8.4.10.1 Introduction

A Critical Habitat Assessment (“CHA”) was completed for the Project, in support of the Project’s alignment with the applicable international standards, which include the Asian Development Bank’s Safeguards Policy Statement (“ADB SPS”). The complete CHA is contained in **Appendix T** of the ESIA.

8.4.10.2 Critical Natural and Modified Habitats

The ADB SPS differentiates between three categories of land and water areas based on habitat condition and biodiversity value:

- **Natural habitat:** includes areas where the biological communities are formed largely by native flora and fauna, and where human activity has not essentially modified the area’s primary ecological functions (ADB SPS, 2009);
- **Modified habitat:** where the natural habitat has apparently been altered, often through the introduction of alien species of plants and animals (ADB SPS, 2009) and includes areas that may still contain a large proportion of native flora and fauna, and/or where human activity has substantially modified an area’s primary ecological functions and species composition (IFC PS6, 2019); and
- **Critical habitat:** is considered a subset of natural and modified habitat (identified irrespective of the condition of these areas) and encompasses areas with high biodiversity value associated with the presence of significant types of biodiversity (ADB SPS, 2009).

8.4.10.3 Assessment Approach

The approach to the CHA was as follows:

- EAAAs (Ecologically Appropriate Assessment Areas) were identified and delineated for volant (flying) species, and non-volant (non-flying) species, respectively, to determine the spatial extent and scope of the CHA;
- Modified and natural habitats were identified / differentiated and mapped;
- A desk-based review of available information on the biodiversity features within the EAAA was undertaken to inform the CHA;
- The key findings of the baseline biodiversity surveys for fauna and flora were reviewed, with a key focus on species of conservation importance such as globally/nationally threatened plants and animals recorded, with consultation with specialist to verify results;
- Biodiversity features identified as present or likely to occur within the volant and non-volant EAAAs were screened against the six qualifying criteria for ‘critical habitat’ provided in the ADB SPS and the ADB Environment Safeguards, ‘A Good Practice Sourcebook’ (aligned also with IFC PS6), including:
 - **Criterion 1 - Habitat required for the survival of critically endangered or endangered species,**

- **Criterion 2** - Areas with special significance for endemic or restricted-range species,
- **Criterion 3** - Sites that are critical for the survival of migratory species,
- **Criterion 4** - Areas supporting globally significant concentrations or numbers of individuals of congregatory species,
- **Criterion 5** - Areas with unique assemblages of species that are associated with key evolutionary processes or provide key ecosystem services,
- **Criterion 6** - Areas with biodiversity that has significant social, cultural or economic importance to local communities, and
- In addition, legally protected or officially proposed areas for protection.

8.4.10.4 Findings of the CHA

The Project area has been described to be located in a mosaic of evergreen forest, shifting cultivation, shrub land and grassland, waterbodies, and built-up areas. In several areas, there has been extensive modification for agriculture and clearance of forests by local communities predominantly. The EAAAs assessed therefore contain both natural and modified habitat in terms of the ADB SPS definitions for these types:

- areas of natural habitat are concentrated in the northern and eastern sections and represent approximately 41% (109,665 ha) of the EAAA for non-volant species and 36% (86,753 ha) of the EAAA for volant species; and
- modified habitat (59-64% of EAAAs) is mostly found in the central and southern sections of the EAAAs, comprising primarily agricultural areas (currently or historically cultivated lands) that have been cleared and transformed through human activity and associated disturbance of the native vegetation and soils.

The EAAAs for volant and non-volant species associated with the Project both qualify as critical habitat in terms of criteria 1, 2 and 5, as key habitats were identified as supporting populations of CR/EN species, endemics and/or restricted-range species, and were also considered important in providing key ecosystem services. In addition, two Protected Areas (PAs) and five Key Biodiversity Areas (KBAs) overlap with the EAAAs and also qualify the EAAAs as critical habitat in terms of the ADB SPS (2009). This has been summarised below in Table 8.28.

The two natural forest types, Montane Forest and Wet Evergreen Forest, are considered the most important ecosystems in the EAAAs in terms of providing key ecosystem services, and equally the most important habitats for supporting CR/EN species, endemics and restricted-range species.

Table 8.28: Summary of the Critical Habitat Assessment Findings

ADB SPS qualifying criteria for Critical habitat	Qualifies as Critical habitat?	Relevant Habitat Types	Rationale
Criterion 1: Habitat required for the survival of critically endangered or endangered species.	Yes: volant and non-volant EAAAs	<ul style="list-style-type: none"> ■ Natural / Modified Montane Forest ■ Natural / Modified Wet Evergreen Forest 	<ul style="list-style-type: none"> ■ 11 fauna (mammals, reptiles, amphibians and birds) represented with CR or EN threat status⁷⁶. ■ 1 species of EN plant. ■ For modified forest habitats, fewer species are likely

⁷⁶ Ten mammals, two reptile and one bird species

ADB SPS qualifying criteria for Critical habitat	Qualifies as Critical habitat?	Relevant Habitat Types	Rationale
			represented than for natural areas but still some CR or EN species may utilise these habitats.
Criterion 2: Areas with special significance for endemic or restricted-range species.	Yes: volant and non-volant EAAAs	<ul style="list-style-type: none"> ■ Natural / Modified Montane Forest ■ Natural / Modified Wet Evergreen Forest 	<ul style="list-style-type: none"> ■ Two mammal, two bird and one reptile species are also endemic and/or -restricted-range. ■ 2 species of endemic and restricted-range fish may possibly occur in the EAAAs. ■ There are three species of amphibians and 10 species of plants that were recorded during field surveys that may potentially be 'new to science'. These species could be local endemics and/or restricted-range. Fewer species are likely to be represented in modified habitats than for natural areas but still some endemic and/or restricted-range species may utilise these habitats.
Criterion 3: Sites that are critical for the survival of migratory species.	No	n/a	
Criterion 4: Areas supporting globally significant concentrations or numbers of individuals of congregatory species.	No	n/a	<ul style="list-style-type: none"> ■ The requirements / thresholds for these criteria have not been met in terms of the species identified.
Criterion 5: Areas with unique assemblages of species that are associated with key evolutionary processes or provide key ecosystem services.	Yes: volant and non-volant EAAAs	<ul style="list-style-type: none"> ■ Natural / Modified Montane Forest ■ Natural / Modified Wet Evergreen Forest 	<ul style="list-style-type: none"> ■ The broader landscape contains a number of KBAs specifically designated for endemic species, which overlap with or are located within the EAAAs. ■ There are also three species of amphibians and 10 species of plants that were recorded during field surveys that may potentially be 'new to science'. ■ Given the potential for the forest ecosystems to provide key ecosystem services at both a local/regional and global scale, which are also considered 'Priority ecosystem services' as per the definition provided in IFC PS6 for this criterion, the forest ecosystems are

ADB SPS qualifying criteria for Critical habitat	Qualifies as Critical habitat?	Relevant Habitat Types	Rationale
			considered to qualify the EAAAs as critical habitat.
Criterion 6: Areas with biodiversity that has significant social, cultural or economic importance to local communities.	No	n/a	<ul style="list-style-type: none"> ■ 'Sacred forest' areas appear to be associated principally with existing cemeteries, rather than the forest and biodiversity that just happen to be where these sites are located. Therefore, strictly speaking the associated forest does not qualify either EAAA as critical habitat in terms criterion 6.
Additional: legally protected areas or areas officially proposed for protection (such as areas that meet the criteria of the World Conservation Union classification, the Ramsar List of Wetlands of International Importance, and the United Nations Educational, Scientific, and Cultural Organization's world natural heritage sites).	Yes: volent and non-volent EAAAs	<ul style="list-style-type: none"> ■ Natural / Modified Montane Forest ■ Natural / Modified Wet Evergreen Forest 	<ul style="list-style-type: none"> ■ Song Thanh Nature Reserve and the proposed Phou Ahyon protected area qualify the EAAAs as critical habitat. As such, despite lack of clarity in the ADB SPS, paragraph 30 (see below) does apply. <p>(i) Act in a manner consistent with defined protected area management plans. (ii) Consult protected area sponsors and managers, local communities, and other key stakeholders on the proposed project. (iii) Implement additional programs, as appropriate, to promote and enhance the conservation aims of the protected area.</p>

8.4.10.5 Implications of the CHA for the Project

Requirements in terms of natural habitat identified

There are a number of Project components that overlap with terrestrial and aquatic areas that are designated as 'natural habitat' and in these instances, the ADB SPS requires that the Project does not significantly convert or degrade areas of natural habitat, and mitigation measures are designed to achieve at least an overall no net loss of biodiversity.

Requirements in terms of critical habitat identified

Both the volent and non-volent EAAAs assessed qualify as comprising critical habitat, based on several of the ADB SPS critical habitat-qualifying criteria (as per Table 8.28).

Where impacts do occur to identified 'critical habitats', the Project is required to fully exercise the mitigation hierarchy, and demonstrate an overall net gain of critical habitat-qualifying biodiversity

associated with Project site. This is aligned with ADB SPS, paragraph 28 – “No project activity will be implemented in areas of critical habitat unless the following requirements are met:

- i *There are no measurable adverse impacts, or likelihood of such, on the critical habitat which could impair its high biodiversity value or the ability to function.*
- ii *The project is not anticipated to lead to a reduction in the population of any recognized endangered or critically endangered species or a loss in area of the habitat concerned such that the persistence of a viable and representative host ecosystem be compromised.*
- iii *Any lesser impacts are mitigated in accordance with para. 27', whereby mitigation measures will be designed to achieve at least no net loss of biodiversity.”*

Requirements in terms of legally protected areas

Legally protected areas or areas officially proposed for protection are also to be considered as critical habitats in terms of the ADB SPS. Phou Ahyon is a proposed protected area and will be crossed by the transmission line. As such, despite lack of clarity under ADB SPS Safeguard 1, paragraph 30 does apply. *The borrower/client will meet the following requirements:*

- i. *Act in a manner consistent with defined protected area management plans.*
- ii. *Consult protected area sponsors and managers, local communities, and other key stakeholders on the proposed project.*
- iii. *Implement additional programs, as appropriate, to promote and enhance the conservation aims of the protected*

Furthermore, IFC PS6 GN6 (IFC, 2019) requires that UNESCO Natural and Mixed World Heritage Sites and sites that fit the designation criteria of the Alliance for Zero Extinction (AZE) be identified during the CHA and brought to the attention of the IFC as early in the financing process as possible. The 500 KV transmission line to the north-east is planned through a portion (2.5 km) of the Phou Ahyon KBA which has also been designated an AZE site, for the conservation of the globally Endangered ‘trigger species’, *Leptobrachium xanthops* (Yellow-eyed Spadefoot Toad). What AZE refer to as ‘targeted protection’ is relevant to this species, by focusing on its specific known threats (according to IUCN habitat loss due to slash and burn agriculture and logging in this case) and ensuring project mitigation is aligned as far as possible with reducing or eliminating the risk posed by the project to the trigger species. The requirement for species-specific mitigation is therefore highlighted for the Project. It has been shown that avoidance of impacts to this species and its preferred habitat is possible through avoiding direct impacts to a stream identified within the AZE which the transmission line will cross, by planning the placement of transmission towers at least 50 m either side of the stream channel to avoid direct impacts to aquatic habitat potentially supporting this important amphibian species.

8.4.11 Assumptions, Limitations and Data/Information Gaps

General:

- The baseline biodiversity assessment and reporting deals exclusively with a defined area and the extent and nature of terrestrial and freshwater habitats and ecosystems in that area, with surveys undertaken over a specific period of time. The assessment findings are thus only applicable to those areas and period sampled, which were extrapolated where necessary and possible to the rest of the study area.
- Not all habitats or ecosystems in the study area could be sampled due to the large area of study. Instead, a representative sample of the various habitats and ecosystems was obtained through focused field sampling of priority areas (i.e. perceived higher quality/more important habitats and/or those nearest to the planned infrastructure and access routes where more significant impacts are likely to occur).

- Seasonal variations in habitat, vegetation and fauna are reflected in the sampling. Seasonality can influence the species encountered at the site, with the flowering time of many plant species for example often posing a challenge in species identification. The field survey was undertaken during the growing season (wet season) and is considered most suitable for the sampling habitat, identification of plants species and sampling of fauna.
- Field assessments were limited to day-time assessments for health & safety reasons covered under ERM's health and safety policy, with the exception of nocturnal surveys of bats.
- In some areas, topographical constraints and impenetrable vegetation cover limited access by field workers, and in these cases the survey team attempted to find alternative access routes and ways to sample the habitat as far as practically possible.
- The classification of habitats outside of focal areas for field assessment was based on remote sensing using available satellite imagery and extrapolation of data collected in the field for habitats considered to be structurally similar.
- The potential occurrence of threatened flora/fauna species identified through IBAT was informed by the presence and condition of ideal habitat for each faunal species and known or modelled species geographical range/distribution. The habitat condition / integrity was used as a surrogate indicator of the likelihood of a particular species being present where field sampling did not verify the presence of species through direct/indirect observations.
- Information on the global conservation/threat status of species plants species was informed by the IUCN online database of threatened species (accessed in 2022), which was assumed to be up to date and accurate at the time of compiling this report. Any subsequent changes to global species threat status made after the compilation of the report are not covered.
- Every effort was made to accurately identify plant and animal species but where identification to species level could not be determined, such species may have only been identified to genus level.
- While disturbance and transformation of habitats can lead to shifts in the type and extent of ecosystems, it is important to note that the current extent and classification is reported on here at the time of the assessment.
- With ecology being dynamic and complex, there is the likelihood that some aspects may have been overlooked, however the baseline assessment has sought to cover dynamic (such as seasonal shifts) and complex processes as far as possible within the limited timeframe of the assessment.
- Desktop information was limited to publicly available information (e.g. IBAT, ecoregions, Protected Areas, KBAs, etc.) at the time of undertaking the baseline assessment.

Non-volant fauna surveys:

- Low coverage for non-volant fauna surveys: The focal survey area for non-volant fauna was identified in the defined high priority areas of biodiversity (high conservation value) of the project, which was informed by preliminary critical habitat screening undertaken in 2020 and supported by information gained through villager interviews which helped to identify target areas where threatened species are more likely to occur. Each survey block had a size of 16km². The survey (which included interviews with villagers) was designed to cover the whole priority area as to confirm where presence or absence of the target species. Different habitats of interest for the specific survey, based on the information given from the villagers and GIS analyses, were identified. The survey was conducted for 3-4 days per survey block for each field campaign (wet season and dry season) and with a survey effort totalling 595 man-days for both wet and dry season (or 119 man-days per survey block), the local ecologists considered the survey to adequately cover the study area (Phiapalath *et al.*, 2022). Overall, populations of the globally threatened mammal species in the survey area were also found to be generally low, with little reason to extend surveys over a much broader area on this basis, as the habitats are all relatively similar to those sampled. While additional pre-construction surveys

have been recommended in some instances to improve confidence for areas of least-impacted forest and primary (older growth) forest patches in particular (see also recommendations in the Biodiversity Action Plan), the baseline survey conducted is considered to provide an adequate representation of the non-volant species composition and population estimates that are adequate to support the assessment of project impacts and risks.

Bird surveys:

- Monthly VP surveys covered peaks in migrations, with the exception of the April 2021 survey which could not be completed due to Covid-19 lockdown restrictions in place at this time which prevented fieldwork at this time. However, the overall result / findings of the VP surveys are not affected by this, since the surveys still lasted a total of ten months and covered the migratory peaks. The migration season in Southeast Asia generally begins in late September through to November, with a peak in October. Local bird experts have also indicated that in Laos, migration extends through to December.
- Data were collected using standard protocols, which were based on internationally-recognised Scottish Natural Heritage (now NatureScot) guidance. Due to the large size of the wind farm and the evolving design changes, a sampling approach was taken that considered a representative sample of the project area using a maximum of 14 Vantage Points (VPs). VP surveys are estimated to cover at least 75 of the 133 turbines planned, which is >56% of turbines. Although the locations of turbines may have changed over the course of the surveys in response to project alternatives and relocation of turbines for various reasons, the findings of the VP survey are habitat based and, given the similarity of results from all the VPs, it is reasonable to extrapolate these findings to turbines in similar habitat. The approach followed identified the area of original turbine locations and split these into discrete arrays, with VPs chosen to survey representative habitat of that array. Each array was treated as a separate wind farm, and the bird occupancy rate fed into the Band model taking into account the total array area. As different arrays contained different proportions of the two turbine types, this was also captured in the model. Cumulative risk of all arrays (excluding those VP's monitoring transmission line flights where the risk cannot be modelled) was then added together to understand the overall impact the Monsoon wind farm would have, taking into account the different occupancy rates associated with the variation in habitats and the rotor swept area derived from the different mix of turbines in each array. On this basis it would be unnecessary to undertake further adjustment of the CRM. In all cases aerial density was found to be extremely low (at all arrays), and this reflects the findings that there is little or no evidence of significant migratory movement through the concession area, nor a large population of species such as raptors or other soaring birds likely to interact with the turbines.
- There are some gaps in the temporal coverage of VP surveys, as some of the identified VPs were easier to access (and thus allowed a survey during the 06:00 to 7:00 and 17:00 to 18:00 period) whilst others required an approach by foot for over 5 km. It is neither possible to start surveying these VPs at 6AM nor continue to survey them till 6PM due to safety concerns in terms of covering the difficult terrain during periods of poor visibility (dark). This gap is inherently challenging to address without teams over-nighting within the forest, which is also not possible with ERM's internal H&S policy procedures.

8.5 Social Baseline

8.5.1 Introduction

This section presents a description of the socio-economic characteristics of the Project Area of Influence (Aol), and where available utilizes national and regional level data for providing a more cogent understanding of the context. This social baseline analysis is based on:

- Social baseline provided in the local EIA (2022);
- Primary data collected by conducting a systematic socio-economic household survey, key informant interviews targeting the Aol, to supplement the available surveys and studies; and
- Secondary data collated from published literature as well as national and regional data sources.

Focus group discussions (FGDs) and key informant interviews (KIIs) were chosen as the qualitative data collection methodology to:

- Provide detailed information rapidly;
- Provide information on the many non-measurable issues (for example, access to natural resources or the structure of social institutions); and
- Ensure a more inclusive, participatory approach than what would have been possible with individual questionnaires.

However, due to the Covid-19 pandemic, government restrictions were imposed on the districts where the Project is located, for the majority of the duration in the second half of 2021. As such, the Project was not able to undertake FGDs. The local villagers were also hesitant to engage in group activities due to the risk of spreading Covid-19.

The Project team was apprehensive of potential risks associated with the undertaking of the social baseline plan, therefore a modification to the plan was implemented with an aim to fill the gaps while respecting the needs to have a Covid-19-safe field operation during the pandemic.

The modification of the social baseline plan consisted of:

- KIIs with village leaders, teachers, healthcare workers, religious leaders, and others; and
- FGDs (in the KII format) with representatives of women groups, youth groups, livelihood groups, ethnic minority groups.

8.5.2 National Socio-economic Overview

This section presents national-level overview of demographics, institutional context, and the economy of Laos.

An overview of the national socio-economic conditions provides a context for the socio-economic conditions and characteristics of the Project-affected population to be understood more thoroughly, which in turn, provides a strong basis for the potential socio-economic impacts on the Project-affected population to be assessed, particularly in the area of vulnerability to change.

8.5.2.1 Demographic Information

8.5.2.1.1 The Lao PDR population

Lao PDR is a land-locked country in mainland Southeast Asia bordering Myanmar, Cambodia, China, Thailand, and Vietnam, with a total area of approximately 237,000 km². The landscape is mostly mountainous (80%) with some plains and plateaus (20%) found mostly among the Mekong river

plains.⁷⁷ The country has 7.2 million people live in 18 provinces in 2020, with an estimated annual growth rate of 1.5%.⁷⁸ The male and female population of Lao PDR are 3.65 million and 3.62 million respectively, with a corresponding share of 50.2% and 49.8%. The country has a total of approximately 1.3 million households with average household size of 5.3 people per family and population density of 31 people per km².

8.5.2.1.2 Ethnicity and Religion

The country is one of the most ethnically diverse countries in mainland Southeast Asia. The Lao government currently recognises 160 ethnic subgroups within 50 ethnic groups.⁷⁹ Out of the total population, the Lao ethnic group accounted for 53 percent, followed by Khamu (11%), Hmong (9%) and other ethnic groups (27%).

Laos is official language and over 80 languages used by different ethnicities in Lao PDR and the most common are Khmu and Hmong languages. Other minority languages include Akha, Arem, Bana, Katu, Ksingmul, Maleng, Lamet, Phai, Tai Daeng, Phu Thai, and Tai Dam.

The most vulnerable ethnic minorities have very few assets, are geographically isolated (mostly highlands), and face language and cultural barriers.

Buddhism is the pre-dominant faith practiced by the population in Lao PDR. Sixty-five percent of the population are Buddhist, while Christians constituted nearly 2%, and 32% reported themselves as having no religion or being animist.⁸⁰

8.5.2.1.3 In-migration and out-migration

A significant portion of the population (35%) still resides in rural areas and work in an agriculture sector dominated by subsistence farming; however, the pace of urbanization (population growth in urban areas) is relatively fast at a rate of at 3.1% per annum in 2015, the highest urbanization rate in the Asia Pacific region.⁸¹

In addition, there is a strong in-migration trend in Lao PDR, where one in ten residents moved into an area from another province.⁸² In the last thirty years, rural to urban migration seems to be a recent phenomenon resulted from networks constructed around the country.⁸³

According to United Nations data, there are 1.3 million Lao nationals living abroad, with Thailand the largest destination country (approximately 300,000). Lao migrant workers are predominantly employed in domestic work, construction, manufacturing, agriculture, seafood processing and entertainment work, mainly in neighbouring border provinces and larger cities in Thailand. Financial remittances from these workers are a significant source of income in the Lao People's Democratic Republic, totalling an estimated USD 265 million in 2020.⁸⁴ It is within the context of this cross-border movement that the migrating population is at the risk of being trafficked for forced labour, sexual exploitation, and child labour.⁸⁵

⁷⁷ Land-Links, 2013

⁷⁸ Lao Statistic Bureau, 2020a

⁷⁹ IWGIA, 2021

⁸⁰ IFAD, 2012

⁸¹ UN-Habitat & ESCAP, 2015, p. 23

⁸² Lao Statistics Bureau, 2016, p. 56

⁸³ Bouté, 2017, as cited in UCRSEA, 2017

⁸⁴ ILO, 2021

⁸⁵ US Department of State, 2021

8.5.2.1.4 Poverty, inequality and human development index

Lao PDR is classified as a low and middle income country (LMIC) and a least develop country (LDC) by the United Nation. LDCs are low-income countries confronting severe structural impediments to sustainable development. They are highly vulnerable to economic and environmental shocks and have low levels of human assets.⁸⁶

Lao's Gross Domestic Product (GDP) per capita is USD 1,789, with GDP growth rate at 7.2 percent on average over the last 20 years.

The poverty rate of Lao PDR has declined from 24.6% in 2012/2013 to 18.3% in 2018/2019 (Lao Statistics Bureau, 2020b); however, the poverty rate in Lao PDR is now expected to increase to 21.5% due to the impact of Covid-19 (Government of the Lao PDR, 2021). Although the poverty rate has been rapidly reduced in rural areas (while urban poverty reduction has stagnated), the gap in poverty rate between rural (23.8%) and urban (7.0%) poverty rates remain – rural poverty rate is 3.4 times higher than that of urban areas as reflected in increased Gini⁸⁷ index from 0.31 in 1992/93 to 0.39 in 2018.⁸⁸⁸⁹

In 2019, Lao PDR's Human Development Index (HDI)⁹⁰ was 0.61, ranking 137th out of 189 countries indicating a medium human development progress. The Lao PDR HDI comes with a Gender Inequality Index (GII)⁹¹ of 0.46, raking 113th out of 162 countries suggesting a relatively low inequalities between women and men, and the Multidimensional Poverty Index (MPI)⁹², which is the share of the population that is multidimensional poor, adjusted by the intensity of the deprivations, is 0.11.⁹³

In 2021, the new prime minister announced seven priorities, vowing to tackle public debt and revenue leakages, boost exports, counter corruption and create more job opportunities. The government has also pledged to foster quality growth and reduce reliance on the natural resource sector, to increase access to basic public services, especially health and education, and to place more emphasis on human resource development.

A brief country overview of Lao PDR is presented in **Figure 8.30**.

⁸⁶ UN Department of Economic and Social Affairs, n.d.

⁸⁷ The Gini Index is a summary measure of income inequality. The Gini coefficient ranges from 0, indicating perfect equality (where everyone receives an equal share), to 1, perfect inequality (where only one recipient or group of recipients receives all the income). Thus, values indicating greater inequality.

⁸⁸ Lao Statistics Bureau, 2020b

⁸⁹ The World Bank, n.d.

⁹⁰ The HDI is a summary measure for assessing long-term progress in three basic dimensions of human development: a long and healthy life, access to knowledge and a decent standard of living.

⁹¹ GII reflects gender-based inequalities in three dimensions – reproductive health, empowerment, and economic activities

⁹² MPI identifies multiple overlapping deprivations suffered by individuals in 3 dimensions: health, education and standard of living.

