Appendix 15.B

Environmental Management Plan (EMP) on Pakbo-Saravan 115kV Transmission Line

Pakbo-Saravan 115kV Transmission Line

ENVIRONMENTAL MANAGEMENT PLAN

For

By

EARTH SYSTEMS LAO
Environment – Water - Sustainability

August 2009

DISTRIBUTION RECORD

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Contents

1. Introduction

1.1 General Background

In Lao PDR, there are four electric power networks; the Northern network, the Central 1 network, the Central 2 network and the Southern network, which are independently operated and not interconnected. The current situation creates technical inconvenience and financial inefficiency. For instance electricity needs to be purchased back from Thailand which constantly buys electricity from Lao PDR at a high price to cover a shortage in a certain region when another region has surplus. This often happens, and the consequent financial loss is recognised as a critical national problem. In order to solve this problem the Government of Lao PDR with support from the Government of Japan is planning to connect the two of these power networks - central 1 and central 2 and central 2 and the southern network. . The construction work for the connection of Central 1 and the Central 2 networks has already started.

The objectives of network interconnection include:

- To improve the National power network
- To increase the efficient management of the power sector,
- To enhance economic activities
- To contribute to fulfilling the Basic Human Needs of Lao PDR.

This Savannakhet – Saravan 115 KV Transmission line focuses on the interconnection of the Central 2 and the South power networks

The transmission line is owned by Electricite du Lao and funded by Japan International Cooperation Agency (JICA).

JICA and TEPCO engaged Earth Systems Lao (ESL) to undertake the Initial Environmental Examination (IEE) for this project. This EMP is prepared as a supporting document to the IEE.

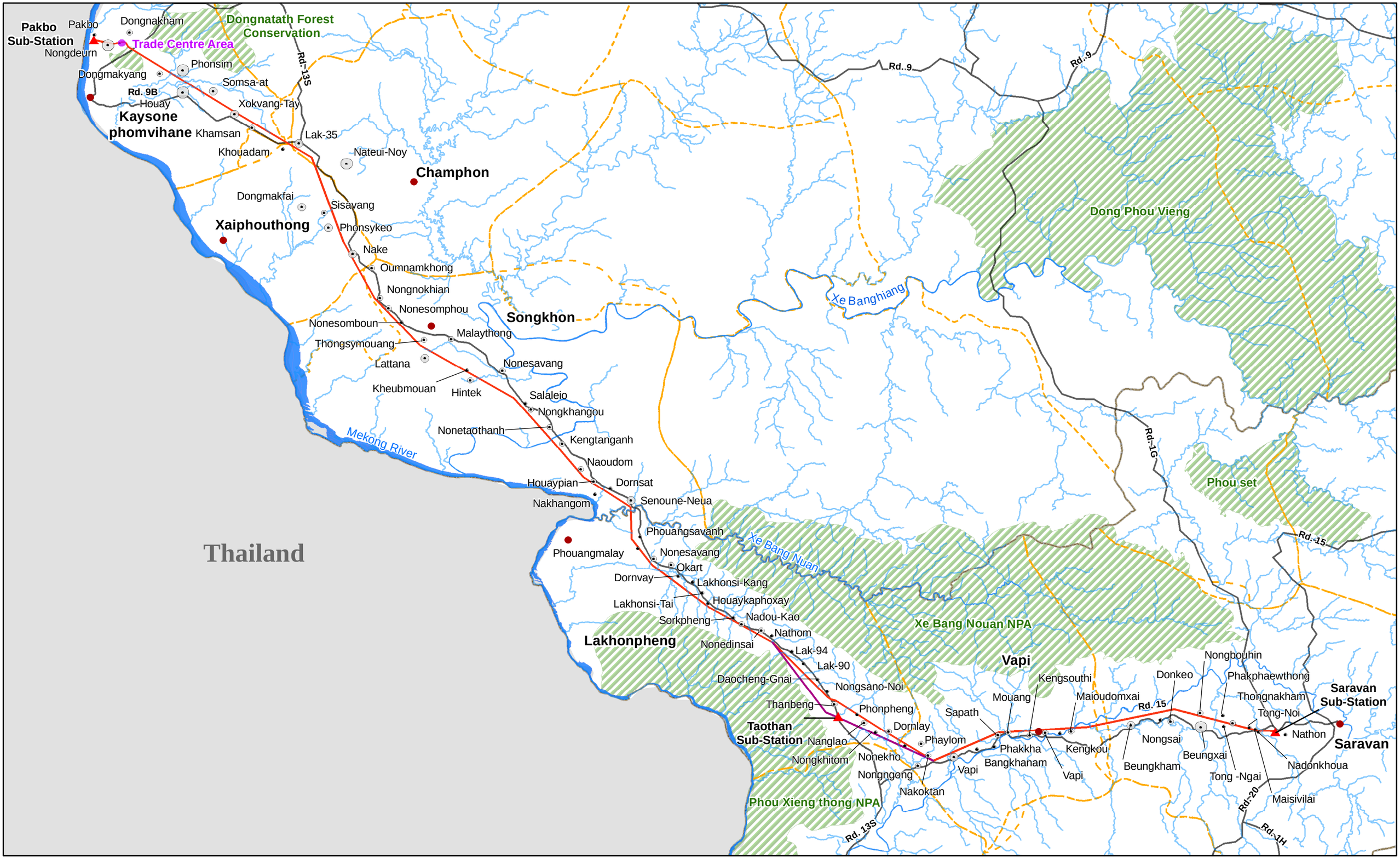

Figure 1.1 The Project Area

Households
- < 110
- 111 - 220
- 221 - 350
- > 351

- Province Boundary
- District Focus
- District Boundary
- National Protected Area
- Main Road
- Streams
- Main River
- Jica Transmission Line 115 KV
- District Centre Point
- Trade Centre Area
- Sub-Station
- Realignment (due to new sub-station location)

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0 5 10 20 km

Sacale:500,000 (A3)

Projection: Wgs 84, UTM Zone 48 North

The Environmental Management Plan (EMP) describes the environmental and social mitigation, management and monitoring measures required during the construction and operation of the Project.

The EMP should be considered a dynamic document, subject to periodic review.

This EMP includes the following:

- EDL's and JICA's policies, legislative requirements and commitments to environmental and social management of the Project.
- A description of the Project.
- Environmental management measures relating to biodiversity, water, erosion and sedimentation, waste, hazardous materials, revegetation, biodiversity, archaeology and culture, dust, and noise.
- Environmental monitoring program.

General targets are included at the end of each section to ensure the continuous improvement of environmental and social management at the Project.

1.2 Environmental and Social Setting

A brief discussion of the environmental and social setting in the Project Area is provided below. More detailed descriptions are provided in the IEE and the RAP.

1.2.1 Environmental Setting

The proposed transmission line will run for approximately 220 km from Pakbo sub-station in Savannakhet Province through a sub-station at Taothan to the Saravan sub-station in Saravan Province. The transmission line ROW will traverse through seven districts, four of which are in Savannakhet province (Kaysone, Champhone, Xaiphouthong and Songkhone) districts, and three in Saravan province (Lakhonphen, Vapi and Saravan) districts.

The general terrain of these areas is flat and mainly used for agricultural practices (NSC, 2007).

The Project is located in the Mekong Floodplain, where the topography of the land is generally flat and low-lying.

Lao PDR has a tropical climate, which is dominated by two monsoons. The northeast monsoon creates dry season conditions (low temperatures, low rainfall and low humidity) from mid-October to mid-April. The south-west monsoon causes heavy rainfall, higher temperatures and high humidity from May to September. Approximately 90% of the total rainfall occurs in the wet season, with the highest rainfall occurring in July and August. Northeast winds are most common in the period September to March (the dry season) and west-southwest winds are more common from April to September (the wet season).

The transmission line ROW is located in the watershed of the Mekong River, though sections of line also traverse sub-catchments of the Mekong, including: Xe Bangkeing, Xe Nouan and Xe Done watersheds.

The transmission line corridor is adjacent to existing roads (Route 13 and Route 15), passes within 500 m of the Phou Xieng Tong National Protected Area (NPA) and 5 km of the Xe Bang Nuan NPA and crosses three major rivers (Xe Banghiang, Xe Bang Nuan Xe Done. Preliminary investigations indicate that the majority of the vegetation along the proposed transmission line route is degraded, with many areas cleared for agricultural land such as rice paddies.

