

Figure 9-49: Shadow Flicker Results – Cluster: D

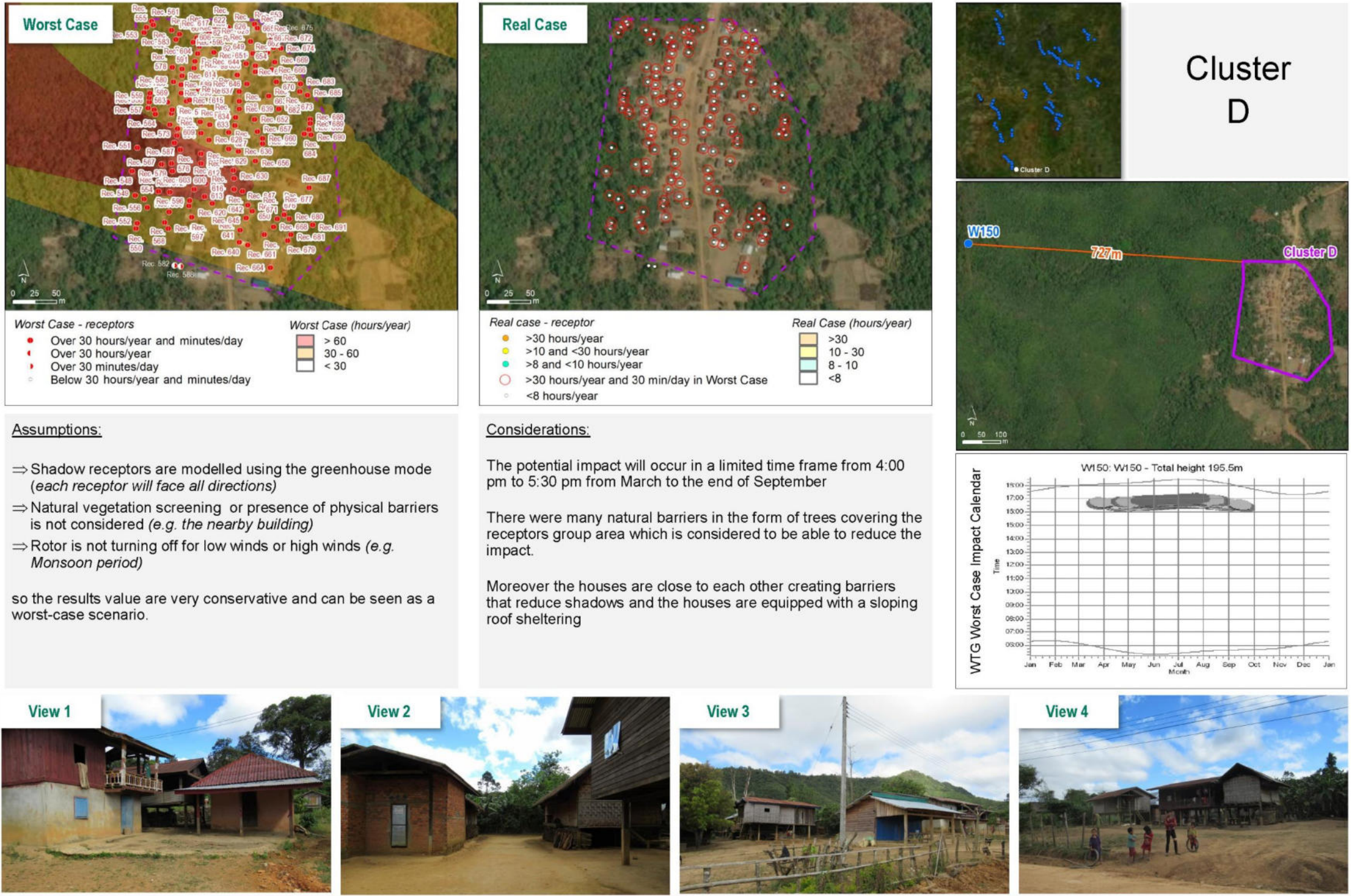


Figure 9-50: Shadow Flicker Results – Cluster: E

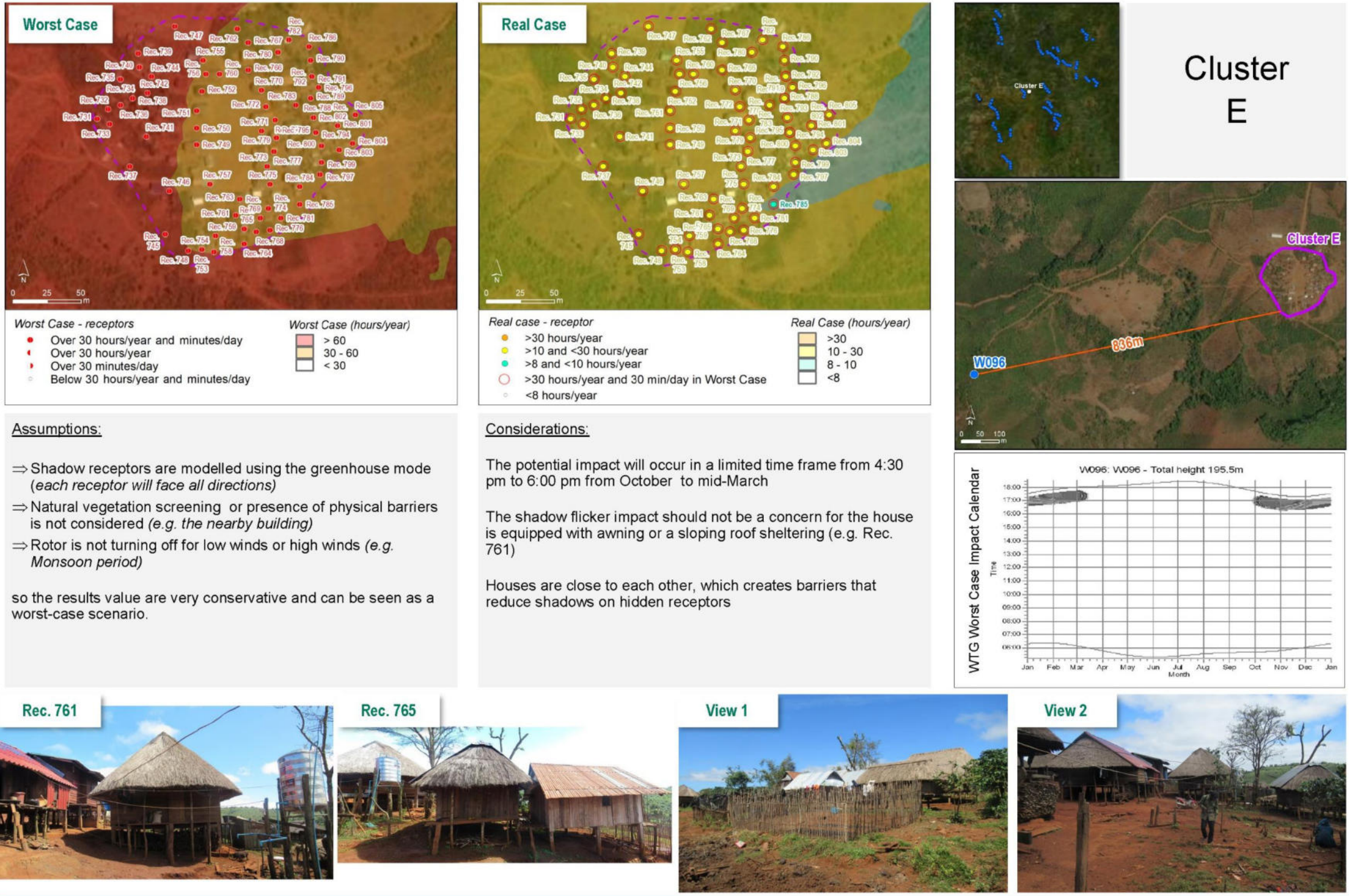


Figure 9-51: Shadow Flicker Results – Cluster: I

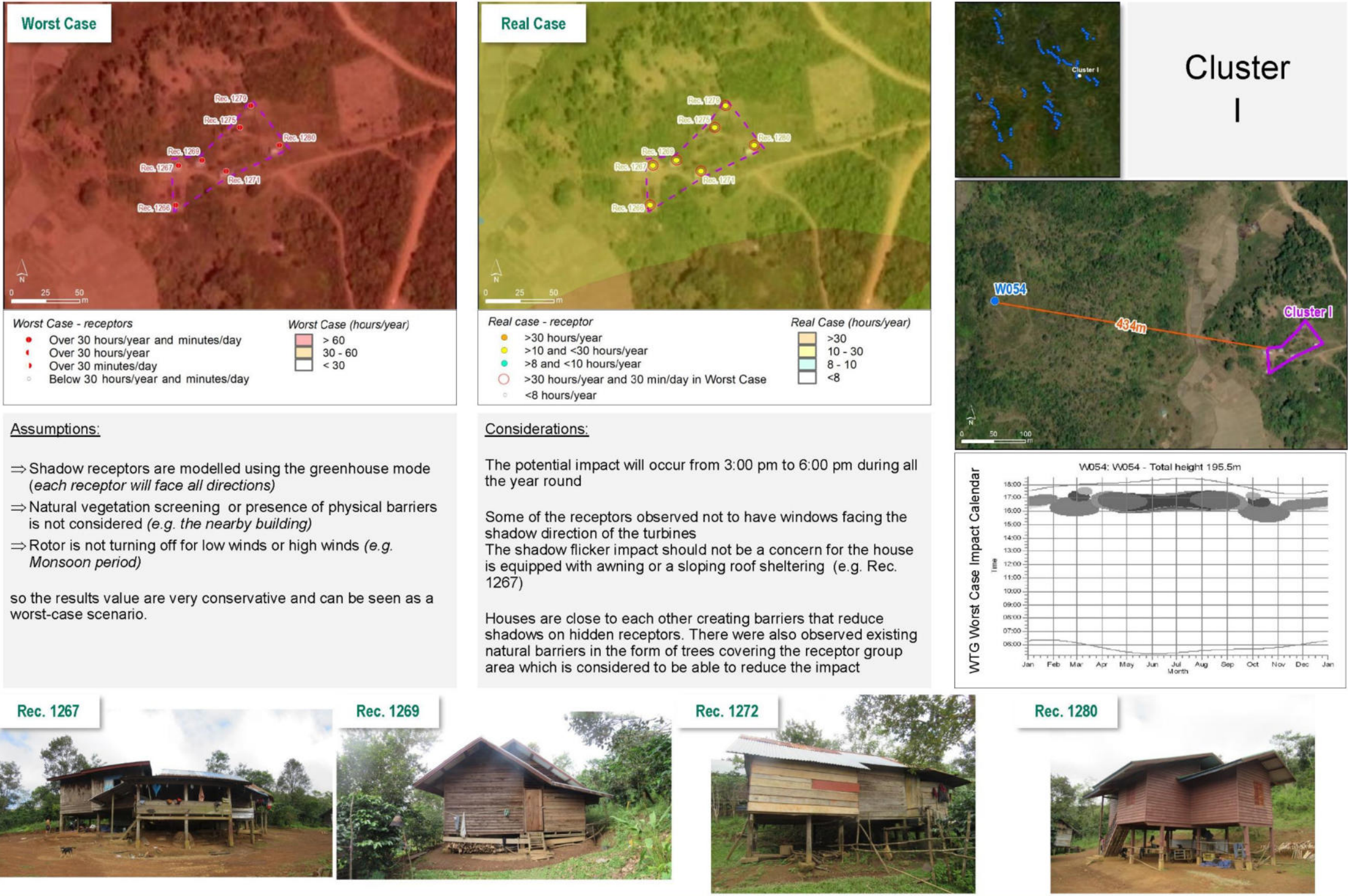


Figure 9-52: Shadow Flicker Results – Cluster: J

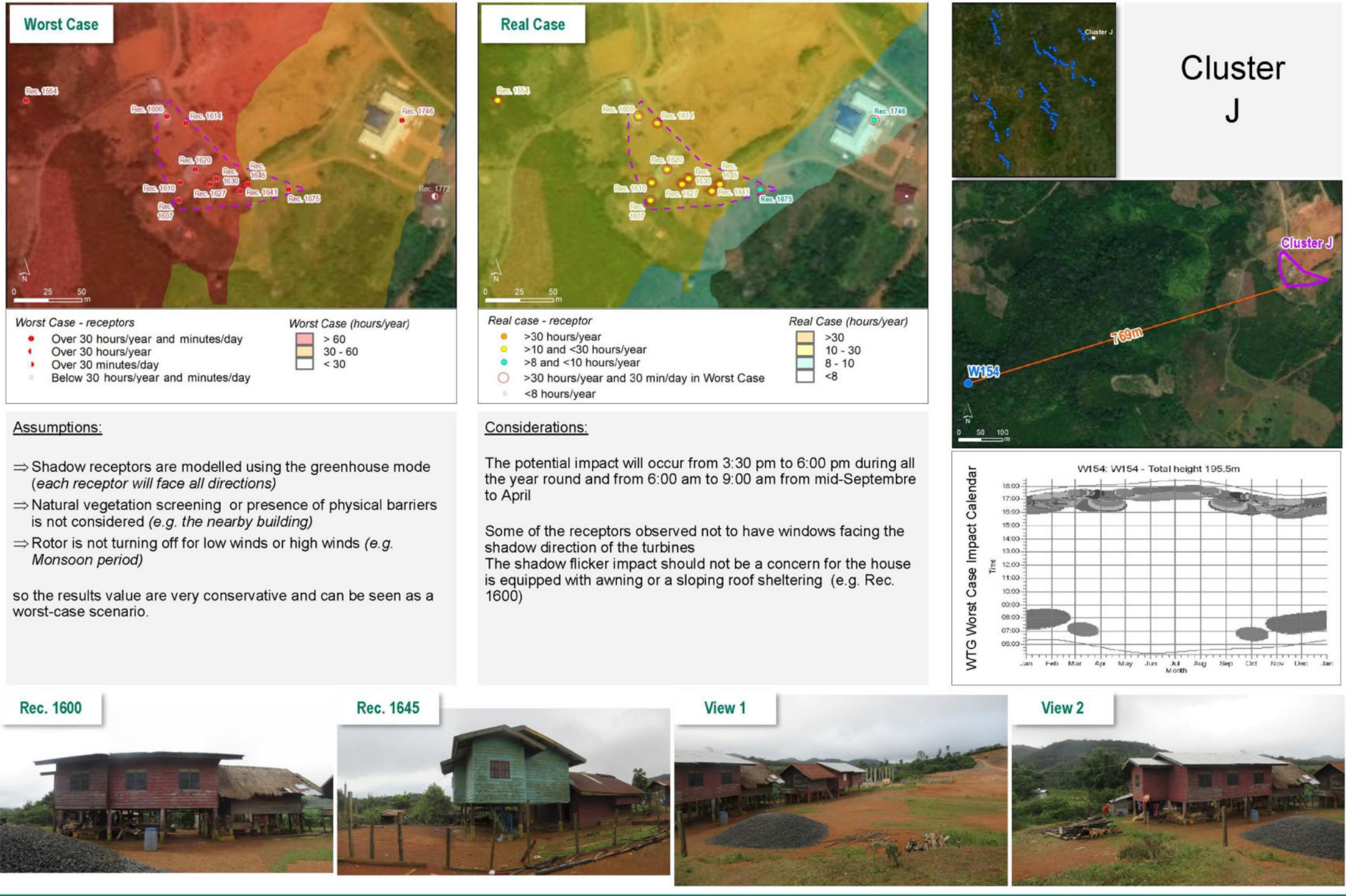
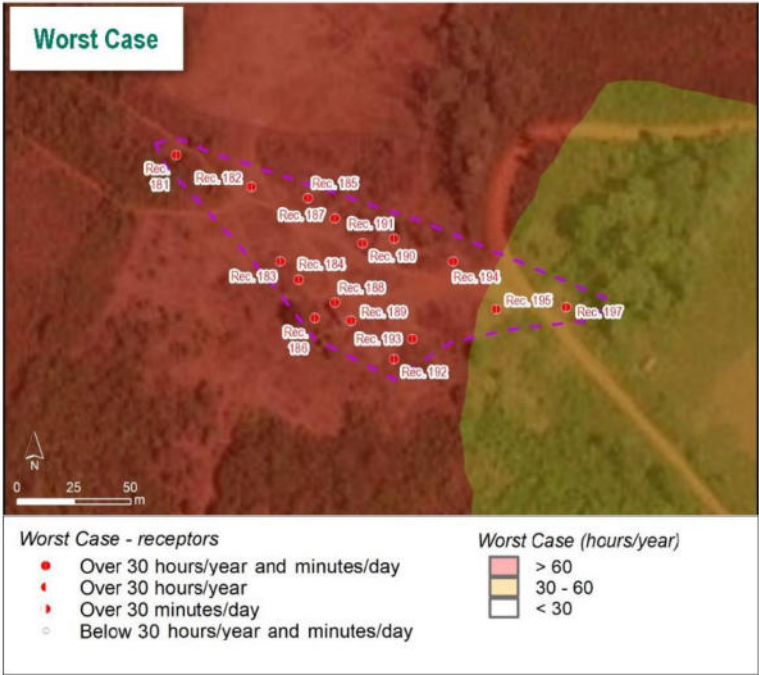


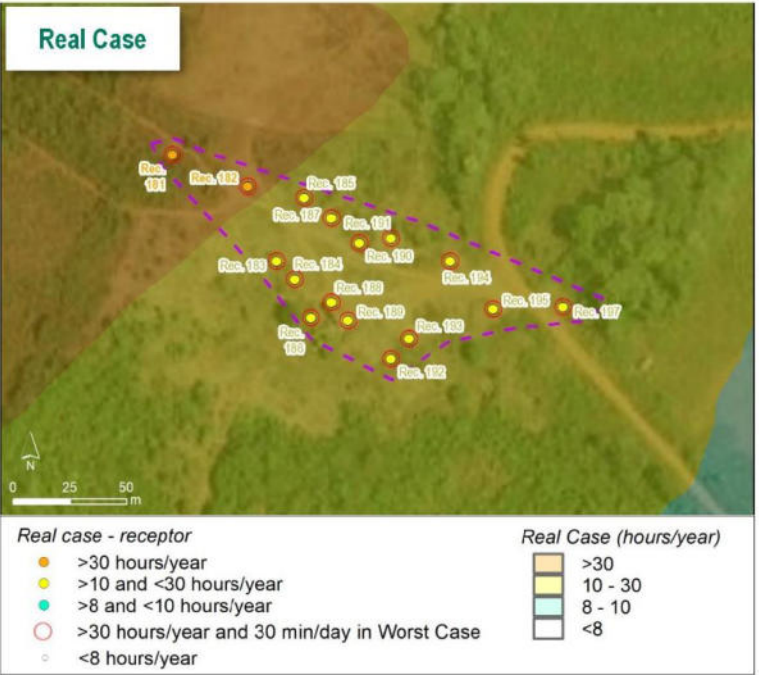
Figure 9-53: Shadow Flicker Results – Cluster: K



Assumptions:

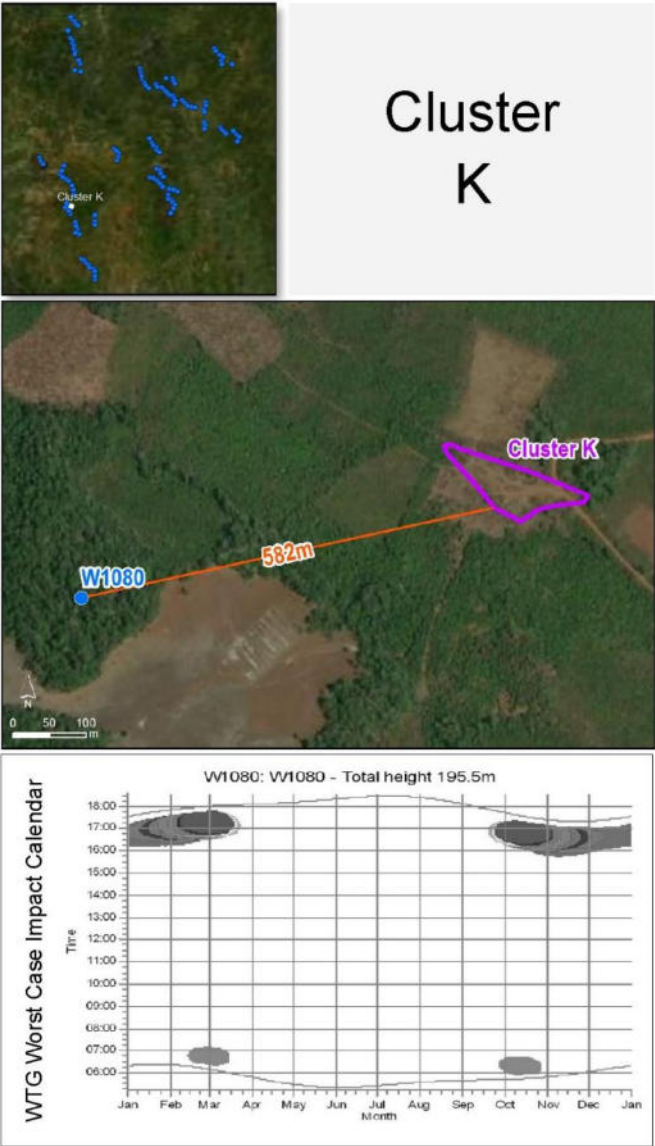
- ⇒ Shadow receptors are modelled using the greenhouse mode (*each receptor will face all directions*)
- ⇒ Natural vegetation screening or presence of physical barriers is not considered (*e.g. the nearby building*)
- ⇒ Rotor is not turning off for low winds or high winds (*e.g. Monsoon period*)

so the results value are very conservative and can be seen as a worst-case scenario.



Considerations:

The potential impact will occur from 3:30 pm to 6:00 pm from October to April and from 6:00 am to 7:00 am in February, March and October



not surveyed

not surveyed

not surveyed

not surveyed

Figure 9-54: Shadow Flicker Results – Cluster: L

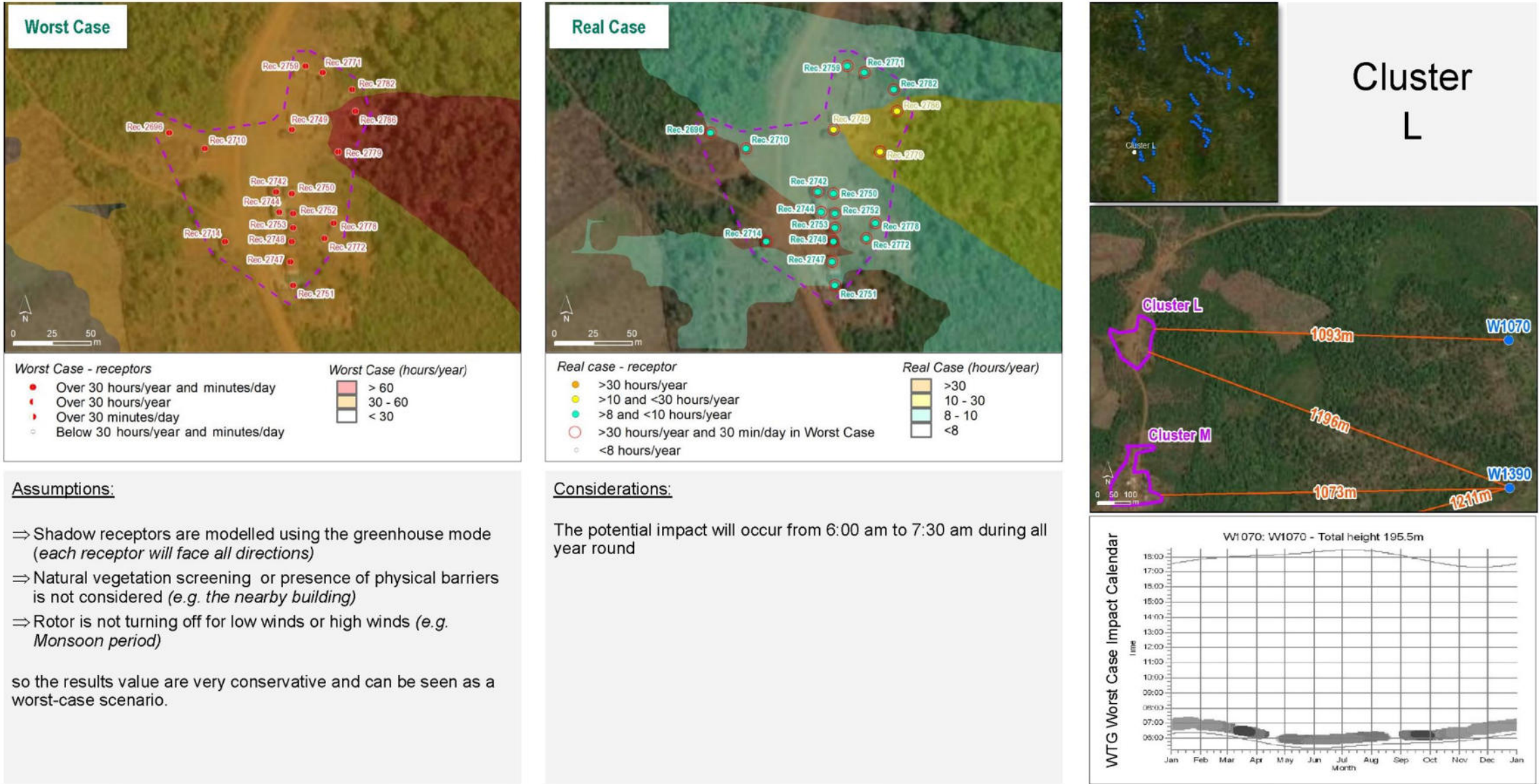
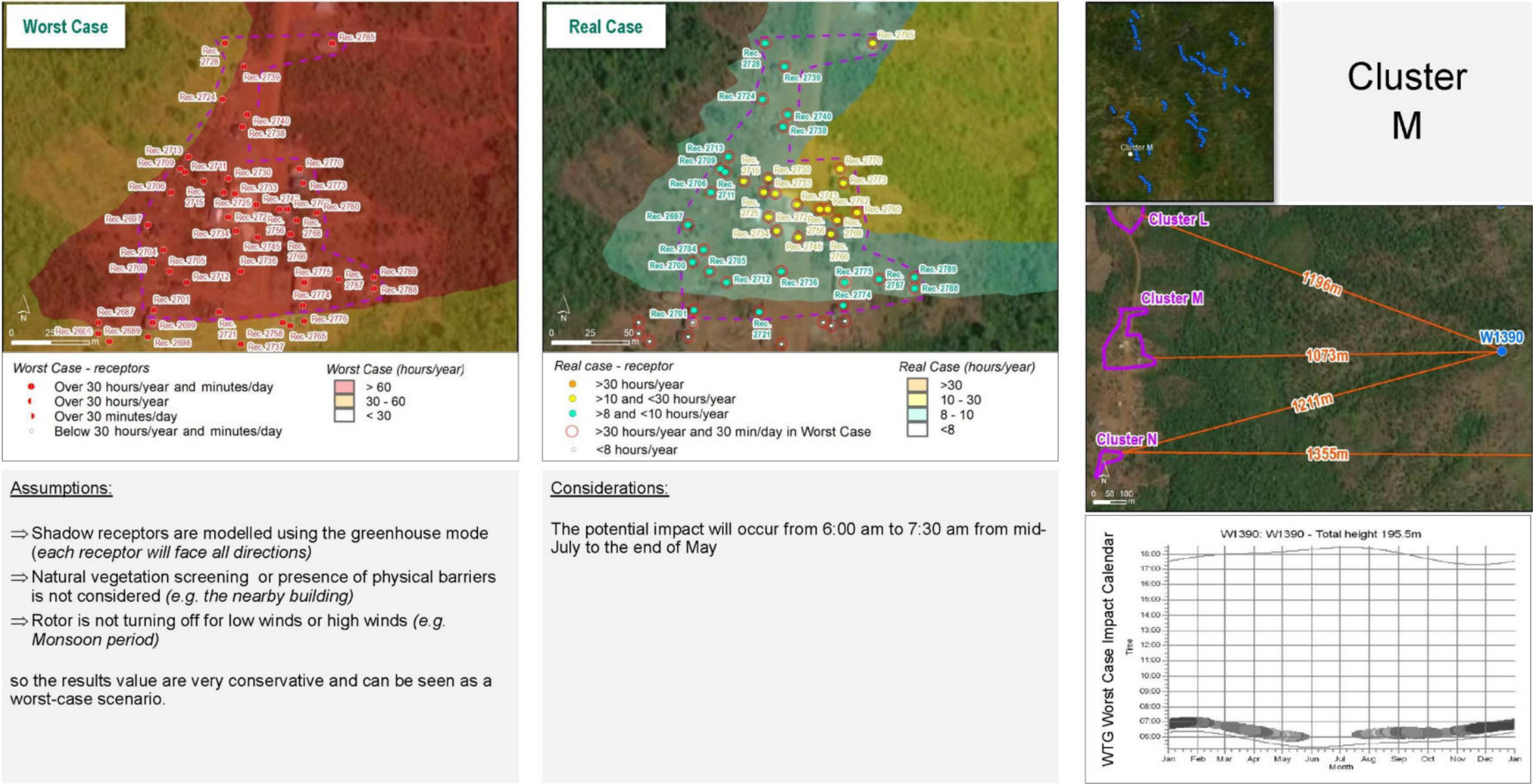


Figure 9-55: Shadow Flicker Results – Cluster: M



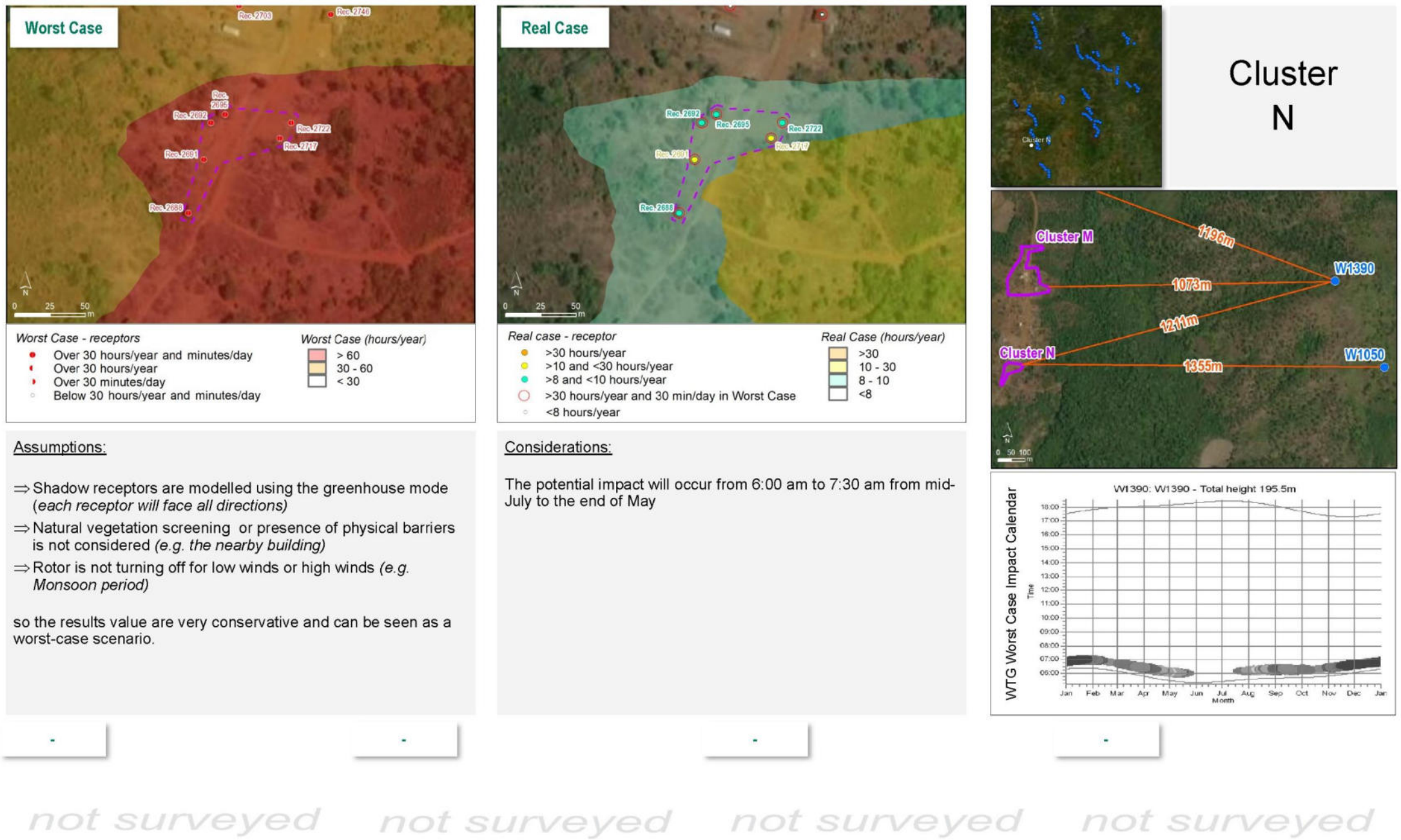
not surveyed

not surveyed

not surveyed

not surveyed

Figure 9-56: Shadow Flicker Results – Cluster: N



Receptor Sensitivity and Impact Magnitude

Based on the modeling results and the photographic field survey, the sensitivity of the 12 clusters is estimated as shown in **Table 9-39**. The overall impact significance is negligible to moderate depending on the cluster.

Table 9-39: Cluster Sensitivity and Magnitude

Cluster	Sensitivity	Magnitude	Impact Significance
School	Low - Medium	Small	Minor
A	Medium	Small - Medium	Moderate
B	Medium	Small	Minor
C	Medium	Negligible	Negligible
D	Medium	Negligible	Negligible
E	Medium	Small - Medium	Moderate
I	Medium	Small - Medium	Minor
J	Medium	Small - Medium	Moderate
K	Medium	Small - Medium	Moderate
L	Medium	Small	Minor
M	Medium	Small	Minor
N	Medium	Small	Minor

9.3.8.5 Additional Mitigation, Management, and Monitoring Measures

The proposed project went through a process to design the layout including aspect related to potential shadow flickering occurrence. It is envisaged that once the executive project will be developed, a final run of the model will be performed and a detailed survey will be organized in order to identify the potential most critical receptors, taking into account local specific receptor settings (such as the mutual position of buildings that can limit the occurrence of shadow flickering, the presence of vegetation barriers, window orientation etc)

The outcome of the field survey will allow a proper development of dedicated grievance mechanism and reporting system able to monitor closely through engagement with residents during the operational phase, where there are predicted impacts from shadow flickers for locations that have been finalized by the project proponent and earmarked for construction.

Based on the type of grievances that will be collected, specific on-site verification of the occurrence of shadow flickering will be managed and tailored mitigation measures will be adopted as follow:

- Visual Screening (Natural) – Continuously assess identified and any potentially sensitive receptors, where shadow flicker modelling indicates the amount could exceed 30 hours per year and 30 minutes per day, to ascertain the extent of existing natural visual screening in place. If not existing, the occurrence of shadow flickering during operation could be further investigated, and if confirmed, natural screening could be implemented to minimize the effect.
- Visual Screening (Architectural/Structural) - If grievances will be received or if natural visual screening at potentially sensitive receptors are found to be insufficient, investigations to implement architectural/structural screening, such as the installation of blinds, window shades, window tinting, awnings or fences, at affected receptors could be evaluated to further minimize the effect of shadow flicker.

- Control - Use of turbine control strategies which shut down turbines when shadow flicker is likely to occur.

9.3.8.6 Residual Impact Significance

The mitigation measures above will be implemented for identified receptors that experience shadow flicker. Residual impacts following the implementation of these mitigation measures will reduce to **Minor** (Table 9-40).

Table 9-40: Impact of Shadow Flicker (Operation)

Significance of Impact					
Impact	Shadow flicker impacts during construction and operation.				
Impact Nature	Negative	Positive	Neutral		
	Potential impacts from shadow flicker would be considered to be negative				
Impact Type	Direct	Indirect	Induced		
	Impacts would be direct				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	Only a certain times under right conditions				
Impact Extent	Local	Regional	International		
	The impact will only be localized within the Area of Influence of the Project.				
Impact Scale	Impact scale is considered localized and small.				
Frequency	Impacts could occur during the operation phase.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the characteristic above, the impact is likely to be at worst case medium, depending on the receptor.				
Receptor Sensitivity	Low	Medium		High	
	The sensitivity is considered to be at worst case Medium, depending on the receptor.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Cluster A, E, J and K are moderate.				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	
Residual Magnitude Significance	Negligible	Minor	Moderate	Major	
	Upon considering the mitigation measure, the residual impact is assessed to be Minor.				

9.4 Biological Environment Impact Assessment

9.4.1 Introduction

Renewable energy projects such as wind farms play an important role in moving towards a more sustainable energy sector that can assist with combating the negative impacts of non-renewable energy on global climate (Bennun *et al.*, 2021). However, these 'clean' energy projects can also result in unintended negative impacts and consequences to the environment unless carefully planned and managed. This includes risks and potential impacts to biodiversity, which underpins the resilience and functions of ecosystems and the flow of ecosystem goods and services (Bennun *et al.*, 2021).

Biodiversity impact assessment is the process of determining the types and significance of effects a project will have on biodiversity, and the various components thereof, and is the core of the ESIA process (Hardner *et al.*, 2015). Risks and impacts to biodiversity typically vary according to the project being assessed as well as the context of the receiving environment where the project is located. The biodiversity impact assessment that follows has been undertaken specifically for the Monsoon WF project located in Lao PDR.

9.4.2 Approach & Methods

The approach to the assessment of biodiversity impacts was as follows:

Step 1: Defining the AoI

The Area of Influence (AoI) for the project was defined to include the development footprint and any temporary works infrastructure, operational activities and infrastructure, any offsite facilities (borrow areas for example) as well as areas beyond the immediate area of effect that could be subjected to indirect impacts (e.g. emissions, noise, water quality issues, etc.).

Step 2: Identification of key ecological receptors and describe biodiversity values

Once the AoI had been defined, the biodiversity 'values' (*also termed biodiversity 'features' or 'attributes'*) and ecological sensitivity of the various environmental receptors were identified (i.e. relates back to key habitats and species identified in the baseline biodiversity assessment).

Step 3: Identification of impacts to biodiversity

Potential project impacts to the key ecological receptors and important biodiversity were identified, including site-specific direct, indirect and induced impacts to biodiversity. The following guidelines were also referred to in identifying and describing biodiversity impacts:

- "Good Practices for Biodiversity Inclusive Impact Assessment and Management Planning" (Hardner *et al.*, 2015⁵); and
- "Mitigating biodiversity impacts associated with solar and wind energy development: Guidelines for project developers" (Bennun *et al.*, 2021⁶).

Step 4: Assessment of impact significance

Biodiversity impact significance is the product of the value or importance of the biodiversity components that will be impacted and the intensity or magnitude (degree and extent of change) of the impact on those resources, systems and/or components. Some regulators, lenders, or corporate standards will use the term "significant" to refer to a threshold of consequence and/or risk that requires

⁵ Hardner, J., R.E. Gullison, S. Anstee, M. Meyer. (2015). Good Practices for Biodiversity Inclusive Impact Assessment and Management Planning. Prepared for the Multilateral Financing Institutions Biodiversity Working Group. Available online at: <https://publications.iadb.org/publications/english/document/Good-Practices-for-Biodiversity-Inclusive-Impact-Assessment-and-Management-Planning.pdf>

⁶ Bennun, L., van Bochove, J., Ng, C., Fletcher, C., Wilson, D., Phair, N., Carbone, G. (2021). Mitigating biodiversity impacts associated with solar and wind energy development. Guidelines for project developers. Gland, Switzerland: IUCN and Cambridge, UK: The Biodiversity Consultancy. Available online at: <https://portals.iucn.org/library/sites/library/files/documents/2021-004-En.pdf>

management or may not be acceptable. The approach to impact significance assessment is based on the traditional risk assessment formula which rates the **magnitude of effect** as the realistic 'worst-case' consequence or end-point of a project activity based on the perceived **importance and/or sensitivity** of a particular environmental receptor. Separate assessment matrices for habitat and species have been used for the assessment of impact significance, and these are contained in **Table 9-41** and **Table 9-42**, respectively.

Table 9-41: Matrix Used to Rate Impact Significance Criteria for Habitat

Habitat Importance / Sensitivity		Magnitude of Effect			
		Negligible	Small	Medium	Large
Negligible	Habitats with negligible interest for biodiversity.	Insignificant	Insignificant	Insignificant	Insignificant
Low	Habitats with no or local designation / recognition; habitats of significance for species of Least Concern (LC) on IUCN RDL of Threatened Species; habitats which are common and widespread within the region, or with low conservation interest based on expert opinion.	Insignificant	Insignificant	Minor	Moderate
Medium	Habitats within nationally designated or recognised areas, habitats of significant importance to globally Vulnerable (VU) Near Threatened (NT), or Data Deficient (DD) species, habitats of significant importance for nationally restricted range species, habitats supporting nationally significant concentrations of migratory species and / or congregatory species, and low value habitats used by species of medium value.	Insignificant	Minor	Moderate	Major
High	Habitats within internationally designated or recognised areas; habitats of significant importance to globally Critically Endangered (CR) or Endangered (EN) species, habitats of significant importance to endemic and/or globally restricted-range species, habitats supporting globally significant concentrations of migratory species and / or congregatory species, highly threatened and/or unique ecosystems, areas associated with key evolutionary species, and low or medium value habitats used by high value species.	Insignificant	Moderate	Major	Critical

Magnitude of Effect definitions for habitat receptors:

Negligible - Effect is within the normal range of natural variation.

Small - Affects only a small area of habitat, such that there is no loss of viability / function of the habitat.

Medium - Affects a sufficient proportion of the habitat that the viability/function of part of the habitat or the entire habitat is reduced, but does not threaten the long-term viability of the habitat or species dependent on it.

Large - Affects the entire habitat or a significant proportion thereof, to the extent that the viability/function of the habitat is threatened.

Table 9-42: Matrix Used to Rate Impact Significance Criteria for Species

Species Importance / Sensitivity		Magnitude of Effect			
		Negligible	Small	Medium	Large
Negligible	Species with no specific value or importance attached to them.	Insignificant	Insignificant	Insignificant	Insignificant
Low	Species and sub-species of LC on the IUCN RDL, or not meeting criteria for medium or high value.	Insignificant	Insignificant	Minor	Moderate
Medium	Species listed on IUCN RDL as VU, NT, or DD, species protected under national legislation, nationally restricted-range species, nationally important numbers of migratory, or congregatory species, species not meeting criteria for high value, and species vital to the survival of a medium value species.	Insignificant	Minor	Moderate	Major
High	Species included on the IUCN RDL as CR or EN. Nationally or internationally important populations of Annex II or Annex IV species. Species with restricted ranges or global breeding range for birds of less than 50,000 km ² . Internationally important concentrations of migratory and/or congregatory species, key evolutionary species, and species vital to the survival of a high value species.	Insignificant	Moderate	Major	Critical

Magnitude of Effect definitions for species receptors:

Negligible - Effect is within the normal range of variation for the population of the species.

Small – Effect does not cause a substantial change in the population of the species, or other species dependent on it.

Medium – Effect causes a substantial change in abundance and / or reduction in distribution of a population over one, or more generations, but does not threaten the long term viability / function of that population, or any population dependent on it.

Large - Affects entire population, or a significant part of it causing a substantial decline in abundance and / or change in and recovery of the population (or another dependent on it) is not possible either at all, or within several generations due to natural recruitment (reproduction, immigration from unaffected areas).

Step 5: Impact mitigation and management measures

Appropriate impact mitigation and management measures are recommended to reduce the magnitude (based on aspects that include the scale, probability and intensity of impact) and thereby reduce the significance of the impact consequence to an environmentally acceptable level where possible. The following best/good practice guidelines were referred to closely for informing impact management and the suite of mitigation measures recommended:

- “Good Practices for Biodiversity Inclusive Impact Assessment and Management Planning” (Hardner et al., 2015);
- “Mitigating biodiversity impacts associated with solar and wind energy development: Guidelines for project developers” (Bennun et al., 2021); and

- “A cross-sector guide to implementing the Mitigation Hierarchy” (Ekstrom et al., 2015⁷).

Step 6: Assess residual impacts

The final step is to assess residual impacts, which are those impacts that are likely to persist after taking into account the mitigation and management measures recommended as part of the mitigation strategy for the project, and their likely implementation success.

9.4.3 Biodiversity Impact Assessment

9.4.3.1 Project AoI

The AoI (Area of Influence) of the WF project was considered for the construction and operational/maintenance phases of the project, and is documented in **Table 9-43**.

The reader is also referred to **Section 4.3** of the ESIA for the full detailed description of project facilities and components as well as a map (**Figure 4-2**) indicating the location of the turbines, access roads, substations and transmission lines and a second map (**Figure 4-5**) showing the location of ancillary facilities (local crush stone location, batching plants, worker camps, laydown areas).

⁷ Ekstrom, J., Bennun, L. and Mitchell, R. (2015). A cross-sector guide for implementing the Mitigation Hierarchy. The Biodiversity Consultancy Ltd with inputs from the IFC (International Finance Corporation). Cambridge, United Kingdom. Available online at: <https://www.csbi.org.uk/wp-content/uploads/2017/10/CSBI-Mitigation-Hierarchy-Guide.pdf>

Table 9-43: Defining the Aol for Construction and Operational/Maintenance Components of the Project

Project Component	Habitats	Plants	Terrestrial Fauna (volant)	Terrestrial Fauna (non-volant)	Aquatic Ecosystems	Notes
CONSTRUCTION PHASE						
Access roads	350 m	350 m	250 m	250 m	Small streams crossed	■ Several small streams crossed by planned roads
Substations	350 m	350 m	250 m	250 m	n/a	■ Based on dust emissions (350m) and likely disturbance distance of most sensitive species. ■ Based on literature such as Kwon et al. (2018 ⁸), there is a strong possibility that species could be disturbed by noise up to a radius of approximately 250m from the construction site, and outside of the 250m, noise level from construction should have been attenuated to background noise levels, with the exception of when piling occurs in which case which the disturbing zone could be larger
Wind Turbines	350 m	350 m	250 m	250 m	n/a	
Worker camps	350 m	350 m	250 m	250 m	n/a	
Laydown areas	350 m	350 m	250 m	250 m	n/a	
Concrete batching plants	350 m	350 m	250 m	250 m	n/a	■ Transmission line impacts to linear ecosystems such as streams/rivers are likely to be minimal.
Crush stone locations	350 m	350 m	250 m	250 m	n/a	
Transmission lines	350 m	350 m	250 m	250 m	Streams / rivers crossed	■ Transmission line impacts to linear ecosystems such as streams/rivers are likely to be minimal.
OPERATIONAL / MAINTENANCE PHASE						
Wind Turbines	350 m	350 m	10 km	250 m	n/a	■ Adjacent areas, including protected areas and key biodiversity areas within a 10km range from the project development area (to account for potential risks to volant populations up to, due to the nature of wind farm projects and their potential avifauna collision risks)
Access roads	350 m	350 m	250 m	250 m	Small streams crossed	■ Several small streams crossed by planned roads.
Transmission lines	350 m	350 m	10 km	250 m	Streams / rivers crossed	■ Transmission line impacts to linear ecosystems such as streams/rivers are likely to be minimal.

