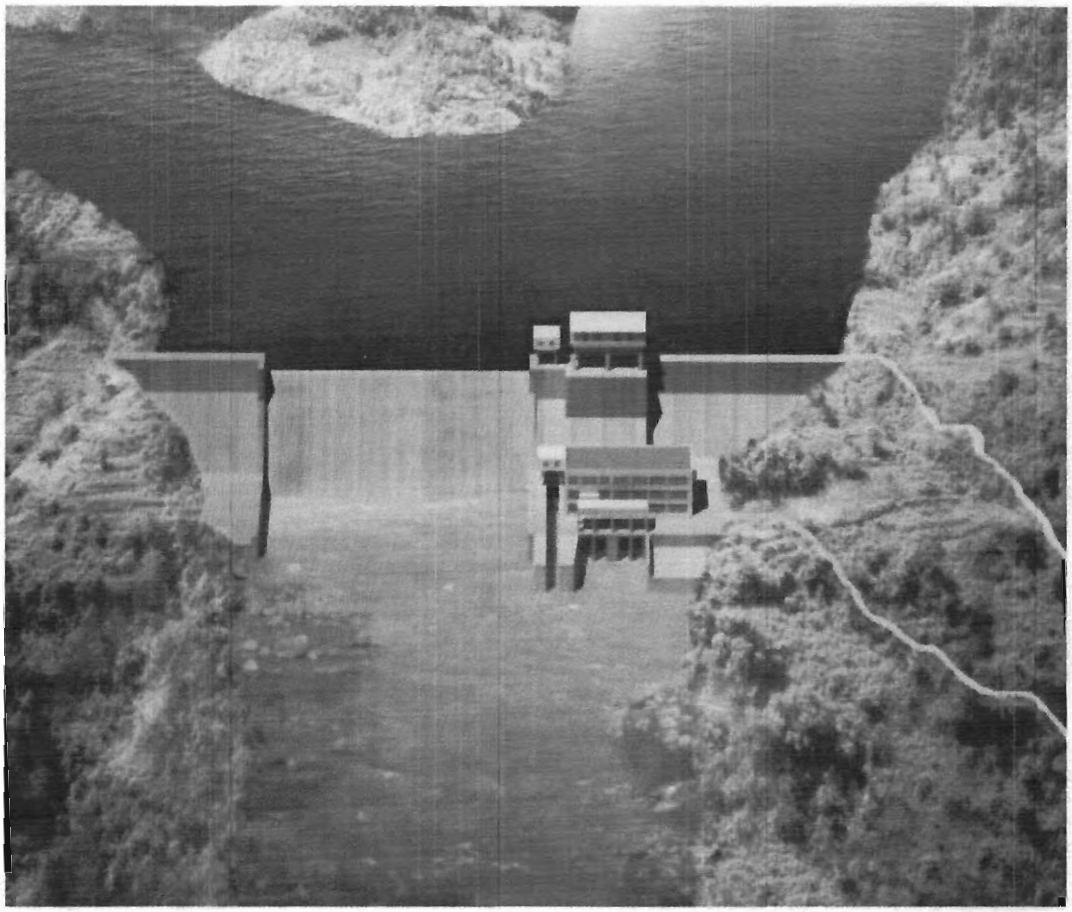
Nam Nga 2 Hydropower Project

Final IEE Report



Nam Nga 2 Hydropower Co., Ltd

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ABBREVIATIONS

AAP	Atmosphere Action Plan
asl	above sea level
ASEAN	Association of Southeast Asian Nations
CA	Concession Agreement
CDB	Convention on Biological Diversity
CITES	Convention on International Trade in Endangered Species
DAFO	District Agriculture and Forestry Office
DAFEO	District Agriculture and Forestry Extension Office
dB	Decibel
DOE	Department of Electricity
DOF	Department of Forestry
EA	Environmental Assessment
EdL	Electricite du Laos
EIA	Environmental Impact Assessment
ESMO	Environmental and Social Management Office
EMP	Environmental Management Plan
EPL	Environmental Protection Law
EMU	Environmental Management Unit
GDP	Gross Domestic Product
GNP	Gross National Product
GOL	Government of Lao PDR
GMS	Greater Mekong Sub-region
GWh	Gigawatt hour
IEE	Initial Environmental Examination
ISA	Initial Social Assessment
km	Kilometer
kV	Kilovolt
LAIIP	Livelihood Augmentation and Income Improving Plan
LFNC	Lao Front for National Construction
LWU	Lao Women's Union
m	Meter
MAF	Ministry of Agriculture and Forestry
MCM	Million Cubic Meter
MIH	Ministry of Industry and Handicraft
MOH	Ministry of Health

MW	Megawatt
MRC	Mekong River Commission
NBCA	National Biodiversity Conservation Area
NTFPs	Non Timber Forest Products
NP	National Protected Area
PAPs	Project Affected Persons
PDR	People's DESMOcratic Republic
PI	Public Involvement
PM	Prime Minister
PMO	Prime Minister Office
PPA	Power Purchase Agreement
RAP	Resettlement Action Plan
ROW	Right of Way
SAP	Social Action Plan
SDP	Social Development Plan
US$	United State Dollars
UXO	Unexploded Ordinance
VDC	Village Development Committee
WERA	Water Resources and Environment Administration
WREO	Water Resources and Environment Office

EXECUTIVE SUMMARY

This initial environmental examination (IEE) was undertaken and the study has followed the guidelines of related regulations and decrees of Lao PDR. Primary objectives of the IEE include:

- Examining the available environmental information as well as baseline investigation on existing environmental situation in the project areas and identification of proposed effected areas in which the project construction and operation will cause noticeable impacts of any kind to environment;
- Reporting the all potential significant environmental issues with regards to the project impact upon environmental resources and screening out the insignificant impact of the project including proposed mitigation measures;
- Identifying potentially direct or indirect impacts caused by the project and adequate mitigation measures; and
- Preparing environmental management plan (EMP) and social development plan (SDP).

The Nam Nga 2 Hydropower Project is Xay District in Oudomxay province. It has catchment area of 1790 km^2 with installed capacity 14.5 MW.

Results of the IEE study shows that the Nam Nga would create some small negative impacts to the natural environment and the livelihood of the local inhabitants. Also some positive socio-economic impacts are anticipated to be created in particular the socio-economic development to the project area and its related watershed area. The following Box provides the magnitude of long-term anticipated impacts as well as the results of mitigation measures that may occur from the Project.

Probable project impacts	**Anticipated magnitude of impacts**	
	Without mitigation	**With mitigation**
Erosion and Water quality	Low negative	Insignificant
Forestry and Terrestrial vegetation	Low negative	Insignificant
Wildlife and wildlife habitat	Low negative	Insignificant
Aquatic ecosystem	Low negative	Insignificant
Conservation area	Insignificant	Insignificant
Village spiritual/funeral sites	Medium negative	Low negative
Infrastructure	Low negative	Medium positive
Land use/agriculture and forestry	Low negative	Insignificant
Fishing	Low positive	Medium positive
Water resources and water use	Low negative	Medium to high positive
Energy sources and energy use	Low negative	Medium to high positive
Health	Low negative	Low to medium positive

Culture and ethnicity	Low negative	Insignificant
Visual aspect	Medium negative	Low negative
Economic opportunity/livelihood	Low positive	Medium to high positive

During the construction phase, such impacts as noise and dust, influx of outside labors and others can be mitigated by appropriate measures. The positive impacts including social and culture conservation and local development can be performed via promotion of economic activity to improve the livelihood of the people in project areas as well as to reduce the poverty of rural population.

Tabulated below is the activities and schedule of EMP, SDP and Monitoring Program proposed for the Nam Nga 2 Hydropower Project.

The above mitigation and development activities require an effective implementation from the project management. This is to ensure that any adverse impacts and promotion positive impacts 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 going on the right track. These are the tentative expected output from the creation of the Nam Nga 2 Hydropower Project.

It is recommended that, with the project at this size, the IEE with EMP, SDP and Monitoring Program is considered sufficient to meet the government environmental assessment requirements. Therefore, it may not require for future full EIA study. However, the separated environmental management and social development action plans should be conducted soonest after the setting up of the project organization and management.

CHAPTER 1: INTRODUCTION

1.1 Background of the Project

The Lao power sector is still in its infancy with only 47% of the household having access to electricity. The sector has the potential to play a pivotal role in achieving the social and economic development objectives of the Government of Lao PDR (GOL) by expanding the availability of low cost, reliable electricity within the country and earning foreign exchange from export sales to the region. GOL power sector policy facilitates these objectives by encouraging optimal use of the country's natural resources, promoting efficiency in power sector institutions and creating a conductive environment for responsible infrastructure investment, both public and private.

The provincial government of Oudomxay province requires to develop Nam Nga 2 Hydropower project to fulfill the needs of electric power in the province particularly in Xay District In order to supply load that have to be increased upon transmission line expansion, according to limitation of electric power sources in northern part, the provincial government of Oudomxayhas urged to develop hydropower potential within the province realistically.

1.2 Objective and Scope of IEE

The main objectives of IEE are to:

(i) Examine the available environmental information as well as baseline investigation on existing environmental situation in the project areas and identification of proposed effected areas in which the project construction and operation will cause noticeable impacts of any kind to environment;

(ii) Report the all potential significant environmental issues with regards to the project impact upon environmental resources and screening out the insignificant impact of the project including proposed mitigation measures;

(iii) Identify expected or potentially direct or indirect impacts caused by the project and adequate mitigation measures; and

(iv) Prepare the environmental management plan and social development plan.

The scope of this initial environmental examination includes the assessment of all significant potentially impact of both positive and negative impacts based on physical setting of the project areas but not limited on:

- Identification and analysis the existing National and International legal frameworks and policy related environmental impact assessment and management to ensure the significant impacts by project be managed and taking into account in compliance with

national and international safeguards.

- Physical Environment: to carry out and analysis the prevailing situation of the topography, geology and landforms, soils, climate, hydrology, surface water, water use, water quality, seismology, potential contaminated sites, mineral resources, noise and air quality and predict the potential impacts by the project and measures to be taken by project proponent.

- Biological Environment: to carry out and analysis the prevailing condition and potential impacts by project to the biodiversity, terrestrial habitats, terrestrial wildlife, wildlife corridors/paths, forests, vegetation cover, wetlands, fisheries, aquatic biota and habitats, NBCAs, conservation areas and other protected areas, areas of significant conservation value, environmentally sensitive areas, wildlife refuges etc., economic value of fauna, flora, rare or endangered species, rare or unique ecosystems, ecological relationships and natural history and prediction of impact by project and measures to be taken by project proponent.

- Socio-economic environment: to carry out and analysis the current condition of population & communities, livelihoods, housing, employment & income, education & training, gender issues, industries, infrastructure facilities e.g. roads, bridges, electricity facilities, water supply, institutions, transportation, use of physical and biological components, land use & planning (existing & planned), energy sources, agricultural development, tourism, socio-economic values, public health and safety, recreation, aesthetic values, archaeological aspects, historical aspects, cultural heritage and religion and anticipate the impact by project and measures to be taken by project proponent.

- The assessment of environmental impacts will predict and evaluate the adverse and beneficial impacts for each stage of the project. To predict how the lives of the project affected people will be improved and any enhancement of the natural systems that will result from the project's implementation. Predict any significant reduction in the quality and quantity of the natural resources in the environmental study areas. Evaluating the risk of significant deterioration in the health, the livelihood and well being of the project affected people.

- To formulate the environmental management plan and social development to make sure that all impacts by the project are taking into account and appropriate manner to manage those potential effects as well as prepare the budgeting and implementing schedule accordingly.

1.3 Rationale of IEE

As mentioned in the Environmental Management Standard for Electricity Project due to size and location of the project which it has an installed capacity of more than 2,000 Kilowatts and result of site investigation and analysis of all potential impacts by project and using the information in the Project Description, the information gathered from the site visit, and other sources as considered necessary, the project screening was found that it has minor significant impacts on physical, natural, social and cultural environments, but the appropriate and sufficient mitigation measures and management plan are required to make sure all anticipated and unforeseen impacts by project must be taken into accounts.

CHAPTER 2: INSTITUTIONAL AND LEGAL FRAMWOR

2.1 Institutional Frameworks

The Water Resource and Environment Administration (WREA) is the central environment management agency which has the mandate to co-ordinate environmental protection efforts of government ministries as well as provincial authorities. WREA is also administering an environmental impact assessment system, in collaboration with relevant line agencies and issue the certificate on environmental assessment of the project development.

WREA is responsible for overall guidance of the DPRA in matters pertaining to the inspection of the implementation of the monitoring and evaluation for the project environment where projects are approved at the central level. If necessary, WREA has the right to inspect the project owners to ensure implementation of project environment monitoring and evaluation.

Department of Livestock and Fisheries, Ministry of Agriculture and Forestry (MAF) implements Government policies, strategies and programs related to the management of fisheries (and livestock), monitors and evaluates data and information related to fisheries (and livestock) and reports on changing situations

State Enterprises Water Supply (Central and Provincial Nam Papa) supplies water to urban locations and implements guidelines for drinking water quality (WHO) managing sewerage and drainage.

Department of Electricity (DOE), Ministry of Energy and Mines undertakes project screening to determine further EA requirements, reviews, requires revision as necessary, and recommends approval of IEE, endorses TOR for EIA, Concurs in consultants that are proposed to conduct the environmental assessment, review and endorses EIA and EIA's EMP prior to final approval by WREA, Implements inspection, monitoring, validation and evaluation requirements and implement relevant PI requirements and oversee the implementation of EMP

National Institute of Hygiene & Epidemiology and Rural Water Supply (Nam Sa At), Ministry of Health (MOH) supplies water and sanitation services to non-urban locations.

The Provincial Water Resource and Environment Office responses for overall guidance of the DPRA in matters pertaining to the inspection of the implementation of the monitoring and evaluation for the project environment where projects are approved at the local level. If necessary, the Provincial, Municipal, Water Resource and Environment Office have the right to inspect the project owners to ensure implementation of project environment monitoring and evaluation.

The Provincial Department of Energy and Mines is responsible for the project coordination during environmental and technical study, involving the project monitoring Technical, EMP and SAP aspects and other related to energy projects.

At present, the Government of Lao PDR, especially, Water Resource and Environmental Administration is under upgrading the EIA regulation into Prime's Minister Degree in order to effectiveness and facilitate the project implementation

the current practice, in term of project environmental and social management and implementation, the GOL has setting up the project steering committee, chair by Minister for Energy and Mines, the member are included Ministry of Agriculture and Forestry, Water Resource and Environment Administration, provincial authority and other ministries concerns. This committee displays very important role in overall management of the project implementation.