1.2.2 Social Setting

Savannakhet has the second largest population in Lao PDR with 825,902 people (NSC, 2005). The province is divided into 15 districts and has a total of 1,543 villages and 131,216 households, with an average household size of 6.3 people. The average size of each village in Savannakhet is 14 km2.

Saravan has a population of 324,327 people (NSC, 2005). Saravan is divided into 8 districts and has 724 villages and 53,013 households, with an average household size of 6.1 people. The average size of each village in Saravan is 15 km2.

The ROW will traverses land within the village boundaries of 81 villages. Within these 81 villages, 904 households own land within the ROW, and will be affected by temporary loss of access and / or changes to the land use, and may be affected by permanent loss of land and / or assets. Table 1-1 presents a summary of the geographic distribution of the affected population.

Table 1-1 Summary of the population affected by the proposed transmission line

Province	District	Villages	No. of Affected Households
2	**7**	**81**	**904**
Savannakhet	***4***	***35***	***462***
	Kaysone	8	101
	Champhone	2	22
	Xaiphouthong	6	96
	Songkhon	19	243
Saravan	***3***	***46***	***442***
	Lakhonpheng	21	211
	Vapi	13	137
	Saravan	12	94

1.3 Policies, Legislative Requirements and Commitments

1.3.1 EDL Policies

EDL has developed environmental and resettlement policy frameworks with the aims to mitigate potential environmental and resettlement impacts associated with EDL development projects. These frameworks are summarised below.

Environmental Policy Framework

Environmental Policy Framework has been prepared in consistence with the World Bank Environmental Assessment Policies and procedures as specified in the World Bank Operations Policy Number OP/BP/GP 4.01 for a "Category B" project. The procedure consists of the following elements:

- Design/construction phase
- Project screening
- EA documentation
- Consultation
- EA review and approval
- Disclosure
- Conditionality/Implementation obligation
- Environmental standards/guidelines
- Licensing and permitting

Resettlement Policy Framework

The EDL's Resettlement Policy Framework consists of the following elements:

- Involuntary resettlement should be avoided or minimized through design efforts.
- Where involuntary resettlement is unavoidable, resettlement activities should be conceived and executed as sustainable development program, providing sufficient compensation, assistance and rehabilitation to the displaced people so that they would be at least as well off as they would have been i the absence of the project
- Ensure that displaced people are benefit from the project.

Ensure that project stakeholders, including the displaced people, are consulted and given opportunity to participated, as practicable, in the design, implementation and operation of the project.

- Assist the displace people in their efforts to improve their livelihoods and standard of living or at least to restore their livelihood to pre-displacement levels.

Resettlement policy has been designed to apply to all components under the project funded by the World Bank and directly related projects funded by other sources. It also applies to all displace people regardless of the total number affected or the severity of impact. EDL has made commitment to pay more attention to the needs of vulnerable groups among the displaced people especially that blow the poverty line, the elderly, women and children, and ethnic minorities.

1.3.2 JICA Policies

As the Project is funded by JICA, the JICA Guidelines for Environment and Social Considerations are also relevant to the environmental and social management of the Project.

1.3.3 Lao PDR Legislation and Regulations

A certificate of environmental approval is issued by Water Resources and Environment Authority (WREA) upon acceptance of IEE. The certificate may have conditions attached to it. Typically, such conditions will include the need for the proponent to implement the Environmental and Social Management Plan and to adequately manage hazardous waste.

Table 1-2 lists the relevant laws, regulations and policies.

Table 1-2 Key relevant Lao PDR laws and regulations.

Title	Date
Environment Protection Law	1999
Regulation on Environmental Assessment in Lao PDR	2000
Law on Water and Water Resources	1996
The Electricity Law	2008
Forestry Law	2007
Decree to Implement the Law on Water and Water Resources	2001
Implementing Decree for the Environment Protection Law	2001
Regulation on the Management of the National Biodiversity Conservation Areas, Aquatic and Wild Animals	2001
MIH Department of Electricity – Power Sector Environmental Policy	2001
MIH Department of Electricity – Environmental Impact Assessment for Electricity Projects	2001
MIH Department of Electricity – Regulation on Implementing Environmental Assessment for Electricity Projects in Lao PDR	2001

Title	Date
MIH Department of Electricity Environmental Management Standard – Social Impact Assessment for Electricity Projects	2001
National Growth and Poverty Eradication Strategy	2002
Land Law	2003
MIH Department of Electricity – Environmental Management Standard for Electricity Projects	2003
Lao Electric Power Technical Standards	2004
Technical Guidelines for Resettlement and Compensation	2005
National Socio-economic Development Plan 2006-2010	2005
Decree on Compensation and Resettlement of People Affected by Development Projects	2005
Regulations for Implementing the Decree on Compensation and Resettlement	2005
Law on National Heritage	2005
Decree on the implementation of the National Policy on Health Impact Assessment	2006
Wildlife and Aquatic Animals Law	2007
National Policy on Environmental and Social Sustainability of the Hydropower Sector in Lao PDR	2007
Regulation for Health Impact Assessment (Draft)	2007
Public Involvement Guidelines (draft)	2009
Regulation for Environmental and Social Impact Assessment (Draft)	2009
UN Framework Convention on Climate Change	*1992*
Kyoto Protocol	*1997*

Within Lao PDR, both land and forest are owned by the State, but the State can issue user rights and rights of inheritance to individuals and communities who have interest in the resource. In exchange for these rights users are expected to maintain the land in good condition and pay taxes on the land to the government. Legislation on ownership of land and water is briefly summarised below.

The Land Law, 1997, describes the system of land tenure, with all land the property of the nation, and remaining under control of the Government of Lao. However, the law recognises and protects private land use rights. These rights can be transferred, granted by the state, or inherited, provided taxes payable on the land have been paid. Land is categorised in accordance with the form of use, and various principles are outlined in the legislation in regard to each type of land. This law provides an important framework for any land compensation, as despite the lack of title ownership, the land use rights are a tradeable commodity. The land

classification administration is also important for determining the various categories of land use within the Project Area.

The Forestry Law, 1996, outlines principles and responsibilities relating to all forest resources, including soil, flora, fauna, water, living and non-living resources. All forest land is owned by the state who has the ability to give user rights to communities in return for sustainable management of the resource. A land use system under the Ministry of Agriculture and Forestry, demarcates land to reflect its agricultural and forestry capabilities. The village-based land classification system is based on 3 categories: forestry areas, agricultural areas, and non-agricultural areas. This legislation is relevant to issues of land use within the Project Area.

The Law on Water and Water Resources, 1996, outlines a similar approach with all water and water resources remaining the property of the State. If relevant approvals are gained by an applicant seeking to use water resources, individuals or entities may attain water use rights. Article 29 stipulates a range of responsibilities for all water users, including the preservation of water resources, the efficient use of water, and the responsibility to maintain water quality, including the environmental and aesthetic qualities of water bodies.

1.3.4 Lao PDR Water, Air and Noise Standards and Guidelines

Lao PDR does not have specific discharge requirements for construction activities, although there is an Industrial Waste Discharge Regulation. Tentative Lao PDR standards from WREA's draft regulation for adoption of environmental standards have been used as ambient guidelines. A list of relevant 'Tentative' Lao PDR standards is presented in Table 1-3.

Table 1-3 Applicable Lao PDR water, air quality and noise standards and guidelines

Air quality
Lao ‘tentative’ ambient air quality standards. (Lao National Environmental Action Plan 1999)
Aquatic fauna/ fresh waters
Lao industrial waste discharge regulation (2005)
Lao ‘tentative’ ambient water quality standards for fresh surface waters. (Lao National Environmental Action Plan 1999)
Drinking water
Lao PDR Ministry of Health Drinking Water Guidelines (2003)
Lao ‘tentative’ ambient water quality standards for groundwater (drinking water supply). (Lao National Environmental Action Plan 1999)
Noise
Lao ‘tentative’ noise standards. (Lao National Environmental Action Plan 1999)

2. Project Description

2.1 Location of the project

The proposed transmission line will run for approximately 220km from Pakbo sub-station in Savannakhet Province through a sub-station at Taothan to the Saravan sub-station in Saravan Province. The transmission line route passes through seven (7) districts across the two provinces (see Table 2-1)

Table 2-1: Provinces and districts

Province	District
SAVANNAKHET	Kaysone Phomvihane
	Xaiphouthong
	Champhon
	Songkhon
SARAVAN	Lakhonpheng
	Vapi
	Saravan

The transmission line corridor is adjacent to existing roads (Route 13 and Route 15), and passes within 500nm of the Phou Xieng Tong National Protected Area (NPA) and 5km of the Xe Bang Nuan NPA and crosses three major rivers (Xe Banghiang, Xe Bang Nuan Xe Done (Figure 1.1).