⁸ Kwon, N., Song, K., Lee, H.-S., Kim, J. & Park, M. (2018). Construction Noise Risk Assessment Model Focusing on Construction Equipment. Journal of Construction Engineering and Management, vol. 144. Available online at: https://www.researchgate.net/publication/324259324_Construction_Noise_Risk_Assessment_Model_Focusing_on_Construction_Equipment

9.4.3.2 Key Receptors & Important Biodiversity

Key ecological receptors and important biodiversity linked with the Aol for the project include the various habitat types and species identified in the Baseline Biodiversity Assessment (see **Chapter 7.4 of the ESIA**). Several medium to high sensitivity ecological receptors and important biodiversity linked with the project Aol were identified, and these are summarized in **Table 9-44**. Critical habitats identified in the CHA (**Appendix T**) have also been included here, including their value from an ecosystem services perspective.

Table 9-44: Summary of Key Ecological Receptors and Important Biodiversity for the Project area

Ecological value	Applicability to the Project
Species level aspects of biodiversity	
Protected/Threatened species of conservation importance (Red Data Listed): flora	1 Red List plant species: <i>Zingiber mellis</i> (EN), recorded within Montane Forest vegetation community
Protected/Threatened species of conservation importance (Red Data Listed): fauna⁹	<p>Several Red Data List species of fauna have been confirmed in the study area, including CR, EN, VU, NT and DD species of birds, mammals and herpetofauna.</p> <p>Birds: 5 Red Data List bird species (includes VU & NT)</p> <ul style="list-style-type: none"> ■ Greater Hornbill, <i>Buceros bicornis</i> (VU) ■ Chestnut-eared Laughing thrush, <i>Ianthocincla konkakinhensis</i> (VU) ■ Black-crowned Barwing, <i>Actinodura sodangorum</i> (NT) ■ Mountain Hawk-eagle, <i>Nisaetus nipalensis</i> (NT) ■ Rufous-bellied Eagle, <i>Lophotriorchis kienerii</i> (NT) ■ Blossom-headed Parakeet, <i>Psittacula roseata</i> (NT), ■ Grey-headed Parakeet, <i>Psittacula finschii</i> (NT), ■ Red-breasted Parakeet, <i>P. alexandri</i> (NT), ■ Rufous-bellied Eagle, <i>Lophotriorchis kienerii</i> (NT), ■ Wreathed Hornbill, <i>Rhyticeros undulatus</i> (VU), and ■ Yellow-billed Nuthatch, <i>Sitta solangiae</i> (NT). <p>Mammals: 11 Red Data List mammal species (includes CR, EN & VU)</p> <ul style="list-style-type: none"> ■ Bengal Slow Loris, <i>Nycticebus bengalensis</i> (EN) ■ Pygmy Slow Loris, <i>Nycticebus pygmaeus</i> (EN) ■ Northern Buff-cheeked gibbon, <i>Nomascus annamensis</i> (EN) ■ Northern Pig-tailed Macaque, <i>Macaca leionina</i> (VU) ■ Red-shanked Douc Langur, <i>Pygathrix nemaeus</i> (CR) Chinese Pangolin, <i>Manis pentadactyla</i> (CR) ■ Sunda Pangolin, <i>Manis javanica</i> (CR) ■ Owston's Civet, <i>Chrotogale owstoni</i> (EN) ■ Large-antlered Muntjac, <i>Muntiacus vuquangensis</i> (CR) ■ Annamite Striped Rabbit, <i>Nesolagus timminsi</i> (EN) ■ Silver Langur, <i>Trachypithecus spec.</i> (EN) ■ Smooth-coated Otter (<i>Lutrogale perspicillata</i> (VU) ■ Asiatic black bear, <i>Ursus thibetanus</i> (VU)

⁹ For the detailed rationale as to why certain species have or have not been considered in the Critical Habitat Assessment see Appendix A and B of the Critical Habitat Assessment (**Appendix T**)

Ecological value	Applicability to the Project
	<ul style="list-style-type: none"> ■ Sun bear, <i>Ursus malayanus</i> (VU) ■ Greater Hog Badger, <i>Arctonyx collaris</i> (VU) ■ Chinese Serow, <i>Capricornis milneedwardsii</i> (VU) ■ Sambar Deer, <i>Cervus unicolor</i> (VU) <p>Reptiles: 4 Red Data List reptile species (includes EN, VU & DD)</p> <ul style="list-style-type: none"> ■ Red River Krait, <i>Bungarus slowinskii</i> (VU) ■ Impressed Tortoise, <i>Manouria impressa</i> (EN) ■ Asiatic Softshell Turtle, <i>Amyda cartilaginea</i> (VU) ■ Chinese Softshell Turtle, <i>Pelodiscus sinensis</i> (VU) <p>■ Amphibians: 1 Red Data amphibian species recorded Firth's Litter Toad, <i>Leptobrachella firthi</i> (EN)</p> <p>Bats: no Red Data List bat species recorded.</p> <p>Fish: no Red Data fish species recorded</p>
Keystone species performing a key ecological role (e.g. key predator, primary producer)	No specific species identified that may be considered keystone species contributing to long-term forest health, etc.
Large or congregatory species populations	None identified.
Endemic species or species with restricted ranges	<p>Several endemic and/or restricted-range species of birds, mammals, reptiles, amphibians and plant species recorded.</p> <p>Birds: 2 restricted-range bird species</p> <ul style="list-style-type: none"> ■ Chestnut-eared Laughing thrush, <i>Ianthocincla konkakinhensis</i> ■ Black-crowned Barwing, <i>Actinodura sodangorum</i> <p>Reptiles: 1 restricted-range reptile species</p> <ul style="list-style-type: none"> ■ Red River Krait, <i>Bungarus slowinskii</i> <p>Amphibians: 1 known and 3 species potentially 'new to science' could possibly be range-restricted (see below)</p> <ul style="list-style-type: none"> ■ Yellow-eyed spadefoot toad, <i>Leptobrachium xanthops</i> (EN) <p>Fish: 2 LC restricted-range fish species could possibly occur</p> <ul style="list-style-type: none"> ■ <i>Schistura imitator</i> ■ <i>Schistura clatrata</i> <p>Plants: 10 species potentially 'new to science' that could also be endemics (see below).</p> <p>Bats: none.</p>
Previously unknown species	<p>Amphibians: 3 species of frog that could be potentially 'new to science' (requiring further confirmation)</p> <ul style="list-style-type: none"> ■ <i>Quasipaa</i> sp.

Ecological value	Applicability to the Project
	<ul style="list-style-type: none"> ■ Maoson's Horned Toad, <i>Xenophrys cf maosonensis</i>¹⁰ ■ Rhacophorus sp. • Plants: 10 plant species that could be potentially 'new to science' (requiring further confirmation) <ul style="list-style-type: none"> ■ Camellia sp. ■ Garcinia sp. ■ Lasianthus sp. 1 ■ Lasianthus sp. 2 ■ Machilus sp. ■ Melastoma sp. ■ Neolitsea sp. ■ Polyosma sp.1 ■ Polyosma sp.2 ■ Smilax sp.
Ecosystem level aspects of biodiversity	
Unique ecosystems	The Project area is unlikely to comprise highly unique ecosystems.
Locally adapted communities or assemblages	The Project area is unlikely to contain unique species assemblages
The main uses and users of the area and its ecosystem goods and services: important ecosystem services (e.g. important water yield area, coastal buffer), valued ecosystem goods (e.g. harvestable goods important for lives and / or livelihoods), valued cultural areas .	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 (as impacts to these ecosystems may result in adverse impacts to Affected Communities, in terms of undermining cultural values and conflicting with subsistence resource needs), the evergreen forest ecosystems are considered important.
Landscape level aspects of biodiversity	
Protected Areas & Key Biodiversity Areas (KBAs)	<p>Song Thanh Nature Reserve located on the Laos-Viet Nam border to the east of the Project area and within close proximity to the transmission line, is known to be an important area of the Annamite Ranges, comprising one of the most extensive contiguous forests in Viet Nam. The Reserve reportedly contains a good population of the Vietnamese Crested Argus (CR).</p> <p>Dakchung Plateau is both a KBA and IBA located in the middle of the Project area. Although extensively degraded, it is thought to hold important concentrations of Black-crowned Barwing (CR), and potentially the Yellow-billed Nuthatch (NT), both species which have adapted to disturbed and secondary habitats.</p> <p>Phou Ahyon and Ngoc Linh are designated as KBAs, IBAs and Alliance for Zero Extinction (AZE) sites¹¹, located north of the project area. These areas hold some of the last remaining populations of restricted-range bird</p>

¹⁰ Herpetologist that conducted the field surveys state that *X. maosonesis* is a species complex, and the individual found will certainly be split as a new species in the near future.

¹¹ AZE sites are aligned to the boundary of existing or proposed designated or protected areas the focal species(s) inhabit, rather than the distribution of the species within it.

Ecological value	Applicability to the Project
	<p>species found in the Kon Tum Plateau EBA, such as the Vietnamese Crested Argus (CR), and Yellow-billed Nuthatch (NT). Additionally, Ngoc Linh also contains populations of the Black-crowned Barwing (NT). The Phou Ahyon AZE is triggered by the amphibian <i>Leptobrachium xanthops</i>. According to the AZE website¹², the Phou Ahyon AZE hosts the entire known population of <i>L. xanthops</i>. ERM investigated the planned TL route through this area and delineated clearly identifiable streams, of which one will be crossed by the transmission line (see ESIA Appendix T and the initial Biodiversity Action Plan for more information and mitigation measures).</p> <p>Upper Xe Kaman is a KBA and an IBA supporting relatively intact old-growth semi-evergreen forest and riverine habitats, with key species of conservation importance including Masked Finfoot <i>Heliopais personata</i> (EN), hornbill species, a range of gibbon species and Siamese crocodile <i>Crocodylus siamensis</i> (CR).</p>
Key ecological processes (e.g. seed dispersal, pollination, primary production, carbon sequestration)	The forest ecosystems are known to provide a range of important ecosystem goods and services which society values (mainly extractive use of timber, plants and wildlife for direct consumption by communities or re-sale to local markets).
Areas with large congregations or species and/or breeding grounds	None identified.
Migration routes/corridors	Key ecological linkages in the project area include the less fragmented and more contiguous forested corridors, watercourses (streams and rivers) and areas providing connectivity to and between Protected Areas (PAs) and Key Biodiversity Areas (KBAs).
Importance as a link or corridor to other fragments of the same habitat, to protected or threatened or valued biodiversity areas	The Project area is also situated within one of the designated biodiversity corridors of the ADB-funded Biodiversity Conservation Corridor Project ("BCCP"), in recognition of its importance in maintaining the forest ecosystem connectivity between Xe Sap National Protected Area ("PA") in Sekong province, and Dong Ampham NPA in Attapeu province (ADB, 2021).
Importance and role in the landscape with regard to a range of 'spatial components of ecological processes', comprising processes tied to fixed physical features (e.g. soil or vegetation interfaces, river or sand movement corridors, upland-lowland interfaces) and flexible processes (e.g. upland-lowland gradients and macro-climatic gradients), as well as important movement or migration corridor for species	

Key to table:

IUCN Global Red List status: CR = Critically Endangered; EN = Endangered; VU = Vulnerable; NT = Near Threatened; LC = Least Concern; DD = Data Deficient; NE = Not Evaluated.

Note that there is no national Red List available for Lao PDR.

¹² <https://zeroextinction.org/site-identification/2018-global-aze-map/>

9.4.3.3 Identification of Biodiversity Impacts

Detailed information on the Construction Phase of the project (**Section 4.9.1** of the ESIA) and Operational/Maintenance Phase (**Section 4.9.2**) were referred to specifically in identifying and assessing biodiversity impacts. Maintenance has been included in the operational phase, noting that onshore wind farms typically have low maintenance and servicing requirements (Bennun *et al.*, 2021). The project concession period will be 25 years with little information on the decommissioning phase available, however decommissioning phase impacts are likely to be similar to construction phase impacts and have therefore not been assessed directly. Cumulative impacts are addressed later on in the ESIA, and include cumulative impacts on biodiversity.

Biodiversity impacts identified for the Monsoon WF project and related activities and infrastructure have been conceptualized and discussed in detail in **Table 9-45**. Impacts are defined in terms of construction and operational (including maintenance) project phases, and include direct, indirect and induced impacts. Pathways of effect are used to understand how biodiversity may be impacted (e.g. direct habitat loss, indirect habitat loss due to disturbance, increased hunting pressure due to settlement associated with the creation of new access roads and other infrastructure).

Impacts associated with the WF are considered to be both 'area based' and 'linear' in nature, and relate to the construction and operation of several wind turbines, electrical substations, the planned electricity distribution network (transmission line) from the WF towards Vietnam, as well as temporary worker camps and equipment laydown areas:

- Biodiversity impacts appear most intimately linked with direct and indirect impacts to that natural and modified terrestrial forest ecosystems, as well as the biodiversity components that these important habitat types support, including the species of fauna & flora that characterize the study area and the ecosystem services that forest ecosystems supply at local, regional and even global scales.
- There are also likely to be localized impacts on freshwater biodiversity, associated mainly with the construction of new access roads across watercourses such as small streams. The risk of incurring potential impacts to these highly connected ecosystems needs to be acknowledged.
- There are also likely to be a range of permanent operational impacts of lower significance associated with the installation and operation of the hard infrastructure (turbines and transmission lines).
- Construction-phase impacts likely to be more temporary in nature (e.g. temporary areas, noise, vibrations and emissions) and therefore far less significant in the long-term.

Table 9-45: Biodiversity Impacts Identified and Conceptualized for the Monsoon WF Project

Impact	Description	Receptor	Perceived Importance/ Sensitivity of Habitat and/or Species	Magnitude of Effect
Direct Impacts: <i>linked with the development project footprint and key activities</i>				
1a Physical destruction and/or disturbance of vegetation	<p>Construction phase:</p> <p>The physical footprint of the wind farm (including turbines, electrical substations, access roads and transmission lines) will be relatively small in scale, being localised and limited to the actual footprint of infrastructure where vegetation will be cleared and converted to artificial surfaces (i.e. wind turbine foundations, access roads, substation foundations and pylons for the transmission line) or modified from wooded (forest) vegetation and maintained as low shrub or grass cover for the transmission line corridor. The following vegetation communities will be affected:</p> <ul style="list-style-type: none"> • Montane Forest and Wet Evergreen Forest subject to varying degrees of existing degradation and fragmentation, • smaller isolated (highly fragmented and degraded) forest patches, • secondary or young/seral forest patches, and • modified (artificial) shrub land/grassland. <p>The perceived importance of the biodiversity loss associated with loss of forest vegetation is typically linked to the conservation/threat status of the vegetation type, which has not been formally determined for Lao PDR, however the ecoregion is considered 'Vulnerable'. Given the extent of loss of forest vegetation which has been sustained (according to the WWF, 2021, "<i>in excess of 75% of the ecoregion's natural habitat has been converted or degraded</i>"), the vegetation threat status may actually be higher than VU realistically, and moreover the forest communities have been identified as important for harbouring threatened/RDL plant species (e.g. <i>Zingiber mellis</i>, EN) as well as plants that may be potentially 'new to science'. Therefore, the perceived importance of the biodiversity features that stand to be impacted is considered 'High'. Whilst there will also be localised impacts to other vegetation communities, including</p>	Habitat	High	Small

Impact	Description	Receptor	Perceived Importance/ Sensitivity of Habitat and/or Species	Magnitude of Effect
	<p>shrub land and small grassland patches, these vegetation types have been identified as having been artificially created through shifting cultivation practices, and are therefore rather small and transitional habitat types of limited biodiversity value as herbaceous communities, in comparison to the forest types in the project area.</p> <p>Most significant is likely to be the transmission line corridor impact, particularly for the portion of the transmission lines to the north and north-west, affecting some relatively contiguous areas of Montane Forest and Wet Evergreen Forest, some being primary forest that has not been subjected to extensive disturbance. In this case the vegetation will not be lost but will be modified from forest to a shorter herbaceous vegetation type, such as wooded shrub lands for example, and maintained as such. Based on the land use mapping undertaken, and a rapid scan of the satellite imagery in GIS, this suggests that the transmission line to the north-east will likely affect areas of lesser impacted/more contiguous forest over a distance of up to 15km of line will affect areas of contiguous forest, with the second transmission line in the north covering a distance exceeding 15km through largely contiguous, dense and lesser impacted forest. If one factors in power line corridor width (40m), the actual extent of vegetation change is likely to exceed about 100 ha.</p> <p>Where there is no or limited access to remote areas, new access road infrastructure across 'greenfield' areas will almost certainly result in the direct transformation of forest, mainly associated with some of the lesser impacted and more contiguous Montane Forest community. Based on the land use mapping undertaken and a rapid scan of the satellite imagery in GIS, this suggests that the new roads through the older growth and least impacted forest habitats could extend over a distance upwards of 20km. If one factors in average road construction corridor width (likely to be approx. 25m), the actual extent of vegetation loss due to new road construction is likely to be in the region of 50 ha. Where existing access roads will be upgraded only, the additional loss of vegetation is considered to be negligible and largely insignificant, especially given the level of degradation and fragmentation of the forest communities that has already occurred in these areas.</p>			

Impact	Description	Receptor	Perceived Importance/ Sensitivity of Habitat and/or Species	Magnitude of Effect
	<p>In the context of there being significant areas of natural and modified forest remaining within the EAAAs, an estimated modification in the region of 100ha and total transformation / loss of roughly 50 ha of the lesser impacted forest habitat can be considered relatively 'small' in terms of the actual magnitude of effect. The WF development is unlikely to threaten the long-term viability of the forest habitat or species dependent on it, with large areas of forest to remain undisturbed.</p> <p>Operational/Maintenance Phase:</p> <p>The physical destruction/disturbance of vegetation is primarily a construction-phase impact initiated by construction activities, albeit that the effects will be permanent in many cases where vegetation is changed.</p>			
1b Reduction in habitat for supporting key species of conservation importance	<p>Construction phase:</p> <p>Changes to species habitat is linked to the direct destruction of or change to the corresponding forest vegetation communities and any additional disturbance through typical edge impacts adjacent to construction activities. The reduction in habitat is primarily a construction-phase impact initiated by construction activities and vegetation transformation, albeit that the effects will be permanent in many cases where habitat is transformed by infrastructure such as foundations and roads. Transmission line corridor habitat will be modified (forest to be modified to shrub land most likely) but not lost entirely.</p> <p>Given that forest-dependent species that are CR and EN could be affected by reduced habitat availability, linked with the change in forest vegetation described above, the biodiversity importance associated with this impact is considered to be reasonably 'High'. One can expect losses of some RDL species, particularly the slower moving and more sedentary species (such as tortoises and frogs) and this will be more relevant to the lesser impacted, more contiguous forest habitat in the north and east sections of the project area, however it is probably unlikely that significant populations of RDL herpetofauna could be negatively affected. Most species of mammals and birds are highly mobile and the more sensitive species are capable of moving</p>	Habitat & Species	High	Small

Impact	Description	Receptor	Perceived Importance/ Sensitivity of Habitat and/or Species	Magnitude of Effect
	<p>away from areas as human presence increases at the construction site. Since the direct loss of habitat will be relatively small, the impact is unlikely to result in a substantial change in the populations of forest-dwelling species, with sufficient forest habitat remaining available in the area (magnitude of effect is likely to be 'small' as a result).</p> <p>Operational/Maintenance Phase: This impact is initiated during construction but can be permanent in the case of hard structures such as foundations and roads, and more long-term in the case of habitat change associated with transmission lines.</p>			
1c Illegal hunting/poaching and collection of forest resources	<p>Construction phase: Whilst increased human activity in the area could result in increased pressure on local forest resources (through illegal hunting/poaching and harvesting of forest products, for example), this will likely be highly localised and relatively short-lived. <i>r. This is also addressed in terms of the project Cumulative Impact Assessment ("CIA") later.</i> This impact may possibly occur if not mitigated but is not likely to result in a substantial change in the population of species identified, thus magnitude of effect is likely to be relatively 'small'.</p> <p>Operational/Maintenance Phase: This impact will likely be less important during operation, as construction crews would have vacated the site and only a small operations and maintenance staff complement would remain on site, and not all the time.</p>	Species	High	Small
1d Bird & bat collisions with wind turbines resulting in injury or mortality	<p>Construction phase: This impact is not relevant to the construction phase.</p> <p>Operational/Maintenance Phase: Bird and bat species that utilise the airspace in the project area are potentially at risk of collision with wind turbine rotator blades and risk incurring serious injury or death.</p>	Species	Medium	Small

Impact	Description	Receptor	Perceived Importance/ Sensitivity of Habitat and/or Species	Magnitude of Effect
	<p>Birds:</p> <ul style="list-style-type: none"> ■ Bennun <i>et al.</i> (2021) indicate that collision risk for migratory species is considered generally greater than for more sedentary species. Larger birds with lower aerial manoeuvrability (such as cranes, storks, geese/swans, eagles and vultures) would probably be most at risk of collision. While most species in the area likely to be affected by the wind farm are considered locally common resident species of Least Concern (LC), there are several birds that are RDL species. It was concluded that there will not be a meaningful collision risk within the lifetime of the WF based on the low level of aerial occupancy by key RDL species of birds observed in the area, including Mountain Hawk-eagle (<i>Nisaetus nipalensis</i>, NT) and Rufous-bellied Eagle (<i>Lophotriorchis kienerii</i>, NT) (noting here that the ecologically acceptable mortality rate or threshold for near threatened species should typically be considered lower or more stringent than for species of least concern). Given the species NT status of RDL birds, the importance/sensitivity of these biodiversity features is considered 'Medium'. ■ Most of the common resident bird species (of LC) are also unlikely to trigger a significant collision risk and all species belong to widespread and locally common and stable populations. Only local effects on common species of LC may occur, due to the statistically low likelihood of collision and widespread and common nature of these bird populations. Furthermore, there are no IBAs (Important Bird Areas) within close proximity to proposed wind farm that could be negatively impacted in terms of bird behaviour for key species of conservation importance or large congregations of birds and extensive field observations during key migratory periods suggest that the study area does not represent a significant migratory or congregatory area. ■ Migrant species are also of LC, and based on observations and experience in CRM the WF is unlikely to result in a significant risk of collision for these species within the lifetime of the WF. The only migrant species that recorded activity at levels of flight that could be associated with potential collision risk was the Grey-faced buzzard (<i>Butastur indicus</i>, LC), which was subject to further Collision Risk Modelling (CRM). The CRM concluded that "In the worst-case scenario of 10,000 individuals, the project is likely to cause 0.16% of the total annual global non-natural mortalities that could occur before significant negative impacts on the global population occur". The project magnitude of effect on birds susceptible to collision was therefore considered to be small. <p>Bats:</p> <ul style="list-style-type: none"> ■ With the exception of <i>Rhinolophus francisi</i> which has yet to be evaluated by the IUCN, all bat species identified during the baseline biodiversity assessment are considered locally 			

Impact	Description	Receptor	Perceived Importance/ Sensitivity of Habitat and/or Species	Magnitude of Effect
	<p>common species of LC, and as such the importance/sensitivity of these biodiversity features is considered relatively 'Low'.</p> <ul style="list-style-type: none"> Most bat species mortalities linked to WF projects relate mainly to migratory, foliage-roosting and tree-roosting species, and especially those species adapted for foraging insects in open spaces above the ground and far from vegetation. Based primarily on foraging strategy, 10 of the bat species recorded are considered to be at high risk for collision and potential fatality, with 11 medium risk of collision species. As bats are typically long-lived and have exceptionally low reproductive rates, fatalities of significant bat numbers could affect local populations of LC species. Since local bat activity can change after WF construction, pre-construction studies have consistently proven to be poor predictors of the scale and magnitude of bat fatality impacts at species and population levels (Hein <i>et al.</i>, 2013, Lintott <i>et al.</i>, 2016). Given the constraints in determining bat fatality impacts prior to operation of the WF, it will be necessary to undertake further operational monitoring to validate operational impacts and to inform appropriate mitigation options. 			
1e Bird & bat collisions with transmission lines or electrocution resulting in injury or mortality	<p>Operational phase only:</p> <p>Collisions with the earth wire of transmission lines (which is typically quite poorly visible to avifauna) may lead to injury or even fatalities in bird and bat species. TL projects can also result in electrocution when birds or bats earth live elements of the line, which is particularly relevant for larger species (with large wing spans). Electrocution risk is relevant to the transmission lines and substations.</p> <p>Birds:</p> <ul style="list-style-type: none"> Electrocution risk is typically quite species-specific, and may disproportionately affect species that utilise the pylons as perches when hunting or for nesting purposes, and this is most significant for raptors and other larger perching birds with large wing spans (Bennun <i>et al.</i>, 2021). There is therefore some risk posed to some of the larger perching raptor species such as Mountain Hawk-eagle (<i>Nisaetus nipalensis</i>, NT) and Rufous-bellied Eagle (<i>Lophotriorchis kienerii</i>, NT), with other raptors such as Black Eagle, Crested Serpent Eagle being locally common resident species of Least Concern (LC). For larger voltage lines, electrocution risk will be minimised as live elements will be placed at a distance from each other such that the chance of birds completing the live circuit will be negligible. However, the lower voltage distribution lines (e.g. 35 kV and 115 kV) that are more 	Species	Medium	Small

Impact	Description	Receptor	Perceived Importance/ Sensitivity of Habitat and/or Species	Magnitude of Effect
	<p>compact in design may present a risk of electrocution for perching and low-flying birds with larger wingspans.</p> <ul style="list-style-type: none"> ■ Although the incidence of collisions of raptors per km of power line is typically quite low in general, collisions are also more likely where species are more abundant and in areas with higher flight activity. The results of the VP monitoring suggest that common resident raptor species of Least Concern (LC) such as Black Eagle (<i>Ictinaetus malaiensis</i>), Crested Serpent Eagle (<i>Spilornis cheela</i>), Grey-faced Buzzard (<i>Butastur indicus</i>), Oriental Honey Buzzard (<i>Pernis ptilorhynchus</i>) and Shikra (<i>Accipiter badius</i>) were the most abundant and recorded the greatest flight times. However, most species were observed at great heights (exceeding 100m and up to 3000m elevation), such that it is only the less commonly observed species such as Rufous-bellied Eagle and particularly the Great Hornbill (<i>Buceros bicornis</i>, VU) that are likely to fly at lower heights typically where risk of collision with overhead power lines could become a concern. Previous experience with collision risk modelling and assessments would conclude that based on the level of aerial occupancy at collision height for the Rufous-Bellied Eagle and Great Hornbill, that collision risk would be unlikely. However, given the propensity for Great Hornbill to utilise evergreen forest habitats, some of which will be traversed by the planned TL to Vietnam, there may be associated risks with the TL in these areas where additional mitigation will need to be considered for this species. Given the VU status for Great Hornbill, the importance/sensitivity of this biodiversity feature is considered 'Medium'. <p>Bats:</p> <ul style="list-style-type: none"> ■ There is limited evidence of risks posed by transmission lines to bats, although electrocution of large bat species, particularly fruit bats (such as 'Flying Foxes' which are unlikely to occur in the area), has been identified as an issue associated with some distribution lines (Bennun <i>et al.</i>, 2021). ■ Since the bat species recorded are largely small insectivores of LC, bat collisions with the transmission lines and possible electrocution risks are considered largely insignificant for this project. 			
1f Vehicular collisions with wildlife	<p>Construction phase:</p> <p>Construction vehicles accessing and working within the site pose a risk of colliding with species utilizing the habitats and crossing roads between habitats. Some species may also be</p>	Species	High	Small

Impact	Description	Receptor	Perceived Importance/ Sensitivity of Habitat and/or Species	Magnitude of Effect
	<p>attracted to access roads created as easy corridors to move between areas and these animals are likely to be more at risk. Slower moving and more sedentary species such as reptiles (e.g. tortoises) and amphibians are likely to be at a greater risk of being injured or killed by moving vehicles, even at low speeds, particularly as cold-blooded species such as reptiles may utilize roads for sunning themselves. Given that some of these species are CR and EN, the importance associated with these species is considered 'High'. Vehicular collisions, whilst probable, are likely to be localised, manageable and therefore also unlikely to diminish populations of the identified species (magnitude of effect considered 'small').</p> <p>Operational/Maintenance phase:</p> <p>This impact will probably be even less significant during operation, when only small operations, maintenance and security teams would probably utilise the access roads, and not all the time.</p>			
1g Dust pollution caused by earthworks and vehicle/machinery operation	<p>Construction phase:</p> <p>Construction activities and operations are known to increase levels of dust due to vehicles travelling on informal dirt roads and through the creation of bare surfaces where vegetation clearing and bulk earthworks take place. Where large quantities of dust are released, this can smother plant parts and reduce photosynthetic activity, however this is likely to be a highly localised impact. Faunal impacts are also likely to be insignificant. Impacts of increased dust will also be limited to particularly windy periods and when vehicles drive along dirt roads, and the magnitude of effect is therefore likely to be 'negligible'.</p> <p>Operational/Maintenance phase:</p> <p>This impact will probably be less significant during operation, when only small operations, maintenance and security patrol teams would probably utilise the roads, and not all the time.</p>	Species	Low	Negligible
1h Water and soil pollution caused by potential	<p>Construction phase:</p> <p>Fuels, oils and other chemical substances required by construction crews operating at the site of the WF will be liable to accidental spillage, and even improper disposal, unless carefully</p>	Habitat & Species	Medium	Small

Impact	Description	Receptor	Perceived Importance/ Sensitivity of Habitat and/or Species	Magnitude of Effect
accidental spills of hazardous substances	<p>managed. This will be most relevant to sensitive species of amphibians and any fish present in watercourses which are naturally the most prone areas to water pollution impacts - given their inherent level of connectivity in the landscape and location at topographic low points. During rainfall events, contaminants could also be washed into adjacent terrestrial habitats and soils that have been subject to pollution could hinder natural plant growth. While the likelihood of significant spills occurring for a project of this nature can be considered low typically (magnitude of effect considered 'small'), where spills of hydrocarbon products and other hazardous substances do happen these can be particularly devastating and long-lasting and may require considerable remediation efforts.</p> <p>Operational/Maintenance phase:</p> <p>This impact may be relevant to maintenance activities, but these are likely to be limited, with insignificant quantities of fuel, oil, etc. stored and handled during the operational phase.</p>			
1i Soil erosion and sedimentation of watercourses	<p>Construction phase:</p> <p>Soil erosion and loss of topsoil is generally considered a significant risk given the high rainfall, steep topography and erodible nature of soils in the region (National University of Laos, 2008). Soil erosion and sedimentation is likely to be most relevant to watercourses (small mountain streams and the larger rivers in valley bottom areas) and specifically where these are crossed by new access roads. Erosion of stream beds and banks would alter the morphology of these ecosystems and potentially reduce habitat availability for aquatic and sub-aquatic species such as fish and amphibians, and certain reptiles. Bare surfaces and open excavations can also be sources of sediment in themselves and excessive sediment can blanket vegetation and habitats, leading to altered instream habitat/biotopes and possibly affecting fish spawning sites and amphibian habitats important for completing species' life stages. The magnitude of effect has been rated as 'small' given the small size of the affected watercourses (small mountain streams) and the potential ease of mitigation.</p> <p>Operational/Maintenance phase:</p>	Habitat	Medium	Small

Impact	Description	Receptor	Perceived Importance/ Sensitivity of Habitat and/or Species	Magnitude of Effect
	Although operational activities are unlikely to initiate any new erosion/sediment effects in themselves, erosion/sediment related impacts initiated during the construction phase may be prolonged and extend into operations unless properly addressed during the construction phase.			
1j Disturbance and nuisance caused by increased noise, light and/or vibrations	<p>Construction phase:</p> <p>General nuisance and disturbance as a by-product of construction activities, including that associated with increased noise / vibrations from heavy construction machinery and artificial light. There are few studies available on the distance to which fauna are typically displaced during the construction phase of wind turbine projects. The displacement of fauna during construction is considered to be mostly associated to noise (for birds and non-volant mammals) and vibrations (herpetofauna). Locally common species are likely to be less sensitive to noise/light disturbance can probably become habituated at the site. Based on literature such as Kwon <i>et al.</i> (2018), there is a strong possibility that species could be disturbed by noise up to a radius of approximately 250m from the construction site, and outside of the 250m, noise level from construction should have been attenuated to background noise levels, with the exception of when piling occurs in which case which the disturbing zone could be larger. Given that the turbines are high in number and clustered relatively close together in areas, this could in theory render relatively areas susceptible to indirect disturbance but this may be more localized.</p> <p>Operational/Maintenance phase:</p> <p>Artificial light impacts during operation are likely when specific facilities such as substations may need to be well-lit for safety and security purposes. This can also attract certain species of insects, which can lead to increased activity by insectivorous species such as bats and small reptiles. Noise and visual disturbance from operating wind farms may not pose as much immediate risks to non-volant fauna, so they show less avoidance behaviors and can be habituated to the disturbances quite easily (Kopucki & Mróz, 2016¹³).</p> <p>The magnitude of effect is likely to remain 'small' given the temporary nature of construction activities and low intensity of operational activities anticipated.</p>	Species	Medium	Small

¹³ Kopucki, R. & Mróz, I. (2016). An assessment of non-volant terrestrial vertebrates response to wind farms: a study of small mammals. *Environmental monitoring and assessment*, vol. 188, no. 2, p. 122. Available online at: https://www.researchgate.net/publication/292186245_An_assessment_of_non-volant_terrestrial vertebrates_response_to_wind_farms-a_study_of_small_mammals

Impact	Description	Receptor	Perceived Importance/ Sensitivity of Habitat and/or Species	Magnitude of Effect
1k Barriers or interference with species movement	<p>Construction phase: Artificial barriers to species movement, such as roads, will be initiated during construction and will continue as long as infrastructure is in place during operations.</p> <p>Operational/Maintenance phase: Migratory bird species are likely to be the most affected by wind farm barrier effects, however no IBAs for migration are found within 50km of the proposed WF project and extensive field surveys did not indicate significant migratory or congregatory populations, suggesting that there is likely to be little effect on bird populations in terms of altered species movement. Whilst there is some evidence of broad front raptor migration in the area, all raptor species involved are species of LC and will probably be largely unaffected. Bats may avoid the wind turbine locations but equally they may be attracted to feed around these areas in the case of insectivores, where artificial light and disturbance may attract greater concentrations of insects to the WF. Barrier effects may also affect terrestrial species such as mammals if wind farms are fenced, particularly for larger migratory mammals (which is not so problematic for this project). It is therefore unlikely that Project will have any population level effect on species movement (magnitude of effect will be 'small').</p>	Species	High	Small
Indirect Impacts: <i>associated indirectly with the main project activities and operations</i>				
2a Increased susceptibility of forest habitat to disturbance	<p>Construction phase: Whilst disturbance is initiated during construction, this impact is principally a long-term effect that continues into the operational phase.</p> <p>Operational/Maintenance phase: Where less impacted and largely contiguous areas of older growth (primary) forest will be traversed by the transmission line and access roads, the disturbance caused will also increase susceptibility to the effect of other forms of natural disturbance, such as increased exposure to wind (especially during storms) along the newly created forest edges which would not yet have developed sufficient low ground cover to provide shelter from wind impacts. The magnitude of effect will likely remain 'small', as only localised sections of mostly fragmented and degraded forest habitats are likely to be affected.</p>	Habitat	Medium	Small

Impact	Description	Receptor	Perceived Importance/ Sensitivity of Habitat and/or Species	Magnitude of Effect
2b Introduction of alien plant species and/or disturbance leading to invasion by alien plants and weeds	<p>Construction phase:</p> <p>The movement of vehicles, people and equipment into and through the project area may facilitate the introduction of Invasive Alien Plants (IAPs) to the area, or contribute to the spread of existing IAP species, primarily through the transport of seed attached to machinery, soils, clothing, etc. The disturbance created by vegetation clearing and earthworks may also create suitable conditions for IAPs and weeds to become established and possibly spread into adjacent habitats. IAPs can have far reaching detrimental effects on native biota and are widely accepted as being a leading cause of biodiversity loss. Key species are likely to be related to those introduced by Laotian plantation programmes (production forestry), and include <i>Eucalyptus</i> spp., <i>Acacia</i> spp., <i>Elaeis guineensis</i> (Oil palm), <i>Hevea brasiliensis</i> (Rubber tree) and <i>Jatropha</i> spp. (Tong, 2009¹⁴) although there may be other key plants. The Global Register of Introduced and Invasive Species v1.1 (Pagad, 2020¹⁵) has recorded 297 species of invasive alien plants for Lao PDR and can be accessed online to view species details.</p> <p>Operational/Maintenance phase:</p> <p>The introduction of invasive alien plants into the lesser disturbed and ecologically important forest ecosystems can have a significant and lasting negative effect on the habitat and plant communities, that can extend well past the construction phase unless controlled. However, with mitigation this will probably be localised and therefore the magnitude of effect is considered 'small'.</p>	Habitat & Species	High	Small
2c Reduced habitat connectivity	<p>Construction phase:</p>	Habitat & Species	High	Small

¹⁴ Tong, P.S. (2009). Lao People's Democratic Republic: Forestry Outlook Study. Asia-Pacific Forestry Sector Outlook Study II, Working Paper Series. No. APFSOS II/WP/2009/17. Food and Agriculture Organization (FAO) of the United Nations, Regional Office for Asia and the Pacific. Bangkok, 2009. Available online at: <https://www.fao.org/3/am612e/am612e.pdf>

¹⁵ Pagad, S. (2020): Global Register of Introduced and Invasive Species- Laos. v1.1. Invasive Species Specialist Group ISSG. Dataset/Checklist. Available online at: <https://cloud.gbif.org/griis/resource?r=griis-laos&v=1.1>

Impact	Description	Receptor	Perceived Importance/ Sensitivity of Habitat and/or Species	Magnitude of Effect
caused by fragmentation of habitat	<p>Whilst indirectly related to the destruction of vegetation and habitat during construction phase of the project, a reduction in habitat connectivity is a long-term and possibly a permanent effect in many cases, extending past construction and into the operational phase.</p> <p>Operational/Maintenance phase:</p> <p>New planned access roads can potentially fragment the remaining contiguous forest habitats and contribute to further fragmentation of areas already degraded and with patchy cover. Fragmentation of habitat can result in a landscape that has a lower capacity to support wildlife, preventing regular movement of species, limiting access to critical resources or increasing the energy required to take advantage of resources (Cornwall & Davis, 2003¹⁶). This is likely to be the most significant for migratory species, and given that large populations of migratory species have not been highlighted for the project area (and that additional habitat fragmentation impacts are unlikely to be severe), the magnitude of effect is considered 'small'.</p>			
2d Loss of ecosystem services	<p>Construction phase:</p> <p>Key ecosystem services are thought to be provided by the natural (and to a lesser extent, modified) forest habitats, and relate mainly to timber and non-timber products that are important for sustaining local livelihoods of the communities in the area that are dependent on these resources. A reduction in forest extent through destruction and degradation could contribute to a diminished supply of key provisioning and regulating/supporting services, however the linear nature of the more significant forest losses is likely to be more of a forest connectivity issue and have less of an overall effect on reducing key forest-related services. Any loss of ecosystem services is likely to be minor ('small' magnitude of effect).</p> <p>Operational/Maintenance phase:</p>	Habitat	Medium	Small

¹⁶ Cornwall, C. and Davis, M.K. (2003). *Fencing guidelines and specifications for conservation easements*. Sonoma Ecology Center, Santa Rosa, California. USA. July 2003.

Impact	Description	Receptor	Perceived Importance/ Sensitivity of Habitat and/or Species	Magnitude of Effect
	Whilst there is a possibility that development can restrict access to natural areas by local communities, the opposite is likely to be the case for this project, with increased accessibility likely to result, meaning that local communities can potentially make increased usage of forest resources and products. As discussed elsewhere in this chapter (under impact 3a below), this comes with its own unique set of unintended consequences on the local biodiversity values of the project area.			
Induced Impacts: <i>typically not directly attributable to the project and related activities</i>				
3a Increased hunting/harvesting pressure due to enhanced accessibility to the area	<p>Construction phase:</p> <p>Whilst this induced impact is linked to the construction of new access roads, it is principally a long-term impact associated with the increased access created to the project area throughout its operation.</p> <p>Operational/Maintenance phase:</p> <p>Improved accessibility to the area gained via the various access roads planned could facilitate increased access to remote areas by local communities wishing to hunt wildlife for bush meat and collect forest products for subsistence and economic reasons. The more remote and less impacted forest areas in the north and east of the project, are likely to host larger populations of forest-dependent RDL CR and EN species at risk of being hunted further, and are considered to be 'High' importance habitats and receptors.</p> <p>Most of the concession area at lower elevations has long standing patterns of settlement supported by tracks and trail, timber use and agricultural settlement leading to habitat fragmentation and reduced biodiversity value. An existing and long-established vehicle road with settlements lies close to both the north-western array and the northern part of Phou Kounking. These northern areas have a well-developed trail system within the mountain range, and agricultural settlements at lower elevations that have been present since at least 1985. At the southern end of Phou Kounking there are a number of small settlements at low elevations, and a well-developed foot trail up the central ridge that turns east at the steepest point of the</p>	Species	High	Small

Impact	Description	Receptor	Perceived Importance/ Sensitivity of Habitat and/or Species	Magnitude of Effect
	<p>mountain, and continues onto the town of Dak Cheung. There is recent evidence in the low southern section of the mountain of access tracks cut to facilitate reported illegal gold mining.</p> <p>The wind farm access roads have the potential to increase access to the higher elevations of the forest, both in terms of the quantity and quality of the access available, including increased vehicular access. Without proper controls this could lead to increased pressure on both wildlife and habitat, however it is recognised that access control will be a priority as recommended in the local EIA mitigation recommendations. Bearing in mind the existing extent of hunter access to the Project area and the implementation of access controls, particularly for vehicles using new WF access road, the magnitude of effect has been regarded as 'small', also since controls on vehicle access would probably restrict hunter access to the existing informal trails and paths primarily.</p>			

Scoped out / Excluded impacts: Note that the following potential biodiversity-related impacts were initially identified for the project, however a decision was made to exclude them from the assessment of impact significance, with the reasons for excluding impacts provided:

Increased risk of fire – whilst fires can have negative impacts on habitats such as forests that are adapted to lack of fire, the project in itself is unlikely to pose a significant risk of fire. This risk, albeit low, can be readily mitigated through simple controls and preventative measures during construction and operation.

Trophic cascade effects – behavioral changes in species can result in cascading effects on the various trophic levels, however these are typically not well- documented or understood and any species-level effects would be purely theoretical and conceptual at this stage and cannot be determined with any high level of confidence or accuracy/ long-term species monitoring at the site will be required to study such effects of the project.

9.4.3.4 Alternatives and Existing Controls

Several project alternatives have already considered within the context of avoiding impacts to biodiversity where possible (detail in **Section 5** of the ESIA):

- Through a process of avoiding impacts where possible (according to the application of the mitigation hierarchy), the extent of forest destruction and disturbance has been minimized as far as possible.
- Project alternatives considered included alternative power generation, site selection, technology and locations for infrastructure development. Turbine layout has been optimized from 240 turbines to 133 turbines, reducing the project footprint quite substantially as well as the areas required for temporary works (laydown areas, installation areas, access roads and WTGs).
- Clustering of turbines as far as possible will reduce the overall area over which the footprint occurs and reduce the number and length of access roads.
- The original transmission line planned to the Ban Lak 25 substation was amended to connect to Thanh My substation in Vietnam, reducing the overall length of the line considerably, thereby reducing overall extent of natural forest clearing and avoiding impacts to two important KBAs. Efforts were focused on planning transmission lines alignments outside of Protected Areas (e.g. Dong Hua Sao PA to the west) and where possible minimizing the impact to KBAs (Key Biodiversity Areas),
- Two alternative transmission line alignments were considered, with the first option selected, resulting in more favorable conditions for construction and maintenance of turbines and facilitating shorter access routes to the towers, reducing the overall area of environmental impact due to road construction.
- 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. However the TL length is restricted in this area and the number of WTGs is also limited in comparison to other clusters of WTGs in the project area. Furthermore, as biodiversity enhancement through an offset intervention has been recommended for portions of Dakchung Plateau KBA to restore degraded forest habitat, in an effort to achieve at least a no net loss of biodiversity for the project, and this should sufficiently compensate for impacts of the project on the KBA habitats. This is discussed in **Section 9.4.3.7 'Residual Impacts to Biodiversity'** with further detail on the preliminary offset strategy contained in the initial **BAP: Biodiversity Action Plan**.
- The potential to avoid of locating infrastructure within the particularly sensitive, less disturbed high elevation Montane Forest habitat on the ridgeline associated with Survey Block 4 (Phou Kounking) was also considered by ERM. This is detailed in the Briefing Note to IEAD dated 11 March 2022. Given the significant contribution the high elevation turbines within Survey Block 4 make to the viability of the Monsoon WF project, avoidance of the area described may not be entirely possible, and in this case minimization of impacts would need to be considered through micro-siting of turbines, control of access and agreement with local communities on sustainable access and use.
- The engineers from Wind Pioneers ran an analysis and concluded that the relocation of the turbines would be detrimental to the overall feasibility of the project from the perspective of the proportional energy generation contribution from these particular WTs. The WTs in question are positioned in an area with sustained high wind velocities, making these the best performing of the entire WF project and critical to the feasibility and technical/financial success of the project. IEAD therefore considers it a necessity to retain the WT locations as relocating these will result in an estimated delivery of 30 to 99 GW below the expected energy generation to Vietnam as stipulated in IEAD's Power Purchase Agreement with EVN.

- Given the significant contribution the high elevation turbines within Survey Block 4 make to the viability of the Monsoon WF project, it has been demonstrated that avoidance of the area described will not be possible, and in this case minimization of impacts will need to be considered through micro-siting of turbines, control of access and agreement with local communities on sustainable access and use. Where infrastructure that is considered critical to the successful implementation of the project and realisation of its goals and objectives overlaps with more ecologically important and sensitive forest habitats, there will be a greater contribution to residual impacts on forest habitat and targets required to meet a net positive (or at least no net loss) biodiversity outcome. This would also need to be taken into consideration from a long-term costs perspective.
- Avoidance of the Wet Evergreen Forest habitat in the north-east will not be entirely possible, as this large contiguous belt of vegetation runs along a roughly west to east corridor, which the proposed transmission line to Vietnam will need to traverse at some point. Alignment as far as practically possible with more degraded forest habitat has however been suggested, rather than creating an entirely new corridor through the less disturbed forest. By aligning roads and power lines with existing disturbances (such as existing roads/transport corridors), the project can minimize further impacts to forest habitat and species.

Other relevant management measures, controls and embedded mitigation confirmed for the Project and identified in the local EIA (2022), as relevant to biodiversity impact mitigation, have also been acknowledged (with reference to sections **4.6, 4.7, 4.8, 9.3.2.2, 9.3.3.2, 9.3.4.4, 9.3.5.1 and 9.3.6.2** of the ESIA). These are summarized below.

Pre-construction Phase controls:

- Clearly define the construction zone(s) and access routes,
- Toilets for workers to be provided,
- Use of modern equipment and vehicles,
- Prepare and implement a water use plan if required,
- Implement an appropriate wastewater treatment system as required (wastewater will be treated initially by wastewater treatment tank before using the service of the septic service company for disposal),
- Prepare a Waste Management Plan, and
- Prior to commencement of work, all contractors would be required to provide detailed site-specific plans as relevant to the project.

