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**LAO PEOPLE'S DEMOCRATIC REPUBLIC
PEACE INDEPENDENCE DEMOCRACY UNITY PROSPERITY**

MINISTRY OF ENERGY AND MINES



ELECTRICITE DU LAOS

**Initial Environment Examination (IEE)
for
Ban Hat to Lao-Cambodia Border 230 kV Transmission Line Project**

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ADB	Asian Development Bank
AP (APs)	Affected Person(s)
CCEM	Central Committee for Ethnic Minorities
DAFEO	District Agriculture and Forestry Extension Office
DOE	Department of Electricity
DOF	Department of Forestry
DPA	District Protected Area
DPRA	Development Project Responsible Agency
EDL/EdL	Electricite'du Laos
EA	Environmental Assessment
EIA	Environmental Impact Assessment
EMO	Environmental Management Office
EMMP	Environmental Management and Monitoring Plan
EMU/EMMU	Environmental Management (and Management) Unit
FAO	Food and Agriculture Organization
FRCDD	Forest Resource Conservation Division
GOL	Government of Lao PDR
GPS	Geographic Positioning System
ICB	International Competitive Bidding
IEE	Initial Environmental Examination
IUCN	International Union for the Conservation of Nature
LECS	Laos Expenditure and Consumption Survey
MAF	Ministry of Agriculture and Forestry
masl	Metres above sea-level
MOIH (MIH)	Ministry of Industry and Handicrafts
MCTPC	Ministry of Communications, Transport, Post and Construction
MEM	Ministry of Energy and Mines
NAFRI	National Agriculture and Forestry Research Institute
NBCAs	National Biodiversity and Conservation Areas
NGO	Non-Governmental Organization
NGPES	National Growth and Poverty Eradication Strategy
NSC	National Statistical Centre
NTFPs	Non-Timber Forestry Products
PAFO	Provincial Agriculture and Forestry Office
PDR	People's Democratic Republic (Lao PDR)
PEMC	Project Environmental Management Committee
PPAs	Provincial Protected Areas
PRP	Preliminary Resettlement Plan
RAP	Resettlement Action Plan
RoW (ROW)	Right of Way (of a transmission corridor)
RP	Resettlement Plan
SIA	Social Impact Assessment
SSAFE	Sustainable Society, Agriculture, Forestry and Environment Consult Company
Swidden	A term used for "slash-and-burn for Cultivation" as practiced in Laos.
TL	Transmission Line
UNDP	United Nations Development Program

UXO	Unexploded Ordinance
VFO	Village Forest Organization
VTE	Vientiane Capital City
WCMC	World Conservation Monitoring Center
WCS	Wildlife Conservation Society
WREA	Water Resource and Environment Administration
WWF	World Wildlife Fund

Initial Environmental Examination (IEE)

Ban Hat to Lao-Cambodia border 230 kV Transmission Line Project

INTRODUCTION

This Initial Environmental Examination (IEE) Report has been updated based on the IEE of Ban Hat-Stung Treng 115 kV Transmission Line prepared in 2006, which was approved and certified by WREA in April 2007.

With requirement of more power to Cambodia, Lao government is requesting World Bank to support upgrading from 115 kV to 230 kV power transmission line project.

The team of SSAFE Consultant with assistants of Environment Office of EdL, Khong district and Department of Energy and Mines of Champasack province was carried out the field re-survey in September and December 2010 in order to verify and obtain the confirmation from the new and old owners of impacted assets and local authorities. The change of environmental and social impacts was investigated, considered and assessed in accordance with GoL guidelines requirements.

1 Background

Power Trade in the Greater Mekong Sub-region is presently limited to a few bilateral agreements, relatively small in scale. However, the region is stepping on to a new stage with the formation of the Region Power Trade Coordinating Committee (RPTCC) in 2004 and significant process in a number of proposed regional investments. Despite these developments, integration of the national power networks is expected to happen gradually over the medium to long term, and for the foreseeable future trade will occur on the basis of bilateral trade arrangements.

The Power Trade Import and Export Study funded by Policy and Human Resource Development Fund (PHRD Fund) through the World Bank, is the first step toward ensuring that these arrangements are rationally developed and financed in Lao PDR. One of the measure components of Power Import and Export Study is to complete the feasibility study of interconnection from the southern region of Lao PDR to the northern part of Cambodia in order to replace local high-cost diesel generation in Cambodia with Lao hydropower. The Bank is considering to finance the interconnection, Ban Hat to Lao-Cambodia border 230 kV Transmission Line Project.

Ban Hat – to Lao-Cambodia border 230 kV Transmission Line Project, would be the first project by the Lao government to supply the power to Cambodia for the high voltage. Once completed it would not only foster further friendship, but it would also bring mutual benefits and better socio-economic conditions to the people on both sides of the border.

To realize the above objectives and commitment while at the same time ensuring that the environmental and socio economic conditions of the project area are protected or preserved, TEPCO was engaged by World Bank to carry out the Initial Environmental Examination (IEE) study of 115 kV Transmission Line in 2007 and now for proposed 230 kV, Initial Environmental Examination (IEE) will have to update accordingly.

This report presents the IEE results of Laos side of the Ban Hat to Lao-Cambodia border 230 kV Transmission Line Project, reflecting the above environmental regulatory requirement for power project development, in accordance with the local and international Environmental Protection Law, Regulations and Guidelines.

- **Name and Address of Project Owner**

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2 Description of the project

2.1 Objectives of the Project

Under support of the GMS power trade project of WB, the objectives of this project are to extend the electrical grid in southern Lao PDR and to export power to Stung-Treng Province in northern Cambodia, providing stable electricity with reasonable price. This will meet GOL's policy in rural electrification in southern Laos and at the same time strengthen the power export sector in Lao PDR.

In addition to an increase in export earning and local economic growth, the transmission line would also bring about a sense of cooperation, friendship, mutual understanding among the government and the people on both sides of the border.

2.2 Need for the Project

Lao PDR has one of the least developed economies in Southeast Asia with average annual income of about US\$ 290 per capita, and has limited resources except hydropower potentials. Therefore, the promotion of hydropower to export electricity to neighboring countries is one of the GOL's policies to obtain foreign currency.

On the other hand, there is currently no electricity supply, but the installation of a diesel engine at the maximum output of 5 MW is underway under construction in Stung Treng Province in Cambodia. In order to recover the operation costs of such diesel engines, the tariff is likely to be set at a considerably high level. Also, the reliability of electricity supply by single unit of the diesel engine seems meager. By transmitting the power produced in the southern Lao PDR, which has significant hydropower potential resources, it will drastically save the overall generation cost and improve the quality of power supply in Stung Treng and other provinces in Cambodia.

Therefore, this project will meet the needs of both countries, Lao PDR and Cambodia, and promote the economic and energy cooperation in the region.

2.3 Scope of the Project

This project consists of mainly two construction works. One is construction of 230 kV transmission line from Ban Hat Substation to Stung Treng Substation in total length of about 82 km. Responsibility of Laotian side is between Ban Hat Substation and the Lao-Cambodia

boarder in length of 27.09 km. The alignment generally follows existing National Road No. 13 South and mostly locates on the Eastern side of the road. During construction, 40 m width clearance (trees, bushes and remove 2 paddy field' huts) along the transmission line Right-of-Way will be carried out. Trees, if any higher than 3 meters, along the transmission line Right-of-Way will be removed.

Another work is expansion of the existing Ban Hat Substation to connect the above mentioned transmission line.

During the operation of the transmission line, periodic inspection and maintenance work will be done.

2.4 Project Study Area

The project study area covers approximately 275 ha – with 100 m wide strip and stretches 27,56 km long, encompasses 1,973 households with total population of 10,728 in 8 villages within Khong district, Champasak province *see Table 1*.

The project area constitutes various types of land-use and forest as shown in detailed in Tables 4 and Figure 1. Project location has been shown in the Map.

Figure 1: Map shows the Location of the Project

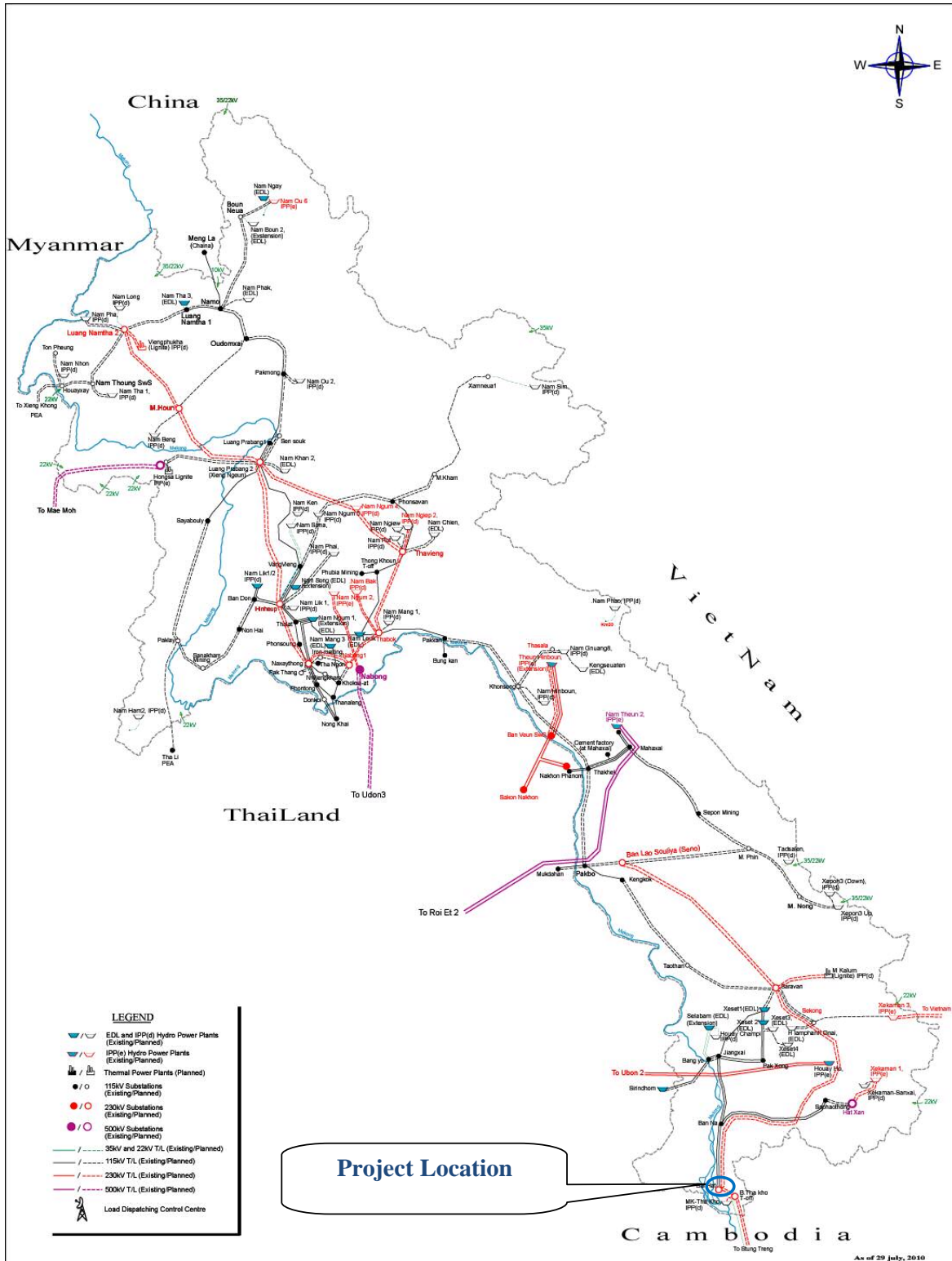
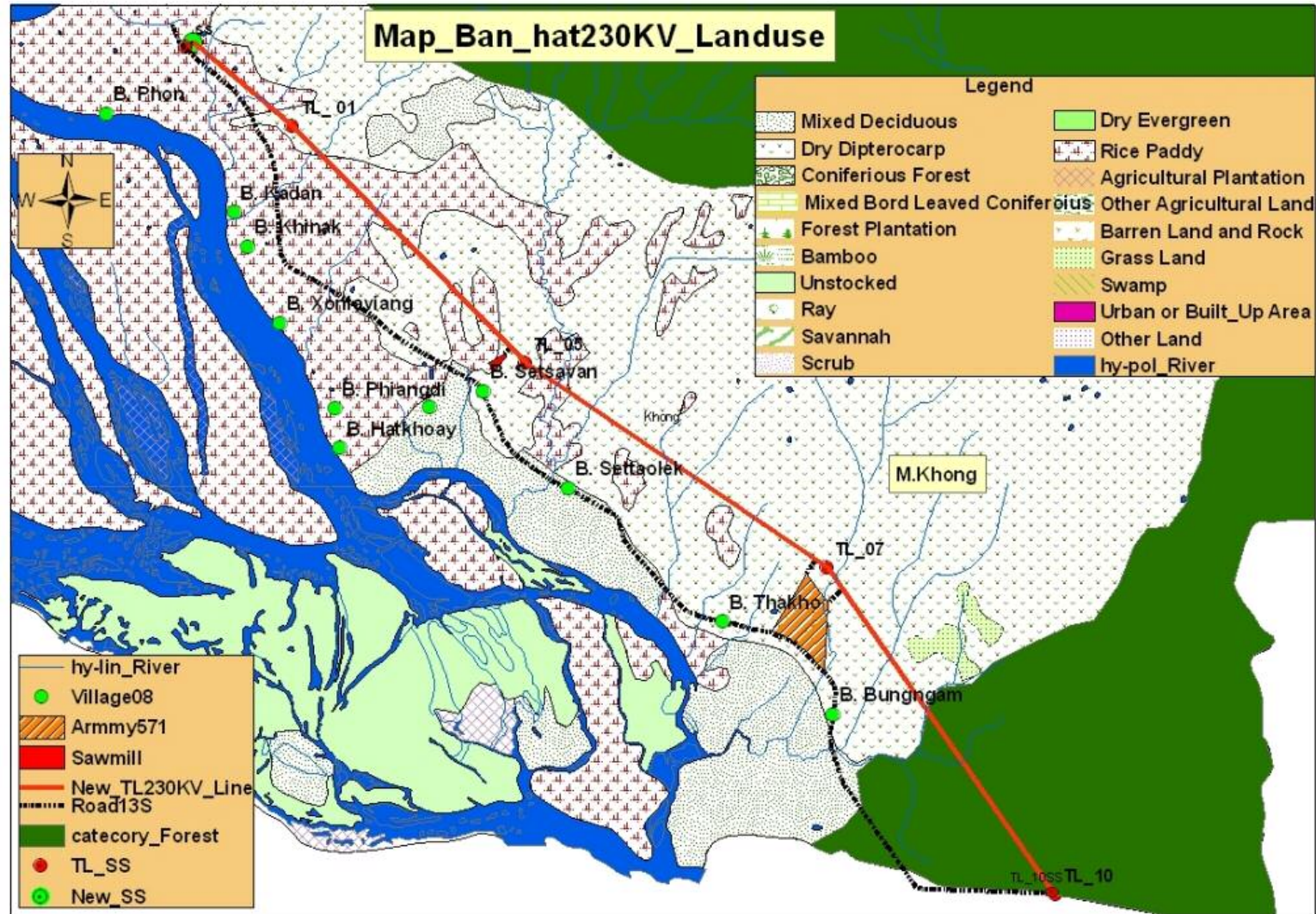


Figure 2: Map shows the Location of the Project



2.1. Project Activities, Timing/Sequence/Construction Period

The details project activities are as follow:

- a). Detail Design Stage: (2.5 months)
- b). Bidding and Selection of Contractors: (6 months)
- c). Construction of transmission line (TL): (12 months)
- d). Substation Facilities: (will be started at the same time with TL works)

2.2. Quantity and Quality of Raw Material to be used

The following are land areas and other materials required for the implementation of the Project:

- Approximately 110 ha of land (40 m wide and approximately 27.56 Km long) along 230 kV Right-Of-Way from Ban Hat sub-station to Lao-Cambodia Border. However some land acquisition is needed for tower foundation and clearance during the construction period. Trees, if higher than 3 meters, along the transmission line Right-of-Way will be removed. Cultivation of any kinds will be permitted unless the height of the produces exceeds three meters. Perennial crops such as rice, corn etc. will not have any interference to transmission line, hence their cultivation will be permitted.
- It was estimated that an approximately 2,148m² (0,214ha) of land is required for the construction of 110 tower bases (10 Angle Towers and 101 Suspension Towers, *in the case that the tower types are A1 for Suspension Tower and A2 for Angle Tower*), these lands are of permanent occupation by the project and will be compensated for. The compensation will be in accordance with the relevant GoL's policy, laws and regulations.

The Standard for each type of tower based on “*The study on Master Plan of Transmission Line and Substation System in Lao PDR, Final Report, by JICA, 2002*”.

<u>Type of Tower</u>	<u>Size of Tower base (m)</u>	<u>Land Required (m²)</u>
AT	64	640
ST	36	3,636

Remark: AT= Angle Tower

ST= Suspension Tower

All electrical components and other materials required for project construction were estimated by TEPCO in collaboration with project owner (EdL), they may include transformers, conductor wires, insulators, steel towers, concrete for tower bases, and others. The detailed quantities of materials are as follow:

- Towers 110 units
- Concrete Volume for Tower Foundations: 0.3-0.5 m³(dependent on so condition)

Complying with the Lao Electric Power Technical Standard 2004, any electrical facilities shall be installed in such a manner so as not to cause no pollution, air, water, noise, vibration, discharging of insulating oil and otherwise which may endanger the human body and damage other objects. Particularly, in this Project, any use of Polychlorinated Biphenyl (PCB) is prohibited, and use of herbicides and pesticides for clearing and controlling Right of Way (ROW) is also prohibited. Contractor must use materials, which are complied with the standard.

Please note that the land of the Ban Hat substation is belong to EDL already, So there is no need

to acquire more land.

2.3. Quantity of Waste Products generated by the Project

From previous similar projects and according to the site survey, the majority of wastes generated from the project would mainly be from clearing vegetation from the 230 kV transmission line rights-of-way. However, some of these “wastes” will not be without its usefulness. The local villagers living along the alignment could make use some of these wastes e.g. for firewood, raw materials for charcoal production, fencing component as well as using in constructions of farm buildings and animal sheds. In the case where the alignment passes through the forests (where commercial timbers are present), the trees with more than 30cm diameters will be identified, logged and sold off by the Ministry of Agriculture and Forestry -(provincial and district forestry staff), prior to the clearing is taking place. As part of the environmental protection procedure, and in order to protect surrounding forests and other natural resources, burning off is not permitted.

The other waste materials anticipated from the project is excess soil excavated from the tower foundations. It is estimated that there will be approximately 1 m³ to 1.5 m³ of soil excavated for each tower. However most of these soils will be used as back fill materials for the foundation; only minor portions will be left behind. The excess soil will be spread around the tower bases to facilitate natural re-vegetation and or use as fill in nearby depressions so as to minimize sedimentation of nearby watercourses. Overall the generated wastes are of minimal quantities, therefore will not have any adverse impact to the environment.

2.4. Project Cost

The Total Project cost is estimated at US\$ 8.5 Million, this includes:

- Transmission line: approximately US\$ 5 Million.
- Sub-station facilities: approximately US\$ 3.5 Million.
- Land and ROW Compensation is included in part of Lao (EDL) contribution.

2.5. Executing Agency

EDL is the Executing Agency for the project as well as the project owner.

Project detailed design, including detailed transmission line surveys, preparation and evaluation of tenders, and construction supervision, will be carried out by consultants in accordance with the MEM and EdL’s regulation and guidelines.

Construction of the transmission line and associated sub-station work will, likewise, be contracted out under international competitive bidding (ICB) procedure.

Management of the project will be the responsibility of the general manager of EdL, with day-to-day implementation carried out by an EdL’s project management team, under the direction of the Distribution Manager. Environmental and socio-economic aspects of the project will be the responsibility of EdL’s Environmental Management and Monitoring Unit (EMMU).

2.6. Scope of the Study

Pursuant to Lao PDR Environmental Protection Law and Environmental Impact Assessment (EIA) decree 112/PO and other concerned regulations, an initial environmental examination (IEE) (and/or EIA) is required for every project undertaken in Lao PDR. This is designed to

screen out potential for adverse impacts to natural resources, social and economic conditions of the area prior to any construction is taking place.

The scope of this study reflects the above requirements and it includes:

+ Requirement for the IEE study:

- 1) Reviewing relevant policies, legislation, regulations and guidelines regarding environmental protection and conservation, including International guidelines. Reviewing also the existing IEE of transmission line projects within EdL in order to learn some good practices.
- 2) Conducting field reconnaissance activities from 7th to 13th September 2010.
- 3) Conducting consultation with the villagers and other stakeholders such as relevant governmental agencies, village representatives. Recording all discussions and comments made by affected and other concerned people or other stakeholders.
- 4) Providing comment to the proposed alignment for the best and sound environment protection and minimizing the impacts and made recommendation to modify the alignment.
- 5) Assessing the existing physical and biological environment along the transmission line alignment. Preparing profile record of all natural conditions in the alignment right of way like water sources, rivers, protected areas in different level etc.
- 6) Identifying potential Impacts on social and natural environment related to location, design, construction, operation and maintenance.
- 7) Recommending impact mitigation measures.
- 8) Preparing Environmental Management Plan (EMP), which includes work plan, time schedule, institutional set up and budget estimation as well as internal and external monitoring plan in this IEE.

2.7. Methodology for Field Survey and Data Collection

The field survey and data collection was carried out in every affected village along the transmission line from Ban Hat Sub-station to Lao-Cambodia Border. The field survey team with total member of six personnel was formed as a unit with one unit leader (also a specialist), who together with the project team leader was in charge of all field survey activities – *Village consultation, liaison with local authorities, interviews, investigations and data collections etc..*

Prior to the arrival of the field survey units, the local district authorities of the project areas were officially notified of the objectives, the timing of the field work activities to be conducted in their districts. They were also informed about their roles and responsibilities in assisting the field survey activities of the units.

In every affected village and prior to the households or the head of the village being interviewed, all the villagers were requested to assemble, mostly at the village temple or at the residence of the village head.

At the assembly, aspects such as **what, where** and **why** was to be constructed, the potential benefits as well as the adverse impact to the environment, communities' social economic conditions and their overall livelihood. Assets relocation and compensation requirement, as well as villagers' perception of the proposed project were specifically consulted and discussed.

At all time during the consultation and discussion session, particular effort was made so the villagers were aware that the project, as proposed, was in no way an imposition to the villagers and that they had every right in determining the outcome of the project.

The primary data collection (required for the study) was obtained through the questionnaire survey of residents including chief of villages and villagers at every village who have land within potential project affected areas. All head of the villages and almost all of the head of the families or households who have affected land and houses within 25m width along the

transmission line from the first sub-station to the last sub-station were interviewed. In addition an on-site (face-to-face) interview was also conducted within the project sites. The survey focused on the attitude of local villagers, regarding the proposed project and its potential impact on current status of land and forest usage, income generation activities, land acquisition, wildlife conditions, resettlement and compensation ; current status of unexploded ordinance (UXO) as well as potential impacts on social, economic and environment.

Before conducting the field survey, list of families/households especially for those people who have been affected by the project were acquired from the head of the villages. Similarly some relevant secondary data such as total number of population, houses, households, the amount of land and name of the owners were also collected. In case of head of families/households were absent either at work or at other engagement, another reliable senior member the family would be interviewed instead. To keep the interviewee from being influenced by each other, the interview session was kept separately and private.

In terms of relevant data for Natural Environment around project affected areas, it was also collected during the field survey, this included the interview and observation such as the characteristics of water or rivers, aspect of the flora and fauna including rare or endangered species, list of protected areas, and some related data were gathered from the previous studies and/or reports and several published papers by the government agencies and the ministries concerned.

2.8. Limitations of the Study

In the process of our study and in particular the field data collections the limitations and assumptions as stated below were observed. Therefore it must be noted all the results presented in this report shall be viewed in light of these perspectives, rather than the absolute statistical information.

- The proposed transmission line alignment given was “a line” drawn on 1:100,000 topographic map there were very limited “physical” on site identification, hence making the designated alignment not very accurate to locate and consequently affecting, to a degree the accuracy of all collected data.
- The study was conducted in rainy season (September, 2010), the majority of the villagers were occupied with other activities. The study created some burdens for them and resulted in limited cooperation in our interviews as well as in a consultation sessions. Most of the interviews were conducted at the night time.
- Some of the lands in the affected area belong to owners in some distant villages; therefore it was difficult to meet, make contact and interview.