2.2 Project design

The Project includes the construction of 220 km of 115 kV transmission line, and one sub-station at Taothan. The Project will utilise the existing sub-station at Pakbo and planned sub-station at Saravan.

2.2.1 Sub-station design

The project will upgrade the existing station at Pakbo; utilise the planned sub-station at Saravan; and construct one new sub-station at Taothan. The new sub-station will be an open air design on an area of approximately 1 hectare. It will consist of main transformers, switchgear instruments.

Sub-stations will take into consideration impacts of noise, vibration and other impacts on the surrounding environment.

2.2.2 Tower design

It is estimated that a total of 544 towers will be needed for this project including a mixture of tension towers and angle towers. Table 2-2 and 2-3 provide an overview of tower design features. The proposed type of tower is 'self-supporting and broad base lattice galvanized steel' towers with concrete foundations. Tower height is 29 m and average footprint of each tower is 52.99 m2.

Table 2-2 Line Design Features

Line design features	Savannakhet – Saravan 115kv line
Line length	217.7 km
Type	Galvanized steel towers with concrete foundations
Number of towers	Standard towers: 469 / Other towers: 75
Average span between towers	400 metres
Tower height	34 – 40 m
Tower land area	51.84 2.99- 90.25 m^2
Right of way (RoW)	25 metres (12.5m either side of line)
Existing Sub-stations	Pakbo
Planned sub-station	Saravan
New Sub-station	Taothan (1ha)

Table 2-3 Type, Weight and Number of Transmission Tower to be used for the Project

Type of Steel Tower	Number of Tower	Land Required per Tower (m2)	Total Area Required (m2)	Total Area Required (ha)
Pakbo - Taothan				
A 1	317	51.84	16,433.28	1.64
A 2	14	56.25	787.5	0.08
B 1	28	60.84	1,703.52	0.17
C 1	6	60.84	365.04	0.04
D-l	2	60.84	121.68	0.01
D 2	1	90.25	90.25	0.01
DE-l	2	60.84	121.68	0.01
Sub-total	*370*		*19,622.95*	*1.96*
Taothan - Saravan				
A 1	151	51.84	7,827.84	0.78
A 2	4	56.25	225	0.02

Type of Steel Tower	Number of Tower	Land Required per Tower (m2)	Total Area Required (m2)	Total Area Required (ha)
B 1	14	60.84	851.76	0.09
C 1	2	60.84	121.68	0.01
D 1	1	60.84	60.84	0.01
D 2	0	90.25	0	0
DE	2	60.84	121.68	0.01
Sub-total	*174*		*9,208.8*	*0.92*
TOTAL	**544**		**28,831.75**	**2.88**

2.2.3 Right of way

Right of Way (ROW) for the transmission line is twenty five (25) metres (12.5 metres from the centre line (see Figure 2-1). The total area for the 220 km line is 5.5km2. According to Lao Electrical Power Technical Standards (MIH 2004) for safe clearance to a live conductor for a 115 kV transmission line the following clearances will be maintained:

- Ground clearance: 5.48 metres
- Navigable river: 2.48 metres (above mast height)
- Un navigable river: 5.48 metres
- Road crossing: 6.48 metres
- Building: not permitted

Tall trees within 12.5 m on both sides of the centre line must be cut to ground level. Trees beyond the 12.5 m are on both sides will be trimmed and pruned to maintain a clearance of 2.48 metres

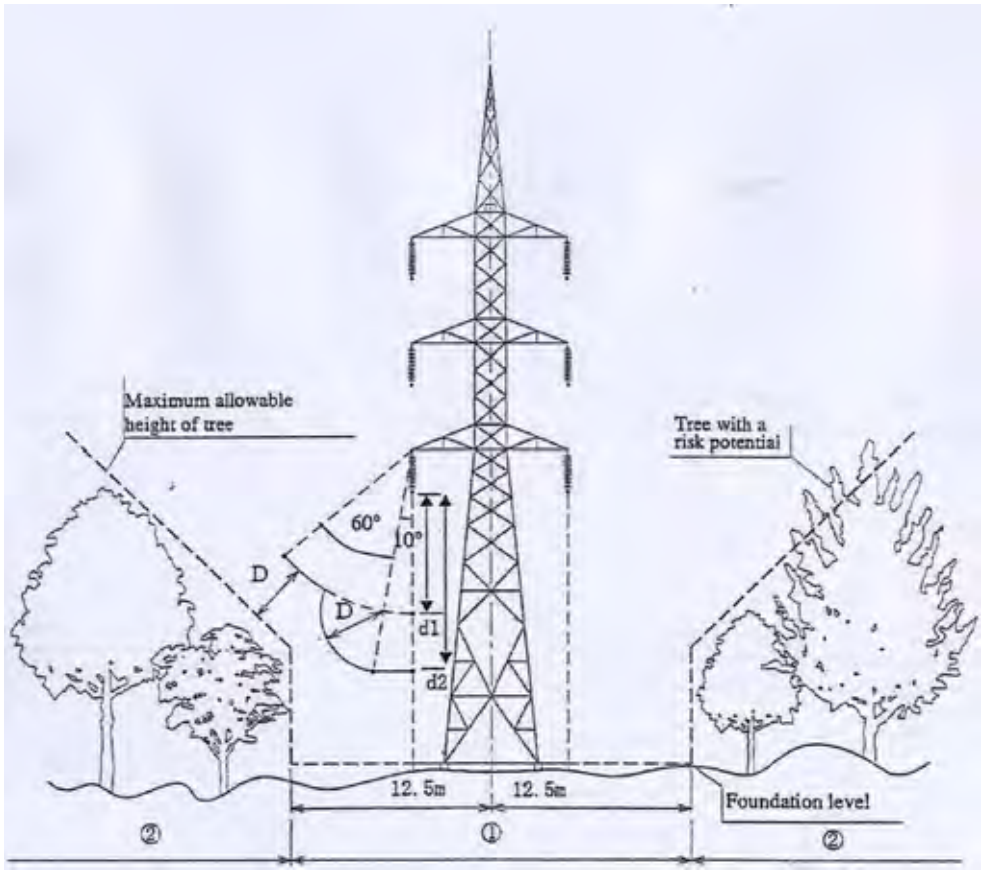

Figure 2-1 ROW for 115kV Transmission line (Provided by EDL 2009)

2.2.4 Access road

As the line runs close to national roads 13 and 15 at this stage access to the line is considered good. The proponent has not planned any additional access tracks at this stage.