Construction Phase controls:

- Limit clearance of vegetation to the development footprint only,
- No burning of cleared vegetation,
- Avoid earthworks in forest areas as much as possible,
- Avoid earthworks during heavy rainfall to reduce erosion risk,
- Backfilling, levelling and compaction of excavations and trenches to occur as soon as possible after completion of earthworks using subsoil initially stripped,
- Coordinate construction activities to minimize stockpiling requirements,
- Stockpiling of construction materials to be at least 30m from waterways,
- Construct suitable drainage systems,
- Avoid earthworks at the sides of streams to reduce erosion and sedimentation risk to watercourses,

- Undertake erosion protection for all foundations,
- Control sedimentation,
- Implement dust suppression on surfaces which could be a source of dust,
- Proper storage of construction material in designated areas (bunded areas, hardstands with roofs),
- Proper solid waste collection, temporary storage and disposal at suitable facilities offsite,
- Hazardous waste to be temporarily stored prior to transported off-site to an appropriate or licensed waste disposal contractor,
- Construction noise mitigation and management measures to be implemented,
- Conduct noise monitoring,
- Conduct water quality monitoring,
- Water for construction to be sourced from nearby streams,
- Fencing and/or security to prevent community members from accessing the construction site,
- Vehicles to be properly maintained,
- No washing of vehicles and equipment in rivers or streams, and
- Conduct regular audits and inspections of the construction area.

Post-construction:

- Restoration to be done post-construction to return the landscape to as close to its original state as possible.

Operational/Maintenance Phase controls:

- Install, inspect and maintain fire protection equipment,
- Emergency plan to be prepared,
- Maintenance and cleaning work annually along the RoW area of the transmission line route, and
- Access controls and security during operation of the WF.

9.4.3.5 Biodiversity Impact Significance

The significance of the various impacts to biodiversity has been assessed using the approach and methods contained in Step 4 of the section on approach/methods, with the results presented in **Table 9-46**. This has taken into account the alternatives already considered and existing controls identified (see **section 9.4.3.4**).

Where considered relevant and necessary, additional mitigation measures aimed at avoiding, minimizing and remediating impacts (aligned with the mitigation hierarchy) have been included in the impact significance assessment contained in **Table 9-46**. Repetition of the existing controls has been avoided¹⁷. Taking into account the recommended best/good practice mitigation measures, residual impacts have also been rated, with further details in **section 9.4.3.7**.

¹⁷ The mitigation approach for AZE Sites is presented in Table 8.49 and in depth in the initial Biodiversity Action Plan

Table 9-46: Biodiversity Impact Significance Assessment for the Monsoon WF Project

No	Impact Description	Receptor	Biodiversity Importance / Sensitivity	Magnitude of Impact	Pre-mitigation Impact Significance	Project Phases	Mitigation Measures Recommended ¹⁸	Residual Impact
1a	Physical destruction and/or disturbance of vegetation	Plant species (EN)	High	Small	Moderate	Construction Operation	Pre-construction: <ul style="list-style-type: none"> ■ ECoW¹⁹ accompanied by an ecologist to undertake micro-siting of wind turbines and substations during pre-construction surveys to avoid the least-impacted natural forest patches as far as possible. ■ Micro-routing of access roads to take place during pre-construction surveys by the ECoW accompanied by an ecologist, around particularly sensitive biodiversity features, which can also be a proactive way of mitigating impacts to the least-impacted natural forest habitat. ■ Pylons in the AZE Phou Ahyon are to be located in sufficient distance (50 m) to the stream within the AZE²⁰. 	Moderate* [*assuming no avoidance or offsetting]

¹⁸ For several mitigation measures, a multi-disciplinary team of ecologists with expertise on both terrestrial and aquatic ecology will need to be appointed to work with the project engineers and develop the required measures

¹⁹ An Ecological Clerk of Works (ECoW) oversees construction activities in ecologically sensitive areas to ensure that construction works follow a pre-determined methodology designed to prevent significant ecological impacts. Competent ECoWs can effectively oversee the management of the risks on construction sites associated with managing biodiversity and can help to ensure a smooth and cost-efficient construction process.

²⁰ Initially, a 20m conservation buffer zone was advised by ERM, based on the available information on the species (i.e. found occurring within 15m of steep mountain streams - Stuart et al., 2012). However, given the cryptic nature of this species and with little available information on its behaviour and ecological/habitat requirements, a more conservative and precautionary buffer width of 50 m was advised by ADB and has been included in the BAP mitigation.

No	Impact Description	Receptor	Biodiversity Importance / Sensitivity	Magnitude of Impact	Pre-mitigation Impact Significance	Project Phases	Mitigation Measures Recommended ¹⁸	Residual Impact
							<ul style="list-style-type: none"> ■ The TL at the stream crossing location will span the entire width of the stream channel and associated instream/riparian vegetation and potential habitat for freshwater frog species, and that pylons be positioned outside of the stream and adjacent areas ■ Wherever possible the existing access road network is to be used and no widening or upgrading roads in the direction of the stream channel or across the channel will be permitted ■ If it is not possible to avoid upgrading existing infrastructure to improve crossing design and flows, a sensitive species survey focusing on amphibians must be undertaken beforehand and the findings and recommendations of such a survey taken into consideration in crossing design and construction ■ A pre-construction survey be undertaken at the stream crossing location to search for the presence of <i>L. xanthops</i> and document locations and potential habitat for this species ■ Compile an appropriate Construction Method 	

No	Impact Description	Receptor	Biodiversity Importance / Sensitivity	Magnitude of Impact	Pre-mitigation Impact Significance	Project Phases	Mitigation Measures Recommended ¹⁸	Residual Impact
							<p>Statement for working in natural forest habitats (for implementation where construction in/through forests is planned).</p> <ul style="list-style-type: none"> ■ Adhere to applicable national environmental laws, specifically those governing the protection and management of wildlife and natural forests ("<i>Wildlife and Aquatic Animal Law</i>" and "<i>Forestry Law</i>") and ensure that any necessary permitting/licensing processes of planned activities in natural forests. ■ Compile a suitable post-construction rehabilitation plan for temporary areas used during construction. 	
							<p>Construction:</p> <ul style="list-style-type: none"> ■ Avoid locating construction camps and material/equipment laydown areas within or near mapped forest areas. ■ Look at a single construction camp, sited in a least sensitive and already disturbed area and avoid developing multiple camp sites if possible. ■ Use existing access roads or upgrade existing roads wherever possible before 	

No	Impact Description	Receptor	Biodiversity Importance / Sensitivity	Magnitude of Impact	Pre-mitigation Impact Significance	Project Phases	Mitigation Measures Recommended ¹⁸	Residual Impact
							<p>considered new access road construction.</p> <ul style="list-style-type: none"> ■ Reduce the road width and construction corridor for roads and transmission lines through the older growth and less impacted, contiguous forests. ■ Avoid locating pylons supporting transmission lines within stream/river beds, rather place these away from the stream banks and ensure the line is suspended across the stream/river channel for the entire span of the stream/river. Take into account any dynamic environments such as large rivers which could flood or where the channel could change course through channel switching and result in damage to pylons. Place pylons above known river floodlines or flood risk areas. ■ Where known species of protected/RDL plant species occur and are at risk of being destroyed, prepare and implement a protected plant rescue and translocation plan and programme. ■ Limit the clearing of natural vegetation, particularly in forests, to the absolute 	

No	Impact Description	Receptor	Biodiversity Importance / Sensitivity	Magnitude of Impact	Pre-mitigation Impact Significance	Project Phases	Mitigation Measures Recommended ¹⁸	Residual Impact
							<p>minimum necessary to adequate complete the works whilst not comprising on health and safety requirements or laws.</p> <ul style="list-style-type: none"> ■ Demarcate the construction zone or servitude for corridors on a map and on the ground clearly using high visibility tape for instance, to avoid impacting on sensitive areas outside of the permitted construction area. ■ Rehabilitate and revegetate temporary-use, construction site camps and lay down areas as soon as reasonably practicable after construction activities have been completed. ■ Implement relevant construction standards (e.g. Construction Code of Practice for the Sustainable Use of Soils on Construction Sites' – DEFRA, 2009²¹). <p>Operation:</p> <ul style="list-style-type: none"> ■ Develop and implement access management plans and controls to avoid access and unnecessary disturbance of sensitive forest habitats 	

²¹ DEFRA Department of Environmental, Food and Rural Affairs. (2009). Construction Code of Practice for the Sustainable Use of Soils on Construction Sites Available online at: https://www.assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/716510/pb13298-code-of-practice-090910.pdf

No	Impact Description	Receptor	Biodiversity Importance / Sensitivity	Magnitude of Impact	Pre-mitigation Impact Significance	Project Phases	Mitigation Measures Recommended ¹⁸	Residual Impact
1b	Reduction in habitat for supporting key RDL species	Forest habitat / Plant & Animal species (CR, EN)	High	Small	Moderate	Construction Operation	<p>Pre-construction:</p> <ul style="list-style-type: none"> See mitigation measures recommended for impact 1a above. Creation of suitable alternative habitats or enhancement of existing ones to support displaced species. <p>Construction:</p> <ul style="list-style-type: none"> See mitigation measures recommended for impact 1a above. Sweep through areas prior to construction to flush animals from habitats likely to be directly affected. Schedule habitat clearance, grading and road construction activities outside of key species' breeding periods where known. <p>Operation:</p> <ul style="list-style-type: none"> Consider options to rehabilitate degraded areas that were previously forest, through a reforestation and tree-planting project - potentially a community reforestation project could be investigated. 	Moderate* [*assuming no avoidance or offsetting]
1c	Illegal hunting/poaching	Plant & Animal	High	Small	Moderate	Construction Operation	<p>Construction:</p> <ul style="list-style-type: none"> Illegal activities such as hunting of wildlife or 	Minor*

No	Impact Description	Receptor	Biodiversity Importance / Sensitivity	Magnitude of Impact	Pre-mitigation Impact Significance	Project Phases	Mitigation Measures Recommended ¹⁸	Residual Impact
	and collection of forest resources	species (CR, EN)					collecting of forest species is to be discussed with construction workers and such activities are to be prohibited. Operation: <ul style="list-style-type: none"> Access controls to be implemented to limit access to areas of high sensitivity (e.g. older growth, less impacted forest areas). 	[*assuming hunting/poaching controls implemented]
1d	Bird & bat collisions with wind turbines resulting in injury or mortality	Bird & Bat species (NT)	Medium	Small	Minor	Operation	Operation: <ul style="list-style-type: none"> Locate wind turbines away from the less disturbed primary forest habitats, as far as possible. Implement an annual monitoring plan focused on investigating fatalities during period of heightened bird/bat activity (seasonally relevant). Given the constraints in predicting bat fatality impacts prior to operation of the WF (see Table 8.48), it will be necessary to undertake further operational monitoring to confirm operational impacts and to inform appropriate mitigation options. Prepare an adaptive management plan to be informed by long-term annual bat/bird carcass monitoring, to determine where additional mitigation 	Negligible* [*assuming operational controls implemented where necessary, based on monitoring outcomes]

No	Impact Description	Receptor	Biodiversity Importance / Sensitivity	Magnitude of Impact	Pre-mitigation Impact Significance	Project Phases	Mitigation Measures Recommended ¹⁸	Residual Impact
							<p>may be necessary for specific turbines/clusters of turbines, such as: adjusting turbine cut-in speeds (increased) for site-specific and seasonal bat activity peaks, feathering of turbine blades, auditory deterrents and/or painting of alternate turbine blades to increase visibility for birds.</p> <ul style="list-style-type: none"> Habitat enhancement for bats (e.g. creation of pools) and provision of bat-boxes in areas under IEAD control away from wind turbines, may serve to reduce the number of bats in the wind farm area and therefore reduce collision risks. 	
1e	Bird & bat collisions with transmission lines or electrocution resulting in injury or mortality	Bird & Bat species (VU)	Medium	Small	Minor	Operation	<p>Operation:</p> <ul style="list-style-type: none"> Implement safe distribution lines, with insulation and spacing of conductors that eliminate electrocution risk for birds. Allow for a minimum spacing of 1m between power cables to safeguard known bat species from electrocution risk. Markers such as coloured balls to be attached to conductors to improve visibility for birds where necessary and technically feasible. 	<p>Negligible*</p> <p>[*assuming operational controls implemented where necessary, based on monitoring outcomes]</p>

No	Impact Description	Receptor	Biodiversity Importance / Sensitivity	Magnitude of Impact	Pre-mitigation Impact Significance	Project Phases	Mitigation Measures Recommended ¹⁸	Residual Impact
							<ul style="list-style-type: none"> ■ Installing flight diverters (hanging or spiral diverters) along all transmission line routes in the vicinity of natural forest habitat and between larger forest patches where birds are likely to move locally, with spacing according to international good practice guidance (e.g. APLIC, 2012²²). ■ Installing flight diverters along the entire transmission line length is unlikely to be feasible technically and financially, and in this case it is recommended that a more pragmatic approach, such as the approach taken by 'LIFE ENERGY'²³ in Slovakia's lowlands, whereby the most dangerous sections of TL are identified through field assistant monitoring and flight diverters installed on the hazardous sections. ■ Provide deterrents at key positions along the transmission lines where visibility is poor and 	

²² APLIC (Avian Power Line Interaction Committee), 2012. Reducing Avian Collisions with Power Lines: The State of the Art in 2012. Edison Electric Institute and APLIC. Washington, D.C.

²³ LIFE ENERGY: Protecting birds from the dangers of power lines. Online article available at: https://www.cinea.ec.europa.eu/news-events/news/protecting-birds-dangers-power-lines-2021-09-01_en

No	Impact Description	Receptor	Biodiversity Importance / Sensitivity	Magnitude of Impact	Pre-mitigation Impact Significance	Project Phases	Mitigation Measures Recommended ¹⁸	Residual Impact
							particularly where less disturbed, larger forest habitats are encountered (e.g. line markers / flight diverters at 15m intervals where hornbill activity has been recorded associated with Wet Evergreen Forest habitat). This will also be based on an adaptive management approach and implemented on a case-by-case basis for specific sections of powerline where high fauna mortalities due to collisions are recorded in long-term annual monitoring.	
1f	Vehicular collisions with wildlife	Animal Species (CR, EN)	High	Small	Minor	Construction Operation	<p>Pre-construction:</p> <ul style="list-style-type: none"> ■ Use existing access roads or upgrade existing roads wherever possible before considered new access road construction. ■ Shepherding protocol to be prepared and implemented where road construction takes place, to check areas to be worked in prior to construction and remove or shepherd wildlife to safety in adjoining forest or habitat²⁴. <p>Construction & Operation:</p>	<p>Negligible*</p> <p>[*assuming traffic controls implemented]</p>

²⁴ An ecologist / biodiversity specialist will be appointed to advise on the shepherding protocol. A training programme will be developed to train workers on the protocol. Wherever possible local people will be recruited to undertake the pre-clearance checks and shepherding/ removal

No	Impact Description	Receptor	Biodiversity Importance / Sensitivity	Magnitude of Impact	Pre-mitigation Impact Significance	Project Phases	Mitigation Measures Recommended ¹⁸	Residual Impact
							<ul style="list-style-type: none"> ■ Limit vehicle speed on site for construction vehicles and vehicles accessing the site (set speed limit at less than 20 km/hr). ■ Place appropriate limits on the number of vehicle movements to and from the wind farm (e.g. maximum of 5 vehicles allowed within a 1-hour window). ■ Restrict vehicles to the use of only authorised access roads. ■ Restrict activities to day time hours when visibility is good. 	
1g	Water and soil pollution caused by potential accidental spills of hazardous substance	Habitat / Plant & Animal species	Medium	Small	Minor	Construction	<p>Construction:</p> <ul style="list-style-type: none"> ■ Employ best practice measures in handling and storing fuels, oils and chemicals liable to spillage. ■ Always use drip trays when temporarily storing or handling fuels or when servicing/repairing vehicles on site. ■ Pollution monitoring plan to be compiled and implemented, with a focus on watercourse monitoring. ■ Prepare an emergency spill response plan. Clean-up any spills immediately. ■ Emergency spill kit provision and training. 	<p>Negligible*</p> <p>[*assuming controls implemented to limit risk of spills]</p>

No	Impact Description	Receptor	Biodiversity Importance / Sensitivity	Magnitude of Impact	Pre-mitigation Impact Significance	Project Phases	Mitigation Measures Recommended ¹⁸	Residual Impact
							<ul style="list-style-type: none"> Remediate any soils, watercourses or habitats where spills take place. Inform the relevant authorities as soon as any significant or major spill event takes place. Disposing of waste into the environment is prohibited. Waste products to be transported to registered waste facilities only for proper disposal. Burial or burning of waste to be prohibited. 	
1h	Dust pollution caused by earthworks and vehicle/machinery operation	Forest habitat / Plant species	Medium	Negligible	Negligible	Construction	Construction: <ul style="list-style-type: none"> Avoid earthworks during particularly windy periods. Employ dust suppression on bare soil surfaces exposed to wind and dirt roads used by heavy construction vehicles. Cover soil stockpiles during windy periods. Use a cover/tarp when transporting soil/sand. 	Negligible* [*assuming controls implemented to limit risk of spills]
1i	Soil erosion and sedimentation of watercourses	Streams / Rivers	Medium	Small	Minor	Construction	Pre-construction: <ul style="list-style-type: none"> Implement best practice stream crossing design and construction, taking into account the sizing of any pipe culverts and placement on the channel bed and not at height. This is to be informed by good practice 	Negligible [*assuming controls implemented to limit risk of erosion and sedimentation]

No	Impact Description	Receptor	Biodiversity Importance / Sensitivity	Magnitude of Impact	Pre-mitigation Impact Significance	Project Phases	Mitigation Measures Recommended ¹⁸	Residual Impact
							<p>guidelines for the design of river crossings, such as SEPA (2010²⁵).</p> <ul style="list-style-type: none"> ■ Compile an appropriate Construction Method Statement for working in watercourses (for implementation at all stream crossings). This is to be informed by good practice guidelines on construction methods, such as SEPA (2009²⁶). ■ Compile a suitable post-construction rehabilitation plan for stream beds and banks modified but not entirely transformed by construction activities. <p>Construction:</p> <ul style="list-style-type: none"> ■ Implement relevant construction standards (e.g. 'Construction Code of Practice for the Sustainable Use of Soils on Construction Sites': publishing.service.gov.uk). 	

²⁵ SEPA: Scottish Environmental Protection Agency. (2010). Engineering in the Water Environment: Good Practice Guide: River Crossings. Second Edition. November 2010. Available online at: <https://www.sepa.org.uk/media/151036/wat-sg-25.pdf>

²⁶ SEPA: Scottish Environmental Protection Agency. (2009). Engineering in the Water Environment: Good Practice Guide: Temporary Construction Methods. First Edition. March 2009. Available online at: https://www.sepa.org.uk/media/150997/wat_sg_29.pdf

No	Impact Description	Receptor	Biodiversity Importance / Sensitivity	Magnitude of Impact	Pre-mitigation Impact Significance	Project Phases	Mitigation Measures Recommended ¹⁸	Residual Impact
							<ul style="list-style-type: none"> ■ Cross streams at right-angles only. ■ Do not place more fill material within the stream channel than what is necessary. Remove any excess fill or material from the channel bed, taking care not to disturb the natural channel bed and bank profiles. ■ Only one stream crossing to be constructed at a time as the construction front progresses. ■ Avoid any unnecessary crossings of streams/rivers and stick to only the planned and agreed to crossings. ■ Any bare soil surfaces need to be revegetated as soon as practically possible to reduce erosion risk. ■ Install sufficient drainage works under all access roads, to reduce freshwater habitat fragmentation, avoid flooding land and damaging nearby waterbodies. 	
1j	Disturbance and nuisance caused by increased noise, light and/or vibrations	Animal species	Medium	Small	Minor	Construction Operation	Construction: <ul style="list-style-type: none"> ■ Limit construction activities to day time hours to limit impacts to nocturnal species. ■ Maintain vehicles and equipment in good working condition. 	Negligible* [*assuming controls implemented to limit disturbance]

No	Impact Description	Receptor	Biodiversity Importance / Sensitivity	Magnitude of Impact	Pre-mitigation Impact Significance	Project Phases	Mitigation Measures Recommended ¹⁸	Residual Impact
							<ul style="list-style-type: none"> ■ Use noise minimizing technology where possible. ■ Aim lights away from forest habitats. ■ Utilize suitable screens to block visual impacts at construction camp sites. ■ Use low intensity lights where possible and aim lights downwards and away from natural forest habitat. Use appropriate lighting that minimises ecological effects on wildlife and also limits attraction of insects. ■ Enforce good conduct by construction workers, including prohibition of hunting, trapping, fishing, and general harassment of wild animals. <p>Operation:</p> <ul style="list-style-type: none"> ■ Enforce good behavior by employees, including prohibition of hunting, trapping, fishing, and general harassment of wild animals. ■ Use low intensity lights where possible. 	
1k	Barriers to or interference with species movement	Animal species (CR, EN)	High	Small	Moderate	Construction Operation	<p>Pre-construction:</p> <ul style="list-style-type: none"> ■ Consider alternative wind farm layouts to minimise barriers to species movement. The alignment of turbines parallel to and 	Minor* [*assuming controls implemented]

No	Impact Description	Receptor	Biodiversity Importance / Sensitivity	Magnitude of Impact	Pre-mitigation Impact Significance	Project Phases	Mitigation Measures Recommended ¹⁸	Residual Impact
							<p>not across known bird flight paths or general flight directions should be investigated.</p> <ul style="list-style-type: none"> ■ Arrange turbines in clusters to reduce overall footprint. ■ Maintain connectivity around or across linear infrastructure (roads primarily) through use of appropriate animal crossings suitable for small mammals and slow-moving reptiles such as tortoises in particular. ■ Look at a single construction camp, sited in a least sensitive and already disturbed area and avoid developing multiple camp sites. ■ Use existing access roads or upgrade existing roads wherever possible before considered new access road construction. ■ Develop protocols for capturing or herding animals found in construction areas where these unable to exit by themselves. Species considered to be dangerous or poisonous/venomous to be handled by professionals. <p>Construction:</p> <ul style="list-style-type: none"> ■ Sequencing of construction activities to avoid 	

No	Impact Description	Receptor	Biodiversity Importance / Sensitivity	Magnitude of Impact	Pre-mitigation Impact Significance	Project Phases	Mitigation Measures Recommended ¹⁸	Residual Impact
							<p>construction activities and multiple teams at multiple sites, to reduce the impact spread and rather concentrate temporary impacts at key points and advance to new areas only once construction at the previous site has been completed. This can assist with permitting species movement and migrations in advance of the project activity moving to their habitat, preserving corridors at all times.</p> <ul style="list-style-type: none"> ■ Avoid locating construction camps and material/equipment laydown areas within or near forest areas. ■ Any temporary excavations, fences or stockpiles of soil and materials must be removed from site once construction is complete. <p>Operation: Avoid placing impermeable fences that could interfere with species movement.</p>	
2a	Increased susceptibility of forest habitat to disturbance	Forest habitat / Plant species (EN)	Medium	Small	Minor	Operation	<p>Operation:</p> <ul style="list-style-type: none"> ■ Rehabilitate forest edges impacted and exposed to disturbance. <p><i>See mitigation measures recommended for impact 1a and impact 1b, above.</i></p>	<p>Minor*</p> <p>[*assuming rehabilitation of disturbed areas]</p>

No	Impact Description	Receptor	Biodiversity Importance / Sensitivity	Magnitude of Impact	Pre-mitigation Impact Significance	Project Phases	Mitigation Measures Recommended ¹⁸	Residual Impact
2b	Introduction of alien plant species and/or disturbance leading to invasion by alien plants and weeds	Natural habitat / Plant species (EN)	High	Small	Moderate	Operation	Operation: <ul style="list-style-type: none"> ■ Compile a suitable Invasive Alien Plant (IAP) species control plan and programme to eradicate dense colonies of alien plants and control the spread of minor species and weeds. ■ Implement IAP species control plan and programme. ■ Monitor IAPs. 	Minor* [*assuming IAP control plan implemented]
2c	Reduced habitat connectivity caused by fragmentation of habitat	Animal species (CR, EN)	High	Small	Moderate	Construction Operation	Construction: <ul style="list-style-type: none"> ■ See mitigation measures recommended for impact 1a and 1b above. ■ Rehabilitate degraded areas that were previously forest to re-connect patches of habitat. Operation: <i>See mitigation measures recommended for impact 1a and 1b above.</i>	Minor* [*assuming controls implemented to limit disturbance]
2d	Loss of ecosystem services	Forest habitat	Medium	Small	Minor	Construction Operation	Construction & Operation: <i>See mitigation measures recommended for impact 1a, 1b, 2a, 2b and 2c (above).</i>	Negligible* [*assuming controls implemented to limit disturbance]
3a	Increased hunting/harvesting pressure due to enhanced accessibility to the area	Animal species (CR, EN) / Plant species (EN)	High	Small	Moderate	Construction Operation	Construction: <ul style="list-style-type: none"> ■ Most turbines are located in areas of existing disturbed landscapes and the design of the wind farm avoids more intact habitat blocks wherever possible. Eight 	Moderate* [*assuming standard access controls and security are successful at reducing access, but assuming

No	Impact Description	Receptor	Biodiversity Importance / Sensitivity	Magnitude of Impact	Pre-mitigation Impact Significance	Project Phases	Mitigation Measures Recommended ¹⁸	Residual Impact
							<p>turbines are located on the southern part of the Phou Koungking mountain and during road construction access to these sites from existing settlements and trails will be controlled through site security.</p> <ul style="list-style-type: none"> Construction workers will be prohibited from hunting or trading in wildlife and forest products, as part of their terms and conditions of employment and will be subject to security checks. <p>Operation:</p> <ul style="list-style-type: none"> Implement access controls including the use of gates, security cameras and security guards at sites of key infrastructure such as substations and the main access roads to turbine clusters. Undertake stakeholder consultation with local villagers regarding access to traditional trails and access to non-timber forest products but prohibiting illegal hunting of protected species. 	no avoidance of more remote forest areas]

Noteworthy findings from the impact significance assessment include:

1. There will be moderately significant, permanent impacts to the natural forest vegetation communities and habitats, with indirect impacts on forest-dependent species. These may be difficult to mitigate unless the lesser disturbed forest communities are avoided entirely, and residual impact will remain of moderate significance.
2. Linear infrastructure (roads and transmission lines) are likely to have the most notable impacts on forests, particularly for the lesser impacted sections of more contiguous northern Montane Forest and the Wet Evergreen Forest areas in the north and north-east (associated with the planned transmission line alignment towards Vietnam).
3. The most significant impacts are likely to be associated with the access roads and turbines planned in the northern sections of the project area, where the less disturbed and more contiguous older-growth forest compartments have been identified.
4. Increased hunting/harvesting pressure due to enhanced efficiency of access to the area (induced impact) could still remain as moderately significant where access to more remote forest habitats is not avoided, even where controls on access are implemented.
5. All other impacts have been considered to be of Minor to Moderate significance and can be readily mitigated, potentially reducing significance levels to low or insignificant levels.

9.4.3.6 Summary of Impact Mitigation

The protection of natural ecosystems and biodiversity generally begins with the avoidance of adverse impacts and where such avoidance is not feasible; to apply appropriate mitigation in the form of reactive practical actions that minimizes or reduces impacts. Mitigation requires proactive planning that is enabled by following the ‘**mitigation hierarchy**’. The application of the mitigation hierarchy is intended firstly, to avoid disturbance and/or loss of ecosystems, and where this cannot be avoided, to minimise, rehabilitate, and then finally offset any remaining significant residual impacts. The mitigation hierarchy has been applied as follows:

- Mitigation aimed at the avoidance of impacts has already been considered on the layout planning for the development, with a reduction in the number of turbines, efficient clustering of turbines and realignment of transmission lines and roads to avoid sensitive forest areas and KBAs undertaken where possible. This is documented in Chapter 4 of the ESIA (Alternatives). n.
- Existing mitigation measures and controls (from the local EIA, 2022) are designed to reduce construction and operational phase impacts and these will be supplemented with the additional mitigation measures contained in the ESIA (**Table 9-46**), in order to minimize and remediate/rehabilitate impacts as far as possible. These measures will likely be the most easily implementable and successful in terms of reducing the significance of residual impacts for the following to relatively minor and acceptable levels:
 - Illegal hunting/poaching of wildlife,
 - Collision risk for birds/bats (wind turbines) and other wildlife (vehicular collisions),
 - Water and soil pollution,
 - Dust pollution,
 - Soil erosion and sedimentation,
 - Nuisance disturbance,
 - Forest disturbance,
 - Impacts to ecosystem services,
 - Invasive Alien Plant impacts, and

- Reduced habitat connectivity.

Despite the avoidance of impacts through project design and realignment considerations and the recommendation of good practice controls and site-specific mitigation to reduce impact extent, potential and/or intensity, there are still residual impacts of moderate and major significance that are not easily mitigatable (see **Section 9.4.3.7**). In this instance a biodiversity offset is recommended, and the initial recommendations are included below in **Section 9.4.3.7**. An initial Biodiversity Action Plan (BAP) has also been compiled which contains the initial strategy outlining the offset (targets, offset receiving areas, principles, key actions, and next steps) with further actions regarding the following key biodiversity mitigation measures as well:

1. Micro-siting of key temporary works and infrastructure;
2. Construction Method statement (including work in watercourses);
3. Post-construction rehabilitation plan for temporary works and areas (including stream beds and banks); Access management plan and controls;
4. Protected plant rescue and translocation plan and programme;
5. Shepherding protocol;
6. Avifauna fatality monitoring protocol;
7. Precautionary and adaptive management plan to be informed by long-term annual bat/bird carcass monitoring, to determine where additional mitigation may be necessary for specific turbines/clusters;
8. Invasive Alien Plant control plan;
9. Ecologist / biodiversity specialist will need to be appointed to advise on where appropriate animal crossings for new access roads could be considered necessary and to provide recommendations for design of crossings'
10. Creation of suitable alternative habitats or enhancement of existing ones to support displaced species;
11. Support local villagers with the training, tools and finances needed to startup small-scale animal operations, such as chicken farms, etc. to support local livelihoods, to alleviate some of the local hunting pressures; and
12. Indicators and metrics recommended for the evaluation of mitigation measures / biodiversity protected plant rescue and translocation plan and programme management interventions.

9.4.3.7 Residual Impacts to Biodiversity

Residual impacts of moderate impact significance that are likely to remain after other forms of mitigation have been considered (avoidance, minimization, and restoration) include

1. Impact 1ab: Transformation or modification of areas of natural forest vegetation, providing key habitat for RDL forest-dependent species and considered 'critical habitats' (direct and indirect impacts); and
2. Impact 3a: Loss of RDL and range-restricted species through increased hunting/harvesting pressure due to enhanced accessibility to the area (induced and cumulative impacts assessed).

These impacts are likely to result in a net biodiversity loss unless adequately mitigated through an appropriate biodiversity compensation strategy.

Importantly, the mitigation of impacts needs to align with the requirements of the ADB SPS (2009) regarding 'natural habitats' and 'critical habitats', both of which are represented in the project area and will be affected to varying degrees:

1. Natural Habitats

"In areas of natural habitat, the project will not significantly convert or degrade such habitat, unless the following conditions are met:

- (i) No alternatives are available.*
- (ii) A comprehensive analysis demonstrates that the overall benefits from the project will substantially outweigh the project costs, including environmental costs.*
- (iii) Any conversion or degradation is appropriately mitigated.*

Mitigation measures will be designed to achieve at least no net loss of biodiversity. They may include a combination of actions, such as post project restoration of habitats, offset of losses through the creation or effective conservation of ecologically comparable areas that are managed for biodiversity while respecting the ongoing use of such biodiversity by Indigenous Peoples or traditional communities, and compensation to direct users of biodiversity."

2. Critical Habitats

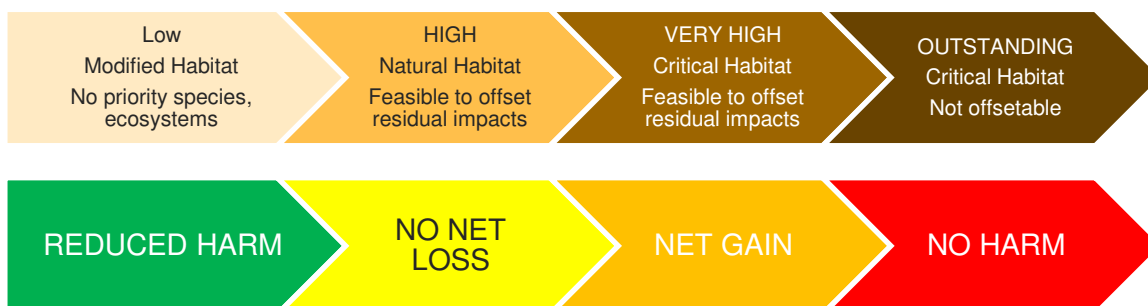
"No project activity will be implemented in areas of critical habitat unless the following requirements are met:

- (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 species⁶ 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."*

Residual impacts of moderate significance relate to the potential loss of critical habitat identified in the CHA and which is aligned strongly with the remaining untransformed but highly fragmented natural and modified Wet Evergreen Forest and Montane Evergreen Forest vegetation communities and habitats represented in the project area. The losses estimated for these forest habitats will be the focus of establishing offset targets and objectives.

Such goals may also depend on the biodiversity significance of the area. This is summarized in the graphic in **Figure 9-57**.

Figure 9-57: Diagram illustrating the process of identifying, measuring and mitigating impacts to biodiversity towards achieving no net loss or net gain outcomes



Source: adapted from Benunn et al., 2021

Biodiversity offsets are typically required in certain situations to compensate for residual impacts to ecosystems and biodiversity, and only once all other forms of mitigation have been considered. Offsets are therefore normally only considered as the 'last resort option in the mitigation hierarchy'. The trigger for offsets is linked to the significance of residual negative impacts of development on biodiversity: where residual impacts are of high enough relative significance, offsets to compensate for biodiversity loss should be explored. Furthermore, the outcomes of the CHA (**Appendix T**) require that a Biodiversity Action Plan (BAP) be compiled to align with the ADB SPS and to include options to offset residual impacts so as to achieve at the minimum a 'no net loss' or potentially a 'net gain' outcome in terms of biodiversity.

In terms of compensating for residual impacts, it is possible that a biodiversity offset could secure the necessary conservation gains required to ensure a net gain or at a minimum at no nett loss scenario for the project. Indeed, there is much opportunity in the local area to contribute to forest habitat and species conservation in a meaningful way. It is therefore recommended that an initial BAP be compiled and used to inform the development of a detailed offset plan and programme for implementation. Some initial ideas for the BAP and biodiversity offsetting that have been identified are follows:

- KfW Bank in collaboration with the World Wildlife Fund (WWF) are currently involved in several projects in Lao PDR, supported under the International Climate Initiative (IKI) of the German Federal Ministry . Two forest corridors³¹ have been identified in the Annamite Mountains region, with the objective of project work being to preserve species diversity and biodiversity through planned and focused conservation activities.
- To support its conservation objectives, WWF-Laos launched a Community-based Forest Restoration and Management for Livelihood programme³², in partnership with Provincial Agriculture and Forestry Department (PAFO) of Sekong and Salavan province. The WWF-Laos Forest Programme aims at halting deforestation and ensuring Laos' forests are effectively protected or under improved management. The project looks not only at restoring and protecting forests and corridors, but also enhancing the income of the area's culturally diverse people who depend on forests for their livelihoods, through forest protection and sustainable use of forest resources and preserving the

³¹ KfW, 2022. Accessible online at: <https://www.kfw.de/stories/environment/nature-conservation/laos-forest-protection/>

³² WWF, 2022. Accessible online at: https://www.wwf.org.la/projects/forest_restoration_and_management/

unique species diversity. One of the priority landscapes of WWF-Laos is the Central Annamites Landscape (CAL), covering southern Laos and part of Vietnam.

- There may be an opportunity for the Monsoon WF project to assist with financing or supporting these existing projects, programmes and already well-rooted conservation initiatives as a form of biodiversity offset mitigation.
- There may be key opportunities to support the existing Protected Area network, or local KBAs (Key Biodiversity Areas) which should be investigated further. Such an example could include working with the Lao PDR Ministry of Natural Resources and Environment (MoNRE) to create a protected area covering the mountain area in Survey Blocks 3 & 4, using the data collected for the Monsoon WF application to support such a designation.
- Habitat enhancement through restoring connectivity in areas suffering from high levels of fragmentation such as within the Dak Cheung KBA.
- Development of a sustainable timber and NTFP harvesting strategy.
- Implementing an Agroforestry support programme.

Initial comments received from the ADB support the general approach that offsets to compensate for biodiversity losses need to be additional, and not within existing conservation areas or overlapping existing initiatives (i.e. to avoid a 'double-dipping' scenario whereby the conservation gains from a site serve two or more purposes). Bearing this in mind then, the most logical way to offset forest habitat loss (which is the most significant direct impact of the project) is through an offset designed to restore key ecological linkages between the patchy forest cover in the vicinity of the project infrastructure, with a focus to restore larger, more contiguous areas of forest cover, which will also likely improve habitat availability and movement of fauna utilising the forests.

Initial estimates of anticipated natural forest habitat loss were undertaken to inform the impact assessment (based on anticipated WT locations, substation positions, access road widths and TL corridor widths), which were determined to be conservatively in the region of approx. 150 ha of natural forest loss for the project (see impact 1a in **Table 9-46**). This has been split also between the loss of Montane Forest and Wet Evergreen Forest, as follows:

- Preliminary estimated loss of natural Montane Forest habitat = 140 ha
- Preliminary estimated loss of natural Wet Evergreen Forest habitat = 10 ha

Given that Lao PDR do not have a national offset policy in place at the moment to guide the development of biodiversity offsets in the country, the approach taken by ERM for the 'Nam Ngiep 1 Hydropower Project Biodiversity Offset' (ERM, 2014³³) was used to determine preliminary offset targets for the Project. This was based on the guidelines and methodology contained in the 'Biodiversity Offset Design Handbook' (BBOP, 2012)

The following no-net-loss biodiversity offset rules have been recommend for the project (in line with ERM, 2014 and BBOP, 2012):

- Offsets should be 'like-for-like' with trading only permitted within the same land class type;
If this is not possible offsets should address the same features and habitats within the broader landscape area;

³³ ERM, 2014. Nam Ngiep 1 Hydropower Project: Biodiversity Offset Design Report. Unpublished report prepared for the Nam Ngiep 1 Power Company Ltd. July 2014. Project no.: 0200749.

- Environmental contributions for specific programs can be used to substitute for the direct management of biodiversity;
- Incremental loss and fragmentation of forest habitats is to be avoided;
- Management of offset sites can be used to improve biodiversity, however this may not replace actions that are already funded;
- Areas with existing or potential land uses that are likely to be in conflict with the objectives of biodiversity offsets will need to be avoided (mining, forestry leases);
- Offsets to be located in close proximity to the impacted area as possible, such that the gains of offset mitigation are retained in the local area impacted and not transferred to elsewhere;
- Location of offsets in the landscape that facilitate connectivity with adjacent habitats are considered preferable;
- Large offset sites that are connected to existing protected areas are also seen as preferable;
- Also, sites similarly used by comparable ethnic groups sharing similar cultural values will be of preference;
- Fairness and equity should be ensured for affected stakeholders; and
- Offsets chosen should be permanent and ongoing in perpetuity.

Initially, the biodiversity offset metric used to calculate habitat targets has been based on the Habitat Hectare Equivalents model of BBOP (2012), which considers habitat type, extent, and condition for both the impacted areas and candidate offset receiving sites with the residual habitat hectare loss calculated by multiplying loss extent by land condition value (see table below):

Habitat Type	Preliminary Estimated Loss (A)	Land Class Condition, Value (B)	Residual Impact Habitat Hectares (C = A x B)	Offset Target (habitat hectares)
Montane Forest	140 ha	High / natural, 0.8	112 HH	112 HH
Wet Evergreen Forest	10 ha	High / natural, 0.8	8 HH	8 HH

Given that active reforestation efforts and active management will increase the biodiversity value and condition of target sites, but with limited evidence of existing conservation management actions undertaken on offsets in Lao PDR, a conservative approach to predict likely gain in terrestrial biodiversity has been used, based on the approach by ERM (2014). This suggests that gains in condition value relative to the existing value of the site prior to offset intervention, with sites with lower baseline condition likely to have a greater capacity for improvement (ERM, 2014). A conservative estimate of ~38% proportional improvement in condition over a 30-year period from low condition forest has been assumed for the project, based on ERM (2014) (see table below for offset gain calculations).

In order to achieve no net loss of biodiversity through the target of 112 habitat hectares (see table above), a minimum area of 235 ha of low value/poor condition forest will need to be rehabilitated and managed as part of the offset. The highly fragmented landscape associated with the Dak Chung KBA has been identified as a logical starting point for planning an offset, as the site is in close proximity to the impacted forest areas, such that the gains of offset mitigation are retained in the local area impacted and not transferred to elsewhere in the country. There may be key opportunities to support the existing Protected Area network, or local KBAs (Key Biodiversity Areas) which should be investigated further. Such an example could include working with the Lao PDR Ministry of Natural Resources and Environment (MoNRE) to create a protected area covering the mountain area in Survey Blocks 3 & 4, using the data

collected for the Monsoon WF application to support such a designation. Rough estimates based on the habitat mapping and classification undertaken for the biodiversity baseline assessment, suggests that for the Dak Chung KBA alone (which has a total extent of 51 km² or 51 000 ha) the extent of degraded/low condition forest habitat could easily exceed 50% of the area, or equating to around 25 000 ha. To secure an area of approximately 400 ha which can result in a potential no net loss and even net-gain in terrestrial biodiversity (see table below) should be relatively easy to achieve for this area alone, as this would be an estimated 1.5% of the Dak Chung KBA.

The target for Montane Forest habitat can therefore be quite readily achieved on Dak Chung Plateau, but not for Wet Evergreen Forest. Therefore, a second site will be required to offset the comparatively far lower losses to Wet Evergreen Forest (10 ha, equating to 8 habitat hectare equivalents), with a possible location being the existing forest disturbance caused by the formal road located to the east of the TL in the north-eastern section where this affects Wet Evergreen Forest habitat. Forest restoration along a roughly 4-5 km stretch of road through Wet Evergreen Forest can potentially net a gain of 30 ha of forest. To meet a target of 8 habitat hectare equivalents (see table above) requires the rehabilitation and management of more than 30 ha of low condition forest of this type. The candidate 30 ha forest offset site associated with the road disturbance would net an estimated gain of 8.3 habitat hectare equivalents, which is potentially a no net loss of biodiversity outcome (see Table below).

Habitat Type	Candidate Offset Site Extent (A)	Base Condition Value (B)	Estimated Gain over 20-year period (20%) (C)	Gain Overall D = A x C	Target in habitat hectares / Target Met?
Montane Forest	410 ha	Low, 0.2	+0.275	112.8 HH	112 HH, target met
Wet Evergreen Forest	30 ha	Low, 0.2	+0.275	8.3 HH	8 HH, target met

As the final positions of WT's and access roads may change through micro-siting to avoid loss of natural forest, and TL corridors are also still to be finalised, the final loss calculations will need to be refined through a more detailed analysis in GIS. This will be used to inform final targets and to determine the proposed boundary of the biodiversity offset to meet targets and thus achieve at least a no net loss, possibly net gain in biodiversity.

In addition, the following is recommended when developing the offset plan:

- Conservation outcomes are likely to be difficult to achieve without involving the local community. Community restoration / rehabilitation projects should be investigated such that the people who are most dependent on the forest resources in the area are the ones who also can benefit from the project;
- The 'Village Forest Management Planning Guideline' developed through the 'Climate Protection through Avoided Deforestation Project' (2016³⁴) supports sustainable use, protection and restoration of village forests in Lao PDR, and may provide a useful reference and guidelines to support offset planning and community forest management;
- It is suggested that the relevant FSC (Forest Stewardship Council) guidelines, norms or standards that focus on natural forest management and impact mitigation be used, where appropriate, to inform

³⁴ Climate Protection through Avoided Deforestation Project. (2016). Village Forest Management Planning Guideline. CliPAD-TC program, a technical cooperation between GIZ, KfW and Lao Government. January 2016. Available online at: <https://www.giz.de/en/downloads/Village-Forest-Management-Planning-Guideline.pdf>

the development of the BAP (most notably “FSC Principles and Criteria for Forest Stewardship” - FSC, 2015³⁵); and

- Engagement of an appropriate delivery partner with a track record of supporting such biodiversity protection and rural poverty alleviation projects.

Since direct/indirect species impacts are unlikely to be significant for the project to warrant the need for offsetting, there will be no need for a specific species offset for the project. That being said, offsetting potential over-harvesting / over-hunting practises that may be induced by the project will require a different approach, focused more on averting loss of species through measures aimed at ensuring sustainable harvesting practices are followed and ensuring appropriate protection of offset sites from illegal activities.

The next step will therefore be to develop a Biodiversity Action Plan and Offset Strategy for the project, which will require initially that forest habitat losses be more accurately determined using GIS (as a proxy for biodiversity loss of habitat and species). This will first require details on road and corridor width, area of transformation associated with each wind turbine and power substation to be quantified as well as the finalisation of road and transmission line route alignments.

Final revised offset targets can then be determined based on the extent of habitat losses determined, using reasonable and appropriate (scientifically defensible) offset ratios/multipliers for the habitat type in question, which should reflect the ecosystem/habitat threat status and/or conservation/threat status of species likely to be affected. It will be important that cost estimates for implementing the biodiversity offset required to achieve no net biodiversity loss (at a minimum for the Project) be evaluated and understood by all stakeholders during offset planning process, from the perspective of initial costs and the anticipated long-term management of the offset (essentially in perpetuity or for as long the Project infrastructure remains).

9.5 Social Impact Assessment

The assessment of potential social impacts arising as a result of the Project are outlined in the following sections. The social impact assessment is based on the methodology provided in **Section 6**.

9.5.1 Scope of Social Impact Assessment

Scoping determines which impacts are likely to be significant and should become the main focus of the impact assessment. A scoping exercise was carried out early in the ESIA process, which helped to outline the potential impacts associated with the Project. The identified potential impacts formed the basis of the social baseline study and impact assessment. The scoping outcomes are summarised in **Table 9-47**. The scoping summary does not intend to capture all potential social impacts of the Project, but key potential impacts to be examined during the social impact assessment.

The social impact assessment seeks to assess the potential social impacts from Project-related activities on sensitive receptors. The social impact assessment expands on scoping outcomes, and takes into consideration:

- The concerns and feedback received during the ESIA stakeholder engagement, baseline collection activities and information disclosure and consultation in July 2022 (refer to **Section 6**), and

³⁵ FSC (2015). Principles and Criteria for Forest Stewardship. Reference: FSC-STD-001 V5-2 EN. Available online at: <https://www.fsc.org/en/document-centre/documents/resource/392>

- The socio-economic characteristics of the affected villagers, particularly their vulnerability, their needs and challenges, as captured under the Social Baseline chapter (refer to **Section 8.5**).

As part of the impact assessment process, the vulnerability of receptors has been considered as part of 'sensitivity'. It is highlighted that the precautionary principle has been applied in undertaking the assessment, including when considering vulnerability.