Review of literatures, laws and regulations concerned

2.1 Lao PDR Institutional and Legislation Frameworks

Measures for monitoring and managing potential environmental and socio-economic impacts have been developed based on Lao PDR legislation, regulations, decrees, standards and guidelines.

The following legislation now in force, and supporting regulations (promulgated or in draft) in Lao PDR are relevant to ensuring environmental and socio-economic issues are addressed during design, construction, and operation of the project:

- **Prime Minister’s Decree No. 164/1993** established eighteen protected areas and required that the government develop management plans for each area. Two additional

protected areas, referred to now as National Biodiversity Conservation Areas (NBCAs), have since been added. The current area totals 3.4 million hectares or 14.3% of the country's area. In addition, provinces and districts have also designated their own conservation areas and protection forests bringing the overall national total to 5.3 million hectares or 22.6% of the total land area.

- **The Electricity Law (2008)** requires that:

- ← EIAs need to be carried out on larger hydroelectric dam projects (as a minimum).
- ← Electricity projects, including transmission and distribution projects, be licensed by the GOL, and as a precondition to the granting of a license, the project demonstrate that national socio-economic development objectives will be satisfied, and that there will be no detrimental environmental impacts
- ← The licensee (in this case EdL) is responsible for ensuring that the environment is protected or damages paid for environmental degradation, and that residents are compensated in cash or in kind for lost property, diminished living conditions, relocation or resettlement.
- ← Inspection and enforcement be carried out for project activities.

In accordance with the EIA provision of the Electricity Law (2008), the Law on Environmental Protection (03 May 1999), the Environmental Protection Law Implementation Decree (04 June 2001), and the Regulation on Environmental Assessment in the Lao PDR (03 October 2000), the GOL enacted the Regulation on Implementing Environmental Assessment for Electricity Projects in Lao PDR (No: 447/MIH, dated 20 November 2001). The following noteworthy information is contained in the Regulation regarding development and review of an Initial Environmental Evaluation (IEE) for electricity projects:

- ← The Ministry of Energy and Mines, under which the Department of Electricity resides, is required to ensure that environmental assessment is included in its decision to approve, finance or undertake any type of electricity project in Lao PDR.
- ← Upon receiving a description of an electricity project from the project owner (i.e., EdL or its consultants on behalf of EdL for the Rural Power Distribution Project), the Department of Environment (DoE), which resides within the Ministry of Energy and Mines, has 30 days to complete project screening to determine whether an IEE or more exhaustive EIA is required. WREA has an additional 15 days to signify its concurrence with this decision, after which DoE has 7 days to provide the screening decision to the project owner. The content of an IEE is determined through the screening process.
- ← An IEE is prepared by the project owner, and submitted to the DoE for review and decision making. Within 7 days of receiving the IEE, the DoE must circulate the report to other line agencies, local government authorities, and the public that may be affected by the project to comment on the IEE. Government agencies and the concerned public have 30 days to provide their comments.
- ← Within 40 days of acting on the IEE report (i.e., from the date the report was submitted to the DoE by the project owner), DoE must provide a written decision on the IEE to WREA. DoE may recommend that: a) the IEE and its conclusions be revised; b) the IEE be accepted and the project approved; c) the EMP be revised; or d) terms of reference be developed for an EIA. Within 10 days of receiving the IEE, WREA must approve the IEE and issue an Environmental Compliance Certificate, agree with DoE that an EIA is required, or indicate in writing to DoE that WREA disagrees with the DoE decision.

The GOL has also enacted five additional legislative instruments (one policy and four standards) for managing environmental affairs in the power sector of Lao PDR. The first of these is the Power Sector Environmental Policy (No. 581/MIH.DOE, dated 04 October 2001), which

requires the power sector to assist the GOL in meeting its social and economic objectives by managing its activities in an environmentally responsible manner. This includes requiring appropriate environmental assessment and management be undertaken to international standards.

The environmental management standard addressing Environmental Management Documents for the Department of Electricity (No: 582/MIH.DOE, dated 04 October 2001) establishes the process for developing various environmental management documents, including environmental management standards and guidelines. This documents standard also identifies such things as the requirements for authorizing standards, consultation, and document control.

The environmental management standard addressing Department of Electricity Environmental Records Management (No: 583/MIH.DOE, dated 04 October 2001), requires that an environmental records management system be established within the Department of Electricity. The standard identifies the types and formats of environmental records that will be kept, requires that a database be created and that records be stored in one central, easily accessible location, such as the Environmental Management Unit's main office, and that record be available for borrowing during working hours.

The environmental management standard addressing Environmental Impact Assessment for Electricity Projects (No: 585/MIH.DOE, dated 04 October 2001), sets out the requirements for EIA for electricity projects in Lao PDR. The following noteworthy information is provided in the standard:

- ← An EIA cannot proceed without an Environmental Screening and an IEE being first carried out. The extent of the EIA and its content depend on the project's Environmental Screening and IEE, with the screening and IEE determining the content and terms of reference of the EIA;
- ← The contents and requirements of an EIA for an electricity project, including requirements for public involvement and development of an EMP, are specified. Regarding public involvement, the standard indicates that the process for public involvement for any follow-up EIA that may be required by a decision rendered by WREA, is scoped during the IEE. Otherwise, public involvement for an IEE is limited to the DoE requesting comments on the IEE from project affected persons.

The environmental management standard addressing Environmental Management Plans for Electricity Projects (No: 584/MIH.DOE, dated 04 October 2001), sets out the requirements for preparing EMPs for electricity projects. The standard indicates that:

- ← An EMP is to be part of a Project Screening Report, IEE report and EIA report, whichever is determined to be required for a project;
- ← An EMP must cover all environmental management measures that are to be implemented during the project's pre-construction, construction, operation and decommissioning, and is to address all significant environmental issues identified in the Project Screening, IEE or EIA, including a social action plan or resettlement action plan, if required;
- ← The EMP must be prepared so as to be able to be used as a stand-alone document for use in implementation; and
- ← A two-stage public involvement process is to be developed and implemented. The first stage is the process established for Screening, IEE or EIA, when the EMP is under development. The second stage is the process for implementation of the EMP.

- **Environmental Management Standard for Electricity Project No.0366/ MIH.DOE, (2003)** states that:

- ← Environmental screening is a preliminary assessment of a project's potential environmental impact. It is normally completed at a projects identification stage. Screening is used to decide whether a project's impacts are of a significant nature to warrant further environmental assessment.
- ← The IEE will determine the scope of the EIA. This will include the scope and plan for conducting the study to meet the requirements of an SIA.
- ← The IEE shall identify the expected social impacts of the project, and a plan to obtain the necessary information for determining the magnitude of the impact and the potential measures to avoid, minimize, mitigate or compensate for the effects.
- ← The IEE shall include the following information related to SIA:
 - Discussion of consistency with governmental regulatory requirement.
 - Brief description of the social conditions in the project area including an estimate of the number of people to be relocated, distribution of population in project area, a brief discussion of the local economy and primary source of income, the presence of significant cultural and infrastructure facilities that will be affected and a list of issues to be discussed in the SIA relative to the social conditions.
 - Preliminary plan for relocating the affected persons (Preliminary Resettlement Plan-PRP). The PRP may provide budget and technical feasibility proposals (availability of relocation sites, etc.) for more than one technical design.
 - A preliminary assessment of land acquisition requirements and a determination of whether the land required for the project fall into forest/tribal or other special areas.
 - Description of indigenous groups in the project area (if any) to include status of the population from the perspective of the GOL, significant unique characteristics of the cultural tradition of the groups, special economic resources of the group.
 - Preliminary plans for protecting and enhancing the integrity of the indigenous groups.
 - Evidence for consulting with governmental agencies, local authorities, NGOs in the project area, and the Project Affected Persons (PAPs) including name of participants, date, location, subjects discussed, discussion results, agreed conclusions, and actions to be taken.
- ← The Regulation for implementing environmental assessment for Electricity Projects requires all electricity projects in Lao PDR to be environmentally screened according to the amount of impact they will or will likely have on the environment. A project must meet the following criteria to justify no further environment assessment: *“Because of its nature, size and location, the project can be expected to have immeasurable or insignificant environmental impact on natural resources, ecological resources, public health and public welfare.*
- **Environmental Protection Law No.02/99/NA, (1999)** does the following:
 - ← Assigns the Science, Technology and Environmental Agency¹ (WREA) the rights and primary responsibilities for protection, mitigation and restoration of the environment in Lao PDR.
 - ← Defines the environmental conservation responsibilities of other GOL agencies such as the Department of Electricity, Department of Forestry, etc.

¹ Created by Decree No. 63/PM, which was superceded by Decree No. 68/PM in 1999.

- ← States that environmental conservation comes before mitigation and restoration
- ← Stipulates that those who generate an environmental impact are responsible for the resulting damage caused
- ← Directs that environmental management and monitoring units (EMMUs) be established at all levels of government, with responsibilities to include such things as: establishing and enforcing sector environmental plans; taking action to abate environmental damage; issuing orders to adjust, suspend, remove or close down activities that cause negative impacts

The Law on Environmental Protection also establishes the authority to make environmental regulations. To this end, the GOL has enacted the Regulation on Environment Assessment in the Lao PDR (No: 1770/STEA dated 3/10/2000). Key features of the Regulation include:

- ← Each Development Project Responsible Agency (DPRA) must ensure that any development project in the Lao PDR carries out EA in accordance with the content determined in this Regulation, and any regulation of its own line ministry. The Environment Assessment must include at least a Project Description to enable DPRA to perform a project environment screening under Article 7 of this Regulation. If the project is not exempt under Article 8 of this Regulation, the EA must include an Initial Environment Examination (IEE) as specified in Article 9 of this Regulation. For some projects, through the findings of the IEE, an Environmental impact assessment (EIA) is required as specified in Articles 11, 12, 13, and 14 of this Regulation.
- ← All project proposals that are submitted to a Development Project Responsible Agency (DPRA) by a project owner, and all project proposals that are prepared by a DPRA must be included a brief description of the project, which include the following information:
 - Project owner
 - Project type
 - Project size
 - Project location
 - Intended product
 - Raw materials to be used
 - Estimate of the quantity and quality of any solid, liquid, or air-borne wastes resulting from project construction or operation
 - Number and origin of project's intended labour force for construction and operation
 - Anticipated positive and negative environmental and social impacts of the project
 - Environmental mitigation measures that will be implemented during the project construction, operation and closure (if applicable).
- ← The DPRA must circulate the project proposal document to relevant government sectors and local authorities, and must consider their comments in its environmental screening decision. Line ministries may specify additional information to be required in project descriptions in their internal EA procedures.
- ← Within 30 days of receiving a project description, the DPRA must complete the screening and explain the screening decision in writing to national WREA in the case of national projects or to the Provincial, Municipal or Special Zone Science, Technology and Environment Office for local projects. Within 15 days of receiving the screening findings the respective environment office referred to above shall either notify the DPRA that it concurs with the decision, or shall instruct the DPRA to reconsider, taking into account relevant information or guidance. Within 7 days after

receiving the record of decision from the respective environment office, the DPRA must notify project owners of the result of the project screening to abide by the record of decision. The DPRA must also notify the Environmental Management and Monitoring Unit of the concerned line ministries or local administration authorities for information and monitoring purposes.

- ← For those projects found by screening to be exempt from further EA, WREA must issue an environmental compliance certificate within 15 days after receiving the screening record of decision from DPRA. There are two types of certificate; one with conditions and another without conditions. Those projects determined to be non-exempt from EA must proceed to conduct IEE.
- ← For foreign investment projects, the IEE report must be written in Lao and English. Line ministries in their internal EA guidelines may set additional requirements for the contents of IEE reports and the number of copies of reports that are to be submitted.
- ← If the IEE report concludes that no EIA is needed, an EMP must be developed within the IEE report, which must have the following contents:
 - measures to prevent and minimize environmental impacts
 - programs for environment control and monitoring
 - responsibilities, organization, schedule and budget for implementation of the EMMP and other issues that the DPRA may deem necessary for the protection of the environment.
- ← During the IEE process, if it is found that the project needs an EIA, the IEE report must contain Terms of Reference for the scoping of a subsequent EIA.
- ← The process for reviewing an IEE report and issuing an Environmental Compliance Certificate is the same for both the EA Regulation at the national level and for the Electricity Sector (see discussion on Regulation on Implementing Environmental Assessment for Electricity Projects in Lao PDR below).
- ← The IEE report and the IEE's EMMP must receive approval from the DPRA before WREA can issue the environmental compliance certificate to the project owner. For projects requiring EIA, the project owner must, during the detailed design phase, prepare the detailed EMP based on the general EMMP of the IEE already approved by WREA.
- ← The project owner is directly responsible for the monitoring and evaluation of the EMMP. The central government DPRAs are responsible for the inspection of the implementation of the monitoring and evaluation for the project environment where projects are approved at the central level.
- ← In order to ensure the effective implementation, the project must establish an environmental unit. The members of such unit may come from the company itself, hired staff, from an outside organization or be entities working on contractual basis.
- ← The project owner of the Environmental Unit must establish monthly reports on project environmental monitoring to be sent to the concerned agency(ies), which are: WREA and/or Provincial, Municipal or Special Zone Science, Technology and Environment Office, and the Environmental Management and Monitoring Units (EMMUs) of the concerned line ministries for information and supervision.
- ← WREA and/or provincial, municipal or special zone Science, Technology and Environment Office and the responsible line agency Environmental Management and Monitoring Unit retain authority to directly control project activities, in order to ensure that project owners carry out effectively and regularly their environmental protection

duties.

- **Water and Resources Law (1997)** does the following:
 - ← Classifies all catchment's areas for various uses
 - ← Promotes protection and rehabilitation of forests, fishery resources and the environment
 - ← Suggests that EIA should be carried out on large-scale water development projects, and requires that funds be provided for protecting and enhancing catchment area resources, and for resettlement compensation

- **Forestry Law (2007)** defines:
 - ← Principles and regulations on the use, management, protection, conservation and regeneration of forest resources with the aim of making forest resources a sustainable resource for supporting national economic and social development, ensuring protection and conservation of watersheds, guarding against soil erosion, and protecting plant and wildlife species and the environment
 - ← Five categories of forest (Protection, Conservation, Production, Regeneration, and Degraded)
 - ◆ *Production Forests* are forests and forestlands used in regularly providing for national economic and social development requirements and for people's livelihoods, timber and other forest products on a sustainable basis and without significant negative environmental impacts.
 - ◆ *Conservation Forests* are forests and forest lands classified for the purpose of protecting and conserving animal and plant species, natural habitats and various other entities of historical, cultural, touristic, environmental, educational or scientific value
 - ◆ *Protection Forests* are forests and forestland classified for the protection of watershed areas and prevention of soil erosion. They also include areas of forestland with national security significance, areas for protecting against natural disaster and areas for protection of the environment.
 - ◆ *Regeneration Forests* are young or fallow areas of forest classified for regeneration and maintenance of forest cover with a view reaching a natural equilibrium as trees increase in maturity.
 - ◆ *Degraded Forests* are forests that have been heavily damaged, to the extent they are without forest or barren, that are classified for tree planting and/or allocation to individuals or organizations for tree planting, permanent agriculture and livestock production or other purposes in accordance with national economic development plans
 - ◆ *Unstocked Forests* are previously forested areas in which the crown density has been reduced to less than 20% because of logging, shifting cultivation or other heavy disturbance. If the area is left to grow undisturbed it becomes forest again.

- ∞ Implementation responsibilities of the Ministry of Agriculture and Forestry (MAF) at the national level, provincial and district forestry offices, including responsibility for issuing land-use certificates at the district level

- ↻ That forest and forest land can be converted to other uses (e.g., for transmission line rights-of-way, etc.) when necessary and if in the public interest, and subject to approval from responsible authorities
- ↻ An individual or organization given permission to convert forest to another use is responsible for payment of a conversion fee, land reclamation and tree planting
- ↻ Provision for allowing long practiced activities such as collecting wood for fences and fuel, non-timber forest products (NTFP), hunting and fishing for non-protected species for household consumption, and other customary uses
- ↻ Provision for setting up a fund for activities such as protection and conversion of forests, tree planting, and forest regeneration to protect and conserve watersheds, the environment and wildlife

The issue of compensation for removal of forests is dealt with in Forestry Law. Compensation is based on the volume of timber (m³) of a given class or species of tree that will be cut down. Compensation is only paid for timber removed from private forestry plantations. No compensation is paid for timber removed from natural forests on public lands. Nor is any compensation paid for removal of any kind of NTFPs such as bamboo, mushrooms, etc. except for villagers' bamboo plantation.

There is no requirement to replant trees on degraded land located away from a transmission line corridor, as compensation for removing trees to create a transmission line right-of-way. Such forms of compensation only apply to reservoir clearing projects, where it is necessary to plant trees to stabilize slopes that could otherwise fail through a process of mass wasting.

Compensation rates range from US\$23/m³ for lesser qualities and grade of timber species, up to a maximum of US\$999/m³ for superior qualities of timber species. These rates are established by the Government of Lao PDR (GOL) as a schedule within regulations under the Forestry Law. During the alignment survey, the Provincial or District forest office staff will assess the volume of natural or plantation forest that will be removed by a project. An assessment report is prepared and sent to the central office of the Department of Forestry in Vientiane, which is responsible for evaluating requests for timber removal and providing approvals.

Timber removed from a transmission line right-of-way by project will be sold, and the proceeds provided to the GOL. Where timber is removed from a private tree plantation, then project proponent is responsible for compensating the owner of the plantation.

During transmission line construction, the Provincial or District forestry office staff will scale and mark all timber cut from the right-of-way. Fines will be levied against the contractor for any timber that is cut and does not receive a timber mark from the forestry department. This helps to limit illegal timber harvesting.

EDL is responsible for paying for all costs incurred by the Department of Forestry, including costs of preparing timber cutting assessments during alignment surveys, and timber scaling and marking during construction.

- **Land Law (2003)** states that:

- ← Land within Lao PDR is the property of the national community, and individuals are assigned to effectively use the land, but not treat it as a tradable commodity
- ← Rights of those who have been allocated land, including the right to transfer that land, are protected by the State
- ← Individuals have a duty to preserve land in good condition
- ← A District may grant the right to use agricultural land and forest land within its jurisdiction for other land uses

← An individual's right to use land can be terminated if the State expropriates the land to use in the public's interest, but the State must pay appropriate compensation damages

- **Road Law (1999)** states that:

← Environmental protection is required during road activities

← National and provincial authorities of the Ministry of Communications, Transport, Post and Construction are responsible for environmental protection on road projects

← Reasonable compensation must be paid to individuals whose land is expropriated for road rights-of-way, relocation of replacement structures, and loss of trees and crops.

- **PM Decree No. 102/PM on the Implementation of the Environmental Protection Law (2001)** defines that:

Development projects and all development activities that related to the environment shall be conducted as follow:

← All development projects, including State and private owned, shall have an environmental impact assessment (EIA) before the establishment and operation of those projects. They shall also have method and protecting or mitigating measures to protect social and natural environment that can be approved by the government.

← The owners of the development projects shall have an obligation to bear the cost occurred in any process of EIA.

③ **PM Decree No. 192/PM on the Compensation and Resettlement (2005)**

The decree sets out clearly the fundamental principle for compensation, provides instructions and measurement procedure for mitigation and compensation for all potential negative impacts on socio-economic and livelihood of the local villagers within or in the vicinity of the project areas.

The Decree clearly identifies the responsibilities of the project owners on mitigation of social impacts and compensation for the loss of properties as well as the rehabilitation and or resettlement of affected people's livelihood.

- **Decree on the Preservation of Cultural, Historical and Natural Heritage** requires that in order to prevent exploitation of relics and antiquities, any person who discovers archaeological relics or a cultural site must inform the provincial and district offices within three days

In addition to the above Lao PDR statutes and regulations, the GOL is also a signatory of the following international conventions that may have a bearing on transmission and distribution projects:

③ **MAF Regulation N° 0524/2001**, on Management of National Biodiversity Conservation Areas, Aquatic Animals and Wildlife provides guidelines on NBCA establishment and zoning and also on restricted activities and development fund establishment and the rights and duties of state agencies in NBCA management.

- **UN Convention on Biological Diversity** (1996) under which Lao PDR agrees to:
 - ← Develop a national biodiversity conservation and sustainable use strategy
 - ← Develop legislation for protecting species and populations that are threatened
 - ← Integrate conservation and sustainable use of biological resources into national decision making
 - ← Conduct EA of proposed development projects with a view to minimizing negative impacts

2.2 World Bank Policies and Safeguards

2.2.1 World Bank Operational Policies

Relevant World Bank Safeguard Policies, include:

+ *Environmental Assessment (OP 4.01)*

The Bank requires environmental assessment (EA) of projects proposed for Bank financing to help ensure that they are environmentally sound and sustainable, and thus to improve decision making. The EA should evaluate a project's potential environmental risks and impacts in its area of influence; examine project alternatives; identify ways of improving project selection, siting, planning, design, and implementation by preventing, minimizing, mitigating, or compensating for adverse environmental impacts and enhancing positive impacts; and include the process of mitigating and managing adverse environmental impacts throughout project implementation.

+ *Natural Habitats (OP 4.04)*

This policy addresses the conservation of natural habitats, which like other measures that protect and enhance the environment, is essential for long-term sustainable development. The policy supports the protection, maintenance, and rehabilitation of natural habitats and their functions in its economic and sector work, project financing, and policy dialogue. The conservation of natural habitats, like other measures that protect and enhance the environment, is essential for long-term sustainable development. The Bank therefore supports the protection, maintenance, and rehabilitation of natural habitats and their functions in its economic and sector work, project financing, and policy dialogue. The Bank supports, and expects borrowers to apply, a precautionary approach to natural resource management to ensure opportunities for environmentally sustainable development. To apply a precautionary approach to natural resource management to ensure opportunities for environmentally sustainable development.

+ *Pest Management(OP 4.09)*

This policy requires adherence to a strategy that promotes the use of biological or environmental control methods and reduces reliance on synthetic chemical pesticides. In Bank-financed projects, the borrower should address any pest management issues in the context of the project's environmental assessment.

+ *Involuntary Resettlement (OP 4.12)*

These instruments outline the safeguards required of World Bank funded projects to ensure that impoverishment risks due to involuntary resettlement are addressed and minimized. The policy has the objectives to:

- Avoid resettlement where possible, and otherwise minimized through alternative project designs
- Resettlement should be conceived and executed as a sustainable development program
- Affected people should be meaningfully consulted, and be facilitated to participate in planning and implementing resettlement plans
- Displaced people should be assisted to improve, or at least restore their livelihoods and standards of living

+ *Indigenous Peoples (OP 4.10)*

These instruments represents the World Bank's commitment to poverty reduction and sustainable development by enshrining respect for the cultures, environments, economies and rights of indigenous peoples. Under the OP and BP, projects affecting indigenous peoples (IP) must ensure:

- IPs are engaged in an a process of free, prior and informed consultation
- The consultation process results in broad community support for the project
- Social analysis is undertaken to ensure potential impacts on IPs are identified
- An IP plan is developed to ensure IPs receive culturally appropriate project benefits, and that adverse impacts are avoided, minimized, mitigated, or compensated.

The OP and BP also mention that where IPs are the sole or overwhelming majority of project beneficiaries, a separate IP Plan is not required, and that requirements outlined above be integral to the project documents (Resettlement Action Plan (RAP) and SIA).

+ *Forests (OP 4.36)*

The objective of this policy is to assist borrowers to harness the potential of forests to reduce poverty in a sustainable manner, integrate forests effectively into sustainable economic development, and protect the vital local and global environmental services and values of forests. In accordance with the requirements for the environmental assessment (EA) for an investment project, the project design should address the potential impact of the project on forests and/or the rights and welfare of local communities.

Two other Operational Policies, *Projects in Disputed Areas (OP 7.60)* and *International Waterways (OP 7.50)* have limited relevance to the project.

This EIA's responses to the requirements of the relevant World Bank safeguard policies are shown in the table below.