⁹³ UNDP, 2020a

Figure 8.30: Lao PDR Country Brief Overview



8.5.2.2 Institutional Context

Lao PDR's system of governance has four levels: national, provincial, district and village with provincial, district, and village levels classified under local governance. The institutional context is summarised below:

- **The National Assembly:** is the supreme organ of the state and the only body with constitutional and legislative power to draw up, adopt, and amend the constitution and to make and amend laws, to legislate and implement state plans and budgets, and overseeing the activities of the executive and the judiciary bodies. Each National Assembly has a term of five years. Elections for the new National Assembly must be completed no later than 60 days before the old National Assembly expires.
- **The President:** The President is the Head of State of the Lao PDR and represents the Lao people of all ethnic groups both domestically and internationally. The President is elected by the National Assembly by a two-thirds majority vote of the members present. The term of office of the President is the same as that of the National Assembly. The main function of the President is to maintain the regular and coordinated operation and stability of the national government, safeguard the independence and territorial integrity of the country.
- **The Government:** The government is the executive body of the National Assembly and the highest body of state administration of Lao PDR. It oversees performance of state functions in all areas: political, economic, cultural, social, national defense, security and foreign affairs.
- **Local government:** The Lao PDR divides local government into three levels: provincial, district and village. Each level includes: provinces and cities; districts and municipalities; villages. Each level has the governing bodies: Provincial governor, district heads and village heads, and mayor for municipality.
- **Courts and the Public Prosecutor's Office**
 - **People's Court:** The People's Court is a state judicial body that has the power to protect and enhance the effects of the revolution, political system, economy, culture and society; Punish and educate violators of the law, educate citizens to respect the rules and regulations.

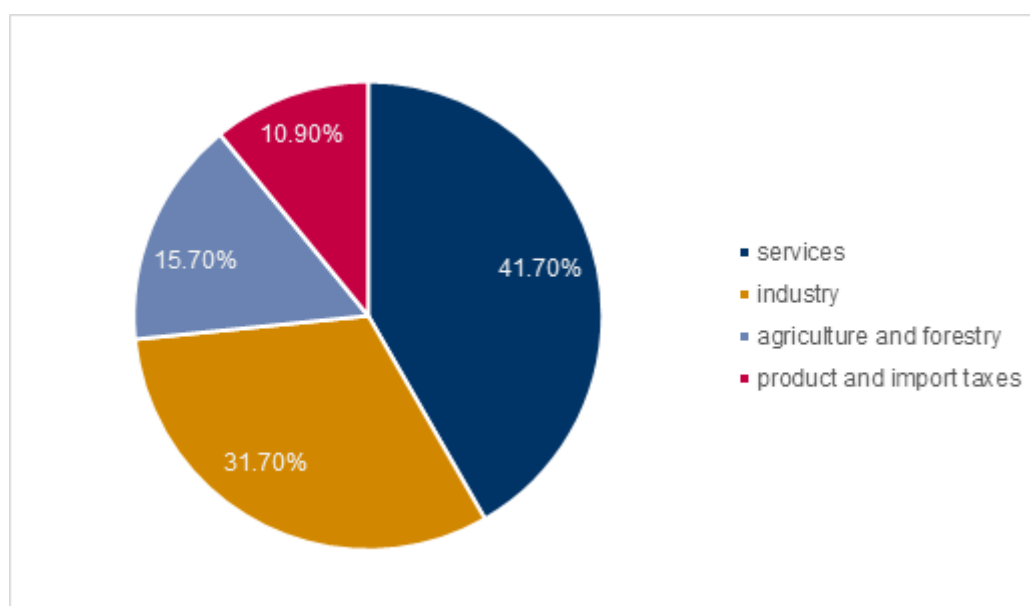
- The court system of the People's Courts of the Lao People's Democratic Republic consists of: The People's Supreme Court; Court of Appeal; Provincial, city people's courts; District People's Court and Military Court.
- **Public Prosecutor's Office:** The People's Procuratorate is the body that monitors the implementation of the law, which consists of: the Supreme People's Procuratorate; Appellate Public Prosecutor's Office; Provincial and city Public Prosecutor's Office; District Public Prosecutor's Office and Military Prosecutor's Office.⁹⁴

8.5.2.3 Economy and Industry

Lao PDR is one of the fastest growing economies in the region, with an average growth rate of 7.5% between 2010 and 2017. Its GDP is driven by energy (hydroelectricity) and mining, timber and non-timber forest products (NTFPs), followed by services and agriculture. Its manufacturing sector has also been steadily growing. The breakdown of the sectoral origins of Lao PDR GDP in 2018 was 41.7% services, 31.7 % industry (including construction and mining), 15.7 % agriculture, forestry, and fishing, and 10.9% product and import taxes.

With a total population of 7.2 million, Lao PDR's population growth is moderate at 1.45 % annually. The majority of the workforce is concentrated in the agricultural sector and lives in rural areas. The agricultural sector is low-tech, labour intensive and has low productivity, i.e. it does not contribute much to GDP growth.⁹⁵

Figure 8.31: Lao PDR's Main GDP Contributor



Source: Ministry of Planning and Investment, 2020. Socio-economic Development Annual Report 2018-2019.

In 2020, like many countries around the world, Lao PDR's economies were impacted by Covid-19 outbreak and its containment measures. Economic growth declined to an estimated 0.4% in 2020, the lowest level in three decades, and a second wave of the pandemic in 2021 has led to a growth rate of just 2.2% forecast for 2021.⁹⁶ The agriculture and industry sectors are expected to drive growth, supported by solid external demand as key trading partners recover. However, the services sector –

⁹⁴ Government of the Lao PDR, 2003 & 2014; OCSC, n.d.

⁹⁵ WB Lao Economic Monitor, April 20

⁹⁶ The World Bank, n.d.b

especially hospitality, transport and other tourism-related services – are struggling to recover as the second Covid-19 wave (since mid-April, 2021) has reversed the initial recovery in Q1 2021.⁹⁷

8.5.2.4 Renewable Energy Planning and Development

8.5.2.4.1 Current Status of Power Generation

Lao PDR has capitalized on its estimated 26,000 MW of technical hydropower potential and aims to become the Battery of Southeast Asia by exporting electricity to neighbouring markets. A large investment program increased the installed capacity in the system from only 640 MW in 2000 to around 9,480 MW by 2020. The Mekong Infrastructure Tracker shows that most power generation is supplied from 63 hydropower dams totalling 7,559 MW in generation capacity. The remaining power is produced by the Hongsa coal plant (1,878 MW), a few biomass plants (35 MW), and eight solar projects (42 MW).⁹⁸

Although approximately 70% of Lao PDR's generation capacity has been dedicated for export, domestic demand has been growing rapidly. Lao PDR's per capita electricity consumption is among the lowest in Association of Southeast Asian Nations (ASEAN) but is rising rapidly at an average rate of 14.5% annually over the past 10 years. By 2019, 100% of households nationally had access to electricity.⁹⁹

8.5.2.4.2 Lao PDR Renewable Energy Planning and Development

The Renewable Energy Development Strategy in Lao PDR of 2011 aims to encourage the development of renewable energy sources at a national level. The Strategy gives:

- an overview of renewable energy and its potential in the country;
- lays out strategy and policy; and
- presents possible implementation measures for renewable energy deployment

The national energy target laid out in the strategy aims to achieve a renewable energy share of:

- 30% in total energy consumption by 2025.
- 10% in total transport energy consumption (using biofuels) by 2025.

Key objectives of the policy are encouraging domestic and foreign investment in renewable energy at the local (village) level to enable a better electricity supply, create socio-economic benefits and sustain an environmentally and socially sustainable development.

Policy priorities are focussed on small power development for self-sufficiency and grid connection, biofuels production and marketing, i.e. through financial incentives to investors and by improving law and regulations on renewable energy. The policy also includes large-scale projects.

8.5.3 Overview of Affected Villages

The Project area including wind turbine towers, transmission line, and access roads are located in the administrative boundaries of 24 villages in Dak Cheung District of Sekong Province and 8 villages in Sanxay District of Attapeu Province (**Figure 8.32**). These 32 villages form the Project-affected population/ communities/ villages and the key focus for social impact assessment.

The following section presents the main socio-economic characteristics of the Project's affected villages including: demographic information, livelihood engagement, income and expenditures, land use and

⁹⁷ The World Bank, 2021

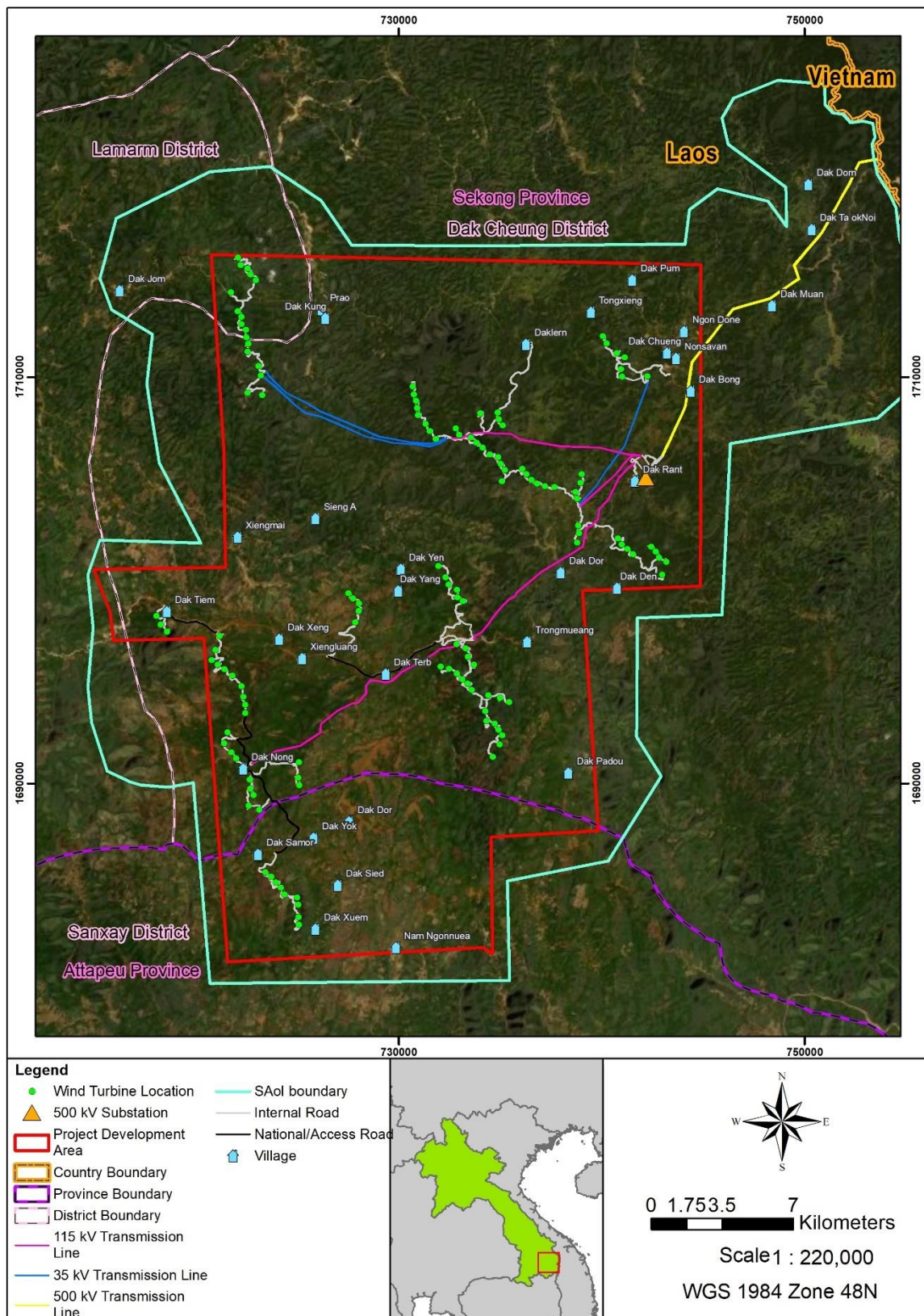
⁹⁸ Stimson, 2021. *An overview of policies and trends on energy, transportation, water, and industrial infrastructure in the Lao People's Democratic Republic*. Retrieved from: <https://www.stimson.org/2021/lao-peoples-democratic-republic/>

⁹⁹ <https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS?locations=LA>

tenure, household assets, access to infrastructure and public services, social network and cohesion and vulnerability.

The information for this section were collected through KIIs with relevant stakeholders including livelihood groups, women group, local authorities, youth, and healthcare personnel and socio-economic household survey as outlined in **Table 8.2**. A total of 449 out of 2,761 households (16.3%) and 2,984 out of 16,851 people (17.7%) of the 32 affected villages were engaged in Project's household socio-economic survey (referred to **Appendix U** for socio-economic household survey database) undertaken in November and December 2021. It is noted that Nonsavan was not included in the HH socio-economic survey as it was later identified as affected village during the DMS survey conducted in May-June 2022.

Figure 8.32: Affected Villages



Source: Innogreen/ERM, 2021, It should be noted that the administrative boundary provided from GIS data is inaccurate. The GIS Data shows that Dak Jom Village is located within Lamarm District; however, based on site visit and engagement with local authorities and villagers it is noted that Dak Jom village is located in and reports to Dak Cheung District.

8.5.3.1 Demographic Information

Population

Table 8.29 presents the population of the 32 Project-affected communities, which are clustered into koumban (village cluster)¹⁰⁰ and akkelad villages¹⁰¹. A total population of the 32 affected villages is 2,761 households and 16,851 people, of which 8,246 are female (48.93%) and 8,605 are male (51.07%). The gender ratio of the affected villages is 1:1.04 females to males, similarly to the country which stands at 1:1 (female 49.8: 50.2 male).¹⁰²

Table 8.29 presents the population by village¹⁰³, the average number of households is 84 and the average population is 518 people per village. Dak Sied of Sanxay District has the lowest population of 117 people, followed by Dak Kung, Sieng A and Dak Pum of Dak Cheung District with approximately 200 people. Dak Bong has the largest population size of 1,228 people, followed by Nam Ngonnuea with 1,031 people. Based on the HH socio-economic survey, the average household size of the affected villages is 6.2 people per household which is higher than the national average of 4.7 people per household as of 2017.¹⁰⁴

The population density of Dak Cheung District is 11 people per km² in 2019¹⁰⁵, and 6.7 people per km² for Sanxay District¹⁰⁶, which is considerably lower than that of the national population density of 31 people per km² in 2020.¹⁰⁷ The mountainous terrain of these districts contributes to a significantly lower population density than the national average.

¹⁰⁰ Koumban is a cluster of villages which has been a priority for Lao administration since 2004 as an institutional link between District and village levels—it is 'A formal administrative grouping of villages within a District defined for a purpose of extending government policies and development programs'. (MAF and NLMA, 2010). The main objective is to strengthen the political infrastructure to advance rural development by bringing smaller villages together in larger units, as a more efficient basis for local administration and planning. Retrieved from: <http://lad.nafri.org.la/fulltext/1786-0.pdf>

¹⁰¹ Akkelad villages refer to those villages which are not clustered under any kouman because they are located in close proximity to the District or the municipality and therefore are governed directly by the District or municipality.

¹⁰² The World Bank, n.d.c

¹⁰³ Number of village population was obtained through KIIs with village heads of each village during the sit visit in November 2021

¹⁰⁴ Lao Statistics Bureau, 2018

¹⁰⁵ Socio-economic Development Plan (2020-2024), Dak Cheung District (Government of the Lao PDR, 2021)

¹⁰⁶ Socio-economic Development Plan (2020-2024), Sanxay District (Government of the Lao PDR, 2021)

¹⁰⁷ Lao Statistics Bureau, 2020c

Table 8.29: Overview of Demographics of Affected Villages

Province	District	Koum Ban (Village Cluster)	Village	Impacted Project Components	Total Village Households	Total Village Population	Surveyed households		Surveyed population	
							N	%	N	%
Sekong	Dak Cheung	Xiengluang	Dak Xeng	Indirect impact	87	419	8	9.2%	61	14.6%
			Xiengluang	Wind turbine, access road and transmission (115kv)	97	571	10	10.3%	59	10.3%
			Dak Tiem	Wind turbine and access road	144	658	21	14.6%	132	20.1%
			Dak Yang	Wind turbine and access road	58	397	10	17.2%	77	19.4%
			Dak Yen	Wind turbine and access road	117	729	17	14.5%	127	17.4%
			Dak Treb	Wind turbine, access road and transmission line (115kv)	149	769	24	16.1%	179	23.3%
			Trongmueang	Wind turbine, access road and transmission line (115kv)	55	366	7	12.7%	51	13.9%
		Dak Duem	Dak Dor	Transmission line facility (115)	100	528	26	26.0%	181	34.3%
			Dak Den	Wind turbine and access road	78	555	10	12.8%	81	14.6%
			Dak Rant	Wind turbine, access road and transmission line (115kv and 35kv)	63	445	25	39.7%	166	37.3%

Province	District	Koum Ban (Village Cluster)	Village	Impacted by Project Components	Total Village Households	Total Village Population	Surveyed households		Surveyed population	
							N	%	N	%
		Nam Dae	Dak Kung	Wind turbine, access road and transmission line (35kv)	40	198	5	12.5%	40	20.2%
			Dak Jom *	Wind turbine and access road	202	1,031	20	9.9%	173	16.8%
			Sieng A	Wind turbine, access road and transmission line (115kv and 35kv)	32	210	6	18.8%	49	23.3%
			Prao	Access road	80	514	14	17.5%	116	22.6%
		Xekamarn	Dak Muan	Transmission line facility (500kv)	67	398	26	38.8%	146	36.7%
			Dak Ta-ok Noi	Transmission line facility (500kv)	46	231	6	13.0%	42	18.2%
			Dak Dom	Transmission Line (500kv)	56	280	6	10.7%	48	17.1%
		Akkelad (no koum ban)	Dak Bong	Transmission line facility (500kv, 115kv, 35kv) and Sub-station 500kv	54	1,228	40	74.1%	203	16.5%
			Ngon Don	Transmission line (500kv)	107	553	20	18.7%	112	20.3%

Province	District	Koum Ban (Village Cluster)	Village	Impacted Project Components	by	Total Village Households	Total Village Population	Surveyed households		Surveyed population	
								N	%	N	%
			Dak Chueng	Wind turbine, access road and transmission line (35kv)		204	672	20	9.8%	117	17.4%
			Tong Xieng	Wind turbine and access road		45	286	31	68.9%	222	77.6%
			Dak Pum	Access road		36	205	5	13.9%	37	18.0%
			Daklern	Access road, Wind turbine and transmission line 115kv		38	257	18	47.4%	141	54.9%
			Nonsavan**	Transmission line facility (500kv)		162	786	0	0	0	0
Attapeu	Sanxay	Nam Zou	Dak Nong	Access Road and Transmission line 115kv		72	598	7	9.7%	41	6.9%
			Dak Samor	Wind Turbine Facility and Access Road		83	730	8	9.6%	49	6.7%
			Dak Yok	Wind Turbine Facility and Access Road		58	550	10	17.2%	58	10.5%
			Dak Sied	Indirect Impact		23	117	5	21.7%	23	19.7%
			Dak Xuem	Wind Turbine Facility and Access Road		76	445	8	10.5%	42	9.4%
			Dak Dor	Indirect Impact		88	731	10	11.4%	67	9.2%

Province	District	Koum Ban (Village Cluster)	Village	Impacted Project Components	Total Village Households	Total Village Population	Surveyed households		Surveyed population	
							N	%	N	%
		Dak Ben	Dak Padou	Wind Turbine Facility and Access Road	66	363	8	12.1%	40	11.0%
		Nam Ngon	Nam Ngonnuea	Indirect Impact	178	1,031	18	10.1%	104	10.1%
Total					2,761	16,851	449	16.3%	2,984	17.7%

Source: Socio-economic survey undertaken by Innogreen/ERM, November 2021

* It should be noted that the administrative boundary provided from GIS data is inaccurate. The GIS Data shows that Dak Jom Village is located within Lamarn District; however, based on site visit and engagement with local authorities and villagers it is noted that Dak Jom village is located in and reports to Dak Cheung District.

** Nonsavan Village was not included in the socio-economic survey as it was later identified during DMS survey in June/July 2022 as one of the affected villages. However, it was included in the DMS survey.

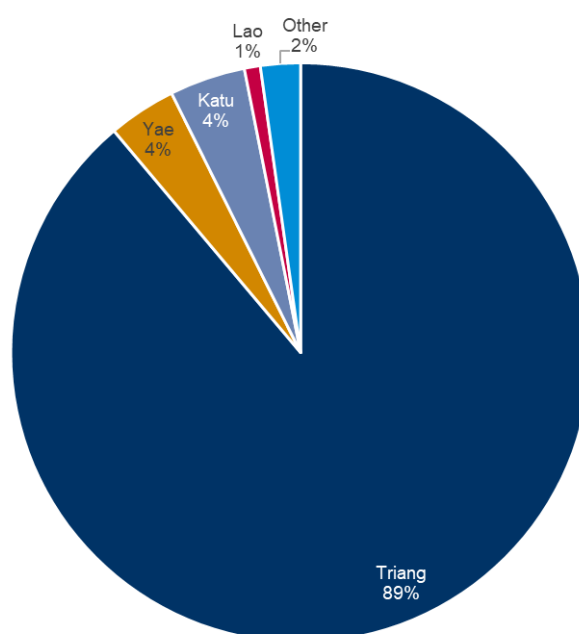
Ethnicity and Religion

Five ethnic groups were identified in the Project affected villages, namely Triang, Yae, Katu, Lao, and Ha Luk (Ha Hak). Of the 449 surveyed households, 399 are Triang households (89%); 17 are Yae households (4%); 19 are Katu households (4%); 4 are Lao households (1%) and 10 are other ethnic groups (2%) (mainly Ha Luk) (**Figure 8.33**). Triang makes up most of the surveyed households, apart from Dak Rant village (Dak Cheung District) where Yae makes up 85.7% of the village population and Dak Xeum village (Sanxay District) where Ha Luk is the main population of the village. The Triang, Yae, Katu and Ha Luk all belong to the Mon-Khmer (previously Lao Theung (people of the mountainous areas)). The Lao ethnic group is part of the Lao-Tai linguistic group (previously Lao Loum geographic group).

Three villages in Dak Cheung District were identified with the most diverse ethnicities—Dak Bong, Dak Cheung, and Dak Muan were identified with all four ethnicities, with Triang being the most dominant ethnic group.

While the main religion of Lao PDR is Buddhism, accounting for 65% of the population¹⁰⁸, about 30% of the population hold an animist belief (belief in supernatural beings or spirits as inhabiting animals, plants, rocks, and other objects in nature, and also the worshiping of ancestral spirits¹⁰⁹). These people are found among the ethnic minority groups of the Lao Theung (people of the mountainous areas) and the Lao Soung (people of the highlands). The majority of the population of the surveyed villages believe in animism, covering 98% of the surveyed population, whilst Buddhism accounts for 2% of the total surveyed households (**Figure 8.34**).

Figure 8.33: Ethnic Groups in the Project Affected Villages

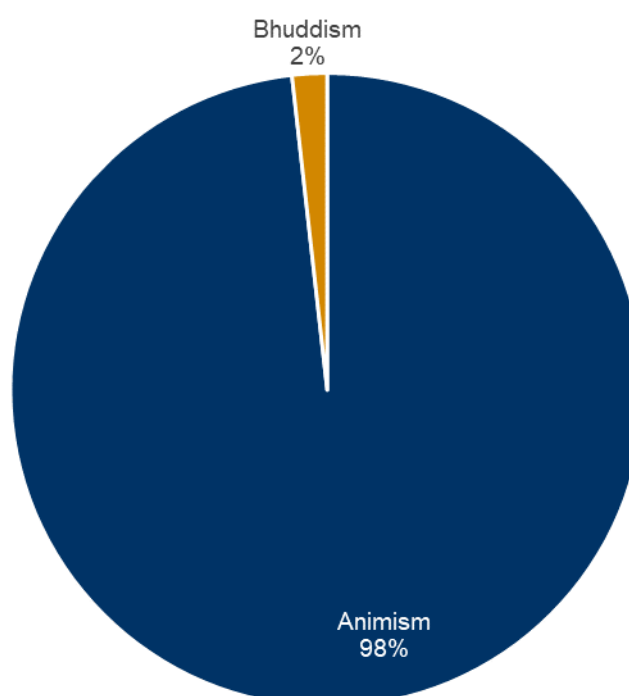


Source: Household socio-economic survey conducted November 2021

¹⁰⁸ PHC, 2015

¹⁰⁹ For a general definition and overview of animism please refer to: <https://iep.utm.edu/animism/>. For reflections on specific animist practices in the Lao PDR, please refer to https://www2.ohchr.org/english/bodies/hrcouncil/docs/13session/A.HRC.13.40.Add.4_enAEV.pdf, articles 54-57.

Figure 8.34: Religions in the Project Affected Villages



Source: Source: Household socio-economic survey conducted November-December 2021

Characteristics of Ethnic Groups

Table 8.30 presents key characteristics of main ethnic groups identified in the affected villages (Triang, Katu Yae and Ha Luk) including languages, land, ceremony, beliefs, language, and community cohesion. This section provides the basis for the assessment of Project impacts on Indigenous Peoples (IPs) in accordance with ADB's and IFC's definition of IPs

Through FGDs and KIIs with village heads and ethnic group representatives in affected villages, all ethnic groups have their own spoken languages. Triang, Yae, Katu and Ha Luk are classified under Mon-Khmer Linguistic Group while Lao ethnic group is Lao-Tai Linguistic Group.¹¹⁰ Due to the similarity of the spoken languages of Triang, Yae Katu, and Ha Luk these ethnic groups can understand one another. The FGDs and KIIs also identified that Lao and Triang are the most common languages for communication in all Project-affected villages. Most of the village members can understand and communicate in mainstream Lao to a great extent, except some of the older generation who have not gone to school and only communicate in their own ethnic group language.