2.2 National Policy, Legal and Administrative Frameworks

The Constitution: Article 17 of the 1991 Constitution of Lao PDR provides that: " All organization, all citizen must protect the environment and natural resources: land, subterranean, forests, fauna, water source and Atmosphere Action Plan (AAP) was passed in November 1993, and subsequently revised in 1995. This policy framework emphasizes that the exploitation and utilization of natural resources should be consistent with the needs of environmental protection and natural resource management. The EAP focuses largely on issues related to the management of key resources, namely forests, biological diversity, land, water, tourism and fisheries. Broad Socio-economic concerns related to the environment are also identified in the 1996-2000 Lao Socio-economic Development plan.

Environmental Protection Law: The increasing awareness of environmental protection and natural resource management in Lao PDR has led in the implementation of the Environmental Protection Law (EPL). The EPL provides a broad and holistic approach to environmental management in Lao PDR, with sustainable utilization of natural being one of its prime objectives. EPL is as exceedingly general document, which outlines the broadest of environmental policies. More detailed implementing regulation has passed to provide specific elaboration on the pertinent issues.

Article 5 of the EPL provides that the Government will ensure that environmental preservation is included in, and is harmonized with, the national socio-economic development plan. This represents a farsighted approach by the government to ensure, in principle, that environmental considerations are incorporated into developmental processes and decision-making. The mandates that all persons, juridical entities and organizations utilizing natural resources in the course of their activities will contribute financially towards environmental protection and natural resource preservation.

Sectional Law: The main sectional Law in existence includes the Forestry Law the Land Law, the Mining Law and the water Resources Law. Most of these laws are fairly recent, having been enacted.

The Prime Ministerial Decree No 164 on National Biodiversity conservation Areas was promulgated in October 1993. It established 18 National Biodiversity Conservation Areas (NBCA) covering more than 10% of the country's area. The 1993 decree was supplemented by a 1996 decree.

National Policy on Environmental and Social Sustainability of Power Industries in Lao PDR is comprised in three main objectives:

Economic Sustainability Relies: upon the maintenance of renewable Energy

Source and the use none renewable energy source rents to support the development of other factors of production

Social Sustainability is based on the principles of inclusiveness, mutual understanding and consensus

Ecological Sustainability relies upon the avoidance of irreversible environmental impacts such as the loss of biodiversity, accumulation of persistent pollutions or disruption of ecological cycles

Table 2.1 – Relevant environmental laws and regulations

Environmental legislation	Year
National Resettlement Policy	2005
Decree on Resettlement and Compensation	2005
National Policy on Environmental and Social Sustainability of Power Industries in Lao PDR	2005
Regulation on Environment Assessment in Lao PDR	2002
Regulation on Implementing the Environmental Assessment for Electricity Projects in Lao PDR	2001
Environmental Protection Law	1999
Land Law	2003
Forestry Law	2005
Biodiversity Country Report	2004
Prime Ministerial Decree 03/PM, on Land and Forest Allocation Policy	1996
Prime ministerial Decree No. 169/PM on forestry and Use Management (superseded by Forestry Law of 11 October 1996)	1993
Prime Ministerial Decree No 164 National Biodiversity Conservation Areas	1993
COM Decree 185, defining the Prohibition of Certain Species of Wild Animals	1991
Prime Ministerial on national Logging Ban, No. 67	1991
Recommendation on the Organization for the Implementation of the prime Minister's Decree on National Logging Ban, No. 67	1991
Lao PDR Constitution	1991
Decree No. 118 of the Council of the management and Protection of Wild Animals, Fisheries and on Hunting and Fishing	1989
COM Decree 74, on Protection of Forests	1989
COM Decree 185, in Relation to the Prohibition of Wildlife Trade	1986

2.2.1 Social and resettlement legislation

The National Resettlement Policy and Guidelines (2005) has addressed key principles of compensation for any loss due to the acquisition of land and resources by the State or developer. Consultations with affected parties must be carried out and the interests of these parties must be kept in mind during the process of rehabilitation. The policy also states that resettlement should result in

an improvement of living conditions and standards. The draft Policy also outlines all items that may warrant compensation, the principles of eligibility and the entitlement process.

The Land Law (1997, amended in 2003) is the key legislation covering the rights an.' procedures regarding the framework for tenure, access, use and management of lance (including forest land). A number of decrees govern land titling (MOF: 996, 997 and 998). The State protects the legal rights of its citizens to own and transfer land and authorize the use of land for a number of legal purposes through long-term leases (Article 13). The land law also ensures that people will be compensated for the taking of land by the State for the public good (Article 70-71).

The Forestry Law (2005) provides the framework for all implementing legislation in the forestry sector. The (MAF) has issued a number of regulations for the allocation, zoning and use of forestland within village boundaries and protected areas. Individuals any organizations have the right to obtain the rights to utilized forestry resources in a sustainable manner.

The Electricity Law (1997) requires a license for the generation and transmission of electricity. Article 14 states that "the investor will submit an environmental evaluation which will include the estimated costs of potential damages and relocation of local residents who may be affected as a result of such electricity production. In Article 18 states that damages to the environment, living conditions and properties residents, or compensate for costs of relocation of residents will be paid by project developer.

The principles concerning Electricity projects and these are found in Section 5 of the Environment Management Standard for Electricity Project No. 585/MIH.DOE, dated October 4, 2001. The principles include:

All affected persons, housing, land and other assets registered at the time of population survey and asset inventories, and all who can demonstrate loss, have the right to adequate compensation for loss to income restoration in conformity with these principles. The replacement of housing plots, housing and agricultural land will be of acceptable standard, use and value to the satisfaction of the affected owner. Where relocation is required, the transition period will be as short as possible.

2.2.2 Legal Status of Ethnic Group in Lao PDR

The Lao PDR Constitution (1991) and other legislation recognize the unity and equality of ethnic groups in the political process and protect their rights to preserve and improve their unique traditions and culture (Articles 1, 2, 3, 8 and 22). All ethnic minorities are Lao citizens, possess family books and identity cards, have the right to use native languages and to practice traditional customs and religion (Const., Articles 8 and 9). The Constitution prohibits any act that discriminates against or divides ethnic groups (Article 8). Ethnic groups maintain land tenure user rights equal to all Lao citizens with certain specifications (see Section 3.1.5.1) and even preferential access and customary user rights to certain forest products (Forestry Law, Article 30; MAF Regulation 535; MAF Orders 54 and 377).

As the primary legal document in Lao PDR, the Constitution provides a framework and minimum rights to be implemented in legislation. However, since the court system remains underutilized, it is difficult to enforce such rights or resolve conflicts between ethnic groups and the government or other stakeholders. Legislation in Lao PDR recognizes primary land tenure and resource user rights for ethnic groups, but most of them remain unaware of these rights under national legislation due to the inability of the government to provide extension to remote ethnic villages such as e.g. those within the NNT NPA. Thus any project within the Watershed Management Area should focus on providing extension of legislation and rights to the ethnic groups and assist in establishing village based rules, zoning and management.

The National Assembly has a special Committee on Ethnic Affairs to draft and evaluate proposed legislation to ensure that the concerns of ethnic minorities are incorporated and not infringed upon. The lead institution for ethnic affairs in Lao PDR is the Lao National Front for Construction (LNFC), which has an Ethnic Affairs Department. Research on ethnic groups is the responsibility of the Institute for Cultural Research under the Ministry of Information and Culture.

The country's new constitution, enacted in August 1991, ensures equal rights for both sexes in the political, economic, cultural, social fields, and family affairs. The role of the Lao Women's Union (LWU) is also recognized in the constitution with an information gathering and service delivery role. Among the 21 other laws which have been enacted since January 1992, some are related to gender issues. Among these are Property Law, Inheritance Law, Insurance Law, Labor Law, Family Law and Election Law.

2.2.3 Right and Entitlements with regard to ownership and land resources

Ownership and land/water resources user rights are regulated in the Lao Constitution under "Article 15"The State protects the rights of ownership (right to possess, use and transfer) and organizations' and individuals' rights to inherit property. As for the land, which is owned by the national community, the State ensures the right to use, transfers, and inherit it in accordance with the law." Land Law 1997, Article 3 states that land is under the ownership of the national community of which the state is the representative in charge of a unified administration throughout the county, in protecting and distributing land to multi-ethnic people and giving land to aliens, stateless people and foreigners on lease or concession. Land cannot be bought and sold by any person or organization.

"Lao PDR land is the property of the national community as provided in Article 17 of the Constitution which is centrally and uniformly administered by the State throughout the country and individuals, families, and economic organizations are assigned the right to use or lease or grant concession of that land. Armed forces, state organizations, political organizations, Lao Front for National Construction and the mass organizations are assigned the right to use that land. Resident aliens, stateless persons, foreign persons and organization may lease or obtain concession of that land".

Article 5: "The State protects the legal rights and benefits of those who have

received the right to use land to ensure efficiency, peaceful and sustainable land use, while also guaranteeing the rights to preserve, the right to use, the rights to usufruct, the right to transfer, and the right to inherit".

2.2.4 Water Resources with Regard to Ownership and User Rights

Water and Water Resource Law of October 11, 1996 by the National Assembly, Article 4 stipulates that ownership of water resource and water resides with the people of Lao PDR. The Government acts on behalf of the people to manage and to evenly and equitably share the uses of water. Individuals and organizations have the right to use the water for specific purposes only with given authorization by the concerned authority, except with the use on a small scale as stipulated in the Law. "Water and water resources are the property of the national community whom the State represents in managing and thoroughly and reasonably allocating its use to various parties.

Individuals, juristic entities, or organizations will have the right to control and use any natural water and water resource in any activity only so long as they are having received approval from relevant authorized agencies, except in the case of small scale usage as provided by this Law".

Article 14 of the same law stipulates that individuals, communities and organizations have the right to use water and water resources for family or business uses. Water and

2.3 International Agreement and Convention

As GOL has ratified the international agreement and conventions to promote sustainable development, existing policies/plans have taken into account the bilateral and multilateral cooperation to manage the share water resources and sustainable utilization of natural resources.

2.3.1 Mekong River Commission

Mekong River Commission (MRC) succeeded the Mekong Committee, which, among other things, had been instrumental in the planning of Nam Nga, the first larger hydropower project in Lao PDR. In 1995 the four riparian countries in the lower Mekong basin Cambodia, Laos, Thailand and Vietnam signed agreement on cooperation for sustainable development in the Mekong River Basin. The primary purpose of the Agreement is to promote economic and social well-being of the people in all the riparian countries through the protection of the environment, improvement of navigation and the cooperation in the maintenance of flows and intra-and inter-basins diversions.

2.3.2 ASEAN membership

Lao PDR became a member of the Association of Southeast Asian Nations (ASEAN) in 1997. The principal legal instrument of ASEAN that has potential nature conservation obligations is the agreement on the Conservation of Nature and Natural Resources. However, it has been ratified by only three countries since it was adopted in 1985, and is therefore not in force. ASEAN also has provisions to assist member countries to establish Tran boundary nature reserves.

2.3.3 International Conventions and treaties

The following conventions also relevant to development projects in Lao PDR:

- Convention on Biological Diversity (CDB) - Lao PDR became a signatory to the CDB in 1992. The obligations of CDB have been fulfilled in terms of new policy and legislation and by establishing NBCAs.

- Convention on the protection of World Cultural and Natural Heritage - This convention was ratified by GOL in 1987. The convention addresses the protection of both cultural and natural objects and sites of high national and international value.

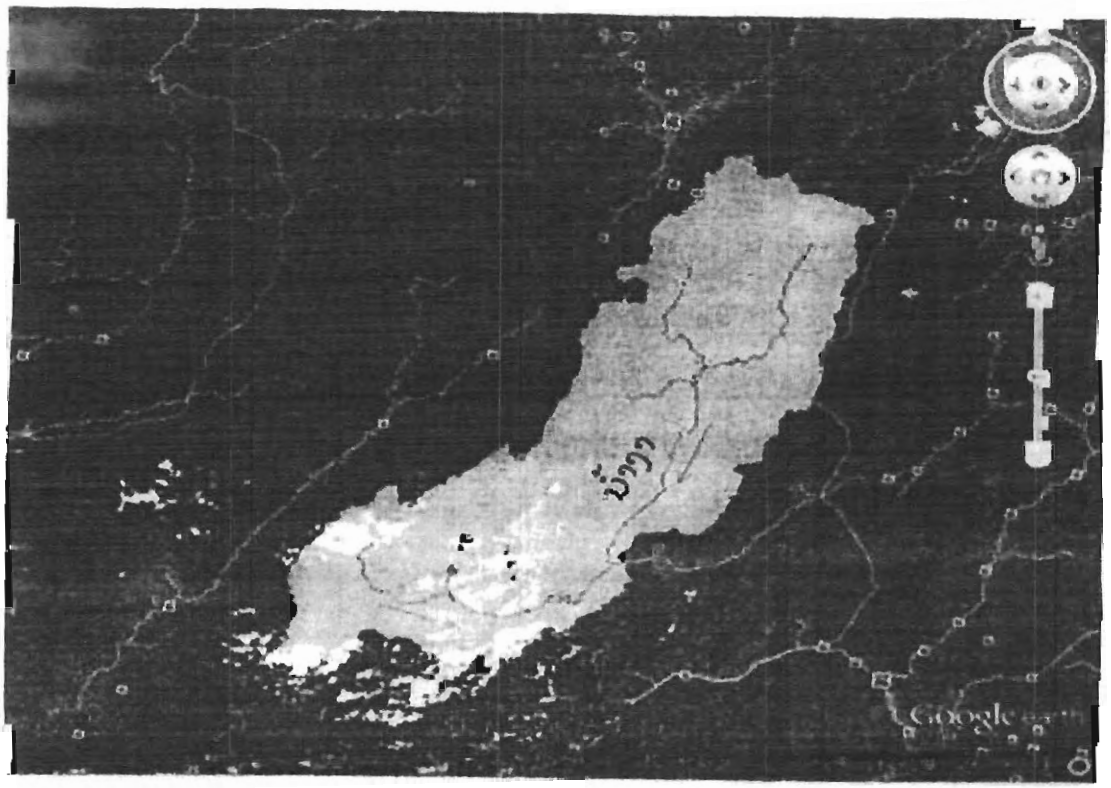
- Convention on International Trade in Endangered Species (CITES) - The Lao PDR ratified this convention in early 2004. Prior to the ratification, the Ministry of Agriculture and Forestry (MAF) issued a regulation that banned all hunting for trade. Hunting for consumption was still allowed. This implies that GOL is now committed to increasing efforts to halt the extensive trade in wildlife from Lao PDR to its neighboring countries.

CHAPTER 3: PROJECT DESCRIPTION

3.1 Project Location

Nam Nga Hydropower Project which is currently proposed for construction is located at the lower portion of the congruence between Nam Nga River and Nam Ngao River, which is about 100 m from such location and about 80 Km distance from Xay District.