Table 1: EIA Responses to World Bank Operational Policies

Operational Policy	Actions and/or Responses
Environmental Assessment (OP 4.01)	Phase 1 Report analyzing project alternatives through environmental and social screening. This EIA which covers environmental impacts, mitigation and management in the design, construction and operation phases of the project. Parallel SIA which covers social impacts, mitigation and management in the design, construction and operation phases of the project.
Natural Habitats (OP 4.04)	Flora and fauna species arrays and habitats are examined in Sections 4.4.1 and 4.4.4 respectively. Conservation status of all species is noted and forest protection areas are identified in Section 4.4.3 and analyzed in Section 5.1.3. Fish species and habitats are examined in Section 4.4.5. Riverine habitats are mapped and described. Habitat preferences are assigned to all species. The absence of endemic species is noted. Impacts on natural habitats and mitigation management is provided in Section 5.

Operational Policy	Actions and/or Responses
Pest Management (OP 4.09)	Reservoir biomass clearance will be by mechanical means. No chemicals will be used. Similarly, use of pesticides will be minimised in resettlement site preparation. Livelihood programs in the resettlement plan and Watershed Management Plan will teach biological and environmental pest control measures.
Involuntary Resettlement (OP 4.12)	A Resettlement Action Plan complying with World Bank guidelines and Lao legislative requirements has been prepared and submitted to rounds of AP and other stakeholder participation and AP approval.
Indigenous Peoples (OP 4.10)	All APs are from the same ethnic minority group (Katu). Therefore an Ethnic Minorities People's Plan (which complies with World Bank and Lao PDR guidelines) has been incorporated into the resettlement plan to produce a Resettlement and Ethnic minorities People's Plan (REMPP),
Forests (OP 4.36)	The Watershed Management Plan will protect the catchment forests as a priority. The project will impact on a minimal area of natural forest. The project includes management measures to minimise exploitation of NTFPs by the construction work force. The REMPP includes the retention of NTFP collection rights for resettlers.
Safety of Dams (OP 4.37)	Dam safety, including an assessment of seismic potential, has been fully covered in the technical and economic component.

2.2.2 Comparison of Lao PDR Law and World and Safeguard Policies

The 2005 changes to GoL legislation related to compensation and resettlement in development represents a significant improvement in the rights of citizens when their livelihoods, possessions and society are affected by development projects. Both Lao PDR law and World Bank policies entitle affected people to compensation for land and non-land assets at replacement cost, and for livelihood restoration support. Lao legislation defines such livelihood restoration measures as being applicable only to severely affected people, defined as those with more than 20 percent of their income generating assets affected, whilst World Bank policy does not differentiate. Decree 192/PM (Article 6) also entitles all affected people to economic rehabilitation assistance to ensure they are not made worse off due to the Project. The legal framework does therefore provide the potential for parity with WB social safeguards on resettlement.

2.3 Previous Studies on IEE

- **The IEE study** for an alternative 115Kv transmission line which linked the Nam Leuk Hydropower Project to Nam Ngum Switchyard, conducted by SOGREAH Ingenierie (1997) stated that:

The screening of impacts carried out for the alternative Transmission Line lead to the conclusion that environmental impacts anticipated are all of limited importance and magnitude and can be well mitigated by appropriate measures. The result of the study also showed that no area of exceptional ecological values is affected either directly or indirectly and no resettlement or alienation of private properties is anticipated. Only about 10 towers were located in paddy field which is not affected long-term agricultural

production and owners have received a compensation for the disruption during construction and the loss of land. Clearing of degraded forest within and outside the Phou Khao Khouay NBCA have been compensated by a provision for the reforestation of about 60 ha. Taking into consideration the findings of the impact screening, no additional detailed study is needed, meaning that no follow-up EIA is required for this Project.

- **The IEE study** conducted by Acres International Ltd in the Northern of Lao PDR (2002) concluded that:

The Northern Area Rural Power Distribution Project which was conducted IEE study in the northern provinces, Lao PDR by Acres in November 2000 generated only minor environmental impacts. This is because the project was involve construction of transmission lines along alignments on which the forestry and wildlife resources have largely been removed as a result of past and recent logging activities, and the practice of shifting cultivation (slash and burn). The transmission line routes and substation sites were chosen to avoid remaining environmentally sensitive areas, villages, and valuable agriculture land. The results of the study also showed that no resettlement is required, so social cohesion, community structure, administrative and community organizations, religious and cultural systems was not adversely affected as a result of having to relocate villages. However, mitigation and compensation measures were formulated to ensure that potential impacts can be satisfactorily addressed. The IEE study, including the environmental management plan and monitoring program was considered sufficient to meet the needs of an environmental impact assessment for the Lao PDR Northern Area Rural Power Distribution Project. Therefore, no follow-up Environmental Impact Assessment is recommended.

- ③ **The study on IEE** for Thakhek-Xepone 115 kV Transmission Line conducted by Dongsay Consultants (2003) concluded that:

The Transmission Line Construction Project only generated minor environmental impacts, which was offset considerably by the positive benefits that accrued from the project. This was because the project involved construction of transmission line along alignment on which the forestry and wildlife resources have largely been removed as a result of past and recent logging activities, and the practice of shifting (slash and burn) cultivation. The line route and substation sites were selected on the basis that avoided environmentally sensitive areas and important view-scapes such as national park, National Biodiversity Conservation Areas, protected areas, protection forests, research areas, outdoor recreation sites, waterfall, religious and cultural/heritage sites, and wetland. Along the route where transmission line traversed, there were some village cemeteries and holy forests (*Pasar and Pamahesak*), and some forest areas which classified as current forest including *Lower Dry Evergreen Forests, Mixed Deciduous Forests, Dry Dipterocarp Forests*. However, some high commercial value species of tree within such forests were already removed. Mitigation and compensation measures have been formulated to ensure that potential impacts could be satisfactorily addressed. The compensation for the loss of village cemeteries and holy forests was suitably considered.

Resettlement was required for some houses and rice huts at some villages, so compensation cost have been discussed and paid. However, social cohesion, community structure, administrative and community organizations, religious and cultural systems was not adversely affected as a result of having to relocate some of the houses.

The IEE study, including the RAP, EMP and monitoring program was considered sufficient to meet the needs of EIA's regulations for the Lao PDR. Therefore, it was considered that an EIA was not required and the IEE study conducted by DSC was the completed EIA.

- ③ **The IEE study** for Pakse-Khone Phapheng Power Transmission Line conducted by STS Consultants (2003) stated that:

The Project generated only minor impacts including socio-economic and environmental impacts due to the alignment has been appropriately selected based on the following principles:

- Avoided existing settlements, public and private structures.
- Avoided encroachment into the corridor of the Dong Houa Sao and Xe Pien NBCAs.
- Facilitated the access to the Project site during construction, operation and maintenance phases.
- Minimized the extent of visual instruction.

- ③ **The study on IEE** for Pakxanh-Pakbor 115 kV Transmission Line conducted by Dongsay Consultants (2004) concluded that:

The project will generate only minor environmental impacts. This is because the project will involve construction of transmission lines along alignments on which the forestry and wildlife resources have largely been removed as a result of past and recent logging activities, and the practice of shifting (slash and burn) cultivation. The transmission line routes have been chosen to avoid remaining environmentally sensitive areas and important view-scape areas such as NBCAs, Protection Forest; recreation areas, waterfall, research areas, religious and cultural/heritage sites, and high valued wetland except for some houses, rice huts, village cemeteries and village holy forests. Mitigation and compensation measures have been formulated to ensure that potential impacts could be satisfactorily addressed. The IEE report, including the environmental management plan (EMP) and monitoring program and Resettlement Action Plan (RAP) were considered sufficient to meet the EA requirements for the Project. Therefore, it was concluded that further more detailed assessment by way of an Environmental Impact Assessment (EIA) was not required for the project.

Environmental Description of the project area

3.1 Physical Resources

3.1.1 General Topography

The southern province, particularly in the Khong district Champasack, in which the project locates the topography of the land is generally flat and in part low laying which had formed part of the overall Mekong flood plain. However, some rugged terrains and mountains stretching predominantly in parallel and on the east side of the Road 13 and the transmission line and are well outside the Xepian NBCA which situates some distances away from the project area.

The proposed transmission line right of way traverses mainly through flat areas comprises of

rice paddy fields, lowland cropping and rice cultivation by villagers. Because of these flood and fertile plain, Champasack Province is known as one of the Rice Plains of the Country (“*Ou Khao - Ou Pa*” or Cradle of Rice) as well as having high potential for other agricultural production.

3.1.2 Affected Villages along the Proposed Transmission Line

The Project covers only 8 villages, under one district of Champasack province. It means that only 8 villages are affected by the project. The total numbers of affected household is 64 (these include only those households of 8 villages who use the land for agricultural production such as paddy fields and. Apart from these lands use types, along the line, there are some Village Used Forests. The affected Districts and villages are shown in table below.

Table 2: Affected districts, villages and households

Province	Districts	Affected Villages	Total No. of Household	Total No. of Family	Total No. of Female	Total Population	No. of Affected Household
CHAMPASACK	Khong	Phonh	78	94	227	474	1
		Kadan	410	430	1351	2593	29
		Khinak	470	474	1392	2493	17
		Phiengdi	410	415	1225	2101	7
		Set savanh	67	76	159	319	10
		Settao Lek	76	85	231	473	1
		Thakho	189	203	601	1238	4
		Beungam	237	239	527	1037	5
Grand Total		8 Villages	1,937	2,016	5,713	10,728	64

Note: This focuses on Project Area Only.

Source: Field data collection on September 2010.

3.1.3 Topography along the Transmission Line

The topographic description along the transmission line alignment we used 1:100,000 scale contour map as the reference as well as alignment map supplied by EdL for identification of the transmission line right of way. Both maps were used for on the ground identification of the “exact” location of the centerline (IPs) of the transmission line to which all measurements were referred.

It must be noted that at the time of the study, the alignment was yet to be finalized and was not marked or had no on site identification, only line on map. Alignment identification was an approximation based on these maps. In addition our survey team, prior to field survey, the transmission line alignment (as given by EdL) was superimposed on the Land Use Type and Forest Cover Map based on the 1:100,000 contour map. The field check has been conducted based on the Land Use Type and Forest Cover Map (*see Figure 1*).

In each portion reference will be made to existing land characteristic, types of vegetation, forest, water resources and types of land use. *See Annex for diagrammatic description of the topography along the right of way of the transmission line*

3.1.4 Soils

The altitude of the lowlands within Khong District varies from 100 to 200 m, the southern most district of the country lies on triassic volcanic. The sediment consisted of sandstone and red shale is deposited in the intra-mountain sedimentary basins which were formed during the late Indonesian orogenic movement. The soil is less fertile when one moves away from the Mekong River, particularly the area on the left hand side of the National road No. 13 South, starting from Ban Hat Substation along the ROW.

3.1.5 Water resources

The steep terrain of Sai Phou Louang (or Troung Son Mountain) in the eastern part of central-southern Lao PDR is part of an intricate system of rivers and streams that form the Mekong River watershed. As mentioned early, Southern part of Lao PDR is consisted of many Plains of the Mekong River which is called as a Plain of Rice (Cradle of Rice) where has high potential for rice and other agricultural production. During the field reconnaissance, within and around the project area from Ban Hat Substation to Lao-Cambodia border, there are some significant stream and wetland areas where the proposed transmission line will cross; Houay Jik and two small unknown name creeks. However, that stream the water is available in both dry and rainy seasons, but on the dry season the water nearly dry up and no any significant species were found there (according villagers reported). Since the Southern part has more vegetation than northern part, with its quite thick layers of soils and flatland are particularly not prone to erosion except for some areas (e.g. along the foothill of high slope mountain) where most vegetation is removed due to heavy logging, slash and burn cultivation and that soils are exposed to rainfall and surface water flows. Nevertheless, water quality in the mountain streams and rivers is generally quite good especially in the dry season, but can be rapidly degraded when soils that are eroded or wasted from exposed slopes enter streams and increase turbidity, thereby reducing the quality of water for aquatic organisms, and domestic and livestock consumption especially in the rainy season. As mentioned above, most of the streams within and around the area have serious problem with water condition (dry) in the dry season. Therefore most villagers supplement their diets with natural fish, freshwater crabs, and other aquatic animals caught not from stream, but from the Mekong River.

3.1.6 Climate

The climate of Southern provinces is tropical and strongly influenced by the annual southwest monsoon rains that affect the region from April/May to September (mean annual rainfall at Pakxe is 1,977.9mm, at Attapeu is 1,954.4mm and at Xekong is 1,274.5mm). The period of the dry season between the three Provinces; Champasack, Attapeu and Xekong is not different (October to April) no rain may fall in some months. The monsoon rains are variable from year to year, resulting in recurring years with weak monsoon systems (MCTPC-IUCN 2000a and 2000b). The hottest month is April (36.1°C at Pakxe, 37.1°C at Attapeu and 36.1°C at Xekong), and the coolest month is December (18.4°C at Pakxe, 17.0°C at Attapeu and 14.6°C at Xekong). (see Table 3)

Table 3: Climate Data by Provinces

Month (2004)	Pakxe (Champasack)			Attapeu			Xekong		
	Avr.Max Tem. (°C)	Avr.Min Tem. (°C)	Rain (mm)	Avr.Max Tem. (°C)	Avr.Min Tem. (°C)	Rain (mm)	Avr.Max Tem. (°C)	Avr.Min Tem. (°C)	Rain (mm)
January	32.3	19.9	0	32.6	17.4	1.2	32.5	16.1	2.4
February	32.1	20.5	2.1	32.8	19.5	8.4	32.8	16.9	11.8

Month (2004)	Pakxe (Champasack)			Attapeu			Xekong		
	Avr.Max Tem. (°C)	Avr.Mi n Tem. (°C)	Rain (mm)	Avr.Ma x Tem. (°C)	Avr.Mi n Tem. (°C)	Rain (mm)	Avr.Ma x Tem. (°C)	Avr.Mi n Tem. (°C)	Rain (mm)
March	35.2	24.5	79.6	35.9	23.3	33.8	36.4	21.1	39.6
April	36.1	26.2	21.7	37.1	24.7	34.6	36.1	23.4	58.6
May	33.8	25.9	187.	35.0	25.0	108.3	34.8	24.4	182.2
June	31.0	24.4	443.	31.7	23.7	554.6	32.4	24.0	188.5
July	30.6	24.6	398.	31.3	23.8	319.5	31.2	23.8	304.7
August	30.3	24.6	583.	30.4	23.6	609.0	30.6	24.2	327.9
September	31.0	24.1	245.	31.5	23.1	285.0	32.1	23.6	158.8
October	32.4	22.1	0.3	32.6	20.1	0	32.7	20.1	0
November	33.3	21.7	15.2	33.8	20.6	0	33.7	19.3	0
December	31.5	18.4	0	32.3	17.0	0	32.1	14.6	0
<i>Annual Mean</i>	<i>32.5</i>	<i>23.1</i>	<i>1,97 7.9</i>	<i>33.1</i>	<i>21.9</i>	<i>1,954. 4</i>	<i>33.1</i>	<i>21.0</i>	<i>1,274 .5</i>

Source: Department of Meteorology and Hydrology (2005)

3.2 Biological Resources

Lao PDR is located in the center of Indochina, sharing borders with China to the north, Myanmar to the northwest, Thailand to the west, Cambodia to the south and Vietnam to the east. The total area of Laos is 236,800 square kilometres. Around 70% of its terrain is mountainous, reaching a maximum elevation of 2,820 metres in the Xieng Khouang province. The Mekong River, which flows through nearly 1,900 kilometres of Lao territory, is the main geographical feature in the west, and in fact, forms a natural border with Thailand in some areas.

Lao PDR has one of the most pristine forest ecosystems in Southeast Asia. It is estimated that half of its woodlands consist of tropical forest, in particular the primary forest. In addition to the fascinating vegetation, Laos plays host to a very diverse animal kingdom.

According to the initial result of the survey and the study on Forest/vegetation Cover and Land Use by plot sampling on SPOT Satellite images maps conducted by Forest Inventory and Planning Division, Department of Forestry (DoF, 2002) for the Southern Lao provinces, 56.5% of the total land area is covered by forest. Champasack province is the second province which mostly covered by natural forests (54% of total provincial land area). Most of the forest type is Current Forest² which includes Dry Dipterocarp Forest (DD), Upper Dry Evergreen Forest (UDE), Lower and Upper Mixed Deciduous Forest (LMD and UMD) and Mixed Coniferous and Broadleaved.

² *Current Forest includes natural forests and plantation forests. It is used to refer to land with a tree canopy cover of more than 20% and area of more than 0.5 ha. The trees should be able to reach a minimum height of 5 m.* The basis for the distinction between forest and other land use groups is the crown density. In this study the natural forests are classified into forest types which compose Upper and Lower Dry Evergreen Forests, Upper and Lower Mixed Deciduous Forests, Gallery Forest, Coniferous Forest, Mixed Broadleaved and Coniferous Forest, and Dry Dipterocarp Forest (FIPD, DOF, 2002).

3.2.1 Vegetation Cover along Proposed Transmission Line Routes

Based on a review of the 2002 Forest and Land Cover maps for the regions through which the proposed transmission lines will be constructed, and from the villagers interview as well as observations made during the field reconnaissance survey, the following observations are made regarding the conditions of forest and wildlife habitat along the proposed 230 kV alignments (*see Annex Pictures*).

The 2002 Land Use Types and Forest Cover maps show that along the proposed alignment from Ban Hat Village to Lao-Cambodia Border, Khong District, Champasack Province, about 51.7 % is forest which mainly includes Dry Dipterocarp Forest (Protection 8.85%), about 47 % is seasonal paddy field, and the other is swamp and water body which covers about 3%. Total affected land will be about 110 ha, *see Table 3*. Reference to the Decree No. 333 (June, 2010) on Protection Forest, some part of the project is laying in the District Protection Area (9.788 ha or 2.447 m length by 40 m width).

Table 4: Land Use Types and Forest Cover along the Transmission Line

	Land Use and Forest Types	Area (ha)	%	Remark
<i>Land Use Type and Forest Cover along TL ROW</i>	Unstocked Forests	6	5.54	This calculation is based on the study area of an approximately 40 m of width and 27.09 km of length along 230 kV Transmission Line from Banhat to Lao-Cambodia border.
	Dry Dipterocarp Forest (DD)	35	32.3	
	Mix Deciduous Forest	10	9.23	
	Land cleared for Rubber Plantation	7	6.46	
	Paddy Field (<i>Na</i>) (RP)	39	35.99	
	Protection Forest	11,36	10.48	
	Total	97,36	100	

Source: Survey Data –September 2010)

Definition of Land Use and Forest Types

- ***Dry Dipterocarp Forest (DD)***: The Dry Dipterocarp Forest occurs in open stands. The tree diameter is comparably small and the height of the stand varies from 8 to 25 meters. The crowns do not spread out widely. This type of forest is normally found in places with shallow soil, where the hard pan emerges above the ground, and on latirized soil. On the most poor and shallow soils the trees are crooked and do not exceed 10 meters in height: If the crown cover is less than 20% and the stand is undisturbed the vegetation type should be classified as Savannah.
- ***The Gallery Forest (GF)***: is not characterized by tree species composition but could be i.e. either deciduous or evergreen. Clues used for identification of this forest type are the occurrence of some other land use types in its vicinity such as streams and villages. In areas where streams are likely to overflow seriously, the forest is often left along the low bank of the streams (both persistent and intermittent ones) forming a long band of forest with the stream bed on one side and, for, example, paddy fields on the other. The width of the Gallery Forest will not be more than 100 m.

- **Swamps (SW):** are areas where the soil is saturated with water. The soil may basically be fertile but the lack of oxygen limits its agriculture or forest-production capacity. The Swamp could have a high ecological or environmental value and the flora and fauna may be rich.

The typical tree species found in the Swamps are trees which can grow in water, i.e. *Adina cordifolia*, *Rhus succedanea* and *Barringtonia acutangula*.

- **Rice Paddy (RP):** Areas permanently being used for rice cultivation. Old paddy that has been abandoned and not been in use for more than one year should not be classified as Rice Paddy.

3.2.2 Wildlife and Aquatic Animals

Generally, Lao PDR still harbors a rich fauna, with many species' populations and their habitats probably being less depleted within Lao PDR than within several other countries of the region. At least 166 species of reptile and amphibian, 700 bird species, and 100 mammal species occur in Lao PDR. As an example, more than 430 bird species found in the Nakai-Nam Theun NBCA represent one twenty fifth of all bird species found world-wide and more than half of all bird species in the Lower Mekong system. Similarly, there are eighty-seven known families of fish in the Indochina region, whilst 74 families have been identified in the whole African continent, and 60 families in South America.

Currently, the richness of Lao PDR's wildlife has less to do with conservation efforts than with the country's low population density and consequently extensive forest cover. Although hunting pressure in the country is still widely, the relative abundance of habitat and, in some areas, its long distance from human settlements, has provided partial protection for the country's wildlife. However, human population and development pressures are rising, especially since 1990. Therefore, wildlife population is dramatically declining throughout the country.

Indeed, Wildlife is the undomesticated animals and plants, which are living in nature. They are including many types and species of a very small size up to a very big size of vertebrates or invertebrates or any type of habitats, such as: mammals, birds, reptile, amphibian, fishes, insects and all type of plant's communities.

Threatened species recorded in Lao PDR, based upon November 1998 data from the WCMC, comprised 220 plants and 150 animals. Numbers of threatened animals are shown in the table below. Categories of threat follow those of IUCN.

Table 5: Numbers of Threatened Wildlife in Lao PDR

No.	Status	Mammals (Species)	Birds (Species)	Reptiles (Species)	Fishes (Species)
01	Critically Endangered	3	2	1	1
02	Endangered	8	4	1	4
03	Vulnerable	20	21	5	-
04	Least risk	20	45	2	-
05	Data deficient	9	-	1	4
	Total	60	72	10	9

Source: Department of Forestry

Apart from referring the records mentioned above, wildlife conditions within the Project Area were surveyed and assessed by visual inspection and villagers' interview. When the study team conducted the site survey in daytime in dry season, they visually observed wildlife along the alignment. Most villagers within affected villages were interviewed regarding their perceptions on wildlife conditions within and around their village areas. According to the survey and villagers' interview, the results showed that only significant habitats remaining occurred on the steep inaccessible areas of Dong Hua Sao, Xepian and other NBCAs outside the study or project area. All wildlife is extensively hunted and the majority of all significant wildlife species have either been eliminated from the study area or they have retreated to the comparative safety afforded by the higher and comparatively inaccessible habitats on Dong Hua Sao, Xepian and other NBCAs due to the project area was involved construction of many infrastructures which the forestry resources and wildlife habitats have largely been destroyed and removed as a result of past and recent development activities.

According to interviews with local authorities and local people during the site investigation, there are some big birds flying in this area, especially in the area about two kilometers close to Lao-Cambodia border. By investigation with local people this kind of birds is Ibis species.

The White-shouldered Ibis, *Pseudibis davisoni*, is a species of wading bird of the ibis family, Threskiornithidae. It occurs at a few sites in northern Cambodia, southern Vietnam, extreme southern Laos and East Kalimantan in Indonesia.

This Giant Ibis is a bird rarely recorded during the last 100 years. Scientists presumed that the species has become extinct in Vietnam already and that only Cambodia and Laos still hold some isolated flocks. This species was recently declared Cambodia's national bird.

However, they believed that the birds must have flown from Cambodia's Mondolkiri province where a globally significant remaining population of probably less than 500 individuals is making its last stand.

The White-shouldered Ibis occurs in lakes, pools, marshes and slow-flowing rivers in open lowland forest. It also inhabits sparsely wooded, dry or wet grasslands and wide rivers with sand and gravel bars.

Therefore the design of the high of transmission line in this section should be considered in order to do not disturbing the flying route of those Ibises.

3.2.3 National Biodiversity Conservation Areas (NBCAs) and/or Protected Areas

The Government of Lao PDR, with the technical assistance of IUCN (through the Lao-Swedish Forestry Programme) and other international agencies have developed a national protected area system for several years (Salter and Phanthavong 1989, Salter *et al.* 1991, Berkmüller *et al.* 1993, 1995a, 1995b). Surveys towards this aim began in 1988, and in 1993, 18 areas covering approximately 10% of the land area of the country were decreed as National Biodiversity Conservation Areas (NBCAs). A further two (Dong Phou Vieng and Xe Sap) were added in 1995-1996, meaning that NBCAs currently cover about 12.5% of total land area of Lao PDR.