Table 9-47: Social Impact Scoping

Project Activities	Project Phase	Potential Social Impacts	Receptors	Location
Construction and operation of the Project	Construction Operation	<p>Economic Opportunities</p> <ul style="list-style-type: none"> ■ Local Employment and Training (refer to Community and Ethnic Group Development Plan (CEGDP) for more details) ■ Increased Access to Agricultural Land/Forest 	Affected villagers	All 32 villages in the Aol
Turbine site, Access road, Internal TL 35kV, 115kV, Sub 500kV, TL500kV	Construction Operation	<p>Economic Displacement and Impacts to Livelihoods</p> <ul style="list-style-type: none"> ■ Loss of Agricultural Land ■ Loss of NTFP Collection 	Affected villagers	<p>22 villages affected by loss of agricultural land are listed in Table 9-51</p> <p>25 villages affected by loss of NTFP collection are listed in Table 9-53</p>
Vehicle movements from the delivery of materials and use of infrastructure and machinery, associated with construction activities	Construction	<p>Impacts to Community Health and Safety</p> <ul style="list-style-type: none"> ■ Infrastructure and Machinery ■ Vehicle Movements ■ Security ■ Potential Spread of Diseases 	Affected villagers Workforce	All 32 villages in the Aol
Construction of the Project	Construction	<p>Impacts Associated with Influx</p> <ul style="list-style-type: none"> ■ Labour and Working Conditions ■ Transactional Sex ■ Community Dynamics and Gender-Based Violence ■ Public Infrastructure and Resources 	Affected villagers Workforce	Location of workers camp
Operation of the Project	Operation	<p>Impacts on Local Amenity:</p> <ul style="list-style-type: none"> ■ Noise ■ Landscape and Visual Disruptions ■ Shadow Flicker 	Affected villagers	All 32 villages in the Aol
Construction of the Project	Construction	<p>Impact on Ethnic Groups</p> <ul style="list-style-type: none"> ■ Erosion of Ethnic Culture 	Affected villagers	All 32 villages in the Aol

Project Activities	Project Phase	Potential Social Impacts	Receptors	Location
Construction of the Project	Construction	Impact on Cultural Heritage (Tangible and Intangible) ■ Access/impacts to the sacred areas	Affected villagers	All 32 villages in the Aol

The following will be undertaken as part of the social impact assessment for each potential social impact:

- Description of the potential social impact, including:
 - The geographical extent of the potential social impacts;
 - Relevant Project phase (e.g. pre-construction, construction, operations); and
 - Potentially affected receptors.
- Identification of existing controls that have been developed and implemented.
- Assessment of the significance of the social impact.
- Development of additional mitigation and management measures, and associated monitoring measures.
- Assessment of residual social impact significance.
- Gender analysis and mainstreaming measures.

9.5.2 Impacts on Economic Opportunities

The development of a project typically generates economic opportunities for the local community. Potential economic opportunities for the Dak Cheung and Sanxay Districts are outlined in the following sections.

9.5.2.1 Potential Impacts

Local Employment and Training

An average of 700 workers (per day) are required during the construction phase (peak workforce requirement is 1,400 workers per day). In the construction phase, 150 positions are available for unskilled workers (90% Laos national and 10% migrant), 350 positions are available for semi-skilled workers (75% Laos national and 25% migrant), and 500 positions available for skilled workers (40% Laos national and 60% migrant).³⁶ While it is currently unclear as to whether the 350 semi-skilled and 500 skilled workers would be sourced from the villages within the Aol, it is highlighted that there are training opportunities available to enable some villagers work in these positions. It is anticipated that the nominated EPC Contractor will be a Chinese company and may hire Chinese workers for the Project (precise numbers of Chinese workers will be determined as part of detailed planning, following receipt of the ADB Notice to Proceed (NTP)). However, past project experience in Lao PDR suggests that there is potential that Chinese EPC Contractors may source some workers from Vietnam. Approximately 280 migrant workers (560 for peak workforce period) will be engaged for construction.

³⁶ Based on the draft CA Annex W as of 21 September 2021. Note that this is subject to change following the concluding of the CA.

A total of 53 workers will be required for the operations phase, of which 20 will be based locally. Eight of these workers will be migrants (i.e., project manager, site and administrative manager, equipment manager, operation manager, safety manager, chef), who will immigrate to the local area.

Baseline data identifies that over 1,664 people are in the active labour force. Of the active labour force, approximately 360 people are in unpaid (working on family farms) or temporary work (e.g. on hydropower projects or coffee plantations). Some local males have trades such as blacksmithing. On this basis, it is expected that there is capacity for villagers within the Aol to be employed in unskilled work, and perhaps some semi-skilled work, for the Project.

In addition to direct employment, there may be indirect employment opportunities. For instance, the Project or workers may require short-term accommodation, or the purchase goods and services from local businesses. The increased demand may result in an associated increase in employment.

Stakeholder engagement with villagers from both the Dak Cheung and Sanxay Districts identified that they have a positive sentiment about the Project, are looking forward to anticipated benefits, most notably in the form of employment. Villagers recognise that employment opportunities associated with the construction phase are temporary, in line with the temporary nature of construction. There is also an expectation that training opportunities will be provided as part of the Project. Villagers are particularly interested in training opportunities for youths as it is the view that the youth population needs opportunities for employment.

Increased Access to Agricultural Land/Forest

Access roads will be constructed to connect the Project with the National Highway No. 16 and internal Project access roads to wind turbines, transmission lines, and other infrastructure, in the Dak Cheung and Sanxay Districts. While the development of these access roads will result in the acquisition of some agricultural land (assessed separately in **Section 9.5.4**), according to the Project's Concession Agreement, all access roads developed by the Project are supposed to be made available for villagers to use. These new roads have the potential to provide access to new areas that were previously inaccessible. The new areas may provide opportunities for villagers to access to new areas for NTFP collection and establish new farms to support their land-based livelihoods. In opening up new area for NTFP collection and new farms, this will be undertaken in consultation with District Agriculture and Forestry Office (DAFO)/Provincial Agriculture and Forestry Office (PAFO) and villagers, and agreement will need to be reached with DAFO/PAFO and villagers.

These opportunities may be tempered by the presence of biodiversity in that there is a potential that the new areas will be areas of high biodiversity value, which may need to be confirmed via ecological field surveys. **Section 9.4.3** addressed impacts to biodiversity associated with improved accessibility gained via various access roads planned. Access roads planned could facilitate increased access to remote areas by local communities and people from outside the communities wishing to hunt wildlife for bush meat and collect forest products for subsistence and economic reasons. Increased human activity in the area could result in increased pressure on local forest resources (through illegal hunting/poaching and harvesting of forest products, for example). Without proper controls this could lead to increased pressure on both wildlife and habitat, however it is recognised that access control will be a priority as recommended in the local EIA mitigation recommendations. Nonetheless, IEAD will work together with the government to restrict access to high biodiversity areas, as outlined mitigation measures in **Section 9.4.3**.

Additionally, it was observed during the Information Disclosure and Consultation in July 2022 that neighbouring villages have agreements on designated NTFP collection areas for each village. Typically, NTFP collection areas are accessed on foot (as most of villagers do not own vehicles), they would note that some areas are too far. Improved access may potentially facilitate people from outside with vehicles to collect NTFPs in the area, leaving villagers whose livelihood is dependent on NTFPs collection

vulnerable or more vulnerable. However, such issues can be mitigated by, for instance, locked gate for roads leading to turbine infrastructure with access given to only local villagers (as part of local employment and security arrangement).

9.5.2.2 Existing Controls

As the Project has not commenced, there are no existing benefit enhancement measures.

9.5.2.3 Significance of Impacts

Methodology for Assessment of Impact Significance

The potential economic opportunities are assessed in accordance with the criteria set out in **Table 9-48** and **Table 9-49**.

Table 9-48: Social Impact Magnitude Criteria

Magnitude	Definition
Large	Change dominates over baseline conditions. Affects the majority of the area or population in the Aol and/or persists over many years. The impact may be experienced over a regional or national area.
Medium	Early evident difference from baseline conditions. Tendency is that impact affects a substantial area or number of people and/or is of medium duration. Frequency may be occasional, and impact may potentially be regional in scale.
Small	Perceptible difference from baseline conditions. Tendency is that impact is local, rare and affects a small proportion of receptors and is of a short duration.
Negligible	Change remains within the range commonly experienced within the household or community
Positive	In the case of positive impacts, it is generally recommended that no magnitude be assigned, unless there is ample data to support a more robust characterisation. It is usually sufficient to indicate that there will be a positive impact, without characterising the exact degree of positive change likely to occur.

Table 9-49: Social Impact Sensitivity Criteria

Sensitivity	Definition
Low	Villagers have low vulnerability/sensitivity; consequently, has a high ability to adapt to changes brought by the project
Medium	Some, but few areas of vulnerability/sensitivity; retaining an ability to at least adapt in part to change brought by the project
High	Profound or multiple levels of vulnerability/vulnerability/sensitivity that undermine the ability to adapt to changes brought by the project

Receptor Sensitivity and Impact Magnitude

The affected villagers are considered to have **medium** sensitivity, as they will be able to participate in decision-making through stakeholder engagement.

The impact magnitude is **positive** as economic opportunities allow affected villagers to improve their livelihoods.

Impact Significance

Based on the above, the impact significance of economic opportunities manifested through local employment, training opportunities, and potential increased access to new agricultural land and NTFP collection area has a **positive** impact significance.

9.5.2.4 Additional Mitigation, Management, and Monitoring Measures

Local Employment and Training

A Local Content and Influx Management Plan will be prepared to maximise the local employment and training opportunities afforded to the affected villagers. The Local Content and Influx Management Plan will be implemented by the nominated EPC Contractor, and will include:

- The responsibilities and management practices associated with the management of labour (covering local and migrant workers) during construction and operation of the Project.
- A hiring policy that reinforces the Project's preference to employ local workers and undertake procurement from local businesses, where possible. The policy will be a tiered system where the hiring preference will be as follows:
 - Villagers from within the Aol;
 - Villagers from the Dak Cheung District or Sanxay District;
 - Villagers from the Sekong Province or Attapeu Province and
 - Villagers from the remainder of Laos.
- A training program targeting skills required for affected villagers to participate in unskilled, and potentially semi-skilled, work for the Project.
- A communications strategy to notify affected villagers of employment and procurement opportunities in advance. This will enable villagers and businesses to be prepare for the application process (e.g. contracting requirements, assistance with application, etc.). The communications strategy will be supported by the SEP.

Community and Ethnic Group Development Plan (CEGDP)

The community development program will be reviewed and updated at five-year intervals, or more frequently required by the GOL or MEM. The community development program is intended to maximize the Project benefits at the community level and ensures wider community benefits are experienced above and beyond the Project's mitigation measures, and the compensation and livelihood restoration measures contained in the Resettlement Management Plan. Within community development activities, rural electrification schemes are among the more common benefit sharing mechanisms implemented by Project proponents, particularly renewable energy. Community development initiatives in addition to Rural Electrification include employment benefits, agriculture and husbandry training, education support, health support, and awareness and capacity building. These programs will extend positive socio-economic impacts beyond the directly affected persons to the wider community within the Project Aol.

9.5.3 Monsoon Windfarm Partnership Program

The Monsoon Windfarm Partnership Program will support community trust and rapport building and appropriate synergies across community beneficiaries. The necessary committee formation will be applied here as deemed necessary to facilitate each community development program.

The Community development's Monsoon Windfarm Partnership Program anchors appropriate synergy and linkages amongst key community actors whenever feasible, which will:

- Reduce duplication of programs and resources.
- Increase likelihood of success; and
- Promotes larger scale and longevity of the program(s).
- Ensure that direct Project related benefits are accrued by the Project communities by increasing agriculture production and linkages
- Help build relationships with the Project communities for timely completion of Projects.
- Capacitate communities in areas of coffee plantation and animal husbandry
- Synergy between Government and Monsoon Windfarm Project initiatives
- Warrants better financial returns
- Enhance reputation at all levels
- Better management of community expectations leads to reduced costs and Project liabilities
- Obtains substantial local support to enhance local processes and minimize local disputes
- Link the project and its interventions to the government's overall development plan in the area and externally funded development interventions
- Promote respect of local culture and protection of cultural heritage

During construction phase, CSR activities and programs will be developed following the principles of the Monsoon Windfarm Partnership Program. Development of CSR activities and programs will follow a participatory approach and each village level plan will be agreed with the respective affected village and their agreement will be documented in the minutes of meetings.

A Community and Ethnic Groups Development Plan was prepared to guide the implementation of suitable programs to support affected villagers. In the first instance, the CEGDP will investigate existing community development initiatives that may be already implemented and/or planned by the government, NGOs, and other organisations. The CEGDP will suggest collaboration with these organisations or enhance existing programs whenever feasible, which will:

- Reduce duplication of programs and resources and completing the existing programs/initiatives;
- Increase likelihood of success; and
- Promotes larger scale and longevity of the program(s).

Derived from the community risks and opportunities, existing community development programs and the Project's 'thriving community' priorities, potential programs that will be investigated in the CEGDP include:

- **Rural electrification – Off Grid Rooftop Solar Power Solutions to Communities (56 HHs):** The Proponent has delivered a number of successful renewable energy projects. Although the Project will not supply electricity to Laos, the Proponent has committed to providing a means of reliable and affordable electricity to the affected villages (Off Grid Rooftop Solar Power Solutions to Communities [56 HHs]). As part of the CEGDP, the details of implementation will be determined (e.g., provision of household solar power systems). This would further the Lao Government's Renewable Energy Development Strategy by increasing the renewable energy share. 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.

- **Agriculture & Animal Husbandry Support:** There are a number of existing agriculture and husbandry programs which will be investigated, such as:
 - IFAD Program supporting agriculture, providing training on weaving for women, and rearing livestock; and
 - Department of Agriculture and Forestry (2021) training on how to prepare soil for coffee plantation (part of the Greater Sub-Region Biodiversity Conservation Corridors Project).

The main objective is to improve agricultural yields. This will be done via several avenues, with the key one being to enhance the techniques used in soil preparation and improvement for coffee plantations, and to improve the local capacity in marketing, product development and market linkages. The coffee initiative is one of the most suitable income-generating programs for the community, as it not only improves livelihoods at a household level, but also contributes to regional economic growth. The other program that will focus enhancing agricultural outputs will assist in building livestock rearing capacity. This program will also address impacts due to loss of NTFP collection areas. Measures to address impacts on NTFP collectors will first require collection of baseline information on (i) different types of NTFP collected by men and women for what purpose (consumption, medicinal and income generating functions), (ii) their seasonality, (iii) locations and stocking density; (iv) and collection practices. Following this, new NTFP collection areas will be identified by the affected villagers, consulted with DAFO and relevant government authorities and formally allocated to respective villages. With external specialist support, capacity building on community-based forest management planning will be undertaken and possibilities for introducing other agro-forestry activities on remaining (unaffected) communal lands will be explored. Market linkages and improvement of techniques for processing of NTFPs for sale to aggregators and directly to consumers will also be explored.

- **Education and Sponsorship Assistance:** The current scenario suggests that there is much room for improvement in delivering quality education and support to further strengthen the education services. The majority of the structures currently in use are temporary and with very limited education supplies and materials. The Education and Sponsorship Assistance Scheme will further improve in areas of education and refurbish or construct infrastructure and facilities that contribute to strengthening the education systems. The Project will investigate the existing scholarship assistance programs including recipients and timeline of such programs to develop scholarship support that avoid duplication of these programs
- **Health Support & Services:** Insufficient healthcare services, inadequate healthcare personnel and lower levels of health awareness were raised as primary community concerns in areas of health services. Various interventions will be further investigated here, such as provision of medical supplies, building and refurbishing health facilities, installation of toilets and sources of clean drinking water, conduct of health check-ups, capacity building training of health staff and awareness raising on immediate health concerns.
- **Protection, Preservation and Promotion of Cultural Heritage:** The Project entails potential impacts and risks (intrusion of workers) to tangible and intangible cultural heritage. Inward migrating workers may negatively influence existing customs and religious practices undertaken by the ethnic groups. Damage or loss of ethnic culture may occur if migrant workers and other outsiders are not respectful of or understand the various customs and religious practices, such as boundaries placed on areas that may only be accessed by women or men. There are also opportunities to promote local culture, especially indigenous crafts as part of the livelihood program.

The CEGDP will be directly supported by the SEP, to ensure the key development opportunities are driven by the community's needs and opportunities, and the community members are aware of the Project benefits and how they can participate.

Ideally, the overlapping of community development priorities and interest between the community, local government and institutions, and the Project would form the strategic community development programs for the CEGDP.

The CEGDP will include a set of criteria to be considered for the selection and prioritisation of programs. While the criteria will be refined further, they generally relate to:

- Budget and timeframe constraints;
- Practicality and potential partners to execute the program successfully;
- Potential unintended consequences from the program;
- If there is opportunity for gender mainstreaming; and
- If there will be disproportionate benefits to a certain group and the potential for the vulnerable groups to not benefit from the CEGDP initiatives.

In addition to this, the CEGDP will include, but will not be limited to:

- Context review results – internal and external;
- Results of the community needs assessment and resources analysis;
- A description of the priority elements and why these were selected as priority elements;
- An overview of stakeholder engagement activities for CEGDP prioritisation, and design and implementation of CEGDP projects;
- Identification of potential partners and partnership strategies;
- A monitoring and evaluation framework for the CEGDP;
- The budget and human resources requirements for implementation of the CEGDP; and
- An implementation plan / schedule.

Increased Access to Agricultural Land/Forest

The management of increased access within the Dak Cheung and Sanxay Districts, and restriction to high biodiversity areas, will be managed via the Construction and Environmental Management Plan (CEMP).

Mitigation measures for biodiversity impacts due to increased access are presented in **Section 9.4.3.5** as follows:

Construction:

- Most turbines are located in areas of existing disturbed landscapes and the design of the wind farm avoids more intact habitat blocks wherever possible. Eight turbines are located on the lower elevation of the Phou Koungking Mountain and during road construction access to these sites from existing settlements and trails will be controlled through site security.
- Construction workers will be prohibited from hunting or trading in wildlife and forest products, as part of their terms and conditions of employment and Worker Code of Conduct, and will be subject to security checks.

- Undertaken consultation with DAFO/PAFO and villagers to identify new areas for NTFP collection and farming and establish agreements with DAFO/PAFO and villagers on access and to and utilize the new areas.

Operation:

- Implement access controls including the use of gates, security cameras and security guards at sites of key infrastructure such as substations and the main access roads to turbine clusters. Access may be given to only local villagers who were already to ensure the villagers can still access to their NTFP collection or farm areas while limit activities from outsiders (as part of local employment and security arrangement).
- Undertake stakeholder consultation with local villagers regarding access to traditional trails and access to non-timber forest products but prohibiting illegal hunting of protected species.

The SEP will be paramount in informing affected villagers of areas able to be accessed, and any conditions of access.

9.5.3.1 Residual Impact Significance

The residual impact significance of the impact of economic opportunities for affected villagers remains **Positive** (**Table 9-50**).

The Project will provide various economic opportunities, particularly in the form of employment. Not only will there be direct employment, but there will be indirect employment in businesses that support the Project and its workers. Additionally, increased access to agricultural land/forest will contribute toward economic growth in the villages in the Aol, in accordance with regulatory requirements. The Project will also implement a CEGDP to identify opportunities to improve the prospects of communities affected by the Project activities, independent of the Project presence, so the benefits will be felt long beyond the life of the Project.

Table 9-50: Economic Opportunities Impact Assessment

Significance of Impact				
Potential Impact	Economic opportunities for affected villagers			
Project Phase	Pre-Construction	Construction	Operation	
Impact Nature	Negative	Positive	Neutral	
	Opportunities for employment and other economic benefits from the Project.			
Impact Type	Direct	Indirect	Induced	
	Economic benefits will be directly provided by IEAD to affected villagers.			
Impact Duration	Temporary	Short-term	Long-term	Permanent
	Some economic benefits may be temporary, such as employment and training opportunities during the construction phase, while some will be long-term such as employment opportunities, increased access to agricultural land, and through the implementation of the CEGDP projects such as rural electrification, increased agricultural skills, women micro-credit scheme, and health and nutritional programs.			
Impact Extent	Local	Regional		International
	The economic benefits will be limited to the villages within the AoI.			
Impact Scale	The economic benefits will be limited to the villages within the AoI.			

Significance of Impact

Frequency	The economic benefits will vary depending on the phase of the Project and will be experienced in both the construction and operation phases.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	The impact of economic opportunities for affected villagers is positive.				
Receptor Sensitivity	Low	Medium		High	
	Affected villagers are able to participate in decision-making on the CEGDP priorities and directly receive the economic benefits provided.				
Impact Significance	Negligible	Minor	Moderate	Major	
	The impact significance is positive .				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	The impact significance is positive .				

9.5.4 Economic Displacement and Impacts to Livelihoods

Economic displacement and impact to livelihoods are inextricably linked concepts. Economic displacement is defined by the United Nations Development Programme (UNDP) (2020b) as the restriction (partially or fully) of individuals or communities to land or resources that are important to their means of livelihood or economic wellbeing. Livelihoods comprise the capabilities, assets and activities required for a means of living (IRP & UNDP-India, n.d.). Economic displacement therefore is likely to have an impact on livelihoods.

Potential economic displacement and impacts to livelihoods associated with the Project, are described in the following sections.

9.5.4.1 Potential Impacts

The majority of Project affected households live a subsistent livelihood which relies heavily on land and other natural resources around them. The main form of land-based livelihoods are agricultural activities (e.g. farming, rearing livestock, etc.) and NTFP collection. The Project impacts on each of the land-based livelihoods are discussed separately, below.

Loss of Agricultural Land

Agricultural land will be acquired to accommodate wind turbines, access roads, 500kV transmission line and the internal 35 and 115kV transmission line (refer to **Figure 9-58**). In the Sekong Province, the Project will need to acquire a total of 23.84 ha (affecting 2 households in Dak Tiem village) permanently. In addition, an area of 146.83 ha will be used temporarily during construction (affecting 168 households in 10 villages). There are 170 households in 18 villages that will have their land impacted both permanently and temporarily.

In the Attapeu Province, a total of 5.47 ha will be permanently acquired (affecting 3 households in Dak Samor village). In addition, an area of 9.70 ha (affecting 2 households in Dak Nong and Dak Yok villages) will be used temporarily during construction. Of these, 33 households in four villages will be impacted both permanently and temporarily. A summary of affected agricultural land is provided in **Table 9-51**. The affected land was recorded as being used as primary and supplementary sources of livelihood.

The acquisition of land currently used for agricultural purposes will lead to economic displacement, since the land will be (permanently or temporarily) removed from its agricultural use, and unable to generate income for landowners and users. In this sense, the loss of agricultural land will cause economic displacement and impact on livelihoods. Whilst some households will be temporarily impacted, it is highlighted that during this period, the impact on livelihoods will experience a similar impact to those households experiencing permanent acquisition.

Figure 9-58: Agricultural Land Removal

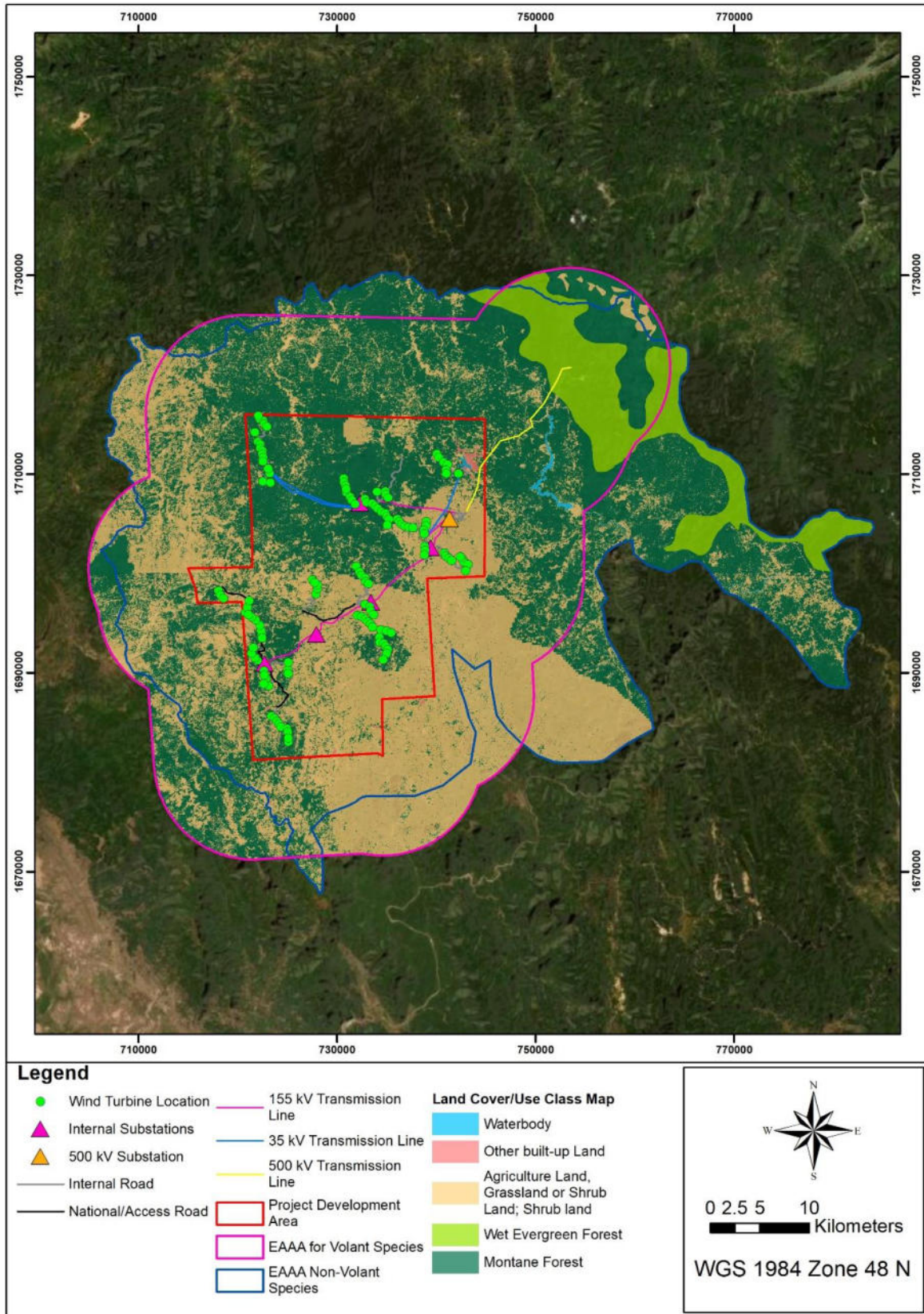


Table 9-51: Loss of Agricultural Land

No	Location	Project Activity	Loss of Agricultural Land						Livelihood Type (primary/ supplementary)
			Affected Area (ha)		Affected HHs (No.)			Total Affect HHs	
			Per.	Temp.	Per.	Per & Temp.	Temp.		
Dak Cheung District, Sekong Province									
1	Dak Tiem	Turbine site, Access Road	2.35	5.07	2	16	3	22	Both
2	Dak Xeng	Access Road	0.16	0.38	0	4	0	4	Both
3	Dak Yang	Turbine site, Access Road	1.09	1.2	0	4	0	4	Both
4	Dak Yen	Turbine site, Access Road	0.44	1.33	0	4	1	5	Both
5	Xieng Luang	Access Road, Internal TL 115kV	0.75	1.84	0	9	0	9	Both
6	Dak Terb	Internal TL 115kV, Turbine site, Access Road	0.06	6.07	0	21	16	37	Both
7	Tong Muang	Internal TL 115kV, Turbine site, Access Road	0	0.73	0	2	0	2	Both
8	Dak Dor	Internal TL 115kV	0.04	4.57	0	12	10	22	Both
9	Dak Den	Turbine site, Access Road	0.46	0.81	0	4	1	5	Both
10	Dak Rant	Turbine site, Access road, Internal TL 115kV, 35 kv ,Sub 500kV	2.65	14.94	0	26	18	43	Both
11	Dak Cheung	Access road	0.18	0.41	0	2	0	2	Both
12	Dak Lern	Access road	0.62	0.72	0	5	0	5	Both
13	Dak Kung	Turbine site, Access road, Internal TL 35 kv	1.09	1.15	0	5	0	5	Both
14	Dak Bong	Access road, Internal TL 115kV, 35kV, TL500kV	13.7	56.41	0	40	68	108	Both
15	Dak Muan	TL500kV	0.08	16.88	0	5	26	31	Both
16	Nonsavan	TL500kV	0.02	2.24	0	1	3	4	Both
17	Ngon Don	TL500kV	0.11	26.7	0	8	22	30	Both

No	Location	Project Activity	Loss of Agricultural Land						Livelihood Type (primary/ supplementary)
			Affected Area (ha)		Affected HHs (No.)			Total Affect HHs	
			Per.	Temp.	Per.	Per & Temp.	Temp.		
18	Dak Ta-ok Noi	TL500kV	0.04	5.37	0	2	0	2	Both
	Total		23.84	146.83	2	170	168	340	
Sanxay District, Attapeu Province									
1	Dak Nong	Internal TL 115kV,Turbine site, Access road	2.9181	5.3083	0	20	1	21	Both
2	Dak Samor	Turbine site, Access road	0.727	1.2842	3	6	0	9	Both
3	Dak Yok	Turbine site, Access road	1.0862	2.2363	0	3	1	4	Both
4	Dak Padou	Turbine site, Access road	0.7353	0.8714	0	4	0	4	Both
	Total		5.47	9.7	3	33	2	38	
	Grand Total		29.31	156.53	5	203	170	378	

Figure 4-5 presents locations of preliminary ancillary facilities. Based on the site visit conducted in November to December 2021 and June-July 2022, these facilities will be located on communal land, which is mostly unused land, grassland, and degraded forest.

Table 9-52 presents land requirements for preliminary ancillary facilities. 12.60 ha of agricultural land will be affected by land requirements of these ancillary facilities. In addition, 126.40 ha of land will be used for spoil disposal area. The spoil disposal area located approximately 2 km from Dak Seng (**Figure 4-5**), the area consists mostly degraded forest, shrub land and agriculture land.

Table 9-52: Land Requirement for Ancillary (Temporary) Facilities

No	Preliminary Ancillary Facilities	Total Area (ha)	Villages	Land		Agricultural Land		Land Use
				Area (ha)	Type	Area (ha)	Type	
1	Existing Local Crush Stone Point	0.25	Ngonedon	0	Communal	0.25	Garden land	crops
2	Potential Camp01	2.00	Dak Bong	0	Communal	2.00	Garden land	crops
3	Potential Camp02	2.00	Dak Ran	0.58	Communal	1.42	Garden land	Crops
4	Potential Batch Plant01	3.88	Dak Ran	0	Communal	3.88	Old garden land	Crops
5	Potential Crush Stone Production Plant01	2.65	Trongmueang	2.44	Communal	0.21	Garden land	Crops
6	Potential Batch Plant02	2.00	Trongmueang	1.46	Communal	0.54	Booking land	Empty land
7	Potential Camp03	2.00	Xiengluang	2	Communal	0	N/A	Forest
8	Potential Laydown Yard	50.00	Dak Tiem	50.00	Communal	0	N/A	Forest
9	Potential Crush Stone Production Plant02	4.00	Dak Tiem	0	Communal	4.00	Garden land	Crops
10	Potential Stone Resource Point02	9.00	Dak Tiem	8.70	Communal	0.30	Booking land	Empty land
11	Spoil Disposal Area	126.40	Dak Seng	-	-	-	-	-

Source: IEAD, 2022.

In the Project area, land use arrangements for agricultural purposes are made via formal land use certificates (e.g., land title and land tax receipt), or an informal traditional booking system (refer to **Chapter 7**). The DMS conducted in June-July 2022 suggests that, of 396 affected land parcels, 15 land parcels have land tiles (3.8%), 320 land parcels have land tax receipts (80.8%) and 61 land parcels are booking land (without land ownership documents e.g., land tax receipts) (15.04%).

The distribution of landownership between men and women varied across villages in the Aol. While most affected villagers identified that men and women have equal ownership of land, the land use certificate may state both names or the man's name only.

Through stakeholder engagement (refer to **Chapter 6**), affected households have indicated that they are worried that they will not be reasonably compensated for the loss of agricultural land, and they have a preference for cash compensation. The affected villagers' concern is principally related to the limited availability of land suitable for rice cultivation, due to the mountainous terrain of the region.

Section 7.2.2.2 presents the consultations conducted by Compensation Committee on compensation unit rate where the village representatives were consulted with on unit rates as a means for market price survey. Resettlement Plan is prepared to address impacts to livelihoods due to Project land acquisition and grievance mechanism will be established to address land acquisition and compensation related grievances (refer to Chapter 7 of the RP for more details).

NTFP Collection

Social surveys undertaken confirmed that affected villagers, generally women, collect NTFP from the nearby forests (refer to **Chapter 7**). Affected villagers are dependent on the collection of NTFP to supplement their livelihoods (e.g. Dok lai, Ling zhi), and other household uses (e.g. firewood, wood for houses, sticks to make brooms). **Figure 9-59** depicts the areas where NTFP are collected.

In the Sekong Province, 101.04 ha of forest will be permanently removed, and 389.87 ha will be temporarily acquired, affecting a total of 1,752 households. In the Attapeu Province, a total of 30.16 ha of forest will be permanently removed, and 58.69 ha will be temporarily acquired, affecting 355 households (**Table 9-53**).

Although land is temporarily acquired for the Project, this may result in long-term impacts, as revegetation of the area after removal of the facilities in the area will require time. There is also potential that the clearance of forest may lead to a permanent impact, if revegetation is unsuccessful. As outlined in **Section 9.4.3.7**, biodiversity offsets are typically required in certain situations to compensate for residual impacts to biodiversity and is the 'last resort option in the mitigation hierarchy'. The biodiversity offset rules for the project are detailed in **Section 9.4.3.7**, to achieve no-net-loss. While the location of the biodiversity offset has not been decided, initial comments from ADB indicate support for this to occur outside of existing conservation areas / overlapping existing initiatives.

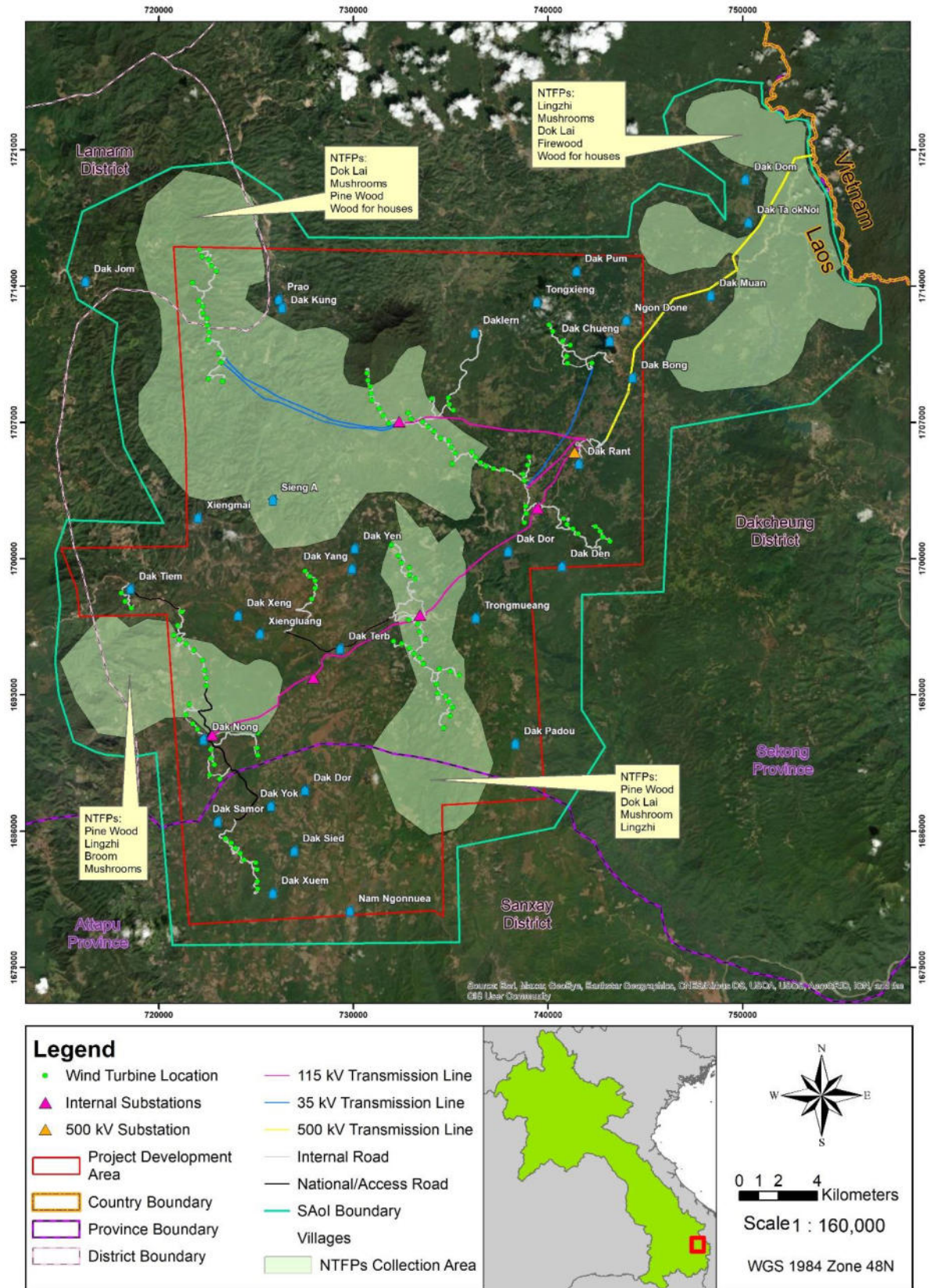
It is also noted that access to forests is still available and there will be improved access to forest resources associated with construction of access road in **Section 9.5.2.1.2**. Given that small, fragmented areas of clearing will be undertaken, instead of larger areas, and new access provided by the Project, the overall impact to the supply of NTFPs will be negligibly affected.

This is further emphasized by the findings of the biodiversity assessment. **Section 9.4.3** also suggests that there will be limited forest clearance:

"In the context of there being significant areas of natural and modified forest remaining within the EAAAs, an estimated modification in the region of 100ha and transformation of roughly 50 ha of the lesser impacted forest habitat can be considered relatively 'small' in terms of the actual magnitude of effect. The WF development is unlikely to threaten the long-term viability of the forest habitat or species dependent on it, with large areas of forest to remain undisturbed."

A summary of the impact on NTFP collection is provided in **Table 9-53**.

Figure 9-59: NTFP Collection Areas



Source: Site visit conducted by Innogreen, November – December 2021

Table 9-53: Impact on NTFP Collection

Location	Project Activity	Produce	Affected Area (ha)		Affected HHs (No.)	Livelihood Type
			Permanent	Long term		
Dak Tiem	Access road	Mushroom, firewood, wood for houses	9.50	14.06	144	Supplementary
Xiengluang	Access road, Transmission line	Firewood, wood for houses	2.22	19.15	97	Supplementary
Dak Terb	Access road, Transmission line	Mushroom, firewood, wood for houses	7.39	23.36	149	Supplementary
Dak Yang	Access road	Mushroom, firewood, wood for houses	1.30	1.89	58	Supplementary
Dak Yen	Access road	Mushroom, firewood, wood for houses	2.60	5.92	117	Supplementary
Trongmueang	Access road, Transmission line	Mushroom, firewood, wood for houses, Dok lai, Ling zhi	15.22	44.03	55	Supplementary
Dak Dor	Transmission line	Mushroom, firewood, wood for houses	0.01	2.34	100	Supplementary
Dak Den	Access road	Mushroom, firewood, wood for houses, Dok lai, Ling zhi	7.74	14.21	78	Supplementary
Dak Rant	Access road, Transmission line	Mushroom, firewood, wood for houses, Dok lai, Ling zhi	22.01	44.69	63	Supplementary
Sieng A	Access road	Mushroom, firewood, wood for houses, Dok lai, Ling zhi, Brooms	9.16	30.59	32	Supplementary
Dak Jom	Access road	Mushroom, firewood, wood for houses, Dok lai, Ling zhi, Brooms	4	6.8	202	Supplementary
Dak Kung	Access road, Transmission line	Mushroom, firewood, wood for houses, Dok lai, Ling zhi, Brooms	6.91	27.73	40	Supplementary
Daklern	Access road, Transmission line	Mushroom, firewood, wood for houses, Dok lai, Ling zhi	4.69	36.45	38	Supplementary

Location	Project Activity	Produce	Affected Area (ha)		Affected HHs (No.)	Livelihood Type
			Permanent	Long term		
Tongxieng	Access road	Mushroom, firewood, wood for houses, Dok laiy, Ling zhi	1.68	4	45	Supplementary
Dak Cheung	Access road, Transmission line	Mushroom, firewood, wood for houses	6.3	13.53	204	Supplementary
Dak Bong	Transmission line	Mushroom, firewood, wood for houses	0.07	11.48	54	Supplementary
Nong Don	Transmission line	Mushroom, firewood, wood for houses, Dok laiy, Ling zhi, Brooms	0.01	2.25	107	Supplementary
Dak Muan	Transmission line	Mushroom, firewood, wood for houses, Dok laiy, Ling zhi, Brooms	0.04	3.46	67	Supplementary
Dak Ta-ok Noi	Transmission line	Mushroom, firewood, wood for houses, Dok laiy, Ling zhi, Brooms	0.06	17.81	46	Supplementary
Dak Dom	Transmission line	Mushroom, firewood, wood for houses, Dok laiy, Ling zhi, Brooms	0.14	30.12	56	Supplementary
Total Sekong			101.04	353.88	1,752	
Dak Nong	Transmission line	Mushroom, firewood, wood for houses, Dok laiy, Ling zhi, Brooms	6.34	11.84	72	Supplementary
Dak Samor	Access road		8.68	3.52	83	Supplementary
Dak Yok	Access road		2.35	1.27	58	Supplementary
Dak Padou	Access road		11.96	5.24	66	Supplementary
Dak Xuem	Access road		20.42	8.94	76	Supplementary
Total Attapeu			49.75	30.81	355	
Grand Total			150.79	384.69	2,107	

Affected villagers revealed that they were concerned about the clearing of and restricted access to the forest, as they would lose sources of food and firewood. NTFP collection remains an important source of livelihood as these products have high value and are able to be sold to buyers from nearby cities and Vietnam.

It is highlighted that the proposed permanent and temporary clearing of forest has been kept to a minimum, and comprises less than 1% of the total Project area. The number of affected households was determined based on the number of households who collect NTFP within the areas identified in **Figure 9-59**. The area of forest will be cleared will, amongst other things, allow for access roads to be laid. As stated in **Section 9.5.2.1**, the access roads will provide greater access to other areas of the

forest that the affected villagers may currently be unable to access, or have difficulty accessing. As such, while there are 2,107 households affected by the clearing of forest, the Project will not remove the ability for NTFP collection.

The biodiversity aspect of NTFP collection (ecosystem services) impacts will be covered within the biodiversity section (refer to **Section 9.4**), as appropriate.

Existing Controls

The Project layout (including access road and transmission line routes) has been optimised to avoid physical displacement of villagers. Agricultural land and access to NTFP were also considered in the design process, and while unable to be avoided, the Project has minimised the magnitude of land acquisition and resettlement. In the current layout (Envision), the Project reduced the number of WTGs to 133 with the intention of reducing land acquisition and related impacts, particularly to agricultural and NTFP collection areas. The Project current layout results in an increased impact to agricultural land by 78.74 ha and NTFP collection area loss is reduced by 57.55 ha. The increased impact on agricultural land is attributed to the fact that villagers had already been informed of Project component locations, resulting in increased claims to land, agricultural activities on land and numbers of affected people.

Significance of Impacts

Methodology for Assessment of Impact Significance

The potential economic displacement and impacts to livelihoods are assessed in accordance with the criteria set out in *Table 9-54* and *Table 9-55*. *Table 9-54*: Social Impact Magnitude Criteria

Magnitude	Definition
Large	Change dominates over baseline conditions. Affects the majority of the area or population in the Aol and/or persists over many years. The impact may be experienced over a regional or national area.
Medium	Early evident difference from baseline conditions. Tendency is that impact affects a substantial area or number of people and/or is of medium duration. Frequency may be occasional and impact may potentially be regional in scale.
Small	Perceptible difference from baseline conditions. Tendency is that impact is local, rare and affects a small proportion of receptors and is of a short duration.
Negligible	Change remains within the range commonly experienced within the household or community
Positive	In the case of positive impacts, it is generally recommended that no magnitude be assigned, unless there is ample data to support a more robust characterisation. It is usually sufficient to indicate that there will be a positive impact, without characterising the exact degree of positive change likely to occur.

Table 9-55: Social Impact Sensitivity Criteria

Sensitivity	Definition
Low	Villagers have low vulnerability/sensitivity; consequently has a high ability to adapt to changes brought by the project
Medium	Some, but few areas of vulnerability/sensitivity; retaining an ability to at least adapt in part to change brought by the project
High	Profound or multiple levels of vulnerability/vulnerability/sensitivity that undermine the ability to adapt to changes brought by the project

Receptor Sensitivity

The affected villagers are considered to have **medium** sensitivity. This is due to their dependence on land-based livelihoods, namely agricultural practices and NTFP collection. Primarily, these land-based livelihoods are for the purpose of subsistence. Given the rural locality, it is difficult to participate in other sources of livelihood (e.g. not many wage-based or enterprise-based livelihood opportunities in or close to the villages in the Aol). This is particularly the case for vulnerable households (in particular poor households) that may already experience difficulties maintaining a secure form of livelihood. However, the Project will provide opportunities to participate in livelihood restoration mechanisms that will seek to restore the affected villagers' livelihoods to a minimum of existing levels, if not better.

Impact Magnitude

Given the number of households permanently and temporarily affected by economic displacement and impacts to livelihoods, the impact magnitude is considered to be **large**.

Impact Significance

As a result, the impact significance is designated as **major**.

9.5.4.2 Additional Mitigation, Management, and Monitoring Measures

IEAD recognises that Project-related activities resulting in land acquisition can have adverse impacts on communities.

As such, a Resettlement Plan was developed in response to the Project causing economic displacement and impacts to livelihoods. The Resettlement Plan was prepared in consultation with the Government of Laos, and will define persons entitled to compensation, principles of compensation, methods of valuing affected assets, resettlement process and tools, grievance process, institutional arrangement for resettlement planning and implementation. This include confirming specific households who are defined as vulnerable, so that appropriate steps can be taken to ensure they are able to access mitigation measures.

The following principles guided the development of the Resettlement Plan:

- Provide a set of clear and transparent standards for compensation that will be applied consistently to all affected villagers.
- Compensation will be provided for loss of assets at full replacement cost (i.e. market value plus transaction costs (for instance registration and taxes)), and provide assistance to help affected villagers to improve, or at least restore their livelihoods.
- While reasonable efforts will be undertaken by the Project to identify land availability and options for replacement land, given the challenges in securing replacement land (refer to **Section 9.5.4.1**), particularly for rice farms, this may be not be feasible. The Project will also help in obtaining and meeting the costs associated with securing land tenure in the name of both spouses, for those assisted to find alternative land.
- Wherever possible, in-kind compensation (e.g. land for land) will be offered to affected households (Ahs). Cash compensation will only be considered based on the preference of AHs.
- If replacement land options are not viable, other compensation measures may be investigated such as cash compensation for the value of the replacement land. It is a common practice in the region for resettlement compensation; however, experience and lessons learned across the world show that there are often consequences of providing cash compensation, and this is especially the case for ethnic groups that meet ADB SPS SR3 and IFC PS7 definition of IP and other marginalised groups due to their limited transaction experience. Accordingly, if cash compensation is offered, the Project will:

- Assess recipient's ability and financial literacy to use cash to restore their standard of living. If required, the Project should provide financial literacy classes to raise awareness on the use of compensation money.
 - Provide incentives for affected households to purchase land (for instance, provide assistance in identifying suitable and secure replacement land. However, it is noted with that this will need to be discussed and agreed with local authority).
 - Encourage deposition of cash compensation into a joint bank account under the name of both husband and wife. Deposition of cash compensation to either husband or wife bank account is possible if preferred and with consent from the other party.
 - Seek to provide cash compensation as instalments over time, which provides the opportunity for recipients to develop improved financial management skills.
- Activities are planned and implemented with meaningful consultation, and the informed participation of those affected.
 - All payments including compensation for loss of land, assets, structures, trees, etc. will be made to affected households prior to physical possession.
 - Lack of formal legal rights to assets lost will not deprive affected villagers from receiving compensation and payments for non-land assets and entitlements.
 - Livelihood planning should provide special assistance to women, minorities, and vulnerable groups who may be disadvantaged in securing alternative livelihoods.
 - The customs and traditions, as well as the religious practices of all affected households, will be respected and protected.
 - A timely, effective, and accessible Grievance Redress Mechanism will be established to manage issues and grievances related to resettlement.