2.2.5 Quantity and Quality of Raw Material to be Used

All electrical components and other materials required for project construction were estimated by TEPCO and Nippon Koei Co., Ltd. in collaboration with project owner (EdL). They may include transformers, conductor wires, insulators, steel towers, concrete for tower bases, and others. The estimated quantities of materials for the construction of transmission lines and sub-stations are as follows:

a) Transmission Lines

Items	Unit	Q'ty
Tower	Ton	3,500
Conductor	Km	1,300
OPGW 60mm2	Km	250
OH G.W.	Km	250

Items	Unit	Q'ty
Insulator	Unit	40,000
Insulator String Unit	Set	3,700
Dumper for Conductor, GW and OPGW	Unit	8,800
Sleeve for Conductor and GW	Unit	850
OPGW Joint Box	Unit	50
GW and OPGW Unit	Set	580

b) Sub-stations

Items	Unit	Q'ty
Pakbo		
115 kV transmission line bays including protection & control	Set	2
Extension of 115kV busbar with structure	Lot	1
Steel structures (gantries)	Lot	1
Conductors, cables, accessories, connectors, hardware, etc	Lot	1
Items	**Unit**	**Q'ty**
Taothan		
3 Phase 115/22 kV Transformer, 10 MVA	Set	2
Auxiliary Transformer, 22/0.4 kV, 200 kVA	Set	1
115 kV transformer bays including protection & control	Set	2
115 kV transmission line bays including protection & control	Set	4
115 kV transformer protection and control	Set	2
115 kV line feeder protection and control	Set	4
115 kV & 22 kV busbar with structure	Lot	1
115 kV & 22 kV steel structures (gantries)	Lot	1
22 kV transformer bays including protection & control	Set	2
22 kV line feeder bays including protection & control	Set	8
22 kV static capacitor banks including protection & control	Set	2
Conductors, cables, accessories, connectors, hardware, etc	Lot	1
Control building	Lot	1
Distributed Control System (DCS)	Lot	1
Optical fiber communications system including ODF, PABX, etc.	Lot	1
VHF radio telecommunications system	Lot	1

110 V & 48 V battery banks and chargers	Set	2
AC & DC distribution boards	Set	1
Earthing, lighting and lightning protection systems	Lot	1
Items	**Unit**	**Q'ty**
Saravan		
115 kV transmission line bays including protection & control	Set	2
Extension of 115kV busbar with structure	Lot	1
Steel structures (gantries)	Lot	1
Conductors, cables, accessories, connectors, hardware, etc	Lot	1

c) Transmission Towers

Total volume of concrete for tower foundations (m^2) = 4,300 m^2.

2.2.6 Quantity and Quality of Waste Products Generated By the Project

The major waste created by the Project will be vegetation from the ROW clearance. Prior to disposal, local residents will be given access to this waste so that they can utilise it for firewood, raw materials, charcoal production, etc.

In the case where the alignment passes the natural forests (where commercial timbers are present), the trees with more than 15 cm diameter will be listed and logged by the Provincial Agriculture and Forestry Department (Provincial Forestry Section) and District Agriculture and Forestry Office (DAFO), and the Provincial Industry and Commerce Department will be responsible for the sale of this timber. Where the alignment passes to the plantation forests, all trees will be removed and sold by the owners.

In addition to vegetation waste, it is anticipated that between 10 m^3 and 12 m^3 of soil will be excavated from each tower base, resulting in a total of approximately 6,000 m^3 of spoil. A part of these soils will be spread around the tower bases to facilitate natural re-vegetation and or use as fill in depressions nearby so as to minimize destruction to the tower bases. Most of the excavated soil, however, need to be taken away and disposed of the appropriate site in comply with the requirement of local authority. The dispose site of the excavated soil needs to be acquired before a commencement of any construction activities.

2.3 Project costing

Total cost of the project is estimated at US$ 37,773,300

- Transmission Line: $24,247,000
- Sub-station facilities: $8,014,300

- Other costs include Consultants fee and Contingency: $5,512,400

2.4 Project activities and schedule

The draft schedule post feasibility includes:

- Detail Design and Preparation Stage: (7 months)
- Bid and Contract with Contractors: (6 months)
- Works for Transmission Lines and Sub-station Construction: (23 months).

3. Management Arrangements

3.1 Function of the EMP

The function of the EMP is to provide a link between policy and implementation, essentially, to act as a planning document, summarising environmental and social commitments and providing the management measures to be undertaken to achieve these commitments. The EMP provides a framework for developing flexible and readily updatable environmental management procedures.

3.2 Responsibility

There are three (3) key organisations involved in the implementation of environmental and social mitigation measures. These three (3) organisations, and a brief description of the responsibilities of each organisation, include:

1. **Project Environmental Management Committee (PEMC)** – This committee consists of officials from relevant Government agencies at the Provincial and District levels. The PEMC will be responsible for deciding compensation conditions, and monitoring the social and environmental aspects for the Project. The PEMC will consist of at least 10 representatives from the different concerned agencies from Savannakhet and Saravan including Provincial EdL Branches, Provincial WREA, Provincial Energy and Mines Department, Provincial Land Office, Provincial Agriculture and Forestry Department (Provincial Forestry Section), Provincial and District Cabinets and other related officials. The PEMC will form subcommittees to focus on particular aspects of the Project such as Environmental management, Forest Clearing, Grievance management and Compensation, etc.

2. **EDL Environment Office** – EDL Environmental Management Office (EO) will be the primary organisation responsible for the planning, implementation and monitoring of all environmental management and compensation measures. EDL EO will ensure that the Project complies with best environmental practices and meets the mitigation and monitoring requirements described in the IEE report. EDL will also set up two Provincial level Environmental Managemnet Units (EMU) – one based in Saravan Province and the other to be based in Savannakhet Province. This report will be submitted to Department of Electricity. The loan should provide funding for institutional support to strengthen EDL's environmental capacity, particularly at the Provincial and District levels.

   The main duties of the EDL EO and EMU are to:

   - Implement relevant Lao PDR policies, laws and regulations.
   - Prepare and revise rules and regulations of environmental management and to carry out supervision.
   - Check the operational condition of the environmental protection equipment and safety equipment.

- Set up and perform the environmental protection program and to upgrade the environmental protection equipment when appropriate.
- Be responsible for the environmental monitoring and management, and assisting the superior authorities in the inspection of environmental management measures.
- Promote and apply advanced environmental technologies.
- Arrange environmental training for employees.
- Provide advice on waste treatment and report accidents.

3. **Environmental Management Office of the Construction Contractor** – The Environmental Management Office of the construction contractor will be responsible for implementation of environmental measures to avoid or minimise environmental impacts during construction. Environmental management reports will be prepared by the construction contractor on a monthly basis as part of the Project's monthly reports for submission to EDL.

   The specific responsibilities of the Environment Department of the Construction Contractor include:

   - Ensuring compliance is achieved with relevant legislation and company policy by establishing and maintaining appropriate management and monitoring systems.
   - Ensuring the management practices described in this EMP are implemented effectively.
   - Monitoring the performance of ESMMP strategies.
   - Regular liaison with EDL, government, community and other stakeholders.
   - Reporting.

In addition to the above groups, the **Environment and Social Management Division (ESD), Department of Electricity (DOE), Ministry of Energy and Mines** and the **Environmental and Social Impact Assessment Division (ESIAD), WREA** will be involved in monitoring the implementation of environmental and social management and mitigation measures, and coordinating activities between different groups. The primary involvement will be through their representatives in the PEMC.

Table 3-1 Institutional Set-Up and Responsibilities for Environmental and Social Tasks

Institution/Organisation	Participants	Tasks
Project Environmental Management Committee (PEMC)	EdL Saravan and Savannakhet Provincial Cabinet Office(Saravan and Savannakhet) District Cabinet Office (Saravan and Savannakhet)	Project consultation meetings Monitoring, evaluate review environmental plan and implementation work Negotiating compensation unit costs, supervision and

Institution/Organisation	Participants	Tasks
	Provincial Energy and Mines Provincial WREAs, Provincial Agriculture & Forestry Dept Provincial Health Dept Provincial Lands & Asset Dept Provincial Communication Transport Post & Construction (PCTPC)	authorization of compensation payment
EdL Environmental Management Office (EO)	Environmental Dept of DOE EdL Project management Office (PMO)	Co-ordination with contractor and Financier and other stake-holders Management activities of the EMUs
EdL Environmental Management Unit (EMU)	Saravan and Savannakhet Provincial EdL Branch (EMU)	Supervision of environmental activities Implementation of RAP Co-ordination with local authorities and affected persons, data collection and reporting

A schematic diagram of the parties responsible for environmental and social management and their relationship to each other is provided in Figure 4.2 below.