Ministry of Agriculture and Forestry (MAF) has overall responsibility for management of all categories of forest including those NBCAs. Responsibility is delegated to the Department of Forestry (DoF), with the Forest Resource Conservation Division (FRCD) in the role of technical unit. From DOF (FRCD) decentralized responsibilities are with the Provincial Agriculture and Forestry Division (PAFO) and the District Agriculture and Forestry Offices (DAFO) who manage the conservation forests, aquatic animals and wildlife within their jurisdiction. The DAFOs themselves must in turn cooperate with people living inside and on the periphery of the relevant forests.

Amongst 20 NBCAs and two corridors throughout the country, Champasack province that the Transmission Line located consist of 2 NBCAs such as Dong Hua Sao (110,00 ha) and Xepian (240,000 ha) NBCAs with the total area is about 350,000 ha.

In addition to the NBCAs, the provinces and districts have also established a number of Provincial and District Protected Areas (PPAs and DPAs) including protection forests. The location of these PPAs and DPAs is quite difficult to confirm especially in the field areas, as the Provincial Agriculture and Forestry Division (PAFOs) have no accurate maps of these areas except for the lists and numbers of PPA and DPA.

None of the proposed alignments pass through any NBCAs within the province. As noted above, the closest that an alignment comes to an NBCA is the transmission line from Ban Hat Sub-station to Ban Hin Hong village at its closest point is about 4 km the line will pass to the west of Xepian NBCA. At this point the line will run parallel on the left hand side with the National Road 13 South. (*Picture 3*).

However, as the alignment will closely follow and parallel the main road from Ban Hat Sub-station to Lao-Cambodia border, and as the land and forest adjacent to the main road has been affected by human activities (logging, slash and burn cultivation and others) since the road was completed, the transmission line will not impinge on any environmentally sensitive areas that may be part of the PPAs and DPAs except for some Village Used Forests.

The pre-survey for selecting of the alignment was conducted and determined by the other survey teams (during preparing of a long-term power development plan in the Lao PDR) before conducting IEE survey, the specific location of naturally vegetated areas, or areas of secondary species-rich vegetation cover like NBCAs, PPAs, DPAs as well as protection forests was confirmed in advance before the alignment has been sited and that the transmission line would be located so as to avoid such important areas, wherever possible.

Reference to the Decree No. 333 (June, 2010) on Protection Forest, about 9.78 ha or 2.447 m length by 40 m width of the project is lying in the District Protection Forest. This Protection Forest Area is established with objective to be the Corridor of the Country Border. Before the

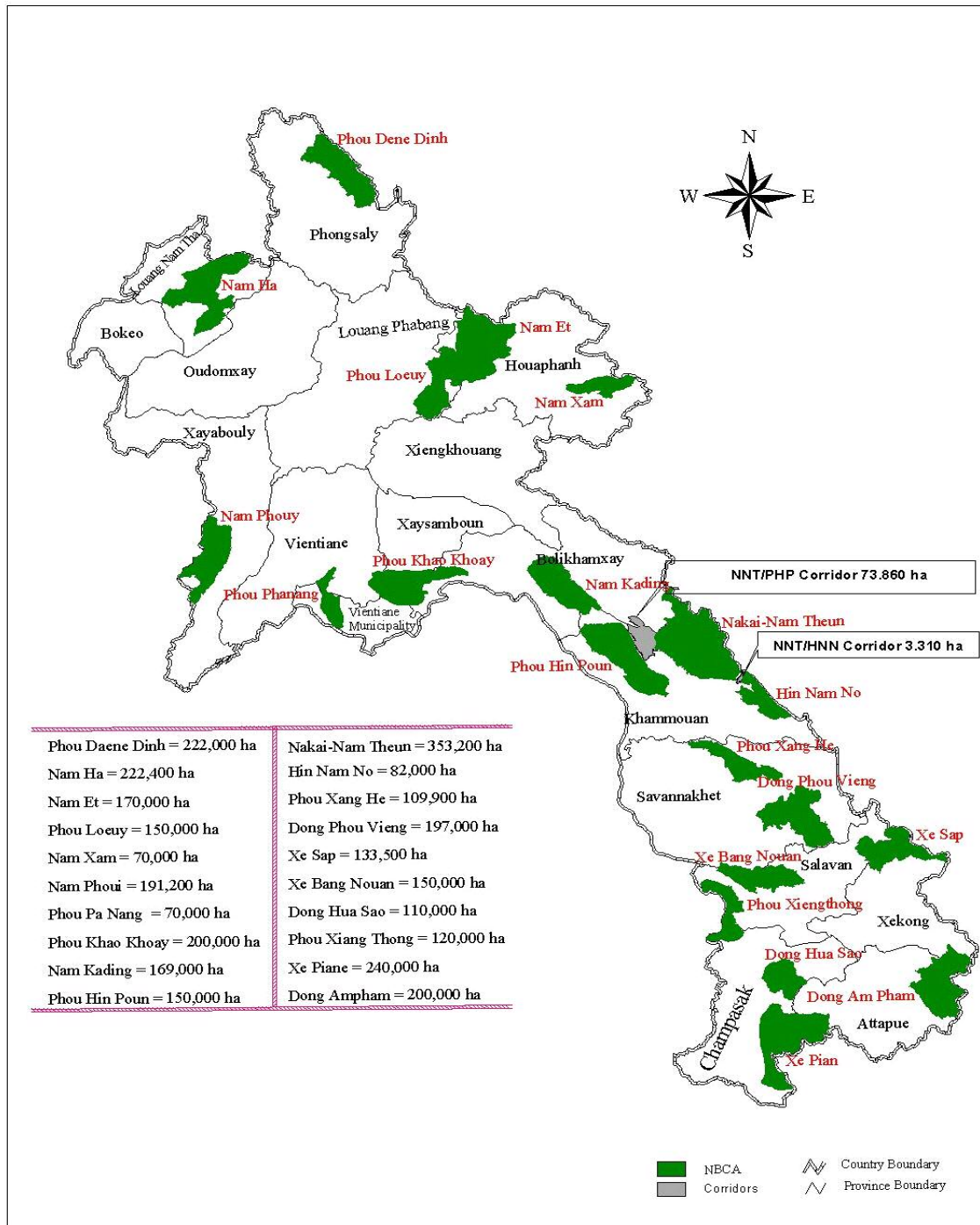
starting of Project Construction, the change of Protection Forest utilization should get the permission from Champasack Province Authority.

Table 6: Summary of Biodiversity Conservation & Protection Areas (Nationwide)

<u>Category</u>	<u>No. of areas</u>	<u>Total area (Ha)</u>	<u>% to national land area</u>
NBCAs or NPAs	20	3,313,596	13.99
Provincial Conservation Forests	57	931,969	3.94
Provincial Protection Forests	23	461,410	1.95
District Conservation Forests	144	503,733	2.12
District Protection Forests	52	55,713	0.23
Corridors	2	77,170	0.33
<i>TOTAL</i>	<i>278</i>	<i>5,343,591</i>	<i>22.56</i>

Source: *Forestry Strategy to the year 2020 of the Lao PDR, Department of*

**Figure 3: Map shows the Location of NBCAs Nationwide
National Biodiversity Conservation Areas**



DFRC

3.3 Socio-economic and cultural conditions

The demographic, ethnic, socio-economic and cultural conditions within the Project area have been documented using a variety of primary and secondary sources. In order to provide data for

load forecasting as well as the social analysis of the Project, the survey and interview were carried out for every affected village and households in 8 villages in Khong District, shown in *Table 1* (of those, 64 affected households from 8 villages). Before conducting survey and interview, a consultation process was also carried out with the local organizations concerned such as District Administration Office, DAFO and village authorities. During the site survey, the study teams visited 8 villages and had consultations with village heads and affected villagers. Details of the consultations are shown in the “Record of Consultation with Local Villagers and Village Authorities”. (See Annex-3)

Secondary sources of data/information included extensive district annual reports; demographic and other data collected directly from district and village authorities in the Project area; and, numerous studies, reports and other documents related to the project.

3.3.1 Population and Demographics

The total population of Laos stands at 5.5 million (National Statistical Center, 2002). At 2.6 million, the proportion of people aged 15-54 years is 48% of the total. The national average for life expectancy at birth is 54 years (World Bank, 2000). This means that the population is very young, with more than 40% aged less than 15 years.

Lao PDR is a rural landlocked country. In 1998, 78% of Lao lived in rural areas and 22% lived in urban areas (World Bank, 2000). The rural village is the basic social unit of the country.

According to the 1995 census, across the country there were nearly 11,400 villages. The average village population was 400, although actual settlements may range from as few as 10-15 households, or approximately 70 people, to larger villages of more than 300 households.

The predominantly rural nature of Lao PDR means population densities are very low. The national average in 2002 is 23 persons/km². The average population density in rural areas was 21 persons/km² and in urban areas, 25 persons/km². The regional distribution of population densities with central region is 27 persons/km², while northern and southern regions are 19 persons/km² and 24 persons/km² respectively (CPC-NSC, 2002).

As mentioned earlier, the project covers only 8 villages within one district; namely Khong district, Champasak Province. According to the field survey conducted by the team survey we see that among 8 villages within the project areas, the total population is 10,728 people with 5,713 female and total of 2,016 families and 1,938 households as shown in table 1.

3.3.2 Ethnic Composition

Ethnically, Lao PDR is highly diverse, both in terms of number of ethno-linguistic groups and in the breadth of their higher linguistic diversity. More than 230 spoken languages, belonging to four language super stocks, have been identified, making Lao one of the world’s most diverse countries. With respect to location, the areas of highest diversity are often in the remotest upland areas, particularly within and around NBCAs. The 2000 Census identified 49 different groups with sub-groups totaling over 200 (ADB, 2000). Ethnic groups within the Lao territory are grouped in four major ethno linguistic families. These families commonly grouped into three categories that reflect the dominant languages, settlement patterns and agricultural practices.

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One of the main characteristics of the Lao PDR is its cultural diversity. Although there have been differing numbers given for the groups, specialists mostly agree on the ethno linguistic classification of the ethnic groups. For the purposes of the 1995 census, GOL recognized 47 main ethnic groups or categories and 149 sub-groups, but the last revision of this list by the LFNC contained 49 categories, and over 160 subgroups. The National Assembly has ratified this list in the Agreement No. 213/NA dated 24 November 2008.

- a) The Tai-Lao groups living in the lowland regions of the country that for the most part cultivate paddy rice, practice Buddhism and are integrated into the national economy. This group includes the Tai-Lao, which is the dominant group, and various other related ethnic groups such as the Tai-Dam, Tai Lue, Phuan and other Tai speaking groups. These correspond to the Lao-Tai group and represent approximately 60% of the population.
- b) The Mon-Khmer groups dominating the middle hills that for the most part practice swidden agriculture, are reliant on forest products and to some extent are isolated from the dominant lowland culture. Many groups, however, exhibit varying degrees of assimilation and adaptation to Tai-Lao culture. These groups: Khmou, Makong, Kata, Yrou and other smaller groups are the original inhabitants of South-East Asia and consist of the Austro-Asiatic or Mon-Khmer ethnic groups approximately 25% of the population.
- c) The Sino-Tibetan groups living in the highland areas practicing swidden agriculture and include the Sino-Tibetan and Hmong-Mien ethnic groups. These groups include the Akha, Lahu, Lisu, Pounoy and others. Many of these groups are relatively recent arrivals from Southern China and Vietnam and form about 5 % of the population, residing mainly in northern areas of Lao PDR.
- d) The Hmong-Iumien groups, including the Hmong and Yao, are also referred to as Lao Soung in the former since they tend to inhabit highland areas in the northern and central provinces of Lao PDR. They also practice swidden agriculture. These groups are also recent arrivals from Southern China and comprise about 10% of population in the Lao PDR.

As stated previously the project area encompasses 10 villages, and only covers one district (Champasak) in Champasack province, while 128 households are affected by the project which consists of only one ethnic group namely *Lao* which is under the Tai-Kadai family that also referred to as Lao-Loum. As the majority of predominant Lao Loom way of life, almost all of them practice paddy rice cultivation,

Base on GoL's and WB's guidelines on ethnic composition of villages, the project affected villages are *not* ethnic villages; hence Ethnic Development Plan (EDP) is not warranted neither required.

3.3.4 Economic Conditions

According to the National Growth and Poverty Eradication Strategy (NGPES, January, 2004), generally, poverty has indeed decreased dramatically over the last decade, as shown through the Lao Expenditure and Consumption Surveys (LECS). LECS-I in 1992/93 showed that 45% of

the population was living below the poverty line. In 1997/98 (LECS-II) this proportion declined to 38.6% of the population a significant reduction in the incidence of poverty

Agriculture and forestry including cultivation of rice, vegetables and other cash and permanent crops, animal husbandry, harvesting of non-timber forestry products and fishing, are the major economic sectors in Lao PDR.

Based on the NGPES (2004), Khong district is not considered as poor district. However, according to the information gathered from field survey, the Table below shows the economic conditions among the different affected villages. 1/10 of the total families are defined as insufficient in term of their economic status.

Table 7: The Socio-Economic Conditions among the affected villages

Affected Villages	Total No. of Families	Good (Families)	Sufficient (Families)	Insufficient (Families)
Phon	94	0	89	5
Kadan	430	150	280	18
Khinak	474	55	411	18
Pheingdi	415	19	247	149
Satsavanh	76	3	65	8
Settao Lek	85	0	70	15
Thakhor	203	23	166	0
Beungam	239	0	239	0
10 villages	2,016	250	1,567	213

Note: Socio-economic classification standard is referred to NGPES (2004).

3.3.5 Agricultural Production and Livelihood Systems

As mentioned above, most of the Lao people especially rural population, involve their livelihood mainly with agricultural productions which include a diversity of cultivation such as paddy rice cultivation, swidden cultivation, upland cultivation, cultivation of vegetable and cash crops, animal raising, fishing, harvesting of NTFPs and others.

+ **Rice cultivation:**

In Lao PDR there are two main agro-systems such as *paddy rice cultivation* and *swidden cultivation* which included shifting cultivation and rotational cultivation. The most common are paddy rice cultivation method and are widely practiced among the lowlanders, with availability of irrigation system double cropping per year are normally achieved. The swidden methods are most common among the highlanders-mainly ethnic minorities (Shifting Cultivation Status Report for FS 2020 Formulation, MAF-DOF, 2003). In Khong district, most people are relied on paddy rice cultivation. Dry season irrigated agriculture development in the district is still limited as electricity is required for pumping water from the Mekong and most streams lack of water in the dry season.

+ **Cash Crops:**

Most lowland households maintain permanent vegetable gardens near streams and springs where they grow a wide variety of vegetables and fruits for sales as well as household consumption. Swidden farmers also grow a wide diversity of crops during the rainy season, either intercropped with rice during the rainy season or in separate plots during both rainy and dry seasons. Throughout parts of Southern Lao PDR, different tree plantations are extensively cultivated as cash crops, as are various other crops, but in a very small scale by small holders. These cash crops include, depending on the region within the Project area, such as *Acacia*, *Teak*, *Eucalyptus*, *cotton*, *bananas*, *orange*, *mango*, *jackfruit*, *tamarind*, *pineapple*, *sugar cane*, *peanuts*, *groundnuts*, *cardamom* and *vegetables*. However, there are plantation (teak wood) area to be affected by the project.

Subsistence households consume the majority of their crops, to vary diets and, during rice shortages, to meet basic needs; or, they use them as animal feed. Surplus rice, vegetables and cash crops are sold in local markets. Because they tend to live nearer to markets and urban centers, 30% of lowland households sell some of their agricultural products (NSC, 2000). Due to lower levels of productivity and greater distances to markets, ethnic minority groups sell much less of their agricultural production.

+ Animal raising:

As stated previously, nearly 90% of rural households raise one or more kinds of livestock, the sale of which constitutes a major source of cash incomes. Nearly all households involve in this activity, for consumption as well as for sale, which is the most important source of cash income, especially for those who own limited agricultural land.

On average, each household raises one or more kinds of livestock that include buffaloes, cattle and pigs. In general, buffalo are used as draught animals in rice paddies. Manure from these large animals is often the only fertilizer used in the production of rice and other crops. Rural households also raise pigs and poultry such as chicken and ducks, for their own consumption and for occasional sale.

+ Fishing and NTFPs harvesting:

Fishing is an important secondary activity for many rural households, with fish often supplying as much as 70% of the protein in the household diet as well as being a source of cash income (Chagnon, 1996). While some households maintain fishponds, the majority fish come from Mekong River (using simple casting nets and other traditional fishing equipment) and some from other streams, lakes especially in the dry season and seasonal floodplains. Most households consume the bulk of their catch, but the sale of fresh and dried fish is also a source of household cash income.

In Khong District fishing are the most important activities and being steadily developed. Fishing activity is primarily for subsistence need of the people living along the Mekong River and its major tributaries. While fishing in the Mekong and streams habitats is practiced throughout the year fishing in non-river habitats such as ponds and rice fields, even it is most intensively utilized, last only for some months of the rainy season. Of these fishing habitats, the Mekong is the most productive both in terms quantity and quality. The non-river habitats are considered to be subsidiary fishing. People settled in the area have developed over the centuries a very rich capture fisheries tradition.

Generally, NTFPs play a central role in the rural economy, as they provide: 1) animal proteins (from wild meat, fish, frogs, shrimp, soft-shelled turtles, crabs and molluscs), 2) calories, vitamins and dietary fiber (from mushrooms, bamboo shoots, fruits and vegetables, honey), 3) materials for house construction and handicraft production (bamboo, rattan, pandanus, broom grass, paper mulberry), 4) traditional medicines and 5) cash income (from the sale of NTFP

species). However, NTFPs collection among the affected villages is only for daily food and household utilization, not for sale.

Food is considered by villagers as the most important product from the forest; and wild meat and fish are the main source of protein in most people's diet. In many villages, all foods except for rice are collected from the forest and river. It has been estimated that wild foods contribute 60-80% of non-rice food consumption, and provide an average of 4% of energy intake, 40% of calcium, 25% of iron, and 40% of vitamins A and C. The importance of NTFP foods increases in times of emergency, when crops fail and villagers use tubers and other NTFPs as a substitute for rice. Rural people also depend on NTFPs for other needs such as medicines and construction materials. Main NTFPs are available within and around the affected villages and have also high potential for generate family income include: Rattan, Yang resin (*Dipterocarpus alatus*), mushrooms, bamboo shoot, wild fruits, wild vegetables, Khisi resin, *Nhot-Nhe* (*Calumus sp.*), *Nhot-Boun* (*Daemonorops schmidtii*) and others.

+ **Handicrafts and home businesses:**

Traditional handicrafts meet practical household needs and to generate cash income. Some of these include weaving, particularly among Lao, Phou-Tai and other lowland groups; basketry and string bags made by Phou-Tai, Ma-Kong and Ka-Leung groups, the embroidery, however, within the Project area is very rare, only for household use in some villages. Small home businesses tend to focus on activities that relate to or complement the agricultural activities of the household. These frequently include rice mills, making or repairing clothes or, adjacent to a road, a small kiosk selling drinks and fruit. In some instances, members of a household may be exclusively engaged in a more substantial household business, such as a temporary garage or other small-scale services.

+ **Income and Sources of income:**

Based on the results of our on-site survey and villagers' interview, it indicated as shown in Table 4.3.4a below that villagers who live within affected areas have different sources of income. However, the main source of income of most villagers is agricultural production/livestock and fishing/fishery due to almost all of the villages within project areas are located along the National Road 13 South and not far away from Mekong River. Meanwhile, the other sources are seen as minor such as small business/services and daily employee/workers. The sources of income in this case do not mean that one household has only one source, it means that one household may have many sources of income which implied the multiple occupations and livelihoods system of the villagers within the affected areas.

Table 8: Main Sources of Income based on Villagers' Interview

Main source of Income	Name of Village															
	Phonh		Kadan		Khinak		Phiengdi		Setsavanh		Settaolek		Thakho		Beungnam	
	No. of HH	%	No. of HH	%	No. of HH	%	No. of HH	%	No. of HH	%	No. of HH	%	No. of HH	%	No. of HH	%
Agricultural Production/ Livestock	63	100	300	73	315	77	150	37	50	76	66	87	100	53	237	100
NTFPs collection	0	0	0	0	0	0	0	0	-	0	0	0	-	-	0	0
Fishing/ Fishery	63	96	51	12	30	7	50	0	-	0	20	26	-	-	47	22
Small business/ services	3	4.8	35	8	30	7	10	3	4	6	6	4	15	8	237	100
Handcraft/ small scale industry	0	0	0	0	3	1	0	0	0	0	0	0	0	0	15	0
Daily employees or workers	28	44	11	3	80	20	170	42	22	47	10	8	20	11	50	21
Others	9	14	16	4	1	0	30	8	-		0	0	-	-	0	0

Note: This focused on the affected villages only. HH: Indicates Total Number of Household within Affected Villages. The figures shown are number of households engage in each type of income generating activity.

Table 9: Main Cash Income for 2009-10 based on Villagers' Interview (In Million Kip)

Sources of Income Per year	Villages							
	Phon	Kadan	Khi nak	Piengdi	Setsa vanh	Settao leuk	Thakhor	Beuangum
Agricultural Production/Livestock	40	200	276	90	42	215	60	270
NTFPs collection	0	0	0	0	5	7	6	100
Fishing/ Fishery	200	10	30	NA	NA	NA	40	474
Small business/ services	72	185	2,775	45	6	60	160	300
Handcraft/ small scale industry	0	0	1,2	0	0	0	0	2
Daily employees or workers	560	22	91	100	44	45	200	300
Others	90	96	480	20	NA	NA	NA	2.4
Total:	962	513	3,652	165	97	327	466	1448.4

Note: NA = Not Available

The figures shown are cash only incomes (Kips) derived from each type of income generating activity

3.3.6 Commercial and Industrial Activities

In terms of Commercial activities, based on available information, within and around the project area particularly the villages located in the town, in addition to the temporary village market there are also small 2-3 shops for each village in the town center that selling food, consumptive goods; and, a few restaurants.

Some rural villages have no commercial facilities due to lack of electricity. Other villages on well-access road or at road intersections have some small kiosks that sell drinks, fruit, cigarettes and other small items. They also have shops that prepare and sell food. In terms of industrial activities, within the project area, there is no factory of any kind or even small scale industries.

3.3.7 Health and Educational Conditions within the Project Area

The social well-being of a country relates to its ability to meet basic human needs as indicated by health, including, maternal and child health, nutrition and access to safe drinking water, sanitation and, education, including educational achievement and literacy. Overall, the levels of social well-being in Lao PDR tend to be low, in absolute terms and in comparison with other countries.

+ Health and disease conditions within the project area:

Based on the information gathered from villagers' interview regarding the health and disease conditions during the last three years within the affected area of the project, the result shows that there is no any dangerous disease broken-out within the project area except for *Malaria* which seen as very familiar with the Lao local people particularly who live in the remote areas. However, it needs to be closely and carefully monitored in order to avoid such disease.

+ Education:

In terms of educational achievement and literacy, the deficiencies in educational achievement are reflected in literacy rates for adults over 15 years of age. The national average of 60% compares poorly with a rate of 83% in the East Asian region (World Bank, 2000). More significant are the variations in educational achievement across geographic regions in Lao PDR, in urban and rural areas and between sexes that indicate systemic problems regarding access to education in Lao PDR. The literacy rates among ethnic minority groups, for both men and women, are substantially lower than for ethnic Lao and other lowland groups. Educational conditions within the Project area (affected villages), based on the on-site interview of Villages Chief, the results in the Table 9 below shows that the educational levels of the villagers within the affected villages are quite different. It was also found for some villages; quite large numbers of illiteracy are still existed, despite some claims of total literacy achievement.

Table 10: Educational Level of Villagers within the affected Villages

Villages		Educational Level	Total
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		Unedu- cated	Literacy/ Primary School	Lower Seconda- ry School	Upper Seconda- ry School	College or University	
Phon	Total	-	200	15	3	2	220
	Female	-	97	8	1	1	107
Kadan	Total	-	1201	200	105	3	1509
	Female	-	508	80	40	1	629
Khinak	Total	-	585	450	170		1205
	Female	-	311	270	75		656
Piengdi	Total	-	1600	80	6	-	1686
	Female		750	45	2		801
Setsavanh	Total		215	8	7	-	230
	Female		105	3	0	-	108
Settao Lek	Total		350	12	2		364
	Female		120	5	-		125
Thakor	Total	-	1450	45	-	-	1495
	Female		724	20	-	--	744
Beungnam	Total	-	765	12			677
	Female	-	320	5			325

Note: This focused only within the affected Villages and the children under 6 years old and the old persons more than 55 are not included.