9.5.4.3 Residual Impact Significance

The additional mitigation measures proposed will lower the residual impact magnitude to **medium**, however the impact significance remains as **moderate**.

Table 9-56: Economic Displacement Impact Assessment

Significance of Impact				
Potential Impact	Economic displacement and impacts to livelihoods from removal of agricultural land and forest (affecting NTFP collection).			
Project Phase	Pre-Construction	Construction	Operation	
Impact Nature	Negative	Positive	Neutral	
	Economic displacement and impacts to livelihoods will cause negative impact on affected villagers.			
Impact Type	Direct	Indirect	Induced	
	The Project will cause direct impact as removal of agricultural land and forest is required as part of the Project footprint.			
Impact Duration	Temporary	Short-term	Long-term	Permanent
	The removal of agricultural land and forest has temporary and permanent implications.			
Impact Extent	Local	Regional	International	
	The impact is limited to the villages in the Aol where land is required.			
Impact Scale	The impact is limited to the villages in the Aol where land is required.			

Significance of Impact

Frequency	The impact will occur once (i.e. Permanent acquisition of agricultural land and forest will only occur once for the area required).				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Due to the large number of households permanently and temporarily affected by economic displacement and impacts to livelihoods, the magnitude is large.				
Receptor Sensitivity	Low	Medium		High	
	The affected villagers have a medium sensitivity, due to their dependence on land-based livelihoods. However, they will be provided with opportunities to participate in resettlement planning and livelihood restoration mechanisms.				
Impact Significance	Negligible	Minor	Moderate	Major	
	The impact significance is moderate being mitigated by Resettlement Plan and Livelihood Restoration Program to ensure compensation is at full replacement cost, and livelihoods of those affected are restored, preferably, improved.				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	
Residual Magnitude Significance	Negligible	Minor	Moderate		Major

9.5.5 Impacts to Community Health and Safety

The Project has the potential to cause various community health and safety issues, in particular during the construction phase, as detailed in the below sections.

9.5.5.1 Potential Impacts

Infrastructure and Machinery

The presence of an active construction site, including the installation of new infrastructure and movement of large machinery, can lead to accidents and injuries if not managed appropriately. The presence of hazards around construction sites and laydown areas can create a range of safety issues, for villagers, or curious onlookers. These include:

- Villagers being struck by machinery, causing injury.
- Noise, vibration and dust resulting from general construction activities, which can cause disruptions in daily life and / or health impacts.
 - An increase in noise may interrupt sleep or cause other disruptions to community activities. Notably, disruptions associated with noise (such as sleep disruptions) have been linked to increases in depression and anxiety.
 - Increased vibration may also have an impact on buildings and other structures (e.g. causing cracks) if nearby to construction activities. Vibrations can be associated with a range of construction activities. Given the nature of the Project, in that piling and blasting will not be required, potential vibrations are not expected to be significant. For this reason, it has not been assessed in detail. Further, it is noted that vibrations were not identified during community consultation as an issue of concern.
 - Excessive dust may be generated from the movement of dirt and machinery. This dust may exacerbate the effects of respiratory diseases (e.g. asthma, upper respiratory infections).
 - Vibration from the use of machines may cause cracks of foundations and buildings.

It is noted that community health and safety impacts associated with infrastructure and machinery is limited to the construction phase, as infrastructure will be secured and construction machinery removed upon completion of construction.

Vehicle Movements

There will be a range of Project-related vehicles movements, including vehicles delivering materials and workers to and from the Project site. These movements have the potential to contribute to or be the root cause of accidents, particularly given there will be a higher number of heavy vehicles in the area. Specifically, the Project will undertake the delivery of workers and materials over an eight-month period involving a maximum total of 180 transport movements per day, as summarised in **Table 9-57**.

Table 9-57: Project Vehicle Movements, Construction

Vehicle Type	Vehicle Movements (Times Per Day)	Purpose of Movement
Truck Bus	15	Construction materials Workers
Truck	50	Wind turbine components
Truck	15	Erection and transport work
Truck	100	Foundation piling
Total	180	

Source: EIA, 2022

Given its rural locality, there are low volumes of traffic currently present in the villages in the AoI. A traffic survey undertaken in September 2020 identified a total of 203 vehicle movements per day towards Dak Cheung District, of which 16 vehicles (8%) were trucks, and 179 vehicle movements towards Sekong District, of which 11 (6%) were trucks. This data is summarised in **Table 9-58**.

Table 9-58: Traffic Survey, September 2020

Vehicle Type	Vehicles Travelling Towards Dak Cheung District (Per Day)		Vehicles Travelling Towards Sekong District (Per Day)	
	No.	%	No.	%
Two-Wheel Vehicle (Bicycle, Motorcycle, agricultural vehicle)	140	68.97	127	70.95
Car, Jeep, Pick-up	41	20.20	36	20.11
Small bus or Passenger vehicle (14 seats)	6	2.96	5	2.79
Truck (Light, Heavy of all types)	16	7.88	11	6.15
Total	203	100	179	100

Source: EIA, 2022

The total baseline truck and bus movements amounts to 38 vehicle movements per day. The Project will cause the number of truck and bus movements to triple. Villagers may not be accustomed to the hazards and risks presented by numerous heavy vehicles and machines (e.g. heavy vehicles require large stopping distances, there are blind spots / low visibility of pedestrians, etc.) and may inadvertently be involved in an incident. In addition, there will be increased noise and dust along the roads due to heavy vehicle movements, hence villages/ households located adjacent or in close proximity to roads may experience impacts. The site visit conducted in November to December 2021 suggests that the local communities are not familiar with associated health and mental health of noise, shadow flickers and pollution as there are currently no existing industries or large development

in the village area. However, impacts of noise, shadow flicker and other pollution will be covered under mitigation measures proposed in this ESIA and respective environmental management plans such as Noise and Vibration Management Plan, Waste Management Plan, Air Quality Management Plan, etc.

The potential health and safety impact associated with transport movements will be limited to the construction phase, given that there will not be deliveries of material during the operation phase, and a limited operational workforce (53 people) will need to commute to the site for maintenance or other activities.

Security

The Project will require security for the duration of the construction phase, as the Proponent has previously experienced theft of construction materials (e.g. copper wire, power supply, lighting protection, etc.). The number of security personnel required will be confirmed as part of detailed Project planning.

If conflict arises between the Project and villagers, there is potential for security personnel, as has been seen in other large-scale developments, to use excessive force, which in turn can pose a risk, including a risk to human rights.

Potential Spread of Diseases

The Project will employ a range of people during construction and operation. There is potential for the workforce to introduce and/or increase the rate of spread of diseases in the Project area including COVID-19. This may occur as a result of waste management practices, or from the spread of diseases brought in by workers and their households. Flu/cold/fever and diarrhoea are common diseases occurring in the villages in the Aol.

Another factor that will influence the prevalence and rates of diseases is the creation of vector habitat during construction and potentially operation. Standing water (i.e. vector habitat) can be created in a variety of ways, such as alterations to drainage patterns during earth moving activities and establishment of trenches (which can fill with water during rainy periods). Vector habitat is of particular note in locations such as Laos, where heavy rainfall occurs during the wet season creating large areas of standing water. This could be exacerbated by the Project, for example if trenches fill with water during the wet season. This could increase the prevalence of vector borne diseases, such as malaria, which has affected some villagers in the Aol.

Associated with the increase in transactional sex (discussed above), there is also a potential for rates of sexually transmitted infections to increase, including human immunodeficiency virus (HIV)/acquired immunodeficiency syndrome (AIDS).

FGDs and KIIs revealed that villagers were most concerned about the spread of COVID-19, and did not identify concerns with the spread of other diseases. Nonetheless, the spread of any diseases may place additional pressure on health infrastructure, discussed below.

9.5.5.2 Existing Controls

A Community Health and Safety Management Plan: Sets out the agreed controls and mitigation measures to protect the health and safety of villagers in the Aol. This includes provisions for:

- Outline requirements and measures to ensure community health, safety and security in compliance with IFC PS4
- Identify road safety hazards and mitigation measures for road safety for the community. Provision of traffic safety training to the communities prior to construction of any small and major roads. The training will be with the objectives of getting the communities familiar with the relevant traffic laws and aware of measures to be undertaken in case road accidents occur (to villagers and cattle).

- Fencing and/or security to prevent community members from accessing the construction site;
- Identifying and being aware of traffic hazards involving villagers;
- Requirements for construction workers to notify villager heads of key construction activities such as:
 - o Deliveries of wind turbines and other large objects;
 - o High volumes of truck movements;
 - o Activities potentially causing noise, vibrations and/or dust; and
 - o Potential presence of UXO
- An example of a program to be implemented as part of the CHSP is a community environmental and safety awareness program, which seeks to enable villagers to understand and identify construction risks, and how to stay safe. The program will include the following topics:
 - o Activities that cause disruption such as air, dust, traffic and noise impacts.
 - o Road safety, especially for children.
 - o Workers code of conduct, worker's health and safety plan.
 - o Security management.
 - o Emergency preparedness and response.
 - o Gender-Based violence and harassment
 - o Sexually transmitted diseases such as HIV/AIDS

Potential Spread of Diseases

- It is understood that villagers in the Aol have received COVID-19 vaccinations from the Government of Lao PDR.
- All workers will be accommodated in the labour camp during construction to prevent occurrence of spreading communicable diseases to local communities
- Provide training on the most common communicable diseases to all workers to raise awareness of the likely diseases, symptoms, preventative measures, transmission routes, and treatment;
- Ensuring health check-ups of all labourers employed to screen pre-existing communicable diseases; and
- Provide access for workers to healthcare services (facilities) and medical care.

9.5.5.3 Significance of Impacts

This section assesses the significance of impact on community health and safety from construction activities. It is noted that the sensitivity and magnitude criteria for community health and safety differs from the impact assessment methodology (**Section 6**), as described below.

Methodology for Assessment of Impact Significance

Community health and safety is assessed in accordance with the criteria set out in **Table 9-59** and **Table 9-60**.

Table 9-59: Sensitivity Assessment Criteria for the Impact on Community Health and Safety

Sensitivity Criteria	Contributing Criteria
Low	Communities with sufficient coping strategy who feel little or no challenge to their wellbeing as a result of project activities. They may share resources with the project occasionally and broadly understand the hazards associated with project components.
Medium	Communities with some coping strategy and some vulnerabilities, who are classed as less sensitive than the high sensitivity group. They are likely to experience temporary inconvenience as a result of changes in environmental or social determinants of health. They may share resources occasionally with the project. The communities express some concerns and anxieties of the impact of the project on their wellbeing. They have some, but far from complete, understanding of the technical hazards associated with project components.
High	Community groups who are very vulnerable because they have high sensitivity to the impacts of the project and very limited coping strategies. The technical hazards of a project component may be unfamiliar and poorly understood by a community; and this could increase sensitivity.

Table 9-60: Criteria for Impact Magnitude for Assessment of Impact on Community Health and Safety

Magnitude	Criteria
Negligible	Project does not impact on environmental, health and safety issues to the surrounding community as the project implements good international industry practices and environmental, health, safety guidelines, following national law/regulations on Environmental, Health and Safety as well as other Recognised internationally sources.
Small	Project will impact on community health, safety and security within villages in the Aol.
Medium	Project will impact on community health, safety and security at regional level.
Large	Project impacts on community health, safety and security at a national level.

Receptor Sensitivity and Impact Magnitude

Construction activities occurring in the vicinity of the villages in the Aol will expose villagers to new impacts, and has the potential to exacerbate existing risks (e.g. traffic). There is a limited ability for villagers to influence construction activities that may cause health and safety impacts, and as the Project will change the baseline environment (albeit for a limited amount of time, during the construction phase only), the villagers have a **high** sensitivity.

The impact on community health and safety from construction activities is **small**, as the impacts are limited to the villages in the Aol.

Impact Significance

As such, the impact significance is assessed to be **moderate**.

9.5.5.4 Additional Mitigation, Management, and Monitoring Measures

Other environmental management plans such as the Traffic Management Plan, Air Quality Management Plan, and Noise and Vibration Management Plan will be prepared to support the CEMP. Refer to the environmental impact assessment sessions for an outline of content will be included in these management plans.

In addition, the following will be prepared to manage potential impacts on community health and safety:

- **SEP:** The SEP will describe how Project stakeholders will be engaged throughout the Project lifecycle. The SEP will establish a systematic approach to stakeholder engagement that will help

the Project build and maintain a constructive relationship with stakeholders. It will also ensure that Project information on environmental and social risks and impacts is disclosed to stakeholders in a timely, understandable, accessible and appropriate manner and format.

- **Grievance Redress Mechanism (GRM) (within the SEP):** A grievance mechanism will be established as part of the SEP to provide villagers with an accessible and inclusive means to raise issues and grievances and allow the Project to respond to and manage such grievances. During the EIA, ESIA consultations and Project information disclosure and consultation with 32 villages in July and September 2022, they have been clearly informed of dedicated GRM for communities which is a separate from GRM for Project workers (refer to Section 5 of the SEP for more details). Additionally, they will continuously be informed of GRM in future engagements and posters pertaining grievance receiving channel will be displayed in the villages To ensure that the community grievance is received by responsible unit designated by the Project, the following measures can be put in place:
 - The management of GRM for workers and community should work in collaboration. If it was found that a villager has lodged their grievance to the wrong channel, the worker GRM should pass on the grievance to community GRM; and
 - The villagers should be made understood of follow up procedure. If the villagers lodge a grievance and do not get a response/confirmation back within specified time, they should follow up on their lodged grievance with the Project.
- **Local Content and Influx Management Plan:** In addition to the aspects outlined in **Section 9.5.2.4**, the Local Content Plan will include:
 - A Workers Code of Conduct, which identifies behavioural standards and cultural awareness requirements for all workers to comply with.
 - A Security Code of Conduct will outline guideline for security personnel and will require security personnel to have specific training relating to:
 - The use of force, such as avoiding the use of force where possible and in accordance with national regulations where necessary).
 - How to communicate and engage with the local communities
 - GBV training
 - All security personnel will be required to undergo background check prior to employment. Security personnel will be prohibited from engaging in armed conflict, or violence towards villagers (including sexual abuse or gender-based violence).
 - The SEP will inform the communities near the Project regarding the risks and consequences of trespassing. Such engagement should start prior to the start of construction activities.
- In addition, the SEP will ensure that the communities are aware of grievance redress mechanism to lodge any grievances in relation to the conduct of security personnel. **Occupational Health and Safety Management Plan:** Sets forth the agreed controls and mitigation measures to protect the health and safety of workers. This will include:
 - Screening of migrant workers prior to entering Laos to ensure they are fit to undertake their relevant tasks/roles.
 - Safety audits which will occur during the construction and operation of the Project, to ensure safety procedures are complied with.
 - Induction and training requirements for all workers, including site-specific induction and training to highlight safety risks and mitigations, and task-specific training (e.g., complying with speed limits, etc.).

- Measures to mitigate against the spread of communicable diseases including COVID-19 amongst workers, and from workers to other villagers.
- Measures to prevent and mitigate the spread of sexually transmitted infections, including HIV/AIDS.

9.5.5.5 Residual Impact Significance

Through the implementation of the additional mitigation measures, the residual impact significance is assessed as **negligible**.

Table 9-61: Impact Assessment for Community Health and Safety

Significance of Impact					
Potential Impact	Community health and safety.				
Project Phase	Pre-Construction	Construction		Operation	
Impact Nature	Negative	Positive		Neutral	
	Accidents or injury to community members.				
Impact Type	Direct	Indirect		Induced	
	Machinery and infrastructure in a construction site are risks to community health and safety.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The impact will occur in the construction phase.				
Impact Extent	Local	Regional		International	
	The impact is limited to the villages in the Aol.				
Impact Scale	The impact is limited to the villages in the Aol.				
Frequency	The impact is not expected to occur frequently.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	The impact is limited to the villages in the Aol.				
Receptor Sensitivity	Low	Medium		High	
	There is limited ability for affected villagers to influence Project construction activities that may cause health and safety impacts.				
Impact Significance	Negligible	Minor	Moderate	Major	
	The impact significance is moderate.				
Residual Receptor Sensitivity	Low	Medium		High	
Residual Impact Magnitude	Positive	Negligible	Small	Medium	
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Through Project information disclosure and the community environmental and safety awareness programs, affected villagers will be able to understand and identify construction risks, and be able to stay safe.				

9.5.6 Impacts to Occupational Health and Safety

The Project will employ 1,400 workers during construction (at the peak period), and up to 40 workers during operation. Occupational health and safety hazards during the construction and operation of the Project are similar to other large industrial facilities and infrastructure projects. They may include physical hazards, such as working at heights, working in confined spaces, working with rotating machinery and falling objects.

9.5.6.1 Potential Impacts

Given the nature of the Project, workers are at risk of occupational health and safety incidents. The WBG EHS Guidelines for Wind Energy (2015) highlight the following key occupational health and safety risks related to windfarm projects:

Working at Heights

Working at height occurs frequently throughout all phases of construction. The main focus when managing working at height should be the prevention of a fall. However, additional hazards that may also need to be considered at any wind energy facility and is especially relevant for maintenance purposes include falling objects and adverse weather conditions (wind speed, extreme temperatures, humidity, and precipitation/rain).

Working in Remote Locations

Given the Project is located in a remote area of Lao PDR, travelling to and from the Project site increases the risk of road accidents and injuries occurring. Based on the site visits conducted in November and December 2021, it is suggested that the conditions of the access roads to the villages and the Project site is generally poor. As such, adverse weather conditions may contribute to dangerous driving conditions.

The risks of emergency situations are amplified in remote areas due to limited/poor access to assistance. Based on the KIIs, there are no firefighting departments available at the district level and limited healthcare facilities in nearby villages. Furthermore, travelling to a hospital may take between 1 to 3 hours. This creates a risk.

Another key risk, which is common when working in a remote area, is the potential inability to communicate. Remote areas such as mountains and forests often have limited or mobile/internet signal; this may include 'blackspots' where there is no signal at all. This poses a threat to workers, who, without being able to access mobile/internal signals, may have no way of calling for help in an emergency.

Lifting Operations

During the construction phase, components are generally assembled and transported to the site where assembly will take place. This involves using large, complex equipment to repeatedly lift loads of varying dimensions and weights. The hazards associated with the use of lifting equipment in construction are:

- Hazards related to the loads, e.g. crushing due to impact of moving objects or loads falling from vehicles;
- Hazards from moving vehicles or collapsing structures, i.e. cranes falling over because of improper fixation or strong wind, unsafe loads, loads exceeding the safe weight limits;
- Falling from lifting platforms or being crushed when the platform moves;
- Hazards related to poor environmental conditions that may interfere with communication between workers (e.g. poor mobile/internet signal), or adverse weather conditions resulting in sweaty/slippery objects; and
- Contact with overhead electrical cables.
- Manual lifting tasks with high loads or repetition that may induce musculoskeletal disorders (MSDs), e.g. lower back pain. In addition to MSDs, manual lifting tasks can also lead to accidents causing acute trauma such as cuts or fractures.

9.5.6.2 Existing Controls

The following existing controls and mitigation measures will be implemented according to the WBG EHS Guidelines for Wind Energy (2015).

Working at Heights

- Eliminate or reduce the requirement to work at heights.
- If working at heights cannot be eliminated, use work equipment or other methods to prevent a fall from occurring.
- Ensure all structures are designed and built to the appropriate standards and have the appropriate working at heights systems fitted.
- Suitable exclusion zones should be established and maintained underneath any working at heights activities, where possible, to protect workers from falling objects.
- Ensure all employees working at heights are trained and competent in the use of all working at heights and rescue systems in place.
- Provide workers with a suitable work-positioning device; also ensure the connectors on positioning systems are compatible with the tower components to which they are attached.
- Ensure that hoisting equipment is properly rated and maintained and that hoist operators are properly trained.
- When working at heights, all tools and equipment should be fitted with a lanyard, where possible, and capture netting should be used if practicable.
- Signs and other obstructions should be removed from poles or structures prior to undertaking work.
- An approved tool bag should be used for raising or lowering tools or materials to workers on elevated structures.
- Avoid conducting tower installation or maintenance work during poor weather conditions and especially where there is a risk of lightning strikes.
- An Emergency Response Plan (ERP) should be in place detailing the methods to be used to rescue operatives should they become stranded or incapacitated while at heights.

Working in Remote Locations

- Suitable communication equipment available for the work crew.
- The training and competence of personnel working remotely and the readiness of all necessary safety equipment at that location.
- Supervision by competent personnel who are empowered to make decisions based on events and conditions at the work location.
- Means for managers to track the exact location of the working crew.
- Local emergency plan in place.
- Provision of suitably qualified first-aid-trained personnel in the work crew.
- Snake guard should be included as personal protective equipment (PPE) for the workers.

Lifting Operations

- Ensure all relevant information is known about the load, e.g., the size, weight, method of slinging, and attachment points.

- Ensure all lifting equipment (including load attachment points) is suitable, capable of supporting the load, in good condition, and in receipt of any statutory inspections required.
- Ensure all supervisors, equipment operators, and slingers are trained and competent in the lifting equipment and intended lifting techniques.
- Where possible, exclusion zones are to be established and maintained in order to prevent any unauthorized access to lifting areas.
- When lifting large loads, ensure weather conditions are favourable for the task.
- Safe operating parameters of heavy lifting equipment should not be exceeded at any time.
- A planning meeting between all parties involved in the lift should be carried out and should include: the details of the lift, the roles of each party involved in the lift, and the methods used to communicate instructions among the parties.

9.5.6.3 Significance of Impacts

Methodology for Assessment of Impact Significance

Occupational health and safety is assessed in accordance with the criteria set out in **Table 9-59** and **Table 9-60**.

Receptor Sensitivity and Impact Magnitude

The sensitivity of the receptor is considered to be **low** as the workforce engaged for key activities related to working at height and lifting operations are expected to be trained to perform the job.

With the implementation of existing controls and mitigation measures according to the WBG EHS Guidelines for Wind Energy (2015), the impact magnitude is expected to be **small**.

Impact Significance

The significance of impacts to occupational health and safety is thus considered to be **negligible**.

9.5.6.4 Additional Mitigation, Management and Monitoring Measures

The nominated EPC Contractor will be required by the Proponent to meet regulatory requirements, as they relate to occupational health and safety. Working and living conditions are discussed under assessment section of **Section 9.5.6**. Additionally, a number of policies and management plans will be implemented in response to the identified potential impacts to occupational health and safety, namely:

- **Occupational Health and Safety Management Plan:** Sets forth the agreed controls and mitigation measures to protect the health and safety of workers, including induction and training requirements (refer to **Section 9.5.4.4**).
- **Emergency Preparedness and Response Plan:** Outlines the measures to respond to unplanned events or emergencies that may result in injury or death.
- **SEP:** The methodology and timing of stakeholder communication, including a community environmental and safety awareness program will be included in the SEP (refer to **Section 9.5.5.4**), to support the aforementioned management plans. Grievance mechanism to be developed as part of the SEP for affected communities. The Project will ensure its own and EPC contractors' grievance mechanism for workers and communicate clearly to workers of this mechanism.
- A Workers' Camp Management Plan will also be prepared to govern the operation of the workers' accommodation facility.

- The Local Content and Influx Management (covering Labour Management) will outline requirements and measures to ensure labour and working conditions in compliance with IFC PS2.

9.5.6.5 Residual Impact Significance

Through the implementation of the additional mitigation measures, the residual impact significance is assessed as **negligible**.

Table 9-62: Impact Assessment for Occupational Health and Safety

Significance of Impact					
Potential Impact	Occupational health and safety impacts from the construction works				
Project Phase	Pre-Construction	Construction		Operation	
Impact Nature	Negative	Positive		Neutral	
	Accidents or injury to workers.				
Impact Type	Direct	Indirect		Induced	
	Machinery, infrastructure and construction activities in a construction site are risks to occupational health and safety.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The potential impact will occur in the construction phase (short-term), and the operation phase (long-term).				
Impact Extent	Local	Regional		International	
	The impact is limited to the workers on the Project.				
Impact Scale	The impact is limited to the workers on the Project.				
Frequency	Impacts have the potential to occur throughout the life of the Project (Pre-Construction, Construction and Operation Phases)				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	The impact magnitude is expected to be small with existing control / mitigation measures.				
Receptor Sensitivity	Low	Medium		High	
	Sensitivity of workers is considered low with skilled workers trained for key activities related to working at height and lifting operations				
Impact Significance	Negligible	Minor	Moderate	Major	
	The impact significance is negligible.				
Residual Receptor Sensitivity	Low	Medium		High	
Residual Impact Magnitude	Positive	Negligible	Small	Medium	
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Through the Project HSE training, HSE policy, Occupational Health and Safety Management Plan and Emergency Preparedness and Response Plan, the workers will be able to identify construction risks, minimize the risks and respond to the risks and emergencies.				

9.5.7 Impacts Associated with Influx

Influx or in-migration relates to the movement of people to a Project area in anticipation of, or in response to, economic opportunities associated with a project. This includes direct employment by the project (e.g. construction worker, supplier of materials, etc.) as well as indirect employment (e.g.

restaurant operators who may experience higher patronage from the construction workforce requiring them to employ more people, etc.).

The workforce requirements for the Project are stipulated in **Chapter 3**, it is anticipated that approximately 560 directly employed workers will move to the AoI during the construction phase. This does not include the workers' families (if applicable), or any other people who may move to the local area to seek economic benefits associated with the Project.

There are a number of negative impacts of influx, such as increased risks to community health and safety, increased transboundary movements, and increased pressure on infrastructure and resources. These will be discussed in the sections, below.

9.5.7.1 Potential Impacts

Labour and Working Conditions

There are a number of fundamental principles and rights at work that apply to all workers, and these are reflected in international standards (e.g. the International Labour Organisation (ILO) Declaration on Fundamental Principles and Rights at Work and the Universal Declaration of Human Rights). Without appropriate safeguards in place, a range of potential impacts can arise, including discrimination within the workplace, mistreatment of migrant labour or other vulnerable groups, and the use of forced labour³⁷ (including bonded labour³⁸), or child labour³⁹. Additionally, workers' mistreatment may extend to:

- Poor condition of workers' accommodation (e.g. poor hygiene standards, lack of privacy, etc.); and/or
- Undue exposure to occupational health and safety risks that lead to or increase the risk of serious injury or death (e.g. lack of training/qualification, inadequate personal protective equipment (PPE), etc.).

Given that 40% of households are identified as vulnerable households, there is a potential for these villagers to be unknowingly engaged in forced labour situations in an effort to increase their income.

Migrant workers may also be vulnerable, depending on their individual socio-economic status. As with local workers, migrant workers may also be unknowingly engaged in forced labour or arrive in Laos with failed expectations of living and working conditions.

In the Lao PDR, the Government has sought to prevent mistreatment of local and migrant workers through the ratification of international conventions and the establishment of local legislation, such as the Labour Law.

Transactional Sex

The increased population due to the presence of a construction workforce, typically made up of males working away from home, may attract sex workers to the local area. Female villagers who are vulnerable may also seek to capitalise on the availability of disposable income of construction workers, and may seek out transactional sex (IFC, 2009). Notably, villagers did not raise the prevalence of sex workers as an existing issue within the villages in the AoI (refer to stakeholder engagement outcomes in **Chapter 6**).

³⁷ Forced labour is defined as "all work or service which is exacted from any person under the menace of any penalty and for which the said person has not offered himself voluntarily" (ILO, n.d.a)

³⁸ Bonded labour (or debt bondage) is a form of forced labour in which workers are forced to work in order to pay off their on debts or inherited debts (ILO, n.d.b)

³⁹ The ILO (n.d.c) defines 'child labour' as the work that is mentally, physically, socially or morally dangerous and harmful to children, and/or interferes with their schooling.

It is noted that the majority (approximately 60% or 840 people) of workers required during the construction phase will be locals. The small proportion of workers from outside the area (approximately 40% or 560 people) will decrease the risk of human trafficking and transactional sex occurring. In addition, workforce behaviours will be bounded by a Workers' Code of Conduct and the Project will establish advisory services for workers as well as health care provision (incorporated within typical health checks and on an as needs basis).

Community Dynamics and Gender-Based Violence

The in-migration of workers may change community dynamics and may be part of villagers' concerns that outsiders may deceive women and children (according to FGDs with women groups). It is anticipated that the nominated EPC Contractor will be a Chinese company and may hire Chinese workers for the Project. Given that the majority of the affected villagers are part of an ethnic group, comprising Triang, Yae and Katu peoples, it is likely that Chinese workers will have different customs and traditions to the ethnic groups that will reside in the Project area. These cultural differences have the potential to cause friction in the community, especially if local customs and traditions are not respected by foreign workers. The potential erosion of ethnic culture is assessed separately, in **Section 0**.

Gender-based violence, that is defined as "harmful acts directed at an individual or a group of individuals based on their gender" (UN Women, 2020) has the potential to occur. Gender-based violence may take many forms, including (but not limited to) domestic violence, sexual violence, human trafficking (refer above). Despite this, it is noted that villagers did not raise gender-based violence as a concern as they have been equipped with how to identify gender-based violence and resources to contact should this occur. However, this should be viewed with a precautionary approach due to the acceptance of the society regarding traditional roles of men and women, domestic violence may be underreported or not fully understood by victims.

Public Infrastructure and Resources

The Project has the potential to impact on public infrastructure and resources, particularly relating to an increased demand on local hospital and health care facilities, as described below.

During the construction phase, there will be a temporary increase in the local population from workers (estimated peak workforce of 1,400 people) (refer to **Table 3.6**). The increased population has a potential to have an impact on public infrastructure, including hospitals and health care facilities.

Through KIIs and FGDs, community members voiced concerns of an increased workforce on hospital and health care facilities. Community members are concerned that the increased demands from the construction workforce may jeopardise their access and level of care available. Villagers most commonly visit healthcare centres (10 of 23 villages in the Aol have healthcare centres) or community hospitals (one in Dak Cheung District, and one in Sanxay District), however the commute to these facilities may encounter barriers to travel for instance there may be poor road conditions or villagers lack a means of transportation (refer to **Section 8.5**). Villagers therefore consider the healthcare facilities as insufficient to address their current needs.

The increased population residing in the villages in the Aol will also place pressure on resources such as electricity, water (drinking and sanitation), and food supply. During construction and operation, the Project will source its power supply from the Lao grid (EDL) with estimated demand of 4,000 MWh/year during construction and 150 MWh/year or 400 kWh/day during operation. The water required for construction of the Project construction will be sourced from groundwater/surface water with an estimated water requirement of 1,000 m³/day or 30,000 m³/month. During operation, water will be sourced from groundwater or surface water. The estimated total water consumption during operation is 20 m³/day, which includes will be 10 m³/day for domestic use and drinking water and 10 m³/day for the plants.

The increased demand may result in shortages, which has the potential to increase the price of resources, and in turn can make it challenging for villagers from to access resources due to the inflated prices.

As the operation phase does not involve a large workforce (i.e. 40 workers), it is not anticipated that Project operations will contribute to additional impacts on public infrastructure.

9.5.7.2 Existing Controls

Labour and Working Conditions

- A number of legislative requirements exist to protect local and migrant workers, which all employers must comply with.

Community Dynamics and Gender-Based Violence

- Gender-based violence is not currently occurring within the villages in the AoI, however this may be due to the acceptance in the society regarding the traditional roles of men and women. As such, there is a potential for the gender-based violence to be underreported or misinterpreted by villagers. The government and NGOs have engaged with villagers regarding gender-based violence and gender equality to raise awareness and equip them with resources.

Public Infrastructure and Resources

- The EPC Contractor plans to have a healthcare facility at each camp which includes a nurse/doctor to treat workers directly whenever possible. This will reduce pressure on the local healthcare facilities. The healthcare workers will be recruited from outside the AoI to avoid impacting existing providers.
- A Water Use Plan will be prepared, that outlines how groundwater or surface water will be used (refer to **Section 9.3.6**).
- Electricity generators may be brought in to supplement the supply of electricity during the construction of the Project.
- Food supply may be brought in from outside the local area, to minimise local supply of food, or can be ordered in advance so that local suppliers are able to cater for the increased demand.

9.5.7.3 Significance of Impacts

Methodology for Assessment of Impact Significance

Community health and safety is assessed in accordance with the criteria set out in **Table 9-59** and **Table 9-60**.

Receptor Sensitivity and Impact Magnitude

The villagers have a **medium** sensitivity, with some ability to adapt to changes brought about by influx. This includes, education on gender-based violence, being inoculated with the COVID-19 vaccination. Further, the close-knit nature of the villagers allows them to support one another if there is pressure on infrastructure and resources.

The impact of the impact of influx is **small**, as the impacts are limited to the villages in the AoI.

Impact Significance

Based on this, the impact significance is assessed to be **minor**.

9.5.7.4 Additional Mitigation, Management, and Monitoring Measures

The nominated EPC Contractor will be required by the Proponent to meet minimum labour standards, so as to ensure workers are treated fairly. Additionally, a number of policies and management plans will be implemented in response to impacts associated with influx, namely:

- **Local Content and Influx Management Plan:**
 - A preference for the recruitment and engagement of local workers and local businesses will be stipulated within this plan (refer to **Section 9.5.2.4**)
 - Establish a formal recruitment process with clear hiring preferences to discourage people from outside of the Project area coming to seek for employment opportunities with the Project.
 - Early communication of the recruitment process and positions available to non-locals so they have time to prepare, train (if necessary) and apply.
 - Set out the responsibilities and management practices associated with the management of labour during construction and operation of the Project. This will include the Workers Code of Conduct, which identifies behavioural standards and cultural awareness requirements for all workers (including security personnel) to comply with (refer to **Section 9.5.5.4**). The Workers Code of Conduct will be discussed and agreed with project affected ethnic groups.
 - Set out the guidance and plans for camp followers
 - In addition to Workers Code of Conduct, and the Project will establish advisory services on safe sex for workers as well as health care provision (incorporated within typical health checks and on an as needs basis). A Workers Code of Conduct will contain provisions that guide workforce behaviours, including behaviours linked to gender-based violence, sexual abuse, etc. following the IFC Emerging Good Practice for Private Sector Addressing Gender-Based Violence and Harassment. Workers who breach the Workers Code of Conduct will be subject to penalization.
 - Outline requirements and measures to ensure labour and working conditions in compliance with IFC PS2.
- **Workers' Camp Management Plan:** The operation of the workers' accommodation facility will be governed by the Workers' Camp Management Plan in line with the IFC and EBRD Guidance Note on Workers' Accommodation: Processes and Standards, and will include aspects such as details of the services and facilities available, hygiene standards, and healthcare provision for Project workers. The audit requirements of the accommodation facilities will also be outlined. In the case that the Project or workers may require short-term accommodations, the parameters for local accommodations will be outlined in the Workforce Accommodation Plan.
- **Community Health and Safety Management Plan (CHSMP):** Sets out the agreed controls and mitigation measures to protect the health and safety of villages in the Aol, such as the establishment of a community health baseline prior to the commencement of the Project, recruitment of local nurse/s or doctor/s to support the local health care needs. Doctors and/or nurses will be hired to be stationed for the Project. The healthcare workers will be recruited from outside the Aol to avoid impacting existing providers

The CHSMP will outline requirements and measures to ensure community health, safety and security in compliance with IFC PS4.
- **Awareness raising trainings on GBV** at the community level should be adopted by the Project. Effective social mobilization and monitoring to be adopted by the Project to mitigate child labour and any form issues of abuse at the community level during the construction of the project.

- **Occupational Health and Safety Management Plan:** Sets forth the agreed controls and mitigation measures to protect the health and safety of workers, including induction and training requirements (refer to **Section 9.5.4.4**).
- **Emergency Preparedness and Response Plan:** Outlines the measures to respond to unplanned events or emergencies that may result in injury or death.
- **SEP:** The methodology and timing of stakeholder communication, including a community environmental and safety awareness program will be included in the SEP (refer to **Section 9.5.5.4**), to support the aforementioned management plans. Grievance mechanism to be developed as part of the SEP for affected communities and workers (separately). The grievance mechanism will also be available (separate for workers vs. villagers) for workers / villagers to report actual or suspected instances of GPB / exploitation.

9.5.7.5 Residual Impact Significance

Through the additional mitigation measures proposed, the residual impact magnitude is reduced to **small**, with a corresponding reduction in the residual magnitude significance to **minor** (**Table 9-63**).

Table 9-63: Worker Influx Impact Assessment

Significance of Impact					
Potential Impact	Impacts associated with construction workers.				
Project Phase	Pre-Construction	Construction	Operation		
Impact Nature	Negative	Positive	Neutral		
	The potential impacts are negative.				
Impact Type	Direct	Indirect	Induced		
	The impact will be indirect, as a result of an increased, migrant population.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The impacts are likely to be experienced during the construction phase only, with the majority of workers in the operation phase being locally based.				
Impact Extent	Local	Regional	International		
	The impact is limited to the villages in the Aol.				
Impact Scale	The impact is limited to the villages in the Aol.				
Frequency	The impact is not expected to occur frequently, and is limited to the construction phase.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	The impact is limited to the villages in the Aol.				
Receptor Sensitivity	Low	Medium	High		
	The villagers have a medium sensitivity, with some ability to adapt to impacts.				
Impact Significance	Negligible	Minor	Moderate	Major	
	The impact significance is minor.				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	The impact significance is reduced following the implementation of additional mitigation measures.				

9.5.8 Impacts of Wind Farm Operation on Local Amenity

Amenity is the term to describe a location's pleasing attributes or character. Amenity may comprise aspects such as landscape character, air quality, and/or the amount of noise the area is exposed to. This section presents various aspects of the Project that may result in disturbance to the local amenity during its 25 year operational period.

9.5.8.1 Potential Impacts

Noise (Operation)

Although the wind turbines selected for the Project have been designed to operate as quietly as possible, low frequency noises may still be audible to affected villagers. Ambient noise monitoring was undertaken (refer to the noise baseline in **Chapter 7**), which found that operational noise levels generally complied with the WBG criteria; exceedances during night time (22:00-7:00).

A noise impact assessment was conducted in accordance with the guidelines and standards mentioned in **Section 9.3.5**, and found that predicted noise levels from operation of the wind farm comply with the daytime and night time noise criteria at all receptors; no exceedances are shown by the assessment. As such, minor impacts from operational noise will be experienced by receptors, with no additional noise mitigation measures proposed. However, noise monitoring is suggested in order to identify potential exceedances and allow additional mitigation measures to be implemented.

Landscape and Visual

The existing landscape and visual amenity is described as a rural, mountainous area, with villages in the AoI surrounded by forest and agricultural land (refer to the baseline landscape values and visual amenity in **Chapter 7**). Due to the height and placement of wind turbines, visual impacts are likely to occur, as the wind turbines are likely to disrupt the rural landscape.

A landscape and visual assessment was conducted to determine the visual influence of the wind turbines on the landscape. Although the impact assessment found that there is a high likelihood of the wind turbines being visible, it is noted that the assessment was based on the topography of the landscape and did not consider potential shielding due to vegetation. This is evidenced in the photomontages provided in the visual impact assessment (refer to **Section 9.3.7**).

Although different ethnic groups have slightly different beliefs, cultures, traditions; they did not express different use or views on the landscape. Through the KIIs with village heads and FGDs with ethnic groups, concerns regarding landscape and visual change impacts on their belief, rituals, etc., were not identified. Their main concerns were mostly related to land acquisition impacts, noise, and safety from the wind turbines.

A Restoration Management Plan will be prepared that will include replanting indigenous species, and landscaping and rehabilitation of construction yards to minimise impacts to the landscape, upon completion of construction.

Shadow Flicker

A shadow flicker assessment was undertaken to determine the potential extent of shadow flicker impacts resulting from the operation of the wind turbines. Shadow flicker may cause annoyance to villagers and livestock. The findings of the shadow flicker modelling (refer to **Section 9.3.8**) identified potential impacts to 12 clusters of potentially affected villagers, which may experience varying levels of impact, depending on the individual. Shadow flicker impact is assessed as medium for Dak Tiem (Cluster A), Dak Yen (Cluster E), Dak Chueng (Cluster J) and Dak Nong (Cluster K) and minor for the remaining clusters.

9.5.8.2 Existing Controls

The Project layout has been optimised so as to minimise impacts to affected villagers, as well as biodiversity.

9.5.8.3 Significance of Impacts

The potential impacts of wind farm operation on local amenity are assessed in accordance with the criteria set out in **Table 9-64** and **Table 9-65**.

Table 9-64: Social Impact Magnitude Criteria

Magnitude	Definition
Large	Change dominates over baseline conditions. Affects the majority of the area or population in the Aol and/or persists over many years. The impact may be experienced over a regional or national area.
Medium	Early evident difference from baseline conditions. Tendency is that impact affects a substantial area or number of people and/or is of medium duration. Frequency may be occasional and impact may potentially be regional in scale.
Small	Perceptible difference from baseline conditions. Tendency is that impact is local, rare and affects a small proportion of receptors and is of a short duration.
Negligible	Change remains within the range commonly experienced within the household or community
Positive	In the case of positive impacts, it is generally recommended that no magnitude be assigned, unless there is ample data to support a more robust characterisation. It is usually sufficient to indicate that there will be a positive impact, without characterising the exact degree of positive change likely to occur.

Table 9-65: Social Impact Sensitivity Criteria

Sensitivity	Definition
Low	Villagers have low vulnerability/sensitivity; consequently has a high ability to adapt to changes brought by the project
Medium	Some, but few areas of vulnerability/sensitivity; retaining an ability to at least adapt in part to change brought by the project
High	Profound or multiple levels of vulnerability/vulnerability/sensitivity that undermine the ability to adapt to changes brought by the project

Receptor Sensitivity and Impact Magnitude

The affected villagers are considered to have **high** sensitivity, as they have a limited ability to adapt to the impacts and/or influence the locations of wind turbines causing impacts to their amenity.

The impact magnitude is considered to be **small-medium**. There will be a perceptible difference from baseline conditions as a result of the combination of factors affecting amenity, for the duration of the operation of the wind farm. However, it is noted that the impact to amenity will not be felt by all villagers in the Aol; rather, a select group/area, aligning with particular aspects of amenity as discussed above, which is reflected in the varied magnitude

Impact Significance

Based on the above, the impact significance is assessed as **moderate-major**.

9.5.8.4 Additional Mitigation, Management, and Monitoring Measures

Environmental impact management plans will be prepared for the Project that will contain mitigation measures for noise, landscape and visual, and shadow flicker impacts. These include the CEMP and

noise and vibration management plan. Of note, environmental impact mitigation measures that may contribute to the mitigation of impacts of wind farm operation on local amenity include:

- Regular noise monitoring will be undertaken. Where the noise criteria is exceeded, additional mitigation measures should be implemented.
- Locate laydown areas, construction camps and access roads in existing disturbed or areas cleared of vegetation.
- Prepare a restoration management plan that includes the replanting of indigenous species, and landscaping and rehabilitation of construction yards.
- Minimise night lighting to the extent possible while maintaining safety.
- Investigate means for natural, and architectural/structural screening, at locations where affected villagers may experience over 30 hours per year and 30 minutes per day of shadow flicker impact.

It is important to communicate the impacts and proposed mitigations, which will be guided by the SEP:

- **SEP:** As previously outlined, the SEP will describe how Project stakeholders will be engaged, throughout the Project lifecycle. Specifically relating to the impacts of wind farm operation on local amenity, stakeholder engagement will be undertaken to inform affected villagers of the potential noise, landscape and visual, and shadow flicker impacts and their mitigation measures. Any households directly impacted by shadow flickers will be consulted on its potential impacts and mitigation measures. The SEP will also contain a grievance redress mechanism to allow affected villagers' feedback to be communicated to the Project and resolved.

A CEGDP is also prepared so that villagers receive the maximum benefits from the Project.

9.5.8.5 Residual Impact Significance

Through the additional mitigation measures proposed, the residual impact magnitude is reduced to **negligible-small**, with a corresponding reduction in the residual magnitude significance to **negligible-moderate** (Table 9-66).

Table 9-66: Local Amenity Impact Assessment

Significance of Impact					
Potential Impact	Impacts of Wind Farm Operation on Local Amenity				
Project Phase	Pre-Construction	Construction	Operation		
Impact Nature	Negative	Positive	Neutral		
	The operation of the wind farm will result in negative impacts.				
Impact Type	Direct	Indirect	Induced		
	Direct impacts will be produced.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The impacts will be experienced for the duration of the Project.				
Impact Extent	Local	Regional	International		
	The impacts are limited to the villages in the AoI.				
Impact Scale	The impacts are limited to the villages in the AoI.				
Frequency	The impacts will occur continuously, throughout the duration of the operation of the wind farm.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	There is a perceptible difference from baseline conditions, affecting some villagers.				

Significance of Impact

Receptor Sensitivity	Low		Medium		High			
	Villagers in the AoI have a limited ability to adapt to the impacts and/or influence the locations of wind turbines causing impacts to their amenity.							
Impact Significance	Negligible		Minor		Moderate		Major	
	The impact significance is major.							
Residual Impact Magnitude	Positive		Negligible		Small		Medium	
Residual Magnitude Significance	Negligible		Minor		Moderate		Major	

9.5.9 Impact on Ethnic Groups (Erosion of Ethnic Culture)

As discussed in **Section 8.5.3.1** Laos is an ethnically diverse society which favours the use of the term “ethnic groups” over the use of the term “Indigenous” (IFAD, 2012). While the Government of Lao PDR officially recognises ethno-linguistic categorisation of ethnic groups, the previously used geographic categorisation continues to be used by the people throughout Laos (IFAD, 2012; Schlemmer, 2017).

As a whole, the population of the villages in the AoI is dominated by the Triang ethnic group (89%), with other ethnic groups residing in the villages being Yea (4%), Katu (4%), and other ethnic groups (2%) (mainly Ha Luk). The Triang, Yae, Katu and Ha Luk ethnic groups all belong to the Mon-Khmer linguistic group or the Lao Theung geographic group. About 1% of villagers belong to the Lao ethnic group, which is part of the Lao-Tai linguistic group or the Lao Loum geographic group. The Lao Loum geographic group contains the greatest number of tribes; approximately 70% of the Laos population identifies as being part of the Lao Loum, and it is generally considered to be “better off” than other ethnic groups (IFAD, 2013). This may be the reason why only ethnic groups that are part of the Lao Theung and Lao Soung are considered as ‘ethnic groups’ within Laos (IFAD, 2012). On this basis, the assessment will focus on the Triang, Yae, Katu, and Ha Luk ethnic groups.

The ADB (2013) and IFC PS7 (2012) provides guidance for the identification of Indigenous Peoples, which is a term used in a generic sense to refer to a distinct, vulnerable, social and cultural group possessing the following four characteristics to varying degrees:

- (1) self-identification as members of a distinct indigenous cultural group and recognition of this identity by others;
- (2) collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories;
- (3) customary, cultural, economic, social, or political institutions that are separate from those of the dominant society and culture; and
- (4) a distinct language, often different from the official language of the country or region.”

The guidance highlights that groups need to be “both distinct and vulnerable” to trigger application of the term Indigenous Peoples. Distinctiveness may be defined with the four characteristics, above, while vulnerability is determined by assessing economic, social, political, demographic and environmental factors.

The ethnic groups located in the villages in the Project Area of Influence (AoI) were assessed against the distinct (four characteristics listed above) and vulnerable definitions to confirm whether these ethnic groups would be considered as Indigenous Peoples for the purpose of meeting ADB SPS SR3 and IFC PS7. This assessment is provided in **Table 9-67**.