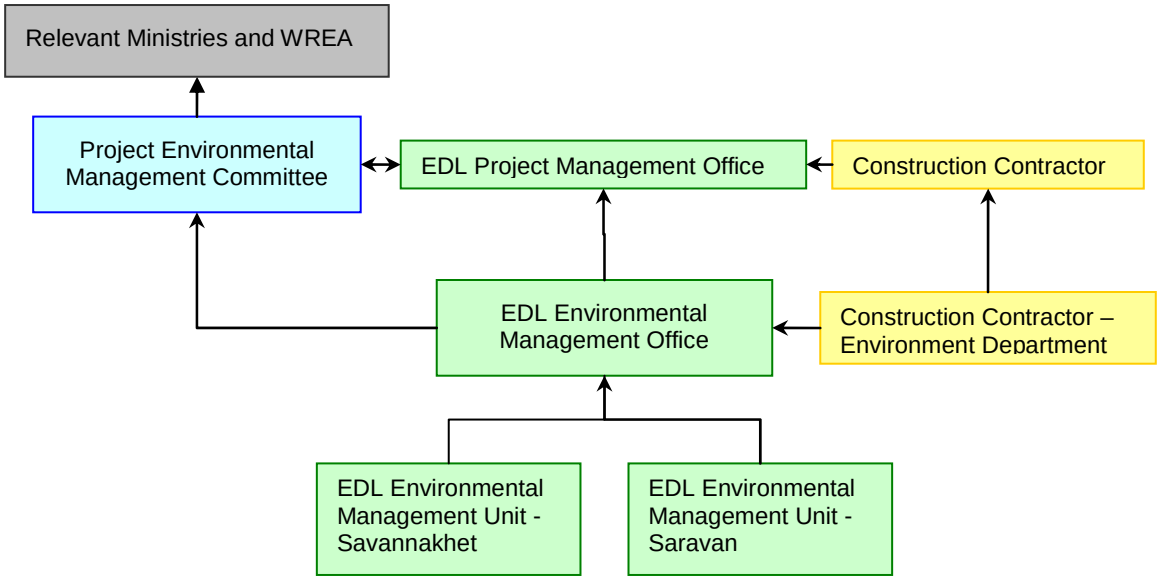

Figure 3-1 Schematic diagram of the parties involved in environmental and social management.

Table 3-2 Government of Lao EMP Budget - Monitoring

Item	Ps/Unit	Day	Unit Price (USD)	Total (USD)	Remarks
Monthly				**8,700**	
EDL Environmental Office	1	60 (20months x 3 days)	30	1,800	1 monitoring mission requires 3 days for covering project area
Driver	1	60 (20 months x 3 days)	15	900	
Transportation/Petrol	1	60 (20 months x 3 days)	100	6000	
3 month				**3150**	
EO & SEU of DOE	2	18 (6 times in 20 months x 3 days)	30	1080	
Driver	1	18 (6 times in 20 months x 3 days)	15	270	
Transportation	1	18 (6 times in 20 months x 3 days)	100	1800	
6 month				**1845**	
WREA, EDL & DOE	3	9 (3 times in 20months x 3 days)	30	810	1 monitoring requires 3 days for covering project area
Driver	1	9 (3 times in 20months x 3 days)	15	135	
Transportation/Petrol	1	9 (3 times in 20months x 3 days)	100	900	
Independent Monitoring				**6300**	
Social Specialist	1	20	200	4000	
Driver	1	20	15	300	
Transport and others	1	20	100	2000	
GRAND TOTAL				**19,995**	

Tables 3-3 and 3-4 below provide a budget for GOL annual monitoring activities and PEMC field activities.

Note:

- Based on the implementation schedule of the project, the total month for implementing the EMP is 20 months[1].
- The estimated Budget includes only basic requirements, the actual practice is largely dependent on the real implementation in the field, the monitoring schedule's frequency may be reduced or increased in order to meet the EMP requirement at the time. The EDL EMU will make a detail action plan for field monitoring.

Table 3-3 PEMC Field Budget

Item	Unit	Quantity	Day	Unit Cost (USD)	Total Cost (USD)
PEMC	Pers.	4 (2 in Saravan and 2 in Savanakhet)	60 (60 days for Saravan and 60 days for Savanakhet)	30	7,200
Driver	Pers.	2	60	15	1,800
Transportation/Petrol		2	60	100	12,000
Miscellaneous (10%)					2,100
Total					23,100

Table 3-4 Summary of total budget estimation

Items	Total Cost (USD)
Monthly Monitoring	8,700
3 Month Monitoring	3,150
6 Month Monitoring	1,845
External Monitoring	6,300
4 Estimation for Field Work of PEMC (including DMS)	23,100
Grand Total	**43,095**

[1] The assumption of time frame for the RAP "20 month" here covers until the end of construction phase. In practice most of the RAP requirement is completed before the commencement of construction phase. However, it is difficult to assume exact period of RAP at this stage, 20 month period is used just for the estimation. Thus, the total period to complete the RAP requirement is most likely to be shorter.

The monitoring requirement of RAP is overlapped with EMP up to the commencement of construction activities. However, the monitoring activities based on EMP are continued until the end of the operation phase.

3.3 Supporting Information and Databases

A range of information was collected to support the preparation of the IEE and this EMP, and once the Project commences, this material will be available at EDL.

Further, a library of data and background information, including the Project IEE and EMP, will be available at the EDL EO.

EDL will maintain computer-based environmental management databases. The databases will include:

- Monitoring information, including:
- Location code, description (including elevation) and map reference.
- Sampling interval.
- Sampling date and time.
- Variable.
- Unit of measure.
- Result.
- Comparison with relevant guideline.
- Quality assurance / quality control information.
- Results of environmental investigations.
- Incident reporting and response records.

The databases will be readily accessible to relevant personnel to allow timely and informed decisions to be made.

3.4 Monitoring and Reporting Systems

During implementation of the EMP, EDL will implement a comprehensive monitoring and evaluation program to oversee the EMP implementation process. The monitoring and reporting processes to be used include:

- Internal Monitoring:
    - Monthly monitoring
    - Three month monitoring

- Six month monitoring
- Incident Report

3.4.1 Internal Monitoring

Internal monitoring will be carried out by EMU, EO and PEMC periodically during implementation of the RAP. Internal monitoring will take place on a monthly, three monthly and six monthly bases as described below.

- Monthly monitoring:

EDL's EO will send their staff to the Project site once a month to consult with the EMU and PEMC, participate in field work and monitoring of construction activities.

- Three month monitoring:

A joint monitoring and evaluation between EDL's EO and the Social Environmental Unit (SEU) of Department of Electricity (DOE) of Ministry of Energy and Mines (MEM) will be conducted at the Project site once every three months. The purpose of the monitoring is to work with the EMU and PEMC to review the progress of EMP work, to adjust the EMP effectiveness and to consult with village representatives and Project affected villagers.

- Six month monitoring:

A joint monitoring and evaluation mission comprised of Provincial WREA, DOE, EDL representatives will be conducted once every six months. The purpose of the monitoring is to review the entire recommendation made by the monthly and three month monitoring and evaluation reports, to consult with the EMU and PEMC, to consult with the Project affected villagers, to evaluate, review and modify if required the EMP and RAP implementation plan.

3.4.2 Incident Reporting

An environmental incident is defined as any incident that impacts on, or may potentially impact on the environment or community, or any activity resulting in regulatory non-compliance or the breach of company policies, standards or commitments. If the incident is related to construction activities, then the Construction Contractor's Environmental Department is also required to prepare an incident report, and submit their report to EDL.

The following situations will constitute environmental incidents:

- All chemical spills.
- All spills of fuel or oil greater than 20 litres controlled (bunded) areas.
- All spills of fuel or oil outside of controlled (bunded) areas.
- All near-miss environmental incidents.

- All non-contained fires within operational areas.
- All uncontrolled gas emissions.
- Bush fire.
- Finding of injured or dead animals.

Environmental incidents will be reported to EDL EO, and the EDL EO will report these incidents to the EDL PEMC following their occurrence. Samples, specimens or photographs should be taken were appropriate.

Reporting the incident entails completing an Environmental Incident Report, which will include the following information:

- Description of the event and its causes.
- Description of affected people or environment.
- Description of corrective actions.
- Description of repairs, clean-up or other remedial measures.
- Actual or estimated costs of repair, clean-up or other remedial measures.
- Description of lessons learned, preventative measures implemented, or processes changed.

Incident reporting sheets should be submitted to the EDL PEMC within 24-hours of the occurrence of the incident.

3.4.3 Monthly Reporting

The EDL EMUs will prepare a report on environmental compliance on a monthly basis. The report will be submitted to the EDL EO, and the EDL EO will incorporate the findings of the Construction Contractor's report and submit to the PEMC.