+ Labour Force:

Based on 2000 census data (NSC, 2000), the Lao labour force³ includes 69.5% of men and 71.1% of women. The proportion of employed men and women in rural areas is 15-50% higher than in urban areas. Only 1.7% of the population is unemployed. Unemployment rates in rural areas are 2-4 times lower than in urban areas in the same province.

Within the Project area (the affected villages), based on the results of survey, each village is available in terms of labour force for Project construction. The Table 10 below is the summary of number of the main and secondary labours which are available for conducting of any activities during the Project construction within each affected village.

Table 11: Summary of the Number of Labour Force within the Affected Villages

Villages	Type of Labour					
	Main Labours			Secondary Labours		
	<i>Total</i>	Male	Female	<i>Total</i>	Male	Female
Phonh	301	171	130	80	55	35

³ In Lao PDR, the labour force is defined as “economically active” persons over the age of 10 years and includes those persons who are presently unemployed.

Kadan	1058	542	516	220	170	150
Khinak	1475	875	600	891	521	370
Phiengdi	1400	677	723	320	158	162
Setsavanh	192	100	92	125	59	66
Settao Lek	205	108	97	120	64	56
Thakho	558	280	278	279	140	139
Beungnam	633	330	303	105	55	50

Note: This focused only within the affected Villages along the Transmission Line.

3.3.8 Infrastructures and Facilities within Project Area

Infrastructures and/or facilities are seen as very important factor in boosting of socio-economic development. Since the transmission line alignment runs parallel with the National Road 13 South where most of the lands along the two sides of the road have been developed/developing and converted/converting into other used purposes. Therefore, some infrastructures and facilities within the project area are available. Table 11 below indicates the existing condition of infrastructures and facilities within the affected villages along the Transmission Line.

Table 12: Summary of Infrastructure and other Facilities within affected Villages

No	Villages	Infrastructure / Facilities					
		Primary School (Unit)	Lower/Upper secondary School (Unit)	Dispensary or Village clinic (Unit)	Electricity (Household)	All weather road (Road)	Public Bus
1	Phonh	1	-	-	60	-	No
2	Kadan	3	-	-	370	1	No
3	Khinak	1	1	1	450	1	Yes
4	Phiengdi	4	-	-	284	1	No
5	Setsavanh	1			45	1	Yes
6	Settao Lek	1	-	-	57	1	Yes
7	Thakho	1			100	1	Yes
8	Beungnam		-	1	237	1	Yes

*Note: This focused only within the affected Villages along the Transmission Line.
NA = Not Available.*

3.3.9 Energy Consumption and Existing Generation

Rural households in Lao PDR use a combination of traditional, intermediate and modern energy resources and technologies. In areas where there is no electricity, the main source of energy for cooking, heating and process activities is firewood. According to FAO, 1999, the consumption of fuel-wood including wood for charcoal in Lao PDR in 1999 is averaged at 0.775m³ per year per person.

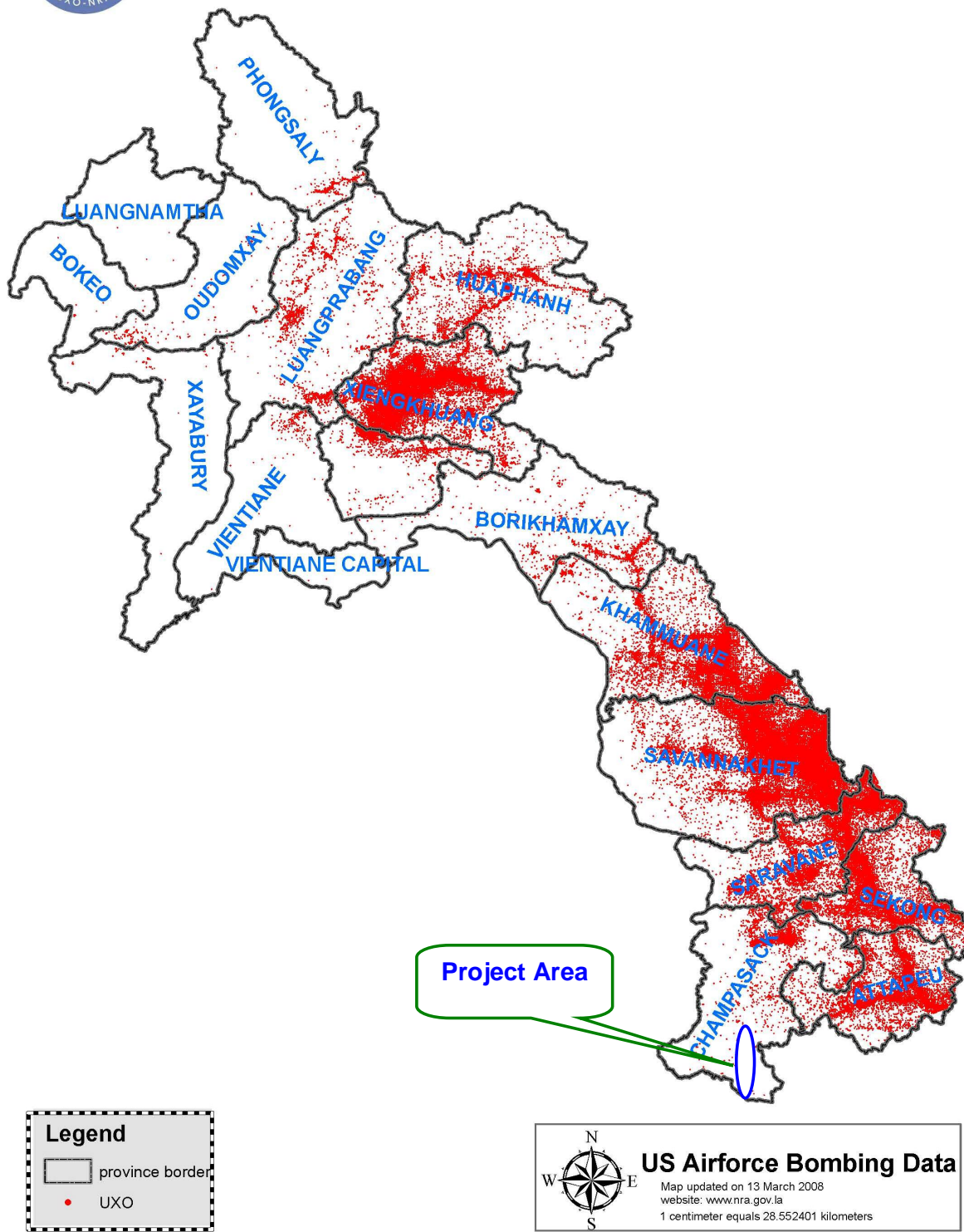
Electricity: Within the project area, all villages are provided electricity especially, while some remote villages which locate quite far away from these areas have no access to electricity, (*see Table 11*).

3.3.10 UXO Conditions

UXO contamination is a very serious problem for the Lao PDR. In addition to the human suffering and loss of life, UXO contamination blocks development in large areas of the country. Thus the National UXO Decontamination Programme addresses an important factor in fighting poverty.



UXO CONTAMINATION MAP in LAOS



Source: Lao National UXO Programme (UXO Lao)

Figure 4: Map shows the UXO impacted areas Nationwide

During a ten-year period (1964 to 1973), the Lao PDR experienced intense ground battles and aerial bombings. It is estimated that over 500,000 bombing missions were launched over Lao PDR, and more than 2 million tons of ordnance was dropped during the 1964-1973 in Lao PDR, while about 30% of ordnance failed to explode, leaving large areas of the country littered with unexploded ordnance (UXO). Severe UXO contamination still affects 15 provinces, Champasack is among them (NGPES, 2004). The areas affected represent over 50% of all agricultural land (MAF/JICA, 2001).

Three decades after the Indochina War, many people are still being killed or badly crippled from ordnance. The litter of highly dangerous ordnance denies access to much needed land, deters the planting of crops and grazing of livestock, and hinders collecting fuel and water. It also discourages movement between villages and slows transport and communication works, and generally undermines social and development activities.

According to the information gathered from the UXO office as shown in the following UXO map, UXO scarcely still remain on some areas within the project area. Paying particular attention to the mentioned portions of the Transmission Line, we investigated-by interviewing the appropriate villagers, according to the results from the interview of villagers within the Project Area especially along the transmission line. It was found that the portions have no UXO contamination and also there is no any villages have severe UXO contamination along the ROW, due to these areas have been developed and most lands have been converted into other used purposes. There is very limited UXO in Khong district as shown in figure below:

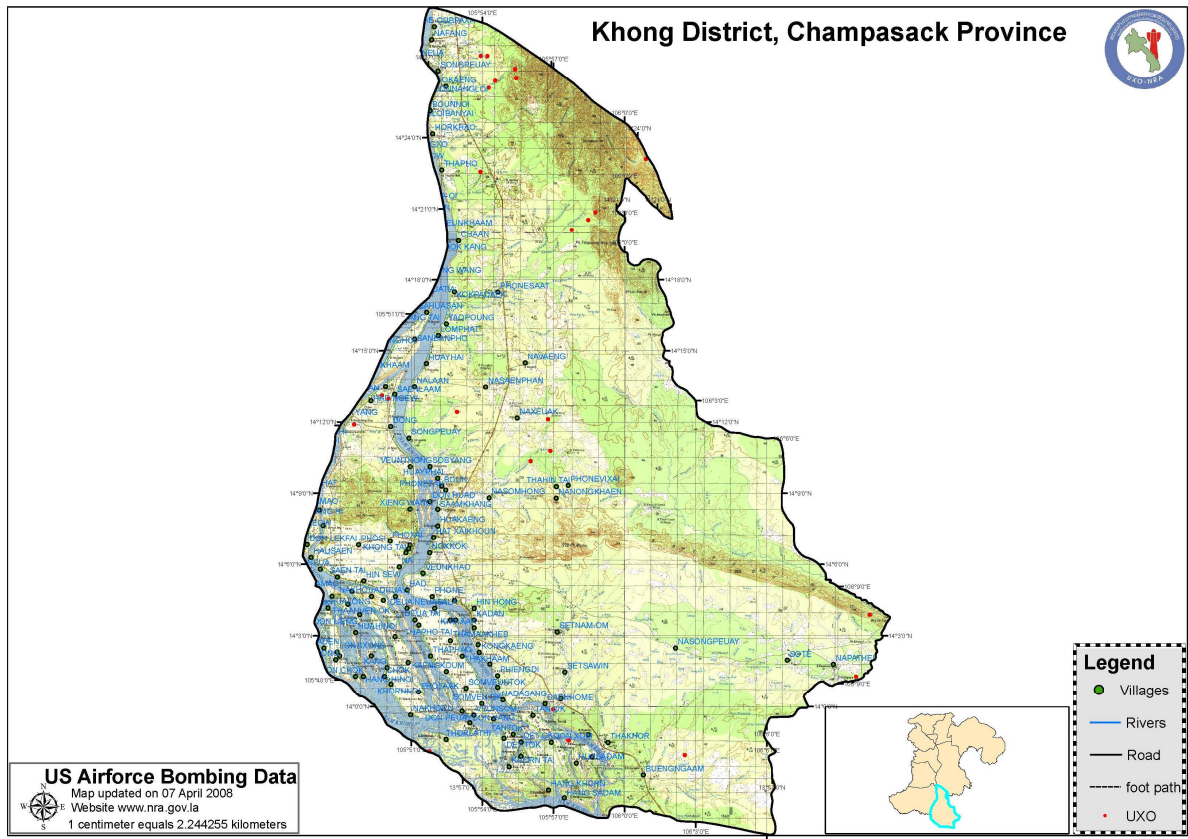


Figure 5: UXO condition in Khong District

4 Screening of Potential Environmental Impacts and Environment Management Plan

4.1 Potential Impact and Mitigation Measures

4.1.1 Impact Matrix

Potential environmental and socioeconomic impacts related to the transmission line project during construction, and operations and maintenance are summarized below, and presented in Table 12.

4.1.2 Transmission Line Consideration

Unlike other types of linear corridor developments (e.g., roads, railways), where the transmission lines are severely limited by physical constraints of gradient, length of river crossing, etc., transmission lines afford considerably more flexibility, thereby enabling the designers to avoid areas of sensitivity. Preliminary route selection for the transmission lines was based on a review of 1:100,000 scale a topographic map which was determined by the engineering study team together with EdL's staffs before the IEE study is conducted.

The consideration and selection of transmission line was based on the following engineering principles:

- Construct a total of 110 towers, however, to keep the alignment as straight as reasonably possible between the start and end points (at least between first PI or angle tower and next angle towers) so as to minimize the costs of construction and imported materials;
- Wherever possible locate the alignment more or less parallel, and in close proximity of an existing road to facilitate construction access and access for maintenance and repairs during operation;

According to the existing conditions of the project area, the following environmental and social principles of route consideration and selection were used in addition to the engineering principles listed above:

- Avoid existing settlements, private and community structures, particularly houses and/or built-up areas, to ensure that resettlement would not be required;
- Minimize the need to expropriate valuable land areas, particularly village holy forest, village cemetery, agriculture land, farm land, etc.;
- Avoid areas of mature forest and other environmentally sensitive areas including NBCAs, PPAs, DPAs, NPAs and eco-tourism sites;
- Avoid any cultural/historical monuments/sites.
- In addition, wherever possible considerations were given to minimizing the extent of visual intrusion upon viewscapes considered as unique or valuable as tourist resources.

For this project a preliminary survey and field visit to identify the alignment was carried out by engineering study team together with EdL's staff before the IEE study is conducted. However, the alignment is identified only on the topography map, but not in the field yet. The detailed alignment survey which involved cutting survey lines through vegetation to enable the cadastral survey team to take unimpeded shots along sight-lines with their survey instruments was conducted as well as the tower locations were marked on the ground along with the centerline of the alignment. As part of the detailed survey, further refinements to the transmission line were based on site specific information collected in the field, including concerns raised in public

meetings held with affected villagers living along the line as well as information and recommendation from this study report.

As mentioned in the previous chapter, complying with the Lao Electric Power Technical Standard 2004, any electrical facilities shall be installed in such a manner so as not to cause no pollution, air, water, noise, vibration, discharging of insulating oil and otherwise which may endanger the human body and damage other objects. Particularly, in this Project, any use of Polychlorinated Biphenyl (PCB) is prohibited, and use of herbicides and pesticides for clearing and controlling Right of Way (ROW) is also prohibited. Contractor must use materials, which are complied with the standard.

4.1.3 Vegetation and Wildlife

Generally, the clearance of vegetation along the presence of the alignment can lead to fragmentation of already diminishing areas of natural forests and wildlife habitats. Overall, the existence value, as well as the ecological research value of the ecosystem will be diminished. Rare and/or threatened vegetation or wildlife species may also be affected by the alignment. The permanently maintenance of the ROW during and after construction will eliminate the ability of the land on which the ROW is situated to re-grow to species-rich secondary forest.

However, for this project, as the habitat is severely degraded over most of the project area due to from time to time exploitation of forest and land resources and the alignment is running parallel with the National Road 13 South for most of the line length, the construction of access roads to the ROW is not much required, except for some areas that the alignment set far away from the main road, in such cases the alignment itself can be used as an access road and existing feeder roads can also be used as access roads for transporting construction materials to the ROW. Therefore forests/vegetations and wildlife habitats will not be significantly affected.

Although forests and wildlife habitats will not be affected significantly by the Project, some patches of primeval forests such as village used forests will be affected. However, in the cases of village used forests are affected by the project; i.e. the alignment from Settaolek village to Beungnam until Cambodia border where it is necessary to remove vegetation, only a narrow right-of-way will be cleared, before clearing the ROW, village forest authority in collaboration with district forestry unit will conduct detail survey for preparing of removal of big trees.

The alignment will more or less parallel, and be in relatively close proximity to (i.e., no more than 0.5 to 1 km) from existing road, thereby minimizing the disruption that would be caused by having to construct lengthy access ways. No new roads will be constructed, only small access tracks to facilitate movement by light tractors or pickup trucks to tower sites. The potential of moving materials to construct towers onto the sites may be small tractors by using old village tracks or feeder roads/trails. Those access roads will be selected by EdL's staff members to make impacts minimum before commence of the construction.

To ensure that the alignment and new access tracks are sited to avoid areas of environmental sensitivity, a member of EdL's EMU will conduct detailed site survey and review the alignment on this report and conducted monitoring since early stage of construction.

In order to avoid for project staff and workers of the project to do hunting and poaching wildlife in the project area, strict rules against such hunting and poaching with penalties should be imposed.

4.1.4 Land Use and Settlements

Resettlement and/or removal of houses and other construction can lead to disruption of community cohesion and social structure, change life style and livelihood pattern of villagers,

may also create a bad impression and poverty to villagers if compensation is improper. Since the alignment is not exactly identified in the field, however, from the filed survey, which was conducted within 50m of width along the TL, we see that there is no any resettlement is required.

As for permanently affected land by towers, its types are summarized in Table 13. Land to be compensated is only 2568 m² of paddy fields.

However, during the detailed alignment survey and identification in the filed, villagers along the route should be consulted again regarding their attitudes and opinions as well as value of their properties and resources.

Table 13: Affected Land Use Types by Each Tower

District/ Village/ Type of tower	Number of Line Towers Located in							
	UF	D.D forest	MD Forests	Land for rubber plantation	Paddy field	Protect Forest	Construct ion Land Land	Total
<u>Ban Hat Substation End Tower T0</u>							1	1
<u>1.B.Phonh</u>								
1.1 Angle tower PI 01	-	-	-	-	1	-	-	1
1.2 Suspension tower	-	-	-	-	-	-	-	-
Total	-	-	-	-	1	-	-	1
<u>2. B.Kadan</u>								
2.1 Angle tower No.PT 01,PI 02	1	-	-	-	-	-	-	1
2.2 Suspension tower No.ST 01, 02,03,04,05,06, 07,08,09,10,11,12,13,14,15,1 6	4	2	-	-	10	-	-	16
Total	5	2	-	-	10	-	-	17
<u>3. B.Khinak</u>								
3.1 Angle tower	-	-	-	-	0	-	-	0
3.2 Suspension tower No.ST 17,18,19,20,21,22,23,24,25,2 6,27,28,29	1	1	-	4	7	-	-	13
Total	1	1	-	4	7	-	-	13
<u>5.B.Phiengdi</u>								
5.1 Angle tower	-	-	-	-	-	-	-	-

District/ Village/ Type of tower	Number of Line Towers Located in							
	UF	D.D forest	MD Forests	Land for rubber plantation	Paddy field	Protect Forest	Construct ion Land Land	Total
5.2 Suspension tower No.ST 30,31,32,33,34,35		0	1	1	4	0	0	6
Total	-	-	1	1	4	-	-	6
6. <u>B.Setsavanh</u>								
7.1 Angle tower No.,PI 03	-	-	-	-	0	-	-	
7.2 Suspension tower No.ST 36,37,38,39,40,41 ,42,43,44,45,46,47, 5	-	1	3	2	6	-	-	12
Total		1	3	2	6			13
7. <u>B.Settao Lek</u>								
7.1 Angle tower No.	0	0		0	0	0	0	0
8.2 Suspension tower No.ST 48,49,50,51	0	0	4	0	0	0	0	4
Total	-	0	4	0	0	0	0	4
9. <u>B.Thakhor</u>								
9.1 Angle tower No	-	-	-	-	-	-	-	-
9.2 Suspension tower No.52,53,54,55,56,57,58,59, 60,61,62,63,64,64,66,67,68,6 9,70	0	16	0	0	3	0	0	19
Total	1	16	-	-	3	-	-	19
10. <u>B.Beunggam</u>								
10.1 Angle tower No. PI 04, PI 05	-	1	-	-	-	1	-	2
10.2 Suspension tower No. 71,72,73,74,75,76,77,78,79,8 0,81,82,03,04,05,06,07,08,09 ,90,91,92,93,94,95,96,97,98, 99,100,101,102,103,104,105		15	0	0	8	12	0	35

District/ Village/ Type of tower	Number of Line Towers Located in							
	UF	D.D forest	MD Forests	Land for rubber plantation	Paddy field	Protect Forest	Construct ion Land Land	Total
Total	0	16	0	0	8	13	0	37
Grand Total	6	36	9	7	39	13		110

Note: DD Forest = Dry Dipterocarp Forest

UF = Unstocked Forest

TP= Tree Plantation

Table 14: Areas under the towers

Land	Number of line Towers Located in and area under tower location							
	UF	D.D forest	MD forest	TD land	Paddy Field	Protection Forest	Total Tower	Total (m ²)
1. Total Angle tower (Areas, A2 = 10 x 10)	1	1	0		2	1	5	640
1.1 Owned Land	1	1	0		2	0	3	448
2. Suspension tower (Areas, A1 = 8x 8)	6	35	9	7	37	13	100	3,636
2.2 Owned Land	2	2	1	0	37		42	1,680
3. Grand Total Areas	6	36	9	7	37	13	110	7,220
Owned Land	2	2	1	0	39	0	44	2,988

4.1.5 Cultural and Heritage Sites

Cultural and heritage sites are national property. Running a high voltage transmission line within close proximity of an important cultural or heritage feature can reduce the esthetics of the site, as well as reduce its existence value, i.e., the value that it exists without being affected by external influences. Relocation of monuments may be culturally unacceptable and result in hostility being directed toward the project.

The proposed alignment will be altered if, as a result of the detailed alignment survey, any property removals are unacceptable and unsatisfactory by villagers who are seen as the owners of the properties and heretofore-unknown cultural/heritage monuments are discovered or identified by villagers. From the result of field survey, there is no cultural and heritage property located along the alignment.

4.1.6 Safety in Health, Other Utilities and Traffic

+ Safety Clearances to Live Conductors

The GoL has established the Lao Electric Power Technical Standards in 2004, which is referring Japanese technical standards as well as other international standards. The EdL have adopted the Lao technical standards for minimum clearance distances for high, medium and low voltage conductors. Minimum clearances are prescribed between conductors and the ground, navigable and un-navigable waterways, road crossings, buildings, antennae, telecommunications lines and other types of utilities.

The proposed the Transmission line will cross approximately ten of farm access track and village access roads and also cross 4 small and medium streams and one wetland area, but would have minimal impacts on their flow system as well as their ecosystem

Table 15 provides a summary of the clearance distances used by EdL for the 115 kv line. The proposed alignment will avoid existing utilities wherever possible. Otherwise, the minimum safety clearances need to be used.

+ Electric and Magnetic Fields by the Transmission Line Project

A standard on electric field is prescribed in the Lao Electric Power Technical Standard 2004 that electric field strength should be lower than 3kV/m at any points of 1m above ground level. Meanwhile, there is no standard on magnetic fields for safety. However, at least, the safety clearances to live conductors must be complied to avoid any impacts on human health, which might be affected. In case for 230 kV transmission line, if the implementation of the transmission line is complied with the safety clearances to live conductors mentioned above, the strength of electric fields at boundary of ROW is estimated no less than 145 cm (Lao PDR Technical standard, Referred to IEC 60383-1).

As for expansion of the Ban Hat Substation, its expansion will be within the land area of the existing substation. Estimation of electric fields and magnetic fields are not practical because of intervention effects of equipment and lines. No one except EdL staff without permission can be close to the transformers and other facilities.