Table 9-67: ADB and IFC Indigenous Peoples Characteristics

Characteristics of Indigenous Peoples	Ethnic Group			
	Triang (Taliang)	Yae (Yaeh / Yae')	Katu	Ha Luk
1. Distinct				
(i) Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others	<p>Triang is classified as one of Mon-Khmer Group in Lao PDR.⁴⁰</p> <p>The 2005 census identified Triang as one of the ethnic groups in Lao PDR.⁴¹</p> <p>ADB Indigenous People Plan for Education for Employment Sector Development Program (2019) recognized Triang as one of the ethnic groups.⁴²</p> <p>Ethnic Group Development Plan (EGDP) of Ministry of Health (2011) (prepared for World Bank) recognized Triang as one of ethnic groups.⁴³</p> <p>Ethnic Group Policy Framework (EGPF)</p>	<p>Yae is classified as one of Mon-Khmer Group in Lao PDR.</p> <p>The 2005 census identified Yae as one of the ethnic groups in Lao PDR.</p> <p>ADB Indigenous People Plan for Education for Employment Sector Development Program (2019) recognized Yae as one of the ethnic groups</p> <p>Ethnic Group Development Plan (EGDP) of Ministry of Health (2011) (prepared for World Bank) recognized Yae as one of ethnic groups.</p> <p>Ethnic Group Policy Framework (EGPF) (prepared for Poverty reduction Fund II (PRF II)) in</p>	<p>Katu is classified as one of Mon-Khmer Group in Lao PDR.</p> <p>The 2005 census identified Katu as one of the ethnic groups in Lao PDR</p> <p>ADB Indigenous People Plan for Education for Employment Sector Development Program (2019) recognized Katu as one of the ethnic groups</p> <p>Ethnic Group Development Plan (EGDP) of Ministry of Health (2011) (prepared for World Bank recognized Katu as one of ethnic groups</p> <p>Ethnic Group Policy Framework (EGPF) (prepared for Poverty reduction Fund II (PRF II)) in 2016 recognized Katu as one of ethnic groups.</p>	<p>Ha Luk is classified as one of Mon-Khmer Group in Lao PDR.</p> <p>The 2005 census identified Ha Luk as one of the ethnic groups in Lao PDR</p> <p>ADB Indigenous People Plan for Education for Employment Sector Development Program (2019) recognized Ha Huk as one of the ethnic groups</p> <p>Ethnic Group Development Plan (EGDP) of Ministry of Health (2011) (prepared for World Bank recognized HA Huk as one of ethnic groups</p> <p>Ethnic Group Policy Framework (EGPF) (prepared for Poverty reduction Fund II (PRF II)) in 2016 recognized Ha Hulas one of ethnic groups.</p>

⁴⁰ NSC/CPI, ADB, SIDA and the World Bank, 2006.

⁴¹ Lao Statistics Bureau (2006). Population Census Lao PDR 2005

⁴² [50399-003: Education for Employment Sector Development Program \(adb.org\)](https://www.adb.org/projects/50399-003/education-for-employment-sector-development-program)

⁴³ Health Services Improvement Project Additional Financing (P124906). Retrieve from: <https://projects.worldbank.org/en/projects-operations/project-detail/P124906>

Characteristics of Indigenous Peoples	Ethnic Group			
	Triang (Taliang)	Yae (Yaeh / Yae')	Katu	Ha Luk
	<p>(prepared for Poverty reduction Fund II (PRF II)) in 2016 recognized Triang as one of ethnic groups.⁴⁴</p> <p>Yes, as confirmed during the social baseline research through secondary and primary sources</p>	<p>2016 recognized Yae as one of ethnic groups.</p> <p>Yes, as confirmed during the social baseline research through secondary and primary sources</p>	<p>Yes, as confirmed during the social baseline research through secondary and primary sources</p>	<p>Yes, as confirmed during the social baseline research through secondary and primary sources</p>
<p>(ii) Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories</p>	<p>It is common for Triang peoples to be located in the highlands (IFAD, 2012). They usually settle in geographies that are favourable for agricultural production (e.g. coffee, cassava, and rice), such as areas with hills with rivers flowing through, and flat areas along the river.</p> <p>Triang peoples have been found to have settled in Dak Cheung, Tha Taeng, and La Marm Districts of the Sekong Province, Sanxay and Samakkee Xai District of Attapeu Province, and Pak Xong District of Champasak Province (Department of Ethnic Affairs, 2015a). Villagers have indicated that their ancestors have been in this area for a long time,</p>	<p>It is common for Yae peoples to be located in the highlands (IFAD, 2012). They usually settle in geographies that are favourable for agricultural production (e.g. coffee, cassava, and rice), such as areas with hills with rivers flowing through, and flat areas along the river.</p> <p>Yae peoples have been found to have settled in the Dak Cheung District of Sekong Province, and Sanxay District of Attapeu Province (Department of Ethnic Affairs, 2015c).</p>	<ul style="list-style-type: none"> ■ It is common for Katu peoples to be located in the highlands (IFAD, 2012) ■ They usually settle in geographies that are favourable for agricultural production (e.g. coffee, cassava, and rice), such as areas with hills with rivers flowing through, and flat areas along the river. ■ Katu peoples have been found to have settled in Kalim, Dak Cheung, and Tang Districts of Sekong Province, Lao-gnarm and Salavan Districts of Salavan Province, and Pakxong and Bachiangchalernsouk Districts of Champasak Province (Department of Ethnic Affairs, 2015b). 	<ul style="list-style-type: none"> ■ It is common for Ha Luk peoples to be located in the highlands (IFAD, 2012) ■ They usually settle in geographies that are favourable for agricultural production (e.g. coffee, cassava, and rice), such as areas with hills with rivers flowing through, and flat areas along the river. ■ Ha Luk peoples have been found to have settled in Lao-gnarm district of Salavan Province, Lamarm and Ta Taeng Districts of Sekong Province, Pakxong District of Champasak Province, and ■ Sanxay and Samakkee Xai District of Attapeu Province. (Department of Ethnic Affairs, 2015d).

⁴⁴ https://ewdata.rightsindevelopment.org/files/documents/01/WB-P153401_3xQD49j.pdf

Characteristics of Indigenous Peoples	Ethnic Group			
	Triang (Taliang)	Yae (Yaeh / Yae')	Katu	Ha Luk
	although the exact duration is unknown.			
(iii) Customary, cultural, economic, social, or political institutions that are separate from those of the dominant society and culture	<p>Yes, as confirmed during the social baseline research, such as:</p> <ul style="list-style-type: none"> ■ There is a regime based on the law, similar to other areas. ■ There are festivals with slightly different traditions and beliefs. ■ There are distinct traditional costumes for males and females. ■ Lao mainstream culture and lifestyle have been absorbed due to increased contacts with people from outside communities, increased access to information through radio, television, and mobile phone and internet. 	<p>Yes, as confirmed during the social baseline research, such as:</p> <ul style="list-style-type: none"> ■ There is a regime based on the law, similar to other areas. ■ There are festivals with slightly different traditions and beliefs. ■ There are distinct traditional costumes for males and females. ■ Lao mainstream culture and lifestyle have been absorbed due to increased contacts with people from outside communities, increased access to information through radio, television, and mobile phone and internet. 	<p>Yes, as confirmed during the social baseline research, such as:</p> <ul style="list-style-type: none"> ■ There is a regime based on the law, similar to other areas. ■ There are festivals with slightly different traditions and beliefs. ■ There are distinct traditional costumes for males and females. ■ Lao mainstream culture and lifestyle have been absorbed due to increased contacts with people from outside communities, increased access to information through radio, television, and mobile phone and internet. 	<p>Yes, as confirmed during the social baseline research, such as:</p> <ul style="list-style-type: none"> ■ There is a regime based on the law, similar to other areas. ■ There are festivals with slightly different traditions and beliefs. ■ There are distinct traditional costumes for males and females. ■ Lao mainstream culture and lifestyle have been absorbed due to increased contacts with people from outside communities, increased access to information through radio, television, and mobile phone and internet.
(iv) A distinct language, often different from the official language of the country or region	<p>Yes, Triang peoples have a specific spoken language, similar to the Ha Luk and Yae ethnic groups, and is categorised as a Mon-Khmer language. Most Triang peoples speak the Triang language but use Lao language for writing (Department of Ethnic Affairs, 2015a).</p>	<p>Yes, Yae peoples have a specific spoken language, similar to Triang, Ha Luk and Katu ethnic groups, and is categorised as a Mon-Khmer language. Most Yae peoples speak the Yae language but use Lao language for writing (Department of Ethnic Affairs, 2015c).</p>	<p>Yes, Katu or Kaluem is spoken (Luangthongkum, 2010). Katu is categorised as a Mon-Khmer language. Most Katu peoples speak the Katu language but use the Lao language for writing (Department of Ethnic Affairs, 2015b).</p>	<p>Yes, Ha Luk peoples have specific spoken language, similar to Triang, Yae and Katu ethnic groups, and is categorised as a Mon-Khmer language. Most Ha Luk peoples speak the Ha Luk language but use Lao language for writing. (Department of Ethnic Affairs, 2015d).</p>

Characteristics of Indigenous Peoples	Ethnic Group			
	Triang (Taliang)	Yae (Yaeh / Yae')	Katu	Ha Luk
	<p>An assessment on language in schools in Dak Cheung District found that although Lao language is taught at all schools, many of the ethnic group members are characterized by poor Lao language skills as their ethnic languages are still largely used in day-to-day life. Children who attended lower and upper secondary could answer questions in Lao language, but their parents' needed translation to ethnic languages.⁴⁵</p> <p>This language issue was confirmed during the Information Disclosure and Consultation activity in July-August 2022. Most of the villagers who participated in the activity can understand basic conversation and communicate in basic Laos; however, translation to Triang was needed for the consultation to be understood, particularly on more complicated topics discussed and for the elders and the women. It is understood that Triang is the most common language used amongst ethnic groups present in the Project Aol. Given similarity of their ethnic languages, other ethnic groups i.e., Yae, Katu and Ha Huk could also understand when translation was conducted in Triang. It is noted that during the Information Disclosure and Consultation activity, the Project ensured that a village coordinator or village head were present to facilitate translation to Triang language. The participants were also informed that they may ask questions or communicate in their ethnic languages to ensure that language barrier would not inhibit ethnic peoples from expressing their concerns, opinions, or suggestions for the Project. The Project has employed a number of Triang speakers as village coordinators to facilitate community consultation.</p>			

2. Vulnerable

In general, the most vulnerable ethnic groups have very few assets, are geographically isolated (mostly in the highlands), and face language and cultural barriers. An assessment of each ethnic group's vulnerability is below.

(i) Territorial, economic cultural, political and language barriers	<ul style="list-style-type: none"> ■ Their location, which is geographically isolated, makes it difficult for them to access political, economic, and social opportunities. The main ethnic groups belonging to the Lao-Tai are mostly found in urban areas or low land. They often have better access to public services and opportunities for socioeconomic development (including education) offered by the government and private investment.⁴⁶ . The site visit in July 2022 observed inadequate school and healthcare facilities in the villages visited. ■ Their economic status (nearly half of the surveyed population live below the national poverty line, which is much lower than the World Bank standard). The social baseline analysis found that the 40% of the population of the affected villages is vulnerable but the vulnerable population is not focussed on one particular ethnic group. According to the World Bank's annual poverty indicator (2015), there is a substantial difference in the poverty rate among the Lao-Tai groups, which stands at about 25%, while Mon-Khmer's poverty rate rises to 42%. The site visit in July 2022 found that their livelihood is highly dependent on
---	--

⁴⁵ [50399-003: Education for Employment Sector Development Program \(adb.org\)](#)

⁴⁶ [50399-003: Education for Employment Sector Development Program \(adb.org\)](#)

Characteristics of Indigenous Peoples	Ethnic Group			
	Triang (Taliang)	Yae (Yaeh / Yae')	Katu	Ha Luk
	<p>agriculture and NTFPs collection and the people expressed that they do not have the capacity/capability to undertake alternative livelihood to diversity their livelihoods.</p> <ul style="list-style-type: none"> ■ Adoption of the Lao political arrangement (i.e., village head or Naai Baan/ Pok Kong Tong Thin) and integration to the Lao government system as evidenced in participation of village head in compensation unit rate consultation by relevant governmental authorities. The village head or Naai Baan/ Pok Kong Tong Thin roles do not duplicate other informal or traditional political institutions, such as tribal leaders. . At provincial level, most of the officers are mainstream Laos, hence during the meeting on 18 July, Lao language was used. While the at district level, there are some officers who are ethnic groups (i.e. Triang, Yae, Katu) who can communicate in ethnic languages; however, these are small portion of the district officers where the majority of the officers are mainstream Laos. ■ The ethnic groups in the project, particularly elders and women, have poor Laos language skills. It is likely that the language barrier inhibits members of these ethnic groups from understanding the continuous rapid socioeconomic development that is taking place around them. They may have little exposure to and awareness of their rights and options, and therefore they may not understand government policy and the strategic development plan for their own district as a whole.⁴⁷ 			
(ii) Project impacts	<p>The Triang, Yae, Kata and Ha Luk peoples will experience the following potential impacts;</p> <ul style="list-style-type: none"> ■ Economic displacement and impacts to livelihoods from the loss of agricultural land and loss of NTFP Collection. ■ Potential risks (intrusion of workers) to Intangible Cultural Heritage with Phou Koungking. The upper elevation of the mountain was mentioned as a prohibited zone (being a sacred forest) during the FGD in July 2022. The lower elevation zone of the Koungking mountain, an area identified by villagers during the July 2022 FGD as a multi-use zone, will be impacted from land acquisition, land clearance, and construction activities of the Wind Turbine Generators (WTGs), transmission line and internal roads. Impacts may arise from noise and shadow flicker impacts from operation of WTGs. ■ Impact of construction related environment nuisance such as vibration, noise, and dust affecting cultural heritage sites close to construction sites. ■ Potential disruption to local ceremonies and activities from increased noise levels, vibration, and dust, including exclusion areas being set up to protect villagers from heavy vehicle/machinery use. 			

⁴⁷ [50399-003: Education for Employment Sector Development Program \(adb.org\)](#)

Characteristics of Indigenous Peoples	Ethnic Group			
	Triang (Taliang)	Yae (Yaeh / Yae')	Katu	Ha Luk
	<p>■ Potential of inward migrating workers to negatively influence existing customs and religious practices undertaken by the ethnic groups, the result of which could be an erosion or loss of ethnic culture. The loss of ethnic culture may occur if migrant workers and other outsiders are not respectful of or understand the various customs and religious practices, such as boundaries placed on areas that may only be accessed by women or men. This potential impact is concerned primarily with the construction phase, as this is when workers and other related people are likely to move to the villages in the AoI. Only a small workforce (40 people) will remain in the operation phase.</p>			
(iii) Pressure from policy on relocation of upland villages to be consolidated to the lowlands	<p>The GoL officially formulated the Village Relocation and Consolidation Strategy in 1989. The strategy sought to improve villagers' access to public infrastructure and services by merging villages with less than 50 households into larger villages (with a minimum of 200 people in upland areas and 500 people in lowland areas), while also relocating remote upland villages to lowland area. The key objective of upland resettlement is to bring villages closer to public infrastructure and services (e.g., roads, markets, schools, hospitals), while also transitioning their livelihoods away from upland, shifting cultivation toward lowland, paddy cultivation.⁴⁸ Based on the inquiry with Dak Cheung District Natural Resource and Environment Officer on 5 August 2022, the government does not have policy to relocate upland villages to lowland. The government only applies village consolidation policy with remote villages where there is no or limited access to the village. All 32 villages in the Project AoI have access roads which can be accessed during both dry and rainy seasons; therefore, the government does not apply village consolidation policy to these villages and does not have any plan to relocate any villages to lowland. It can therefore be concluded that the villages are not and will not likely be threatened by upland village consolidation strategy.</p>			
(iv) Pressure on land and resources from multiple concessions in the Project development area	<p>Pressure on land from Project land acquisition</p> <p>Approximately 30.6 ha of agricultural land will be impacted and 160.6 ha of will be temporarily impacted. The acquisition of land currently used for agricultural purposes will lead to economic displacement, since the land will be (permanently or temporarily) removed from its agricultural use, and unable to generate income for landowners and users. In this sense, the loss of agricultural land will cause economic displacement and impact on livelihoods. Whilst some households will be temporarily impacted, it is highlighted that during this period, the impact on livelihoods will experience a similar impact to those households experiencing permanent acquisition.</p> <p>While the Project development area covers 70,000 ha, it is highlighted that the proposed permanent and temporary clearing of forest has been kept to a minimum and comprises less than 1% of the total Project area. The access roads will provide greater access to other areas of the forest that the affected villagers may currently be unable to access or have difficulty accessing. In</p>			

⁴⁸ : Jonas Kramp, Diana Suhardiman & Oulavanh Keovilnavong (2022). *(Un)making the upland: resettlement, rubber, and land use planning in Namai village, Laos*. The Journal of Peasant Studies, 49:1, 78-100. Retrieved from: <https://www.tandfonline.com/doi/pdf/10.1080/03066150.2020.1762179?needAccess=true>

Characteristics of Indigenous Peoples	Ethnic Group			
	Triang (Taliang)	Yae (Yaeh / Yae')	Katu	Ha Luk
	<p>opening up new area for NTFP collection, this will be undertaken in consultation with DAFO, and agreement will need to be reached with DAFO and villages. As such the Project will not remove the ability for NTFP collection</p> <p>Primarily, these land-based livelihoods are for the purpose of subsistence. Given the rural locality, it is difficult to participate in other sources of livelihood (e.g., not many wage-based or enterprise-based livelihood opportunities in or close to the villages in the Aol). This is particularly the case for vulnerable households (in particular poor households) that may already experience difficulties maintaining a secure form of livelihood. However, the Project will provide opportunities to participate in livelihood restoration mechanisms that will seek to restore the affected villagers' livelihoods to a minimum of existing levels, if not better.</p> <p>Cumulative impact on land and NTFP resources</p> <p>Other known developments (existing and planned) in and around the Project area have been identified as follows:</p> <ul style="list-style-type: none"> ■ Several hydropower projects, with associated linear transmission lines, are identified in both Dak Cheung and Sanxay districts. ■ A number of road upgrade / improvement projects are identified in both Dak Cheung and Sanxay districts. ■ A potential bauxite mining project has been identified in Sanxay District, within Sekong and Attapeu provinces. A large area of the project area and surrounding areas up to the border with Vietnam may potentially be subject to surface mining. It is noted that there are currently no actual activity occurring on the ground. The GoL is now collecting data at the site to solve overlapping area with the Project development area issue. <p>The physical footprint of the wind farm is relatively small, particularly when compared to projects such as dams for hydropower or mining, and therefore in isolation will be unlikely to significantly reduce ecosystem services. The main pathway for effects related to the wind farm would be if improved access to more intact parts of the project area leading to unsustainable harvesting of forest resources. It was observed during the Information Disclosure and Consultation in July-August 2022 that neighbouring villages have agreements on designated NTFP collection areas for each village. Typically, NTFP collection areas are accessed on foot (as most of villagers' own vehicles), they would note that some areas are too far. Improved access may potentially facilitate people from outside with vehicles to collect NTFPs in the area, leaving villagers whose livelihood is dependent on NTFPs collection vulnerable or more vulnerable. However, such issues can be mitigated by, for instance, locked gate for roads leading to turbine infrastructure with access given to only local villagers (as part of local employment and security arrangement). Future mining-related impacts on land and NTFP resources may be greater in comparison to the small scale/magnitude of impacts associated with the Project, linear road upgrades and transmission lines in the region, and may also affect the quantity and quality of water.</p>			
(vii) Risks of becoming vulnerable or more vulnerable	<p>Their livelihood is highly dependent on agriculture and NTFPs collection and villagers expressed during the Information Disclosure and Consultation activity in July-August 2022 that they do not have the capacity/capability to undertake alternative livelihood to diversity their livelihoods. If livelihood restoration programs and CEGDP implemented properly and effectively, the risk of directly affected villages (affected by Project land acquisition) becoming vulnerable or more vulnerable due to the Project will be mitigated. In addition to livelihood vulnerability, increased exposure to outside communities may increase integration to Laos mainstream society; however, this integration is already underway with the increasing penetration of information and communication</p>			

Characteristics of Indigenous Peoples	Ethnic Group			
	Triang (Taliang)	Yae (Yaeh / Yae')	Katu	Ha Luk
	technology, such as mobile telephones and mobile internet. Inward migrating workers may negatively influence existing customs and religious practices undertaken by the ethnic groups. This may contribute to an erosion or loss of ethnic culture and traditions.			

Although villagers retain their ethnic identity, such as speaking in the language of their ethnic group, it was observed that villagers of all ethnic groups are well integrated into mainstream Laos society. This was evidenced by clothing and housing styles, and it is noted that apart from some of the elderly population, most villagers can understand Lao, and are able to use written Lao. Additionally, through Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs) with villagers, it is understood that villagers live harmoniously. For instance, villagers celebrate ceremonies together, and no current or historical conflicts were identified. Despite the level of integration, villagers in the Aol retain their ethnic identity, which meets the ADB's definition of distinctiveness.

With respect to vulnerability, the social baseline analysis found that the 40% of the population of the affected villages is vulnerable but the vulnerable population is not focussed on one particular ethnic group. However, there are anti-discrimination laws in Laos that prohibit discrimination against ethnic groups. Villagers indicated that they do not experience discrimination based on ethnicity, and therefore are not more vulnerable within the region for this reason.

With respect to vulnerability, based on the discussed in **Table 8-30**, the villagers in the Project Aol are more economically disadvantaged when compared to the mainstream Tai-Lao groups—nearly half of the surveyed population live below the national poverty line, which is much lower than the World Bank standard. Their location being geographically isolated, makes it difficult for them to access public infrastructures and services, political, economic, and social opportunities. Their poor Laos language skills, particularly elders and women. It is likely that the language barrier inhibits members of these ethnic groups from understanding the continuous rapid socioeconomic development that is taking place around them. Their land and NTFP resources are under pressure posed by cumulative impacts of development projects within the Project development area—particularly mining projects which have significantly larger impacts on land and natural resources when compared to the Project and other linear developments e.g., transmission line and road improvement projects. Given that their livelihood is highly dependent on land-based livelihoods i.e. agriculture and NTFPs collection, together with the fact that the villagers expressed during the Information Disclosure and Consultation activity in July-August 2022 that they do not have the capacity/capability to undertake alternative livelihood to diversity their livelihoods—this makes them particularly susceptible to impacts on land and natural resources brought about by multiple development projects in the area. Additionally, increased exposure to outside communities and inward migrating may contribute to an erosion or loss of ethnic culture and traditions. However, there are anti-discrimination laws in Laos that prohibit discrimination against ethnic groups. Villagers indicated that they do not experience discrimination based on ethnicity, and therefore are not more vulnerable within the region for this reason.

Based on the above discussions, it is concluded that the ethnic groups in *discussion* meet ADB and IFC definition of distinct and vulnerable to a varying *degree*. Since the ethnic groups that meet ADB SR3 and IFC PS7's definition of IP may be vulnerable to losing or being exploited of their land and access to natural and cultural resources, the FPIC may be needed if any of the circumstances require FPIC is applied. FPIC is applied to project implementation, design, and expected results related to the impacts that would affect Indigenous Peoples communities. The Project was assessed against the criteria for IFC PS7 FPIC requirements in **Section 0.Potential Impacts**

Social Impacts Assessed Previously

Despite recognition that the Triang, Yae, Katu, and Ha Luk ethnic groups are Indigenous Peoples, it is considered that the impact assessments undertaken in **Sections 9.5.2 – 9.5.6** have adequately captured the specific concerns relating to Indigenous Peoples, since the overwhelming majority of the population of affected villagers comprises people from ethnic groups.

- The ethnic people are still highly dependent on natural resources such as forests and rivers. They collect food e.g. bamboo, mushrooms, and wood for cooking (firewood) and construction of houses from the forests (**Section 8.5.3.2**). The Project impact to NTFP collection area is assessed under NTFP Collection in **Section 9.5.3**. There will be temporary and permanent loss to NTFP collection area; it is, however, noted that the loss of forest will require a biodiversity offset

(discussed in **Section 9.4.3**) and access to forests is still available and there will be improved access to forest resources associated with construction of access road (discussed in **Section 9.5.2.1**).

- The ethnic people predominantly seek health treatment from healthcare centers, such practices of medical herbal and spiritual healing are therefore not identified as community's practice and therefore will not be impacted by loss of NTFP collection area due to the Project land requirement.
- As discussed in **Table 9-68** the affected ethnic communities do not have different political/social institution from the mainstream society—the communities are governed by village heads and District government. Decision making process in the villages are based on consultations of village heads, belief leaders and heads of Village Women's Union (which is a common practice across Lao PDR, not only within ethnic groups communities). The political/social institution of the communities have been influenced by the GOL policy on Koumban since 2004. The objective of the policy 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.⁴⁹
- Accordingly, no additional assessment is required for these impacts, relating to ethnic groups that meet ADB SPS SR3 and IFC PS7 definition of IP.

Erosion of Ethnic Culture

There is a potential, however, for the workers coming into the area to negatively influence existing customs and religious practices undertaken by the ethnic groups; the result of which could be an erosion or loss of ethnic culture. The loss of ethnic culture may occur if migrant workers and other outsiders are not respectful of or understand the various customs and religious practices, such as boundaries placed on areas that may only be accessed by women or men. A common mitigation against the loss of ethnic culture, is promoting cultural awareness amongst workers as part of the induction process, encouraging workers to participate in cultural practices, and providing workers who are villagers from the AoI with time off for religious or cultural festivities.

This potential impact is concerned primarily with the construction phase, as this is when workers and other related people are likely to move to the villages in the AoI (refer to impacts associated with influx in **Section 9.5.6**). Only a small workforce (40 people) will remain in the operation phase.

ADB Requirements for Consent through Broad Community Support

Broad Community Support (BCS) is covered under ADB SPS Safeguard Requirement 3.4, and is triggered when the following three criteria are met:

- (i) If there is commercial development of the cultural resources and knowledge of Indigenous Peoples.
- (ii) Physical displacement from traditional or customary lands; and
- (iii) Commercial development of natural resources within customary lands under use that would impact the livelihoods of the cultural, ceremonial, or spiritual uses that define the identity and community of Indigenous Peoples. (p. 18, Safeguards Policy Statement [SPS]).

⁴⁹ 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>

The Project does not involve the commercial development of the cultural resources and knowledge of Indigenous Peoples, and nor does it require any physical displacement. The third criteria concerning the commercial development of natural resources includes three further sub-criteria: commercial development of natural resources within customary lands under use that would affect the livelihoods or the cultural, ceremonial, or spiritual uses that define the identity and community of IP. Although the Project activities meet the first two sub-criteria, the third is not met as revealed during community consultation conducted in Ban Prao including villagers from Dak Kung (19 July 2022) and in Dak Lern (20 July 2022). The villagers explicitly expressed that the Project activities would not affect their identity and community as they defined these (and as is required under SR3). Based upon this it can be concluded that BCS is not triggered for this Project.

For policy application, BCS of affected IP communities refers to a collective expression by the affected IP communities, through individuals or recognized representatives, of BCS for such project activities. BCS may exist even if some individuals or groups object to them. For project activities requiring BCS, evidence of the support including documentation of processes and outcomes will be required.⁵⁰

The Project was assessed by the Lenders' Environmental and Social Advisor (LESA)⁵¹, against the criteria for ADB BCS requirements in **Table 9-68**. The assessment determined that BCS is not applicable to the Project.

Table 9-68: BCS Applicability

ADB BCS Criteria	Observations/Findings	Applicability
ADB SPS SR3 Criteria: Commercial development of the cultural resources and knowledge of IP.	There are no Project activities that entail commercial development of cultural resources and knowledge of ethnic groups in the Project area	Not Applicable
ADB SPS SR3 Criteria: Physical displacement from IP traditional or customary lands	There is no physical displacement as a result of Project's land acquisition. The Project will only result in economic displacement whereby the Project has proposed mitigation measures in as outlined in the Resettlement Plan (RP) and this CEGDP	Not Applicable
ADB SPS SR3 Criteria (iii) Commercial development of natural resources within customary lands under use that would affect the livelihoods or the cultural, ceremonial, or spiritual uses that define the	<p>■ Impacts to NTFP Collection in Forests. The Project acquisition/use will impact customary land use of IPs for livelihood support e.g., non-timber forest products and upland rotational cultivation. However, the Project ESIA Section 9.5.2 and Section 9.5.3 demonstrated that small, fragmented areas of clearing be undertaken, instead of larger areas, and new access to NTFP collection and agricultural areas provided by the Project, the overall</p>	The Project will not have impact on cultural, ceremonial, or spiritual uses by avoiding cemeteries in its activities through design modification and locational changes. The Project activities in Phou Koungking will be in lower elevation area which is a multiple-use zone and will not breach any belief associated with the mountain. Nonetheless, the Project has undertaken to respect and apply any ceremonies considered

⁵⁰ ADB (2013) A Planning and Implementation Good Practice Sourcebook. Retrieved from: <https://www.adb.org/sites/default/files/institutional-document/33748/files/ip-good-practices-sourcebook-draft.pdf>

⁵¹ The role of Artelia, as Lenders' E&S advisor (LESA), is to review the activities and justification put forward by the Project and provide an opinion. Hence, verifications and reviews conducted by the LESA as part of its assignment are objective opinions and it is up to the Project to consider if these views are to be integrated in their arguments. However, similarly for all type of references, the LESA does not bear responsibility in case of issues arising from the use of its arguments by the Sponsors/ERM

ADB BCS Criteria	Observations/Findings	Applicability
identity and community of IP	<p>impact to the supply of NTFPs will be negligibly affected. Consultation and agreement with provincial government to identify and provide access to forest areas for NTFP collection. Additionally, livelihood restoration measures will be outlined in the RP and in this CEGDP.</p> <p>■ Impacts to Agricultural Lands.</p> <p>Project acquisition/use will impact customary land use by IPs for upland rotational cultivation.</p> <p>The impacts to agricultural lands used for rotational cultivation will be significant since affected ethnic groups are not recognized by Lao laws as owners of the land. Land cultivated by ethnic groups and left fallow for more than 3 years are not compensated.</p> <p>The Project has prepared RP and livelihood restoration programs to minimize livelihood impacts due to loss of agricultural land.</p> <p>■ Impacts to customary lands with spiritual, ceremonial, or cultural uses and to critical cultural heritage.</p> <ul style="list-style-type: none"> - The Project has optimized the Project layout to avoid all Project impacts on cemeteries. - Based on consultation with Dak Kung, Dak Lern and Prao village representatives in July 2022, Phou Kounking 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. - Eight (8) WTGs will be developed in the lower elevation of Phou Kounking. Consultation with Dak Lern and Proa clarified that the Project activities in the lower elevation of Phou Kounking Mountain are not “Kalam” or prohibited. (In Lao language Kalam means prohibited, taboo or wrong according to the local customs.) However, prior to entering the forest and commencing construction activities, 	<p>necessary by local communities. The Project will have impact on the livelihood on the households affected by land acquisition. But the degree of impact will not affect the identity or community of the ethnic groups in the area as assessed by members of these groups themselves. The effect on the ethnic group’s defined identity and community resulting from livelihood impact is a crucial requirement for the third criterion to be triggered for BCS. The participants in the community meeting in B. Prao, Dak Kung and Sieng A on 19 July 2022 as well as those in the FGD in Dak Lern on 20 July 2022 made the assessment that Project activities will not have that effect. This means that even if the affected lands are considered customary land albeit outside the national law, the impact on it will not trigger the BCS requirement because the identity and community of the ethnic groups will remain unaffected. Thus, none of the three SR3 criteria will trigger the BCS requirement for the Project.</p>

ADB BCS Criteria	Observations/Findings	Applicability
	<p>the Project must consult with Dak Lern and Prao villages and comply with villages' "Heet-Kong" or rituals. 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.</p> <ul style="list-style-type: none"> - In addition, the Project will limit land clearance to minimize impact to the forest area. - Protocols and measures to be implemented by the EPC and O&M Contractor who will be entering Phou Kounking Mountain will be discussed with affected villages and their agreements will be obtained. 	

For customary land, the ADB Indigenous Peoples Safeguards Planning, and Implementation Sourcebook (2013) refers to it as patterns of long-standing **community land** and resource use in accordance with indigenous peoples' customary laws, values, customs, and traditions, rather than formal legal title to land and resources issued by the state (Paragraph 275). The 2019 Lao Land Law has six land categories and **community or communal land** is not one of these (Article 21).⁵² But it grants land use rights to organizations and collectives of Lao citizen and recognizes customary land use right under certain conditions (Article 3 and 130).⁵³ In the Project area, there are affected areas not covered by any individual land use right certificate (LUC) or tax payment certificate which are used by the community for timber and non-timber product collection. These areas are most likely categorized by the Land Law as forest land and designated in the Forestry Law as production forest (Article 17). Production forest is allocated for supply of timber and non-timber products.

The government under the Forestry Law may further designate the production forest as part of the village forest area which means that it is under village management (Article 3).⁵⁴ But the designation is to the village as a government administrative unit and not to an ethnic group. The Land Law also prescribes the use of state land for collective purposes by granting State Land Use Rights to the villagers in one or more villages to collectively use the lands in accordance with the local land allocation plans and the laws (Article 81). But this provision also clearly indicates that the right remains in the State and as such, the villagers have no right to transfer, sell, exchange, lease the land use rights, nor grant concession, use the rights as shares or as collateral.

Pertaining to Project impact (specific impacts per village during construction and operations phase are presented in **Table 9-69**), the Project will not have impact on cultural, ceremonial, or spiritual uses by avoiding cemeteries in its activities through design modification and locational changes. The Project activities in Phou Kounking will be in lower elevation area which is a multiple-use zone and will not

⁵² The categories are as follows: (i) agricultural land; (ii) forest land; (iii) water area land; (iv) industrial land; (v) communication land; (vi) cultural land; (v) land for national defence and security; and (vi) construction land.

⁵³ The conditions are the following: (i) clearance, development, protection, and regular use more than 20 years before 2019; (ii) certification of village administration of continuous use; (iii) certification of adjacent landowners of continuous use; and (iv) free from past and present disputes.

⁵⁴ The village forest area can include all forest categories designated according to forest land use and allocation plans at the village level, including Village Use, Conservation and Protection Forests (Forestry Law Article 3).

breach any belief associated with the mountain. Nonetheless, the Project has undertaken to respect and apply any ceremonies considered necessary by local communities. The Project will have impact on the livelihood on the households affected by land acquisition⁵⁵. But the degree of impact will not affect the identity or community of the ethnic groups in the area as assessed by members of these groups themselves⁵⁶. The effect on the ethnic group's defined identity and community resulting from livelihood impact is a crucial requirement for the third criterion to be triggered for BCS. The participants in the community meeting in B. Prao, Dak Kung and Sieng A on 19 July 2022 as well as those in the FGD in Dak Lern on 20 July 2022 made the assessment that Project activities will not have that effect. This means that even if the affected lands are considered customary land albeit outside the national law, the impact on it will not trigger the BCS requirement because the identity and community of the ethnic groups will remain unaffected. Thus, none of the three SR3 criteria will trigger the BSC requirement for the project.

Table 9-69: Project Activities and Potential Impacts to the Affected Ethnic Groups Livelihoods, Cultural, Ceremonial, or Spiritual Uses of the Customary Lands in the Project Area and Requirements for BCS

Project Activities and Potential impacts	Village/s	Ethnic Groups Affected	Duration and/or Extent of Impacts	Significance of impacts (post-mitigation measures)
Construction Phase				
Land acquisition and impacts to livelihoods of ethnic groups	18 villages in Dak Cheung District and 4 villages in Sanxay District	Triang, Yae, Katu and Lao	Temporary loss of land (during construction period) and permanent loss of land	Moderate
Impacts of the WTG, T/L, and internal roads construction to intangible cultural heritage in Phou Koungking Mountain	Prao, Dak Lern, and Dak Kung	Triang and Katu	During construction period	Minor
Impacts on Dak Bong Cemetery during the construction of overhead transmission line	Dak Bong	Triang, Yae, Katu and Lao	During construction period	Minor
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	Minor
Impact related environment nuisance such as vibration, noise, and dust affecting ethnic minority ceremonies/ rituals/activities and	All villages, except, Dak Jom, Nam Ngonneua, and Dak Padou	Triang, Yae, Katu and Lao	During construction period	Minor

⁵⁵ The affected privately-used land will be either be replaced with land of similar features or compensated at replacement value per the Resettlement Plan (RP).

⁵⁶ To assess whether the project will affect their ethnic identity and community, the meeting participants from the villages of B. Prao, Dak Kung and Sieng A were asked if the project activities will have an impact on specific indicators of these two terms. The indicators of ethnic identity were their belief, practices, the way they look at themselves as ethnic group and the way others will look at them. The indicators of community were the way they relate with each other and to outsiders, their sense of cohesion as a group and the unity of the community members. On these indicators, the answer was that the Project will not have an impact on these. The same indicators were used in Dak Lern in an FGD and the same answer was given.

Project Activities and Potential impacts	Village/s	Ethnic Groups Affected	Duration and/or Extent of Impacts	Significance of impacts (post-mitigation measures)
cultural heritage sites close to construction sites				
Operations Phase				
Impacts of the access roads to the Phou Koungking Mountain during Operations Phase	Prao, Dak Lern, and Dak Kung	Triang and Katu	Permanent impact	Minor
Noise and Shadow flicker impacts on cultural heritage	N/A	N/A	N/A	Minor
Shadow flicker impacts	Dak Tiem, Dak Yen, Dak Chueng and Dak Nong	Triang	Permanent impact	Minor

IFC PS7 Requirements for Free, Prior and Informed Consent

The applicability of IFC PS7 Requirements for Free, Prior and Informed Consent was also assessed by the LESA. Per GN7.27, the process of FPIC is triggered if the project activities and outcome are associated with any of the following potentially adverse impacts:

- (i) impacts on lands and natural resources subject to traditional ownership or under customary use;
- (ii) relocation of Indigenous Peoples from lands and natural resources subject to traditional ownership or under customary use;
- (iii) significant impacts on critical cultural heritage that is essential to the identity and/or cultural, ceremonial, or spiritual aspects of Indigenous Peoples lives, including natural areas with cultural and/or spiritual value such as sacred groves, sacred bodies of water and waterways, sacred trees, and sacred rocks; and
- (iv) use of cultural heritage, including knowledge, innovations, or practices of Indigenous Peoples for commercial purposes.

The Project will definitely not generate the last three adverse impacts because it will not entail relocation, will avoid impacts on cultural resources and will not use cultural heritage for commercial purposes.

It is the first impact that needs further analysis if it applies to the Project. The impact must be on land subject to traditional ownership or under customary use to trigger FPIC. While Indigenous Peoples may not possess legal title to these lands as defined by national law, their use of these lands, including seasonal or cyclical use, for their livelihoods, or cultural, ceremonial, and spiritual purposes that **define their identity and community**, can often be substantiated, and documented (PS7 Paragraph 13).

The NTFP area is state land but is used by ethnic groups in the Project site for livelihood. Around 12% of the affected households collect NTFP and 3% consider it as their primary livelihood (RP Section 3.2 and 4.3). The level of reliance on NTFP collection widely varies across the 25 villages where it is practiced (RP Section 3.1). The information gathered from two community consultations meetings and FGD during the site visit (18-21 July 2022) established that the Project will not affect areas used for cultural, ceremonial, and spiritual purposes. While the project has livelihood impact in NTFP area, it is not assessed to affect their defined ethnic identity and community as specified in PS Paragraph 13 to

trigger FPIC.⁵⁷ The ethnic group members who attended the two meetings and one FGD during the site visit made this assessment themselves.

On land and natural resources under customary use, it is interpreted that the use refers to long-established consistent pattern of use incorporating beliefs and customs which have been transmitted through generations. Swidden cultivation and NTFP collection are considered as the Triang's customary use of natural resources who were semi-nomadic until recently.⁵⁸ Swidden cultivation is also the traditional livelihood paired with hunting among the Katu.⁵⁹ This seems to be also the case among the Yae and Ha Luk based on their current livelihood system (RP V2 Table 4.3). Swidden cultivation traditionally considered the main economic activity of Triang, Katu, Yae and Ha Luk, has undergone so much change that it can no longer be considered customarily practiced. The same can be said for NTFP collection which is traditionally for subsistence but is currently largely driven by the market.

The Project affected land and natural resources have to be under customary use or traditional ownership to trigger the FPIC. But for land traditionally owned outside the national laws, it must affect the ethnic group's defined identity and community to trigger the FPIC. Due to the absence of customary use and effect on the ethnic group's defined identity and community for land traditionally owned outside the national law, the Project impact would not trigger the FPIC. Thus, due to the absence of any physical displacement or impact on any cultural resources and heritage and land under customary use or effect on defined identity and community of ethnic groups, it is clear that FPIC is not applicable to the Project.

Support of Indigenous Peoples for the Project

The Project consulted the local authorities and affected people through meetings, FGD and Key Informant Interview (KII). Four meetings were held as part of EIA preparation (2014-2020) and 8 FGD and 5 KII were done during the ESIA preparation (November-December 2021). In addition, 8 meetings were organized to disclose the ESIA (July-August 2022) (See RP V2 Table 7.3 and 7.6). The government Compensation Committee also held another 4 meetings (February-May 2022) on unit rates (RPV2 Section 7.6.3).

From a review of the results of these engagements, it is noted that support for the Project was expressed and no opposition to the Project was articulated (RP V2 Table 7.6). Concerns over impacts (e.g., siltation of water supplies, influx of workers and disturbance of cemeteries) were expressed but they also assisted the Project to come up with measures to mitigate these impacts. Community 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.

The absence of any objection to the Project and the willingness of the local communities to engage with it were witnessed during the two consultations attended by affected people from 5 villages and two FGD held in Dak Lern during the Consultant's site visit (18-21 July 2022).⁶⁰ Those meetings were noted to have met the requirements for meaningful consultation.⁶¹ IFC GN7.14 requires the Project to

⁵⁷ To assess whether the project will affect their ethnic identity and community, the meeting participants from the villages of B. Prao, Dak Kung and Sieng A were asked if the project activities will have an impact on specific indicators of these two terms. The indicators of ethnic identity were their belief, practices, the way they look at themselves as ethnic group and the way others will look at them. The indicators of community were the way they relate with each other and to outsiders, their sense of cohesion as a group and the unity of the community members. On these indicators, the answer was that the project will not have an impact on these. The same indicators were used in Dak Lern in an FGD and the same answer was given.

⁵⁸ Dang Nghiem Van and others. 2010. Ethnic Minorities in Vietnam. Hanoi: The Gioi Publishers. Page 82.

⁵⁹ Yap, J. 2018. The Katu in Southern Laos. The Laotian Times. 11 April.

⁶⁰ The villages were B. Prao, Dak Kung, A Sieng, Dak Rant and Dak Dor.

⁶¹ Artelia. 2022. IEAD Monsoon Wind Power Project Environmental and Social Due Diligence-Back-to-Office Report on 2 August. HCMC. Page 28 and Table 6 Item 1. Meaningful consultation according to the SPS (Paragraph 32), is a process that: (i) begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle; (ii) provides

engage with the affected communities within the project's area of influence through a process of information disclosure and Informed Consultation and Participation (ICP). The ICP process is an antecedent from where FPIC process is built if it was applicable to the Project (GN 25).

Although it is assessed that FPIC is not applicable to this Project, the LESA noted that together with the communities and the government, the Project exhibited the six characteristics of Good Faith Negotiation (GFN). These characteristics are as follows: (i) willingness to engage in a process and availability to meet at reasonable times and frequency; (ii) provision of information necessary for informed negotiation; (iii) exploration of key issues of importance; (iv) use of mutually acceptable procedures for negotiation; (v) willingness to change initial position and modify offers where possible; and (vi) provision of sufficient time for decision making.⁶²

The LESA's assessment is based on the community meetings observed, documentation of consultations contained in RP V2 (Section 7.6) and plan for future stakeholder engagement (RP V2 Section 7.5 and 7.7 and CEGDP Section 6.4). The adequacy of the GFN is measured by the extent it moves the dialogue into agreement.⁶³ The compromise agreement made between the government and the affected people on the unit rates and the Project's incorporation of their concerns in the safeguard documents indicate that the three parties are capable of GFN. This capability is taken as an assurance that the Project and the government will, consider the community in their decision affecting community interest, provide prior disclosure of all relevant information and negotiate with them to come up with a common agreement on the decision without deceit, intimidation, and coercion. However, the performance of the three parties on these aspects must be regularly monitored to ensure their continuous application.

Specific mitigation measures to address impacts on livelihoods, cultural heritage and other community health and safety impacts risks presented in **Section 7.2.2.3** were discussed and agree with communities. For instance,

- The Project agreed to comply with villages' Heet-Kong prior to any activities in the Phou Kounking
- The Project agreed with Dak Rant village to provide Worker Code of Conduct for their review
- The Project agreed to inform the villages of number and timing of transportation vehicles and activities
- The Project agreed to support the villages with education and healthcare facilities, employment and vocational training, agricultural improvement, and livestock, etc.

The Project places a strong emphasis on respecting the cultures and customs of the villagers and has been participating in various rituals as part of granting access and permission to undertake technical studies to support the ESIA. This will be formalised as part of a management plan to apply to all workers.

9.5.9.1 Significance of Impacts

The significance of impact assessments undertaken in **Sections 9.5.2–9.5.6** remain unchanged. This section assesses the significance of the loss of ethnic culture.

timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people; (iii) is undertaken in an atmosphere free of intimidation or coercion; (iv) is gender inclusive and responsive, tailored to the needs of disadvantaged and vulnerable groups; and (v) enables the incorporation of all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues.

⁶² FPIC as process requires Good Faith Negotiation (GFN) between the client and affected communities (GN25).

⁶³ International Labor Organization. 2013. Understanding the Indigenous and Tribal People Convention 1989 (No. 169). Handbook for ILO Tripartite Constituents. Geneva. Page 16.

Methodology for Assessment of Impact Significance

The potential economic displacement and impacts to livelihoods are assessed in accordance with the criteria set out in **Table 9-70** and **Table 9-71**.

Table 9-70: Social Impact Magnitude Criteria

Magnitude	Definition
Large	Change dominates over baseline conditions. Affects the majority of the area or population in the Aol and/or persists over many years. The impact may be experienced over a regional or national area.
Medium	Early evident difference from baseline conditions. Tendency is that impact affects a substantial area or number of people and/or is of medium duration. Frequency may be occasional, and impact may potentially be regional in scale.
Small	Perceptible difference from baseline conditions. Tendency is that impact is local, rare and affects a small proportion of receptors and is of a short duration.
Negligible	Change remains within the range commonly experienced within the household or community
Positive	In the case of positive impacts, it is generally recommended that no magnitude be assigned, unless there is ample data to support a more robust characterisation. It is usually sufficient to indicate that there will be a positive impact, without characterising the exact degree of positive change likely to occur.

Table 9-71: Social Impact Sensitivity Criteria

Sensitivity	Definition
Low	Villagers have low vulnerability/sensitivity; consequently has a high ability to adapt to changes brought by the project
Medium	Some, but few areas of vulnerability/sensitivity; retaining an ability to at least adapt in part to change brought by the project
High	Profound or multiple levels of vulnerability/vulnerability/sensitivity that undermine the ability to adapt to changes brought by the project

Receptor Sensitivity and Impact Magnitude

The affected villagers have a **high** sensitivity, as they are unable to influence the influx of workers and other people to the area.

The magnitude is **small**, due to the migrant workforce comprising 560 people (approximately 3% of the population of the villages in the Aol).

Impact Significance

The impact significance is therefore assessed to be **moderate**.