Based on the site visit conducted in November 2021, the communities have absorbed cultures and ways of life from the mainstream Lao society as evidenced in their clothing and housing styles. It was observed that mostly men have adopted the mainstream Lao clothing while women were observed to still wear 'Sin' (a traditional skirt) in combination with modern clothing. In term of housing, some villages have adopted the styles and materials from mainstream Lao for their houses; while in some villages, traditional housing were still observed such as Sieng A and Dak Dom villages (**Figure 8.35**).

The site visit and FGDs with ethnic groups undertaken in November 2021 also found that the locals celebrate Lao mainstream festivals such as Laos' New Year, and wedding ceremonies absorbed from

¹¹⁰ IFAD, 2012

Laos mainstream culture over time. Access to education and information also changed mode of medical treatment from traditional treatment to modern medical treatment in healthcare centers.

The communities have absorbed Lao mainstream culture and lifestyle mainly due to increased contacts with people from outside communities, increased access to information through radio, television and mobile phone and internet (young people identified to use internet for social media and contact with other people located outside of the villages), and increased access to infrastructure and education. The project will contribute even more to this because of the infrastructure development, employment, business opportunities and interaction with outsiders. Integration with Lao mainstream culture and lifestyle are therefore more visible in youth and younger members of the communities as presented in **Figure 8.35**.

Figure 8.35: Integration of Lifestyle to Mainstream Society



Current clothing of the surveyed village population which have adopted from the mainstream Laos. Additionally, the house has also adopted materials and style from the mainstream Laos.

Women in some villages were observed to still wear traditional skirt called 'Sin' with a combination of mainstream Laos clothing. In some villages, traditional houses were observed.





Source: Socio-economic household survey by ERM/Innogreen, November and December 2021




Through FGDs and KIs and desktop research, it was understood that despite common animist beliefs, each ethnic group (Triang, Yae, Katu, Lao, and Ha Luk) has slightly different practices, rituals, customs, and ceremonies. These differences are discussed in more detail in **Table 8.30**.



Table 8.30: Characteristics of Ethnic Groups

Aspect	Triang	Katu	Yae	Ha Luk (Ha Hak)
Language	Triang have their own spoken language, which is similar to Yae and Katu	Katu have their own spoken language, which is similar to Triang and Yae	Yae have their own spoken language, which is similar to Triang and Katu	Ha Luk have their own spoken language, which is similar to Triang, Katu and Yae.
Political institution	<p>The key political institution of all ethnic groups include:</p> <ul style="list-style-type: none"> ■ Village head (<i>Nai Baan or Pok Kong Tong Thin</i>) which is a common village level authority across Laos, not only amongst ethnic groups. Responsibilities of village head may include (but not limited to) (i) allocating the use of communal land and other resources among households in the village; (ii) manage the people in the village, and to support the people in order to bring about more stable employment and sustainable livelihoods; (iii) settling disputes between members of the village; (iv) disciplining members of the village for violation of rules and customs; (v) representing the community or village on meetings convened higher-level authorities; and (iv) disseminate the government policies and laws to all people in the village.¹¹¹ ■ Belief leader or <i>Tao Kae Naew Home</i> which is translatable as an elderly who can gather/assemble all villagers together. Tao Kae Naew Home is usually someone who are well equipped of Heet-Kong (<i>Heet is long inherited traditions and Kong is social norm, custom or guidelines</i>) and have extensive experience in performing rituals that can guide the villagers. Tao Kae Naew Home is responsible for performing rites and guiding the villagers in following Heet-Kong of the village. ■ Head of Village Women's Union which represent the women in the villages. Village Women's Union main functions include: (i) Protect the rights and interests of the Lao multi-ethnic women and children. (ii) Promote the implementation of the policy on gender equality (iii) Educate women of all ethnic groups to have a proper understanding of the government's policies/laws; and (iv) protection and the support of customs and traditions of ethnic group women. <p>The decision at village level is made based on the consultation of the above mentioned parties; however, relevant villagers may also be included in decision making process. In general, the Village Head is the representative of the village in meetings with governmental authorities e.g. district and provincial authorities. to bring concerns of the villages forward to the authorities, and also communicate governmental policies/plans to villagers. It is noted that this format of decision making is common across Laos, not only within ethnic groups communities but also practiced by mainstream Laos communities.</p>			
Traditional clothing	Triang's traditional clothing is similar to other ethnic groups in the Mhon-Khmer linguistic group. Men usually wear 'Ka-Tiew' (rolled tail or end of loincloth which runs between the legs and is tucked into the waistband at the back) and cloth across shoulders, women traditionally	Katu have unique traditional clothing, men wear 'Ka-Tiew'; while women wear shirt and skirt made of traditionally woven cloth. Men have adopted to clothes from the Lao mainstream, while women still preserve traditional clothing	Men of Yae ethnic groups wear 'Ka-Tiew', and women wear loincloth similar to Triang ethnic groups. The key difference is the pattern of Katiew and skirt for women, which are unique to each ethnic group. During winter, they	Ha Luk have unique traditional clothing, men wear 'Ka-Tiew'; while women wear shirt and skirt made of traditionally woven cloth.

¹¹¹ [https://www.vientianetimes.org.la/Laws%20in%20English/49.%20Law%20on%20Local%20Administration%20\(2003\)%20Eng.pdf](https://www.vientianetimes.org.la/Laws%20in%20English/49.%20Law%20on%20Local%20Administration%20(2003)%20Eng.pdf)

Aspect	Triang	Katu	Yae	Ha Luk (Ha Hak)
	<p>wear loincloth, running from from chest down to shins.</p>  <p>Source: Department of Ethnic Affairs, 2015a</p>	<p>as evidenced in ceremonies and festivals.</p>  <p>Source: Department of Ethnic Affairs, 2015b</p>	<p>wear additional clothes to keep warm.</p>  <p>Source: Department of Ethnic Affairs, 2015c</p>	 <p>Source: Department of Ethnic Affairs, 2015d</p>
Community features	<p>Each Triang village usually constructs fences made of bamboo (height up to 5 meters) around the villages and two gates for entry-exit of the village, known as “Patou Vieng”. The fence is for protection against thieves and wild animals from attacking livestock and village members. Additionally, villages also have Salakuan, a building in the middle of the village, for receiving guests and ritual ceremonies and feasts.</p>	<p>Traditionally, the houses are built to form a circle around “Salakuan”, a building in the middle of the village used as a meeting hall and for ceremonies.</p>	<p>Similar to Katu, the houses are built to form a circle around “Salakuan”. In front of the Salakuan and each house, there is usually a pole for securing animals e.g., buffalos, cows, pigs for animal offering/sacrifice rituals.</p>	<p>Traditionally, a fence made of bamboo are constructed around the houses. Salakuan and poles for securing animals for ceremonies and sacrifice rituals are not common in the village. Rather, a nearby tree or somewhere else appropriate for securing animals e.g., buffalos, cows, pigs, are used for securing animals for sacrifice rituals.</p>

Aspect	Triang	Katu	Yae	Ha Luk (Ha Hak)
	 <p>Source: The identity of Triang Ethnic Group [Lao PDR] - Library records OD Mekong Datahub</p>	 <p>Source: The identity of Katu Ethnic Group [Lao PDR] - Library records OD Mekong Datahub</p>	 <p>Source: The identity of Yae Ethnic Group [Lao PDR] - Library records OD Mekong Datahub</p>	 <p>Source: The identity of Haluk Ethnic Group [Lao PDR] - Library records OD Mekong Datahub</p>
Livelihood	<p>Based on the FGDs with ethnic groups, all ethnic groups have similar livelihoods comprising cultivation of rice, coffee, and cassava plantation. Some are still engaged in shifting cultivation and collection of Non-timber forest products (NTFPs). The socio-economic household survey conducted in November to December 2021, indicated that key primary livelihoods of active workforce comprised agriculture (farming and livestock) (75%) and day laborer (17%), while only 3% are engaged in NTFP collection as their primary livelihood. Consultation with Dak Rant village on 20 July 2022 found that while the villagers indicate to collect NTFPs in addition to agricultural activities or when they are free from agricultural activities. However, in Dak Learn village (and potentially Prao and Dak Kung villages given location being close to Phou Koungking which is a key resource for NTFPs), it was found that NTFP collection makes up a primary livelihood. Based on the village consultation conducted on 18-21 July 2022 in Dak Lern village, all of the households are engaged in timber and non- timber forest products (NTFPs) (mushroom, bamboo shoot, honey, ginseng, orchid, rattan, tiger grass etc.) collection from the foothill of Phou Koung King. Bamboo shoots and tiger grass can be sold as a raw material or processed as added value products. Timber and non- timber forest products (NTFPs) collection is big cash income source of households because these are sold to merchants from Vietnam.</p>			
Ceremony	<p>Triang people organize several ceremonies to worship spirits throughout the year. At the beginning of the year, Triang celebrate the 'new rice ceremony' or Boun Kin Khao Mai by offering buffalos, cows and pigs to worship and food for community members. In June, they celebrate the festival "Boun Duean</p>	<p>Katu ethnic group holds several ceremonies throughout the year including rice ceremony (Boun Kwan Khao), ceremony prior to planting rice, ceremony for rice harvest and other ceremonies which organized within the households or together as a</p>	<p>Celebrations are conducted after rice harvest for 3 days and 3 nights which involve animal sacrifice / offering (such as buffalo, cow, pig) to worship spirits – known as the 'Boon Ja' ceremony. Yae have Boun Phao Thane, Boun Sak Khao, Boun Hor Khao Tom are</p>	<p>Ha Luk ethnic group holds several ceremonies throughout the year including rice ceremony (Boun Kwan Khao), "Chongkapiew" ceremony which is organized within the households or together as a community. The ceremonies usually involve offering of buffalos</p>

Aspect	Triang	Katu	Yae	Ha Luk (Ha Hak)
	6". At the end of the year, worshipping spirits by offering buffalos for any wrong deeds or rites that have been caused in that year.	community. The ceremonies usually involve offering of chicken, pig or buffalo to worship spirits.	three festivals celebrated for the rice harvest and they prepare tools for land clearing for the new plantation season, with the tool attended to by local ironsmiths.	and cows to worship spirits. At present, the "Chongkapiew" ceremony is performed once in 2-3 years.
Religion and belief	Animism is belief in supernatural beings or spirits as inhabiting animals, plants, rocks, and other objects in nature. They also worshipf ancestral spirits.			
Skills sets	All ethnic groups engage in ironsmithing, bamboo handicrafts, and weaving, which are unique to their ethnic groups. These skills have been passed on from generation to generation.			
Tangible and intangible cultural heritage	<p>Cemeteries are highly respected sacred places for the Triang ethnic group. Additionally, they also have sacred forests, sacred ponds and prohibited areas.</p>  <p>Triang maintain folk songs and folk tales in their own language. Moreover, they have musical instruments such as drum (Kong La).</p>	<p>Similar to Triang culture, cemeteries, sacred forests, ponds and prohibited areas are highly respected sacred places for the Katu ethnic group.</p>  <p>Katu maintain folk songs and folk tales in their own language. Additionally, they also have local musical instruments such as drum and pipe.</p>	<p>Same for the Yae ethnic group in terms of cultural heritage.</p>  <p>Yae have their song known as "Lam Yae", as well as their own drum (Kong La) and sarong (Sin Lom).</p>	<p>Similar to Triang, Katu and Yae, sacred forests and prohibited areas are highly respected sacred places for the Ha luk ethnic group.</p>  <p>Ha Luk maintain folk songs and folk tales in their own language. Additionally, they also have local musical instruments such as drum and pipe.</p>

Source: Department of Ethnic Affairs, 2015a, 2015b, 2015c & 2015d

Tangible Cultural Heritage

Cemeteries

Figure 8.36 presents a map depicting the locations of cultural heritage resources and **Figure 8.39** presents the cultural heritage resources in relation to the Project facilities. One of the core beliefs of animism is spirits believed to be inhabiting inanimate, often nature-based objects and also ancestral worship.¹¹² This is observed within the Project area. Cemeteries (*paa saa*), which are mostly forested areas, are observed in all surveyed villages (**Figure 8.38**). In the cemeteries, there are usually small huts of the deceased where the local people believe the spirits of the deceased live. Local villagers offer food, tools, and other worshipping materials to the deceased at these small huts (**Figure 8.37**).

Based on the consultation with Dak Learn village representative (village deputy and belief leader) on 20 August 2022, cemeteries are regarded as highly sacred place as they expressed the area as being highly respected and prohibited. The village coordinator of Dak Tiem village added to this premise that he considered cemetery as a highly sacred place as his parents who passed away are resting there. Activities to disturb resting of their ancestors such as chopping of wood or loud noise are prohibited—he feared if his parent are woken up from their resting by disturbing activities, the parent spirits will be angry at him for not protecting them and let them rest in peace after death. For this reason, people are prohibited from entering cemeteries for any kind of activities such as hunting or collecting timber and NTFPs. If cemeteries are impacted, it is required to undertake rites involving a sacrifice of a pup and use its blood to spread across affected cemetery area.

Village Ceremonial Ground (Salakuan)

There is ceremonial ground in the village which are used for performing rites or ceremonies. Poles located in the middle of the villages to secure animals and serve as a place for performing animal sacrifice (**Figure 8.36**). In some villages, such as Dak Jom village, sacred houses or Salakuan in the middle of villages are used for performing animal sacrifices. Women and outsiders are strictly forbidden from entering Salakuan.

Figure 8.36: Pole Used for Securing Animals to Perform Animal Sacrifice



Dak Den village



Sieng A village



¹¹² See <https://iep.utm.edu/animism/>.



Dak Dom village



Dak Jom Village

The wooden pillars located in the ceremonial courtyard in the center of the villages are used for securing animals such as buffalos to perform animal sacrifice. In some villages, Salakuan, a building in the middle of the village, is used as a meeting hall and to organize ceremonies (refer to (iii) and (iv)).

Figure 8.37: Cemeteries and Huts of the Deceased

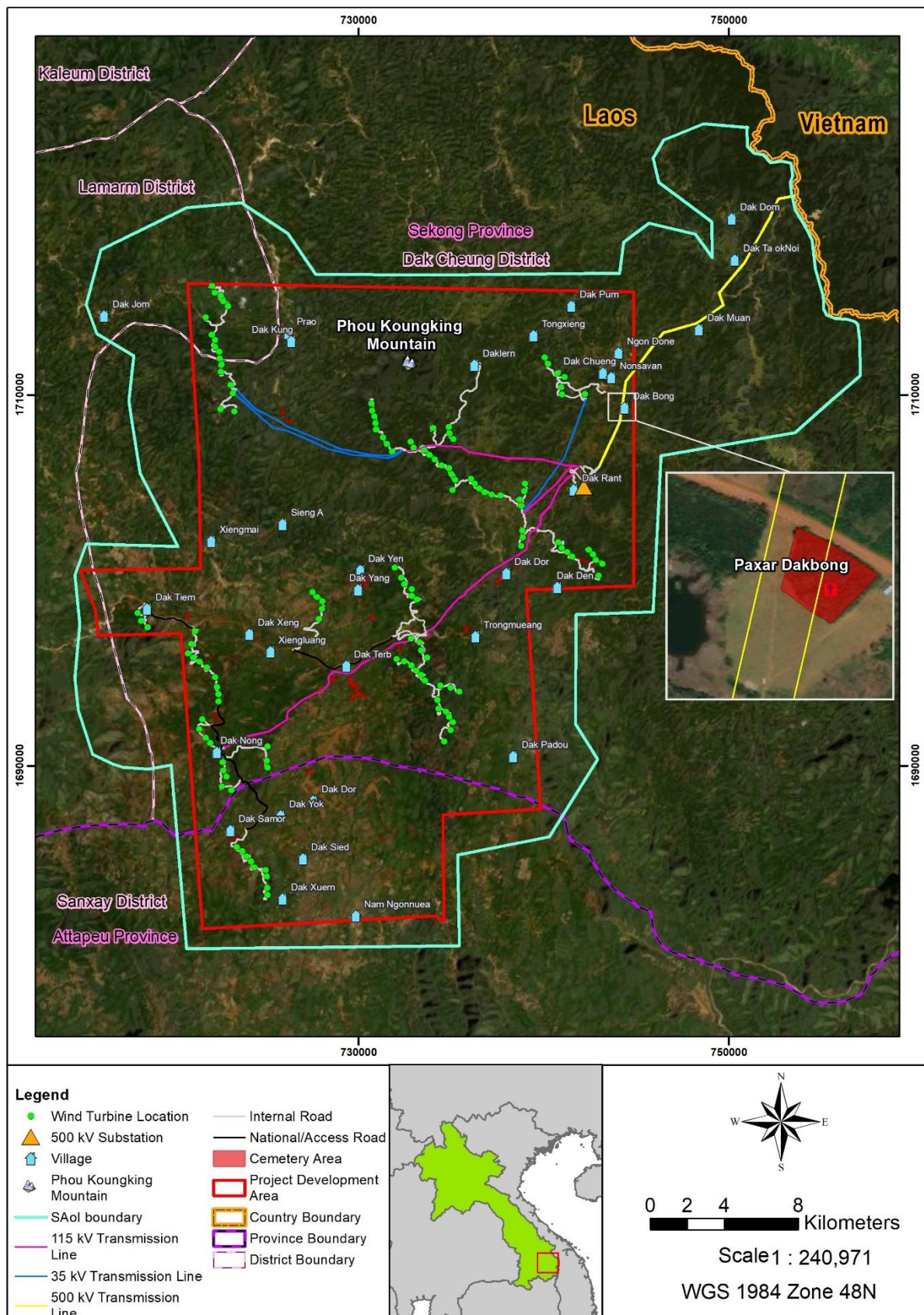


Cemetery of Dak Terb village (left) and Prao village (right) which is a forest area. Hunting and collecting NTFPs are prohibited in this area as it is regarded as a sacred area. There are some small huts of the deceased in the cemetery. None of these are affected by permanent or temporary project facilities.



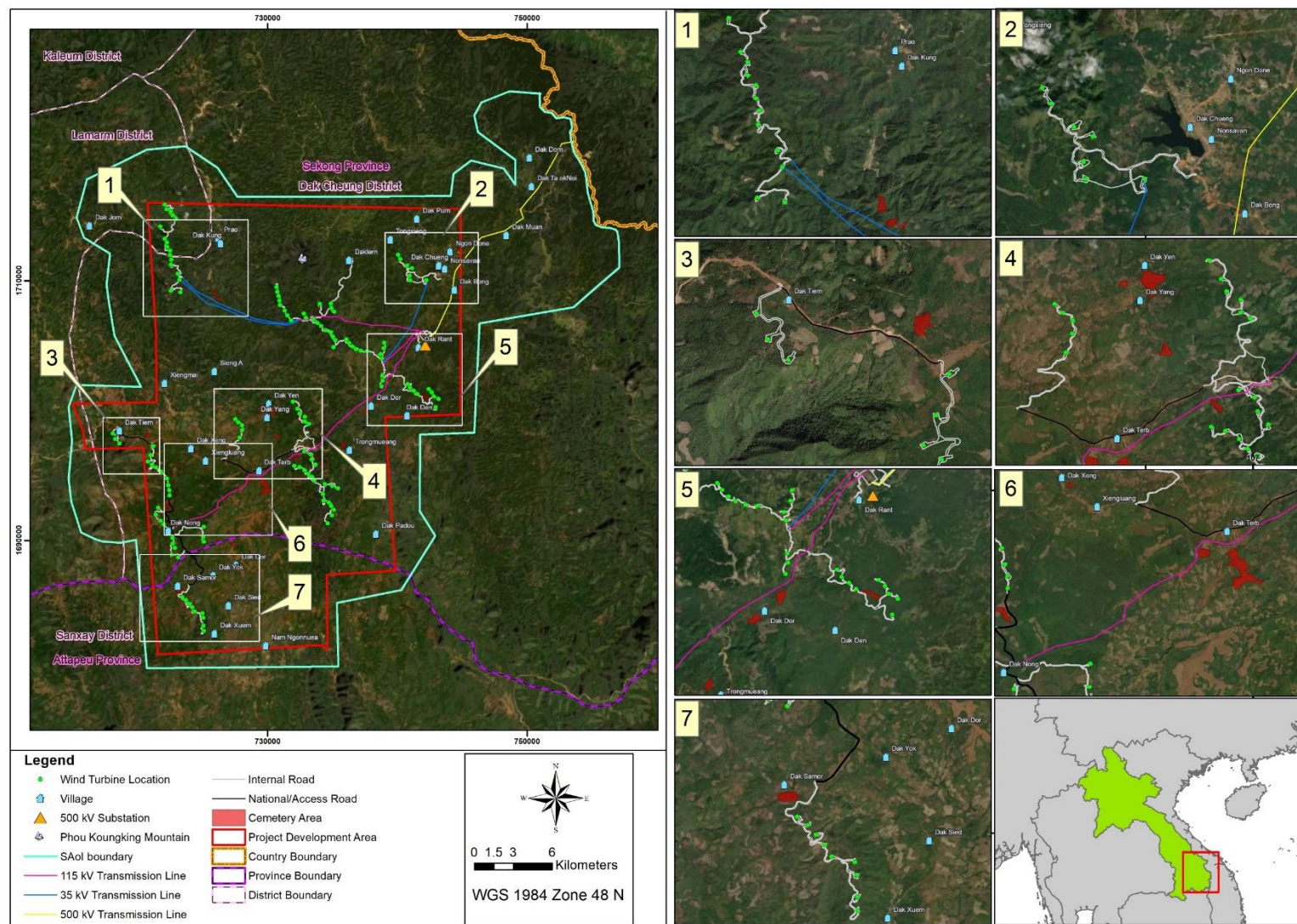
Small huts of the deceased located in the cemetery areas of Dak Terb village (left) and Ngon Don village (right). The locals offer food, drink and other worshipping materials to the deceased at these small huts.

Figure 8.38: Cultural Heritage Sites



Source: ERM/Innogreen, 2021

Figure 8.39: Cultural Heritage Sites in Relations to the Project Facilities



Intangible Cultural Heritage

In addition to the spiritual significance of cemeteries located throughout the Project development area, community consultation revealed the nature and extent of present animist beliefs among ethnic minorities. Cemeteries were identified as the zones of highest sacredness or spiritual significance due to the connection with more direct and sometimes recently deceased relatives. The spirits of ancestors are widely and highly respected. Unrelated to ancestral spirits, villagers also identified and respected supernatural beings or spirits as inhabiting animals, plants, rocks, and other objects in nature that are commonly recognised in animist beliefs across southern Lao. These beliefs, however, were noted as potentially in decline among younger generations. A third type of spiritual entity, described as an individual ghost, was also identified by the ESIA survey team in consultation with the village heads and local villagers of Ban Dak Dreun and Prao. These consultations noted this ghost as potential intangible cultural heritage associated with Phou Koungking Mountain (as shown in **Figure 8.40**), in the central north of the Project development area. Rites, ceremonies, and festivals also comprise expressions of local intangible cultural heritage of importance to villagers.

Phou Koungking

Based on the consultation with representatives from Prao and Dak Lern (19 and 20 July 2022), Phou Koungking is administratively under the jurisdiction of Prao and Dak Lern and the division of their area of jurisdiction is governed by an agreement of the two villages relating to NTFP collection. The lower elevations of Phou Koungking are designated as a multi-use zone, with ongoing activities in this zone including NTFP collection and other agricultural activities. Information about access to and use of higher elevations of the mountain differed between villages, however all agreed that villagers in Dak Lern are the primary custodians of the mount. Consultations conducted with Dak Lern representatives indicated that accessing the higher elevations of Phou Koungking although not prohibited is highly difficult, and this is the reason why people do not usually access area for NTFP collection. It should be noted that the Project eight WTGs are proposed in the lower elevation which is designated as multi-use zone of the Phou Koungking Mountain, and therefore will not affect the higher elevation of Phou Koungking.

Earlier consultations had revealed that the forest was once believed to have been inhabited by a spirit known as Phi Bang Bot, and this was noted as potentially significant intangible cultural heritage. Phi Bang Bot was believed to be responsible for visitors to the mountain becoming disorientated and lost on the mountain's steep terrain. Additional details clarifying present beliefs about the sacredness of Phou Koungking were obtained during the village consultations conducted during July 2022, revealing that different villages possess different beliefs and myths/legends connected with Phou Koungking.

The consultation with Dak Lern representatives (20 July 2022) suggested that people are not afraid of entering high elevation area because of spirits, but rather dangerous animals such as snakes and also the risk of becoming disorientated and lost. When asked about beliefs in spirit in Phou Koungking, the representatives described 'Phi Bang Bot' (literally translated as covering the eyes), a ghost that has the power to blind people and cause them to get lost in the forest. However, belief in or concern about Phi Bang Bot is neither strong or common among villagers as it has been a long time since individuals claimed to have encountered the ghost. Villagers, however, believe that when entering the forest/mountain, "Heet" (long inherited traditions) and "Kong" (social norms, customs or guidelines) must be followed. For instance, offerings involving incense, rice, and tobacco are commonly performed prior to entering the forest for NTFP collection.