Figure 3.1: Project Location



The Nam Nga 2 Hydropower project is located at the lower portion of the congruence between Nam Nga River and Nam Ngao River, which is about 100 m from such location and about 80 Km distance from Xay District. The dam is 245.408 m in length, 47.2 height, the dam crest is at the 493.7 m and the catchment area is 1,790 Km2. The full supply level of the dam is 488 m and the dead water level is at 487 me. The installed capacity of the dam is 14.5 MW and 0.6259 x 108 KWh is generated (62.59 GWh) per annum. The dam site is presented in Picture 1.1, the river length to be developed in the dam area is about 7 Km.

The river portion of Nam Nga River where this project will be developed is 7 Km long and the average slope of the riverbed is 2.84%. The boundary of the reservoir and the dam structure is located in the high mountains and both sides of the river banks are quite steep, in which both the left and right river banks has the slope of 20-300 and 300-350 respectively (see figure 2.1). The dam site of Nam Nga Hydropower project is going to be located at the lower section of the congruence

point between Nam Nga and Nam Ngao River, which is about 100 m from this point, the river width is about 60 m.

A crest level of 534 m above mean sea level has been assumed for the weir, allowing rise in level during passage of the design flood. A concrete weir with associated masonry concrete flanks would be appropriate at the site, taking account of the height of structure envisaged, valley profile and geological conditions, and has been adopted for cost estimation.

An in-river diversion channel would be required for passage of flows during dam construction. The channel would be located to suit construction of the combined concrete gabion-masonry weir and power station works and one of the masonry concrete flanks. To facilitate river closure and construction of the remaining flank, river diversion would be effected through temporary openings formed at low level in the concrete weir. The channel has been sized to be capable of passing the mean annual flood of 43.9m^3/s.

Nam Nga hydropower dam is designed for 20 years flood cycle and controlling of 100 years flood cycle that correspond to water flow is 2,140 m^3/s and water level at downstream of dam site which is correspond to water flow 466.81 m. In addition, at the time of full dam operation the maximum of water flow is 61 m^3/s and water level at dam site is 488 m, and water level at downstream is 456.513m.

The power station would be of the surface type housing horizontal axis Francis turbine-generator units. and 50% load limitation, the minimum flow allowed for operation of one turbine would be 14.41/4 = 3.60 m^3/s, producing about 3.75 MW.

3.2 Dam type power intake

The power intake is of the dam type, and the bottom slab elevation of the power intake is determined as 466.63m based on the experiences of relevant projects and after the calculation. A vertical trash rack will be arranged at the power intake, and the rack slot will also be functioned as the bulkhead gate slot. The trash rack will be arranged vertically with 4 openings, and the opening dimension for single unit is 2-3.5 × 5 (opening number--width×height) m; the dimension of the bulkhead gate is 3.5m×5.0m, and the opening dimension of the service gate behind it is 2-3.5 × 4 (opening number--width×height).

3.3 Penstock

One penstock for one Unit is applied to supply water. The penstock for one unit is about 38m long and internal diameter of penstock is 3.5m .

3.4 Powerhouse and Turbines

The powerhouse consists of the unit hall and the erection bay, its control dimension is 33m×13m×40m, two units will be installed in it, the capacity of single unit is 7.25MW, and the turbine installation elevation is 459.7m.

The powerhouse is arranged on the left bank of the main riverbed, the draft tube

bulkhead gate will be arranged on the draft tube for unit maintenance, the dimension of the draft tube bulkhead gate for one unit is 2-3×4 (opening number--width×height), the gate will be operated with the winch hoist on the tailrace platform, and the elevation of the powerhouse platform is 469.40m. The auxiliary powerhouse will be arranged at the upstream side of the powerhouse

Key characteristics of the project are summarized into Table 1.3-1.

Table 1.3-1 Key Characteristics of the Nam Nga2 Hydropower Project

Item		Characteristics	
Site	Province	Oudomxay	
	District	Xay	
	Village at intake weir site	Keo	
	River	Nam Nga	
	Catchment Area	1,790 km^2	
	Water way	power intake	466.63 m
		Length of Penstock	38 m
	Power facility	Type of power house	Surface type
		Turbine type	Francis (H), 2nos.
		Installed Capacity	14.5 MW
		Design Discharge	14.41 m^3/s
		Effected Head	118 m
		Transmission line	21 km
	Total Construction:	US$ 27.41×10^6	

3.5 Supply of Main Building Materials

The cement necessary for construction can be supplied mainly from Luang Prabang Cement Factory and supplementarily from Vang Vieng Cement Factory, and transported through road; the admixtures can be supplied from Thailand and transported through road; the wood can be supplied from Oudomxay and transported through road; the steel products can be supplied mainly from Kunming in China and supplementarily from Thailand, and transported through road; the explosive materials can be supplied from Vientiane and transported through road; the oils can be purchased in Vientiane and transported through road.

The E&M equipment can be purchased in China, transported to Yuxi in China through railroad, and transported to the site through road; the excavating and filling equipment can be purchased or leased in Vientiane, other construction equipment can be purchased overseas, and transported through road; other materials and goods can be purchased in Vientiane.

3.6 Construction Diversion

3.7 Diversion Mode

The water retaining structure is a 47.2m high concrete gravity dam, the dam site is within the wide river valley, and the wide floodplain is on the right bank, thus the actual conditions satisfy the requirement of open channel diversion and stage diversion. Based on the topographical and geological conditions at the dam site and according to the project layout, it is proposed to use the cofferdam for closure of the riverbed in stages for diversion. Stage 1: the earth and rock cofferdam for water retaining, open channel for water release; Stage 2: the earth and rock cofferdam for water retaining, sediment flushing bottom outlet for water release. .

3.7.1 Diversion Standard and Diversion Procedure

This Project belongs to grade IV small (1) type, the main hydraulic structures are grade IV, and less important hydraulic structures are grade V; the usage period of the cofferdam for Stage 1 is one year, the maximum height of the cofferdam is about 7m, and the corresponding reservoir capacity is less than $0.1\times10^8m^3$; the usage period of the cofferdam for Stage 2 is 6 month, the maximum height of the cofferdam is about 7m, and the corresponding reservoir capacity is less than $0.1\times10^8m^3$; according to the specification, the diversion structures belong to grade V, the diversion standard for Stage 1 is P=20% (throughout a year), and the discharge is $683m^3/s$: the diversion standard for Stage 2 is P=20% (November ~ May) , and the discharge is $175m^3/s$.

CHAPTER 4: APPROACH AND METHODOLOGY

4.1 General Approach

The general approach for conducting IEE for Nam Nga HPP includes ground survey, village profile and household survey with the use of questionnaire and interview and discussion with community leaders as summarized below:

- Village surveys of in the project area were made to downstream, along access road and transmission line, watershed and surrounding areas near to the project intake weir. Information was obtained through interviews with village leaders and household heads/representatives, and through group discussions. These surveys covered the issues related to; population, ethnic composition, history, assets, livelihood and services.

- Socio-economics of fishery and gardening were made via sampling of 20% of the total households of the 5 main villages in the project area, especially in downstream area and there is none single village in the project construction area. The data was collected by interviewing household representatives. Variables include household composition, housing, water supply, assets, land use and production, livestock, food security, occupation, commercial activities, resource use, and income and expenditure.

- Discussions with local leaders were also carried out as part of all site visits since leaders could provide the latest information and status about the village. In addition to the information in the village surveys, information was obtained related to leadership positions and capacity as well as local-level activities and concerns.

- Discussion with ritual practitioners were also undertaken in order to assess cultural practices, rituals relating to relocation, territorial spirits and religious beliefs that could play a role in the formulation of social and resettlement plans.

The field survey and data collection were mainly concentrating on the area within the catchments and the surrounding vicinities which include intake weir, powerhouse, road and transmission line corridors. The data collection included land used, forest types, river system, flora and fauna in particular rare and endangered species within the project area.

Prior to the arrival of the field survey units, the local district authorities of the project areas were officially notified about survey's objectives, 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.

Regarding the relevant data for natural environment around project affected areas, this was undertaken and 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.

4.2 Questionnaire and Interview Form

Village profile questionnaire has been developed with pretest to collect information of each potentially affected village. The household interview form with pretest was employed based on requirement of national technical guideline on Environmental Management Standard for Electricity Project and National Guideline on Resettlement and Compensation. This also includes some information concerning the changes of livelihood, and the data on ethnic composition of the local population.

Project Study Area

To meet with relationship of environmental parameters, the main following areas are relatively included in the IEE study:

- Upstream of Reservoir area (Watershed Area)
- Reservoir Area
- Downstream Area
- Construction sites including transmission line and main access road corridor.

CHAPTER 5: EXISTING ENVIRONMENTAL CONDITION

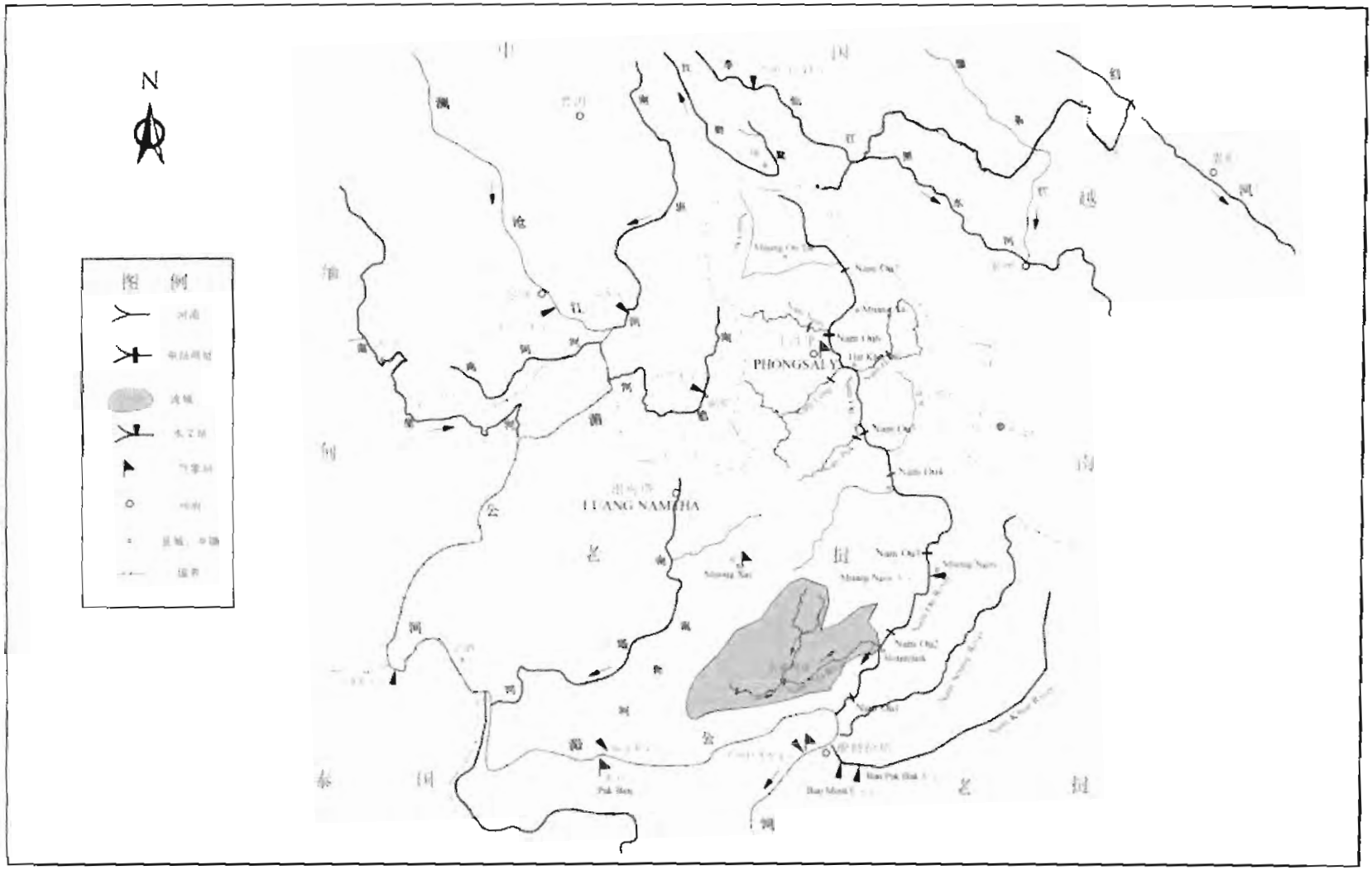
5.1 Description of Physical Environment

5.1.1 Topography and Geomorphology

The dam site is a wide "U"-shaped valley and the dam axis is selected at about 100m downstream of confluence between the mainstream and the tributaries. The right bank of the dam site is distributed with floodplain. The river flows from west to east at the dam site, with riverbed elevation of 458m～ 459m, dam axis width of some 60m, and the R/B floodplain width of about 150m.

The left bank of the dam site is a stripe ridge, with a width of about 50m, and there are small gullies developed in the upstream and downstream, with a left bank slope of 20°～ 35°, being gentle in the upper part and steep in the lower part. The slopes on the right bank are between 30°～ 35°, and the right bank slopes are relatively complete.

Figure 5.1: Topographical Area



5.1.2 Geology

There is no landslid e or collapse and other unstable physical geological mass distributed at the dam site, and the physical geology is mainly manifested as rock weathering and local surface rocks are toppled and deformed.

Rock weathering is mainly related to such factors as lithology and terrain, etc., mudstone is strongly weathered, followed by siltstone, and fine sandstone is weakly weathered. The upper part of the slope is weathered more deeply than the lower part. The bedrock lithology exposed by boreholes at the dam site is mainly fine sandstone interbedded with somewhat mudstone. The thickness of fully weathered mudstone is generally 10m - 15m, while that of strongly weathered rock mass is generally 12m - 18m, fully weathered fine sandstone generally 3m - 6m, and the thickness of strongly weathered rock mass generally 3m - 10m.

Local area of the riverside on the left bank may be seen toppling and deformation of the rock mass, which lowers the integrity and strength of surface rock mass. According to field observation and similar project experiences, its deformation depth is generally not greater than 5m.