Table 15: Safety Clearances to Live Conductors

Conductor to Specified Target	Minimum Clearance Distance (m) for 230 kV
Ground Surface (Accessible to pedestrians only) and common place	6.67
Navigable River	5.0 Above mast height
Un-navigable River	7.0
An area such as a mountainous district where persons do not have easy access	6.17
Road Crossing	7.17
Buildings	Not Permitted
Antennae	N/A
Telecommunications Lines	4.0
Other (Mekong Crossings)	16.5 above high water level, or 5.0 above mast height, which- ever is greater

Source: EdL, MIH (MEM)

4.2 Environmental Impacts related to Design and Construction

4.2.1 Construction Activities

Generally, construction of the 230 kV transmission lines will typically involve the following tasks:

- Clearing of vegetation from the 40 m ROW by felling and lopping of trees, shrubs and bamboo including disposal of waste from site clearing to provide adequate clearance between vegetation and the conductor wires. Only manual or mechanical methods will be used to clear vegetation. Using of herbicides, pesticides and other chemical poison along the ROW which can contribute to contamination of watercourses and threaten people, beneficial insects, birds and other wildlife will not be allowed.
- To gain access to the alignment, access tracks will be cut from various points along the main roads to which the TL runs more or less parallel. Where soil conditions dictate, the tracks will be surfaced with suitable road topping material.
- The sites for lattice steel towers will be cleared and grubbed, and holes dug to permit construction of each of the four tower footings. At locations where rock or densely compacted soil is encountered, rock drills will be used to create holes for the tower anchor bolts. In such cases, compressors will be required on site to provide compressed air for the pneumatic drills.
- Cement and aggregates will be carried to the each tower site to make concrete that will be poured into the holes to serve as the tower footings.

- The steel components and bolts for the lattice steel towers will be carried to each tower site, where the tower will be assembled and erected manually.
- When once the towers are in place, the insulators will be installed and pulling wheels will be hung from each insulator string. Nylon ropes will be run along the centerline of the alignment from tower to tower. Drums of conductor wire will be transported to strategic locations on the alignment, connected to the nylon ropes, which will then be connected to (gasoline) powered winch that is secured further along the alignment. Conductor wire will be secured to the nylon rope, which will be winched in one at a time to string the conductors from tower to tower, through the wheels suspended from the insulators. The conductor wires will be secured to the insulators with the appropriate tension and sag.
- Grounding rods and/or continuous buried “counterpoise” (grounding) wires will be installed as required.
- Temporary equipment stockyards, work camps and field mobile offices will be constructed. The main stockyards will be located near existing towns where advantage can be taken of transportation systems, existing vacant level land and, wherever possible, fenced off secure areas. Work camps along the transmission line will generally consist of temporary tent camps that will be moved as the construction proceeds along the alignment. Camps will house small work crews and will, therefore, not require any significant infrastructure. Water for the camps will be provided by villagers, otherwise purchased from cities. Sewage and solid waste will be stored; sediments will be deposited at a temporarily made pond or tank near the camps. Garbage from the camps will be buried and other trash will be brought to outside for disposal.
- When once construction has been completed, sites that are no longer required (e.g., access tracks, storage and camp sites) will be reinstated. This will include removing debris or other contaminants, and returning the site to the same (or better) condition in which it was found. Where it was necessary to gain access to the alignment across agricultural lands, these areas will be reinstated to ensure future productivity.
- **Substation Construction**
 - The substation upgrades involve adding new equipment, modifying existing equipment, or replacing existing equipment with new equipment. All construction work for the
 - Ban Hat expansion would occur within the existing substation property.
 - The substations would be built or upgraded in compliance with the applicable requirements of the Policy and Standard on Safety and Labour Protection (EdL 2007). The final design of upgraded substations would take the local conditions of the sites into consideration and, where warranted, would include safety provisions beyond the minimum requirements established in the various applicable safety methods. Contractors would be required to adhere to all such safe working practices. The new and upgraded substations would be designed to allow future maintenance to be done with minimum impact to substation operation and with the necessary clearance from energized equipment to ensure safety.
 - Construction of expansion of existing substation would include site grading, installation of concrete foundations for substation equipment, installation of a fence along the substation perimeter to contain substation equipment and secure the facility, installation of gravel surfacing material within the fenced area, and installation of substation equipment. Sites for a substation expansion area would be graded and leveled to ensure both a stable base for the substation equipment and proper drainage and runoff control. Depending upon soil characteristics specific to each site, soil may need to be

replaced to ensure stability and drainage. Topsoil would be removed, stockpiled, and re-spread on-site. Excess soil would be removed from the site. Once the site is graded, a perimeter fence, typically a chain link fence, is installed to contain the substation equipment. After installation of the fence, concrete foundations are placed to support the substation equipment and gravel is laid throughout the fenced area. After the surface area is prepared, substation components would be delivered on tractor-trailer trucks and installed on their foundations.

- **Substation Maintenance and Operation**

Inspections would be performed regularly over the life of the substations to maintain equipment and make necessary repairs. Routine maintenance would be conducted as required to remove undesirable vegetation that may interfere with the safe and reliable operation of the substations.

4.2.2 Clearing Vegetation along ROW

Only manual or mechanical methods will be used to clear vegetation. Using of herbicides, pesticides and other chemical poison along the ROW which can contribute to contamination of watercourses and threaten people, beneficial insects, birds and other wildlife will not be allowed. Burning to clear and control vegetation will be prohibited and eliminating potential cause of bushfire.

Trees and bushes cleared shall be disposed properly and only to areas permitted by authorities concerned. In order to avoid illegal cutting trees and dealing with logs, before ROW clearing, detailed survey will be conducted by provincial forestry section and district forestry unit to list and mark commercial tree species. The local authorities have rights to conduct logging and logs selling based on the relevant laws and regulations.

4.1.7 Waste from the Project

Work camps along the transmission line will generally consist of temporary tent camps that will be moved as the construction proceeds along the alignment. Camps will house small work crews and will, therefore, not require any significant infrastructure. Water for the camps will be provided by villagers, otherwise purchased from cities. Sewage and solid waste will be stored; sediments will be deposited at a temporarily made pond or tank near the camps. Garbage from the camps will be buried and other trash will be brought outside for disposal.

Main waste will be vegetation debris from ROW clearances. Debris will be stacked outside area of the ROW and burning off shall not be permitted. Wherever possible and where safety is assured, villagers will be permitted to remove vegetation such as bamboo and small trees that have an economic or practical value. Packaging wastes from electrical equipment will be recycled wherever possible (making them accessible to villages, otherwise it will be disposed of in local approved landfills).

4.2.4 Vegetation and Wildlife

Based on the review of forest cover maps, field reconnaissance and villagers' interview, it is indicated that most of the vegetation that will be affected is included some commercial tree species, herbaceous and woody stemmed shrubs and bamboo. However, most of big trees and commercial species were exploited by conducting development activities, logging, clearing and burning for shifting cultivation. It is also evident that any areas of old forest such as national biodiversity conservation areas (NBCAs) and protection forests are not encountered along the

proposed line ROW except for some types of forest such as *Dry Dipterocarp Forests* especially along the TL from Settao Lek to Lao-Cambodia border (*see Table 3 and Annex D*).

In some areas that trees may need to be cut through second growth stands, the overall impact of such tree removal is deemed to be minor, as only a few areas are likely to be encountered. In some areas it may also be necessary to remove individual trees or large tree branches that lean into or overhang the 40 m ROW corridor, if they are deemed to pose a threat to the integrity of the transmission line particularly where the TL crossed the *Dry Dipterocarp Forests*.

The Provincial Agriculture and Forestry Department (PAFO) especially Provincial Forestry Section (PFS) together with District Agriculture and Forestry Extension Office (DAFEO) have responsibility to monitor the implementation of compensatory tree planting. ROW clearing will be carried out by a contractor, whose work will be strictly defined by the contract specifications and special provisions.

A monitoring program will be implemented that involves DAFOE, other authorities concerned, village forest Organization (VFO), and an independent third party, who will audit the environmental performance of the project. Strict rules against wildlife hunting (if any) and poaching will be imposed on project staff, workers, and all contractors engaged to the Project, with penalties levied for anyone caught carrying and using fire arms, or using animal snares and traps. Project owner shall be directly responsible for dissemination of all regulations and information concerned to its staff and/or employees as well as for any misconduct made by its staff and workers.

4.2.5 Land Use and Settlements

As principally said, the alignments will be sited so as to avoid crossing villages and other areas of settlement. Instead, the transmission lines will be routed behind, around or between villages. In case the construction of transmission line could not avoid crossing villages, houses and/or other constructions (*there is no resettlement on this project*), such houses and other constructions e.g. rice huts, within 40 m along the line need to be removed, resettlement and compensation must be considered based on the laws and regulations concerned. While the compensation cost for the losses will be paid appropriately by EdL to villagers according to the existing conditions of the affected properties, the final resettled amount will also be based on negotiation agreement of both sides.

Consultation with local authority and local villagers is necessary and compensation process will be confirmed before the construction. The basic principle of compensation for the losses of land is that landowners have their choice between accepting cash payment and compensation by land of equivalent value at other location. The previous experiences from other projects indicated that most affected people preferred compensation by land.

Where it is necessary to construct transmission lines and or substation over and on agricultural land, or any other land, in particular the land on which the tower is to be situated will be permanently acquired by EdL. It was estimated that amongst 110 towers in total, 39 towers will be constructed on rice paddy fields and 2 towers will be on unused paddy-field which is still classified as other agricultural lands. For standard lattice towers 36 m² of land is required per tower (105 towers) and for angle towers require at least 64 m² of land, *see table 14*. However, most of the project will be constructed during the dry season, when there will be fewer crops that could be damaged. If crops are damaged, compensation will be paid properly. Likewise, compensation will be paid by EdL to farmers for lost value of crops if farmers are prevented in advance from cultivating an affected piece of land because construction is planned to proceed during or part of the cropping season.

The land compensation for construction of towers is based on the loss of existing properties on the land that the towers will be situated.

As mentioned earlier, in order to reduce impact during access roads construction, construction in the dry season (from October to May) and/or after the harvesting season (paddy rice and other crops) (November to January) is recommended.

It is, therefore, anticipated that existing or dry season farm roads will be used to gain access to the alignments. While the existing logging tracks and/or village roads (numerous village roads were observed during field survey) can be used for accessing the alignment. In an exceptional situation if temporary access tracks need to be constructed over sensitive agricultural lands, the contractor will take appropriate measure to lessen the impact to such land. Placing bamboo mats on top of the soil where temporary access tracks need to be constructed over agricultural lands, is one such practice that has been used economically and effectively (Geo-textile materials are rarely used due to their prohibitive cost). The bamboo mats and road base materials will be removed after completion of the construction and the contractor will make sure that previous conditions of such land are practically restored.

Dust may be a negative impact to villagers and wildlife. In dry and windy conditions, water spraying will be carried out on all local roads where construction machinery and trucks use for gaining access into transmission alignment or construction area.

Another issue during the construction is the noise of trucks and heavy equipment. In order to reduce impacts to local villagers and wildlife, the construction would basically be limited only during daytime (from 7.00AM to 6.00PM), and noise level limited up to 55dB of the noise limit in daytime at boundary of the residence. If it is exceeding the noise limit, measure such as installing protection walls will be taken. In case that construction during evening is required, the local affected people will first be consulted sufficiently in advance.

4.2.6. Historical, Cultural and Archeological Property

In case that any historical, cultural or archeological assets are found during excavation, the excavation work shall be stopped to avoid losses of important properties. The provincial culture and touring Directorate shall be informed thereof. The construction work will be resumed after inspection by the authorities and reaching an agreement.

4.2.7. Health and Safety

To protect worker health and safety, the Contractor or Constructor will be required to prepare and submit a worker health and safety plan for approval, prior to commencement of construction activities. Workers will undergo pre-employment medical screening and be certified as fit for work. Workers will receive health and safety training, including a training component on UXO recognition and management. UXO specialists, if necessary, will be needed to carry out surveys of sites that are to be excavated, and will remove and destroy any UXO encountered especially within the areas that the map suggests the remain of UXO. Areas that have been given the “all-clear” for construction will be demarcated. UXO pathfinders will accompany transmission line corridor clearing crews to sweep for, identify, and dispose of UXO. Local villagers will receive public health education that focuses on prevention of mosquito borne diseases as mentioned in section 4.3.6 such as malaria as well as hygiene and sexually transmitted diseases.

The construction work force faces the principal risks to health and safety. The main health and safety risks include:

- Inadequate sanitation facilities in worker camps
- Introduction of vector borne diseases such as malaria and others

- Other epidemic or sexually transmitted diseases introduced by migrant workers
- Serious injury or death as a result of a fall from a tower
- Serious injury or death resulting from accidental collapse of a tower, or from being struck by a falling object from a tower
- Hand, eye and foot injuries from falling or falling objects
- Serious injury or death from unexploded ordinance (UXO).
- Safety and Health for Substation works
 - Use Best Management Plan (BMPs) to minimize the potential for spills or leaks from equipment during construction, including frequent inspections of equipment; requiring portable spill containment kits for construction equipment; ensuring that equipment operations are present at the nozzle at all times when fueling is in progress; and prohibiting the refueling of equipment in wetlands.
 - Use of protective devices (e.g., breakers and relays) that would de-energize the transmission line in the event of an emergency.
 - Use of fences at substations to prevent access.
 - Ground metal buildings, fences, and other large, permanent conductive objects in close proximity or parallel to the line to prevent electric field discharge.

The public may also be at risk from the construction phase of the project, primarily as a result of:

- Objects falling onto or across public roads during tower/power pole erection or conductor stringing
- Spread of epidemic or sexually transmitted diseases from the migrant work force.

4.2.8. Erosion and Silt control

During the construction, the project will involve only minimal excavation that could contribute to soil erosion and the potential for sedimentation of watercourses. Excavation will be limited to the following:

- Digging four holes for each of the lattice tower concrete support bases (115 kv system)
- Clearing, excavating and leveling tracks to access the transmission line alignment or tower base construction sites

The towers should be, principally, located so that to avoid high slope areas. In case that can not avoid such areas, excavations for tower bases must be limited to the immediate area of the tower legs. It is recommended that on sloped land, the legs of the tower be designed so that the downhill legs are longer than the uphill legs (i.e., staggered legs). This will enable the towers to be sited without having to excavate a level cut into the slope, which could create future problems with slope stability and erosion. However, for this project there is no high slope within the proposed construction areas particularly along ROW. Most construction will proceed during the dry season. This will avoid difficulties that would otherwise be encountered during the rainy season.

The number of access tracks used will be limited to approximately one every three transmission towers (approximately one every kilometer). Access tracks will be selected at a closest point and should be an average not more than 1 km in length. The tracks will be no wider than 2.5

meters and will be covered with suitable road topping material such as geotextile in areas where moist soil conditions or the potential for water borne soil erosion could lead to problems. However, using of existing or dry season farm roads/tracks to gain access to the alignments is highly recommended.

In case of access tracks that are not required for permanent use⁴ will be decommissioned by rehabilitation, re-contouring the slope and seeding the surface to encourage rapid re-vegetation. Internationally accepted best environmental management practices will be used to assess the risk of slope failure and erosion, and prevent and control potential problems. It is anticipated that existing sources of aggregate will be available for use by the project. Therefore, no major borrow sites, and no quarries will be developed for the purposes of the project.

The re-vegetation after construction within the transmission line towers is not necessary due to the footprint for a 230 kV tower (36 m^2 for suspension towers and 64 m^2 for angle towers) and the project area is flat land, low slope, therefore, the area that would be exposed to the forces of erosion is limited; and natural plants regeneration occurs quite quickly during the early part of the rainy season, thereby the possibility that soil erosion within the transmission line towers will be insignificant.

4.2.9. Interference with Other Infrastructure

As transmission line construction, particularly tower erection and conductor stringing, moves from location to location as the work progresses, traffic disruption along the roads where erection crews are unloading materials from heavy trucks will be minor. Constructor should adhere to its established practices of posting warning signs and managing traffic to protect the traveling public and its workers. In the event that stringing conductors presents a possible risk to traffic on roads or rivers, bamboo scaffolds will be constructed across the roads and rivers to protect pedestrians, vehicles, boats (and the conductor itself) from potential injury/damage during conductor stringing. In case of over weight of construction materials that will be transported to the construction and/or substation sites, it may be necessary to temporarily reinforce some of the weaker roads or bridges.

4.2.10. Overview of Approach to Compensation

The following are the key principles and objectives that have been adopted for electricity development projects in Lao PDR and it is applicable to this project:

- Involuntary displacement shall be avoided or minimized wherever possible by exploring all viable alternative project designs and locations.
- Land acquisition and resettlement shall be planned and implemented in such a way as to cause least possible amount of social, cultural and economic disruption.
- Affected people shall be (i) compensated as per the compensation principles, (ii) assisted directly and indirectly in the transfer of residence, if required, and during the transition period at the relocation site, (iii) assisted directly and indirectly in their efforts to improve their living standards, in a sustainable manner at the new location.
- Livelihoods shall be restored and be done so without detriment to the environment and the social fabric of the surrounding areas.
- Existing cultural and religious practices shall be respected and, to the maximum extent practical, preserved.

⁴ If necessary, only those tracks that provide access to 'corner' towers will be constructed for permanent use

- Special measures shall be implemented to protect socially and economically vulnerable groups such as ethnic groups, women headed families children and aged people without support structures and people living in extreme poverty.
- All people residing cultivating or making a living within the areas acquired for project prior to a formally recognized cut off date shall be considered as affected people and will be entitled to resettlement and rehabilitation assistance sufficient to assist them to improve or at least maintain their pre-project living standards, income earning capacity and production levels. Lack of legal titles to the land a person is cultivating or to the place residence will not be a bar to resettlement entitlements.
- Replacement residential and agricultural land will be as close as possible to the land that was lost, and acceptable to the affected persons (APs).
- Temporarily affected land and communal infrastructure will be restored to pre-project conditions.
- The compensation and resettlement activities will be satisfactorily completed and rehabilitation measures in place before approval for construction or civil works.
- The previous level of community services and resources shall be improved after resettlement.
- An affected persons shall not be dispossessed of his/her property nor displaced from his/her place of residence or employment without payment of full compensation and/or without making arrangements for relocation and rehabilitation.
- The Executing Agency shall see that institutional arrangements are in place to ensure effective and timely design, planning, consultation, and implementation of the Resettlement Plan.
- The entire cost of resettlement program shall be considered as an integral part of the project cost and accordingly shall be budgeted in annual and overall implementation plans of the project.
- The resettlement programs shall be planned and implemented with the consent and agreement of the affected people and host population and shall encourage their active participation. A full participatory public involvement process shall be implemented.
- There shall be effective mechanisms for hearing and resolving grievances during the implementation of resettlement programs.
- Prior to loan appraisal, details of the Resettlement Plan shall be disclosed to the APs in a form and manner that they can understand.

+ The principles for compensation are as follows:

- All affected persons, housing, land, and other assets registered at the time of the population survey and asset inventory, and all who can demonstrate a loss, have the right to adequate compensation for loss and to income restoration in conformity with these principles.
- Compensation for affected houses, other structures, and for land loss shall be at replacement cost and provided prior to relocation.
- The replacement of housing plots, housing and agricultural land shall be of acceptable standard, use and value to the satisfaction of the affected owner.

- Where relocation is required, the transition period shall be as short as possible. The affected person must receive land as compensation prior to relocation, although under special circumstances cash may substitute for land.
- Prior to the approval of the resettlement program, public consultation must be carried out with the affected persons to ascertain their opinions.
- Prior to settling into new resettlement areas, infrastructure and services shall be replaced to a level of service higher than before.
- Material and tools to be used at the new site or for the new occupation, or for rehabilitation, shall be supplied in a timely manner.

If compensation alone is not adequate to improve the livelihood of affected persons, additional rehabilitation measures shall be developed for this purpose.

However, during conducting the field survey for this Study, initial assessments of potential losses to be compensated has been made especially to various land and assets likely to be affected by the project. These assessments are based on the field survey and villagers' interview. However, based on this report, before starting of project construction, construction contractor, under supervision and guidance of environmental management committee, need to coordinate and work in collaboration with local authorities to collect detail data concerning the loss of assets, issue formula which will be applied for cost estimation of construction and negotiation with affected villagers to ensure understanding and agree on compensation cost in order to avoid subsequent impacts. Project Environmental Management Committee (PEMC) needs to be established at province level in order to be responsible for the implementation of relevant tasks and activities and convene meeting to discuss on detailed compensation procedures and cost with affected village representatives and affected villagers (*See Figure 1*).

The estimation of compensation will be based on the following categories of the loss:

+ *Permanent Losses*

For this project, permanent losses especially the land and/or paddy field that the towers and the sub station will be located (*see Annex Dand Table 13*) need to be compensated as soon as the land is required for construction or before construction is started. The compensation cost for permanent losses must be sufficient to actually replace the lost of land/paddy field and other assets, if any. The permanent losses may include the loss of products or assets on the land and the compensation shall be with land of equal productivity or asset value.

+ *Temporary Losses*

Temporary losses of land and/or products on the land are areas that can be returned to the owner, more or less, in their original previous condition after conducting any activity relating to the implementation of the project. The compensation cost for temporary loss of land will be as a rental cost (or subsistence cost) including the cost of lost products (if any) exist on the land based on the local market value in the year of compensation payment. The rental cost of the land will be based on the period of land rental and the real situation of productivity or quality of such land which will be assessed again at the end of rental period. If the land has no adverse impact, then the land can be returned to the owner without any additional cost concerning land quality loss. However, if the land has been significantly impacted, then the landowner will be compensated properly and satisfactorily. Section 5.2.1 lists construction activities which would have temporary impact on land for which compensations, in the form of rent and rehabilitation costs are required.

+ *Estimation of Compensation Cost*

The methods used to estimate indicative compensation costs for this project were broadly applied in other similar previous power projects and have been satisfactory for both sides (project owner and affected villagers). However, for this project, the methods and rates will need to be refined closer to actual period of compensation and especially when it is clearly understood what type of compensation package the Affected Persons (APs) want and what is actually available.

According to the other similar previous projects, the compensation cost especially for the lost of land including seasonal and irrigated rice paddy field, swidden/cultivation areas and other agricultural land was estimated based on the total of average productive value of land in the past ten years and the actual area of the land. Cash compensation will be normally considered when the affected land and assets are relatively small proportion of the APs livelihood and a suitable or equivalent alternative asset is not available.

The formulas below were used for the calculation of *Permanent loss and Temporary loss* of land in other similar previous EdL power projects. They were specifically used in the compensation of the rice paddy field and other farmland or garden which have been satisfactory for both sides (project owner and affected villagers).

However, the actual methodology for compensation estimate needs to be agreed upon and finalized by PEMC in consultation with the concerned local authorities and villagers as well as APs and it will be set-up in a final compensation agreement, well before the construction is taking place. The actual final cost for compensation varies from place to place and from district to district

(i) For Permanent loss of productive land

$$\text{Compensation Cost} = \text{Average Annual Productive Value of Land per One Hectare (or one sq meter)} * \text{Area of lost Land (ha or m}^2\text{)} * 5 \text{ years}$$

(ii) For Permanent loss of fallow/non productive/swiden land

$$\text{Compensation Cost} = 1/3 \{ \text{Average Annual Productive Value of Land per One Hectare (or one sq meter)} * \text{Area of lost Land (ha or m}^2\text{)} * 5 \text{ years} \}$$

(iii) For Temporary loss of land

Compensation unit Cost

1. Paddy land = 80 kip/m²
2. Garden land = 60 kip/m²
3. Swidden land = 50 kip/m²
4. Non productive/unused land = 30kip/m²

Note: the unit cost above were based on previous similar project in Champasak and Saravan Province

In addition to the above methodology, compensation for crops will be at prevailing current local market price. The value of house garden will vary tremendously depending on what type of crops are grown on the garden. Many small temporary or seasonal gardens are located around the house and along the riverbank where water is easily accessible; in case of this project the so called house' gardens are located outside of the TL ROW and not anticipated to be affected.

According to the Technical Guideline for Resettlement and Compensation of the Lao PDR, this states that *“due to a virtual non-existence of rural land markets the compensation should be determined based on the average productive values of land based on the past three to four years of production, and should be equivalent to at least 6-7 years of harvest value”*.

Most of shifting cultivation areas (including rotational and pioneering shifting cultivation) in Lao PDR especially in the northern part is used for upland rice production. The use of land in upland area of local people is unlikely to have a legal right to the land except for those villages which have been allocated land and forest that conducted by GoL' Land Allocation Program with at least three hectares of land for one household. Therefore, it is an aspect that compensation entitlements need to be carefully considered to ensure that APs are compensated so that they can restore their land and other assets as well as their livelihood.

In terms of swidden and cultivation area (rotational cultivation), compensate of one third of total cost of paddy field (with the same area) has been applied for the similar previous projects. However, there is no clear guidance regarding compensation entitlements for areas of fallow upland and/or natural grassland which are likely to be areas of previous shifting cultivation; impact on these land areas will have an impact on the livelihoods of APs.