The Construction Contractor Environment Department will also be required to provide EDL EO with monthly environmental and social monitoring reports. EDL EO will incorporate the Construction Contractor's report into their monthly reports.

Monthly reports will comprise of:

- Any significant environmental incidents or events that have occurred in the preceding month.
- Targets achieved, progress and effectiveness of measures implemented.
- Results of the monitoring program.
- Significant changes in the structure and/or content of the EMP.

3.4.4 Annual Reporting

At the end of every calendar year, EDL EO will undertake an annual formal review of mitigation implementation. The review will include progress on compensation and environmental mitigation.

The Annual Environmental and Social Report will include:

- Results from all monitoring activities carried out during the year compared with relevant guidelines.
- An explanation of any breach of compliance requirements, including the cause of the breach, and the corresponding corrective measures planned or underway to prevent future occurrences.
- A record and analysis of all significant environmental incidents.
- A review of the effectiveness of the EMP and recommended improvements to the EMP and environmental management procedures.

The Annual Environmental and Social Report will be submitted to the PEMC.

Recommended improvements will be incorporated into the EMP on an annual basis.

4. Management and Mitigation Plan

The management and mitigation plan for the Savannakhet to Saravan Transmission Line Project is provided in the table below.

Potential impact area	Project issue / impact	Significance	Mitigation and management measures	Responsibility
DESIGN AND CONSTRUCTION				
Terrestrial Biodiversity	Impact on terrestrial vegetation, terrestrial fauna, forest resources and protected areas	Minor - Moderate	Management clearing of the ROW:	
			Avoid clearance of mixed deciduous forest wherever possible.	EDL Project Management Office
			Minimise the amount of land cleared for the Project.	EDL Project Management Office
			Use of herbicides will be prohibited.	Contractor
			Burning will be prohibited.	Contractor
			Identify sensitive habitats and important NTFP areas close to construction areas and designate these as 'no go' areas.	Contractor
			Maintain forest cover as close as possible to the edge of all Project components.	Contractor
			Only use local, non-invasive plant species in revegetation work.	Contractor
			Carefully monitor land clearance activities throughout the construction phase to ensure that vegetation is not cleared beyond pre-defined project boundaries.	EDL EO/EMUs
			Ensure that ground vegetation and shrubs are not disturbed in the ROW below the required clearance height	Contractor
			Ensure that the alignment of the transmission line is sited as far as possible from NPAs and other designated environmentally sensitive areas.	EDL Project Management Office
			Consider the implementation of measures to minimise impacts on birds and mammals due to electrocution and wire strikes, particularly where the transmission line alignment passes in the vicinity of the NPAs.	EDL Project Management Office

Potential impact area	Project issue / impact	Significance	Mitigation and management measures	Responsibility
			Prohibit staff and contractors from hunting or trading of wildlife as well as the collection of timber and NTFPs in the vicinity of the NPAs..	Contractor
			Selling of logs by the Contractor and by EdL will be prohibited. Logging and logs selling process will be based on the Forestry Law No.6 (24/Dec/2007) Article 49 and conducted by the Forest and Forestland Management Organizaions.	Contractor EDL EMUs
			Forestry Clearing Committee, District Forestry Unit and land owners to list and mark big trees or commercial tree species and cut before ROW clearing.	PEMC District Forestry Unit
Land use	Impact on land use	Moderate	Provide compensation for productive land and residential land lost as a result of the Project.	PEMC EDL EO / EMUs
			Replace or re-install utilities and facilities (such as ground water pumps, fishing ponds, access tracks) disturbed by the Project.	PEMC EDL EO / EMUs
			Construction activities will be timed to avoid disturbance of field crops where possible.	Contractor
			Where crop disturbance is unavoidable, compensation will be paid.	PEMC EDL EO / EMUs
			Access track construction will be minimised. Established roads will be used for construction and maintenance where possible. Where construction of access routes is required, they will be restricted to a single carriage way within the ROW.	Contractor
			Temporary concrete batching plants will be located on disturbed sites or areas of low production value (eg grass land where possible).	Contractor
			Spoil disposal areas will be identified prior to beginning construction. Productive land areas and areas important for biodiversity will be avoided.	EDL Project Managmenet Office

Potential impact area	Project issue / impact	Significance	Mitigation and management measures	Responsibility
			Felled trees and other cleared or pruned vegetation will be made available to the owner (individual or village), or will be removed if requested by the owner.	EDL EO / EMUs
			Compensation for removed or pruned trees will be paid at fair market value based on tree type and age.	PEMC/EDL EO/EMUs
Aquatic Biodiversity	Impact on local aquatic flora and fauna	Negligible	Prohibit hunting and fishing, and species introduction by employee of contractor and Project staff	Contractor EDL EO / EMUs
			Control erosion and sedimentation from Project activities. (See below).	Contractor
Erosion and Sediment Transport	Erosion and sediment transport during project construction	Minor	Where possible, schedule construction activities during the dry season (low rainfall).	Contractor
			Towers will be located on flat to gently sloping terrain (i.e. slopes of less than30o).	EDL Project Management Office
			Minimise the area of land cleared for project construction work, and retain vegetation in suitable locations (e.g. riparian) to maximise filtration of sediment from turbid runoff, during and post construction.	Contractor EDL EO / EMUs
			Progressively revegetate disturbed land surfaces at the Project site as soon as practicable, to facilitate long term stabilization.	Contractor
			Compensate villagers for any lost land, assets and livelihood, associated with increased sediment transport rates downstream of project areas.	PEMC EDL EO / EMUs
Water Quality	Increased total suspended solids (TSS) and turbidity downstream of construction areas.	Minor	See above measures for 'Erosion and sediment transport'	EDL EO/ EMUs
	Changes to pH downstream of project areas.	Negligible	Install sedimentation ponds to collect runoff from concrete preparation and construction sites.	Contractor

Potential impact area	Project issue / impact	Significance	Mitigation and management measures	Responsibility
			Treat (neutralise) runoff from concrete preparation and construction sites, if necessary, prior to off site discharge.	Contractor
			Prevent washing of excess concrete/ cement from vehicles or equipment adjacent to or in streams.	Contractor
	Accidental release of oil or hydrocarbons	Minor	Store liquid hydrocarbons (fuels, oils and lubricants) in leak-proof containers within suitably designed bunded areas.	Contractor
			Provide temporary shelters to prevent rainfall entering bunded areas.	Contractor
			Store absorbent material in hydrocarbon storage areas.	Contractor
			Store spill response kits at suitable locations, in case of spills outside bunded areas.	Contractor
			Conduct regular maintenance of vehicles and equipment to prevent hydrocarbon leaks.	Contractor
			Conduct vehicle / equipment maintenance in designated areas where contaminated runoff can be contained.	Contractor
			Park vehicles and equipment on sealed surfaces where contaminated runoff can be contained.	Contractor
Air quality	Dust emissions	Minor	Disturb only the minimum area necessary. Leave ground vegetation, such as grasses and shrubs, under the line within the ROW	Contractor
			Water roads and / or construction areas to minimise generation of wind-blown dust.	Contractor
	Vehicle exhaust	Negligible	Use low emission trucks and mechanical equipment	Contractor
Noise	Nuisance noise impacts	Minor	Limit the hours of operation to daylight hours. Local residents will be consulted if some evening work is required.	Contractor