Figure 3.3: Landform on Right Bank of Dam Site

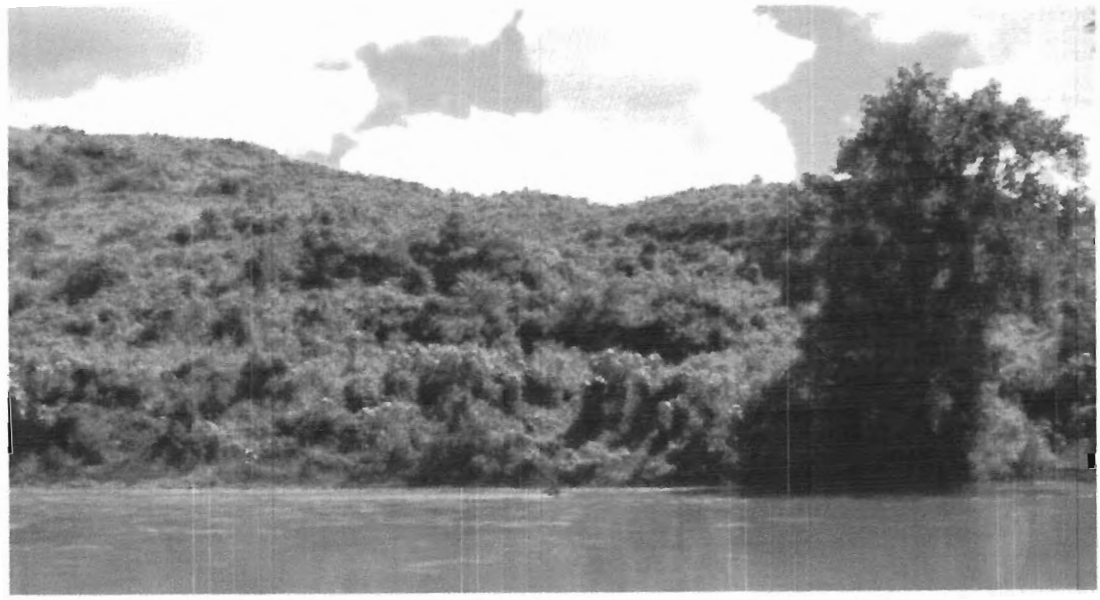
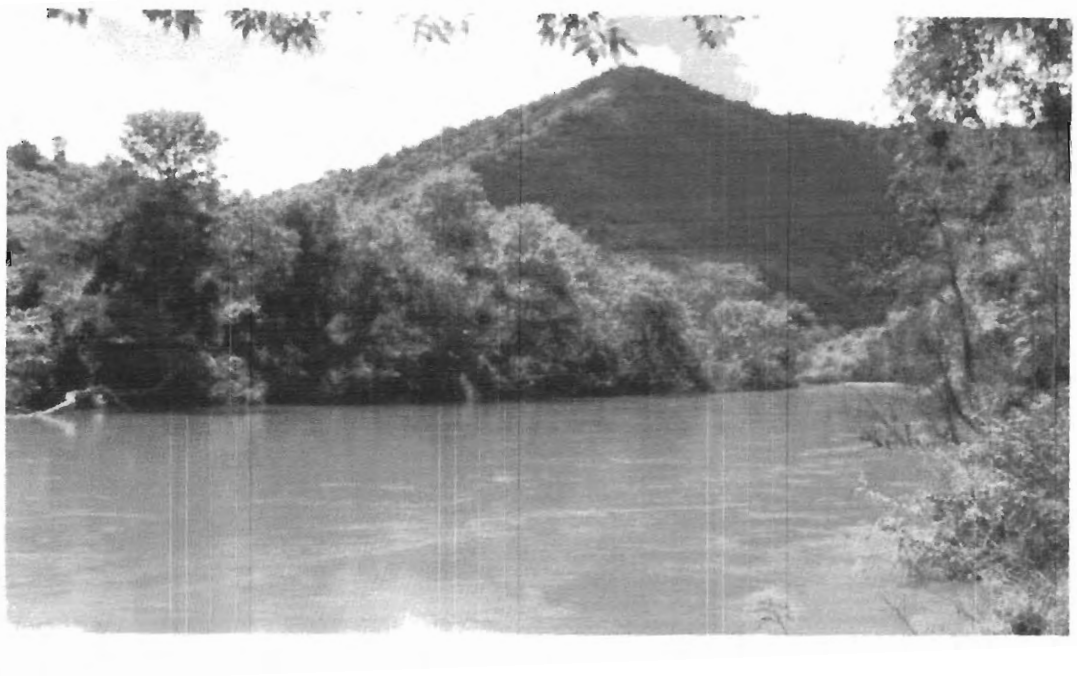
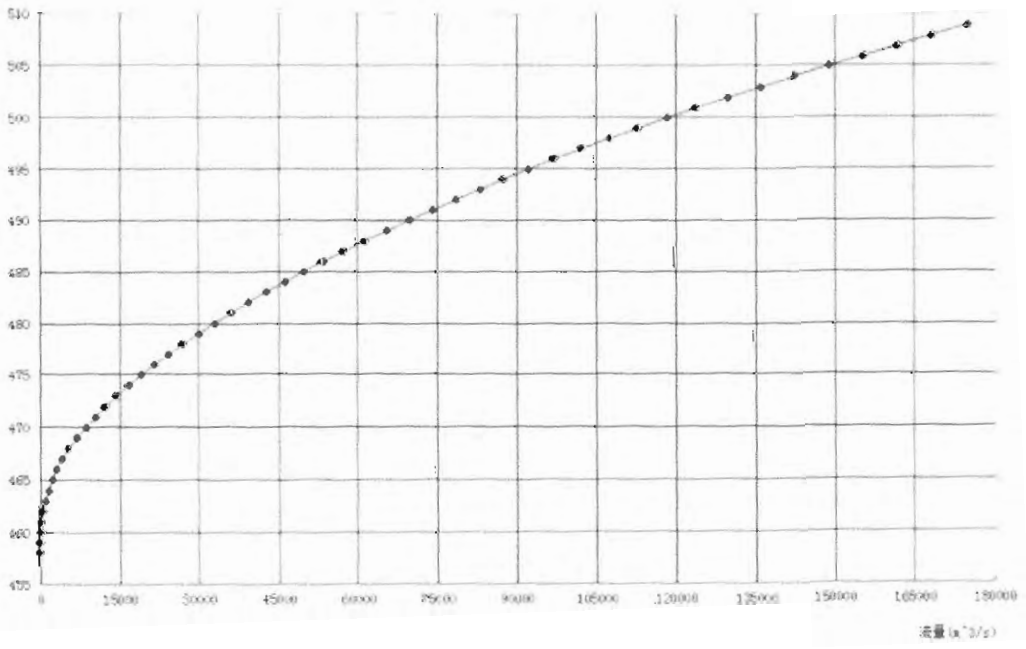


Figure 3.3: Landform of River Bed at Dam Site (Facing Upstream)



The volume capacity of reservoir and reservoir evaporation is very small is not effected to reservoir operation so this case the sedimentation load to the reservoir storage will be rapidly created, the relation between elevation and Area are presented in below:

Figure 3.6: Arch Dam Preliminary Reservoir Volume Curve



5.1.3 Meteorology

Lao PDR is a tropical monsoon climate area, with abundant precipitation. The air temperature is hot all year round, without great changes to seasonal temperature difference. There is no clear distinction between spring, summer, autumn and winter, and there are merely two seasons: rainy season and dry season. In every

May – October, warm and humid air currents blow from the ocean toward the continent, and form the rainy season. From November to the next May, cold and dry air currents blow from the continent toward the ocean, and form the dry season. Due to impacts of the monsoon climate, intra-year distribution of precipitation in the basin is uneven, which are mainly focused in the rainy season. According to the statistics of rainfall collected from the meteorological stations, the rainfall in the period of May – October accounts for some 85% of the annual precipitation, while the rainfall in the period of November – next April accounts for about 15% of annual precipitation. The basin has abundant precipitation, with great changes in surface distribution, and the general trend of precipitation tends to decrease from northwest to southeast, and the changes are in the interim between 1,200mm and 1 ,600mm.

The meteorological stations in Nam Ou Basin and neighboring basins include Phongsaly (El. 1,300m), Muong Xay (El. 636m), and Lang Prabang (El. 305m). To be specific, Phongsaly Station is located in the upstream area of the basin, and Muong Xay Station is located at west side in the middle reaches of the basin, while Lang Prabang Station is close to the confluence of Mekong River and Nam Ou River.

Since there is no meteorological observation data at the dam site of Nam Nga II HPP, considering that Lang Prabang Meteorological Station is close to the HPP, and the elevation difference is insignificant, the climatic conditions are similar, and there is no great difference in meteorological elements, the meteorological elements of the HPP area are mainly to refer to the statistical results of meteorological achievements of Lang Prabang Meteorological Station.

5.1.4 Basic Hydrological Data

Nam Nga River is located downstream of Nam Ou River, and it is a primary tributary of Nam Ou River. Nam Ou Basin has a developed river system, with multiple tributaries, but there is no hydrologic station on either of the tributaries. There is but Muong Ngoy Hydrologic Station downstream of Ban Sop Houn Bridge at the county seat of M. Ngoy in the downstream of mainstream Nam Ou River, the water catchment area of which is 19,258km$_2$. The said station has the water level and discharge observation data for the period of 1987 – 2011 (in which observation of 1993, 2004 – 2006 was missing).

The neighboring Nam Beng River is established with Nam Beng Hydrologic Station, the basin area of which is 1,918km$_2$, the measured data were in the period of April 2003 – February 2005, and the years of data available is short. The neighboring Nam Khan River has Ban Mout Hydrologic Station and Ban Pak Bak Hydrologic Station, the basin areas of which are 7,321km2 and 7,049km2 respectively, and the measured data were in the periods of 1960 – 2004 and 1985 – 2004 respectively, with good data availability, but there are great differences with the basin area of the dam site. On the neighboring Nanla River in Chinese territory, there is Manlasa Hydrologic Station, which is a Chinese national basic station, with high level of hydrologic observation and data collation precision, and the measured data were for 43 years from April 1965 to December 2007, with detailed and representative data.

5.2 Description of Biological Environment

TOn biological impact analyzed, which is included together with social-economic impact assessment. Detailed social economic impact from Nam Nga hydropower dam construction is summarized in the below table.

Expected loss from impact on Nam Nga hydropower dam construction nearby the area is different, it is depending on flooding level and altitude of areas in each season for year round. Land areas affected from each area are shown in the table 5.1:

Table 5.1 - Land area affected from each area of project site

Loss of types	Zone 1: Upstream area	Reservoir area		Zone3: Dam Construction area	Zone4: Downstream area
		Zone2 UR: Upstream area	Zone2 LR: Downstream area		
1. Agricultural land	0	√	√	√	0
2. Resident area (building), trading center, industry	0	0	0	0	0
3. Short term agricultural land & forest	0	√	√	√	√
4. Long term agricultural land & forest	0	√	√	√	√
5. Other lands (Institutes and infrastructures)	0	0	√	0	0

As shown in above table on land loss from each area is different.

Zone 1: it is the area on upstream of the dam reservoir area (above Nong Tao village onward) and concession area of the project with is higher than 488 m will not affected .

Zone 2 UR: The area is located on upstream of the dam reservoir area (Nong Tao village area). This area will be flooded of agricultural land and forest in some parts in raining season and temporary, but in the most of year the area will not be flooded and a small part that along the river will be flooded for whole year.

Zone 2 LR: The area is located above Keo village and below Nong Tao village. All

area and forest will loss and be flooded for whole year. It means all asset in the area will loss.

Zone 3: The area will construct dam, powerhouse, office and other facilities for Nam Nga hydropower. The area is under the dam project concession and the area will be affected from dam construction, therefore the land will be compensate to the owner according to the laws and regulations.

Zone 4: The area is located on downstream, expectedly discharging water of power generation surplus discharging water when heaving flooding occurrence, that will flooding impact differently on amount of raining and height of land in each area. In overall, based on hydrology analysis in the area, flooding will occur around 5 to 7 days only. Therefore, agricultural land and vegetation along the river bank might be affected in some period of time. However, at the beginning of dam construction, water quality of Nam Nga river at downstream might be changed, that will be negative impact on aquatic lifes (crap, fish, shrimp and others) in the area.

5.2.1.1 General Description

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.

Principally, the alignments will be sited so as to avoid crossing villages and other areas of settlement. Instead, the transmission lines will be routed along existing road. In case the construction of transmission line could not avoid crossing villages, houses and/or other constructions, such houses and other constructions e.g. rice huts. However, the transmission line 22 kV line and single concrete pole have not significant impacts to social environment. The consideration and selection of transmission line was based on the following engineering principles:

- Construction of the pole, 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 will be 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, NPAs, eco-tourism sites;
- Ensure adequate clearance between the alignment and significant cultural/historical monuments/sites.
- In addition, wherever possible considerations were given to minimizing the extent of visual intrusion upon views capes considered as unique or valuable as tourist resources.

For this project, there is no resettlement involved.

5.2.1.2 Land use and vegetation

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 Right of Way (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.

For this project, as the habitats are severely degraded over most of the project area due to from time to time exploitation of forest and land resources and the alignment will more or less run parallel with the new access road from powerhouse to existing EDL's grid, the construction of access roads to the ROW is not much required, it is, therefore, anticipated that forests/vegetations and wildlife habitats will be insignificantly affected.

The line route will be followed the existing road to the powerhouse. However, although forests and wildlife habitats will not be affected significantly by the Project, in the cases of holy forests affected by the project, where it is necessary to remove vegetation, only a narrow right-of-way will be cleared. To ensure that the alignment and new access tracks will be avoided areas of environmental sensitivity, a member of Project's Environmental and Social Management Office (ESMO) will be involved in the detail design and reviewing the detailed alignment survey and conducted monitoring since early stage of construction.

5.2.2 Fishery and fish migration

In the upper Nam Nga HPP fall the fish and aquatic species found are few species and none economic value. The fisheries are conducted mainly for household consumption and fresh fish consumed during the rainy season, some of which they can fish on the Nam Nga or some pond in the project area. All kinds of fish are caught for human consumption.

Men fish in the mornings and evenings, before they leave for the fields after return. Most fish are caught by cast nets in the Rapides, by deep water gill nets, bait and hook are also used but to a lesser extent. Boys and sometimes search banks and

willows for frogs, aquatic insects and small fish that supplement the family's diet.

In the upper part of intake weir, The fishing in the main river, Nam Nga and small streams, the species caught from upper Nam Nga HPP are migrated toxic species (eg: Common carp, Grass carp, Big head carp and silver carp), for some indigenous species available in this area *(see Table 5.4).*

The purpose of fishing is mostly for household consumption within the four villages in downstream, average fish consumption was found to be between 2 to 6 kg/household/month, the average fish consumption has been founded to be 2 to 5 kg/household/month.

Four villages existed in the downstream area of the powerhouse and one village is located in the upstream of the intake weir. The fishing here is not for full time where fishing is normally after the farm work. The fishing for consumption of the villagers not for permanent, depend on timely available, mostly they have to go the fishing in the night time, somebody used gill net and cash net with the mesh size from 1 inch to 4 inch, hooks, bamboo traps for catching fishes. All of villages catching fish for household consumption not for selling. This village they has one family do the fish aquaculture. It has three fish ponds of about 20 X 10 X 1.5 m each. Tilapia (Pa ninh) is the cultured species with the stocking rate about 10 fingerlings per m^2. The fishes are cached every day for family consumption.