The Technical Guideline for Resettlement and Compensation also states that *“Compensation entitlements to illegal occupiers of state or public land are generally unrecognized. Where the AP do not possess any legal rights to the affected occupied land, and the entitlement to compensation for such land is not acceptable, some alternate development options should be looked into”*.

In terms of planted fruit trees and industrial trees, the following methods have been broadly applied for similar previous projects:

+ For Planted Industrial Trees

$$\text{Compensation Cost} = [\text{Land Clearing Cost} + \text{Cost of Seedling}] + [(\text{Maintenance Cost}) * (\text{Year of Maintenance})]$$

+ For Planted Fruit Trees

$$\text{Compensation Cost} = [\text{Land Clearing Cost} + \text{Cost of Seedling}] + [(\text{Maintenance Cost}) * (\text{Year of Maintenance})] + [(\text{Average Harvesting Value/year}) * (\text{Years of Harvesting})]$$

Note: Years of Harvesting for Fruit Trees may range from 1 to 7 years depending on Fruit Tree Species.

The Regulation of Ministry of Agriculture and Forestry No. 0196/MAF.2000, dated 15 August 2000, Article 23 identified the formula for compensation for the loss of plantation tree as follow:

$$\text{Cost of Tree Plantation Farm} = \text{Land Use Cost} + \text{Land Development Cost} + \text{Cost of Existing Planted Tree} + \text{Cost of Agricultural Produces (if any)}$$

In terms of forest and non-timber forest products (NTFPs), generally, they play an important role in the livelihood of many local people especially the poor. Most rural households, especially the poorest, depend heavily on forests not only for timber for house construction and other purposes but also for food, fodder, fencing materials, medicines and condiments. Villagers also often derive cash income from sale of NTFPs and, in many local areas, harvesting of forest resources is one of the few available economic activities. NTFP consumption and sales often equate to more than half of family income. Impact on these resources will have also a significant impact on the livelihoods of APs. Although there is no clear guidance regarding compensation entitlement for village used forests as well as lost NTFP source within the village forests or in case of there is adverse impact on NTFPs, however, to ensure that villages and/or villagers will be compensated so that they can restore their forest land and assets livelihood, it may be necessary to provide compensation for forest land more broadly than only for village forest land. Where village forest land is lost and has significant impact in large area then new forest will presumably need to be allocated.

Based on the result of site survey during the IEE study, no people will be resettled, only two paddy field's huts under TL line will be affected and needed to relocate. There are about 5,250 trees with diameter at breast height equal to 20 cm will be cut for transmission line construction. About 250 of these trees will be compensated as they are owned by villagers. The compensation cost will be provide 10,000 kip/tree for cutting down labor wage only, because the owners can use those cut timber for their further needs.

Compensation for temporary land occupation, crop damages or missing seasonal production are considered based on the given above formula, derived from previous practices on similar EDL projects.

However due to the nature of the construction, it is anticipated there will be no crop damage as a result of temporary occupation of land, because all of the construction work will be conducted during dry season or after harvesting season.

Once the detailed survey was finalized, prior to the construction work, additional compensation might be identified, which will unavoidably increase the compensation costs. Therefore provision of budgetary contingency is necessary. Based on the scope of the impacts and compensation measures above, the compensation budget is calculated and shown in Table 16, 17 and 18 below.

Table 16: Estimation of Compensation Cost (for rice paddy field land loss)

Village	Angle Tower		Suspension Tower		Total(LAK)
	No.	Total cost(LAK)	No.	Total cost(LAK)	
Phonh	1	375,000	-	-	375,000
Kadan			10	2,400,000	2,400,000
Khinak	-	-	7	1,923,840	1,923,840
Phiengdi	-	-	4	1,201,920	1,201,920
Setsavanh	1	375,000	7	962,020	1,680,000
Settao Lek	-	-	-	-	-
Thakho	-	-	3	720,000	720,000
Beunggnam	-	-	8	1,920,000	1,920,000
Total	2	750,000	39	9,127,780	10,492,780

The total estimation of paddy field land under towers compensation is LAK 10,492,780 kip

Note: The above amounts are calculated based on the Formula as indicated in Section 5.2.7 for the permanent loss of the rice paddy field where the towers will be located only. In this case, the productivity of rice (husk) per one hectare for one season is 2,500 kilograms (or 2.5 tons/ha). The market price for 1 kilogram of husk rice is 3,000 Kip. It means that the cost of compensation for one Angle tower foundation is 240,000 LAK and 375,000 LAK for Suspension Tower.

Table 17: Estimation of Compensation Cost (non productivity land loss)

Villages	Angle Tower		Suspension Tower		Total(LAK)
	No.	Total cost(LAK)	No.	Total cost(LAK)	
Phonh	-	-	-	-	-
Kadan	1	3,000	1	1,920	4,920
Khinak	-	-	2	3,840	3,840
Phiengdi	-	-		-	-
Setsavanh	-	-	1	1,920	1,920
Settao Lek	-	-	-	-	-
Thakho	-	-	-	-	-
Beunggnam	-	-	-	-	-
Total:	1	3,000	4		10,680

Table 18: Estimation of Compensation Cost (paddy field's huts dismantle and rebuild)

Villages	Asset	No	Siz	Compensation Cost LAK
Phiengdi	Paddy field's hut	1	5mx3m=15 m ²	800,000
Thakhor	Paddy field's hut	1	5m x4m=20 m ²	800,000
Total:		2		1,600,000

Note: The compensation cost will be provided for dismantle and rebuilt.

Table 19: Estimation of Compensation Cost (for Temporary loss)

No.	Statement	Unit	Quantity	Unit Price (Kip)	Total Comp. Cost (Kip)	Compensated Time (Years)
1	<u>Rental</u>				<u>19,436,850</u>	
	<u>Land</u>					
	Paddy	m ²	192,990	80	15,439,200	
	Garden	m ²	13,785	60	827,100	
	Swidden	m ²	55,140	50	2,757,000	
	Non productive land	m ²	13,785	30	413,550	
2	<u>Crop damage</u>				<u>10,000,000</u>	
	Dry season crop		Lump sum		10,000,000	
3	<u>Rehabilitation</u>				<u>15,000,000</u>	
	Rehabilitation/ restoration		Lump sum		15,000,000	

Total Temporary Compensation Costs = 44,400,000 Kip

The temporary land areas shown (include access roads/tracks, machinery yards and camping areas) were estimated based on site observation of availability of existing tracks as well as from previous similar projects within the project proximity. Unit cost used for the estimate of temporary land of various types (shown above in (iii) For temporary loss of land) were obtained from previous similar projects.

4.2 Environmental Impacts during Operation and Maintenance**4.2.1 Transmission Line Maintenance**

EdL carries out corridor maintenance using manual means of trimming the vegetation. In the current practice, EdL is conducted inspection of transmission line at least twice per year with aiming to check the condition of towers, conductors, insulators as well as clearing or trimming vegetation and cut any tree with higher than 3 meters in order to avoid electrical arching or service interruption. Using of herbicides, pesticides and other chemical poison along the ROW which can contribute to contamination of watercourses and threaten people, beneficial insects, birds and other wildlife will not be allowed. Burning to control vegetation along the ROW is also prohibited. Any crop cultivation of local people under transmission line is allowed. Rather, local people living along routes will be participated under contract to manually clear and cut vegetation/trees along ROW under supervision of EdL technical staff. However, villagers' participation in maintenance of Transmission Line is more recommended.

EDL's EMU will be responsible for monitoring environmental and social aspects of project during operations and maintenance activities. Therefore, EDL will provide training on

environmental aspects to substation and transmission lines crews. Also, involvement of local villages in operation and maintenance as employees will be of great socio benefit.

4.2.2 Substation Maintenance

Substations should be well operated and maintained. So, operation and inspection procedures will be defined and training of operators on the procedures will be conducted.

One of the issues of substation is contamination of watercourses and soils by leakage of oils from transformers. In order to avoid such contamination, oil containment systems such as oil separators will be installed close to transformers. The oil separator has functions to tentatively store leaked oils and to separate the oil from water.

Particularly, in order to avoid contamination by PCBs, use of equipment containing PCBs will be prohibited. Bidding document shall specify no equipment containing PCBs will be permitted.

4.2.3 Land Use and Settlements

The availability of a reliable source of 24-hour electricity to supply to the energy consumption for Southern and Central 2 region, over time, will significantly contribute to the quality of life of local people and contribute to the development of regional industry, agricultural production and commercial activities, in the near future may increase the attraction of people migration to the area especially those who want to improve their living. This may result in a process of induced development along the corridor served by electrification, leading to increased exploitation of remaining forest resources. Other potential negative impacts could include land speculation by investors, and displacement of long time residents. However, cultivation of crops along the ROW is allowed as long as not to be higher than 3 meters.

4.2.4 Disturbance to Residents and Wildlife

Transmission line “hissing” may be noticeable at the place very close to the line. Since transmission line ROW is sired away from residential areas, direct impacts of the noise to residents will be minor.

One of the concerns on impacts to residents is interference with communications such as Telephone and Televisions. Even though the transmission line has clearance with residential areas, the impact should be monitored and consulted with local villagers. If necessary, necessary measures such as erecting additional antenna will be taken, otherwise it should be compensated.

Another issue is an impact to migratory birds. During preparation and construction of the project, it will be observed and surveyed if there are migratory bird routes crossing the transmission line. If such routes are found, warning signs will be put on the wires on the migratory routes.

4.2.5 Health and Safety

Health and safety plan will be prepared and implemented by EdL throughout operation phase of the project. The health and safety plan includes periodic health and safety training and practice drills.

Sign boards (Dangerous Warning Signs) need to be put on every tower as well as on the conductors where those are crossing roads and rivers.

As for electric and magnetic field, as mentioned above, electric fields by the transmission line will not exceed the safety standards if the line is constructed complying with the safety clearance. In the case of the substations, no one without permission will not be allowed to enter substation and close to transformers.

4.2.6 Disposal of Wet Cell Batteries

There is the potential that when areas that are currently off-grid are connected to the grid, residents who presently use wet cell (lead-acid) batteries for lighting may dispose of them in large numbers. Uncontrolled disposal of wet cell battery may cause threat to the environment. Normally, unused or old batteries have value for their lead content, and batteries with useful life have value for other uses other than for lighting and operating small home appliances.

Therefore, it would appear there is a financial incentive not to discard unused and usable wet cell batteries into the receiving environment. An added mitigation issue is that the number of wet cell batteries involved in providing electricity to off-grid villages, relative to the total number in service throughout the country (in automobiles, trucks, farm vehicles) is very small. The primary issue relating to battery disposal in Lao PDR, particularly in the project areas, is the way scrap dealers process the batteries. However, the number of unused batteries will not be high as most villages within the project area have already been connected to 22 KV line.

Table 20: Potential Impacts and Mitigation Measures

Issue	Mitigating Measures	Cost of Mitigation	Responsibility	Start Date	End Date
I. Design and Construction Phases					
1) Clearing of forest and bushes along the TL ROW	<ul style="list-style-type: none"> • Trees and bushes cleared shall be disposed only to areas permitted by Authorities concerned. • Use of herbicides or pesticides will be prohibited to control vegetation along ROW. Only manual or mechanical methods will be allowed. • Burning to clear and control vegetation along ROW is also prohibited. • No high commercial tree species, however, before ROW clearing, the detail survey by Provincial Forestry Section and District Forestry Unit to list and mark big trees or commercial tree species (if any) for felling is needed. • Logging and logs selling process will be based on the Forestry Law No 01-96(2007) Article No 15 and conducted by PAFO and DAFO in accordance to the Regulation No 0221/MAF 2000. Selling of logs by EdL or the Contractor is prohibited. 	Minor	Contractor	Before construction of TL is started	After construction activities are completed
2) Wastes from camps of workers	③ Worker camps will be sited at least: (a) 1 km from National Biological Conservation Areas (NBCAs), National/Provincial/District Protected Areas (NPAS, PPAs,DPAs), (b) 50	Minor	Contractor	When construction of TL is	When construction activities are

Issue	Mitigating Measures	Cost of Mitigation	Responsibility	Start Date	End Date
	<p>meters from any surface water bodies, and (c) 1 km from any villages or sites of cultural significance</p> <p>③ Water for the camps will be provided by villagers, otherwise purchased from cities.</p> <p>③ Sewage and solid waste will be stored; sediments will be deposited at a temporarily made pond or tank near the camps.</p> <p>③ Garbage from the camps will be buried daily and other trash will be brought to outside for disposal.</p>			of TL is started	activities are completed
3) Disposal of construction debris and wastes	<p>③ Main waste will be vegetation debris from ROW clearances; debris will be stacked outside area of the ROW and burning off shall not be permitted; wherever possible and where safety is assured, villagers will be permitted to remove vegetation such as bamboo and small trees, that have an economic or practical value; packaging wastes from electrical equipment will be recycled wherever possible (making them accessible to villages, otherwise it will be disposed of in local approved landfills).</p>	Minor	Contractor	Before construction of TL is started	After construction activities are completed
4) Affecting wildlife	<p>③ To ensure that the alignment and new access tracks are normally sited at least 1 km from areas officially designated as environmentally sensitive, a member of EdL's EMU will</p>	Minor	Contractor	When construction starts	When construction activities are completed

Issue	Mitigating Measures	Cost of Mitigation	Responsibility	Start Date	End Date
	<p>conduct detailed site survey and review the alignment on this report and conducted monitoring since early stage of construction.</p> <p>③ Strict rules against wildlife hunting, poaching and trading in accordance to Forestry Law No 2007 Article No 43 will be imposed on project staff, workers, and all contractors engaged to the Project. Violators will be penalized.</p>				
5) Erosion and Silt Control	<p>③ The towers will be located so that to avoid high slope (>30°) areas.</p> <p>③ In case that it cannot be avoided to select such slope areas, the legs of the tower will be designed to minimize to excavation on slopes.</p> <p>③ Construction will proceed during dry conditions.</p>	Minor	EdL, Contractor	Before construction of TL is started	After construction activities are completed
6) Interference with local villagers' activities during construction and transportation of materials	<p>③ Construction must be carried out during dry (non-farming) season, approximately from October to April;</p> <p>③ Bamboo mats will be placed on the top of the paddy soils where temporary access tracks need to be constructed over agricultural lands. The bamboo mats will be removed after completion of the construction.</p> <p>③ Temporary access paths will be decommissioned once construction completed;</p> <p>③ The existing drainage system such as streams will be maintained by building appropriate</p>	Minor	Contractor	Before construction of TL is started	After construction activities are completed

Issue	Mitigating Measures	Cost of Mitigation	Responsibility	Start Date	End Date
	<p>structures such as bridges, culverts etc.</p> <p>③ To avoid contamination by oils from heavy equipment, sump oils will be stored in drums or containers, and then brought to companies licensed to manage these materials.</p> <p>③ Transportation of material is allowed only in daytime (from 7.00AM to 6.00PM).</p> <p>③ Contractor should adhere to its established practices of posting warning signs and managing traffic to protect the traveling public and its workers.</p>				
7) Dust emission	<ul style="list-style-type: none"> • Water spraying in dry and windy conditions on the local road where the trucks pass through and any construction sites 	Minor	Contractor	When construction starts	After construction activities are completed
8) Noise (civil works)	<p>③ Construction would take place only during daytime (from 7.00AM to 6.00PM)</p> <p>③ If noise level is exceeding 55dB of the noise limit in daytime, measure such as installing protection walls will be taken.</p> <p>③ If construction during evening is required, the local affected people will first be consulted at least one week in advance.</p>	Minor	Contractor	When construction starts	After construction activities are completed
9) Interference with other infrastructure during	<p>③ Contractor should adhere to its established practices of posting warning signs and managing traffic to protect the traveling public and its workers.</p>	Minor (depends on the quantity of material and	Contractor	Before construction of TL is started	When construction activities are completed

Issue	Mitigating Measures	Cost of Mitigation	Responsibility	Start Date	End Date
construction and transportation of materials	<ul style="list-style-type: none"> ③ In the event that stringing conductor presents a possible risk to traffic on public roads or rivers, bamboo scaffolds will be constructed across the roads and rivers to protect pedestrians, vehicles, boats (and the conductor itself) from potential injury/damage during conductor stringing. ③ In case of overweight material during transportation, it may be necessary to temporarily reinforce some of the weaker roads and/or bridges. 	quality of roads/bridges)			
10) Injury and sickness of workers and members of the public	<ul style="list-style-type: none"> ③ Contractor will be required to develop a health and safety plan two weeks before starting construction work, and then EDL will review and approve it; workers will be subjected to health screening and health and safety training sessions will be provided; public health education will be part of the EDL program. ③ Necessary safety tools such as helmets, working shoes, ear protection, dust filter and others will be provided and be required to be used by workers. 	Minor	Contractor	Before construction of TL is started	When construction activities are completed
11) Earth-moving	<ul style="list-style-type: none"> ③ The earth-moving to be disposed only to areas permitted by technical field survey Team and local authorities concerned. 	Minor	Contractor	When construction starts	After construction completion
12) Loss of historical, cultural and archeological property.	<ul style="list-style-type: none"> ③ In case any historical, cultural or archeological asset in encountered during excavation, the excavation work shall be stopped and the Provincial Culture and Tourism Directorate 	Minor	EDL	Before construction of TL is started	After construction activities are completed

Issue	Mitigating Measures	Cost of Mitigation	Responsibility	Start Date	End Date
property.	Provincial Culture and Tourism Directorate (PCTD) shall be informed thereof. The construction work will be resumed after inspection and approval by the authorities.			started	
13.) Contamination of water	③ Location of towers will be adjusted to avoid streams and wetlands.	Minor	EDL	Before construction of TL is started	After construction activities are completed
II. Operation Phase					
14.) Maintenance of ROW and ROW checking	③ No herbicides will be used to control vegetation along ROW. Manual or mechanical methods will be used. ③ Burning to clear and control vegetation along ROW is also prohibited. ③ Rather, local villagers living along routes will be participated under contract to manually cut vegetation along rights-of-way. ③ Plantation trees and crops with higher than 3 meters will not be allowed. ③ ROW checking and maintenance of ROW should be conducted at least once or twice a year	Minor	EDL (Champasak Provincial Branch Operations Unit)	After construction activities are completed	During Project Life
15.) Contamination of watercourses and soils by leakage of oils from transformers	③ Transformers will be placed upon concrete pads banded to contain any routine spills or leaks. ③ Oil containment systems such as oil separators will be installed close to transformers. The oil	Minor	EDL (Champasak Provincial Branch Operations Unit)	Before construction of Substation is started	When construction activities are completed

Issue	Mitigating Measures	Cost of Mitigation	Responsibility	Start Date	End Date
	separator has functions to tentatively store leaked oils and to separate the oil from water. ③ Operation and inspection procedures will be defined and training of operators on the procedures will be conducted.				
16.)Contamination of watercourses and soils by PCBs	Bidding documents will specify no equipment containing PCBs will be permitted.	Minor	EdL Project Management Office	When equipment is delivered	After construction activities are completed
17.)Safety; Injury to villagers	Health and safety plan will be prepared and implemented by EDL throughout operation phase of project, including periodic health and safety training and practice drills Sign boards (Dangerous Warning Signs) need to be put on every tower as well as on the conductors where the line is crossing roads and rivers.	Minor	EDL (Champasak Provincial Branch Operations Unit)	After construction activities are completed	During Project Life
18.)People' health effects by electro-magnetic field	③ 25 m width of ROW will be obtained. ③ Safety Clearance to Live Conductor for 230 kV; minimum clearance distance (meter) according to EdL standards: <ul style="list-style-type: none"> ○ Ground surface: 6.67 meters ○ Navigable river: 5.0 meters (above mast height) ○ Un-navigable river: 7.0 meters ○ Road crossing: 7.17 meters ○ Building: Not permitted 	Minor	Contractor	When construction starts	After construction activities are completed

Issue	Mitigating Measures	Cost of Mitigation	Responsibility	Start Date	End Date
	<ul style="list-style-type: none">○ Telecommunication Line: 4.0 meters○ An exclusion perimeter around the substation of at least 16.5 meters will be maintained with a fence.				

Note: *All items which are noted to be the responsibility of the Contractor will be specified in the bidding document.*

4.3 Environmental Monitoring Program

The monitoring program to support the Mitigation Plan is presented below:

Table 21: Monitoring Plan

Phase	Issues	What Parameter is to be monitored	Where Parameter is to be monitored	How Parameter is to be monitored/type of monitoring equipment	When Parameter is to be monitored/measurement frequency or continuous	Responsibility	Start Date	End Date
Construction Phase	1) Clearing of forest and bushes along TL ROW	Ways of clearing forest and bushes, log selling process	ROW and surrounding areas	Visual observation and interview with contractor	Weekly	EMU in the GMS-PMO Site Office (EMU/PMO) and PAFO/DAFO	Start of construction	End of Construction
	2) Wastes from camps of workers	Way of treatment of wastes from camps	Camp sites and surrounding areas	Visual observation	Weekly	EMU/PMO	Start of construction	End of Construction
	3) Disposal of construction debris and wastes	Way of disposal of debris and wastes from construction, recycle of woods and other construction materials by villagers	ROW and construction sites	Visual observation	Weekly	EMU/PMO and Local Village Authority Head	Start of construction	End of Construction

Phase	Issues	What Parameter is to be monitored	Where Parameter is to be monitored	How Parameter is to be monitored/type of monitoring equipment	When Parameter is to be monitored/measurement frequency or continuous	Responsibility	Start Date	End Date
Construction Phase	4) Affecting wildlife	Wildlife hunting activities conducted by persons related to the project	Access road and surrounding areas	Visual observation	Weekly	EMU/PMO and Local Village Authority Head	Start of construction	End of Construction
	5) Erosion and silt control	Excavation activities and erosion	Bases of towers and access roads	Visual observation	Weekly During rainy day after construction is completed	EMU/PMO	Start of construction	First rainy season after completion of construction
	6) Interference with local villagers activities during construction and transportation of materials	Access road conditions and traffic control measures, Villagers complaints Placement of agricultural protection mats	Access roads	Visual observation, interview with local villagers	Weekly, during dry season	EMU/PMO	Start of construction	End of Construction
	7) Dust emissions	Dust conditions Complaints from villagers	Construction site and access roads	Visual observation, interview with local villagers	Weekly	EMU/PMO	Start of construction	End of Construction

Phase	Issues	What Parameter is to be monitored	Where Parameter is to be monitored	How Parameter is to be monitored/type of monitoring equipment	When Parameter is to be monitored/measurement frequency or continuous	Responsibility	Start Date	End Date
	8) Noise (civil works)	Decibels Complaints from villagers	Villages nearby access roads or construction sites	Noise meter, interview with local villagers	Weekly When there is a complaint from local villagers	EMU/PMO	Start of construction	End of Construction
Construction Phase	9) Interferences with other infrastructure during construction and transportation of materials	Appropriate location of warning signs Temporary structures to protect traffic Reinforcement of roads and bridges	ROW and access roads	Visual observation, interview with local villagers	As required, prior to start of construction	EMU/PMO	Start of construction	End of Construction
	10) Injury and sickness of workers and members of the public	Injury and sickness of workers and members of the public Use of worker protection equipment	Camps and villages nearby construction sites	Visual observation, interview with local villagers	Monthly, at random times-more frequently if violations are observed	EMU/PMO	Start of construction	End of Construction

Phase	Issues	What Parameter is to be monitored	Where Parameter is to be monitored	How Parameter is to be monitored/type of monitoring equipment	When Parameter is to be monitored/measurement frequency or continuous	Responsibility	Start Date	End Date
	11) Earthmoving	Way and place of earth moving	Construction areas and disposal sites	Visual observation	Weekly	EMU/PMO and Local Village Authority Head	Start of construction	End of Construction
	12) Loss of historical, cultural and archeological property	Accidental finds of historical, cultural or archeological property	ROW, access roads and construction sites	Visual observation, interview with local villagers	When required—if artifacts are uncovered (chance find)	EMU/PMO and Provincial Culture and Tourism Directorate	Start of construction	End of Construction
	13) Contamination of water	Oil, turbidity	Streams and wetlands near construction sites	Visual observation	Weekly	EMU/PMO	Start of construction	End of Construction
Operation Phase	14) Maintenance of ROW and ROW checking	Ways of clearing forests and bushes	Along ROW	Visual observation, interview with local villagers	Twice a year	EMO and EMU/PMO	End of construction	End of project life
	15) Contamination of watercourses and soils by leakage of oils from transformers	Oil contamination of water and soils	At substation site	Visual observation	As per EdL substation system inspection schedule	EMO and EMU/PMO	End of construction	End of project life

Phase	Issues	What Parameter is to be monitored	Where Parameter is to be monitored	How Parameter is to be monitored/type of monitoring equipment	When Parameter is to be monitored/measurement frequency or continuous	Responsibility	Start Date	End Date
	16) Contamination of watercourses and soils by PCBs	Certificate/or bill of lading for transformer oil	At substation upon delivery of transformer oil	Checking material specifications	Once, on delivery of oil to substation	EMO and EMU/PMO	End of construction	End of project life
	17) Safety to villagers	Placement of warning signs	At every transmission line tower	Visual observation	Once/year	EMO and EMU/PMO	End of construction	End of project life
	18) Health effects to people by electromagnetic fields	Distances from protective fence (substation) and heights (transmission line)	Along the ROW and at the substation fence line	Visual observation	Once, before transmission line or substation is energized	EMO and EMU/PMO	End of construction	End of project life

5 INSTITUTIONAL RESPONSIBILITIES AND PROCEDURE

EDL and its EMU will be responsible for ensuring the project complies with the environmental policies, procedures, and best practices of the GoL and World Bank, and the specifications and special provisions that are set out in the construction contract. EDL will be responsible for ensuring, on a day-to-day basis, that the mitigation measures and monitoring activities identified in the EMP.