9.5.9.2 Additional Mitigation, Management, and Monitoring Measures

In addition to the management plans specified in previous impact assessment sections, The CEGDP will be prepared and incorporate aspects of a traditional Ethnic Group Development Plan, due to the overlap of the two management plans, given that the majority of the affected villagers belong to an ethnic group / are considered to be Indigenous Peoples. A SEP will also be prepared to support the CEGDP. These plans seek to:

- Promote ethnic cultures through Project activities in collaboration with the Project affected communities;
- Implement development programs to improve the livelihoods of ethnic groups (refer to **Section 8.5.6.1**) including providing ethnic women with economic development opportunities;

- Implement measures to remove obstacles for ethnic minorities to participate in Project activities and decision-making, including impact mitigation and benefits; and
- Provide a grievance redress mechanism and appeal process for the Project-affected persons that is culturally appropriate.

The Local Content and Influx Management Plan will include the Workers Code of Conduct that will include cultural awareness requirements for all workers (refer to **Section 9.5.4.4**).

9.5.9.3 Residual Impact Significance

Through the implementation of the additional mitigation measures, the magnitude is reduced to **negligible** as the migrant workforce will have cultural awareness training, and result in a **negligible** residual magnitude significance (**Table 9-72**).

Table 9-72: Ethnic Groups Impact Assessment

Significance of Impact					
Potential Impact	Impact on Ethnic Groups (Erosion of Ethnic Culture)				
Project Phase	Pre-Construction	Construction	Operation		
Impact Nature	Negative	Positive	Neutral		
	Erosion of ethnic culture is a negative impact.				
Impact Type	Direct	Indirect	Induced		
	Indirect impact will be produced from the migrant workforce.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The impacts are limited to the construction phase.				
Impact Extent	Local	Regional	International		
	The impacts are limited to the villages in the AoI.				
Impact Scale	The impacts are limited to the villages in the AoI.				
Frequency	The impacts will occur infrequently.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	The magnitude is small, as the migrant workforce comprises 560 people.				
Receptor Sensitivity	Low	Medium	High		
	The affected villagers have a high sensitivity as they are unable to influence the influx of workers.				
Impact Significance	Negligible	Minor	Moderate	Major	
	The impact significance is moderate.				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	
Residual Magnitude Significance	Negligible	Minor	Moderate	Major	

9.5.10 Impact on Cultural Heritage (Tangible and Intangible)

Cultural heritage resources are defined using a combination of the ADB definition of tangible cultural heritage, IFC PS8 and the definition of cultural heritage in Lao PDR's Law on National Heritage (No. 11/NA, 2021) below:

- The Law on National Heritage (No. 11/NA, 2021) defines national heritage as “cultural, historical and natural heritage existing in the form of tangible objects, intangible items, movable or

immovable and living or non-living organism that are of outstanding value and reflecting the history of Lao nation and Lao people.”⁶⁴

- The ADB SPS defines physical cultural resources as “Movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings and may be above or below ground or under water. Their cultural interest may be at the local, provincial, national, or international level.”⁶⁵
- IFC PS8 defines cultural heritage as (i) tangible forms of cultural heritage, such as tangible moveable or immovable objects, property, sites, structures, or groups of structures, having archaeological (prehistoric), paleontological, historical, cultural, artistic, and religious values; (ii) unique natural features or tangible objects that embody cultural values, such as sacred groves, rocks, lakes, and waterfalls; and (iii) certain instances of intangible forms of culture that are proposed to be used for commercial purposes, such as cultural knowledge, innovations, and practices of communities embodying traditional lifestyles.

This section discusses the potential impact of the Project on cemeteries and sacred areas which may trigger the Indigenous Peoples Safeguards consent requirement (2009) in relation to potential impacts on “*cultural resources that Indigenous Peoples own, use, occupy, or claim as an ancestral domain or asset*” and FPIC in relation to “*significant impacts on critical cultural heritage that is essential to the identity and/or cultural, ceremonial, or spiritual aspects of Indigenous Peoples lives, including natural areas with cultural and/or spiritual value such as sacred groves, sacred bodies of water and waterways, sacred trees, and sacred rock*”.

9.5.10.1 Potential Impacts

Impacts to Cemeteries

The Project has taken into consideration impacts to cultural heritage resources for Project layout optimization. Cemeteries (*paa saa*), which are mostly forested areas, are observed in all surveyed villages. Based on the consultation with Dak Lern 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 certain activities prohibited. The village coordinator of Dak Tiem village added to this that he considers the 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 awoken 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 puppy (i.e. a young dog) and use its blood to spread across affected cemetery area.

The final Project layout has been optimized and refined to avoid impacts to all cemeteries—the Project has re-routed the transmission line and access road alignments to avoid cutting through almost all the cemeteries. It is noted that an overhead transmission line will pass over Dak Bong Cemetery (**Figure 9-60**). The transmission line is approximately 70 m above the ground, therefore there will be no modifications (i.e., vegetation clearance and earthwork) made to the cemetery area. However, under the Regulation on Safety for High Voltage Transmission Line and Substation, EDL/2013, 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. The Project consulted with Dak Bong village on 21 July 2022, the village representatives indicated that cutting of trees within ROW in

⁶⁴ Law on National Heritage No. 11/NA (2021)

⁶⁵ ADB (2009). Safeguard Policy Statement, page 39-40. Retrieved from: <https://www.adb.org/sites/default/files/institutional-document/32056/safeguard-policy-statement-june2009.pdf>

cemetery area 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.

Impacts to Phou Kounking

Figure 8.39 presents location of Phou Kounking in relation to Dak Lern, Dak Kung and Proa villages. Eight WTGs, transmission line and internal roads (approximately 12.6 ha of land requirement) are proposed in the lower elevation which is designated as multi-use zone of the Phou Kounking Mountain, and therefore will not affect the higher elevation of Phou Kounking. Project activities within the lower elevation of the Phou Kounking 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. Refer to **Section 8.5.3.1** for details discussion of beliefs around Phou Kounking and findings from consultations with Dak Lern, Dak Kung and Prao villages in July 2022.

Phou Kounking is classified as a legally protected forest at a provincial level but not nationally protected, managed by the Provincial Agricultural & Forestry Office (PAFO). It is noted that this forest is also designated as a protected forest to protect area's watersheds. Any potential ecological impact of the Project is assessed in **Section 9.4.3** of the ESIA and the mitigation measures are proposed in the Biodiversity Action Plan (BAP). Interview with DAFO also corroborate that there is a sacred forest in Phou Kounking. The Project will strictly comply with the regulations and requirements from relevant authorities and the BAP and limit land clearance within this mountain as this area is also listed as a protected forest under the National guideline.⁶⁶

Impacts on Ceremonial Grounds

There are ceremonial grounds located within villages for performing rites or ceremonies such as poles for securing animals or sacred houses (salakuan) which serve as a place for performing animal sacrifice. There are no ceremonial grounds or sacred places being affected by Project land acquisition.

Impacts on Critical Cultural Heritage

IFC PS8 para. 8 defines critical cultural heritage as (i) the internationally recognized heritage of communities who use, or have used within living memory the cultural heritage for long-standing cultural purposes; and (ii) legally protected cultural heritage areas, including those proposed by host governments for such designation.

Based on the discussions of tangible and intangible cultural heritage in **Section 8.5.3.1** there is no critical cultural heritage identified in the Project development area or in Project vicinity and therefore the Project will not impact critical cultural heritage

Table 9-73 presents the potential impacts from project activities during construction and operation on cultural heritage resources.

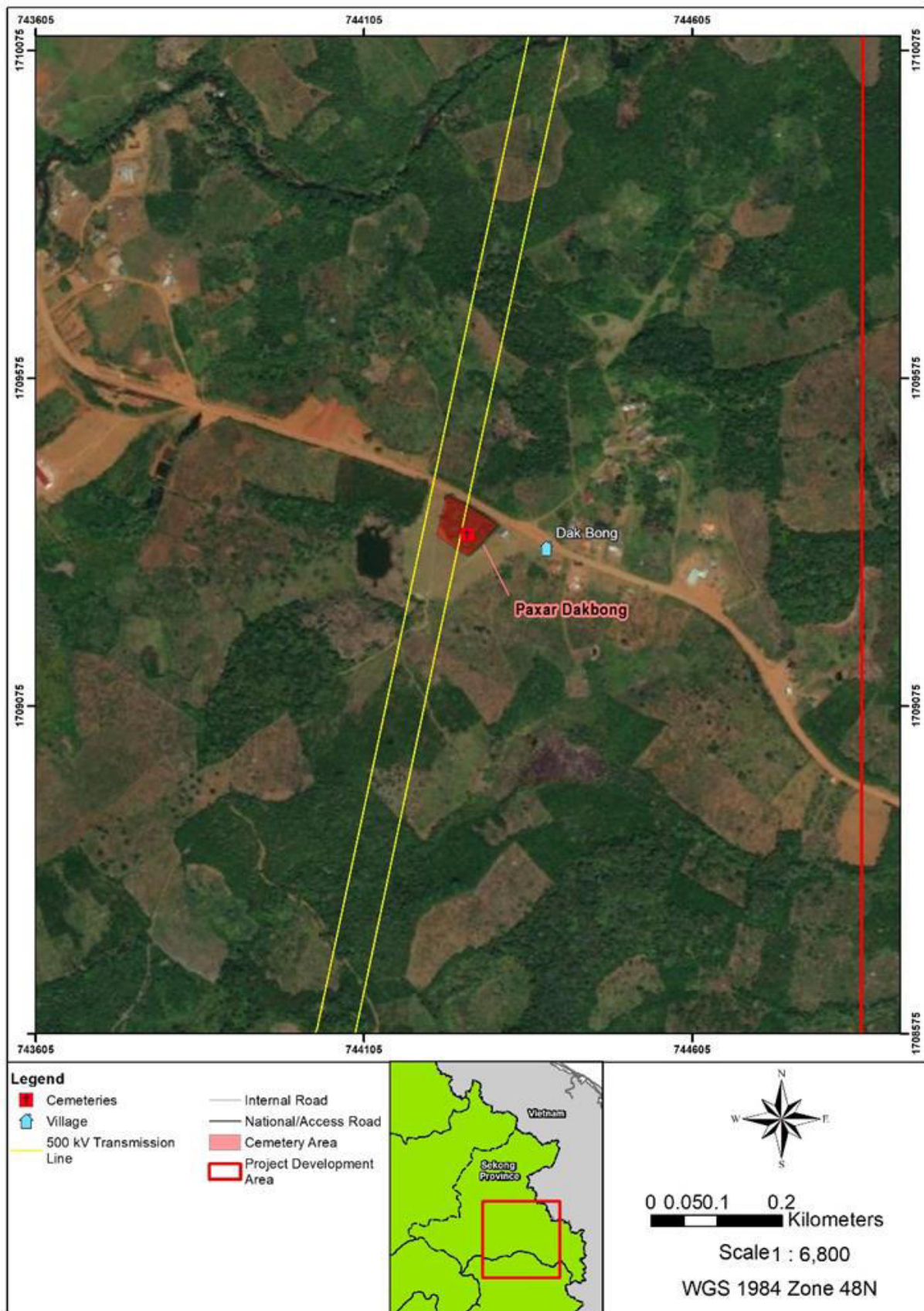
Table 9-73: Potential Impacts from Project Activities on Cultural Heritage Resources

Phase	Potential Impacts from Project Activities
Construction	<ul style="list-style-type: none"> ■ Potential encroachment of workers into Dak Bong Cemetery which is considered sacred ground during the construction of the overhead transmission line. ■ Impacts arising from environment nuisance such as vibration, noise, and dust affecting ethnic minority ceremonies/rituals/activities and cultural heritage sites close to construction sites. ■ Potential of impact of outside workers brought in by the project and its contractors as well as the potential entry of camp followers will negatively influence existing customs and religious practices undertaken by the ethnic groups, the result of which could be an erosion or loss of ethnic cultural elements. The loss of ethnic cultural elements may occur if migrant workers and other outsiders are not respectful of or

⁶⁶ Law on Forestry (2019) No. 08/NA

Phase	Potential Impacts from Project Activities
	<p>do not understand the various customs and religious practices, such as boundaries placed on areas that may only be accessed by women or men.</p> <ul style="list-style-type: none"> ■ This potential impact is primarily a concern associated with the construction phase when workers and other outsiders will likely to move to the villages in the Aol. Only a small workforce (40 people) will remain in the operation phase. ■ Construction of Project components will involve excavation and ground disturbance at several wind turbine locations. Potential impacts to cultural resources that are not yet known may occur during the construction phase of the Project during clearing or excavation work. <p>In addition to these direct physical impacts described above, the Project has the potential to cause indirect impact to cultural heritage resources. Indirect impacts result from Project activities that do not physically damage a resource, but rather, impact stakeholders' ability to use or access to cultural heritage resources, thereby negatively affecting its cultural value. For instance, restriction on public access to existing tangible cultural heritage sites or areas used for intangible cultural heritage activities, such as forests.</p>
Operation	<ul style="list-style-type: none"> ■ Potential impacts of shadow flicker on cultural heritage sites located in close proximity to the wind turbine towers. ■ Changes to the natural landscape resulting from presence and operation of WTGs.

Figure 9-60: Dak Bong Cemetery



9.5.10.2 Existing Controls

The Project places a strong emphasis on respecting the cultures and customs of the villagers, and has been participating in various rituals as part of granting access and permission to undertake technical studies to support the ESIA. This will be formalised as part of a management plan to apply to all workers. The Project has also sought to minimise any impact to cultural heritage through the optimisation of the Project layout.

9.5.10.3 Significance of Impact

Methodology for the Assessment of Impact Significance

Impact on cultural heritage is assessed in accordance with the magnitude criteria in **Table 9-74** and sensitivity criteria in **Table 9-74**.

Table 9-74: Social Impact Magnitude Criteria

Magnitude	Definition
Large	Change dominates over baseline conditions. Affects the majority of the area or population in the AoI and/or persists over many years. The impact may be experienced over a regional or national area.
Medium	Early evident difference from baseline conditions. Tendency is that impact affects a substantial area or number of people and/or is of medium duration. Frequency may be occasional and impact may potentially be regional in scale.
Small	Perceptible difference from baseline conditions. Tendency is that impact is local, rare and affects a small proportion of receptors and is of a short duration.
Negligible	Change remains within the range commonly experienced within the household or community
Positive	In the case of positive impacts, it is generally recommended that no magnitude be assigned, unless there is ample data to support a more robust characterisation. It is usually sufficient to indicate that there will be a positive impact, without characterising the exact degree of positive change likely to occur.

Table 9-75: Social Impact Sensitivity Criteria

Sensitivity	Definition
Low	Villagers have low vulnerability/sensitivity; consequently has a high ability to adapt to changes brought by the project
Medium	Some, but few areas of vulnerability/sensitivity; retaining an ability to at least adapt in part to change brought by the project
High	Profound or multiple levels of vulnerability/vulnerability/sensitivity that undermine the ability to adapt to changes brought by the project

Receptors Sensitivity and Impact Magnitude

Receptors have a **medium** sensitivity, as the Project has been proactive in seeking feedback from villagers on the location of wind turbines so as to avoid cultural heritage. However, some wind turbines are located within the Phou Koungking and TL installation activities in Dak Bong cemetery.

The magnitude of the impact is **medium**, regarding potential impact to Phou Koungking and Dak Bong cemetery, given that the impact will occur for the duration of the construction of wind turbines and installation of TL and operation of the wind farm.

9.5.10.4 Additional Mitigation, Management, and Monitoring Measures

A Cultural Heritage Management Plan will be prepared to guide the workers on the protection of cultural heritage sites, structures and values that may be impacted by the Project. In the first instance, the Cultural Heritage Management will require:

- Pre-construction survey. This will build on existing field data, to identify the presence of tangible and intangible cultural heritage resources
- Project design to avoid and minimize impacts to cultural heritage resources. Workers camps, spoil disposal sites, laydown areas and other ancillary facilities will be located away from any cultural heritage sites.
- Further consultation with the villagers who reside close to Phou Kounking to ensure the communities have a good understanding of Project activities and potential impacts on the Phou Kounking;
- Consultation with village leaders, and elders on ceremonies and rituals to be undertaken to seek permission to enter the forest for construction and ongoing maintenance purposes. **Section 8.5.3.1** discusses consultations with village heads and belief leaders regarding requirements to access Dak Bong cemetery and Phou Kounking mountain.
- Seek permission from the village leaders, elders and the broader community to enter and utilise the sacred areas that overlap with the Project footprint. Document the consent process and the consent itself.
- The Project will perform required rituals or provide budget for the villages to perform rituals prior to accessing Phou Kounking and Dak Bong cemetery
- The Project will plan Project activities to avoid activities that involve the use of large equipment and machinery which may cause noise and dust disturbance to the nearby villages during their ceremonies and festivals. The annual cycle of the ceremony and festival is presented in **Table 7.30**.
- Sacred sites, burial grounds in the forest, cemeteries, sacred trees and will be marked and labelled prohibited for entry (no-go zones) by workers
- Establish a Chance Finds Procedure that will guide workers in the event that potential cultural heritage is encountered.

The cultural heritage protocol will be supported by various plans such as the SEP which provides stakeholder engagement strategies and activities throughout the Project lifecycle. The SEP outlines requirements for the Project to inform villagers regarding Project activities. The CEMP will also outline requirements for the EPC Contractors to notify the community relations team prior to entering the sacred forest to ensure appropriate notification and rituals are taken place prior to start of work.

To ensure workers are aware of the cultural heritage sensitivities and the various protocols in place, a cultural heritage training and awareness program will be provided for Project workers. Additionally, the Workers Code of Conduct will contain a statement requiring workers to respect cultural heritage and adhere to all protocols and management plans.

9.5.10.5 Residual Impact Significance

Through further consultation and confirmation of the rituals/ceremonies required, the impact magnitude will be reduced to **small**. This will in turn result in the residual magnitude significance of **minor** (**Table 9-76**).

Table 9-76: Cultural Heritage Impact Assessment

Significance of Impact					
Potential Impact	Impact on Cultural Heritage (Tangible and Intangible)				
Project Phase	Pre-Construction	Construction		Operation	
Impact Nature	Negative	Positive		Neutral	
	The impact is negative.				
Impact Type	Direct	Indirect		Induced	
	The Project will directly impact on intangible cultural heritage.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The impact will remain throughout the operations phase.				
Impact Extent	Local	Regional		International	
	The impact is limited to the villages in the Aol.				
Impact Scale	The impact is limited to the villages in the Aol.				
Frequency	The impact will be sustained over the operations phase.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	The magnitude will is considered to be medium , being limited to the sacred forest.				
Receptor Sensitivity	Low		Medium		High
	The receptors have a medium sensitivity.				
Impact Significance	Negligible	Minor		Moderate	Major
	The impact significance is moderate.				
Residual Impact Magnitude	Positive	Negligible		Small	Medium
Residual Magnitude Significance	Negligible	Minor		Moderate	Major

9.5.11 Vulnerable Households/Groups

9.5.12 Summary of Gender Impacts and Mainstreaming Measures

The gender disaggregated socio-economic profile is presented in **Chapter 7**. From this, it can be seen that women are well represented across the affected villages. For instance, in both the Dak Cheung and Sanxay Districts, women have taken on leadership positions including village heads and village board members. FGDs and site visit observations have also confirmed that gender-based violence is not a prevalent issue, and villagers have been equipped with knowledge to identify and manage such situations (refer to **Section 9.5.7.1**).

Despite this, there are a number of aspects of improvement, namely:

- **Education:** The rate of education for males outpaces that of females, for instance, 59% of females have no formal educational attainment, 40% of females have attained university level educational qualifications. There is a near equal split of females and males who have obtained basic schooling, secondary schooling and vocational training. It was reported that the lack of economic resources and work were the main reasons for females discontinuing study.
- **Livelihood:** Female-headed households, and in particular where households are predominantly or wholly comprised of females, are more likely to experience food deficiency due to lower agricultural productivity (associated with smaller agricultural land and lack of male labour). While

agricultural activities are allocated equally between females and males, women generally have the additional responsibility of household chores (e.g. cooking, cleaning, etc.) and childcare.

- **Healthcare:** Through FGDs with women's groups, insufficient healthcare was identified. Specifically, there are insufficient stocks of medicines, and lack of healthcare personnel.

Accordingly, this Project is classified as Category II: Effective Gender Mainstreaming (EGM).

Through the social impact assessment above (**Sections 9.5.2-9.5.7**) there is a potential for the following impacts to disproportionately impact women. These potential impacts and their respective mitigation measures are summarised in **Table 9-77**. ADB will be responsible for the development of the Gender Action Plan and gender mainstreaming measures, which may involve measures proposed within the ESIA and associated management plans.

Table 9-77: Summary of Gender Impacts and Mitigation Measures

Potential Social Impacts	Gender-Specific Impacts	Significance of Impact	Gender-Specific Mitigation Measures
<p>Economic Opportunities (Section 9.5.4)</p> <ul style="list-style-type: none"> Local Employment and Training Increased Access to Agricultural Land/Forest 	<ul style="list-style-type: none"> The Project will seek to provide equal opportunities to access employment and training opportunities. The Project will support women's economic development to capitalise on the potential new agricultural areas and/or forest. 	<p>Impact Magnitude: Positive Gender Sensitivity: Medium Impact Significance: Positive</p> <p>Residual Impact Magnitude: Positive Residual Gender Sensitivity: Medium Residual Impact Significance: Positive</p> <p><i>The residual impact significance rating is the same for all stakeholders.</i></p>	<p>Local Content and Influx Management Plan:</p> <ul style="list-style-type: none"> Ensure the hiring process is fair and equitable for women. Ensure women and men are able to participate in training programs targeting skills required to participate in the Project workforce. <p>CEGDP:</p> <ul style="list-style-type: none"> Investigate potential programs, such as IFAD Programme supporting women in agriculture, providing training on weaving for women, and rearing livestock
<p>Economic Displacement and Impacts to Livelihoods (Section 9.5.4)</p> <ul style="list-style-type: none"> Loss of Agricultural Land Loss of NTFP Collection 	<ul style="list-style-type: none"> The loss of agricultural land (permanent or temporary) may further decrease the size of land for female-headed households (which typically have smaller landholdings). As the collection of NTFPs is typically undertaken by women, the loss of forest would also impact upon the amount of NTFP available for women. This may further impact upon livelihood security of women. The impacts of economic displacement can disproportionately affect women, as their unique role in the household means they may have more difficulties coping with the familial disruption that resettlement can cause than their male counterparts. This is particularly the case if 	<p>Impact Magnitude: Large Gender Sensitivity: High Impact Significance: Major</p> <p>Residual Impact Magnitude: Medium Residual Gender Sensitivity: Medium</p> <ul style="list-style-type: none"> Residual Impact Significance: Moderate The residual impact significance rating is the same for all stakeholders. 	<p>Resettlement Plan:</p> <ul style="list-style-type: none"> It is critical to mainstream gender considerations into all components of resettlement planning, including engagement processes. Gender-specific consultation during the preparation of the Resettlement Plan will be undertaken, to integrate the unique needs and perspectives of women. The following additional considerations will be made for gender equity and social inclusion: <ul style="list-style-type: none"> Women, and Project affected families, especially from vulnerable households will be encouraged to get involved in all resettlement activities and their effective involvement will also be ensured in all local level resettlement committees. Provision of asset titles, security of tenure, establishment of bank accounts and any cash and in-kind compensation will consider the

Potential Social Impacts	Gender-Specific Impacts	Significance of Impact	Gender-Specific Mitigation Measures
	resettlement-related engagement efforts do not effectively enable women's meaningful participation throughout the resettlement process.		<ul style="list-style-type: none"> head of the household along with the spouse. Additional incentives to encourage joint-account for cash compensation or replacement land in the name of women. Provision of trainings focused on women as a part of livelihood restoration programs. Households categorised as vulnerable for Resettlement Plan will be given priority to access livelihood restoration programs and local employment or procurement schemes put in place by the Project. The Project will assist with issuance of land titles and encourage land titles and/or compensation bank book in joint souses names. Title or bank book in husband or wife name is possible if preferred and with consent from the other party
<p>Impacts to Community Health and Safety from Construction Activities (Section 9.5.5)</p> <ul style="list-style-type: none"> Infrastructure and Machinery Vehicle Movements Security 	<ul style="list-style-type: none"> Construction activities will not necessarily result in gender-specific impacts, however it is prudent that women are equally made aware of potential construction risks. Gender Based Violence and Sexual Exploitation and Child Abuse and Exploitation 	<p>Impact Magnitude: Small Gender Sensitivity: High Impact Significance: Moderate</p> <p>Residual Impact Magnitude: Small Residual Gender Sensitivity: Low Residual Impact Significance: Negligible</p> <p><i>The residual impact significance rating is the same for all stakeholders.</i></p>	<p>SEP:</p> <ul style="list-style-type: none"> Gender-specific consultation should be undertaken to determine the best method to deliver the community environmental and safety awareness to women. For instance, consultation with village women in order to determine the appropriate time/period to undertake group discussions or visits.
Impacts to Occupational	<ul style="list-style-type: none"> Workers' activities will not necessarily result in impacts to 	<p><i>The residual impact significance rating is the same for all stakeholders.</i></p>	N/A

Potential Social Impacts	Gender-Specific Impacts	Significance of Impact	Gender-Specific Mitigation Measures
<p>Health and Safety (Section 9.5.6)</p> <ul style="list-style-type: none"> Working at Heights Working in Remote Locations Lifting Operations 	<p>the community/gender-specific impacts. Any potential impacts are discussed in the Impacts to Community Health and Safety section, below.</p>		
<p>Impacts Associated with Influx (Section 9.5.6)</p> <ul style="list-style-type: none"> Labour and Working Conditions Transactional Sex Community Dynamics and Gender-Based Violence Potential Spread of Diseases Public Infrastructure and Resources 	<ul style="list-style-type: none"> It is likely that the construction workforce will be predominantly comprised of male workers. Some of these workers will be migrant workers. The occurrence of transactional sex may increase, which may in turn lead to the spread of diseases, such as sexually transmitted diseases. As noted earlier, there is an existing lack of healthcare provisions and workers. Migrant workers may have different customs and traditions to the villagers belonging to the various ethnic groups. This may result in a change in community dynamics and/or gender-based violence against women. Gender Based Violence and Sexual Exploitation and Child Abuse and Exploitation 	<p>Impact Magnitude: Small Gender Sensitivity: High Impact Significance: Moderate</p> <p>Residual Impact Magnitude: Small Residual Gender Sensitivity: Medium Residual Impact Significance: Minor</p> <p><i>The residual impact significance rating is the same for all stakeholders.</i></p>	<p>Local Content and Influx Management Plan</p> <ul style="list-style-type: none"> Establish and enforce a WCC, which will have strict guidelines for worker interactions with local women, and fellow female workers. Provide skills training to women to maximise the potential for local hiring. <p>Community Health and Safety Management Plan</p> <ul style="list-style-type: none"> Conduct an awareness campaign on HIV/AIDS and sexually transmitted diseases (STDs) focusing on targeted groups such as transport workers and adolescents. Conduct an awareness campaign on nutrition and promotion of a healthy life-style (in conjunction with the reproductive health and nutrition program within the CEGDP). Conduct a waste-management and sanitation awareness campaign for preventing vector-borne diseases. Supplement awareness campaigns on gender-based violence to ensure women are aware of how and where to report and provide support to facilitate the process.
<p>Impacts of Wind Farm Operation on Local Amenity (Section 9.5.8)</p> <ul style="list-style-type: none"> Noise 	<p>No gender-specific impacts.</p>	<p><i>The residual impact significance rating is the same for all stakeholders.</i></p>	<p>N/A</p>

Potential Social Impacts	Gender-Specific Impacts	Significance of Impact	Gender-Specific Mitigation Measures
<ul style="list-style-type: none"> ■ Landscape and Visual ■ Shadow Flicker 			
<p>Impact on Ethnic Groups (Section 9.5.9)</p> <ul style="list-style-type: none"> ■ Erosion of Ethnic Culture 	<ul style="list-style-type: none"> ■ There is the potential for migrant workers to negatively influence customs and religious practices that may have gender-specific boundaries/rules. ■ For instance, women and outsiders are strictly forbidden from entering the Salakuan (sacred house). 	<p>Impact Magnitude: Small Gender Sensitivity: High Impact Significance: Moderate</p> <p>Residual Impact Magnitude: Negligible Residual Gender Sensitivity: High Residual Impact Significance: Negligible</p> <p><i>The residual impact significance rating is the same for all stakeholders.</i></p>	<p>CEGDP</p> <ul style="list-style-type: none"> ■ Ethnic culture will be promoted so that workers are aware of potential gender-specific cultural considerations. ■ Provide support for documentation and preservation of traditional knowledge on herbs and its benefits/usage, skills, and indigenous crafts passed through women (e.g., hand knitting mats, bamboo baskets, and woven woollen carpets). ■ Set up a women's cooperative to promote indigenous crafts, which will involve the investigation of where indigenous crafts can be sold and market for these crafts. This will support potential efforts to increase revenue.
<p>Impact on Cultural Heritage (Tangible and Intangible) (Section 9.5.10)</p>	<p>No gender-specific impacts.</p>	<p><i>The residual impact significance rating is the same for all stakeholders.</i></p>	<p>N/A</p>

9.6 Climate Change Risk and Impact Assessment

9.6.1 Impacts on Climate Change

The Project will generate electricity with installed capacity of approximately 600 MW and electricity generation capacity of 1,707 GWh/year from wind energy. This will contribute to a significant increase in electricity generated from renewable energy in Lao PDR, which could lead to a decrease in importation of fossil fuels that would have been needed in the absence of the Project. Subsequently, this Project is expected to reduce the anthropogenic emission of greenhouse gases (GHGs), particularly carbon dioxide (CO₂) which is one of the major causes of man-induced global warming.

The scope of this study covers a quantitative assessment of the GHG emissions from the Project using available information and assumptions, and a comparison of emissions from the Project to Lao energy sector's GHG emission portfolio.

9.6.1.1 Potential Impacts

Based on the ESIA dated 2020, GHG emissions during **pre-construction phase** is related to clearing of forest and agricultural land for the construction of the Project. Vegetation contains large amounts of carbon. When it is cleared, it releases much of that carbon in the form of heat trapping gases, primarily carbon dioxide (CO₂), which warms the atmosphere.⁶⁷

The main sources of GHGs **during the construction phase** are:

- construction machinery and equipment in various activities such as clearance and levelling of the construction area,
- running transport vehicles to and from the Project area,
- construction of tower bases, and
- construction of access road etc.

Based on information provided by IEAD, electricity will be purchased from the grid for the Site office, workers' camps, batching and crushing plants, etc. during construction phase. There is no plan for self-consumption of electricity from the Wind farm during construction.

During **operation phase**, the electricity production of the wind farm will not emit GHGs as it is a form of renewable energy and there is no involvement of fuel combustion in energy production process. Therefore, any self-consumption of produced electricity will not produce emissions and is not included in project scope for GHG emissions. Furthermore, the Project will reduce dependency on electricity from combustion of fossil fuel such as coal and natural gas, therefore the Project will help reduce the emission of GHGs, which is discussed in **Section 9.3.4.3**. However, based on information provided by IEAD, fuel will be needed to operate on site generators and for operating vehicles. Electricity will be purchased from the Lao grid for operation and maintenance (O&M) of accommodation and warehouse. There is a plan for self-consumption of the electricity generated from the wind power during the operation phase, and diesel generators are to be used for backup when electricity generated from the wind farm is not available.

⁶⁷ Land Clearing & Climate Change: Risks & Opportunities in the Sunshine State. Retrieved from: <https://www.climatecouncil.org.au/uploads/c1e786d5d0fe4c4bc1b91fc200cbaec8.pdf>

Table 9-78: Project Scope and Activity by Emission Source during Construction and Operation

Phase	Source Class	Scope 1 and Scope 2 Emission
Pre-Construction	Land use conversion	Land clearance and preparation which result in conversion of forest to developed land
Construction	Stationary combustion	Generators (diesel)
	Mobile combustion	50-80 machines and equipment for land preparation and construction activities such as cranes, backhoe, bulldozers, etc. 20-50 vehicles
	Electricity	Purchased electricity from Lao grid
Operation	Stationary combustion	Generators (diesel)
	Mobile combustion	12 cars
	Electricity	Self-consumption and Purchased electricity from Lao grid

Source: ESIA dated September 2020 and IEAD.

Note: Mobile sources is a term used to describe a wide variety of vehicles, engines, and equipment that generate air pollution and that move, or can be moved, from one place to another. It includes vehicles used on roads for transportation of passengers or freight as well as off-road vehicles, engines, and equipment used for construction, transportation, agriculture, and other purposes. By definition, other combustion sources are considered to be stationary (Stationary Combustion Guidance, WRI/WBCSD (2005))⁶⁸.

9.6.1.2 Existing Controls

Embedded/in-built controls for Project's impacts on climate change during construction included in the ESIA are:

- During construction phase, avoid burning in area clearance activities that may lead to occurrence of fire which may, in turn, lead to burning of forests;
- Land preparation and construction work to avoid cutting of trees or removal of plant species outside of the concession area;
- Ensure the maintenance of construction machinery and equipment to keep them in good conditions to ensure efficiency, as lower efficiency machineries generally emit higher CO₂.⁶⁹
- Avoid emissions of CO₂ in excessive of specified standards; and

⁶⁸ Calculation Tool for Direct Emission from Stationary Combustion (2015). Retrieved from: https://ghgprotocol.org/sites/default/files/Stationary_Combustion_Guidance_final_1.pdf

⁶⁹ STAPPA/ALAPCO. (1999). Reducing Greenhouse Gases and Air Pollution: A Menu of Harmonized Options. Retrieved from: <https://www.oecd.org/environment/cc/2055676.pdf>

- Issue the rules to prevent staff and workers from burning waste within construction area.
- Existing controls for Project's impacts on climate change during operation included in the ESIA are:
- Replant trees in the areas where land clearance and levelling works are undertaken;
- Participate in the protection of forests and green areas in Dak Cheung District and Sanxay District. These forests and green areas in the two districts will help maintain the overall climate condition and meteorology in the Project area and in the localities; and
- Replantation in areas around the wind turbine towers, office building, and sub-station of the Project to allow the Project area.

9.6.1.3 Significance of Impacts

Impacts during Pre-construction Phase

The total release of GHG emissions (Scope 1)⁷⁰ during the pre-construction phase is estimated to be **56,980 tonnes CO₂ equivalent** (*Error! Reference source not found.*), accounting for 80.49 % of total GHG emission from the Project throughout the Project life (28 years).

Vegetation clearing in this area can result in a change of carbon (C) stocks from the removal of living biomass.

GHG emission of vegetation clearing is estimated based on net changes in C stocks over time. The use of C stock changes to estimate CO₂ emissions and removals, is based on the fact that changes in ecosystem C stocks are predominately (but not exclusively) through CO₂ exchange between the land surface and the atmosphere. Thus, increases in total C stocks over time are equated with a net removal of CO₂ from the atmosphere and decreases in total C stocks are equated with net emission of CO₂.⁷¹ The estimation of GHG emission due to vegetation clearing is therefore assumed for Project period (25 years) – as after vegetation have been cleared, the C stocks which serve as CO₂ sequestration will be lost (equated to CO₂ emission) throughout the Project period.

The land use category is assumed to be forest land and crop land in line with IPCC categories (IPCC, 2003⁷²). GHG emissions from land clearance are assessed using the Equation below and the parameters summarized in *Error! Reference source not found.*

The estimation of total GHG emission due to vegetation clearing is presented in *Error! Reference source not found.*

Equation: Change in Biomass Carbon Stocks on Land Converted to another Land category

$$\text{Annual Change in Carbon Stocks} = A_{\text{conversion}} \times (B_{\text{after}} - B_{\text{before}}) \times CF$$

Where:

⁷⁰ The GHG Protocol classifies removal of native vegetation – emissions resulting from removal or suppression of native vegetation for other uses (land-use change) as Scope 1 Emission. Retrieved from: https://wribrasil.org.br/sites/default/files/ghg_protocolo-florestas-technicalnote.pdf

⁷¹ IPCC Guidelines on Good Practice Guidance for Land Use, Land-Use Change and Forestry (2003). Retrieved from: https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_01_Ch1_Introduction.pdf p. 1.6

⁷² IPCC Guidelines on Good Practice Guidance for Land Use, Land-Use Change and Forestry (2003). Retrieved from: https://www.ipcc-nggip.iges.or.jp/public/gpplulucf/gpplulucf_files/GPG_LULUCF_FULL.pdf

Annual change in Carbon Stocks = Annual change in carbon stocks in living biomass in land converted to 'other land'⁷³ (ton C/year)

$A_{\text{conversion}}$ = Area of land converted to 'other land' from some initial land use (ha/year)

B_{after} = Amount of living biomass immediately after conversion to 'other land' (tonnes d.m./ha)

B_{before} = Amount of living biomass immediately before conversion to 'other land' (tonnes d.m./ha)

CF = Carbon fraction of dry matter (default = 0.5) (tonnes C/tonnes d.m.)

To convert tons of carbon to tons of carbon dioxide equivalence, multiply by the atomic weight difference between C and CO₂ (44/12).⁷⁴

Table 9-79: Amount of Living Biomass Before and After Conversion

Description	Amount of Living Biomass (tonnes d.m./ha)
	Forest land
Before	25 ^a
After	0 ^b

a – carbon stocks in biomass for forest land for tropical and sub-tropical forests, montane dry region from Table 3A.1.3 from Chapter 3.3 of Good Practice Guidance for Land use, Land-use Changes and Forestry (IPCC, 2003)

b – default assumption of 0 was assumed when converted to other land as per Section 3.7.2.1.1.1 from Good Practice Guidance for Land use, Land-use Changes and Forestry (IPCC, 2003)

Source: IPCC 2003 Good Practice Guidance for Land use, Land-use Changes and Forestry

Table 9-80: GHG Emission from Land Clearing in the Pre-construction Phase

Phase	Description	Calculation
Pre-construction	Annual carbon stock change due to land clearing (ton C/year)	$= A_{\text{conversion}} \times (B_{\text{after}} - B_{\text{before}}) \times CF$ $= 44.4 \times (0-25) \times 0.5$ $= -555 \text{ ton C/year}$
	Annual CO ₂ emission due to loss of carbon stock (CO ₂ eq/year)	$= \text{Annual change in carbon} \times \text{conversion}$ $= 555 \times (44/12)$

⁷³ This category includes bare soil, rock, ice, and all unmanaged land areas that do not fall into any of the other five categories (forest land, crop land, grassland, wetlands, and settlements).

⁷⁴ IPCC Good Practice Guidance for LULUCF (2003). Retrieved from: https://www.ipcc-nggip.iges.or.jp/public/gpplulucf/gpplulucf_files/Chp3/Chp3_2_Forest_Land.pdf p. 3.51

GHG Protocol for calculations tool for forestry in Brazil. Retrieved from: https://wribrasil.org.br/sites/default/files/ghg_protocolo-florestas-technicalnote.pdf

EPA Greenhouse Gases Equivalencies Calculator - Calculations and References. Retrieved from: <https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references>

Module C-CS: Calculations for Estimating Carbon Stocks. Retrieved from: <https://winrock.org/wp-content/uploads/2018/08/Winrock-Guidance-on-calculating-carbon-stocks.pdf>

		= 2,035 CO₂eq/year
	Total change in carbon stock over the Project life (25 years) (ton C)	= Annual change in carbon stock x 25 years = 555 x 25 = -13,875 ton C
	Total CO ₂ emission due to loss of carbon stock over the Project life (25 years) (ton CO ₂ eq)	= Total change in carbon stock x conversion = 13,875 x (44/12) = 50,875 ton CO₂eq

Impacts during Construction Phase

The total release of GHG emissions during construction is estimated to be **2,391.55 tonnes of CO₂ equivalent per year** or **7,174.65 CO₂ equivalent throughout** (11.35% of total emission over the Project life of 25 years) construction period (3 years) as shown in *Error! Reference source not found.*. The majority of emissions during construction phase are from the use of mobile transportation/ equipment/ machineries, followed by stationary combustion.

Table 9-81: Emissions Breakdown by Scope and Activity during Construction

Emission Scopes	Emission/year (tCO ₂ eq/year)	Total Emission during construction (3 years) (tCO ₂ eq)
Scope 1: Direct Emission		
Stationary Combustion	65.57	196.72
Mobile Combustion (equipment/machineries/vehicles)	87.98	263.93
Total Direct Emission	153.55	460.65
Scope 2: Electricity indirect GHG emissions		
Purchased electricity from the national grid	2,238	6,714
Total Emission (Scope 1 + Scope 2)	2,391.55	7,174.65

Impacts during Operation Phase

During operation phase, there would be no GHG emission from the electricity production from the wind farm. The majority of GHG emission derived from Mobile Combustion (equipment /machineries /vehicles), followed by purchased electricity and stationary combustion, respectively. The total operational lifetime of the Project by IEAD is expected to be 25 years. The total release of GHG emissions during operation is estimated to be **234.28 tonnes of CO₂ equivalent per year** or **5,857.00 CO₂ equivalent throughout** the

operation period of 25 years (8.37% of total GHG emission throughout the Project life of 25 years) as shown in *Error! Reference source not found.*

Table 9-82: Emissions Breakdown by Scope and Activity during Operation

Emission Scopes	Emission/year (tCO ₂ eq/year)	Total Emission during Operation (25 years) (tCO ₂ eq)
Scope 1: Direct Emission		
Stationary Combustion	18.00	450.00
Mobile Combustion (equipment/machineries/vehicles)	132.35	3,308.75
Total Direct Emission	150.35	3,758.75
Scope 2: Electricity indirect GHG emissions		
Purchased electricity from the national grid	83.93	2,098.25
Total Emission (Scope 1 + Scope 2)	234.28	5,857.00

Total Emission throughout the Project Life

Error! Reference source not found. presents an overall GHG emission breakdown by phase. The assessment of GHG emission indicates that the majority of GHG emission derives from pre-construction phase (79.61%), followed by construction (11.23%), and operation (9.16%).

Table 9-83: GHG Emission Breakdown by Phase

Phase	Scope 1 Emission (tCO ₂ eq)	Scope 2 Emission (tCO ₂ eq)	Total Emission	% of total Emission
Pre-construction (28 years)	50,875.00	NA	50,875.00	79.61%
Construction (3 years)	460.65	6,714.00	7,174.65	11.23%
Operation (25 years)	3,758.75	2,098.25	5,857.00	9.16%
Project Life (28 years)	55,094.40	8,812.25	63,906.65	100%
Annual Average (over 28 years)	1,967.66	314.72	2,282.38	NA

Methodology for Assessment of Impact Significance

Greenhouse emission falls under the following three scopes:

- **Scope 1 – Direct GHG emissions:** Direct GHG emissions occur from sources that are owned or controlled by the company, for example, emission from combustion in owned or controlled generators or vehicles, etc. Direct CO₂ emissions from combustion of biomass shall not be included in Scope 1 but reported separately.
- **Scope 2 – Electricity indirect GHG emissions:** Scope 2 accounts for GHG emissions from the generation of purchased electricity produced by a third party and consumed by the company (or Project, as in this study). Purchased electricity is defined as electricity that is purchased or otherwise brought into the organizational boundary of the company. Scope 2 emissions physically occur at the facility where electricity is generated. In this study, only emissions from the grid are considered, therefore all Scope 2 emissions are location-based. A location-based method reflects the average emissions intensity of grids on which energy consumption occurs (using mostly grid-average emission factor data).⁷⁵ This is relevant to the site as all of the electricity purchased by the site will be from the national grid, and none of the electricity purchased will be directly from the supplier, which if relevant would be counted as market-based.
- **Scope 3 – Other indirect emissions:** Scope 3 is an optional reporting category that allows for treatment of all other indirect emissions that are related to the business operations of the site but where emissions occur from outside the boundary of the site, namely emissions from suppliers and customers. Scope 3 emissions are a consequence of the activities of the company, but occur from sources not owned or controlled by the company. Scope 3 emissions include some of purchased fuels, and use of sold products and services. However, according to Equator Principles, only Scope 1 and Scope 2 emissions are required to be quantified and reported publically (on annual basis); therefore, this assessment does not cover quantification of Scope 3 emission.

Scope 1 and Scope 2 have been considered for this Project, which were quantified according to the following standards:

- GHG Protocol Corporate Accounting and Reporting Standards⁷⁶
- GHG Protocol Scope 2 Guidance⁷⁷
- 2003 IPCC Guidelines on Good Practice Guidance for Land Use, Land-Use Change and Forestry⁷⁸
- 2006 IPCC Guidelines for National GHG Inventories⁷⁹
- 2010 Ministry of Natural Resources and Environment (MONRE), Lao PDR on calculation for the emission factor for electricity generation in Lao PDR⁸⁰

⁷⁵ GHG Protocol Scope 2 Guidance. Retrieved from: https://ghgprotocol.org/sites/default/files/Scope2_ExecSum_Final.pdf

⁷⁶ GHG Protocol Corporate Accounting and Reporting Standards. Retrieved from: <https://ghgprotocol.org/standards/scope-3-standard>

⁷⁷ GHG Protocol Scope 2 Guidance. Retrieved from: https://ghgprotocol.org/scope_2_guidance

⁷⁸ IPCC Guidelines on Good Practice Guidance for Land Use, Land-Use Change and Forestry (2003). Retrieved from: https://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf_files/GPG_LULUCF_FULL.pdf

⁷⁹ IPCC Guidelines for National GHG Inventories (2006). Retrieved from: <https://www.ipcc-nggip.iges.or.jp/public/2006gl/>

⁸⁰ Calculation for the emission factor for electricity generation in Lao PDR (2010). Retrieved from: <http://monre.mynapcloud.com/2017/dndmcc/images/stories/pdf/calculation%20for%20the%20emission%20factor.pdf>

- 2020 Lao's PDR's First Biennial Update Report⁸¹
- 2021 Lao PDR's Revised Nationally Determined Contribution (NDC)⁸²

GHGs and Their Global Warming Potentials

The global warming potential (GWP) is used to evaluate the potency of non-CO₂ GHG compared to CO₂ as a baseline. For example, methane (CH₄) is 25 times more potent than CO₂ in its global warming effect, meaning that 1 kg of CH₄ emitted is equivalent to 25 kg of CO₂ emitted. The 100 years' time horizon is used in line with GHG inventory best practices.

Although Lao PDR's First Biennial Update Report dated 24 July 2020 applied the GWP of the 1996 IPCC Second Assessment Report (SAR); however, this assessment uses the GWP sourced from the 2007 IPCC Fourth Assessment Report (AR4) as the values are more updated and more commonly adapted. Detail of GWP factors used in this assessment are shown in *Error! Reference source not found.*

Table 9-84: Global Warming Potentials

Industrial Designation or Common Name	Chemical Formula	Global Warming Potential for 100 years' Time Horizon from IPCC Fourth Assessment Report
Carbon Dioxide	CO ₂	1
Methane	CH ₄	25
Nitrous Oxide	N ₂ O	298

Source: 2007 IPCC Fourth Assessment Report Working Group I. Retrieved from:
https://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html

Emission Factors

An emission factor represents an average emission rate for a given source, and is generally expressed as mass or volume of emission per source type or measure of activity related to the source.

The 2006 IPCC emission factors for stationary and mobile combustion were used for the purpose of GHG emission calculation of this report. Although the 2021 Lao PDR's NDC applied the 1996 IPCC guidelines, this report used the 2006 IPCC guideline as it provides a more updated data and is more widely adopted. *Error! Reference source not found.* provides emission factors for stationary and mobile combustion related to the Project activities and used for the purposes of this report.