Table 5.3 - Fishing gears used in this area

No	English name	Lao name
1.	Gill net	Mong xay
2.	Fish hook and line	Bet khan
3.	Fish hook long line	Bet phiar
4.	Scoop net	Kheuang
5.	Big bamboo trap net	Loop
6.	Small bam boo trap net	Xay
7.	Cast net	Hai
8.	Bamboo pen	Tone
9.	Chinese drift net	Kadoung
10.	Basket bamboo	Soom
11.	Hand net	Saving

CHAPTER 6: POTENTIALLY IMPACTS AND MITIGATION MEASURES

6.1 Physical Environmental Impacts and Mitigation Measures

6.1.1 Climate

6.1.1.1 Anticipated impacts

The Catchment of Nam Nga 2 Hydropower Project is influenced by the monsoon climatic variations. The proposed reservoir will result in minor changes to the air temperature and relative humidity over the water and around the shore. Some potential exists for the reservoir to change the rates and intensity of occurrence cloud base creation or suppression. The magnitude of the changes will be small and not particularly noticeable because of the comparatively small forces created by the reservoir in relation to the dominant impacts of the seasonal monsoons. Only minor microclimatic changes are expected.

Magnitude of environmental impact on climate is as follows:

	Anticipated Magnitude of Impacts						
Climate	-3	-2	-1	Ins	+1	+2	+3
Construction							
Operation							

Note: Ins = Insignificant
-1 = Low negative -2 = Medium negative -3 = High negative
+1 = Low positive +2 = Medium positive + 3 = High positive

6.1.1.2 Mitigation measures

No mitigation measure is required for this issue.

6.1.2 Hydrology and water resources

6.1.2.1 Anticipated impacts

The creation of the proposed of reservoir along the valley and divert the average of 2.8 m^3/s from the reservoir via headrace canal and return to the Nam Nga River supply through the power station, and from power station to the Nam Nga River, the key changes to the hydrology and river regimes of the Nam Nga. The hydrological change will be most significant for the Nam Nga bio-diversity from intake weirs to powerhouse. Impacts on the riparian vegetation should be limited. More important should be limited to the impact on fish biodiversity. From environmental impact perspective, running the power plant in this manner has certain consequences. The second of river from intake weir to release from powerhouse will effectively be dry for some time during operation of the power plant. Some environmental impacts will be occurred and altered since unlikely that range species in the river including small fishes, aquatic insects and others. The magnitude of impacts during construction, there will be affected on hydrology due to flow diversion and temporary structures that will divert flow. However,

during course the power plant in operation and the storage of water in the reservoir are likely have some impacts on the Nam Nga with distance of 10 km from intake weir to the power plant.

The compensation to this change and its tributaries will be come donor River to maintain the flow. On the hand, the Nam Nga Intake weir will be prevented the Promable Maximum Flood (PMF) during rainy season and minimize the disaster risk of the local people in downstream area of the intake weir.

As there is no reservoir to store water and regulate river runoff, the impact on the groundwater level is minor.

The magnitude of environmental impacts on hydrology and water resources is as follows:

	Anticipated Magnitude of Impacts						
Hydrology and Water Resource	-3	-2	-1	Ins	+1	+2	+3
Construction							
Operation			■				

Note: Ins = Insignificant
-1 = Low negative -2 = Medium negative -3 = High negative
+1 = Low positive +2 = Medium positive + 3 = High positive

6.1.2.2 Mitigation measures

The minimum riparian releases at the Intake Weirs should be not less than the Minimum natural flow in the dry season to maintain the Nam Nga bio-diversity.

6.1.3 Geology

6.1.3.1 Anticipated impacts

The erosion impacts due to construction would not be expected to be significant with implementation of adequate mitigation measures.

Here is the magnitude of environmental impacts on geology and soil.

	Anticipated Magnitude of Impacts						
Geology and soil	-3	-2	-1	Ins	+1	+2	+3
Construction			▒				
Operation				■			

Note: Ins = Insignificant
-1 = Low negative -2 = Medium negative -3 = High negative
+1 = Low positive +2 = Medium positive + 3 = High positive

6.1.3.2 Mitigation measures

Mitigation measures should be implemented with a best management measures

followed. For the road construction and excavation works, sufficient measures should be taken to maintain the present natural condition at the intake weirs.

The creation of the reservoir area should be ensure that mitigation measures to control erosion and sedimentation in the reservoir are implemented and should be ensure that sediment yield will remain at the current estimated low level.

The banks and bed of the excavated at the intake weir and powerhouse are expected to cause some erosion in areas of poor soil and steep slope along access road improvement, building up the project facility. These areas should be protected with riprap to control erosion of the banks and bed where potentially eroded. The situation should be monitored and if it is determined that any erosion is putting the structural stability of the powerhouse with risk. Also, rectification work should be carried out, especially in the powerhouse and switchyard areas. The major erosion control activity at construction sites for the project should be managed for excavated surfaces, especially during the wet season when the volume of runoff is expected to be high. It will be covered by plastic where seen to be high potentially eroded.

6.1.4 Sediment transport and erosion

6.1.4.1 Anticipated impacts

The present sediment yield from the catchment is no consequence to the reservoir or functions during the design life of the project. The long-term protection of watershed area is essential to insure that sediment yield will remain at the current low level. The flows from the intake weir are expected to remove the sandbars and finer sediment bed leaving a coarser substrate, but however, some micro hydropower and sediment loads to intake weir or powerhouse more than estimation,

6.1.4.2 Mitigation measures

The creation of the catchment area should be ensure that mitigation measures to control erosion and sedimentation into the reservoir are implemented and should be ensure that the sediment yield is lower level remain at the current estimated low level. An appropriate watershed management plan will design to minimize the any slash and burn for agricultural activity and enforcement to the forestry. The buffer zone will be preserved at less 100 m from full supply level

6.1.5 Erosion during construction and operation

6.1.5.1 Anticipated impacts

Most of the erosion from construction results from removal of vegetation including changes in sediment yields which have frequently been observed after vegetation has removed and catchment areas have been converted to other land uses. The proposed the Nam Nga hydroelectric project maybe will undertake several construction activities for power plant facilities and supported infrastructures such as roads and bridges.

The erosion impact due to construction is considered insignificant. However, the

contractor should be carefully with the road construction and excavation works at the intake weir, penstock and powerhouse.

The banks and bed of the excavated for powerhouse foundation are expected to be soil erosion. These areas should be protected with riprap or shot create to control and protect the land slide in wet season. The situation should be monitored.

The magnitude of environmental impacts on erosion is as follows:

	Anticipated Magnitude of Impacts						
Erosion	-3	-2	-1	Ins	+1	+2	+3
Construction							
Operation							

Note: Ins = Insignificant
-1 = Low negative -2 = Medium negative -3 = High negative
+1 = Low positive +2 = Medium positive + 3 = High positive

6.1.5.2 Mitigation measures

Erosion and sedimentation should be controlled during the construction of the project components. If the areas of the site not disturbed by construction activities, in this area should be maintained in their existing conduction. The following main points of measures should be planned to control sedimentation and erosion affected by the project:

Soil erosion and sediment control practices should be installed prior to any major soil disturbance, or in their proper sequence and maintained until permanent protection is established. Only areas intended for immediate construction activity will be cleared of vegetation and topsoil, in cognizance of the overall construction schedule. Any disturbed areas that should be left exposed and not subject to any construction traffic will receive a temporary seeding. Following initial disturbance or rough grading, all critical areas subject to erosion should be receive a temporary seeding in combination with straw or a suitable material.

Dust control activities should be implemented on the construction site. Dust control should be consistent with the activities of stabilization with temporary vegetation, and sprinkling with water until the surface is sufficiently wetted to suppress dust.

Soil and spoil removed during the construction process should be stockpiled separately and stabilization measures implemented. The stockpiles should be constructed with stable batters and grassed to prevent erosion. Ridges maybe created on topsoil stockpiles to provide for moisture retention to assist regrowth and slow run off to avoid the areas of drainage lines should be control drainage and erosion from the stockpiles. The erosion of the base of the dump should be considered in planning the location of the site.

The major erosion control activity at construction sites for the project should be management of excavated surfaces, especially during the wet season when the volume of runoff is expected to be high.

6.1.6 Surface Water and Water Quality

6.1.6.1 Anticipated impacts

None of water quality was officially analyzed; however, the observation indicated that the water quality in the Nam Nga River is good and fresh. The Nam Nga River has a soft water with near neutral pH, high dissolved oxygen, and low conductivity and nutrients. The river is located in a relatively undisturbed catchment with a small number of people engaged in shifting cultivation.

Some part of this river flow through four main villages communities undertaking a variety of agricultural and fisheries activities. During the dry season, riverbanks are utilized for growing vegetables. River water is also used by livestock and the human population for bathing and drinking water. The quality of water diverted through the turbines from the power station into the Nam Nga River should be also considered to ensure that water entering to the river is good quality. The water quality monitoring will be implemented.

The water quality might be occasional episodes of anoxia in isolated areas due to small regime of river flow, in river diversion pipe or canal will be considered by construction method, the effect to water quality during construction and powerhouse and the riparian flow. The relative willowness of the main

Due to the run off river scheme of dam type and after dam construction, it is not high decomposition rates of biomass will lead to annual minimum dissolved oxygen levels. At the time of construction, precautions will be taken to ensure that normal volume of poor quality water enter the Nam Nga downstream of the intake weir. The long-term riparian release will be deoxygenated and to minimize releases of anoxic water into the riparian flow.

Water quality impact can be scaled as follows:

	Anticipated Magnitude of Impacts						
Surface water quality	-3	-2	-1	Ins	+1	+2	+3
Construction							
Operation							

Note: Ins = Insignificant
-1 = Low negative -2 = Medium negative -3 = High negative
+1 = Low positive +2 = Medium positive + 3 = High positive

6.1.6.2 Mitigation measures

6.1.6.2.1 Upstream area of the dam

To mitigate water quality in the reservoir should be reduced of residual biomass level. The salvage logging and reservoir clearance should be taken before impounding the reservoir and monitoring to determine the economics and means for continuing the removal biomass, including diameter and poorly formed logs which may be economically harvested for sawn timber, bamboo, and chip board from the inundation zone. Firewood collection should be undertaken during the

construction, stockpiling fuel for future use by local villages. This methodology to be clears the reservoir before inundation to reduce the impact of the biomass.

6.1.6.2.2 Downstream area

The water quality releases to downstream of the intake weir should be investigated to manage the concentrations to exceed pre determined trigger levels. In the area adjacent to the Nam Nga downstream of the dam and powerhouse and river confluence and area adjacent to the downstream channel, direct impacts on local people should be mitigated through alternative means if water qualities from pre impoundment level.

There are four villages that residing in the downstream area. They are currently using water from the river. In this regard, adequate water supply will be considered and provided.

6.1.7 Air quality

6.1.7.1 Anticipated Impacts

The impacts on air quality due to the construction of the intake weir, headrace canal, powerhouse and traffic road should be temporary, minor and controllable. The head of a contactor should be required to implement an emission and dust control plan. The Head Contactor's (HC's) emissions and dust control plan should include methods for dust suppression relating quarry sites, crushing and batching plans including road construction, embankment and channel construction, haulage of materials and construction work camps. Methods for dust suppression should be employed as necessary, including water supplying to control dust which will be resulting from the construction activities.

The air pollution will originate from the fugitive dust resulting from construction activities, addition to the land clearing and surface excavation activities request for construction of the project, construction of headrace canal systems will also be a potential source of air emissions from point sources. In addition, there will be increased traffic on unsealed gravel to contribute to air pollution fugitive dust.

The following table shows the magnitude of impacts on air quality.

	Anticipated Magnitude of Impacts						
Air quality	-3	-2	-1	Ins	+1	+2	+3
Construction							
Operation							

Note: Ins = Insignificant
-1 = Low negative -2 = Medium negative -3 = High negative
+1 = Low positive +2 = Medium positive + 3 = High positive

6.1.7.2 Mitigation Measures

The impact on air quality from the project should be temporary, minor and controllable. The construction contract will be required to implement an emission

and dust control plan within their framework The emission and dust control plan should include methods for dust suppression relating quarry sites, crushing and batching plans including the road construction, embankment and Canal construction, haulage of materials and construction work camps Methods for dust suppression should be employed as necessary, including water supplying to control dust which it will be resulting from the construction activities.

The construction equipment emission as a result of diesel fuel combustion is expected to be minor. However, it would be request that combustion engines be inspected and adjusted as required to minimize pollution levels.

6.1.8 Noise

6.1.8.1 Anticipated impacts

Noise impacts will be mainly originated from the contractors activities. Noise impacts during construction should be temporary and minor, primarily emanating for construction equipment and vehicles. However, some of construction sites of the Nam Nga 2 Hydropower project are not situated adjacent to areas of human settlement; therefore noise levels are not expected to represent a nuisance factor.

Here is the magnitude of impacts on noise.

	Anticipated Magnitude of Impacts						
Noise	-3	-2	-1	Ins	+1	+2	+3
Construction							
Operation							

Note: Ins = Insignificant
-1 = Low negative -2 = Medium negative -3 = High negative
+1 = Low positive +2 = Medium positive + 3 = High positive

6.1.8.2 Mitigation measures

It should be the responsibility of the head of contractor to implement a noise minimization plan within the framework. The HC, as part of the noise minimization plan, must ensure that the noise levels from construction equipment and vehicles conform to the requirements of equivalent with the exception of any drilling machines used for explosion. Any noise control devises such as mufflers that are defective will not be allowed.

At additional, those surface construction areas, including quarries, where it is near by village and this activity should have restricted working hours, including restricted times for above ground blasting. In other areas, which are far from settlements, work would be permitted to undertake on the day time. Construction workers exposed to noise levels of 80 dB or more than should be provided with adequate hearing protection, in accordance with the requirements of the health and safety plan.

6.2 Potential Impact on Biological Environment and Mitigation Measures

6.2.1 Overview of the impacts

Generally, the clearance of vegetation within the intake weir, powerhouse and reservoir 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 flooding. The permanently maintained access roads to the intake weir and powerhouse during and after construction will eliminate the ability of the land on which the roads situate to re-grow to species-rich secondary forest.

Based on the land use and forest map and conducting field survey, most vegetation type covered within the project area is Unstocked Forest and Scrub, however, there are some Mixed Deciduous Forest which is severely degraded over most of the project area due indiscriminant clearing for various land use types, in particular slash and burn type of clearing endemic not only for the project area but through the country. In this respect the intake weir and reservoir as well as access roads and transmission lines are sited on the degraded lands and forest, hence would not be a significant cumulative adverse impact, in the already degraded vegetations and wildlife in the project area.

The construction of the Nam Nga Hydropower Project is little construction activities, the permanent camp site, temporary camp, material storage and quarry area is require large area.