Potential impact area	Project issue / impact	Significance	Mitigation and management measures	Responsibility
Climate and Energy	Greenhouse gas emissions and energy loss	Minor	Implement measures designed to reduce greenhouse gas emissions and energy loss in transmission systems (including energy efficient transformers, power factor correction and SF6 recycling and elimination strategies)	EDL Project Management Office
General Waste and Hazardous Material	Potential health and safety impacts	Minor	Minimise the production of waste.	Contractor
			Site worker camps at least 1 km from NPAs and other areas of conservation significance, 50 m from surface water bodies and 1 km from villages and sites of cultural significance.	Contractor
			Sewage and solid waste will be stored in septic tanks or treatment ponds.	Contractor
			Maximise waste recycling and reuse.	Contractor
			Waste will be properly disposed and buried on a daily basis.	Contractor
			Clearly label hazardous materials and waste storage sites with appropriate signage in both English and Lao.	Contractor
			Maintain an inventory of all hazardous materials on site and update regularly.	Contractor
Construction Waste	Health, safety and nuisance impacts of improperly disposed waste.	Minor	Vegetation debris from the ROW will be stacked outside the ROW. Burning is not permitted.	Contractor
			Packaging waste will be recycled or disposed of in the local landfill.	Contractor
Archaeology	Loss of physical cultural resources	Minor	Suspend excavation and take appropriate counter-measure according to the instruction or guidance of the Provincial Culture and Tourism Directorate (PCTD) when historical, cultural or archeological property or heritage is discovered or identified at construction site for authorities' inspection.	Contractor
			Compensate for the loss of community's cultural properties such as village cemeteries.	PEMC EDL EO / EMUs
Health and Safety	Increased spread of diseases,	Minor	Where possible, local labour will be used.	Contractor

Potential impact area	Project issue / impact	Significance	Mitigation and management measures	Responsibility
	including sexually transmitted infections		Public health information will be provided to the construction workforce and community before commencement of works – including information on STIs.	EDL Environment Office
			Support existing provincial STD HIV/AIDS awareness and prevention programmes and apply them specifically to the TL construction.	EDL Environment Office
	Sanitation and waste	Minor	Construction contractor to prepare an Occupation Health and Safety Plan and provide related training and instructions to staff and sub contractors during induction.	Contractor
			Construction workforce facilities will include proper sanitation, water and waste facilities.	Contractor
	UXO	Minor	Areas of high likelihood of UXO contamination will be surveyed prior to engaging in construction activities. Surveyed and cleared areas will be marked.	EDL Project Management Office
	Electrocution risk and effects of electro-magnetic radiation	Minor	EDL standards for safe clearance to live conductor for a 115 kV transmission line will be adhered to.	EDL Project Management Office
			Danger and Warning Signs will be erected on every tower as well as on conductors where the line is crossing a road or river.	EDL EO / EMUs
			Appropriate conductor materials will be used to minimise health and safety risks.	EDL Project Management Office
	Occupational health and safety	Minor	Construction contractor to prepare an Occupation Health and Safety Plan and provide related training and instructions to staff and sub contractors during induction.	Contractor
			Employees will be provided with training and appropriate PPE (personal protection equipment)	Contractor
Roads and Access	Temporary loss of road use and access routes	Minor	Post warning signs to indicate slowing traffic, merging lanes and change of route.	Contractor

Potential impact area	Project issue / impact	Significance	Mitigation and management measures	Responsibility
			Identify alternative access routes when roads are blocked.	Contractor
OPERATIONS				
Terrestrial Biodiversity	Impact on terrestrial vegetation, terrestrial fauna, forest resources and protected areas	Moderate	Maintenance of the ROW:	
			Maintain forest cover as close as possible to the edge of all Project components.	EDL Branch Office (Saravan and Savanakhet) EDL Branch Office
			Plantation trees and crops with higher than 3 m will not be allowed.	EDL Branch Office (Saravan and Savanakeht Branch Office)
			ROW checking and maintenance of ROW should be conducted at least once or twice a year.	EDL Branch Office (Saravan and Savanakhet) EDL Branch Office
			Use of herbicides, burning to clear and control vegetation will be prohibited.	EDL Branch Office (Saravan and Savanakhet) EDL Branch Office
			The boundary of the NPA will be regularly patrolled to ensure that local residents are not utilising protected area forests.	EDL Branch Offcie in cooperation with PAFO
Water Quality	Contamination from leakage of oils from transformers	Minor	Transformers will be constructed within a concrete bunded area to contain any spills or leaks.	EDL Branch Office (Saravan and Savanakhet) EDL Branch Office
			Transformers will be periodically inspected.	EDL Branch Office (Saravan and Savanakhet) EDL Branch Office
	Contamination from use of herbicides	Minor	Use of herbicides will not be permitted.	EDL Branch Office (Saravan and Savanakhet) EDL Branch Office

Potential impact area	Project issue / impact	Significance	Mitigation and management measures	Responsibility
Health and Safety	Electrocution risk	Minor	EDL standards for safe clearance to live conductor for a 115 kV transmission line will be adhered to.	EDL Branch Office (Saravan and Savanakhet) EDL Branch Office
			Danger and Warning Signs will be maintained on every tower as well as on conductors where the line is crossing a road or river.	EDL Branch Office (Saravan and Savanakhet) EDL Branch Office
			An exclusion perimeter around the Nongsano sub-station of at least 12 metres will be maintained with a fence.	EDL Branch Office (Saravan and Savanakhet) EDL Branch Office
	Effects of electro-magnetic field	Minor	25 m ROW will be maintained through period inspection.	EDL Branch Office (Saravan and Savanakhet) EDL Branch Office

5. Monitoring Program

5.1 Objectives

The objectives of the environmental and social monitoring program are to:

- Identify the Project's ongoing compliance with relevant environmental and social legislation and licensing commitments.
- Provide early warning of potential impacts, determine the extent of predicted impacts and identify any unforeseen impacts associated with Project activities.
- Provide feedback on the adequacy of management practices and allow improved practices to be developed to continuously improve operations.
- Detect and measure environmental trends or changes and enable analysis of their cause.

5.2 Context

5.2.1 Categories for Monitoring

The environmental monitoring program includes two main categories of monitoring:

1. **Discharge monitoring**: The monitoring of contaminants being discharged or emitted from the Project to the environment. Discharge/emission monitoring is usually undertaken either at the point of discharge or within the local catchment area. Discharge monitoring provides direct information concerning the concentrations and loads of contaminants being discharged from the operation, and also serves as a link between ambient monitoring results and the Project.
2. **Ambient monitoring**: The monitoring of background conditions and the receiving environments that could be affected by Project activities. While discharge monitoring should determine if environmentally significant releases have occurred, effects on the ultimate receptors within the receiving environment can be determined only by ambient monitoring.

A third category, investigation monitoring, will also be undertaken as required, to determine the occurrence, nature and extent of possible impacts following an environmental incident (oil leakage, etc), or to verify/refute third-party claims of environmental impact. For example, investigation monitoring may be undertaken upstream of a routine monitoring point to identify a source of contamination.

5.2.2 Quality Assurance / Quality Control

To ensure quality assurance / quality control (QA/QC), the following measures will be implemented:

- Clearly defined employee responsibilities for managing and conducting monitoring.
- Procedures for monitoring and sample collection.
- The training of responsible personnel in the use of monitoring equipment and in sample collection procedures.
- The regular maintenance and calibration of on-site monitoring equipment, as per the manufacturers' instructions.
- The regular use of duplicate samples, field blanks, and laboratory blanks, etc.
- Chain-of-custody procedures for sample handling and transportation.

5.2.3 Review and Modification of Monitoring Program

Data from the monitoring program will be reviewed and statistically significant trends will be identified within the Annual Environmental and Social Report. This report will provide discussion on the effectiveness of the monitoring program and the need (if any) for changes to the program.

5.2.4 Monitoring Criteria

The criteria listed below are relevant to the monitoring of the Project:

Waste water discharge:

- Lao industrial waste discharge regulation (general effluent standards) (2005).

Ambient water quality:

- Lao PDR tentative ambient water quality standards for fresh surface waters – Class 2 (1999).

Drinking water quality:

- World Health Organization (WHO) guidelines for drinking water quality, 3rd edition (2006).
- Lao PDR Ministry of Health drinking water guidelines (2003).

Noise emission and ambient quality:

- IFC general EHS guidelines: noise management (2007).
- Lao 'tentative' noise standards (Lao National Environmental Action Plan 1999)

Table 5-1 Ambient water quality guidelines applicable to the Project.