⁸¹ 2020 Lao's PDR's First Biennial Update Report. Retrieved from:
https://unfccc.int/sites/default/files/resource/867493251_Lao%20Peoples%20Republic-BUR1-1-Draft%20Biennial%20Update%20Report-BUR_Lao%20PDR_24July2020.pdf

⁸² 2021 Lao PDR's Revised Nationally Determined Contribution (NDC). 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)

Table 9-85: Emission Factors for Stationary and Mobile Combustion

Fuel	tCO ₂ /Litre	tCH ₄ /Litre	tN ₂ O/Litre
Emission factors for stationary combustion			
Diesel	2.7 x 10 ⁻³	1.09 x 10 ⁻⁷	2.19 x 10 ⁻⁸
Diesel B5	2.56 x 10 ⁻³	1.04 x 10 ⁻⁷	2.08 x 10 ⁻⁸
Emission factors for mobile combustion			
Gasoline	2.11 x 10 ⁻³	1.11 x 10 ⁻⁷	1.11 x 10 ⁻⁷
Diesel	2.70 x 10 ⁻³	1.42 x 10 ⁻⁷	1.42 x 10 ⁻⁷

Source: IPCC 2006 (converted from kg/TJ)

Error! Reference source not found. presents emission factors considered for the calculation of emission from national grid. During construction, the Project will source electricity used for construction activities from Lao PDR's national grid (Scope 2 emission), therefore the 2021 Lao PDR's NDC applied the emission factor of **0.5595 tCO₂/MWh** for Lao PDR national electricity grid is used for calculation of GHG emission from purchased electricity for Project activities during construction.⁸³

During operation, the Project will not emit GHG from the operation of the Project, avoided emission will therefore be calculated for the operation period of the Project. The Guidelines for Estimating Greenhouse Gas Emission of Asian Development Bank Projects—Additional Guidance for Clean Energy Project (2017)⁸⁴ refers to International Financial Institution (IFI) Approach to GHG Accounting for Renewable Energy Projects where “the baseline emissions are calculated based on the energy production of project multiplied by the Combined Margin (CM) emission factor in tCO₂e/MWh”.⁸⁵ This approach is also in line with the World Resources Institutes (WRI)'s Guidelines for Quantifying GHG Reductions from Grid-Connected Electricity Projects which outline that “baseline emissions are estimated using a combined margin emission rate...”

Error! Reference source not found. presents the CM emission factors for Vietnam grid for calculation of GHG emission reduction—the CM emission factor of the Harmonized IFI Default Grid Factors 2021 is 0.493 tCO₂/MWh, while the average CM emission factor of the Institute for Global Environmental Strategies (IGES) 2021 is 0.602 tCO₂e/MWh for Clean Development Mechanism (CDM) projects. The IFI CM emission factor (**0.493 tCO₂/MWh**) is used for the calculation of avoided emission of the Project as it is in line with ADB's guideline and the most updated emission factors available. It is however noted that alternative emission factor for GHG emission avoidance is available such as the emission factor provided by IGES.

⁸³ Calculation for the emission factor for electricity generation in Lao PDR (2010). Retrieved from:

<http://monre.mynapcloud.com/2017/dndmcc/images/stories/pdf/calculation%20for%20the%20emission%20factor.pdf>

⁸⁴ [Guidelines for Estimating Greenhouse Gas Emissions of Asian Development Bank Projects: Additional Guidance for Energy Projects \(adb.org\)](#)

⁸⁵ Combined Margin (CM) is derived at by combining the Operating Margin (OM) and Build Margin (BM) the weighting of 75% OM: 25% BM for variable generation (e.g. most wind and solar PV).

Table 9-86: Emission Factors for Electricity

Emission Factor	tCO ₂ /MWh	Source
Lao PDR national grid emission factor	0.5595	2021 Lao PDR's NDC ⁸⁶ 2010 MONRE, Lao ⁸⁷
Lao PDR CM emission factor (for GHG reduction calculation)	0.876 (intermittent energy)	Harmonized IFI Default Grid Factors 2021 ^{88 89}
	0.574 (average combined margin for CDM projects)	Institute for Global Environmental Strategies (IGES) 2021
Vietnam national grid	0.8041 (grid emission)	2020 Department of Climate Change, Vietnam MONRE ⁹⁰
Vietnam CM emission factor (for Emission reduction calculation)	0.493 (intermittent energy)	Harmonized IFI Default Grid Factors 2021 ^{91 92}
	0.602 (average combined margin for CDM projects)	Institute for Global Environmental Strategies (IGES) 2021

GHG Emission Calculation Methods

Scope 1 GHG Emission

Scope 1 method of IPCC was selected since information regarding site specific or country specific emission factors are not available. This approach is used to estimate the GHG emission in general by analyzing the emission based on fuel consumption.

Applying Scope 1 emission estimation requires the following for each source category and fuel:

- Data on the amount of fuel combusted in the source category
- Emission factors

In general, GHG emissions based on fuel used is the product of fuel consumption and emission factors of the fuel source as demonstrated in Equation below:

$$\text{GHG Emission}_{\text{GHG, fuel}} = \text{Fuel Consumption}_{\text{fuel}} \times \text{Emission factor}_{\text{GHG, fuel}}$$

⁸⁶ 2021 Lao PDR's Revised Nationally Determined Contribution (NDC). 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)

⁸⁷ Calculation for the emission factor for electricity generation in Lao PDR (2010). Retrieved from:

<http://monre.mynapcloud.com/2017/dndmcc/images/stories/pdf/calculation%20for%20the%20emission%20factor.pdf>

⁸⁸ <https://unfccc.int/climate-action/sectoral-engagement/ifis-harmonization-of-standards-for-ghg-accounting/ifi-twg-list-of-methodologies>

⁸⁹ https://unfccc.int/sites/default/files/resource/Harmonized_IFI_Default_Grid_Factors_2021_v3.2_0.xlsx

⁹⁰ <http://dcc.gov.vn/van-ban-phap-luat/1082/He-so-phat-thai-luoi-dien-Viet-Nam-2020.html>

⁹¹ <https://unfccc.int/climate-action/sectoral-engagement/ifis-harmonization-of-standards-for-ghg-accounting/ifi-twg-list-of-methodologies>

⁹² https://unfccc.int/sites/default/files/resource/Harmonized_IFI_Default_Grid_Factors_2021_v3.2_0.xlsx

Where:

- $Emission_{GHG, fuel}$ = emission of a given GHG by type of fuel (tCO₂eq)
- Fuel Consumption_{fuel} = amount of fuel combusted (litre)
- Emission Factor_{GHG, fuel} = emission factors of a given GHG by type of fuel (tCO₂eq/litre) (amount (tCO₂eq) of a given GHG emitted per one unit of fuel combusted (tCO₂eq/litre))

Source: 2006 IPCC guideline for National GHG inventories; Volume 2: Energy Chapter 2

Scope 2 GHG Emission

A similar estimation method applies for Scope 2 - indirect GHG emission from purchased electricity. Data required for Scope 2 emission estimation are:

- Data on the amount of electricity consumption
- Source of electricity and emission factor of the source
- Emissions assessment based on the type of electricity source (hence emission factors) and the amount of electricity consumption is illustrated in the equation below:

$$Emission_{GHG, electricity\ source} = Electricity\ Consumption_{electricity\ source} \times Emission\ factor_{GHG, electricity\ source}$$

- Where:
- $Emission_{GHG, electricity\ source}$ = emission of a given GHG (tCO₂eq)
- Electricity Consumption_{electricity source} = emission factors of a given GHG by type of electricity source (tCO₂eq/MWh) (amount of GHG emitted per one unit of electricity consumed)
- Emission Factor = amount of GHG emitted per one unit of electricity consumed (tCO₂eq/MWh)

Total GHG Emission

The estimate the total GHG emissions (Scope 1 and Scope 2) is the sum of Scope 1 and Scope 2 emission as equation outlined below:

$$Total\ Emission = Scope\ 1\ Emission\ (tCO_2eq) + Scope\ 2\ emission\ (tCO_2eq)$$

Avoided GHG emission

According to the GHG Protocol⁹³, avoided emissions are “*emission reductions that occur outside of a product’s life cycle or value chain, but as a result of the use of that product. Other terms used to describe avoided emissions include climate positive, net-positive accounting, and scope 4.*”

Based on the World Resources Institute (WRI)⁹⁴, attributional approaches generate inventories of absolute emissions and removals that are attributed to a given entity, such as a product, company, city, or nation.

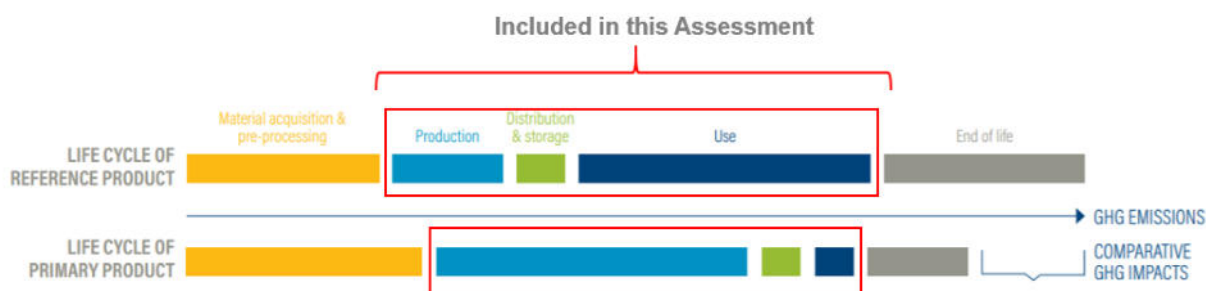
⁹³ <https://ghgprotocol.org/blog/do-we-need-standard-calculate-%E2%80%9Cavoided-emissions%E2%80%9D>

⁹⁴ WRI (2019). Estimating and Reporting the Comparative Emissions Impacts of Products

Comparative impacts are estimated as the difference between the total, attributional, life-cycle GHG inventories of a company's product (the "assessed" product) and an alternative (or "reference") product that provides an equivalent function (*Error! Reference source not found.*).

Life-Cycle Emissions of Reference Product – Life-Cycle Emissions of Assessed Product

Figure 9-61: Calculating Comparative GHG Impacts Using the Attributional Life-Cycle Assessment (LCA) Approach



Source: WRI, 2019.

In this assessment, comparative GHG impact only captures comparison of GHG emissions from pre-construction, construction and operational phases of the Project, excluding of material acquisition & pre-processing, and decommissioning. The timeframe for assessment is 28 years as per the Project's lifetime.

GHG emission from the operation of national grid is *Reference Product*⁹⁵, while GHG emission from the Project pre-construction, construction, and operation is *Assessed Product*.

Therefore, avoided GHG emissions from the Project for this assessment are estimated as:

Avoided GHG emission = Life-Cycle GHG emissions from national grid – Life-Cycle GHG emissions from the wind farm

Assumption and Limitation

It is noted that GHG data in this report cannot yet be used for official GHG inventory reporting⁹⁶ until the site is operational and actual operation data would be used for a more precise GHG inventory calculation.

The GHG calculation methodology for the Project's GHG emissions has been formulated using suitable calculation methodologies sourced from the 2006 Intergovernmental Panel on Climate Change (IPCC)⁹⁷. These methodologies can be replicated for the GHG inventory when the Project becomes operational. In this chapter, some assumptions made include the following:

⁹⁵ Based on an assumption that the majority of GHG emission from national grid is from operational phase

⁹⁶ Official GHG inventory reporting includes Sustainability Reporting, CEGDP, DJSI or other nationally relevant greenhouse reporting schemes.

⁹⁷ IPCC Guidelines for National GHG Inventories (2006). Retrieved from: <https://www.ipcc-nggip.iges.or.jp/public/2006gl/>

- Equator Principles (July 2020)⁹⁸ Principle 2: Environmental and Social Assessment stated:

“GHG emissions should be calculated in line with the GHG Protocol⁹⁹ to allow for aggregation and comparability across Projects, organisations and jurisdictions. Clients may use national reporting methodologies if they are consistent with the GHG Protocol. The client will quantify Scope 1 and Scope 2 Emissions.”

Therefore, quantification of GHG emissions for the Project considers Scope 1 (direct emissions from the facilities owned or controlled within physical Project boundary) and Scope 2 (indirect emissions associated with the off-site production of energy used by the Project), and excludes other indirect Scope 3 emissions (for definitions of scopes, please refer to the section below and GHG Protocol¹⁰⁰).

- This assessment focuses on CO₂, CH₄ and N₂O emissions because these are the most prevalent GHGs emitted from power production industry.
- The assessment covers pre-construction, construction (3 years), and operational (25 years) phases, totaling to an assessment period of 28 years.
- GHG emission during and post decommissioning has not been taken into account in this assessment, as the Project is a build-operate-transfer model and therefore will continue to be operated by the Government of Lao PDR or other entities.
- GHG emission due to vegetation clearing of the Project is assumed for the Project period of 28 years;
- It is assumed, given the nature of this renewable energy Project, that the combined Scope 1 and Scope 2 emissions of the Project are not exceeding 100,000 tonnes of CO₂ equivalent annually. Therefore, required by the Equator Principles (July 2020) an alternatives analysis evaluating lower GHG intensive alternatives and consideration of relevant Climate Transition Risks (as defined by the Task Force on Climate-Related Financial Disclosures (TCFD))¹⁰¹ would not be needed as the Project does not exceed this GHG emissions threshold.

9.6.1.4 Additional Mitigation, Management, and Monitoring Measures

The following mitigation measures will be put in place for the Project during **pre-construction** to reduce GHG emissions:

- The planned area for vegetation clearance plan linked to the construction works need to be clearly determined and demarcated by landmark to avoid accidental clearance. Site clearance plan should be prepared to identify areas that will be retained with natural vegetation within the Site's boundaries.
- Clearing vegetation outside of designated areas will be prohibited for Project staff, workers, all contractors and personnel engaged or associated with the Project, with sanctions, including fines and dismissal, and prosecution under the relevant laws for clearing vegetation
- The Project should consider carbon offsetting for lost vegetation to the Project forest clearing such as re-forestation in other areas.

⁹⁸ Equator Principles (July 2020). Retrieved from: <https://equator-principles.com/wp-content/uploads/2021/02/The-Equator-Principles-July-2020.pdf>

⁹⁹ The GHG Protocol is based on a comprehensive globally standardised framework to measure and manage greenhouse gas (GHG) emissions from operations. Available from ghgprotocol.org.

¹⁰⁰ GHG Protocol available at: ghgprotocol.org.

¹⁰¹ <https://www.fsb-tcf.org/>

- The following measures will be put in place for the Project **during construction** to reduce GHG emissions;
- Use high fuel efficient machineries and engines, and develop and implement preventive maintenance plan for machines, and engines to ensure combustion efficiency.
- Develop vehicle maintenance plan and transport planning for construction to avoid unnecessary trips.
- Ensure that construction work is done within designated construction areas and avoid trees removal outside of construction area.
- Develop rules to prevent burning of waste within the construction area by Project workers.

The following mitigation measures will be put in place for the Project **during operation**:

- It is proposed to undertake an annual GHG inventory to monitor the GHG emissions according to the applicable requirements (i.e. ADB SPS, EP III and IFC).
- Replant trees in area where clearance and levelling work were undertaken during pre-construction and construction.

Where feasible, arrange emissions offsets, including flexible mechanisms under the United Nations Framework Convention on Climate Change (UNFCCC) and the voluntary carbon market, including reforestation, and afforestation. The Project may participate in forest protection of Dak Cheung and Sanxay districts in collaboration with relevant governmental agencies and local communities.

9.6.1.5 Residual Impact Significance

After total amount of GHG emissions of the Project life-cycle are estimated, the significance of potential impacts to GHG during pre-construction, construction and operation are assessed in the following sections.

During pre-construction, construction and operation, the Project will emit 1,816.96 tCO₂eq/year, 2,391.55 tCO₂eq/year and 234.27 tCO₂eq/year, respectively, which are considered insignificant compared to the country's GHG emission of 24,099,000 tCO₂eq in 2014 (approximately 0.008%, 0.01% and 0.001%, respectively). The impacts of Project's GHG emissions on climate change have been assessed as negligible for all Project phases (pre-construction, construction and operation). With additional mitigation measures adopt by the Project, the Project's impact on climate change will be further reduced.

Additionally, the Project will have positive impact on climate change by contributing to avoided GHG emission of 630,740.73 tCO₂eq annually, which would be 16.91% compared to the Energy sector's contribution to GHG emissions, and 2.62% compared to the net annual country emissions. Impacts Assessment for Pre-construction Phase

The impact of the Project's impact on climate change during pre-construction phase could be assessed in accordance to the amount of impact during the pre-construction period, as provided in *Error! Reference source not found.*

Table 9-87: Impact Assessment for Project's Impact on Climate Change during Pre-construction

Significance of Impacts			
Impacts	Potential impacts on climatic condition due to GHG emissions.		
Impact Nature	Negative	Positive	Neutral

Significance of Impacts

	Potential impacts to climate would be considered to be adverse (negative).				
Impact Type	Direct	Indirect		Induced	
	Potential impacts would likely be direct impacts through the release of emissions from fuel combustion (stationary and mobile combustion).				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	Many of the major GHGs can remain in the atmosphere for tens to hundreds of years after being released.				
Impact Extent	Local	Regional		International	
	GHGs are a global emission and may affect the global climate.				
Impact Scale	The emissions from the Project are calculated to be 1,816.96 tCO ₂ eq per year during pre-construction, compared to Lao PDR's GHG release of 24,099,000 tCO ₂ eq in 2014, the total GHG releases from the Project are insignificant (approximately 0.008%).				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Minor emissions of GHG will be emitted as a result of the Project construction, and considered insignificant emissions according applicable international standards. Magnitude is considered Negligible .				
Sensitive Receptor	Low	Medium		High	
	The direct receptor to GHG is the global atmosphere. The greenhouse effect is enhanced by GHG emissions of anthropogenic nature. Minor emissions of GHG will be emitted as a result of the Project, and not likely to significantly change atmospheric GHG concentrations. Receptor sensitivity is rated as Low .				
Impact Significance	Negligible	Minor	Moderate		Major
	The combination of a Low resource sensitivity and Negligible impact magnitude will result in an overall Negligible potential impact.				

Impacts Assessment for Construction Phase

The impact of the Project's impact on climate change during construction phase could be assessed in accordance to the amount of impact during the construction period, as provided in *Error! Reference source not found.*

Table 9-88: Impact Assessment for Project's Impact on Climate Change during Construction

Significance of Impacts

Impacts	Potential impacts on climatic condition due to GHG emissions.			
Impact Nature	Negative	Positive		Neutral
	Potential impacts to climate would be considered to be adverse (negative).			
Impact Type	Direct	Indirect		Induced
	Potential impacts would likely be direct impacts through the release of emissions from fuel combustion (stationary and mobile combustion).			
Impact Duration	Temporary	Short-term	Long-term	
	Many of the major GHGs can remain in the atmosphere for tens to hundreds of years after being released.			
Impact Extent	Local			
	GHGs are a global emission and may affect the global climate.			
Impact Scale	The emissions from the Project are calculated to be 2,391.55 tCO ₂ eq per year during construction, compared to Lao PDR's GHG release of 24,099,000 tCO ₂ eq in 2014, the total GHG releases from the Project are insignificant (approximately 0.01%).			
Impact Magnitude	Positive	Negligible	Small	
	Minor emissions of GHG will be emitted as a result of the Project construction, and considered insignificant emissions according to applicable international standards. Magnitude is considered Negligible .			
Sensitive Receptor	Low	Medium		High
	The direct receptor to GHG is the global atmosphere. The greenhouse effect is enhanced by GHG emissions of anthropogenic nature. Minor emissions of GHG will be emitted as a result of the Project, and not likely to significantly change atmospheric GHG concentrations. Receptor sensitivity is rated as Low .			
Impact Significance	Negligible	Minor	Moderate	Major
	The combination of a Low resource sensitivity and Negligible impact magnitude will result in an overall Negligible potential impact.			

Impacts Assessment for Operation Phase

The impact of the Project's impact on climate change during operation phase could be assessed in accordance with the amount of impact during the operation period, as provided in *Error! Reference source not found.*

Table 9-89: Impact Assessment for Project's Impact on Climate Change during Operation

Significance of Impacts					
Impacts	Potential impacts on climatic condition due to GHG emissions.				
Impact Nature	Negative	Positive		Neutral	
	Potential impacts to climate would be considered to be adverse (negative).				
Impact Type	Direct	Indirect		Induced	
	Potential impacts would likely be direct impacts through the release of emissions from fuel combustion (stationary and mobile combustion).				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	Many of the major GHGs can remain in the atmosphere for tens to hundreds of years after being released.				
Impact Extent	Local	Regional		International	
	GHGs are a global emission and may affect the global climate.				
Impact Scale	The emissions from the Project are calculated to be 234.27 tCO ₂ eq per year during operation, compared to Lao PDR's GHG release of 24,099,000 tCO ₂ eq in 2014, the total GHG releases from the Project are insignificant (approximately 0.001%).				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Minor emissions of GHG will be emitted as a result of the Project construction, and considered insignificant emissions according to applicable international standards. Magnitude is considered Negligible .				
Sensitive Receptor	Low	Medium		High	
	The direct receptor to GHG is the global atmosphere. The greenhouse effect is enhanced by GHG emissions of anthropogenic nature. Minor emissions of GHG will be emitted as a result of the Project, and not likely to significantly change atmospheric GHG concentrations. Receptor sensitivity is rated as Low .				
Impact Significance	Negligible	Minor	Moderate		Major

Significance of Impacts

The combination of a Low resource sensitivity and Negligible impact magnitude will result in an overall **Negligible** potential impact.

Assessment of Avoided Emission

Based on the Guidelines for Estimating Greenhouse Gas Emission of Asian Development Bank Projects—Additional Guidance for Clean Energy Project (2017)¹⁰², the IFI CM emission factor of 0.493 tCO₂e/MWh is used for the calculation of GHG Emissions in baseline scenario. This approach results in a total avoided GHG emission of the Project throughout its life-cycle is **20,974,868.35 tCO₂e** as shown in *Error! Reference source not found.* This is a significant amount of avoided GHG emissions signifying the benefit of low carbon electricity production through wind farms, however as mentioned above, the avoided emissions are used only to compare emissions between typical grid electricity production and the electricity production from the Project, and do not signify any actual GHG emission reduction.

It is noted that alternative emission factors are available for the calculation. The IGES (2021) provides an average CM of 0.602 tCO₂e/MWh for Vietnam grid. Bases on this IGES' emission factor, the Project would avoid GHG emission of 25,690,350 tCO₂e/year. However, ERM recognize that the IFI approach is in line with ADB's guideline and provides the most updated and standardized emission factor. Therefore, it is deemed the most appropriate for the calculation of GHG emission avoidance.

Table 9-90: Estimation of Avoided GHG Emission

Scenario	Source of Emission	Years	CO ₂ eq emission (tCO ₂ e)	Rationale
GHG Emissions in baseline scenario in the absence of the Project	Electricity generation from the national grid	25	21,038,775.00	Without the wind farm, the grid will need to generate 1,707 GWh/year or 1,707,000 MWh/year. Emission factor for the Viet Nam grid is 0.493 (tCO ₂ /MWh) (IFI combined margin, 2020). Therefore, total emission of 1,707,000 (MWh) x 0.493 (tCO ₂ /MWh) x 25 (years) would have been emitted by the electricity generation by the grid. ¹⁰³
GHG Emission in the Project scenario	Pre-construction	NA	50,875.00	Section 9.6.1
	Construction	3	7,174.65	Section 9.6.1
	Operation	25	5,857.00	Section 9.6.1

¹⁰² [Guidelines for Estimating Greenhouse Gas Emissions of Asian Development Bank Projects: Additional Guidance for Energy Projects \(adb.org\)](#)

¹⁰³ Based on assumption that the majority of emission is from operation phase

Scenario	Source of Emission	Years	CO ₂ eq emission (tCO ₂ e)	Rationale
	Electricity generation	25	0	Wind farm is renewable energy, thus electricity production process does not emit GHGs
Avoided Emission		28	20,974,868.35 (749,102.44 tCO ₂ eq/year)	(GHG emission from national grid) – (GHG emission from the Project (wind farm)) over an assessment period of 28 years (pre-construction, construction and operation phases of the Project)

Result Comparison to GHG Emissions in Lao PDR

According to the draft of the First Biennial Update Report (2020)¹⁰⁴, the GHG inventories showed that the net national emissions was 24,099.98 GgCO₂eq (24,099,000 tCO₂eq) in the inventory year, 2014. Agriculture, Forestry and Other Land Use (AFOLU), especially forest remaining forest, cropland remaining cropland and lands converted to forest had a capacity to remove equivalent to about 13,000 GgCO₂eq/year (13,000,000 tCO₂eq/year). AFOLU sector had net emissions of 18,793.41 GgCO₂eq/year (18,793,410 tCO₂eq/year), which was the largest source of emissions, accounting for about 78% of the total country's GHG emissions. Second largest source of emissions was the Energy Sector, which emitted 3,729.42 GgCO₂eq/year (3,729,420 tCO₂eq/year) (15% of the country's emissions). Other IPCC sectors, industrial processes and product use (IPPU) and Waste accounted for 5% and 2% of the national emissions, respectively.

The evidence presented in this chapter indicated that the **annual GHG emission of 2,282.38 tCO₂eq** from the Project (refer to *Error! Reference source not found.*) are expected to account for approximately 0.010% of the total GHG emission produced by Lao PDR annually, and approximately 0.061% of the GHG emissions produced by the Energy Sector annually. Therefore, the Project's contribution to national and Energy Sector emission is considered **negligible**.

Moreover, the Project's contribution to **avoided GHG emission of 749,102.44 tCO₂eq annually** (*Error! Reference source not found.*) would be 20.09% compared to the Energy sector's contribution to GHG emissions, and 3.11% compared to the net annual country emissions. Therefore, it can be concluded that **the Project will contribute to the country's GHG emission mitigation efforts**.

9.6.2 Risks from Climate Change

The objective of a climate change physical risk assessment is to understand the physical threats in terms of climate driven natural hazards likely to affect the said project.

¹⁰⁴ Ministry of Natural Resources and Environment (MONRE), Global environment Facility (GEF) and United Nations Environment Programme (UNEP). 2020. Draft of First Biennial Update Report. Retrieved from: https://unfccc.int/sites/default/files/resource/867493251_Lao%20Peoples%20Republic-BUR1-1-Draft%20Biennial%20Update%20Report-BUR_Lao%20PDR_24July2020.pdf

Accordingly, this assessment was performed with an aim of qualitative evaluation of the natural hazards likely to affect the said projects under present (baseline) and future scenarios (climate change scenarios) of projected greenhouse gas emissions.

This assessment was conducted in accordance with the requirements of The Equator Principles. The Equator Principles Financial Institutions (EPFIs) support the objective of the 2015 Paris Agreement and recognize that EPFI's have a role to play in improving the availability of climate related information, such as the Recommendations of the Task Force on Climate Related Financial Disclosures (TCFD¹⁰⁵) when assessing potential transition and physical risks of the projects financed under the Equator Principles. Equator Principles states that the Climate Change Risk Assessment should be aligned with Climate Physical Risk and Climate Transition Risk categories of the TCFD (Equator Principles 2020).

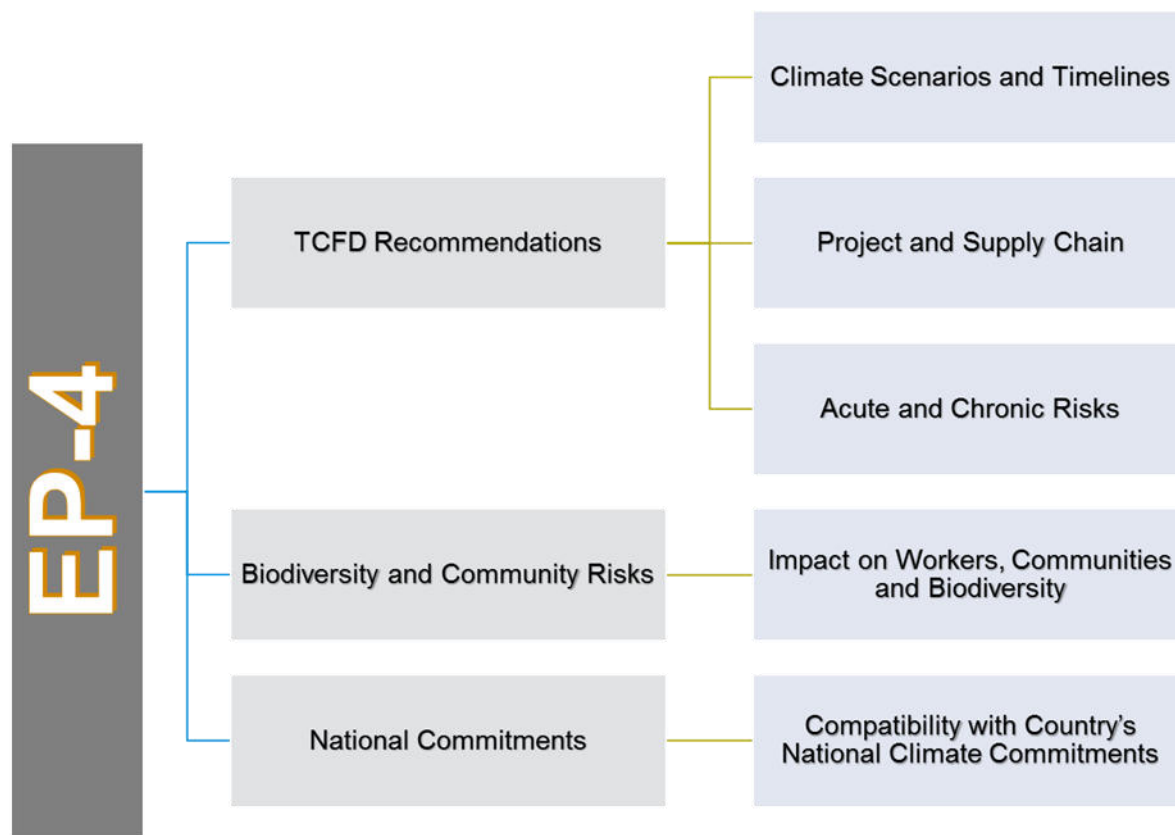
EP-4 is a risk management process that facilitates the process of determining, assessing and managing environmental and social risks risk in financing major projects. It provides a minimum standard for due diligence to support responsible risk decision making. The key features of EP-4 which relate to physical risk assessment are summarised below-

- The framework recognizes the importance of biodiversity, human rights, and climate change. As per EP-4, negative impacts on project that affects ecosystem, communities, and the climate should be avoided where possible. If these impacts are unavoidable, then the process considers how these can be minimized, mitigated and/or offset.
- In reference to climate change, the EP-4 recommends the developer to include assessment of potential climate change risks as part of ESIA or other assessment. The depth and nature of the climate change risk assessment is reported to depend on the type of Project as well as the nature of risks, including their materiality and severity. Further, climate risk assessment is required to be aligned with climate change physical risk and climate transition risk categories of the TCFD. Additionally, the climate risk assessment is required to consider the Project's compatibility with the host country's national climate commitments, as appropriate.
- TCFD recommends assessment of financially material climate related physical risks including acute and chronic risks over different relevant time horizons and scenarios including 2°C or lower scenario. The assessment may include impacts on products and services, supply chain and/or value chain, adaptation and mitigation activities, investment in research and development, and operations.

Figure 9-62 provides an overview of EP-4 in relation to the physical risk assessment.

¹⁰⁵ TCFD, 2017. Implementing the Recommendations of the Task Force on Climate-related Financial Disclosures. Available at: <https://www.fsb-tcfd.org/wp-content/uploads/2017/06/FINAL-TCFD-Annex-062817.pdf>

Figure 9-62: Key Components of EP-4 Related to Physical Risk Assessment



This assessment was conducted with the following objectives.

- Evaluate and identify the potential hazards to the Project arising from current and future climate variables for the site and the supply chain network;
- To understand the likely implications of these hazards on proposed project, communities and ecology in the surrounding area;
- To assess any implication of the project which may exacerbate climate change impacts on climate change of communities and ecology; and
- To evaluate how the present project considerations can accommodate potential impacts of climate change in terms of physical risks.

9.6.2.1 Area for Assessment

The Area of Assessment for the Climate Change Risk Assessment (hereinafter referred to as 'CCRA') was selected based on the TCFD's recognition that physical risk can have a wide range of financial implications: supply chain disruption, impacts on availability of raw material and other natural resources, etc.

Accordingly, the study area was selected to include the major project components from all Assets as presented in **Table 9-91**, while all Key Assets were included in one single Study area.

Table 9-91: Key Project Assets

Study Area	Assets	Major Components
Wind Turbines concession area, transmission line route, and access roads	EN-171/4.5-MW	<ol style="list-style-type: none"> 1. Wind Turbine (WTG) 2. Inverter 3. Transmission Lines and Towers 4. Storage Room 5. Site Office 6. Access Road

9.6.2.2 Potential Risks

Overview of Climate Change Physical Risks in Laos DPR

Natural Hazards Profile

Lao is vulnerable to a wide range of natural disasters. Floods, including flash floods, severe storms, monsoons, and landslides are prevalent in the country. Additionally, Lao is susceptible to droughts, earthquakes, and epidemics with varying degrees of impact and severity in different regions.

The frequency of the extreme weather events in Lao PDR increased from about once every two years before 1992 to every year or even twice a year after 1992. Approximately three-fourths of the disasters in Lao PDR have been climate related. During 1966 to 2009, flooding was the most frequently occurring climate change hazard, followed by storms and drought.

Most storms are followed by severe flooding, threatening livelihoods almost every year, and with more frequent and intensified flooding in recent years. Flash floods in the northern mountainous areas are common (such as in the Project Area). Flooding has an adverse impact on housing, health and education, industrial activities, and infrastructure.

Lao PDR is also experiencing increasingly frequent episodes of drought, with shortages or delays in rainfall contributing to water stress. Severe droughts occurred in 1996, 1998 and 2003. It is estimated that 6 out of 17 provinces are already at high risk of droughts.

Climate Change Projections

As reported in Lao PDR's Country climate profile¹⁰⁶, climate change projections indicate a fairly quick and drastic change in the spatial distribution of bioclimatic conditions across the northern and mountainous regions of the country (in which the Project is located). A significant warming and modification of rainfall patterns is predicted for 2030, with further intensification in these trends by 2060.

Temperatures are projected to increase across the country as well as in the Lower Mekong Basin and across seasons. By 2060, the average annual temperature basin-wide increase could be as low as 0.1°C or as high as 4.0°C depending on the global emissions trajectory and pattern of changes that follow.

¹⁰⁶ <https://climateknowledgeportal.worldbank.org/sites/default/files/2021-06/15505-Lao%20PDR%20Country%20Profile-WEB.pdf>

Rainfall could increase or decrease with significant variation in the magnitude of change and the location of impacts. Average change in rainfall by 2060 under the dry and high emission scenario is projected to be 1.7%, under the wet, and high emission scenario up to +6.0% in the most part of the country.

Climate Change Risks in Lao PDR

Eckstein (2021)¹⁰⁷ ranked Lao PDR 45th based on overall climate risk. Lao PDR's rank based on fatalities per 100000 inhabitants was evaluated to be 28, rank based on losses in million USD was evaluated to be 86, and rank based on losses in GDP as percentage was evaluated to be 66. The ranking was developed based on evaluation of data from 180 countries. This indicates that Lao PDR falls within top 30% of the countries in the world with highest exposure to climate related physical risks.

Climate Change Risks to Wind Farms

Climate change is causing more frequent and more severe extreme weather events, increasing the likelihood of critical coping thresholds being exceeded. Wind Energy projects may suffer infrastructure damage, project delays and constraints on water supplies, lost production/ generation, power supply transmission disruption, and variability in energy generation. Threats to health and safety of employees, business reputation, violation of regulatory standards, social license to operate and financial disruptions may become more prevalent. **Table 9-92** presents the potential impacts of different climatic parameters on a typical wind energy project.

Table 9-92: Potential Impacts on Wind Energy Sector

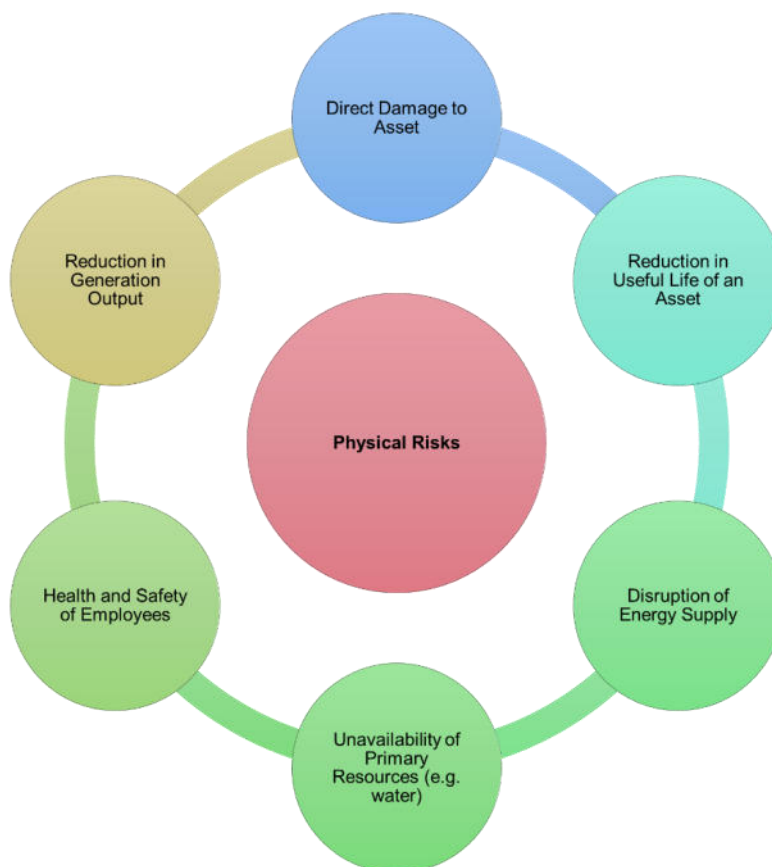
Wind Power	
Wind speed	<ul style="list-style-type: none"> • Changes in wind speed can reduce generation (turbines cannot operate in very high or very low winds) • Within operational wind speeds, output is greatly affected by wind speed. • Changes in wind patterns and duration affect output (e.g., ability to forecast output)
Air temperature	<ul style="list-style-type: none"> • Changes in extreme cold periods can affect output (e.g., through turbine blade icing)
Storm surges	<ul style="list-style-type: none"> • Damage to offshore wind farms
Extreme events	<ul style="list-style-type: none"> • Damage to infrastructure • Difficult access to offshore locations (e.g., for maintenance)

Source: ADB (2013), *Guidelines for Climate Proofing Investment in the energy Sector*

Figure 9-63 presents the general risks on wind energy projects as a result of climate change. Anticipated impacts of these changes in climate were reported to be flooding, damage to building construction, disruption of energy transmission, increased insurance premiums, higher operating costs, early retirement of assets, decreased production capacity, and high variability in availability of water.

¹⁰⁷ David Eckstein, Vera Kunzel, and Laura Schafer, Global Climate Risk Index. 2021.
https://germanwatch.org/sites/default/files/Global%20Climate%20Risk%20Index%202021_2.pdf

Figure 9-63: General Risks from Climate Change to Wind Farms



ADB's Guidance on Climate Proofing Investment in Energy Sector

Energy production and distribution can be highly vulnerable to impacts of climate change through various phases of the project including designing, construction, and operations. Insufficient attention to these impacts may result in increased long-term costs of energy sector investments and reduce the benefits that these investments could deliver.

Therefore, ADB published a guidance document on Climate Proofing of Investment in Energy Sector in May 2013, with an aim to assist its developing member countries (DMC) to enhance the climate resilience of vulnerable sectors including energy sector¹⁰⁸.

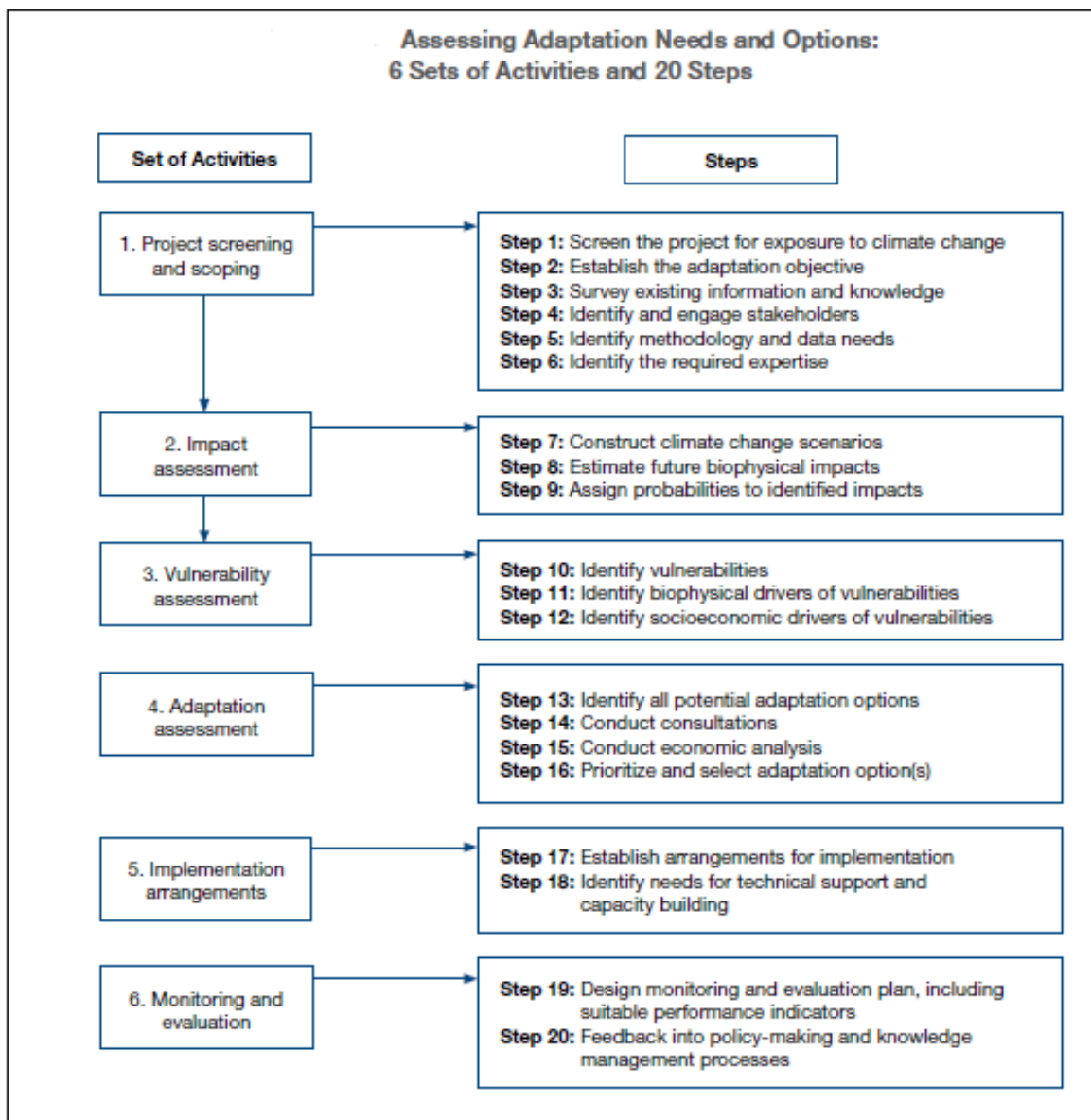
A climate change assessment is deemed to be best integrated into the activities of the project at concept stage. The methodological approach for Climate risk screening and scoping presented in this Guidelines for building adaptation into energy investment projects is divided into six different sets of activities as presented in **Figure 9-64**. The process begins with scoping the project and defining the assessment and its objectives. The core activities related to project design fall under impact assessment, vulnerability

¹⁰⁸ <https://www.adb.org/sites/default/files/institutional-document/33896/files/guidelines-climate-proofing-investment-energy-sector.pdf>

assessment, and adaptation assessment. Finally, the process ends with defining implementation arrangements and monitoring frameworks.¹⁰⁹

However, the scope of present assessment is limited to screening level assessment of natural hazard and climate change physical risks as presented in. The screening level assessment is followed by identification of high level implications of the climate related physical risk on the project.

Figure 9-64: Climate Change Risk Assessment Methodology

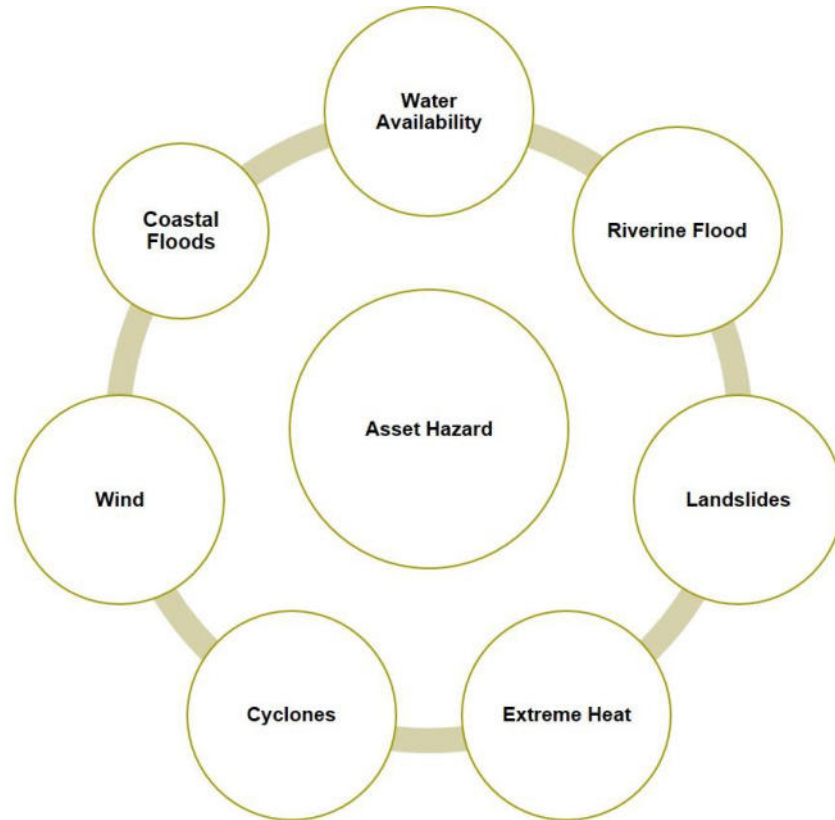


¹⁰⁹ <https://www.adb.org/sites/default/files/institutional-document/33896/files/guidelines-climate-proofing-investment-energy-sector.pdf>

Approach

The assessment in general starts with the collection of geospatial information for the Study Area to be assessed. Present study aims at evaluation of natural hazards which are likely to be experienced along various roads under the purview of Project Astro (**Figure 9-65**).

Figure 9-65: Hazards Evaluated in this Assessment



Based on the geospatial information, baseline natural hazards and the climate change projection data was collected and collated. It should be noted that the present assessment utilizes data sources which are readily available as open source. A brief description of the various steps performed in this study is provided below.

- Task – 1A: The first step focuses on evaluation of historical data on natural hazards in the area of interest to evaluate the existence and magnitude of identified natural hazards. This assessment was performed qualitatively based on the availability of historical data. The potential impact of each natural hazard was evaluated on a scale of three levels categorized as **Low, Medium, and High**. The hazard categorization was based on the potential impact on built and natural environment considering intensity/ magnitude, and/or frequency of the hazard in the region.
- Task – 2A: The second step constitutes evaluation of climate change projections to assess the extent of changes in climatic variables such as precipitation, and temperature. This provided information on any significant changes in temperature and precipitation in the upstream of the Site which may have impact on the Site operations in future.