6.2.2 Forestry and terrestrial vegetation

The review of forest cover maps, field reconnaissance and villagers' interview, it indicated that most of the vegetation that will be affected by flooding was unstocked forest Regarding the proposed transmission line, there is none commercial tree species, herbaceous and woody stemmed shrubs, grass and bamboo which belong to different type of forests such as *Mixed Deciduous Forest, Unstocked Forest and Scrub* and *swidden (hay)*.

However, some of the big and high value commercial species were destroyed and removed by various causes including bombing during Indochina war, converting activities for other uses such as clearing and burning for shifting cultivation and logging. It is also confirmed that any areas of sensitivity forest such as National Biodiversity Conservation Areas (NBCAs) and protection forests are not present within the project area especially reservoir and intake weir.

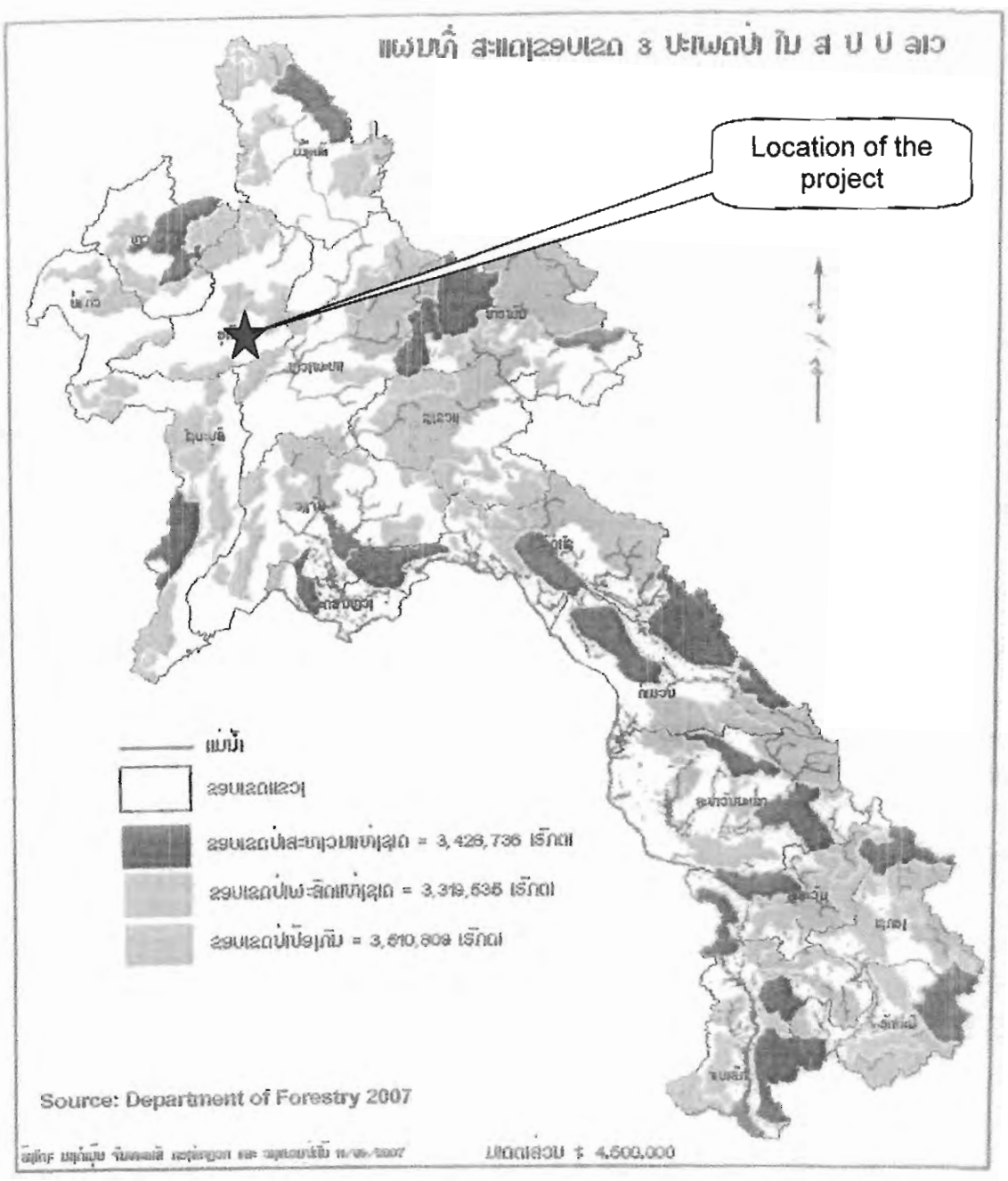
In addition to the NBCAs, the provinces and districts have also established a number of Provincial and District Protected Areas (PPAs and DPAs) including protection forests[1]. The location of these PPAs and DPAs is quite difficult to confirm especially in the field areas, as the Provincial Agriculture and Forestry Division (PAFOs) have no accurate maps of these areas except for the lists and

[1] *The Forestry Law also defines 'protection forests'* as a *distinct* forest *category (M. 17) not intended for protection of biodiversity, environment or culture but for watershed protection, erosion control, national security*

numbers of PPA and DPA.

However, as the result of conversion of land use and forest types, most of the land and forests within the project area have been disrupted by human activities (logging, slash and burn cultivation and others), and therefore it is unlikely there would be any forest conservation of any kind still existed.

The pre-survey for selecting of the project was conducted and determined by the other survey teams 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 project has been sited and designed so as to avoid such important areas, wherever possible.



So far, the magnitude of impacts on forestry and terrestrial vegetation is as below.

Forestry and terrestrial vegetation	Anticipated Magnitude of Impacts						
	-3	-2	-1	Ins	+1	+2	+3
Construction							
Operation							

Note: Ins = Insignificant
-1 = Low negative -2 = Medium negative -3 = High negative
+1 = Low positive +2 = Medium positive + 3 = High positive

6.2.3 Wildlife and wildlife habitat

Wildlife and wildlife habitat, according to the filed survey and local villagers' interview as well as the data and information gathered from the authorities concerned showed that the only significant habitats remaining occur on the steep slopes. Other more accessible lower and less steep slopes where forests have been destroyed, wildlife and wildlife habitat have also been disturbed, resulting from slash and burn for shifting cultivation, bush fire, and indiscriminant logging as well as bombing during Indochina War.

The results of survey and local villagers' interview also indicated that some of the wildlife live mainly on the upper slopes and may move down into the lower area especially around the proposed location of intake weir and powerhouse near the at night time and they may return back to the comparative safety of the upper slope areas in the day time. Therefore, through the cause of project design and implementation, it is of prime important that the encroachment and habitat destruction is kept to a minimum and for example temporary access roads to the construction sites should be permanently closed and rehabilitated to its original condition after the completion of the construction work.

Overall, due to most of the forest and forest land within the project area have been destroyed through various causes as stated above it was found that there is no significant wildlife and/or wildlife habitat remained within the project areas and Nam Nga covers an area of reasonably undisturbed habitats.

Impact on wildlife and wildlife habitat can be scaled as follows.

Wildlife and Wildlife habitat	Anticipated Magnitude of Impacts						
	-3	-2	-1	Ins	+1	+2	+3
Construction							
Operation							

Note: Ins = Insignificant
-1 = Low negative -2 = Medium negative -3 = High negative
+1 = Low positive +2 = Medium positive + 3 = High positive

6.2.4 Aquatic ecosystem

6.2.4.1 Anticipated impacts

Anticipation that the aquatic habitats significant impacts will be occurred within the downstream channel of powerhouse due to construction and operation of Nam Nga 2 Hydropower project but it is important that the downstream donor is enough to compensation for fish migration.

The construction of the intake weir in Nam Nga 2 Hydropower, will cause the reduction of flow to downstream of dam site and because of that it will impose and adverse impact of low magnitude on fish ecology along the downstream section of Nam Nga River, at the present time. The fish could not immigrate due to some rapid (keng) so the fish can not migrate up to river reach. There are very few fish species existed in the downstream area and along Nam Nga River. The Nam Nga Intake Weir will be divert all discharge to power station during dry season February to May, this will be cause the potential impact on ecosystem from intake weir to the

power station where the flow will be turn back to the river but it is important that the downstream donor is enough to compensation for fish migration and minimum flow will be released to maintain the ecosystem.

Aquatic ecosystem	Anticipated Magnitude of Impacts						
	-3	-2	-1	Ins	+1	+2	+3
Construction							
Operation							

Note: Ins = Insignificant
-1 = Low negative -2 = Medium negative -3 = High negative
+1 = Low positive +2 = Medium positive + 3 = High positive

The potential impact on ecosystem due to solid waste from campus and workshop, the project car maintenance will be generated some hundred litters of gear oil and oiling form the used car or tractors, heavy equipment and dust from the crashing plant, if none appropriate measures taken in place and it will be cause major issues to water quality after heavy rain

6.2.4.2 Mitigation measures

The training of the villagers is necessary to prevent them from aquaculture development, catching fish during upstream migration along narrow and willow stretch of the river for spawning in the breeding season and also downstream migration along narrow and willow stretch of the river at the end of breeding season for grown development.

The creation of the reservoir will increase the fist population of certain fish species and also decrease the population of others fish species. However the overall of fish yield will be much higher and the fish catch will be more catch compare to the present catch. Nevertheless aquatic plants under improper monitoring and control may multiply and spread all over the water surface of the reservoir and headpond which will absorb all the available oxygen. In this case it will result in a great reduction of fish population. Moreover illegal fishing will cause to the damage of fish population. There for it require an intensive training of villagers to under take a proper aquatic weed and fishery management.

Similarly aquatics weeds growth and agrochemical application must be closely monitored to prevent water pollution in the future will be adverse effect on aquatics ecology. Additionally it also require and appropriate aquaculture training to the villager in downstream area to undertake fishes culture in ponds, rice come fishes, and the natural ponds for the aquatics conservation activities of the villages.

The project reservoir will be large potential for fisheries with many species are expected to adapted to reservoir condition and establish population. A comprehensive reservoir fisheries management plan should be implemented with the local people. Endemic species impacts are minor, as most or all of them have known to have part of known distribution range outside the project area or the species are migratory in nature. The further mitigation should emphasis to some of the following points:

- To ensure that fish populations which may develop in the downstream channel should be maintained through periods of low flow caused by low or no generation events at the power station.

- At the intake weir (I), the project should be design minimum water flow to maintain the river in the dry season to reduce aquatic habitat in the downstream of Nam Nga intake weir.

An appropriate Fishery management plan will be developed to promote Natural fish species (Indigenous species), for stocking assessment in the reservoir, to ensure that the local fisheries community and the rights to harvest of aquatic resource without depleting and also carryout intensive training to the villagers on fish culture and fishery management plan in the upper and lower reservoir. To train the knowledge about fisheries activities as follows:

- Establishment of fishing ground

- Establishment of appropriate measure against over fishing

- Reserve and protect breeding ground in reservoir area

- Establishment of a mechanism to maintain a sustainable of fishes stock

The minimum flow released will be designed at minimum natural flow into the river along downstream of the dam. And the water gate will also provide small stream for the fish to pass through.

It is recommended the project owner have to provide strictly recommendation to sub contractor to have appropriate measures such as:

- Solid waste tank of waste water from the campus and workshop need to be build to store the used oil or gear oil to prevent the leakage and the side of the tank will be consistence with proposed oil sue for equipment during construction.

- The rock crashing plan will be created the water treatment system to ensure that all dust and must of the rock crashing plan will not be overflow through the river

6.3 Environmental Impact during Construction and Mitigation Measures

6.3.1 Headrace cannel, Intake weir and Powerhouse and switchyard

6.3.1.1 Anticipated impact on wildlife/wildlife habitat

Based on the project design that intake weir, headrace canal and powerhouse are located in the same area, so far we can group the impacts on these issues together due to construction sites of these four main project components will be interrupted to wildlife and wildlife habitats are similar, As mentioned earlier, some species of wildlife still remains on the upper slope of the dense forest where are consider as outside project. However, wildlife within the area is under considerable

hunting pressure. Intake weir and powerhouse areas are considered as degraded forest, only cemetery forest nearby where need to be considered during the construction phase.

In addition, forest and vegetation within this construction area will be cleared for headrace canal from the intake weir to powerhouse and powerhouse site, so the wildlife habitat will also be severely disturbed by the forest clearing activity during construction stage, this will be the supported factor for exacerbation. The boisterous noises from the construction machines will also disturb the natural living of the wildlife. Moreover, the construction workers may hunt wildlife within and around the project area. The direct impact zone consisted large degree of very steep hillside and relatively inaccessible gorge which has prevent it from being exploited and it considered the low value.

The clearance of vegetation, resulting in potential loss of habitat, local biodiversity, and local resources (wild animals) by the presence of machines to construction of headrace canal and other powerhouse, potential disturbance of wildlife, particularly due to project-related noise, vibration by machines.

Strict rules against logging outside the approved construction areas and wildlife hunting 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 work closely with district forestry officers will 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.

Increased pressure on ecological resources due to in-migration to the area or simulation of the local economy, improved management of ecological resources by the local community, increased knowledge of local ecology due to wildlife and also fauna surveys (as part initial impact assessment and ongoing monitoring).

6.3.1.2 Mitigation measures

Key recommendations to minimize the impacts of the Na Nga Hydroelectric power project on local biodiversity and ecological resource use and to maximize potential project related benefits include:

- Minimizing the impacts of wildlife hunting by appropriate sitting of project facilities, project the high-value habitat and effective site rehabilitation;
- undertaking a site specific survey of disturbed areas, once the location of project facility has been finalized, to map vegetation types and identify any rare or endangered wildlife species and other fauna species;
- Minimizing the noise and vibration generated during construct a project-by-project activity by ensuring that all wild animals;
- Supporting local conservation initiatives concerned with the protection of high-value habitat, or endangered species;

- Establishing an appropriate program to monitor the effects of the project on biodiversity and ecological resource use.

6.3.2 Forest and vegetation

The project could result in the following potential impacts (both positive and negative) on terrestrial biodiversity and conservation:

6.3.2.1 Anticipated impacts

Direct impacts

- Clearance of vegetation, resulting in potential loss of habitat, local biodiversity, and local resources (NTFPs).
- Potential disturbance of forests, particularly clearance of forest, due to project related construction area such as dam, power, headrace canal, desalting basin and other construction activities.

Indirect impacts

- Increased pressure on ecological resources due to in-migration to the area or stimulation of the local economy.
- Improved management of ecological resources by the local community due to Nam Nga Hydroelectric Power Project initiatives.
- Increased knowledge of local ecology due to vegetation surveys (as part of initial impact assessment and ongoing monitoring).