The consultation with Dak Bong representatives (19 July 2022) indicated that entry to the high elevation of Phou Koungking is not prohibited but it is difficult to access the top of Phou Koungking. The sacred forest is at the tip of Phou Koungking Mountain where it is highly steep. For this reason, hunting and NTFP collection activities are only at the foot of the mountain. Villagers do not hunt or collect NTFPs in the sacred forest because of steepness and there is a belief that they will get lost within the sacred forest. It was noted that the location of the project components is approximately 2 km away from the sacred forest at the tip of Phou Koungking Mountain

Consultation with Dak Rant village (20 July 2022) suggested that in general, the villagers don't have a strong connection to Phou Koungking and would defer to the views held by villagers in Prao and Dak Lern. One elderly man recounted a tale suggesting that Phou Koungking was the ancestral origin place people from the Dak Cheung region. However, in the short discussion that followed it was revealed that others had not heard this tale and as such it was concluded that this belief was not widely shared. The same question was put to villagers in Dak Lern who also had no knowledge of this tale.

Based on the above discussions, it can be concluded that Phou Koungking Mountain is not regarded as a "sacred" place considered holy and deserving respect or worship. It appears that due to the steepness and inaccessibility of the terrain it is regarded as a place of some hazard and the stories surrounding it that could be construed as having intangible heritage value are more related to recognition of these hazards than animist spiritual beliefs. Cemeteries, by contrast, are regarded as highly sacred places by villagers, and if impacted certain remediation rituals involving animal sacrifices are required to restore spiritual balance.

Project Activities within Phou Koungking

Consultation with Dak Lern and Prao clarified that the Project activities in the lower elevation of Phou Koungking Mountain are not "Kalem" or prohibited. (*In Triang language Kalam means prohibited, taboo or wrong according to the local customs.*) However, prior to entering the forest and commencing construction activities, the Project must consult with Dak Lern and Prao villages and comply with villages' "Heet-Kong" or rituals (in Triang language Heet-Kong means inherited traditions or ritual practices) and Kong (meaning social norms, customs, or guidelines). For Project construction activities, the project is required to provide budget for the village to perform a specific ritual. The ritual involves animal sacrifice with a pig, a jar of rice whisky and a copper bracelet. The pig will be sacrificed while the blood spills onto the copper bracelet. Following this, everyone in the village must touch the blood of the pig. Thereafter, the pig will be cooked, and all villagers must eat the pork and drink rice whisky from the jar. The copper bracelet will be left there where the ritual is performed. The ritual is usually performed in the village towards the end of the day or in the evening when everyone has returned from their daily activities and is available to participate in the ritual. It is noted that by performing this ritual, permission is sought from all spirits that the people believe in including the village spirit, forest spirit, mountain spirits, etc. Villagers believe that if the rituals are not carried out correctly, it will result in illness and depression of people in the village. However, if errors occur in the performance of rituals, further rituals may be performed to remediate the missteps.

In conclusion, Project activities within the lower elevation of the Phou Koungking Mountain are not prohibited and will not incur any impact on intangible cultural heritage if the Project consults with the villages and complies with villages' Heet-Kong.

Rites, Ceremonies and Festivals

An important component of animist beliefs involves the ritual sacrifice of large animals such as buffalos, cows, and pigs to stay on good terms with the spirits that are believed to inhabit animals, plants, rocks, and other objects in nature, and also ancestral spirits. Animal sacrifice is also performed when a family member falls ill as an offering to evil spirits which are believed to have caused the illness. Consequently, some of the livestock bred by villagers is destined for sacrificial use, though following sacrifice the meat is prepared and eaten by the villagers. Specific seasonal rituals are also linked to rice cultivation as an essential part of a belief system in which the paramount deities are spirits of the soil, such as Boun Duean 6. **Table 8.31** provides a summary of key annual ceremony/festival cycle practiced by the affected villages.

The consultation with Dak Rant village on 20 July 2022 indicated ceremonies and festivals are joint activities by all members of the village. All village members usually help with preparation of the ceremonies and festivals, and high rates of attendance are believed to be required for them to be effective.

Table 8.31: Annual Cycle of Ceremonies and Festivals

Month	Ceremony/Festival	Description
January	Boun Phao Thane or Boun Thang Hai	Boun Phao Thane or Boun Thang Hai is usually held in the first month in each year. Before forest is cleared for rice cultivation or plantation (cassava, coffee, banana, etc.), villagers burn wood or charcoal in a forest and cut down grass or trees with a 'big knife' in the burning area for land clearing. Thereafter, the villagers would go into the forest to collect mushrooms, vegetables and hunt wildlife to celebrate in that area. This is to worship to forest spirit in order to have productive agriculture season.
June	Boun Duean 6 or Boun Sak Khao	Boun Duean 6 and Boun Sak Khao is held June each year prior to rice growing and land clearing. A duck/chicken or a cow/buffalo will be sacrificed using 'a big knife' – as an offering and to worship spirits, and to ask for blessings for productive and fertile rice farming and plantation (cassava, coffee, banana, etc.) season.
September to October	Boun Kin Khao Mai	Boun Kin Khao Mai is usually held at the conclusion of the rice harvest (between September-October). The ceremony takes place within families and then within the community to celebrate. During the ceremony, a duck/chicken or a cow/buffalo will be sacrificed as an offering to the village spirit and forest spirit. Villagers usually bring food to eat together to celebrate the success of the harvest season.
November to December	Boun Hor Khao Tom or Boun Sa Loup Khao	Boun Hor Khao Tom or Boun Sa Loup Khao is usually organized after the finish of harvest season after Boun Kin Khao Mai between November to December each year. All households in the villages would bring a basket of unmilled rice, a chicken (for sacrifice), rice whisky and some flowers to worship the village spirit and forest spirit. The villagers would also eat and celebrate together. It is believed that this ceremony will bring as much agricultural productivity as this year to the next year.
Ritual for entering forest for NTFP collection	Prior entering the forest	Prior to entering the forest for NTFP collection, six grains of rice, tobacco and incense are required to be offered to spirits under a large tree in the forest in order to safe passage from spirits to enter the forest and collect NTFPs.
Ritual for construction activities in Phou Kounking	Prior to entering the forest and any construction activities	For Project construction activities, the project is required to provide budget for the village to perform required rituals. One such ritual described in detail involves a pig, a jar of rice whisky and a copper bracelet. The pig will be sacrificed while its blood flows over the copper bracelet. Everyone in the village must touch the blood of the pig. Thereafter, the pig will be cooked and all villagers must eat the pork and drink rice whisky from the jar. The copper bracelet will be left there where the ritual is performed. The ritual is usually performed in the village in the evening. It is noted that by performing this ritual, it covers asking for permission from all spirits that the people believe in including village spirit, forest spirit, mountain spirits, etc.

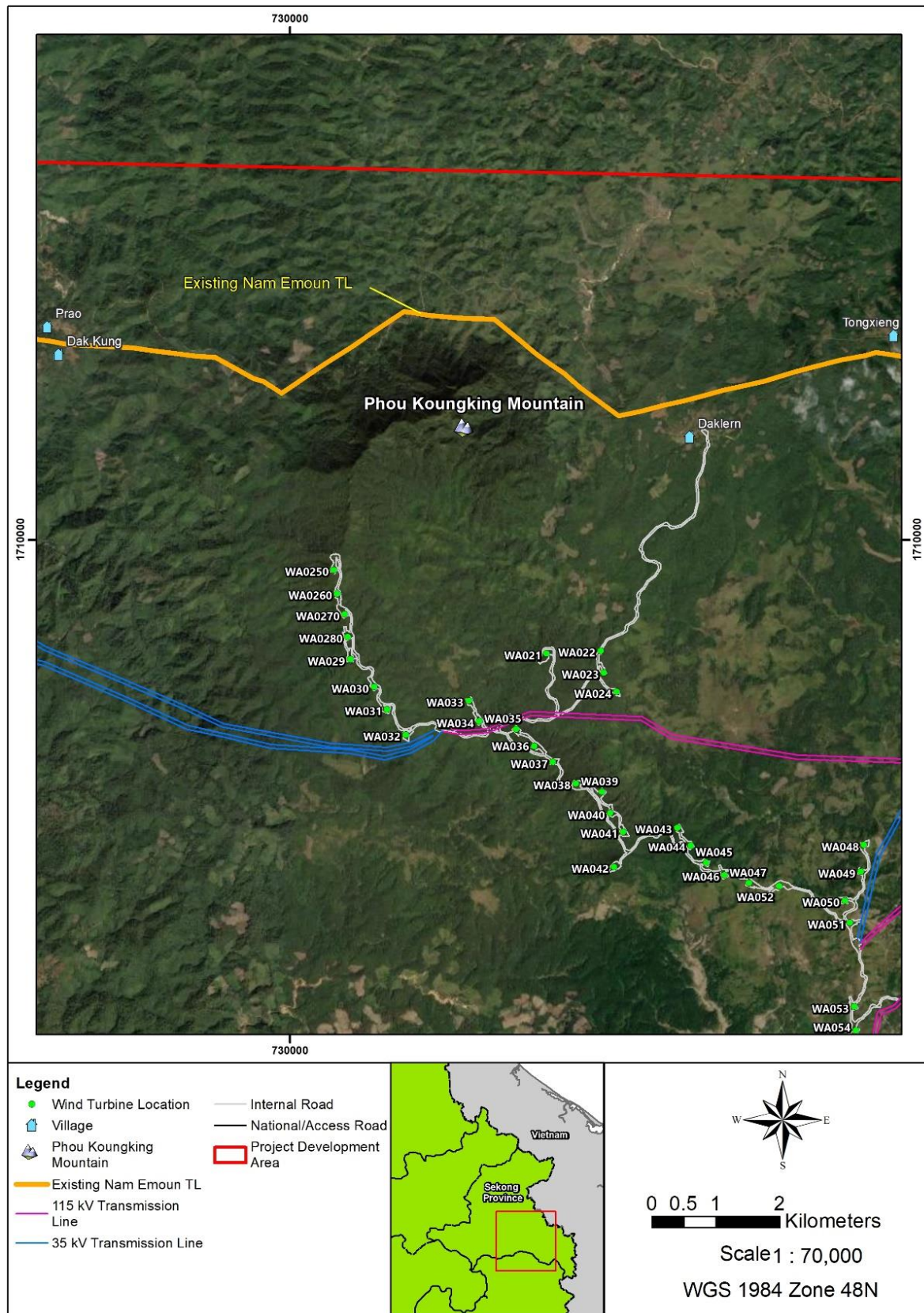
Month	Ceremony/Festival	Description
Ritual for activities in cemetery area	Prior to entering the cemetery and any activities	Prior to entering or any activities within cemetery area, in consultation with relevant villages, it is required to undertake rites involving the sacrifice of a puppy (i.e., a young dog) and use its blood to spread across affected cemetery area

Source: FGDs and KIIs conducted by ERM/Innogreen, November and December 2021
The Project activities during construction and operation may potentially have impacts to the cultural resources as presented in **Table 8.32**.

Table 8.32: Project Activities and Potential Impacts to the Cultural Heritage Resources

Project Activities and Potential impacts	Village/s	Ethnic Groups Affected	Duration and/or Extent of Impacts
Construction Phase			
Impacts of the WTG, T/L, and internal roads construction to intangible cultural heritage in Phou Kounking Mountain	Prao, Dak Lern, and Dak Kung	Triang and Katu	During construction period
Impacts on Dak Bong Cemetery during the construction of overhead transmission line	Dak Bong	Triang, Yae, Katu and Lao	During construction period
Impacts of labor influx during construction phase to intangible cultural heritage of ethnic groups	All 32 villages	Triang, Yae, Katu and Lao	During construction period
Impact related environment nuisance such as vibration, noise, and dust affecting ethnic minority ceremonies/ rituals/activities and cultural heritage sites close to construction sites	All villages, except, Dak Jom, Nam Ngonneua, and Dak Padou	Triang, Yae, Katu and Lao	During construction period
Operational Phase			
Impacts of the access roads to the Phou Kounking Mountain during Operations Phase	Prao, Dak Lern, and Dak Kung	Triang and Katu	Permanent impact
Noise and Shadow flicker impacts on cultural heritage	N/A	N/A	N/A

Figure 8.40: Phou Koungking



Source: ERM/Innogreen, 2021

Education Attainment

The FGDs and KIs with youth and village heads in Dak Cheung District found that the average level of education for girls is 3rd to 4th year of secondary school (equivalent to years 8 and 9) and 4th year of secondary school (9 years of education) for boys. The majority of the villages (18 villages of 23 villages) identified that all students are enrolled in schools, starting from kindergarten at the age of 4-5 years old. However, five villages, namely Sieng A, Xiengluang, Dak Treb, Dak Yang and Daklarn indicated that not all students are enrolled in schools, due to poverty.

Most youths attend primary schools in their villages; however secondary schools are only available in some bigger villages including Xiengluang, Dak Cheung, and Dak Dor. Therefore, some students are required to travel from 4 to 10 km to secondary schools. The common means of travel include walking and biking.

The FGDs and KIs with youth and village heads in Sanxay District identified the average education level primary school, and 4th to 5th year of secondary school. Similarly, youth attend primary education in the village, and are required to travel to Sanxay village and Chalenxay village (approximately 12-16 km away) for secondary education, on foot or by bike.

53% or 1,472 people of the surveyed population have completed primary education¹¹³, followed by 30% (745 people) attending secondary education. These figures are considerably lower compared to those of Sekong and Attapeu Provinces. In Sekong Province, 94.1% and 92% of population complete primary and (lower) secondary school¹¹⁴, while 85.5% and 95.4% of Attapeu's population complete primary education and (lower) secondary education, respectively¹¹⁵. 56 people (2%) have attended or completed vocational education and approximately 153 people (5%) have attended university. 209 people of the surveyed population (7%) identified they have not received education (**Figure 8.41**). This figure is lower than the national figure (in 2015) where the population aged 6 years and above who had never attended school accounted for 13%, 27% currently attending school (in 2015) and school dropouts (58%).¹¹⁶

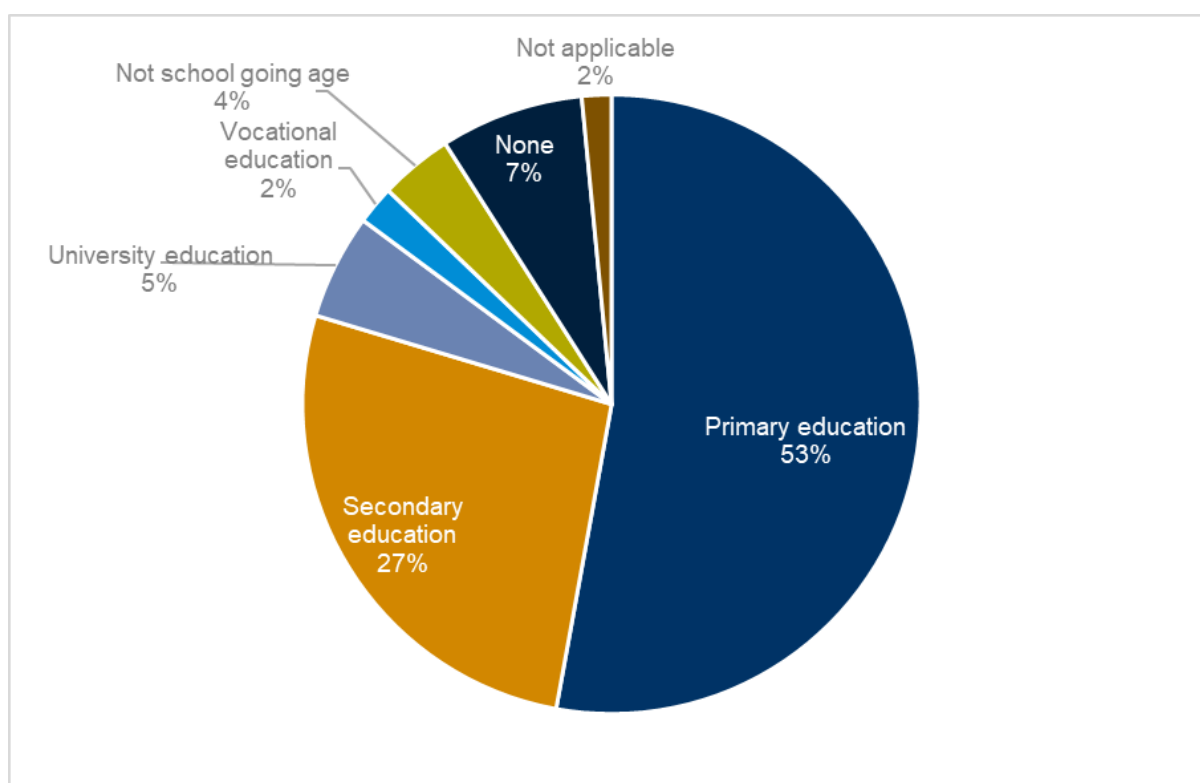
¹¹³ Primary education are for children aged 6-10 years (Grade 1-5)
Lower Secondary Education are for students aged 11-14 (Grade 6-9)
Upper Secondary Education are for students aged 15-17 (Grade 10-12)
Source: Government of the Lao PDR, 2015.

¹¹⁴ Sekong Statistics Bureau (2018). Local Statistic of Sekong Province Report for 2018 (p.41). Retrieved from: https://laosis.lsb.gov.la/board/BoardList.do?bbs_bbsid=B404

¹¹⁵ Attapeu Statistics Bureau (2018). Local Statistic of Attapeu Province Report for 2018 (p.44). Retrieved from: https://laosis.lsb.gov.la/board/BoardList.do?bbs_bbsid=B404

¹¹⁶ Lao Statistics Bureau (2015). The 4th Population and Housing Census 2015 Retrieved from <https://lao.unfpa.org/en/publications/results-population-and-housing-census-2015-english-version>

Figure 8.41: Education Attainment of the Surveyed Population



Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

Disaggregated data per koumban (village cluster) (**Table 8.33**) shows that other villages in Sanxay District (i.e., Dak Padou and Nam Ngon villages) have the highest ratio of its population having received education (98%) while Koumban Dak Duem has the lowest ratio of its population having received education (82%). In general, population of villages in Sanxay District have a larger proportion of its population having received primary education than Dak Cheung District. Koumban Nam Zou has the highest rate of its population enrolment in basic education (85%), while Akkelad villages in Dak Cheung District have the highest rate of its population attend or complete secondary level education (36%). All koumbans and villages have a small proportion of its population (1-6%) having attended or completed higher education levels, such as vocational training or university education.

Table 8.33: Education Attainment by Koumban

	Dak Cheung District										Sanxay District			
	Koumban Xiengluang		Koumban Dak Duem		Koum Ban Nam Dae		Koumban Xekamarn		Akkelad (Dak Cheung)		Nam Zou		Other villages	
	(N=640)		(N=397)		(N=378)		(N=376)		(N=812)		(N=204)		(N=122)	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
No education	118	18	29	7	30	8	30	8	73	9	17	8	3	2
Primary education	402	63	211	53	205	54	205	55	290	36	173	85	90	74
Secondary education	107	17	122	31	116	31	116	31	294	36	12	6	19	16
Vocational education	2	0	4	1	5	1	5	1	39	5	0	0	2	2

	Dak Cheung District										Sanxay District			
	Koumban Xiengluang		Koumban Dak Duem		Koum Ban Nam Dae		Koumban Xekamarn		Akkelad (Dak Cheung)		Nam Zou		Other villages	
	(N=640)		(N=397)		(N=378)		(N=376)		(N=812)		(N=204)		(N=122)	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
University education	6	1	25	6	3	1	3	1	99	12	2	1	1	1
Not going to school age	5	1	6	2	16	4	16	4	16	2	25	12	7	6

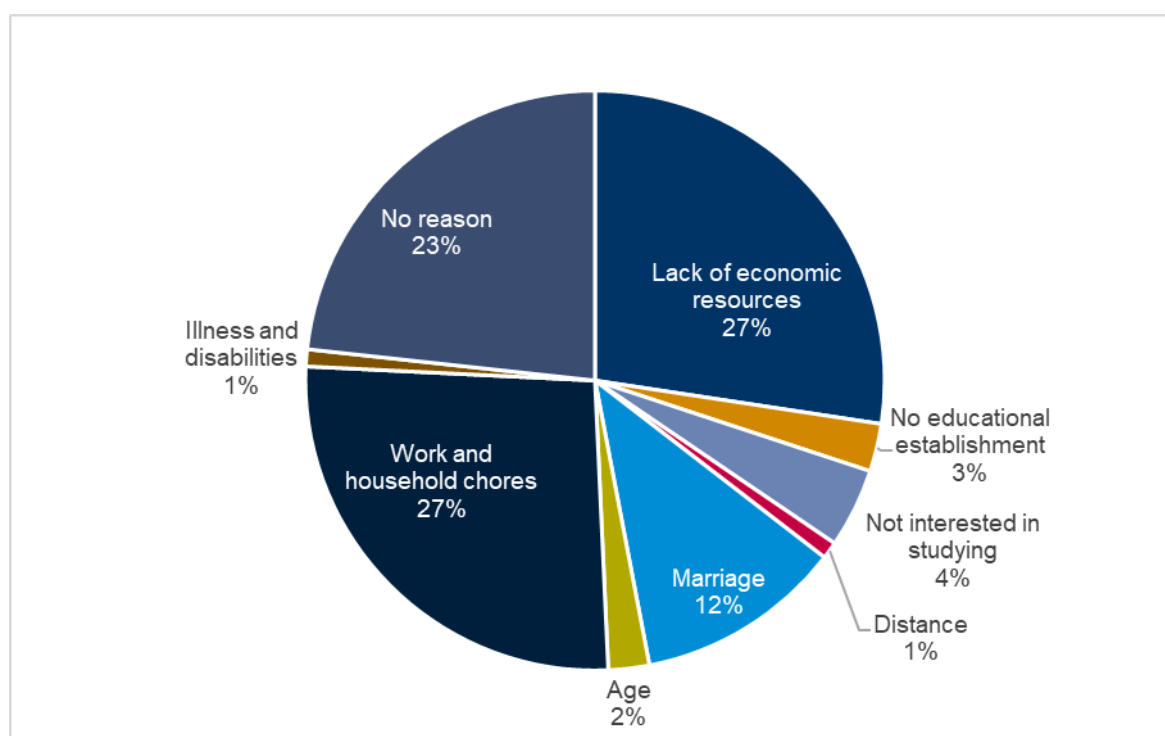
Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

The FGDs and KIIs with youth and village heads in Dak Cheung District reveal that average dropout age of school for both girls and boys is around the age of 14 to 17 years old. While the average dropout age of Sanxay District is between 12 and 13 years old. The main reasons for dropping out are the lack of economic support from families and work (such as work on families' farms and work as laborers) to earn additional income for the families, particularly in poor families.

The FGD and KII findings are supplemented by the socio-economic HH survey which reveals that the main reasons for discontinuing their study are work and household chores (27%), lack of economic resources (27%), no reason provided (23%), marriage (12%), no interests in studying (4%), and no educational establishments (3%) (**Figure 8.42**). "No reason" given by some respondents can be interpreted as certain individuals dropping out early following the social norms in the area.

The average age to start helping their families by working on farms is between 10 and 13 years old for both boys and girls. Girls usually help with housework (cooking and cleaning), weeding at the farm, and collecting firewood. Boys usually work on the farm such as ploughing the rice farm, fencing of the farm, and other farm works. After graduation or drop-outs, men would be engaged in agricultural work and work as laborers in hydropower projects such as Xekamarn 3 Hydropower and E Moon Hydropower transmission line, while women would work in coffee collection and removing weeds in coffee plantations in Paksong and Pakxe Districts of Champasak province, which are located around 150 – 200 km from the villages. Particularly youth in Sanxay District indicated that both men and women also work as laborers in Chinese banana plantations, such as in Nam Noi area, Ban Phia Keow, and Xaysettha District, Attapeu Province. These plantations are located around 70-90 km from the villages.

Figure 8.42: Reasons for Discontinuing Study



Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

Current scholarships and skills training available in the village are mostly livelihood related, with a few related directly to education. These programs, training, and scholarships include:

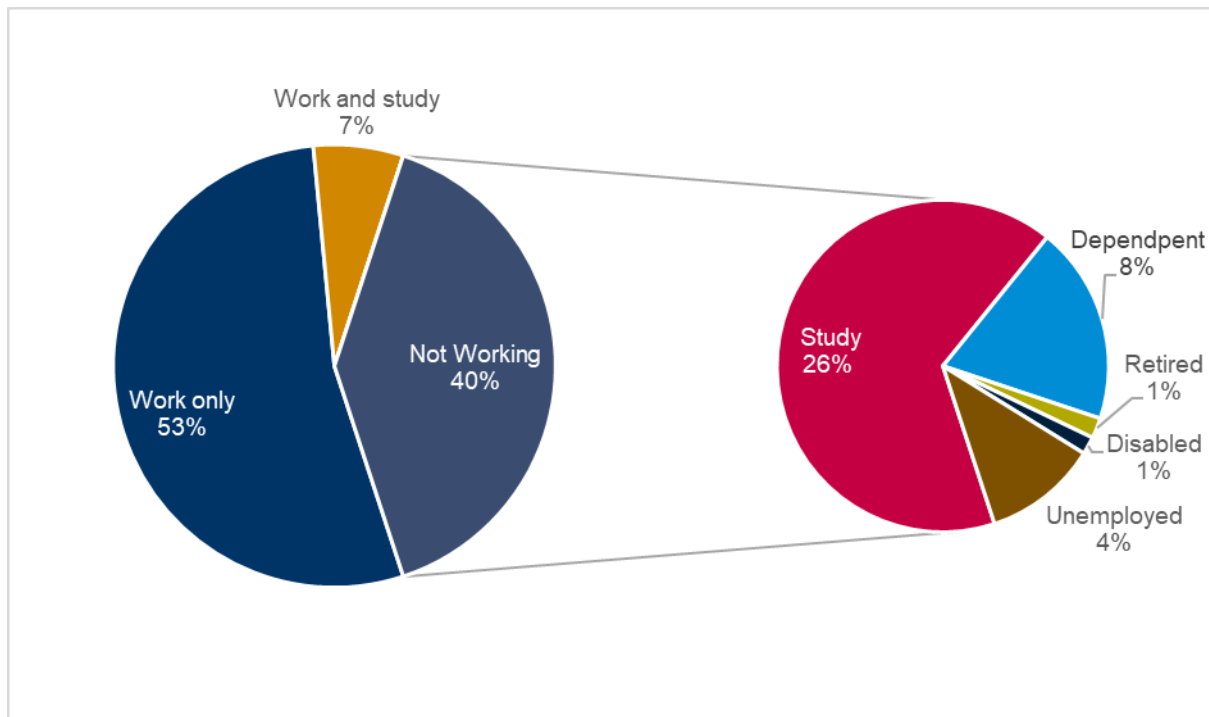
- In last 2 years, the Taiwanese Government has been offering scholarships for students in Xiengluang village;
- The provincial government provides scholarships for education for poor families; and
- Asian Development Bank (ADB) project assisting in further education for boys and girls in Dak Cheung, Dak Muan, Dak Dom, Dak Xeum villages.