EdL will be required to assign two environmental specialists to the EMU in (Champasak Provincial Branch Operations Unit) Province during the construction phase and one permanent environmental specialist during project implementation to efficiently implement the required environmental monitoring and evaluation works at the site. This Officer will be in charge of all coordination of the concerned environmental work of this project. He/she is, who was at least trained on Environmental Safeguard. This person may be from the EDL branch office. Environmental procedures to be followed are described below:

5.1 Data Collection

+ *Construction*

Most data collection would be performed by the EMU in the GMS PMO in Champasak Province. For some activities (see Monitoring Plan, Table 6) the local village head will participate in the monitoring activities and report his findings to the EMU. In addition, some monitoring activities are the responsibility of government authorities (e.g. DAFO/PAFO for forestry and PCTD for cultural properties), again these are specified in the Monitoring Plan.

+ *Operation*

The EMU local office has full responsibility for data collection

5.2 Data Analysis

For both construction and operation activities, data will be provided by the EMU to the GMS PMO. The GMS PMO will include one environmental specialist assigned to analyze all the environmental data collected

5.3 Reporting

The Environmental and Social Office at EdL Headquarters (EMO) will prepare environmental reports and any recommendations for further actions based upon on the data analysis performed by the GMS PMO and issue reports as follows:

- ③ During construction, quarterly reports to DOE and WREA
- ③ During construction, weekly reports to the EdL Deputy Manager
- ③ During operation, EdL Provincial Branch Manager will receive reports as required, but at least annually.

Reporting to the World Bank will be done as part of the EdL regular reporting requirements. Each report to the World Bank will be required to include a separate section on environment, which will include a summary of the findings, any environmental issues that occurred during the reporting period and how they were managed, or how they will be managed, and a schedule for completion.

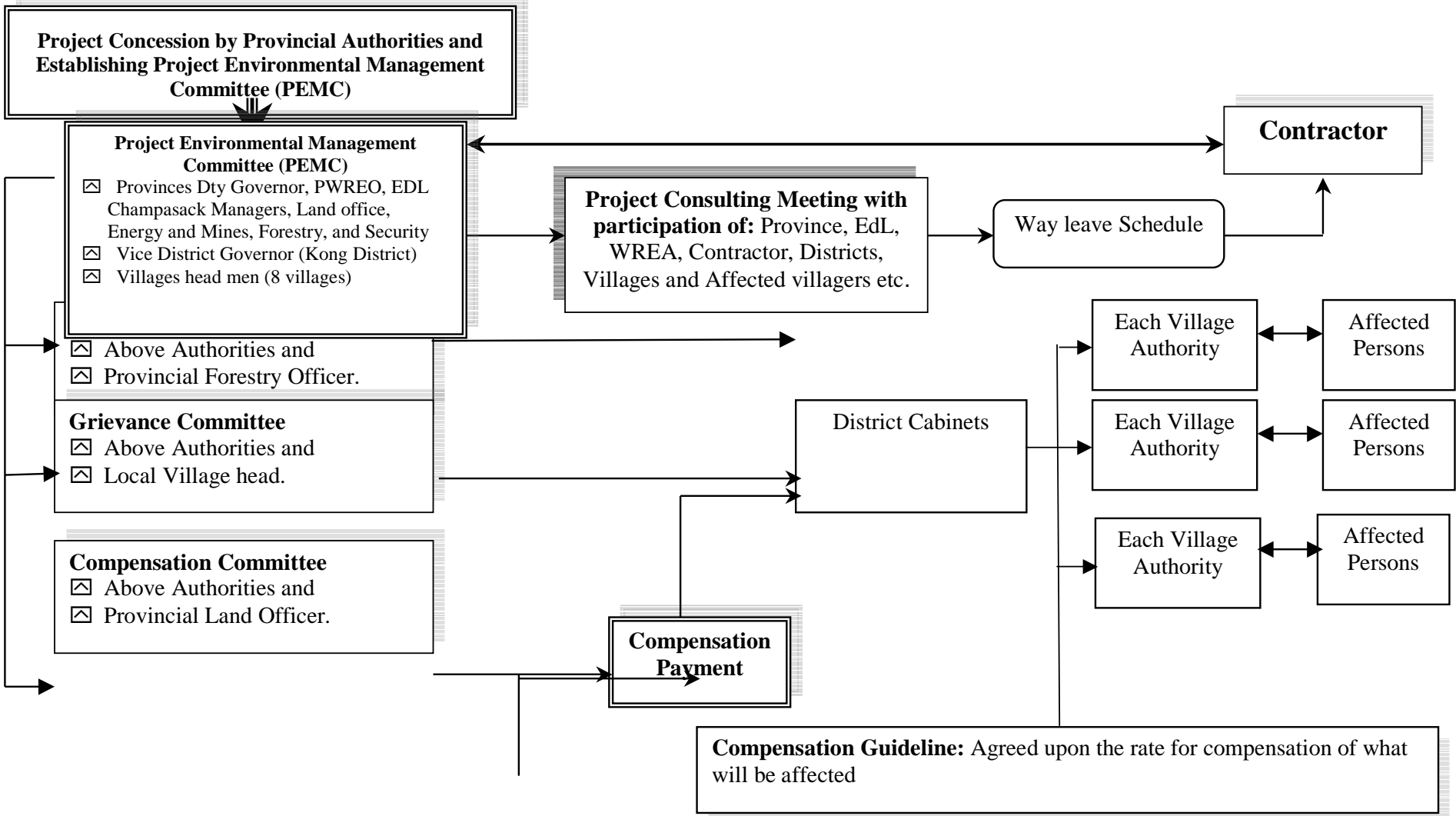
5.4 Management

Both the EdL Project Manager (construction) and the EdL Provincial Branch Manager (operation) have the authority to implement any actions based upon the recommendations in the environmental reports.

Table 22: Institutional Set-Up and Responsibilities for Environmental and Social Tasks

Institution/Organisation	Participants	Tasks
DOE and/or EdL Vientiane	Environmental Dept of DOE EdL project management Office (PMO)	<ul style="list-style-type: none"> • Co-ordination with contractor and WB and other stake holders
EdL Environmental Office (EMO)	Champasack Provincial EdL Branch (EMU)	<ul style="list-style-type: none"> • Implementation of RAP • Supervision of environmental activities • Co-ordination with local authorities and affected persons, data collection and reporting
Project Environmental Management Committee (PEMC)	<ul style="list-style-type: none"> • Provinces Deputy Governor • EdL Champasak • Provincial Cabinet Office(Champasak) • District Cabinet Office (Champasak) • Provincial Energy & Mines Dept. • Provincial STEOs • Provincial Agriculture & Forestry Dept • Provincial Health Dept • Provincial Lands & Asset Dept 	<ul style="list-style-type: none"> • Project consultation meetings • Monitoring, evaluate review environmental plan and implementation work • Negotiating compensation unit costs, supervision and authorization of compensation payment
Forest Clearing Committee(Sub PEMC)	<ul style="list-style-type: none"> • EdL VTE (EMO) and (EMU) • Provincial/District Cabinets • Provincial Energy & Mines Dept. • Provincial STEOs • Provincial/District Forestry Officer 	<ul style="list-style-type: none"> • Determination of timber value • Monitoring of clearing process • Provide guidance and authorization of timber sale and or relocation, appoint contractor in timber handling activities
Compensation Committee(Sub PEMC)	<ul style="list-style-type: none"> • EdL VTE (EMO) and (EMU) • Provincial/District Cabinets • Provincial Energy & Mines Dept. • Provincial Land Officer 	<ul style="list-style-type: none"> • Determination, negotiation of value of land • preparation of compensation guidelines • monitoring of disbursement of compensation payments • Participation in Compensation Committee • Certification of transfer of land ownership • Payment of compensation (with EdL)
Grievance Committee(Sub PEMC)	<ul style="list-style-type: none"> • EdL VTE (EMO) and (EMU) • Provincial/District Cabinets • Provincial Energy & Mines Dept. • Village Authority 	<ul style="list-style-type: none"> • Settlement of complaints about compensation payments, as well others arise from the project implementation discrepancies and conflicts


Figure 6: Project EMC Organization Chart for BanHat to Lao-Cambodia 230 kV Transmission Line Project



5.5 Monitoring and Evaluation Schedule

Monitoring and Evaluation schedule is given in table below:

Table 23: Time schedule for Environmental Monitoring and Evaluation

Monitoring by:	M 1	M 2	M 3	M 4	M 5	M 6	6 Months	Project Complete
EdL' EMU	⑨	⑨	⑨	⑨	⑨	⑨		
EMU & SEU of DOE			⑨			⑨		
WREO, EdL& DOE						⑨		
Independent								*

Note: Time schedule for monitoring and evaluation is based on 12 months construction period.

+ Budget Estimation

According to the previous similar projects, the compensation will be carried out by temporally Project Environmental Management Committee (PEMC) which will be established in Champasak province. The PEMC will be consisted of at least 10 persons who are representative from the different authorities concerned such as DOE, EdL in Vientiane, Provincial EdL Branches of Champasak, Provincial WREO, Provincial Energy and Mines Department, Provincial Land Office, Provincial Agriculture and Forestry Department (Provincial Forestry Section), Provincial and District Cabinets and other related. The activities and tasks of the PEMC are described in *Table 15*. The budget estimation for fieldwork of the PEMC which will be born by EdL is described in Table below. The procedure of compensation is based on *Figure 6.1.6. Project Organization Chart*. The detail implementation plan including budget for fieldwork will be prepared by EMU to submit to EdL for approval based on the budget estimation in table below:

Table 25. summarizes overall budget estimate for the entire Environmental Management work for the project.

Table 24: Budget Estimation for Environmental Monitoring and Evaluation EDL

Monitoring	Ps/Unit	Day	Unit Cost US\$	Total US\$	Remarks
Monthly				13,500	(\$1,125x12mths)
EDL's EMO Monitoring:					
Environmental Officer	1	5	40	200	DSA and Accommodation
Driver	1	5	35	175	DSA and Accommodation

Monitoring	Ps/Unit	Day	Unit Cost US\$	Total US\$	Remarks
Transportation/Petrol	1	5	150	750	Car rental include petrol
<u>Grand total:</u>				<u>13,500</u>	

Table 25: Budget Estimation for Environmental Monitoring and Evaluation by DOE, WREA and Independent

<u>3 Months</u>				<u>5,300</u>	(\$1,325x4Qt)
EMO & SEU of DOE staff	2	5	40	400	DSA and Accommodation
Driver	1	5	35	175	DSA and Accommodation
Transportation	1	5	120	750	Car rental include petrol
<u>6 Months</u>				<u>3,050</u>	(\$1,525 x 2)
WREO, EDL & DOE	3	5	40	600	DSA and Accommodation
Driver	1	5	35	175	DSA and Accommodation
Transportation	1	5	120	750	Car rental include petrol
<u>Independent</u>				<u>5,850</u>	
Social Specialist	1	20	200	4,000	
Driver	1	10	35	350	DSA and Accommodation
Transport and others	1	10	120	1,500	Car rental include petrol
<u>Grand total:</u>				<u>14,200</u>	

Table 26: Budget Estimation for fieldwork of PEMC

Item	Unit	Quantity	Day	Unit Cost (Kip)	Total Cost (Kip)	Remark
Field Allowance	Pers.	10	60	60,000	36,000,000	
Accommodation	Pers.	10	45	90,000	40,500,000	
Transportation	Car	01	20	500,000	10,000,000	Car rental
Petrol and Oil	Car	01	20	200,000	4,000,000	(90,500,000)
Miscellaneous(10%)					9,050,000	
<u>Total</u>					<u>99,550,000</u>	

+ Summary of Total Budget Estimation

According to the previous similar projects, the compensation will be carried out by temporarily Project Environmental Management Committee (PEMC) which will be established in the Champasak province. The PEMC will be consisted of at least 10 persons who are representative from the different authorities concerned such as Deputy Governor, Provincial WREO, Provincial Energy & Mines Department, Provincial Land Office, Provincial Agriculture and Forestry Department (Provincial Forestry Section), EdL Branches of Champasak, Khong District Governenor and other related. The activities and tasks of the PEMC are described in *Table 2*. The budget estimation for fieldwork of the PEMC which will be born by EdL is described in Table below. The procedure of compensation is based on *Figure 6.1,6 Project Organization Chart*. The detail implementation plan including budget for fieldwork will be prepared by PEMC to submit to EdL for approval.

The table below summarizes the overall budget estimate for compensations, monitoring and evaluation work. The compensations includes community assistant due to the losses in community lands and forests.

Table 27: Summary of Total Budget Estimation

Items	Total (\$)	Remark
1 Permanent Loss	<u>1,825</u>	
- Paddy rice field compensation budget	1,312	
- Non productivity land compensation budget	1.4	
- Loss of tree	313	
- Loss assets (paddy field's huts dismantle and rebuild)	200	
2 Temporary Loss	<u>5,452</u>	
- Land Rental	2,385	
- Crop Damage	1,227	
- Rehabilitation	1,840	
3 Estimation for Field work of PEMC	<u>12,215</u>	
4 Estimation for Monitoring and Evaluation by EDL	<u>13,500</u>	
5 Estimation for Monitoring and Evaluation by DOE, WREA and Independent	<u>14,200</u>	
6 Estimation for Community assistant	<u>2,500</u>	
7 Estimation for Consultation & workshop	<u>5,000</u>	
8 General Admin	<u>2,000</u>	
9 Contingency	<u>6,000</u>	
Grand Total	<u>62,693.4</u>	

Note: Exchange rate in December 2010. USD1=LAK 8,000

6 PUBLIC INVOLVEMENT

6.1 Objective of Consultation and Public Participation

Information dissemination to, consultation with and participation of APs and involved agencies and stakeholders reduce the potential for conflicts, minimize the risk of Project delays, and enable the Project to design resettlement and rehabilitation as a comprehensive development program to suit the needs and priorities of the APs, thereby maximizing the economic

and social benefits of the investment. Specific objectives of public consultation are as follows:

- ③ To establish a clear, easily accessible and effective complaints and grievance procedure
- ③ To share fully the information about the proposed Project, its components and its activities, with the APs
- ③ To obtain information about the needs and priorities of the APs, as well as information about their reactions to proposed policies and activities
- ③ To inform about various options for relocation and rehabilitation measures available to the APs
- ③ To obtain the cooperation and participation of the APs and communities in activities required to be undertaken for resettlement planning and implementation.
- ③ To ensure transparency in all activities related to land acquisition, resettlement and rehabilitation.

6.2 Consultation during the IEE Study

+ Methodology of Consultation

- (a) In every affected village and prior to the affected household individuals or the head of the village were being interviewed, all the villagers were requested to assemble in a centrally located place in the village; mostly at the village temple, school or at the residence of the village head. Place and location of the assembly was chosen by village committee.
- (b) At the assembly, the villagers were officially informed about the general objective of the project as well as the survey. The aspects such as *what, where and why* are to be constructed was discussed. General topographical map (1:100,000) on which the proposed transmission line alignment is shown, was used for visual reference.

The potential benefits as well as the adverse impact to the environment, communities' social economic conditions and their overall livelihood were also thoroughly discussed. Assets relocation and compensation requirement, their rights and responsibilities as well as villagers' perception of the proposed project were specifically consulted, discussed. Minute of the consultation, especially their requests were recorded.

At all time during the consultation and discussion session, particular effort was made so the villagers were aware that the project, as proposed, was in no way an imposition to the villagers, and that they had every right in determining the outcome of the project.

- (c) By the end of the assembly session, the affected properties and the property owners would be known and only these household individuals were asked to stay for more detailed interviews (by using preset questionnaires). The affected households were shown "on site" where the proposed transmission line alignment would be situated, relative to the land and village. Even though the field survey was carried out in mid March at which time the villagers were not involved with rice cultivation or harvesting activity, but some villagers were not present due to other engagements, therefore in some villages the rate of participation in consultative process are low.

+ Date, participants Consultation

Date and people consulted with is recorded in the table below:

Table 28: List of Names of head of village and local organizations and authorities participated in consultative process

No	Date	Time	Village Name	Participants Names of Organization	Chair Person	Remarks
1	08/09/10	19:00	Phon	- Head of Village - Lao women Union - Head of village land allocation unit - Lao National Front - Local militia	Mr. Air	Including Affected villagers
2	09/09/10	08:00	Kadan	- Head of Village - Head of units - Head of village land allocation unit - Lao National Front - Local militia	Mr. Sang	Including Affected villagers
3	10/09/10	08:30	Khinak	- Head of Village - Head of units - Head of village land allocation unit	Mr. Intieng	Including Affected villagers
4	10/09/10	14:00	Sonlavieng	- Head of Village - Deputy headman - Head of village land allocation unit	Mr. Leum	Including Affected villagers
5	11/09/10	09:00	Phiengdi	- Head of Village - Deputy headman - Head of village land allocation unit	Mr. Viengdavan	Including Affected villagers
6	11/09/10	09:00	Mai Sivilay	- Head of Village - Deputy headman - Head of village land allocation unit	Mr. Davone	Including Affected villagers
7	11/09/10	14:00	Setsavanh	- Head of Village - Deputy headman - Head of village land allocation unit	Mr. At	Only village(Public) land is affected
8	12/09/10	14:50	Settao Lek	- Head of Village - Deputy headman - Head of village land allocation unit	Mr. Bounli	Including Affected villagers
9	13/09/10	8:30	Thakhor	- Head of Village - Deputy headman - Head of village land allocation unit	Mr. Khamun	Including Affected villagers
10	13/09/10	13:00	Beung Ngam	- Head of Village - Deputy headman - Head of village land allocation unit	Mr. Mai	Including Affected villagers

+ Place of Consultation

Usually at Houses of heads of the affected villages, but in some villages these were not possible due to “rice transplanting season” and most of the families stayed in the farms and some families were gone to work away from village. Therefore, the consultations were carried out at individual’s farms.

+ Main discussion points

Outline of the Project was explained to the representative villages and villagers concerned. Alignments of the transmission line and affected land are discussed.

Since the impacts and affected land by the Project will be minimal, all of participants basically agreed to the implementation of the Project with few comments. They expressed their willingness to participate in the construction work of the Project as labors to get income from the Project. Only in some villages, participants mentioned that proper compensation for affected lands should be ensured. Most villages that were not connected to main power line expressed their desires to have electricity for their villages.

6.3 Further Consultation and Participation

During the IEE report preparation and drafting plans, many consultations and discussions were also conducted with the WB during the mission. Many advices and suggestions made by the mission improved of the proposed environment management and the mitigation plans result from this IEE. After completion final draft the IEE report, EMP and RAP, the consultation meeting will be held in Khong District, Champasak Province for presenting the results of IEE to the Local authorities, the APs representatives and other concerned provincial line agency representatives. The project impacts and its mitigation, compensation implications will be explained at this meeting, while interests and feed backs from the attendants will be taken into account for further effectiveness of the plans.

Further consultation with and participation of APs will be considered as follows:

🕒 Disclosure of final RAP to APs:

Once this RAP is approved by the Bank and WREA, it will be translated into Lao language and then disclosed to APs and opened in public for further public consultation.

🕒 Information to APs about Compensation Payment:

EdL through the districts and villages authorities has to notify and consulted each AP with the time and procedures for compensation payment.

🕒 Information to APs regarding Site Clearance and Construction:

APs will be informed and consulted about the schedule for the Project ROW clearance and tower construction and stringing.

🕒 Information to the General Public about Schedule of Physical Works:

The local authorities will notify the general public along with APs about the schedule of physical works. Public announcements will be made in village meetings.

Feedback from APs related to the Transmission Project should be accepted anytime on the course of the procedures and EdL should reply to them.

8. clusion and Recommendations

Overall, the Banhat to Lao-Cambodia border 230 kV Transmission Line Project will only generate minor environmental impacts, which will be offset considerably by the positive benefits that will accrue from the project. This evaluation is supported by the following:

- Along the route where transmission line will be traversed, there are some forest areas which classified as Current Forest which include Dry Dipterocarp Forest. However, some high commercial value species, big trees and wildlife habitat were already removed.
- The 230 kV transmission line routes have been selected on the basis that they will avoid as possible as environmentally sensitive areas and important view-scapes such as national park, National Biodiversity Conservation Areas, recreation areas, waterfall, protected areas, research areas, religious and cultural/heritage sites, and high valued wetland.
- The transmission line will traverse some part of Protection Forest, near to the country border. The permission from the province authority should be taken.
- The biophysical resources in the areas through which the transmission lines will be routed have been extensively exploited over the recent past by human activities such as logging, fuel wood collection, and slash and burn for cultivation, leaving degraded land that is only just recovering in some areas.
- The transmission line will traverse through some village used forests that is considered as a temporally and minor impact (during construction), so that compensation for the losses will not be required.
- Resettlement is not required for any property along the alignment except for rice paddy field which will be temporary in the construction phase only. However, social cohesion, community structure, administrative and community organizations, religious and cultural systems will not be adversely affected as a result of losing such things.
- Legislative and regulatory mechanisms are in place, which ensure the project will be subjected to a thorough environmental review, including review of the EMP.
- Legislative and regulatory mechanisms are also in project affected people will be compensated for any crop losses (if any), damage to land, or loss of land that results from the project. Permanent losses of all properties along the TL (e.g. such properties lie on where the towers are located) will be compensated by project owner (EdL), while temporally losses of land, fruit trees, crops and others during construction phase will be compensated by constructor.
- Mitigation measures have been proposed that will, if implemented effectively, ensure that any adverse impacts that may accrue as a result of the project, will be satisfactorily addressed. A monitoring plan will be developed, which will be executed by a third party to ensure that environmental mitigation is undertaken to address negative impacts.
- Conducting construction in the dry season (from October to May) and/or after the time that the farm productions (paddy rice and other crops) are harvested (in from November to January) is highly recommended.
 - During the construction and maintenance especially during the clearance of vegetation along the line, labour force from numbers of affected village is available, and hiring of villagers labour within the affected villages is highly recommended in order to have participation and promote them to have additional income.
 - Overall budget estimate for the entire Environmental Management Project with the total amount of **62,693.4 \$USS**

From this study, it is anticipated that the project will generate only minor environmental impacts. This is because the project will involve construction of transmission lines along alignments on which the forestry and wildlife resources have largely been removed as a result of past and recent logging activities, and the practice of shifting (slash and burn) cultivation. The transmission line routes have been chosen to avoid remaining environmentally sensitive areas and important view-scape areas such as NBCAs, Protection Forest; recreation areas, waterfall, research areas, religious and cultural/heritage sites, and high valued wetland except for some rice paddy field. Mitigation and compensation measures have been formulated to ensure that potential impacts can be satisfactorily addressed. This IEE, including the environmental management plan and monitoring program as discussed above is considered sufficient to meet the Environmental Assessment requirements for this Project. Therefore, further more detailed assessment by way of an Environmental Impact Assessment (EIA) is not required for this project.

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