6.3.2.2 Mitigation measures

The proposed hydroelectric power activities at intake weir, powerhouse and headrace canal will involve the clearance of vegetation to excavate the pits and construct project facilities and infrastructure. The exact nature of the vegetation to be cleared is dependent upon the final location of project facilities. The two deposits are located within areas broadly identified as relatively intact habitat. Although within this broader area, the deposits themselves are predominantly located in land comprised of forest regeneration, bamboo and scrub. There is no flexibility in the location of pits and little flexibility in the sitting of dam, so some clearance of intact habitat will most likely be unavoidable during pit excavation and dam construction. However, there is greater flexibility in the location of other project facilities such as the processing plant, mine camp, heap leach pads, and therefore the potential to avoid disturbance of higher value habitat by careful sitting.

The habitat types identified in the project area during the survey are locally and regionally common. At a regional scale, the reduction in available habitat due to clearance for hydroelectric power purposes will therefore be dam and no impacts on biodiversity are expected. At the local scale, habitat reduction and loss of

biodiversity is expected to be minor - however the loss of locally available forest, bamboo could disrupt current community resource use (in particular, the collection of NTFPs).

However, some of the big and high value commercial species were destroyed and removed by various causes including bombing during Indochina war, converting activities for other uses such as clearing and burning for shifting cultivation and logging. It is also confirmed that any areas of sensitivity forest such as National Biodiversity Conservation Areas (NBCAs) and protection forests are not present within the project area especially head pond/reservoir and intake weir.

The project owner will closely work with Oudomxay Department of Agriculture and Forestry as well as district authority to do detail survey the kinds of timbers that may economically potential and removal before the project construction.

6.3.3 Reservoir area

6.3.3.1 Anticipated impacts

The Land Use Types and Forest Cover maps show that within the project area which will be directly affected by flooding are almost unstocked, scrub forest, none valuables timber, bamboo with the total flooding area of 35 ha will be affected near by intake weir.

6.3.3.2 Mitigation measures

- Initial identification of losses for compensation by reforestation around the project area or some appropriate in junction with District authorities concerned.
- Vegetation clearance will be taken before reservoir impounding.

6.3.4 Disposal of spoils

6.3.4.1 Anticipated impacts

The Nam Nga 2 Hydropower Project will create spoil disposal areas that are majority come from ground excavation for foundation of powerhouse area and will consist of sandstone. Some of this may be used in concrete aggregate, but it is expected that the bulk of this will be placed in the spoil heaps which have been initially sited in depression so as to reduce their visibility. After the operation is finished the heaps will be landscaped and revegetated as part of the site protection and rehabilitation plan. However, alternatively, the spoil should be placed in heaps so that it can be used at a later date for other development purposes. This should be further considered during detailed design stage.

6.3.4.2 Mitigation measures

- Appropriate place has to be identified for the disposal of the excavated spoil. (The spoil can be dumped a little further away from the canal area);

- The excavated spoil can also be used for other construction purposes if the construction is done simultaneously.

6.3.5 Access road and road Improvement

6.3.5.1 Anticipated impacts

Access road from the intake weir to main road (approximately 4 km) need to be constructed. Due to mountainous terrain and steep slope, the roads must have sufficient drainage and where necessary the steep gradient drain will be lined with rock or concrete in order to ensure the minimization of the soil erosion. In less steep batter or embankment vegetation cover will be used. The road should have adequate turnoffs for water runoff and they will be provided along the road to break up the length of slope runoff effect. This should be located and maintained at a vertical and interval of at least 2-3 meters. Excessive earthwork and vegetation clearance will be kept to a minimum at all times.

The road improvement from the Xay District Center to dam site will upgrade and the construction will be replacement some invertors and expansion of the right of way of the road, it would be cause the some impacts on forest, soil erosion and slope stability and it would be resulted to water quality in the Nam Nga River.

6.3.5.2 Mitigation measures

- Frequent Spraying of water during construction to minimize the pollution of air
- Minimize the distance of the access road as much as possible.
- Where the potential erosion will be design slope stability and mitigation soil excavation out of the area by loading waste material to the appropriate area or landfill or use for construction material
- The road improvement will be minimum road size expansion or right of way to ensure that all dust and waste soil, rock will be reused for other proposed such as landfill for permanent camp

6.3.6 Impact due to camping

6.3.6.1 Anticipated impacts

Some forests still remain within the project areas particularly in the powerhouse site and near the intake weir. Camping within this area should not cause any impact on forest. Worker camps should not be established within the proximity of any rich forest like mixed deciduous forest and attention must be paid with sitting of the worker camps so that the workers do not interfere with any wildlife. Hunting and removal of forest products including timber and Non-Timber Forest Products (NTFPs) from this area is not allowed except for some kind of NTFPs such as wild-vegetable, wild-fruits, bamboo shoot, mushroom, rattan shoot and some wild starchy roots and this will need to be strictly controlled so as to avoid any further

depredation of theses resources.

According to the laws and regulations concerned, logging outside the approved construction areas and wildlife hunting and poaching within the area will be strictly enforced 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 staff and workers will not be allowed and have no right to hunt wildlife and cut any tree except for dead fuel-wood. However, the best way, the Contactor should provide bottled gas or kerosene to workers for cooking as an alternative to fuel-wood. Burning to clear vegetation and wastes within the construction sites will not be permitted. Project owner will 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. These requirements will be stipulated in the contract document. These issues need to be also stated in the Environmental Management Statement prepared by the Contractor.

6.3.6.2 Mitigation measures for vegetation clearance

To minimize impacts due to vegetation clearance, it is recommended that:

- Wherever possible, facilities should be located away from areas of higher value habitat or significant NTFP collection. Sensitive habitats should be identified and designated as `no go' areas and fragmentation of habitats (e.g. by access road construction) minimized.

- Vegetation clearance should he minimized and restricted to the immediate working area.

- Erosion should be minimized by effective drainage control to prevent additional loss of land.

- Buffer zones of vegetation will be left along stream banks to maintain riparian habitats and prevent sedimentation.

- If economic trees need to be removed as part of the site clearance, the local community should be given access to these trees.

- Effective rehabilitation should be undertaken to ensure that areas of project disturbance are returned to pre-existing habitats or land uses - or other habitats/uses as agreed between the Nam Nga hydroelectric Power Project and the community, government and other stakeholders. (In the case of the pits, however, the loss of vegetation will be permanent.)

- The local community should be compensated for any loss of access to local resources, in particular NTFPs.

- Rates of land clearance in the project area should be monitored and regular terrestrial flora and fauna surveys undertaken to assess the

effectiveness of the proposed management measures. Improved management measures should be developed as required.

6.3.7 Potential Impact from the Transmission Line Construction

Generally, construction of the 22 kv transmission lines will typically involve the following tasks:

- Clearing of vegetation from at least 20 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

- To gain access to the alignment, wires. Access tracks will be cut from various points along the main roads to which the Transmission Line (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.

- 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.

Based on the field observation and review of land use and forest cover map, it is anticipated that most of the vegetation that will be affected is unstocked forest and scrub which include herbaceous, woody stemmed shrubs and bamboo. This is the characteristic early serial stage vegetation community that becomes established following logging and shifting cultivation. It is not anticipated that any areas of old forest will be encountered along the proposed rights-of-way. Nor does it appear that the alignment will pass through any species-rich areas of second growth forest and any NBCA or protected area. In the event 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 if any such areas are likely to be encountered. Also, the rapid rate of growth, estimated at 0.5 m^3/ha/year, for tree species in most of Laos means that those areas currently classified as woody scrubland, have the potential to become secondary forest land. There is no any area appeared as wildlife habitat due to most of forestlands have been converted from time to time by slash and burn for shifting cultivation.

CHAPTER 7: INITIAL SOCAIL ASSESSMENT

7.1 Existing Social-Economic Environment

7.1.1 Xay District socio-economic perspective

In terms of socio-economic development, according to the report on the socio-economic implementation plan of Xay District for the fiscal year from 2004-2008, the district has build a firmed foundation in various sector such in terms of development of infrastructure, industries and mines, transport, trade, as well as in strengthening of the social sectors, health, education, information and culture.

In its five next fiscal year planning from 2010 – 2014, key majors focus are investment on infrastructure, attraction of foreign and in country investment as well as development of social sectors.

According to report, key major challenges and difficulties are facing and remaining currently and in the future by the district can be summarized as follow:

(i) Xay District is a poor district with 75% are mountainous area, villages of minorities are very scattered and dispersed with low educational background, most all live in dependence on natural resource' s response, and very limited production products for selling at the market.

(ii) Shortage of skilled manpower, limited in capacities and experiences thus many projects related to socio-economic development of district were not implemented in accordance with time schedule of plan; management and control of foreign and in country investment are not well coordinated in a systematic manner; limited skill labors, and shortage of national budget.

(iii) Influence due to World Financial Crisis may be affected on socio-economic development of Xay District in the next 5 years plan.

7.1.2 Village profile in the project area

There are two villages within the project study area, namely Keo Village and Nong Tao, there are 154 families with total 1,037 inhabitants, 524 of whom are female, consisting of two ethnic groups: Lao and Khummu.

In each village, there is one complete primary school, with village drug kits, some families in Nong Tao village already have electricity, while in Keo Village, they are going to launch the use of electricity. For the annual income per person it is relatively low, only 500.000 Kip/person/year.

During the hydroelectric power construction, the truck will pass on the road through village. It can make noise and accident may be occurred.

7.1.3 Public Health system

The health care delivery in Lao PDR is dominated by the public health system network, although private alternatives are growing. The public health care delivery system in Lao PDR has four administrative strata: central (ministry, college of health technology, and reference/specialized centres), provincial (provincial health office, provincial and regional hospitals, and auxiliary nursing schools), district (district health offices and district hospitals) and village (health centres) levels.

In 2009, there are 4 central teaching and referral hospitals; 5 regional hospitals; 12 provincial hospitals; 126 district hospitals; and about 874 health centres. A total of 5,081 hospital beds were available, 0.9 beds per 1,000 inhabitants. There are no private hospitals, but there are some 1,865 private pharmacies and 254 private clinics, mainly in the urban areas (WHO, 2009).

The MOH has achieved in training Villages Health Volunteers (VHV) focused in out reach and difficult villages to access in rainy season. Currently there are 13,267 VHVs, 5,094 Traditional Birth Attendance (TBAs), 502 retired nurses and midwifes that they stay in remote villages (Phetban), 791 Traditional Healers (TH).[2]. After VHVs received training, they will get kit of essential drugs for their villages. Up to now there are 5,812 Village Drug Kits (VDKs), 314 VDKs for type A, 5,219 VDKs for type B and 279 VDKs for type C.

Underfinancing of the health sector is placing a major burden on the management and implementation of national policies for prevention and care. The estimated per capita health expenditure is US$ 85, and the government expenditure accounts for 20.8% of the total health expenditure.

Salaries account for 75.3% of domestic public expenditure on health (WHO, 2009). Hospitals are highly dependent on user fees for recurrent expenditure. Financial barriers to service access are important in Lao PDR. Risk-pooling and prepayment has been introduced through social security for the formal sector and health insurance for the public sector.

The number of doctors per thousand citizens in Lao PDR is 0.4. The shortage of health workers is worsened by the uneven distribution of staff among different types of health facility and the shortage of non-medical staff to implement essential administrative and support tasks. Central hospitals have high ratios of high- and mid-level medical staff compared with other types of facility.

Although big challenges confront the current Lao PDR's health care system, the health indicators show some good achieventments in health outcomes during the past decades along with the stable economic growth. For example, the infant mortality rate in Lao PDR declined from 137 to 70 deaths per thousand 1,000 live births from 1990 to 2005. Over the same period, the maternal mortality ratio fell from 750 to 400 deaths per 100,000 live births. The rates however are much higher in the rural and remote areas. Life expectancy at birth rose by around 10 years in a decade, from 51 years in 1995 to 61 in 2005 (WHO, 2009).

[2] PHC Expansion Project, MOH,ADB

To improve situation on health, the Ministry of Health is continuing to implement Primary Health Care (PCH) approach in strengthening its peripheral networks on a basis of setting of VDKs in each remote villages in mountainous area. These VDKs have essential drugs for basic treatment of common diseases with minor pain. The VHVs are selected from their own village and then they received training how to diagnose symptom of disease and able to treat patients according to their illness, and to refer them to health facilities.

According to interview with public health official and village leaders, common diseases are cold fever, diarrhea, malaria, gastric disease...,These are seasonal transmission. According to the culture, villagers prefer to treat first with traditional medicine at village when they got sick. If not relieved, they then went to health facilities to get treatment with western medicine.

According to report of PHC expansion project implemented by MOH with financial support from ADB, more than 80 % of villages in the whole country can access to health care services. Out of 874 Health Centers (HC), 98 % are functioning. This means there are permanent staffs with provision of essential drugs.

Healthy Village Model (HVM) with application of PHC concept is being implemented in many provinces and Department of Health in Vientiane capital is achieved a lot in developing HVM in Vientiane Capital.

7.1.4 Education

Lao PDR, with most 40% of the total population living under the national poverty lines, is one of poorest countries in South East Asia. The level of education and literacy rate of population is strongly related to the level of poverty. Children out of primary school in 2006 are 125,270 people. In the same period, primary school enrolment is 83.70 %, total primary completion rate is 75%, net secondary school enrolment is 34.9%, gross tertiary school enrolment is 9.1%, adult total literacy rate of people ages 15 and above is 72.70 %, total public spending on education of the government is 14%.

It is noted that enrollment growth in the education sector recovered strongly after the collapse in public expenditure in the late of 1990s. There is a clear picture of faster enrollment growth at the higher levels of education. Primary and secondary enrollments have also made progress over the past ten years, driven heavily by better female enrollment.

However, there are widespread disparities in education access and outcomes in Lao PDR. Children with low income households, ethnic minority groups and rural areas have much lower participation and poorly in other educational indicators. The Lao Government continues to express a firm commitment to addressing equity, access, relevance and quality concerns in education, with special attention to girls and ethnic minorities. It has set out education policies and strategies aimed at ensuring that all children and adults are reached the level of education. The most vulnerable groups are specific targets for achieving Lao Commitment to the World Education Forum (26-28 April 2000 Dakar) with respect to:

- Eliminating gender disparities in primary and secondary education by

2005, and achieving gender equity in education by 2015, with a focus on ensuring girls' full and equal access to and achievement in basic education of good quality (Goal 5) and

- Improving every aspect of the quality of education, and ensuring their excellence so that recognized and measurable learning outcomes are achieved by all, especially in literacy, in innumeracy, and essential life skills (Goal 6).

- However, challenges and difficulties are remaining in order to reach the setting expectations. In 1996, the ADB has conducted a study on primary education in 12 of the 18 provinces in Lao PDR. The study found two major gender-related issues that are remaining:

- Significant physical, socio-cultural, and economic constraints to access, and

- Perceptions about the limited benefits and poor quality of education on the part of those intended to use it.

- A number of analyses note that the key determinants for ethnic minority girls to continue in completion of their school are they are living in isolated plateaus or mountainous areas so that parents decided to drop out their children from school. Another issues are financial constraints of the family, and social culture of community that do not allow daughter to continue in higher education.