Labor Force

Based on the HH socio-economic survey regarding work engagement in the past 12 months (**Figure 8.43**); of the 2,769 surveyed population, 1,664 people (60%) of the population are in active labor force while the remaining of 879 people (40%) are not engaged in any kind of work as they are in school (728 people or 26%), dependent on the family or remittance (213 people or 8%), incapable of work due to mental or physical disability (19 people or 1%), in retirement (22 people or 1%), or unemployed (123 people or 4%).

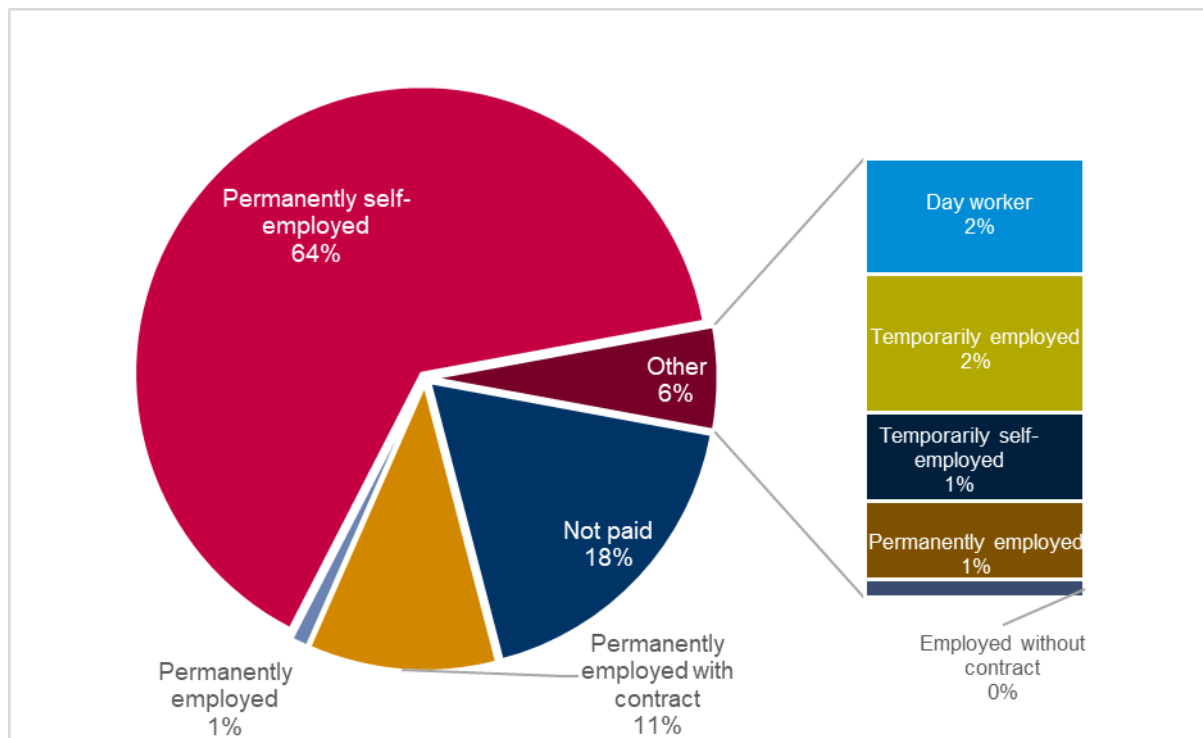
In addition, the survey reveals that of the 1,664 people who are actively working, the majority (58%) are engaged in permanent or self-employed work (such as agriculture and livestock), followed by engaged in unpaid work (such as work in family farms) (22%), and permanently employed with contracts (such as civil servants and company employees) (13%), respectively (**Figure 8.44**). Most of the workforce (1,158 people or 83% of active workforce) work within a short distance from the village while the remaining work in other villages or cities (17%).

Figure 8.43: Active Labour Force of the Surveyed Population



Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

Figure 8.44: Types of Employment (for Primary Occupation)



Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

Working Status

Disaggregated data of working status of surveyed population is presented in **Table 8.34**, Koumban Dak Duem have the highest rate of its population in active workforce (71%); of which they are engaged mostly in permanent work (e.g. agriculture and livestock) (73%), followed by unpaid work (working on families' farms and housework, etc.) (24%), and temporary employment (labourers in hydropower projects and coffee plantation) (5%). On the other hand, Koum Ban Nam Dae have highest ratio (45%) of its population not engaged in any kind of work, the main reasons for no work engagement are shown in **Figure 8.43**.

Table 8.34: Working Status of Surveyed Population

	Dak Cheung District										Sanxay District			
	Koum Ban Xiengluang (N=617)		Koum Ban Dak Duem (N=396)		Koum Ban Nam Dae (N=354)		Koum Ban Xekamarm (N=225)		Aekkalad (Dak Cheung) (N=801)		Nam Zou (N=272)		Other villages (N=144)	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Active workforce	382	62	282	71	194	55	132	59	463	58	139	51	80	56
Unpaid work	119	31	67	24	30	15	12	9	66	14	3	1	3	2
Temporary	23	6	14	5	3	2	8	6	20	4	2	1	2	1
Permanent	227	59	206	73	160	82	113	86	365	79	134	49	75	52
No work	235	38	114	29	160	45	93	41	338	42	133	49	64	44

Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

Migration

Through FGDs and KIIs with village heads and youth groups, migration is not a prevalent phenomenon in the area. Prao village had the highest rate of out-migration of 10 households (out of 80 households) migrated to work in urban area, while the remaining villages only have a few or no out-migration. Other villages (i.e. Dak Padou and Nam Ngonnuea) identified that 20-30 households have temporarily migrated to banana plantations in other areas to earn additional income.

The out-migrated population consist of mostly men migrating for work as labourers in bigger cities such as Attapeu, Pakxe, Pakxong; some working in coffee and banana farms; and some working in E Moon hydropower project and traveling back home once per week. Additionally, the FGDs with youth group added that a few youth in the villages have temporarily migrated to bigger cities for higher education such as vocational education, college or university education.

In-migration identified were mostly government employees, for instance, in Dak Den village 10 soldiers, three police and two teachers migrate from other districts/provinces.

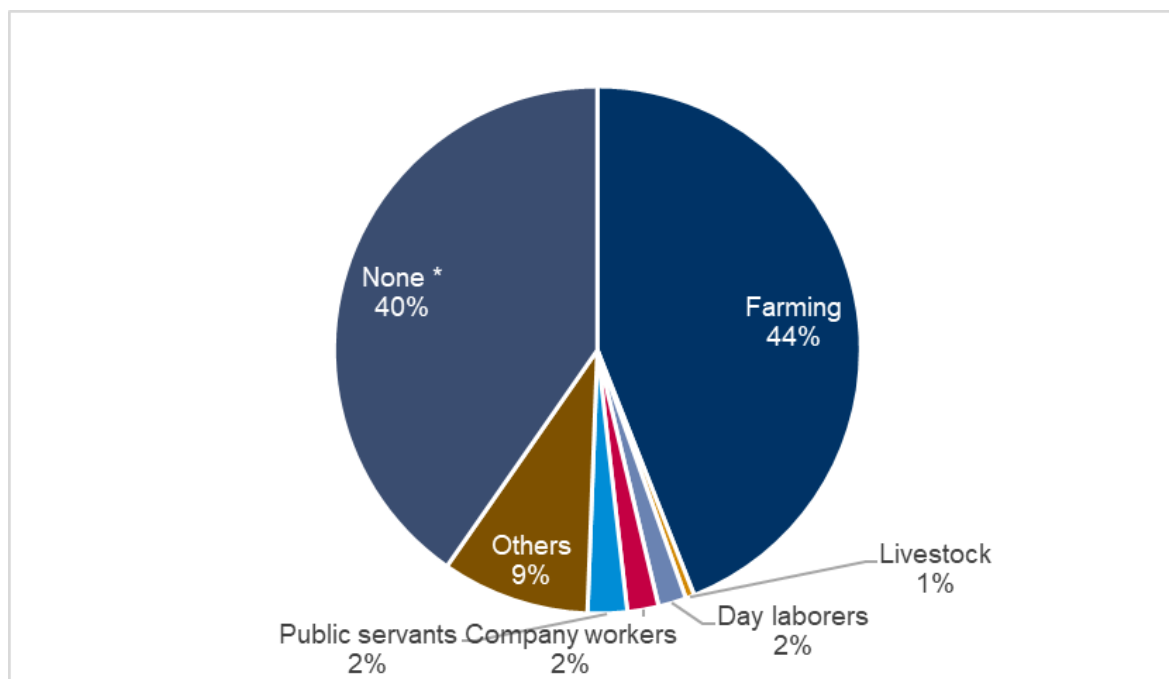
8.5.3.2 Livelihood Engagement

Main Livelihoods

The main livelihoods identified through FGDs and KIIs with livelihood groups and local authorities were land-based livelihoods i.e. engagement in agricultural activities including rice farm, coffee and cassava cultivation, livestock and non-timber forest products (NTFPs) collection.

Of the 2,302 surveyed population, the largest percentage (45%) is engaged in land-based livelihoods with farming (44%) and livestock (1%). Wage-based livelihoods have the second largest working population including company workers (2%), day laborers (2%), and public servants (2%). Only approximately 1% of the surveyed population are engaged enterprise-based livelihoods such as small shops/retail shops and production of handicrafts for sale. Other livelihoods include soldiers, traditional medicine healers, retired, volunteers, etc. No livelihoods (*none) are identified by the survey population as studying, children, being in the army, and unemployed (**Figure 8.45**).

Figure 8.45: Livelihoods of the Surveyed Population



*Note: No livelihoods identified by surveyed population as still studying, children, unemployed, and being in the army

Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

Table 8.35 presents livelihoods of the surveyed population by koumban. Land-based livelihood is the main livelihood for all koumbans, followed by wage-based livelihood and enterprise-based livelihood, respectively.

Table 8.35: Livelihoods of the Surveyed Population by Koumban

District		Dak Cheung District										Sanxay District			
Koumban		Xiengluang		Dak Duem		Nam Dae		Xekamarn		Aekkalad		Nam Zou		Other villages	
		(N=538)		(N=336)		(N=333)		(N=218)		(N=663)		(N=135)		(N=79)	
		N	%	N	%	N	N	%	N	N	%	N	%	N	%
Land-based	Farming	332	62	239	71	160	48	94	43	280	42	129	96	74	94
	Livestock	3	1	3	1	4	1		0	2	0	4	3	0	0
Wage-based	Day laborers	12	2	7	2	5	2	7	3	19	3	0	0	0	0
	Company workers	3	1	0	0	3	1	4	2	44	7	1	1	2	3
	Public servants	2	0	14	4	2	1	8	4	46	7	0	0	0	0

District		Dak Cheung District										Sanxay District			
Koumban		Xiengluang (N=538)		Dak Duem (N=336)		Nam Dae (N=333)		Xekamarn (N=218)		Aekkalad (N=663)		Nam Zou (N=135)		Other villages (N=79)	
		N	%	N	%	N	N	%	N	N	%	N	%	N	%
Enterprise-based	Small business	0	0	0	0	0	0	1	0	8	1	0	0	2	3
	Handicrafts	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Others		75	14	29	9	65	20	25	11	76	11	0	0	0	0
None *		111	21	44	13	93	28	79	36	188	28	1	1	0	0
All surveyed population		538	100	336	100	333	100	218	100	663	100	135	100	79	100

*Note: No livelihoods or 'none' identified by surveyed population as still studying, children, unemployed, and being in the army

Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

Supplementary Livelihoods

Of the 2,302 surveyed population, 1,022 people (44%) have a second occupation, of which 735 people (31%) work are engaged in farming activities, 214 people (10%) work as day laborers, and 81 people (4%) are engaged in livestock. The remaining supplementary livelihoods include NTFPs collection, small businesses, handicraft productions, and others such as homemakers, carpenters, etc. (**Table 8.36**).

Table 8.36: Supplementary Livelihood of Surveyed Households

District		Dak Cheung District										Sanxay District			
Koumban		Xiengluang (N=466)		Dak Duem (N=234)		Nam Dae (N=279)		Xekamarn (N=236)		Aekkalad (N=689)		Nam Zou (N=135)		Other villages (N=79)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
Land-based	Farming	118	25	155	66	64	23	67	28	179	26	63	54	7	16
	Livestock	13	3	15	6	22	8	0	0	19	3	5	4	7	16
Wage-based	Day laborers	48	10	8	3	18	6	17	7	52	8	41	35	30	67
	Company workers	6	1	0	0		0	0	0	0	0	0	0	0	0
	Public servants	0	0	0	0	2	1	0	0	1	0	0	0	0	0
Enterprise-based	Small business	3	1	0	0		0	0	0	3	0	0	0	0	0
	Handicraft production	7	2	0	0	1	0	3	1	0	0	2	2	0	0
Others		12	3	3	1	3	1	3	1	6	1	2	2	1	2
None		259	56	53	23	160	57	146	62	422	61	3	3	0	0

District	Dak Cheung District										Sanxay District			
Koumban	Xiengluang (N=466)		Dak Duem (N=234)		Nam Dae (N=279)		Xekamarn (N=236)		Aekkalad (N=689)		Nam Zou (N=135)		Other villages (N=79)	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
All surveyed population	466	100	234	100	279	100	236	100	689	100	116	100	45	100

*Note: No livelihoods or 'none' identified by surveyed population as still studying, children, unemployed, and being in the army

^Note: NTFP collection data updated following the DMS result

Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

Livelihood Diversification

To understand the resilience to impacts on their livelihoods of the surveyed households, livelihood diversification amongst 2,984 surveyed population was analyzed (**Table 8.37**). In terms of types of livelihoods, 829 out of 2,984 (28%) are dependent on a single livelihood including 467 people (16%) with land-based livelihoods and 45 (2%) with wage-based livelihood, and 314 (11%) with other sources of livelihoods. Approximately 1,011 people (34%) rely on two types of livelihoods, 729 people (24%) get their secondary source of income from land-based livelihoods, 259 people (6%) generated their supplementary income from wage-based livelihood, and 376 people (13%) gain their income from other sources of livelihoods.

Table 8.37: Livelihood Diversification

Livelihood Diversification		Type pf Livelihood	No. of People	%
Primary Livelihood	Secondary Livelihood			
One Livelihood	None	Land-based	467	16%
		Wage Labour	45	2%
		Business	3	0%
		Other sources	314	11%
Total of Population Dependent on One Livelihood			829	28%
Two-Livelihoods	Land-based	Land-based	585	20%
		Wage Labour	209	7%
		Business	1	0%
		Other sources	57	2%
	Wage Labor	Land-based	64	2%
		Wage Labour	2	0%
		Business	0	0%
		Others	2	0%
	Other	Land-based	80	3%
		Wage Labour	3	0%
		Business	5	0%

	Other sources	3	0%
Total of Population Dependent on Two Livelihoods		1,011	34%
No Livelihoods*		1,144	38%
Total		2,984	100%

*Note: No livelihoods or 'none' identified by surveyed population as still studying, children, unemployed, and being in the army

Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

Land-based livelihoods

Cultivation, animal husbandry, and NTFPs collection are the most common livelihoods in all villages and for all ethnic groups. Through the FGDs with livelihood groups, the majority of the people have agricultural production land with average land holding size of 1 to 3 ha per household. The FGDs and KIs with all relevant groups show that the surveyed population are dependent on the forest resources for food, medicine, hunting, firewood, wood for construction of houses, etc.

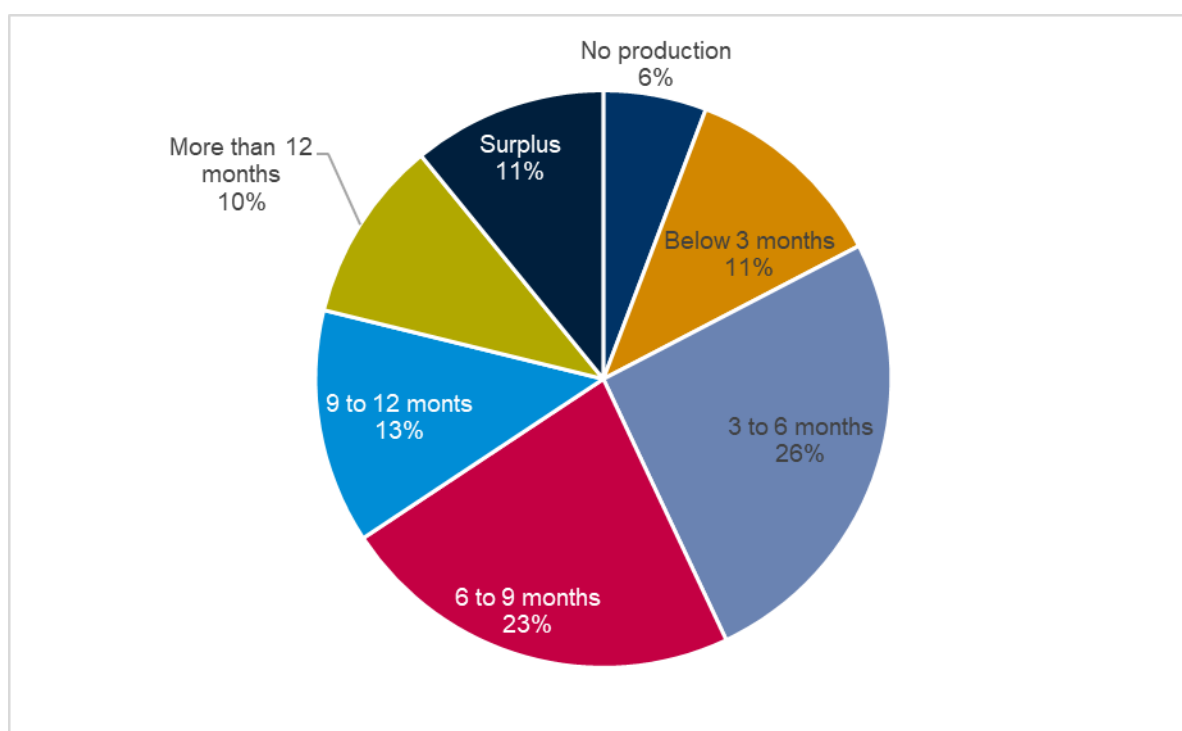
Rice, coffee, cassava, and other crops (such as ginger, ginseng, banana, vegetables, etc.) are commonly grown in most of the surveyed villages. The farmers are engaged in rice farming from May to August/November. Rice and vegetables grown are mostly for household consumption, while other crops such as coffee and cassava are for sale. In general, rice harvested is sufficient for the family for the months of June to October. The FGDs with livelihood groups reveal that the villagers experience rice and food deficiency, particularly during the months October to April as it is dry season, with low to no productivity.

Of a total 449 surveyed households, around half (49%) have sufficient amount of food for household consumption for 3 to 9 months – of which 26% have food sufficiency¹¹⁷ for 3 to 6 months and 23% for 6 to 9 months. Approximately 11% of the surveyed population have food sufficiency below 3 months and 6% have no food production at all (**Figure 8.46**). The Laos Statistic Bureau (2019) indicates that food poverty and food insecurity¹¹⁸ are regular occurrences, particularly amongst poor households in rural areas. In rural areas, 14% of its population experiences mild food insecurity, 12% experiences moderate food insecurity and 11% experience severe food insecurity.

¹¹⁷ The number of households which are food secure

¹¹⁸ Food insecurity refers to a lack of regular access to enough safe and nutritious food for normal growth and development, and to lead an active and healthy life. This can be due to the unavailability of food and/or lack of resources.

Figure 8.46: Food Sufficiency



Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

Table 8.38 presents food sufficiency by koumban (village cluster). Koumban Xiengluang has the highest proportion of population with food sufficiency for lower than 3 months (20%), while the population having food sufficiency for 3 to 9 months constitutes almost 50% of the surveyed households. Whilst koumban Dak Duem appears to have the highest proportion of its households having food surplus (21%).

Table 8.38: Food Sufficiency by Koumban

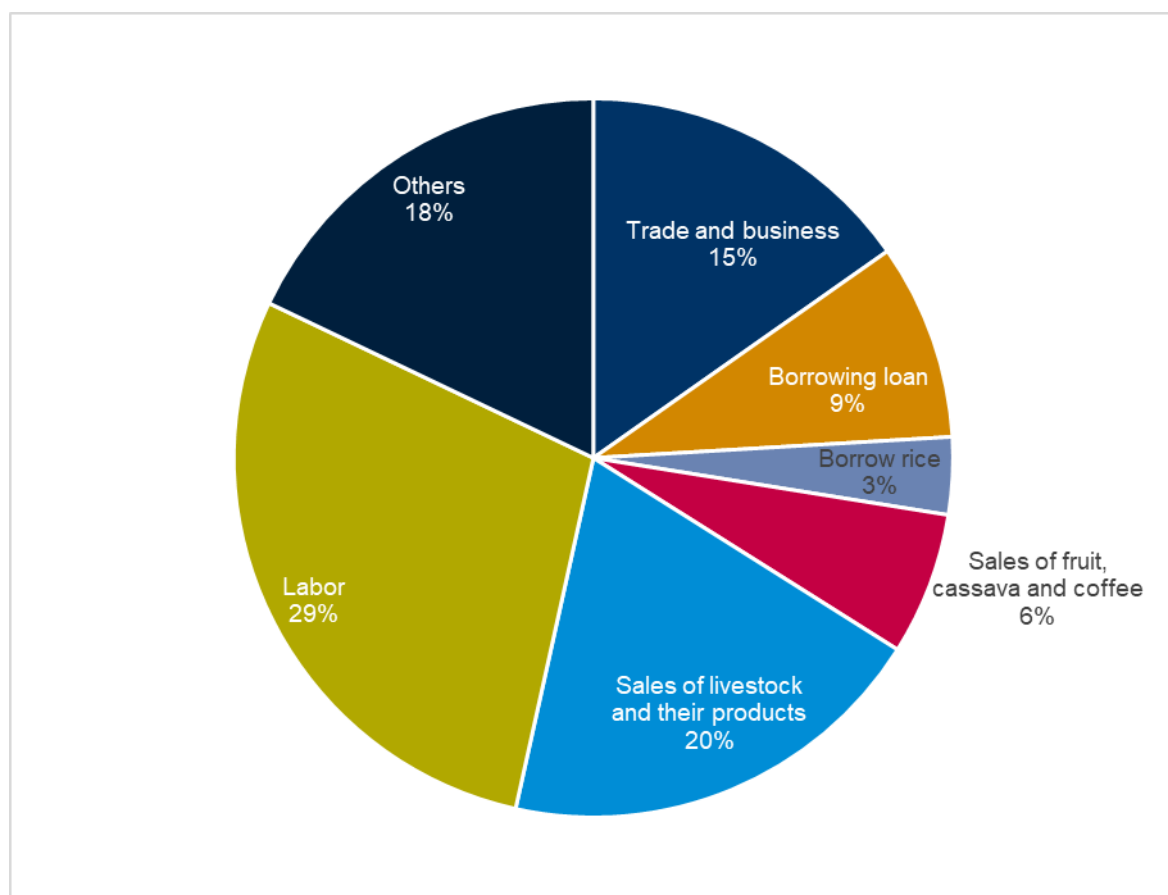
District	Dak Cheung District										Sanxay District			
Koumban	Xiengluang		Dak Duem		Nam Dae		Xekamarn		Aekkalad		Nam Zou		Other villages	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
No production	1	1	9	14	1	2	0	0	15	11	0	0	0	0
Below 3 months	16	19	5	8	5	8	3	9	14	11	7	15	2	8
3 to 6 months	18	21	8	12	23	38	8	25	36	27	19	40	3	12
6 to 9 months	23	27	14	21	15	25	9	28	24	18	8	17	9	35
9 to 12 months	11	13	11	17	10	17	2	6	12	9	7	15	6	23
More than 12 months	8	9	5	8	3	5	5	16	15	11	5	11	5	19
Surplus	8	9	14	21	3	5	5	16	17	13	1	2	1	4
Total	85	100	66	100	60	100	32	100	133	100	47	100	26	100

Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

Figure 8.47 presents approaches deployed by the surveyed households to make up for household food insecurity. Of the total 375 surveyed households, 29% indicated that they would work as laborers to earn additional income for food purchase, 20% sell livestock and their products, 15% are engaged in trades and business, and 18% have other approaches including handicrafts (e.g. blacksmith and bamboo products), NPFTs collection, service, or are dependent on income from other family members.