Parameter	Unit	Lao (1999)
pH	-	5-9
Dissolved Oxygen	mg/L	>5

Parameter	Unit	Lao (1999)
Biological oxygen demand (BOD_5), 20°C	mg/L	1.5
Coliform bacteria (total)	MPN/100ml	5,000
Coliform bacteria (fecal)	MPN/100ml	1,000
Nitrate nitrogen (NO_3-N)	mg/L	10
Nitrite nitrogen (NO_2-N)	mg/L	5
Ammonia nitrogen (NH_3-N) (un-ionised NH_3), pH<7.5	mg/L	0.06
Ammonia nitrogen (NH_3-N) (un-ionised NH_3), pH>7.5	mg/L	0.4
Total dissolved solids (TDS)	mg/L	1000
Phenols	g/L	5
Boron	mg/L	2
Oil and grease	mg/L	2
Copper (Cu)	mg/L	0.1
Nickel (Ni)	mg/L	0.1
Manganese (Mn)	mg/L	1
Zinc (Zn)	mg/L	1
Cadmium (Cd)	g/L	5
Chromium, hexavalent (Cr(VI))	g/L	50
Lead (Pb)	g/L	50
Mercury (Hg)	g/L	2
Arsenic (As)	g/L	10
Cyanide	g/L	5

Table 5-2 Drinking water quality guidelines applicable to the Project*.

Parameter	Unit	Lao (2003)	WHO (2006)
Arsenic (As)	mg/L	<0.05	0.01
Barium (Ba)	mg/L	-	0.7
Boron (B)	mg/L	-	0.5
Chromium - total (Cr)	mg/L	-	0.05
E. coli or thermotolerant coliform bacteria	MPN/100 mL	0	0
Electrical Conductivity (EC)	US/cm	1000	-
Fluoride (F)	mg/L	<1.5	1.5
Iron (Fe)	mg/L	<1	-
Manganese (Mn)	mg/L	<0.5	0.4
Molybdenum (Mo)	mg/L	-	0.07
Nitrate (NO_3)	mg/L	40	-
pH		6.5-8.5	-
Selenium (Se)	mg/L	-	0.01
Turbidity (NTU)	NTU	<10	-
Total Hardness (as $CaCO_3$)	mg/L	<500	-
Residual chlorine in chlorinated water supply	mg/L	0.2	-

* Relevant criteria are shaded in blue. In general, the WHO guidelines have been shaded as these represent international standards for human health and are applicable to developing and developed countries world-wide. Where WHO guidelines are not provided, the Lao values have been shaded.

Table 5-3 Noise level standards applicable to the Project *.

Criteria	Applicable to	Day	Night
IFC (2007)	Residential, institutional, educational	55 dB(A) (1 hour average)	45 dB(A) (1 hour average)
	Industrial, commercial	70 dB(A) (1 hour average)	70 (1 hour average)
Lao (1999)	Not defined	70 dB(A) (24 hour average)	70 dB(A) (24 hour average)

* The tentative Lao PDR ambient noise guideline for industrial areas is 70 dB (24 hour average). In the rural context of the Project, this standard provides only limited community and wildlife protection. The IFC ambient noise criteria for residential areas present more appropriate standards for this situation.

5.3 Strategy

The monitoring program is outlined in the table below.

Location	Issue	Parameter	Project Phase	Frequency
Design and Construction				
ROW	Biodiversity	Ensure that the alignment of the transmission line is sited as far as possible from NPAs and other designated environmentally sensitive…	Design	Once
	Biodiversity	Presence of boundary markings prior to clearance	Pre-Construction	Once
	Biodiversity	Confirm use of manual clearing methods. No use of herbicides or burning	Construction	Monthly
	Biodiversity	Visually confirm that clearance does not extend past the set boundaries.	Construction	Monthly
	Biodiversity	Visually confirm that ground vegetation and shrubs and trees below the clearance distance are allowed to remain in the ROW	Construction	Monthly
	Waste Management	Ensure vegetation debris from the ROW will be stacked outside the ROW	Construction	Monthly
	Waste Management	Check that apoil disposal areas are 100 m from surface water resources, and are properly stacked, contoured and revegetated to prevent erosion and sediment transport.	Construction	Monthly
	Erosion control	Presence of erosion control measures; absence of gullies, rivulets, etc.	Construction	Monthly
	Sediment transport	Monitor the turbidity of water downstream of construction activities	Construction	Monthly
	Water Quality	Oil and Turbidity; pH downstream of cement mixing sites	Construction	Monthly

Location	Issue	Parameter	Project Phase	Frequency
Contractor Camps	Biodiversity	Evidence of wildlife extraction (e.g. fishing and hunting equipment; animal remains; etc.)	Construction	Monthly
	Waste Management	Proper solid waste disposal	Construction	Monthly
	Waste Management	Proper storage and disposal of sewage	Construction	Monthly
	Water Quality	Monitor field parameters (pH, EC, ORP, temperature); Faecal coliforms; turbidity; and presence of oil in surface water downstream of contractor camps	Construction	Monthly
	Health and Safety	Confirm presence of proper latrines	Construction	Monthly
	Hazardous Materials	Check that hazardous materials are properly stored (i.e. bunded area, proper signage, etc.)	Construction	Monthly
Affected Villages	Village grievances	Keep a record of reported grievances and any corrective measures undertaken to address these grievances.	Construction	Monthly
	Log selling	Review the process of log selling, and identify who has access to the cuttings and who is selling the cuttings.	Construction	Monthly
	Noise	Keep track of grievances regarding noise. Ensure that project activities - including vehicles on the road - are during daylight hours only.	Construction	Monthly
	Air quality	Keep track of grievances regarding dust. Ensure that dust mitigation measures being fulfilled.	Construction	Monthly
Sub-station	Water quality	Oil and turbidity	Construction	Monthly
Post-Construction and Operation				

Location	Issue	Parameter	Project Phase	Frequency
ROW	Biodiversity	Record incidents of bird and mammal death resulting from electrocution or collision with transmission line or towers.	Operation	Monthly
	Health and Safety	Check that no buildings have been constructed in the ROW	Operation	Quarterly
Contractor Camps	Rehabilitation	Confirm that contractor camps are properly decommissioned	Post-Construction	Once
NPA	Extraction of resources from the NPA	Check for evidence of increased extraction of wildlife from NPAs by visually looking for evidence and consulting with local residents	Operation	Monthly (first year of operation)
Sub-station	Biodiversity	Record incidents of bird and mammal death resulting from electrocution	Operation	Monthly
	Health and Safety	Presence of security fence to maintain12 m buffer	Operation	Annually
	Water quality	Visual observation for oil contamination.	Operation	Monthly

6. Emergency Response

6.1 Objectives

The objective of emergency response management for the Project is to ensure that emergency response procedures are established for environmental and community issues as well as health and safety issues.

6.2 Context

An environmental incident is defined as any incident that impacts on, or may potentially impact on the environment or any activity that causes the specific conditions or limitations of a license or permit to be exceeded. An environmental incident will require an emergency response.

The following situations are environmental incidents:

- All spills of fuel or oil greater than 20 litres within workshop areas.
- All spills of fuel or oil outside of workshop areas.
- All non-contained fires within operational areas
- All uncontrolled gas emissions

All near miss environmental incidents should also be reported as these are important in improving management procedures to prevent environmental incidents.

6.3 Strategy

6.3.1 Priority

Emergency response to an environmental incident will need to prioritise the actions undertaken according to the following sequence:

1. Protection and rescue of human life
2. Minimisation of the area impacted by the incident
3. Protection of the environment, plant and property
4. Rendering the area safe in which the emergency has occurred
5. Restoration of all disrupted services
6. Decontamination and rehabilitation of the incident scene and surrounding area

Depending upon the severity of an environmental incident, emergency response may also involve using the services of, or notifying, the following groups:

- Police
- Department of Transport and Communications
- Water Resources and Environment Agency (WREA)
- District or Provincial Hospitals
- District and Provincial Government*
- Village chiefs
- Local community
- Others likely to be affected (e.g. fisherman, farmers downstream)

6.3.2 Spill management

Spill management broadly covers the management of a range of liquids including fuel and oil.

The environmental risk posed by a spill needs to be placed into the context of the chemical constituents of the spill, the size of the spill and the location of the spill. Spill ratings definitions fall within the following categories:

- Contained within primary protection system (i.e. all spills contained within first bund)
- Contained within secondary protection area (i.e. all spills contained by second bund or drainage control)
- Contained within construction area (i.e. all spills that occur away from fixed spill containment structures such as bunds but are still within construction areas.)
- Off site spill (i.e. all spills that originate from activities but occur outside of construction areas, such as on roads)

7. References

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