Notably, 9% indicated that they would borrow loans, which are understood to be loans from friends and relatives from the same village, and 3% would borrow rice from their friends and relatives in the same villages. This practice of borrowing and exchanging food, products and money within villages show that these villages have a strong social cohesion and established relationships to help each other overcome hardships. It is noted that micro-credits/micro-finance schemes are not currently available in the villages.

Figure 8.47: Approach for Making Up for Food Insecurity



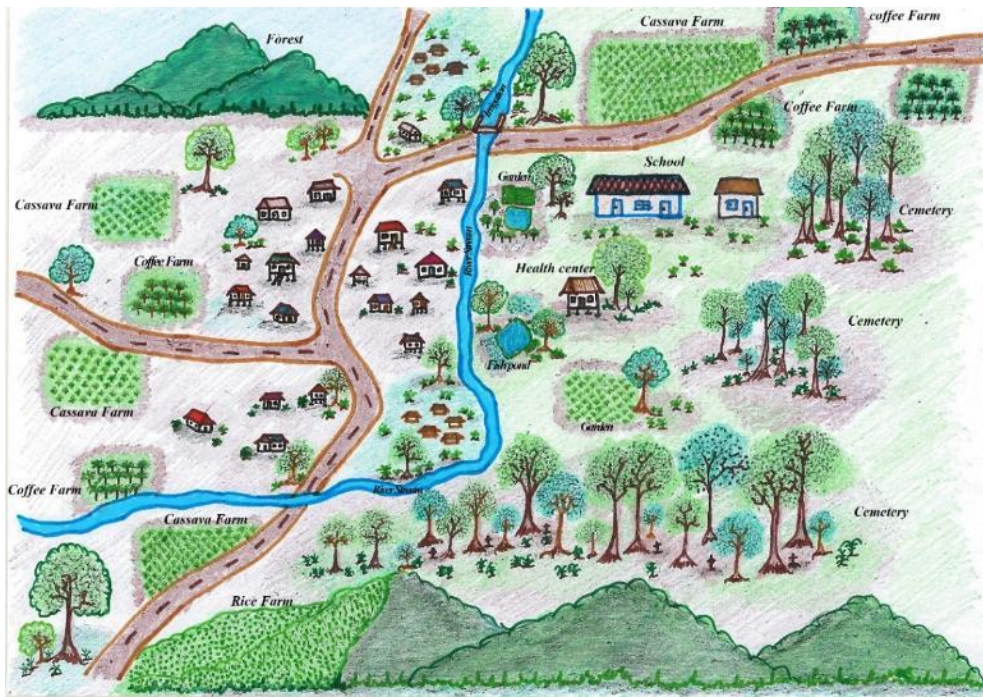
Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

Cultivation, animal husbandry, and NTFPs collection activities are the common livelihoods across surveyed villages. **Figure 8.48** presents an overview of cultivation land, forestry land, cemetery, and village facilities and public services such as school, health centre and Salakuan.

Figure 8.48: Agro-Forestry Production Area



Agriculture production area map of Dak Jom Village, Dak Cheung District



Agriculture production area map of Dak Samor Village, Sanxay District

Source: Site visit and FGDs undertaken by ERM/Innogreen, November and December 2021

Cultivation

The following section summarizes the main cultivation practises in the Study Area.

Rice: Based on the land and asset survey conducted in November 2021, the cultivated rice paddy area ranges from 0.1 to 3 ha and the average rice farm area is approximately 0.1 ha or 1,000 m² (refer to **Figure 8.49** for photos of common rice cultivation). Rice farms are usually located in low land areas and close to streams as they require sufficient water for irrigation and productivity. Therefore, rice farms are cultivated in fixed locations with limited suitable land plots, and rice farming is not part of the shifting cultivation practices. The rice productivity varies across households, with minimum of rice productivity around 300 kg/year, and maximum of rice productivity around 90-100 ton/year. The average price of rice is between 3,000 and 6,000 kip/kg.

Coffee: The FGDs with livelihood groups indicate 90% to 100% of the villages are engaged in coffee cultivation (mainly Catimor coffee) (**Figure 8.49**). The coffee plantations are located between 3 km to 10 km from the households. Coffee is usually planted during March to April and takes around three to four years to yield productivity. Between November and January was identified as the busiest time of the year due to the coffee harvesting season. The average coffee plantation size is 0.14 ha and the average productivity of coffee is approximately 1 ton/household/year. The price for coffee is approximately 5,000 kip/kg in urban Dak Cheung, and the coffee is sold in the villages and urban Dak Cheung.

Cassava: Cassava is planted around March/April and it takes about one year for productivity, while harvesting of cassava is around November/December. Cassava productivity ranges from 3 ton/household/year (**Figure 8.49**).

Figure 8.49: Examples of Cultivation



Rice cultivation in Dak Treb Village



Rice cultivation in Dak Rant Village



Drying rice in Dak Dom Village



Rice storage in Dak Dor Village



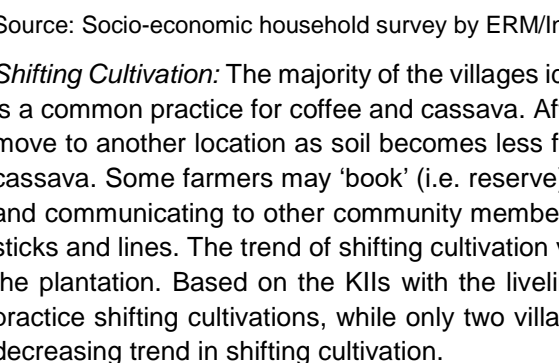
Coffee cultivation in Tong Xieng Village



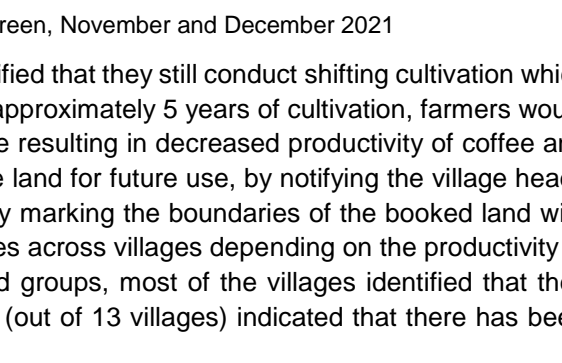
Coffee cultivation in Daklarn Village



Cassava cultivation in Dak Nong Village



Cassava cultivation in Dak Treb Village



Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

Shifting Cultivation: The majority of the villages identified that they still conduct shifting cultivation which is a common practice for coffee and cassava. After approximately 5 years of cultivation, farmers would move to another location as soil becomes less fertile resulting in decreased productivity of coffee and cassava. Some farmers may 'book' (i.e. reserve) the land for future use, by notifying the village heads and communicating to other community members by marking the boundaries of the booked land with sticks and lines. The trend of shifting cultivation varies across villages depending on the productivity of the plantation. Based on the KIIs with the livelihood groups, most of the villages identified that they practice shifting cultivations, while only two villages (out of 13 villages) indicated that there has been decreasing trend in shifting cultivation.

Farming methods: Intercropping is practiced among survey villages, as mentioned during KIIs. Intercropping is cultivation of two or more crops simultaneously on the same field. The common crops for intercropping are rice, coffee, and cassava. The farming methods are still labour-intensive as the use of agriculture machinery is still limited in this region. In most villages, there are no irrigation system for their production land due to the mountainous terrain and the dry climate of the regions, resulting in limited water resources for irrigation. Irrigation is mostly available only for rice cultivation as rice requires sufficient water to grow and reach productivity (**Figure 8.50**).

Figure 8.50: Irrigation for Cultivation



Irrigation for rice paddy in Dak Rant Village



Irrigation in Dak Rant Village

Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

Animal Husbandry

In the surveyed villages, people raise animals in large numbers, including both large animals such as buffalos, cows, goats and pigs, and small animals such as poultry. Large animals are released to graze outside the village and in the mountain areas where grass is available. Pigs and poultry are usually raised in the yards around the house. Animal husbandry is mainly for household consumption, performing ceremonies, and annual festivals (i.e. animal offerings) and for welcoming the visit of relatives and village official guests. Approximately ten households practise animal husbandry in large number for sale and is the main income source for the households (**Figure 8.51**).

Figure 8.51: Animal Husbandry



Buffalos grazing in open grassland in Dak Rant Village



Buffalos are kept under the house in Dak Yen Village



Cow husbandry in Dak Rant Village



Pig husbandry in Dak Yen Village

Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

NTFPs Collection

Livelihoods of the Project-affected households are still highly dependent on natural resources such as forests and rivers. Households surveyed collect food e.g., bamboo, mushrooms, and wood for cooking (firewood) and construction of houses from the forests. Linzhi mushroom and Dok Lhai have been identified as the most common and wanted NTFPs as these products have high local value. Based on the FGD in Dak Lern on 19 July 2022, some of the households in Dak Lern are engaged with timber and non-timber forest collection, both for subsistence and commercial/trading. In addition, it was informed by the village head that NTFP collection activity of Dak Lern villagers in Dak Lern area will not be affected by the Project. He believes that the establishment of the Project facilities will open other areas for NTFP collection. There are “middlemen” from nearby cities and Vietnam that come into the village to buy these products (e.g. Linzhi mushroom, Dok Lhai, ginseng), or these products will also be sold at local markets. In addition, subsistence hunting is practised, mostly small animals such as wild chickens, squirrels, wild birds, etc. are hunted for household consumption and extra may be sold to the markets (**Figure 8.52**).

In general, women and men collect the same NTFPs according to seasonality. However, the main difference for gender-based NTFP collection is that men are capable of access to deeper/further part of forests to collect NTFPs than women and mostly hunting activities are practiced by men. **Table 8.39** presents NTFP collection seasonal calendar, frequency and amount of collection and price of each NTFP.

Table 8.39: NTFP Seasonal Calendar

Season (month)	Type of NTFP	Frequency of collection/month	Amount collected/time	Purpose	Process of NTFP	Price (Kip/Kg)
Jul - Dec	Dok Lhai (a medicinal flower sold to Vietnam)	5, 10, 20 times per month depending on the households	100 gram – maximum 2 kg. Sometimes none.	Commercial only	No	250,000 – 1,500,000 LAK/kg (price depends on the quality and size of Dok Lhai)

Season (month)	Type of NTFP	Frequency of collection/month	Amount collected/time	Purpose	Process of NTFP	Price (Kip/Kg)
Jul - Nov	Linzhi mushroom (small)	5, 10, 20 times per month depending on the households	500 gram to max 2 kg. Sometimes none.	Commercial only	No	80,000-200,000Kip/kg
	Linzhi mushroom (large)					5,000Kip/kg - 80,000Kip/kg
Aug - Sep	Dok Sao Nam Khung	5-6 times	Amount varies a lot—from none to a few kgs.	Commercial and household use	No	600,000-1000,000kip/kg
Jan - Mar	Broomgrass	More than 5 times (depends on each family)	Minimum 1 bundle	For household use and for sale	Processed at household level	Small bundle 5000Kip/bundle Large bundle 20,000-30,000kip/bundle
All year round	Wood (<i>Mai Baek</i>)	-		For household use and commercial	Processed at household level	5000-50,000Kip/kg
Jan - Mar	Rattan	-	1-3 kg	For household use and commercial	Processed at household level	5000 Kip/kg
-	Somsamongling (ginseng)	-	Due to limited availability, villagers could only collect small amount	For household use and commercial	No	1 million Kip/kg
-	Bamboo shoots	-	-	For household use and commercial	Processed at household level	Raw bamboo is sold at 20,000 Kip/kg while fermented bamboo is sold at 30,000 Kip/kg
-	Honey	-	-	For household use and commercial	Processed at household level	-
-	Orchids	-	-	Commercial only	Processed at household level	The following flowers are sold Hang-Yao, Kai-Kua and Lai Noi

Season (month)	Type of NTFP	Frequency of collection/month	Amount collected/time	Purpose	Process of NTFP	Price (Kip/Kg)
-	Agarwood (<i>Por Hueng</i> in Laos language) – a high-valued fragrant resinous dark wood	-	-	Commercial only	Processed at household level	-

Figure 8.52: NTFPs Collection



Dok Lhai collection in Dak Kung Village



Selling of hunted small wild life in Xiengluang Village

Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

8.5.3.2.1 Wage-based livelihoods

Waged labour

FGDs with livelihood groups indicated that some men from the villages work as labourers in hydropower projects in E-moon Hydropower and Xekamarn Hydropower, while women are engaged in coffee collection in bigger provinces such as Pakxong and Pakxe Provinces. Some households from Sanxay District work as labourers in banana plantation in Nam Noy area, Ban Phia Keow and Xaysettha District, Attapeu Province (70-90 km from the villages).

Civil Servants

The fewest number of actively working people surveyed are engaged as civil servants (60 people or 2%). Most are living in the locality and the common positions are teachers; however, some of the teachers and police in-migrated from other districts or provinces.

Handicraft

In addition to engagement in agricultural production, the people in the villages also have the traditions in production of various handicrafts products including blacksmith products, weaving and bamboo item handicrafts. Weaving is predominately conducted by women while blacksmith products are typical conducted by men. The handicrafts products are mostly for household consumption; some people may

be able to produce extra and sell them in the markets. The most outstanding handicraft products are Ban Dak Treb of Dak Cheung District, Ban Dak Dor and Ban Dak Nhok of Sanxay District where the people in these villages have the tradition in smith-work that can generate income for the families. Examples of handicrafts are shown in **Figure 8.53**.

Figure 8.53: Handicrafts



Ironsmith handicraft in Dak Xuem Village



Weaving in Dak Ta-ok Noi Village



Ironsmith handicraft in Dak Treb Village



Bamboo handicrafts in Dak Nong Village

Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

8.5.3.2.2 Enterprise-based livelihoods

According to the data from the field survey, in the Study Area, there is no trade facility. There are only a few retail shops in some villages on the roadsides, which sell food and consumer goods for daily use. Within the Project and surrounding areas, there is no industrial factory. Industrial factories are located in the surrounding area of the municipality of the District and these factories are mostly of small-scale industrial factories, such as: small furniture factory, rice mill, automobile repair shop, drinking water factory, ice-making factory. Small scale retail shops in the Study Area are shown in **Figure 8.54**.

Figure 8.54: Small Businesses



Retail shop in Dak Dor Village



Retail shop in Trong Mueang Village

Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

8.5.3.2.3 Livelihood Trainings and Programs

According to secondary data and information gained through KIs, trainings and programs have been provided by the government and non-governmental organizations (NGOs) to improve agricultural practices, livelihoods, and food sufficiency for the Project affected communities. These trainings/programs include the following:

- International Fund for Agricultural Development (IFAD) program supporting agriculture and livestock practice and production, providing training in weaving for women;
- Workshops by the Ministry of Agriculture and Forestry (2021) for soil preparation for coffee plantation (part of the Greater Sub-Region Biodiversity Conservation Corridors Project funded by Asian Development Bank);
- World Food Programme promoting nutrition and providing lunch and water supply for schools;
- German-Laos Association Development (GLAD) supporting people in livestock such as providing goats, pigs and pepper plants;
- Training by CARE International on coffee planting skills;
- Government relation department providing scholarship to women for vocational weaving;
- PRF providing funds to build school in Prao, Dak Pam, Dak Den, Xiengluang, Dak Yen, Tong Xieng, Dak Kung, Dak Dom, Dak Treb, Dak Xeum Dak Dor, villages;
- Scaling Up Participatory Sustainable Forest Management (SUFORD) providing assistance and promoting forest consumption management; and
- District Agriculture and Forest Office providing seeds and collaboration with organizations and companies to provide assistance and support to people within the district.

8.5.3.3 Income and Expenditure

Data available from 443 surveyed households was used in the financial analysis, which is discussed in more details in the following section.

Income

The average monthly household income of the 443 surveyed households over the past 12 months is LAK (Laotian Kip) 1,272,593 (approximately USD 110), and the average monthly income per capita (per person) is LAK 199,954 (approximately USD 18), which is lower than the national average of LAK 1,588,000 (USD 175.5) per households per month¹¹⁹ and the provincial average household income of LAK 1,200,000 per month (approximately USD 123.73).¹²⁰ The monthly income per household and per capita varies across Koumbans. Akkelad villages in Dak Cheung District has the highest average monthly household income of over LAK 2,500,000 (approximately 217 USD), while Koumban Nam Dae has the lowest average monthly household income of LAK 200,470 (approximately 17 USD) (over 10 times less than those of Akkelad villages) **Table 8.40** provides the average monthly household income by Koumban.

Table 8.40: Average Monthly Household Income by Koumban

District	Dak Cheung District					Sanxay District	
Koumban	Xiengluang	Dak Duem	Nam Dae	Xekamarn	Akkelad	Nam Zou	Other villages
Average Monthly Income per Household (LAK)	942,834	1,725,018	200,470	1,722,094	2,540,679	744,078	1,032,981
Average Monthly Income per Capita (LAK)	132,794	246,431	23,310	277,757	403,282	128,289	187,815
Minimum Monthly Household Income (LAK)	41,667	41,667	63,333	125,000	121,667	83,333	158,333
Maximum Monthly Household Income (LAK)	45,916,667	8,333,333	3,583,333	7,000,000	11,633,333	3,875,000	3,666,667

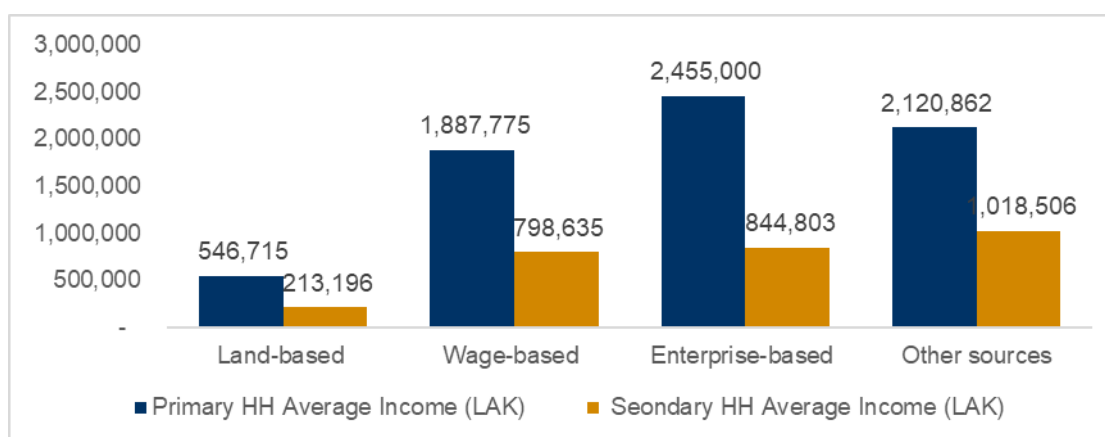
Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

Table 8.41 presents disaggregated average monthly household income by livelihood type. Land-based livelihoods contribute to the lowest average HH income—LAK 546,715 (approximately USD 48) for primary income sources and LAK 213,196 (approximately USD 19) for secondary income source. Wage-based and enterprise-based livelihoods have significantly higher average HH income than that of land-based livelihood by 3.4 times and 4.5 times, respectively. In addition to the main livelihood types discussed, other sources of income (such as handicrafts, NPFT collection, remittances and pension) contribute to approximately LAK 2,000,000 (approximately USD 174) HH monthly average income.

¹¹⁹ Laos Statistics Bureau (2021). Report on economic growth in Laos PDR in 2020 and trend in 2021. The average household income at national level is LAK 19,056,000 (USD 2,106.6) annually in 2020 (average exchange rate in 2020)

¹²⁰ Laos Statistics Bureau (2021).

Table 8.41: Average Monthly Household Income by Livelihood Types



Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

Expenditure

The average monthly expenditure of 443 surveyed households is LAK 728,375 per month (approximately USD 65). The average monthly household income (LAK 1,272,593) is approximately 1.7 times higher than the average monthly household expenditure (**Table 8.42**).

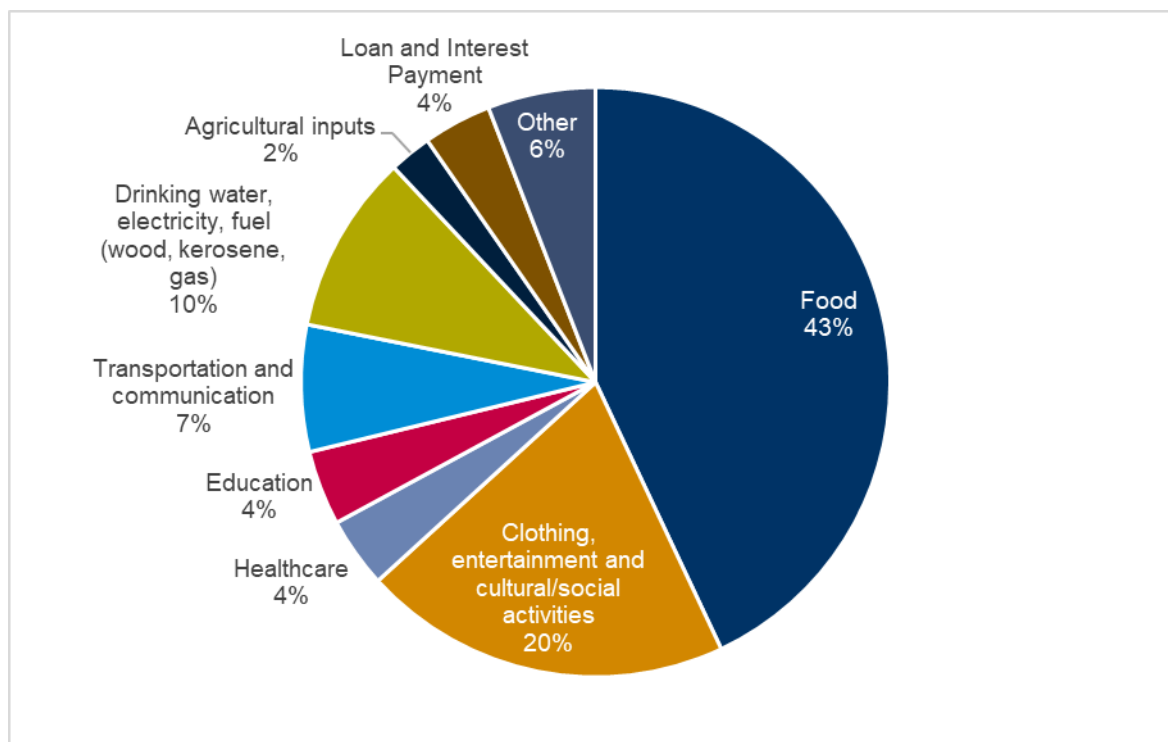
Table 8.42: Average Monthly Household Expenditure by Koumban

District	Dak Cheung District					Sanxay District	
Koumban	Xiengluang	Dak Duem	Nam Dae	Xekamarn	Aekkalad	Nam Zou	Other villages
Average Annual Expenditure per Household (LAK)	6,697,908	10,889,594	1,956,500	12,888,342	17,935,400	5,455,745	5,360,000
Average Monthly Expenditure per Household (LAK)	558,159	907,466	163,042	1,074,029	1,494,617	454,645	446,667
Average Monthly Expenditure per Capita (LAK)	78,614	129,638	18,958	173,230	237,241	78,387	81,212
Minimum Monthly Household Expenditure (LAK)	2,700,000	90,000	760,000	13,000,000	850,000	560,000	900,000
Maximum Monthly Household Expenditure (LAK)	35,000,000	67,000,000	30,000,000	46,000,000	135,000,000	32,000,000	15,000,000

Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

Figure 8.55 presents average monthly expenditure by item, which shows that most of the expenditure is spent on food (43%), followed by clothing, entertainment and cultural/social activities (20%), Drinking water, electricity, fuel (wood, kerosene, gas) (10%), transportation and communication (7%), and education (4%) and healthcare (4%). Other expenditures incurred to the households are presented in **Figure 8.55**.

Figure 8.55: Average Monthly Expenditure by Expenditure Items



Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

Based on the socio-economic HH survey, almost half of the surveyed households are in debt. Some 191 households (43%) of the surveyed households identified that they are in debt, while 256 households (57%) identified that they have no debts in the past 12 months.

8.5.3.4 Land Use and Tenure

The Department of Land under Ministry of Natural Resources and Environment (MONRE) is the main governmental authority responsible for land administration. The 2019 Land Law recognizes land use rights of individuals, legal entities, collectives, and organizations of Lao citizens, and stipulates that these rights are to be managed through registration in land books, certification of land use, issuance of land titles and registration of transfer and changes of land use rights. The land title is the primary document that proves land use rights.

There are two land registration methods by which individuals can register the land that they are using lawfully. First is systematic land registration, which is carried out throughout a designated area where land allocation, zoning, or classification is required. Systematic registration confers a Land Title. Second, persons or entities can make application to certify their right to use certain land. Land certificates are issued certifying the temporary right to use agricultural or forestland which is issued by District level authorities.¹²¹

¹²¹ Giz, 2015

During the past two decades, it has become a common practice in Laos for individuals to claim land ownership over plots that they do not legally own and sell such plots despite lacking a formal land title, after having their ownership certified by the village authorities. The process to obtain a land transfer certificate only requires an agreement between the buyer and seller, payment of the land use tax and the certification of village authorities. In this manner, some buyers were also able to have land titles issued by MONRE, using the land use tax payment or land certificate as evidence of their ownership. Following the enactment of the 2019 Land Law, the requirements for formal land purchase are more widely known and therefore this informal form of land transaction has reportedly become less common.

Within the 23 villages located in the vicinity of the Project Area in Dak Cheung District, privately held land plots cover nearly all areas, which are primarily agriculture land in the form of paddy fields, ranging from 1 to 3 ha. Most households have land use certificates and tax payment evidence for the land plots which they reside and conduct cultivation.

The FGDs with livelihood groups found that in the Project Area, land use and tenure include:

Booking land: this is a traditional system, which is not recognized in Laos law. Village members claim or 'book' land for farming (or so-called booking) (e.g., rice, cassava, and coffee) by notifying the village heads and communicate to other village members by marking the booked land with sticks and lines or threads. The one who booked the land will then pay tax on this land to the village head. This land then can be used in the future for farming. After a few years (3-5 years) of farming, the land may become less fertile and less agriculturally productive, land users will move to claim a new piece of land for farming and 'book' the old piece of land which they may come back in the future to farm on this land again. This is understood to be a part of shifting cultivation practice.

Booked land can be inherited as land tax receipts are recognized by local authorities as evidence for land ownerships. Inherited booked land can transfer into land use right (land use certificate) or land title by informing the village authority and District Natural Resource and Environment office to determine the land and issue a letter to confirm land ownership.

Booking land within village communal land or production forest cannot be transferred to land use right nor land titles. The village authorities and the District Natural Resource and Environment Office will conduct survey and determine that such claim do not comply with the policy of the districts and provinces and the Land Law.

Land use certificate: This refers to a document that certifies the land use right. It is issued by relevant State agency in pursuance of the policy on land allocation for Lao people to use as place of living and farming.

Individuals, legal entities, and organizations who are granted land use rights shall use their lands in accordance with their purposes and in consistency with the Land Allocation Master Plan, land use strategy and land use plan adopted by the State for each time period (Land Law 2019, Article 86).

Article 126 of 2019 Land Law prescribes acquisition of land use rights. Lao citizens including Lao legal entities and organization will acquire land use rights on one of the following bases:

- Allocation by the State;
- Transfer
- Inheritance
- Sale of allocated State land use rights with determined timeframe as prescribed in Article 123 of 2019 Land Law.¹²²

Land titles (bai taa din): A land title is the only document considered as the main evidence for permanent land use rights. Titles formally mark the boundaries of land, and the holders of land use

rights may protect, use, lease and transfer these rights, as well as bequeath or otherwise pass these under inheritance law (Land Law 2019, Article 99). However, land titles are generally only seen in urban and peri-urban areas and the process of obtaining them and paying for systematic adjudication is expensive. Mostly households in the affected villages do not have land titles; however, some land titles are under preparation.

Community land and community forest: All community members can access and make use of community land and forest equally. There is no system for management of community land and forest undertaken by the villages such as community forest management plan. However, local authorities periodically conduct monitoring to see if the forest use by the villages was undertaken in accordance with the Lao laws and requirements.

50% of the interviewees asserted that land ownership is mostly in men's names (or the head of the family), while the other 50% stated that ownership is equal between men and women. The average land holding size is ranging from 1 to 3 ha per household. In general, the local people are not concerned about land tenure in the form of land titles because land ownerships are recognized within their villages. Moreover, it is costly for the people to obtain land use certificate or land titles for their booking land.

The Detailed Measurement Survey (DMS) conducted in June-July 2022 suggests that, of 396 affected land parcels, 15 land parcels have land titles (3.8%), 320 land parcels have land tax payment receipts (80.8%) and 61 land parcels are booking land (without land ownership documents e.g., land tax receipts) (15.04%). Refer to the Resettlement Plan (RP) for more details on Project land acquisition impacts.

8.5.3.5 Health and Healthcare

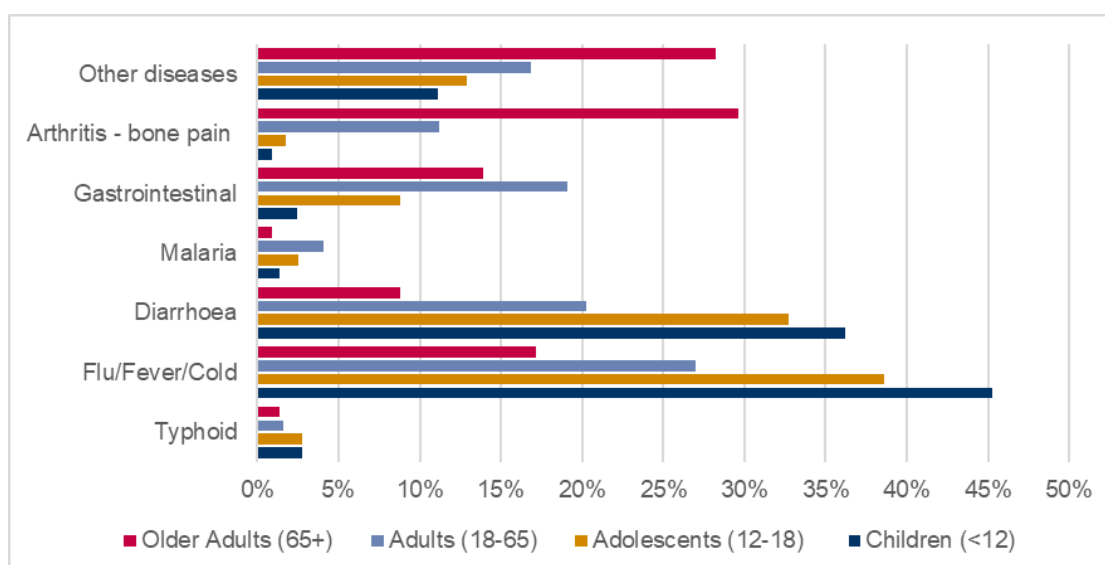
During the time of the site visit (November – December 2021), the majority of the affected community population have been vaccinated against COVID-19.

Through the KIIs with village heads, the most common diseases in the surveyed villages are cold, diarrhoea particularly for children. Women experience endometritis and concerns around health risks related to giving birth. For the elderly, common diseases are kidney disease and gastritis. Other diseases identified include malaria, stomach pain and leucorrhoea.

Data desegregated by age group reveals that flu/cold/fever and diarrhoea are most common among children (aged <12) and adolescents (aged 12-18) with approximately 40% and 30% of children and adolescents experience flu/cold/fever and diarrhoea, respectively. While flu/cold/fever (25%) and diarrhoea (20%) are also common among adults (Aged 18-65), they have increased experience of gastrointestinal (20%) and arthritis (bone pain) (10%) and other diseases such as liver and kidney related diseases, respiratory diseases, pneumonia, etc. Older adults (Aged +65) commonly experience arthritis (bone pain) (30%), flu/cold/fever (17%), gastrointestinal (14%) and other diseases (28%) (**Figure 8.56**).

Sexually transmissible diseases (e.g., HIV/AIDs) were not identified as common diseases in the Project Area. Based on the Department of Planning and Cooperation, Ministry of Health (2020), in 2020 there were a total of 1,414 people identified with HIV positive, of which 41% is female and 59% is male. In Southeast Asia, the average rate of HIV positive is 0.06 per 1,000 uninfected people (WHO, 2022), whilst for Lao PDR the rate is 0.02 per 1,000 uninfected people—it can therefore be assumed that rate of sexually transmissible diseases such as HIV is low in Laos PDR, particularly in remote area as such the Project area.

Figure 8.56: Common Diseases by Age Group



Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

8.5.3.6 Local Healthcare Facilities

Dak Cheung District has the Community Hospital of Dak Cheung District, which has 28 beds and provides small and medium surgical services and 10 dispensaries¹²³.

Of the 23 surveyed villages in Dak Cheung District, 10 villages have healthcare centres located within the village. Local healthcare facilities usually have x-ray room, nativity room, and rehabilitation room and a doctor and nurses. The remaining 13 villages have no healthcare facilities available in the villages. For these villages, they have to travel to healthcare facilities in other villages or bigger cities such as Xiengluang Health centre, Dakdor Health Centre, Prao Health Centre, and Dakchueng Hospital. The KIIs with village heads indicate that for closer villages, travel may take 10 minutes while those further away may have to travel 6-17 km to the local health facilities or approximately 1-3 hours. During the KIIs, some concerns were raised about the roads to the healthcare facilities are poor, particularly during rainy seasons which make access to the local healthcare facilities more difficult.

Through KIIs with healthcare personnel from Xiengluang and Dak Jom Villages, local healthcare facilities experience issues with insufficient healthcare personnel, medicines, and medical equipment.¹²⁴

Sanxay District has one District hospital with 20 beds and 9 dispensaries in all Kum Ban with a total of 24 beds and 109 medical staff posted in the dispensaries.

Of 8 villages in Sanxay District, only two villages have healthcare centres available, namely Dak Samor and Nam Ngonnuea Villages. The KIIs with healthcare personnel found that these facilities have 5-6 healthcare workers (including doctors and nurses). The medical equipment and medicine have been reported insufficient as one healthcare centre provides healthcare service to five villages with population around 2,300 people.

¹²³ A dispensary is the room or area in a hospital where medicine is prepared and given out to patients. A dispensary is often run by a pharmacist, doctor, or nurse, who is authorized to dispense — or hand out — medicine.

¹²⁴ Note that due to the Covid-19 situation at the time of the site visit, only two healthcare personnel were able to participate in the KIIs.

In Dak Samor, the average number of people receiving treatment from the healthcare centre is 15 people per month, while for Nam Ngounuea village is 60 people per month. The ratio of people having access the healthcare services is relatively low compared to the population. This is partly due to local people still preferring traditional treatment prior to seeking medical treatment from healthcare centres. Additionally, lack of vehicles to travel to healthcare centres and poor road conditions, and lack of economic means¹²⁵ also prevent the local people from getting access to these healthcare centres.

There are healthcare centres in Koumban Nam Zou and a hospital in Sanxay District, however this requires people to travel almost 60 km to get medical treatment. Due to the distance to the district hospital, only people with serious illness seek treatment there.

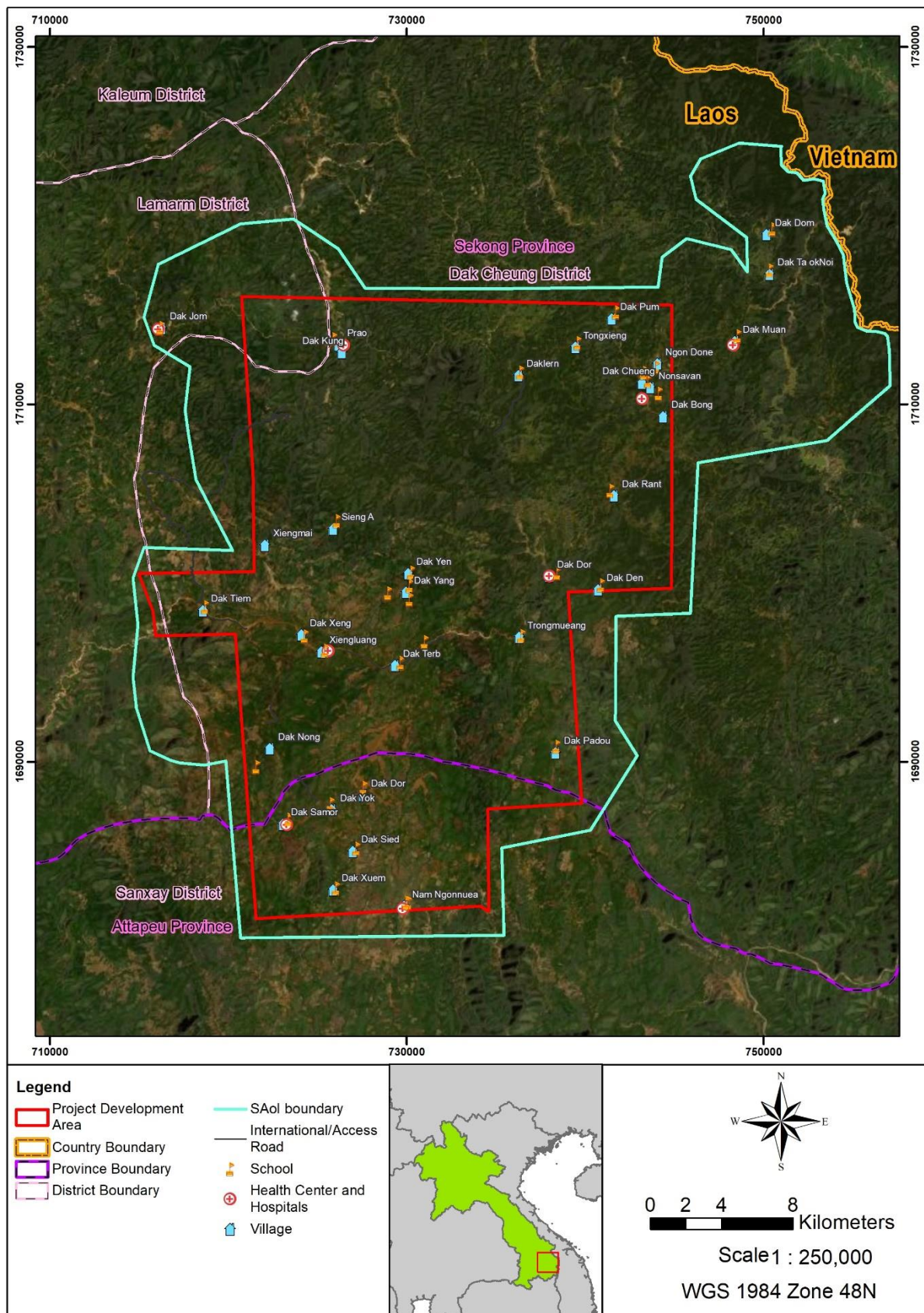
Of 447 surveyed households, 247 (55%) identified to use health centres most frequently, followed by government hospitals (191 people or 43%), pharmacy (4 people or 1%) and traditional medicine/healer (4 people or 1%).

8.5.3.7 Access to Infrastructure and Public Services

The following section discusses access to infrastructure and public services of the affected villages. **Figure 8.57** presents locations of local infrastructures and public services i.e. schools and healthcare facilities of the affected villages which are located in within the Project Area.

¹²⁵ Although the service fee for healthcare centre service is relatively low-cost at 5000kip/person/time of healthcare service.

Figure 8.57: Local Infrastructures and Public Services



Source: ERM/Innogreen, 2021

Local Schools

Education attainment of the population of the affected villages are discussed under **Section 8.5.3.1**. All Project affected villages have a primary school within the village, which provides education from P1 to P5 classes. All primary schools appear to be sufficient in quality, except Xiengluang (Dak Cheung District) and Dak Padou (Sanxay District) where the school quality was identified as “poor” during interviews.

The villages in Dak Cheung District area have three lower secondary schools and one upper secondary school, which is located at Ban Xiengluang. The villages in Sanxay District have one lower secondary school at Ban Nam Ngonnuea. **Figure 8.58** presents photos of secondary school in Dak Dor Village and primary school in Dak Yang Village.

Figure 8.58: Schools in Surveyed Villages



Dak Dor Secondary School



Dak Yang Primary School

Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

Local Roads

Dirt roads are available in all 31 surveyed villages. Of the 23 surveyed villages in Dak Cheung District, 17 villages identified to have “good” conditioned roads from interviewees; two villages (Dak Sieng A and Dak Ta-ok Noy) identified to have “moderate” conditioned roads; and three villages (Dak Tiem, Dak Den and Dak Dom) indicated that the roads are “poor”. Of 8 surveyed villages in Sanxay District, six villages indicated to have “good” conditioned roads; Dak Padou village has “moderate” road conditions, whilst Dak Door indicated to have “poor” road conditions of motor vehicles. The means of transport of the locals include motorbike, walking, biking, and farm tractor.

It was noted during the KIIs that during rainy seasons the (red soil) dirt roads get muddy from heavy rain and make it inconvenient to travel and increase travel times. Examples of conditions of local roads are presented in **Figure 8.59**.

Figure 8.59: Local Roads



Access road to Tong Xieng Village



Access road to Dak Kung Village

Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

Solid Waste Collection

Through KIIs with village heads, there is no waste collection and disposal system in the surveyed villages; therefore, the village members' burn, bury, and throw waste around the house or into the forests as means of waste disposal.

The use of toilet is extremely low in the Project Area because people are not accustomed to using latrines and most of them still follow the old defecation practices, such as: defecating in the garden behind the house or in the forest area surrounding the village. The local health department have come to the villages to promote the use of toilets in the villages nearly every year (EIA, 2020). This could be a factor in the increase coliform bacteria reported in surface water samples (**Section 8.3.7**).

Internet Services

KIIs with youth groups indicated that they have access to the internet to contact with people from outside communities, to receive news and information, to interact on social media, and to study online during the Covid-19 pandemic.

Supply

From the KIIs with village heads, water supply for domestic use across villages is from multiple sources including wells (Nam Sang), river stream (Houay), and gravity-fed water systems (Nam Lin), which is sourced from streams to store in common tank for water supply to households in the villages (**Figure 8.60**). Rainwater is stored in tanks for drinking and domestic use during rainy season. It is noted that piped water supply system (Nam Papa) is not available in the surveyed villages (water is not pumped into homes). The main source of water identified across survey village is gravity-fed water system.

Of 23 villages surveyed in Dak Cheung District; 12 villages (52%) source their drinking water from gravity-fed water systems sourced from rivers/streams, 6 (26%) villages depend on rivers or streams, 3 villages (13%) use shallow wells, and 2 villages (9%) source drinking water from drinking water factory. Of 8 villages in Sanxay District, 6 villages (75%) sources drinking water from gravity-fed systems sourced from rivers/streams and 2 villages (25%) sourced from dug-well. The remaining villages' source drinking water from other sources including tube/dug wells and drinking water factories (bottled water).

The KIIs found that water supply is insufficient in most villages, particularly during the dry season (April-May). In addition, the villages implement rules and measures to protect drinking water sources such as

prohibition of livestock and littering of waste near water source areas and fencing around the water source. Water is also boiled before drinking for sanitization.

All sources of water supply will be surveyed and identified particularly those close to project facilities or will be traversed by the internal road system which will be constructed. Any impact on water supply due to project activities should be compensated/replaced. All details of the survey will be updated in Water Quality Management Plan.

Figure 8.60: Water Supply



Gravity-fed water system in Xiengluang Village



Gravity-fed water system in Prao Village



River stream in Dak Tiem Village



Water storage tank in Dak Yen Village

Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

Energy Supply

Based on KIIs with village heads in Dak Cheung District, all surveyed villages have access to electricity, except Dak Dom village where the electricity grid is not available, and the village depends on dynamo generators.

The main sources of electricity supply include transmission line and solar cells. Households access electricity by connecting to the grid (**Figure 8.61**). Poorer households usually share electricity with nearby households or their relatives which have already connected to the grid.

Some village heads indicated that the electricity bill is too expensive and therefore make it unaffordable for some households in the village.

Only three villages (i.e. Dak Yok, Dak Padou, and Nam Ngonnuea) in Sanxay District have access to electricity. The main source is power grid and solar cells. Solar cells are of individual household use and not community based solar cell systems.

Firewood is predominately used for cooking in the villages and is collected from the nearby forest areas. The distance for traveling for cutting firewood is within one km or less (EIA, 2022).

Figure 8.61: Energy Supply



Solar cell in Dak Jom Village



Electricity grid in Dak Yang Village

Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

Markets

Through KIIs with village heads of affected villages in Dak Chueng District, markets are available in Dak Bong, Dak Cheung, and Ngon Don Villages. The remaining villages in Dak Cheung District do not have markets within their villages. People in villages located nearby urban Dak Chueng usually go to markets in urban Dak Cheung. For those villages located far from the urban markets, there are occasional markets, 2-3 times per month. The people usually purchase or exchange products at retail shops available in the villages.

In Sanxay District, Dak Nong, Dak Smor, Dak Sied, and Dak Xuem villages have access to markets, whereas the remainder do not have market access.

8.5.3.8 Social Network and Cohesion

Through KIIs with local authorities and ethnic group representatives of Dak Cheung District, it was asserted that there have been no conflicts amongst ethnic groups in villages where multiple ethnic groups are present such as Dak Muan village where four ethnic groups are present (Triang, Yae, Katu and Lao). In addition, different ethnic groups living in the same village also celebrate their ceremonies together despite differences in ethnicity. The FGDs with ethnic group representatives reveal that there have not been any conflicts between ethnic groups in the past.

The KIIs also suggest that there are established social networks particularly support system to help one another overcome hardships. Village members help each other during difficult times such as during shortage of food, by sharing food and rice or money to each other.

Much of the population in rural areas do not have bank accounts and do not use the services provided by the banks, they usually borrow money from relatives in the village when they need financial assistance. Micro-credit schemes and informal loan schemes are not practiced in these rural villages. As discussed earlier, 9% of surveyed households indicated that they would borrow loans, from friends and relatives from the same village, and 3% would borrow rice from their friends and relatives in the same villages.

Labour exchange is also a standard practice across the villages, particularly among families with small number of family members or with elderly people and women-headed households, for agricultural activities.

8.5.3.9 Vulnerability

Vulnerable groups are people, especially those below the poverty line, the landless, the elderly, women and children, or other, who by virtue of gender, ethnicity, age, physical or mental disability, economic disadvantage, or social status may be more adversely affected by the Project impacts than others and who may be limited in their ability to claim or take advantage of impact mitigation measures and Project related benefits.

To align with ADB's definition of vulnerability¹²⁶, vulnerable households are defined as meeting at least one of the following criteria:

- Poor households i.e. living under the national poverty line set by the Laos Government (LAK 9,364 (USD 0.83) per day per person);¹²⁷
- Households of elderly persons above the age of 65 with no economic support;
- Households with physically and/or mentally disabled members who need care from other family members;
- Female-headed households with dependents; and
- Households with no land/squatters.

Since the majority of households in the Project Area belong to ethnic groups, being Indigenous Peoples alone in this case does not apply as a criterion for vulnerability.

A total of 178 households out of 449 surveyed households (40%) have been identified as vulnerable. Koumban Xiengluang are identified with the highest proportion (58%), while Koumban Xekamarn have the lowest (18%) proportion of its surveyed population having at least one characteristic of vulnerability (**Table 8.43**).

Table 8.43: Number of Vulnerable Households

District	Dak Cheung District										Sanxay District			
Koumban	Xiengluang (N =97)		Dak Duem (N =61)		Nam Dae (N =45)		Xekamarn (N =38)		Akkelad (N =134)		Nam Zou (N =48)		Other villages (N =26)	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Vulnerable households	56	58	26	43	21	47	7	18	41	31	19	40	8	31
Non-vulnerable households	41	42	35	57	24	53	31	82	93	69	29	60	18	69
All surveyed households	97	100	61	100	45	100	38	0	134	100	48	100	26	100

Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

¹²⁶ ADB SPS 2 (2009) Involuntary Resettlement Safeguard has defined vulnerable groups as "...Those below the poverty line, the landless, the elderly, women and children, and Indigenous Peoples, and those without legal title to land...".

¹²⁷ The national poverty line is estimated at LAK 280,910 (USD 24.90) per month per person at 2019 prices or approximately LAK 9,364 (0.83 USD) per day per person.

All surveyed households may have more than one vulnerability **Table 8.44** illustrates that among the 178 vulnerable households, a large portion of households are categorized as households with one vulnerability (178 households or 40%). There are households having a small proportion of the households (2-6 households) having two vulnerabilities in which are scattered across koumbans.

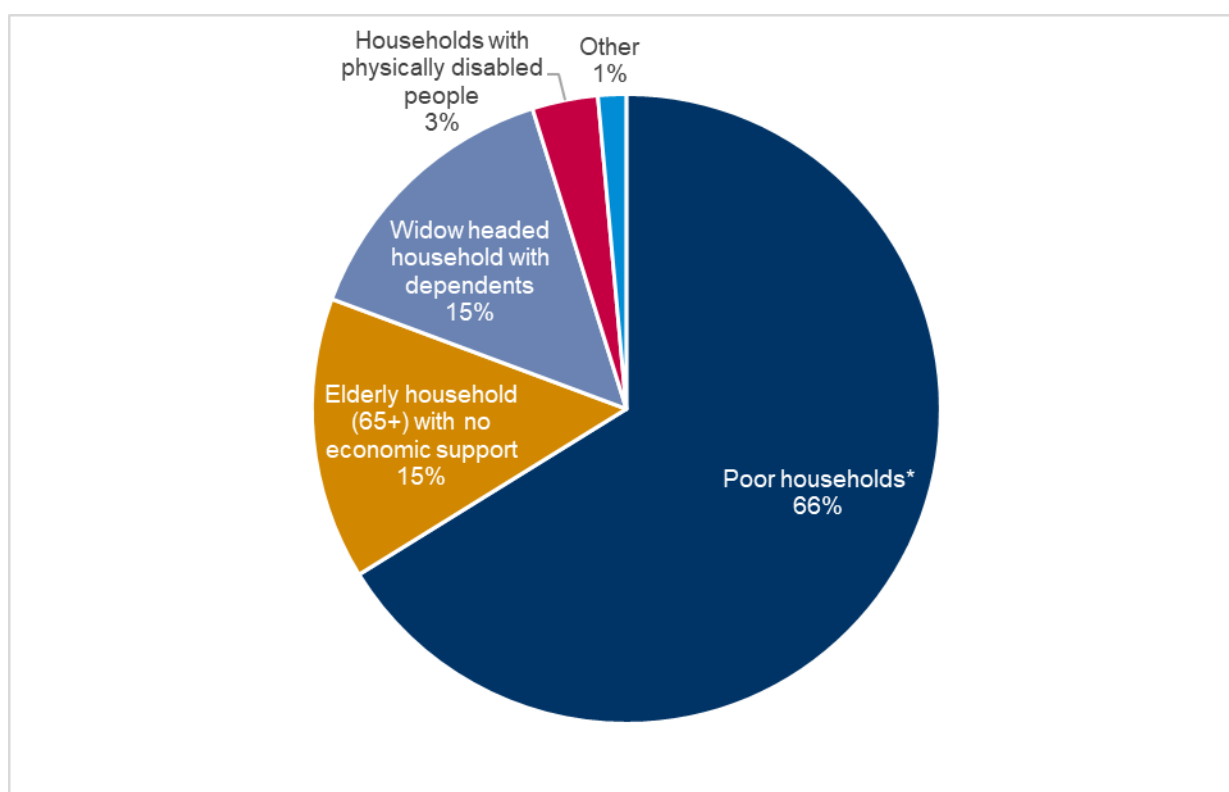
Table 8.44: Number of Vulnerabilities among the Surveyed Households

District	Dak Cheung District										Sanxay District			
Koumban	Xiengluang (N =97)		Dak Duem (N =61)		Nam Dae (N =45)		Xekamarn (N =38)		Akkelad (N =134)		Nam Zou (N =48)		Other villages (N =26)	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Households with one vulnerability	56	58	26	43	21	47	7	18	41	31	19	40	8	31
Households with two vulnerabilities	6	6	4	7	2	4	0	0	10	7	3	6	2	8
Households with three vulnerabilities	1	1	0	0	0	0	0	0	0	0	1	2	0	0
All surveyed households	97	65	61	50	45	51	38	18	134	38	48	48	26	39

Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

Of the 178 vulnerable households, the majority (66%) of the households are identified with poverty, followed by elderly households (65+) with no income support (15%), and widow-headed households with dependents (15%), households with physically disabled people (3%) and other (1%), respectively. Other vulnerabilities include female-headed households, and households with no land (**Figure 8.62**).

Figure 8.62: Characteristics of Vulnerable Households



Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

Table 8.45 presents data analysis of the vulnerable households by category for each koumban. Most of the households in this region are classified as poor households, living below the national poverty line set by the Laos Government of USD 0.83 per person per day and World Bank's poverty line of USD 1.90 per person per day.

Approximately 10% of the households in koumban Xiengluang, Dak Deum and villages in Sanxay Districts are identified with vulnerability of elderly households (65+) with no economic support. Akkelad villages in Dak Cheung District have the highest share (10%) of its households identified with widow headed household with dependents. Households identified with physically disabled people are considered relatively low across koumbans in both Districts.

Table 8.45: Vulnerability Household by Category

District	Dak Cheung District										Sanxay District			
Koumban	Xiengluang (N =97)		Dak Duem (N =61)		Nam Dae (N =45)		Xekamarn (N =38)		Akkelad (N =134)		Nam Zou (N =48)		Other villages (N =26)	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Elderly household (65+) with no economic support	10	10	5	8	3	7	0	0	5	4	5	10	2	8
Widow headed household with dependents	3	3	5	8	2	4	3	8	13	10	3	6	1	4

District	Dak Cheung District										Sanxay District			
Koumban	Xiengluang (N =97)		Dak Duem (N =61)		Nam Dae (N =45)		Xekamarn (N =38)		Akkelad (N =134)		Nam Zou (N =48)		Other villages (N =26)	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Households with disabled people requiring care	2	2	0	0	1	2	0	0	4	3	0	0	0	0
Other	2	2	0	0	0	0	0	0	1	1	0	0		0
Total surveyed households	97	17	61	16	45	13	38	8	134	18	48	16	26	12

Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

The average monthly household income of the surveyed vulnerable households is LAK 1,261,159 (USD 111.76)¹²⁸, and the average monthly income per capita is LAK 203,412 (USD 18) (**Table 8.46**). This is comparable to the average annual income of 443 surveyed households at approximately USD 110 and monthly income of USD 18. The lowest and highest income per households and per capita among the vulnerable groups are those with income below the government poverty line and the elderly HH +65 with no economic support, respectively.

It must be noted with caution that in this region, income is not the sole indicator for vulnerability. Based on the site visit, the livelihoods of the people e.g. farming, animal husbandry, NTFPs collection, hunting, etc. are mainly for subsistent household consumption, and the people are still highly dependent on natural resources meaning that the people obtain resources for their fundamental needs e.g. food, water, housing, energy, etc. from natural resources. Therefore, their livelihoods are not targeted at generate high income but rather sufficient provision of food and fundamental needs for the households.

According to the Notice on Measures for Poverty Alleviation and Development Plan (No.348, dated 16 November 20117), the Government of Lao defines households that are above poverty as:

- Households that have access to sufficient food of 2,100 kcal per person per day;
- Households that have sufficient clothes;
- Households that have housing;
- Households that have sufficient labours, occupations or stable income sources;
- Households that have sufficient finance for medical emergencies; and
- Households that have access to basic public services such as clean water, power, transport, information, bank, markets and safety and security.

¹²⁸ Exchange rate as of 12 January 2021.

Table 8.46: Average Monthly Household Income per Households and per Capita among the Vulnerable Households

Type of Household Vulnerability	Average Monthly Income per Household	Average Monthly Income per Capita*
Below poverty as defined by the govt. (<USD0.83/per day/per capita)	688,333	111,021
Elderly HH +65 with no economic support	1,728,347	278,765
Widow headed household with dependents	1,553,791	250,611
Disabled persons requiring family care	1,074,166	173,252
Average	1,261,159	203,412

Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

Table 8.47 presents disaggregated sources of income by vulnerability category. Land-based livelihoods, including agriculture and livestock, are the highest contribution to sources of income across vulnerability category, ranging from 80-88% of all surveyed valuable households. Wage-based is a significant of income contributor in households with handicapped person/s (20%). Enterprise-based livelihoods however were not identified as income sources for any of the vulnerable groups.

Table 8.47: Sources of Income of Vulnerable Households

Type	Elderly HH +65 with no economic support (N=24)	Widow headed household with dependents (N=28)	Households with disabled persons (N=5)
Land-Based	88%	86%	80%
Wage-based	4%	7%	20%
Enterprise-based	0	0	0
Other sources	8%	7%	0

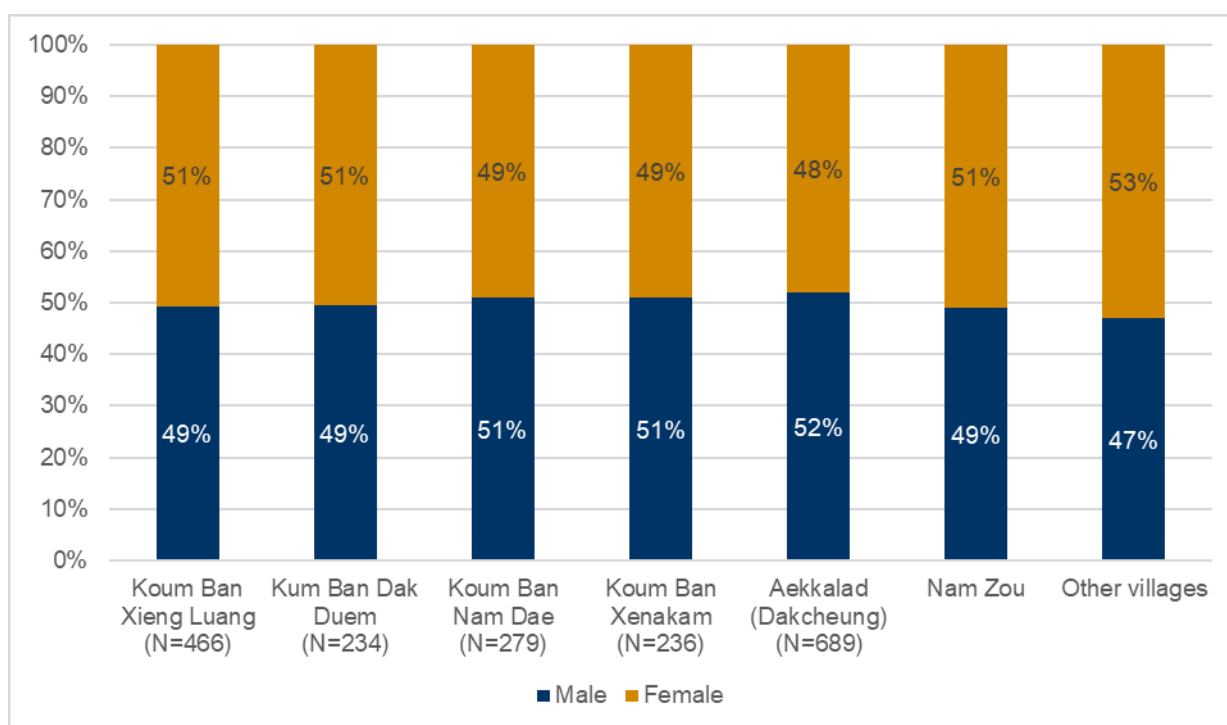
Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

8.5.4 Gender Disaggregated Socio-economic Profile

8.5.4.1 Demographic Profile of Affected Villages

Of the 370 surveyed households in Dak Cheung District, the ratio between male and female are roughly 1:1 (1,307 males versus 1,274 female), similarly to the country's which stood at 1:1 (female 49.8: 50.2 male) (The World Bank, n.d.c). The gender ratio is slightly different between koumbans; however the ratio remains roughly at 1:1 male to female. Akkelad villages appear to have slightly higher male to female ratio than other koumban at 52% male to 48% female (**Figure 8.63**).

Figure 8.63: Gender Ratio by Koumban



Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

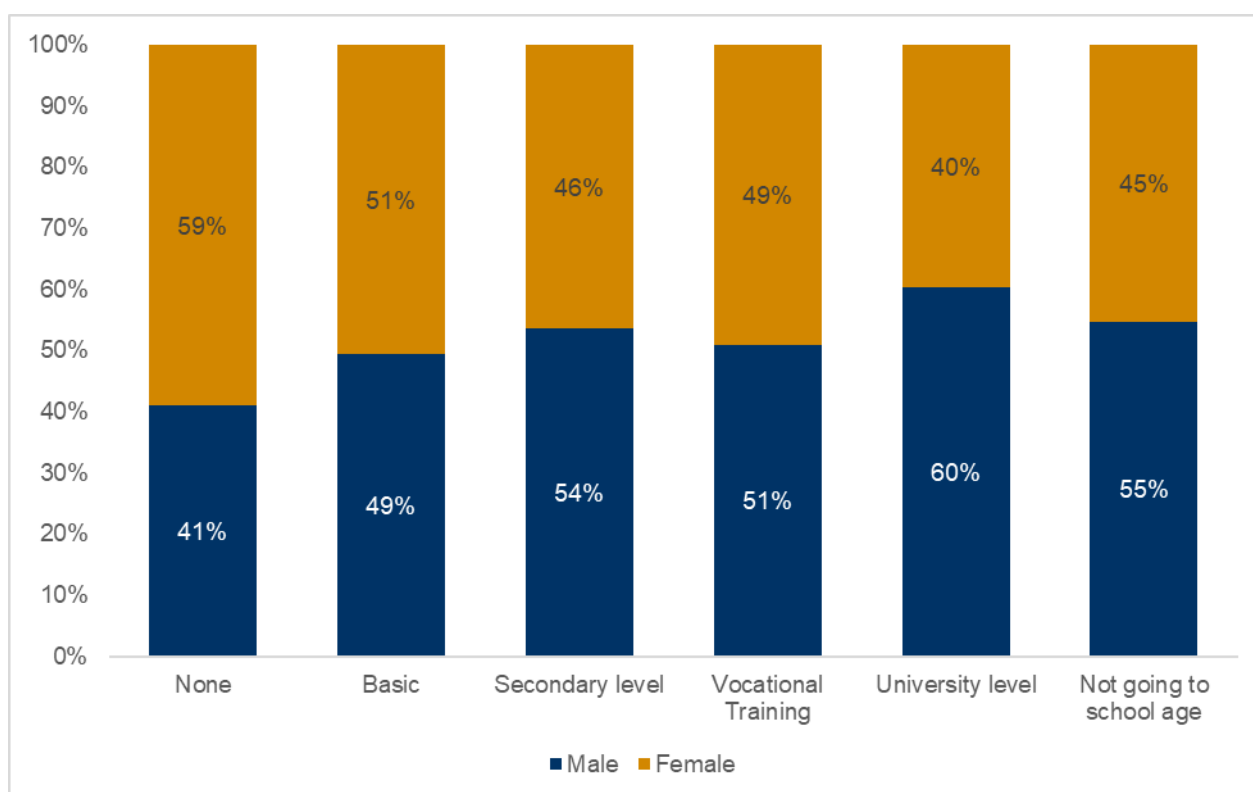
8.5.4.2 Education Attainment

In terms of education attainment, females have slightly lower average level of education than males (according to KIIs with village heads and youth groups). The average level of education for females is up to year 3-4 of secondary school, while for males it was identified that the average education is year 4-5 of secondary school.

Based on the socio-economic household survey (**Figure 8.64**), the data shows that females outnumber their male counterparts at not having received education (59% and 41% respectively). Females and males equally receive primary education, while males have a slightly higher share of receiving secondary education (54% and 46% respectively). The survey shows equal portion of males and female receive vocational education, while males have a higher share of receiving university education than females (60% and 40%) respectively. Notably, males and females equally attend post graduate education.

Based on the 1,483 surveyed female population, the main reasons for discontinuing study include lack of economic resources (19%), work (13%), marriage (11%), household chores (4%), no educational establishment (3%), no interests in studying (2%), no reason (17%), and other reasons (31%) including distance from school, illness and disabilities, age and failing (i.e., not making the necessary grades to continue attending).

Figure 8.64: Education Attainment by Gender



Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

8.5.4.3 Maternal and Reproductive Health

Through the FGDs with women group, the average age of women getting pregnant is 15-18 years old. Mostly, women give birth at home or at local healthcare centres. For those villages located closer to the district hospitals women would give birth in hospitals.

8.5.4.4 Gender-based Violence

Based on the FGDs and site visit observation, gender-based violence does not seem to be an issue in the villages within the Study Area. There have been no reports of gender-based violence to the village heads by women or village heads that participated in the FGDs and KIIs.

It is, however, worth noting that this information should be viewed in the country context. In the Lao PDR, there are several traditional sayings describing the role of men and women in the family; for example, “Men are the net, women are the basket”, “The husband should lead, the wife should follow” and “The man is the boss and women are the labour”. These views, and many others, reinforce gender inequality and creates disparity between the sexes, allowing men to have culturally accepted control over women.

Many different types of violence, physical and non-physical have been reported during the survey conducted for the United Nations ¹²⁹ looking into gender-based violence in rural Laos. 45% of the women surveyed indicated that their spouses have been violent in some form towards them, revealing the high incidence of domestic violence in the areas surveyed (Bokeo, Luangprabang, Savannakhet, Salavan Provinces and Vientiane Province). These areas are however, located in the North of Laos and not close to the Project. No information is available for the Project area.

¹²⁹ CUSO/ GDG, n.d.

This survey suggests that even though gender-based violence is not prevalent in the Project affected villages, it does not necessarily mean that it does not exist. It could be under-reported or that women (and men) accept it as part of the cultural norms.

According to the survey above, the most common factors influencing violent behaviour, as described by women victims, were that the violator was drunk, money, and work-related problems. Gender inequality in family economics is a significant influencing factor in domestic violence. Education can also be a factor in domestic violence as less educated women are more likely to experience violence than women who have some or higher education.

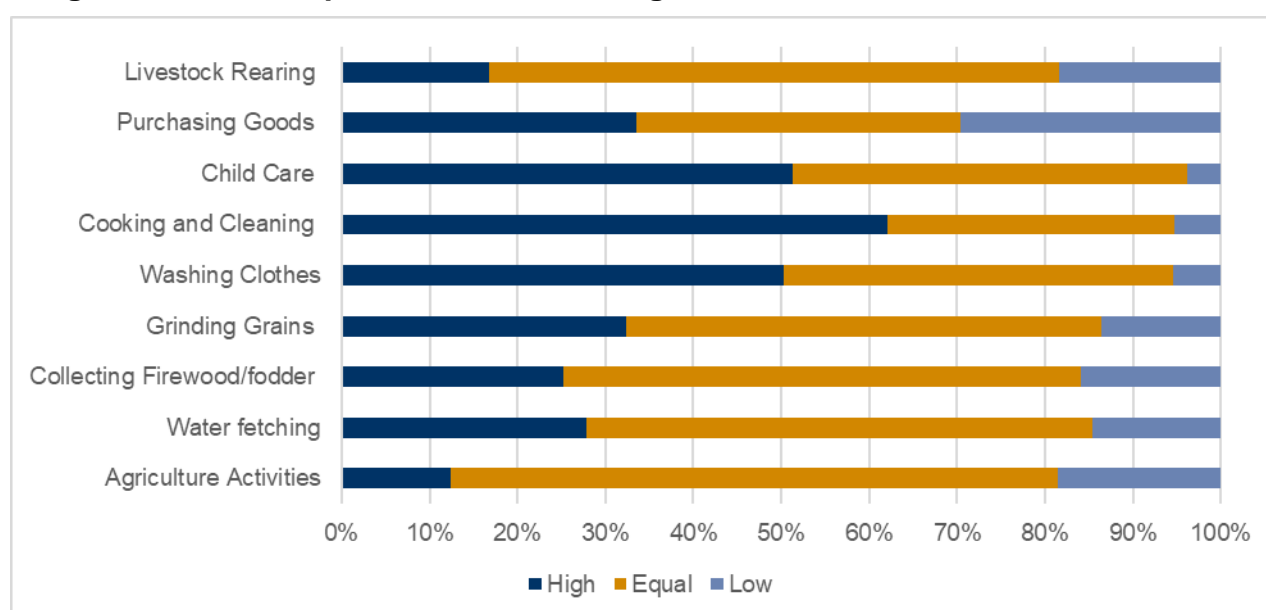
8.5.4.5 Livelihood and Division of Labor

In general, female-headed households and male-headed households have similar livelihoods, i.e. land-based livelihoods including rice, coffee and cassava cultivation, animal husbandry and NTFPs collection. However, it is noticeable that female-headed households, particularly if the rest of the family is composed of females, children or elderly, have a significant fewer cultivation land areas and smaller animals holding size. Female-headed households may not have sufficient laborers for collecting large woods for construction and maintenance of houses and barns as this task is mostly undertaken by males. Additionally, these households may be more likely to experience food insecurity as they have a lower agricultural productivity due to smaller farming size and lack male members to undertake hunting to provide alternative food sources for the family.

Based on the FGDs with women groups, the main tasks undertaken by women in the households include childcare and chores such as cooking, washing clothes, cleaning, etc. In addition, women collect NTFP products such as firewood for cooking and food and conduct farm work. Notably, the women groups interviewed noted they were responsible for income and expenditure management. Women in the villages also engaged in handicrafts such as bamboo products and weaving, while men are engaged in blacksmithing.

Based on the socio-economic HH survey, tasks undertaken by men and women are mostly equally allocated including agricultural activities, water fetching, collecting firewood/fodder, grinding grains, and livestock rearing. However, women have higher responsibility for cooking and cleaning and childcare. Interestingly, women identified to have different levels of participation in purchasing goods –34% indicated to have high participation while 30% indicated to have low participation (**Figure 8.65**).

Figure 8.65: Participation of Female in Agriculture and Household Activities



Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

8.5.4.6 Access to and Ownership of Land and Natural Resources

As discussed in **Section 8.5.3.4** most people do not have land titles, only land use rights (i.e. land use certificates) and booking land (no formal document). During the KIs with women groups, it was identified that men and women usually have joint ownership of land. However, one women group asserted that despite joint land ownership, most of land use certificates are in the husband's names. Whether both husband and wife names can be included on the land use certificates is dependent on the practice of officials from the land use registration authorities, as in some villages the officials put both males and female names on the land use certificates.

Based on the socio-economic HH survey, the level of ownership between men and women are shown in **Table 8.48**. Approximately 50% of women and men have equal ownership of land, house, cash and livestock. However, over 30% of women was identified to have unequal ownership of land and house compared to their husbands. 74% of women do not have ownership of bank account deposit and 81% do not have ownership of ornaments such as jewellery, ceramics, glassware, and furniture, etc.

Table 8.48: Ownership over Property between Male and Female

Ownership	High	Equal	Low	None
Land	9%	49%	36%	5%
House	9%	56%	32%	3%
Cash	43%	41%	13%	3%
Livestock	4%	49%	11%	36%
Bank deposit	5%	16%	5%	74%
Ornaments	8%	10%	1%	81%

Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

8.5.4.7 Female Support Networks and Organizations

Lao Women's Union (LWU)

In 1995, the Lao Women's Union was established to protect the rights of all women in Lao PDR. The main objectives and responsibilities of the LWU include: responding to women's development needs; promoting the status and roles of women; promoting unity amongst women of different ethnic groups and social strata throughout the country. (LWU, n.d.). Another important part of the Lao Women's Union's work is advocating for the protection of women's rights under the law, especially their right to live free from violence and eliminate gender-based violence against women from all sections of society (UNDP, 2021). The organizational system of LWU operates throughout the country at four levels, namely: central; provincial/ministerial, District/municipal and village ones with a total membership of 1,015,506 women (LWU, n.d.).

Through the FGDs with women groups, there are active village-level LWU in all villages. Women in the village regularly participate meetings of LWU and some women are responsible for the LWU at village levels with a representative in the villages participating in village and district level meetings. Village LWU collects data related to women, provides assistance to women and vulnerable groups, addresses gender-based issues, and promotes gender equality.

CARE International Laos in Dak Chueng District, Sekong Province

Care International is one of the main active NGOs in Dak Cheung District, particularly in the area of women empowerment. Based on the FDGs with women groups in Dak Cheung District, CARE International has implemented a framework of Gender Equality and Women's Empowerment by supporting coffee cultivation, providing training and workshop on coffee processing and forming of

women's groups (refer to **Box 8.1**). In addition, CARE also has been providing workshops on early marriage and childbirth and family health planning for those interested, in collaboration with District healthcare centres and office. CARE International also has programs targeting food security and providing assistance to vulnerable people.

Box 8.1: Boosting Coffee Production Project

CARE is a global NGO that supports women equal opportunities to earn an income, gain access to their fair share of resources, participate in decisions that affect their lives, and lead their communities through the increasing impacts of climate disasters and other crises.

CARE Australia has established a Boosting Coffee Production project, which seeks to support coffee farmers to increase their income. The Dak Cheung District is identified as a major location where this project is taking place.

The Boosting Coffee Production project involves:

- Increasing farming knowledge within rural communities.
- Establishing women-led coffee producer groups, enabling women to access technical training in coffee production, the establishment of crop nurseries and management of coffee gardens.
- Teaching women how to set up, use and maintain coffee processing centres and building their skills in coffee grading, quality control, basic business and financial literacy.
- Promoting gender equality by applying CARE's Social Analysis and Action and Engaging Men and Boys at household and community levels. Both approaches help to change gender norms and roles around doing housework and caring for children, elderly and people with a disability.

As this is an established program in the Dak Cheung District, the Project should liaise with CARE to determine if there is potential for collaboration.

Source: CARE Australia, n.d.

District Health Office

In addition to LWU and CARE International, the District Office also work in collaborations with these organizations to promote awareness about gender based violence and sexual health.

8.5.4.8 Participation in Decision-making Process and Financial Linkage

The FGDs with women groups indicate that mostly women and men make decisions related to finance equally in the household; however, in most cases women do not have their own bank accounts. The key areas of decision-making in which women and men make together include household expenditure, saving, and education for children. Women are more dominant in making decisions related to household chores, e.g. cooking and daily expenditure, e.g. food consumption.

Table 8.49 presents disaggregated data of level of decisions by women by different topics based on the socio-economic HH survey. Women and men in general have equal decision-making power in topics related to pregnancy, children, and household activities. Notably, 43% of the surveyed households identified that women have high power in decision-making related to cash, while 74% of women do not have power in decision-making for bank deposit. Women, however, were identified to have low power in decision-making related to leaderships and politics in particular (45% of the surveyed households).

Women also participate in the village and District meetings, in women's union activities. Women also identified to have increasing roles in village politics and administration (Dak Yen), responsible for women's union, or managing funds.

Table 8.49: Level of Decision by Women by Topic

Level \ Topic	High	Equal	Low	None
Activities	10%	72%	14%	4%
Agriculture	12%	66%	15%	7%
Land/house	5%	47%	13%	34%
Pregnancy	4%	89%	3%	4%
Children	6%	85%	4%	5%
Leaderships/politics	17%	21%	45%	17%
Outside home	11%	30%	28%	31%

Source: Socio-economic household survey by ERM/Innogreen, November and December 2021

8.5.4.9 Female's Needs and Challenges

The FGDs with women groups have identified their main needs are improved healthcare and support on livelihoods.

Women identified that they need support in improving livelihoods, including weaving and handicraft training, vocational training, and cassava and coffee processing, in order to increase added values to the agricultural products, and support different farming methods and seeds, which will have increased values. Moreover, women also need support on the linkage of agricultural activities to the market.

Women representatives also expressed their needs for:

- Improved health care centers as currently medicine and medical personnel are not sufficient in the existing healthcare; and
- Improved education for girls and boys and education facilities and supplies as currently these are lacking.

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