- Education system in Xay District is developed with 87 primary school children with 4,079 children's enrollment, 3 secondary school with 637 children' s enrollment including, 11 kindergarten with 220 babies[3]. It is note that gender issue is not mentioned in this report.

7.1.5 Communication facilities

The communication system is well developed in this area, the mobile can use through the district and reached to all villages in rESMOte areas.

7.1.6 Transportation

The infrastructure is well developed in this area, there are road connected with National Road, the transportation from Xay District to Oudomxay provincial centre is connected.

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[3] . Report on Socio-Economic Development of district 2004-2008 and Fiscal Year Planning of the district from 2009-2014

7.1.7 Water sources

The water sources to use and drink in all surveyed villages are from gravity feed water system supported by donors through the Ministry of Health, and then to province and district. The village population is small, and there is no observable industries in the upstream or downstream, the project will not impact current water use situation.

Contact of villagers with water at a stream is to fish during dry and rainy season that they can catch fishes for family's consumption, and if in excess they can sell fish to district market. Vector borne diseases can be infected and transmitted to these people.

7.1.8 Tourism and Recreation

Currently, there is no specific plan of the district for tourism attraction to see waterfall at Nam Nga River and green forest at the mountain yet the district governor has mentioned that natural view can attract visitors; outsiders that he raised it will be an attractive area for outsiders to visit the district. The tourist and recreation is very limited at this stage, so far when Nam Nga 2 Hydropower Project develop and it will provide opportunity to district to promote the tourist program by contribution some fund to preserve the project watershed.

7.2 Potential Social Impact and Mitigation Measure

7.2.1 Affected villages

In fact, none village will be direct impacted by project, due to very low dam as of run-off river scheme, not trans-basin scheme, no affected villages and project site is not in the NBCA area. In addition, the project will be slightly affected to waterfall downstream of the dam site due to dam construction and operation, based on hydrological study, so there are remaining flow will be maintained the downstream of the natural river and biodiversity along the Nam Nga River

7.2.2 Compensation issue

The intake weir area will require land for construction of campsites, residential and administrative buildings, powerhouse, construction facilities and the dam and its acProject Owning structures and access road to construction site. In principle, any affected assets that obtaining a livelihood will be compensated according to consultation and discussions with communities and district authority. The reservoir area is very minor affected by land in the forest.

Any losses of land presently used by the PAP will be fully compensated according to GoL laws and regulations and specific agreements negotiated with the owners during the district, provincial and central level public consultations.

7.2.3 Influx and impact on host community

It is estimated round 100-200 labor forces for work during the construction phase, mostly they will be males. The problems of an influx of newcomers are often closely related and have similar effects on host communities. Therefore, this will

be a place to attract number of newcomers to find jobs before and during project construction as well as in operation phase.

It may occur conflict of interest between community and newcomers with different social culture, tradition and lifestyles with host community that may arise problems in some circumstances. Experiences with similar project implemented in Laos from discussions and consultations with villagers and local authority found any specific issues of conflict between newcomers and host community unless outsiders did not respect social culture of community. Therefore, it is necessary to teach workers as newcomers to follow and respect social culture of local community rules and their tradition.

In order to avoid such circumstances, the manager of project construction at the site has to take a proactive approach and well prepare an influx management plan in association with Social Development Plan (SDP) initiatives as part of the overall project impact assessment. The expertise of the SDP team should develop appropriate methodology that can be applied to the management of the population influxes in response to the social and economic effects of a project.

Once the construction of project commences, an influx of newcomers to the area will be increase to look for job. This would place additional pressures on local resources, including community infrastructure, agriculture lands, forest products and other resources. It may cause conflict between newcomers and population in the community.

In order to avoid these problems, it is necessary to develop a set of comprehensive plans that this will be developed jointly between all stakeholders to ensure that the newcomers are preferentially directed to these villages and that the villagers are prepared and able to receive them in a mutual respect.

The key is project developer should work closely with both provincial and district governors as well as with village authorities and mass organization of local government.

7.2.4 Employment opportunity

It is estimated that construction period is about 2.5years. Many activities will be done during the construction phase such as access road and construction of hydropower plant. It will require approximately 100-200 workers during this period. The first priority is given to local people who are living in the project area. It is certain that the economic benefits will be occurred from employment and linkage activities. The local people may be employed according to their labor capacity and their income may increase, and as the consequence their living condition will be also increased.

Thus, in order to improve the local livelihoods by increasing the income of local people, the contract document between the project owner and the contractors should be clearly specified that the local people have to have priority in employment. The local people are ethnic minority thus they are most unskilled and illiterate wherever possible to use them in hardship needed, it may be applied for them first if they accept rather than for others from outside.

7.2.5 Commercial opportunity

A part from the engagement in the project construction activities, the local community will have also opportunity in trading that relates to their local products production and selling including all kind of their agriculture plantation and NTFPs. As payment is made to the large workforce, it will increase disposable income, and some of this be spent within the local or village markets. This will create sudden increase in demand for many products including food and non-food products. The increase in demand for local supply of their product is such as meat, fish, vegetable as well as other local products like bamboo basket, rice box and others.

It is important to inform local people on this matter before the project commence so that they will be able to exploit the opportunity rather than surrender these to outside entrepreneurs.

7.2.6 Increase in affluent/poor income gap

Since there will be no impact on villages, land value for local communities due to project, all of people in the communities have equal right and opportunity to participate in project development activities as well as in land use within their own villages.

7.2.7 Land Use and Loss of Land

Agriculture is the main activity of rural people in Lao PDR, with 80% of the population residing here. In the project area most families are farmers relying on the cultivation of paddy fields to obtain their food. Swidden cultivation is practised and bush fallows left for a period that is gradually decreasing as land becomes scarce due to the growing population. Other land uses include pastureland for livestock, orchards, vegetable gardens, tree plantations for timber, bamboo, etc.

The most relevant land use category in terms of agricultural production - and the most difficult to replace is paddy land. Based on the project design and proposed construction activity and field work carried out during study, there is none piece of the land of the construction activity occupied the land use of the local village at this state

7.2.8 Compensation in the Downstream Area

Impact on the downstream area of the dam will be very different from impact caused in the reservoir area. The main difference is the fact that no land will be submerged, and no fields or villages will be covered by water. The main impacts in the downstream area will be the following:

- Impacts caused by construction activities (and limited to the construction phase): traffic, noise and dust along the access roads.
- Some loss of land, mainly for the construction of the access roads; any such loss will have to be compensated.
- Loss of fisheries once the power plant starts operating and effects on

fish populations will take place. Assessment of this impact will need a thorough monitoring program.

- Effects of the fluctuations in river discharge due to turbine operation. This can have the effect that river bed gardens can no longer be used, and the surge wave presents a danger for people using the river for any purpose

Any quantifiable losses by the PAP will be fully compensated according to GOL laws and regulations and specific agreements negotiated with the owners during the district, provincial and central level public consultations.

7.2.9 Potential Health Impact during construction

Potential health impacts pertinent to each of the project phases such pre-construction, construction and operational and to their short-term, long-term or permanent nature. Distinction should be made between changes in the social environment brought about by specific project activities and by the project-generated population influx, changes in the physical environment (mostly the presence of camps) and hazards associated with construction activities (camp safety).

This influx of the worker and outsiders to the project construction area will threaten the efficiency of existing institutions and health facilities and create social and health problems for the affected population relating to sanitation, availability of drinking water and the potential spread of STDs. There may be a considerable population influx, and project employees will earn relatively good and regular salaries. There will be frequent communication between local and the influx populations during the construction phase in particular and this raises concerns regarding impacts particularly on women and their families.

Many of these changes would influence the way people interact, including the way they interact sexually. One outcome may be an increased number of casual sexual contacts, including commercial sexual contacts. As a result, the prevalence of sexually transmitted diseases, including HIV infections and AIDS, may increase and could have a very negative impact without precautionary measures. Blood tests may need to be carried out if data is insufficient to preclude the problem.

Diseases such as giardiasis, amoebiasis, cholera, tuberculosis, hepatitis and meningitis could increase in number or bring about epidemics if the population influx results in overcrowding of houses and deteriorating sanitary conditions in the project area. The absence of safe drinking water and hygienic conditions may result in the spread of vehicle-borne infections among the work camps and the general community. Stool tests for young children especially will need to be carried out if data is insufficient to preclude the problem.

Use and abuse of alcohol and drugs is often common in and around construction sites and in camps. The consequences of alcohol and other drug abuse are many and varied. Some are acute and put an individual at immediate risk, such as driving or operating machinery while intoxicated. In addition, many sexually

transmitted diseases are acquired under the influence of alcohol. The sharing of needles by intravenous drug users increases their risk of exposure to HIV. Abuse problems, and the potential negative health effects of alcohol and drugs, are more likely to occur if many workers have to live away from their families while working on the project sites, and if there are few opportunities for recreational activities on and around site.

A substantial number of potential hazards will be created by the activities taking place on site. Workers may endure injuries from machinery and equipment, chemicals, explosions, burns, electrocution, falls, falling objects, dust and vibration during construction activities. Workers exposed to dust and fumes may develop occupational lung diseases such as silicosis occupational asthma and industrial bronchitis. Workers exposed to a level of noise higher than 85 decibels (over an 8 hour period) are at increased risk of noise-induced hearing loss.

Most projects will result in an increase in traffic levels on the new roads, putting workers and local communities at an increased risk of road-related accidents and injuries. The risk will be greater if speeding and drunk driving becomes commonplace, and will also be influenced by the mechanical condition of the project vehicles. In many instances where there are construction projects the number of severe injuries and deaths caused by motor vehicle accidents is far in excess of what would normally be expected. The result could be injury, permanent disability or the loss of life, all leading to lost production.

Any direct impact has affected network on health infrastructure like HC and DH due to project construction and in operation phase. Positive changes are rather than negatives. It means that livelihood of indigenous villagers would be improving, and community would be healthy due to road accessibility, electricity to village community due to project.

However mitigation measure should be undertaken:

(i) At Xay District Hospital. Project developer has to support in training of emergency care. This team will receive in job training with provision of some emergency care of medical equipment needed. When injured patients or due to accident during project construction, they can treat and manage in this district hospital.

(ii) At powerhouse site. In close to the area of construction site, developer has to hire two health staffs. One may be assistant doctor or doctor who can give diagnosis and treatment of small surgery in case of fracture or accident during the construction. He/she can make early diagnosis of simple and severe cases and be referred patients to Xay District hospitals.

(iii) Training of VHVs, TBAs on subject to promote community good nutrient intake, and in application 3 principle of hygiene and prevention of disease transmission for community in project area.

7.3 Existing Social Culture Environment

7.3.1 Ethnic group in project area

The ethnicity group of villages within project area is classified by Lao, Khummu, that their lifestyle and living condition are typically different.

All of villages under survey live on subsistence agriculture plantation, and depended on NTFP mostly with limited economic development and integrated into market economic system. Moreover due to rapid investment in land concession, they are more exposed to loose their own land. Seeing this situation, the

7.4 Potential impact on Culture and Mitigation Measure

7.4.1 Impact on vulnerable group

Women headed households, the elderly and sick and households with insufficient labour to survive may require additional assistance and consideration with regard to logistics of the relocation. These households may also be disadvantaged more significantly due to disruption of current living conditions and way of life. These households will receive assistance as stipulated in Article 6 of the Decree on Resettlement and Compensation of June 2003. File household data collected Suggests that women headed households have an income from sales of agricultural products, handicrafts and home businesses. Women may therefore be more dependent on income from agriculture and any disruption of this income due to land loss or the time required to re-establish market gardens could lead to an impact on the overall standard of living of female-headed households. Programmes specifically targeted at women and female-headed household to help reestablish disrupted incomes from agriculture will be developed. These will include agricultural extension services and other farming methods to increase the productivity of available land, as well as skills training and access to micro-credit and training schemes to promote alternate income sources.

If the project caused any impact on this issue, the assistance to vulnerable groups and individuals will encompass the following:

- Assistance improving living condition. This is why legal counsel and the Witness NGO/Consultant have a critical role to play once implementation gets under way.
- Assistance in receiving healthcare
- Monitoring and continuation of assistance if required. Both Legal Counsel and the Witness NGO/international Consultant in particular will monitor this.

7.4.2 Impact on significant sites

During project construction, if there are required amount of quarries and construction material as proposed by project in the project area. Since the field study based on design structure of the project facility will not affected to any significant area. To avoid the direct impact on people believes the project

carefully design to use raw contraction materials as well as quarries area, camp, building and office will be out off the sensitive area

Mitigation measures: The project contractor will consult with local authorities on selection of quarries site and before commencement setting up the quarries or any lock blasting will be approval by State Concerned Authorities. The traditional method of secrefication must be respected and followed to avoid any conflict or misunderstanding.

Before the project start the construction of crashing plan, rock blasting and opening any land for its construction activities, the traditional belief must be respected and closely consultation with village authorities, especially , the elder villager or Neo Hom Ban must be taking into account how to compensation and what kind of scarification have to follows and removal of this beliefs to avoid any conflict of interest of the local people to make sure that the project will be not un-respected to their belief

7.4.3 Impact on village culture site

The access road improvement from Xay District centre to Dam site passed some part of the village conservation forest and the rock exploitations for construction material will directly impact on village cultures and belief and may other villages in this region will be accured during project implementation.

Mitigation Measures:

The prior commencement of the these activities, the project will be closely consultation with villages alders and chief of the village, to discuss on procedure of scarification and to provide common understanding among the villagers,so they could agree with the project

CHAPTER 8: PUBLIC CONSULTATION

The team survey of Study team has conducted study for Nam Nga 2 Hydropower Project has carried out a primary of public consultation and disclosure of basic information in accordance with the policy, legal and administrative formwork of Laos's government on environmental protection guidelines. This primary public consultation has been carried out between our surveys in May, 2009 at each of three villages in the project area. Participants to the public consultation, they were from the different groups as in following:

- Representative of government officials at the Xay District,
- Representative of Lao Women's Union at village level, Lao national front for Construction Youth Union at the village level,

CHAPTER 9: ENVIRONMENTAL MANAGEMENT (EMP)& SOCIAL DEVELOPMENT PLANS (SDP)

9.1 Environmental Management Plan (EMP)

9.1.1 Framework and aim

The policy framework for Nam Nga 2 Hydropower project's EMP & SAP are prepared based on results of IEE where they have been identified and analyzed including proposal for appropriate management of mitigation measures to the natural environments and the project affected persons. The main aims of the EMP and the SDP include the followings:

- Describing the environmental management measures which will be carried out as part of the implementation of a project.

- Addressing all environmental management measures that are to be implemented during the project's pre-construction, construction, operation and decommissioning (closure) stages. The EMP intent to incorporate all significant environmental impacts identified in the project IEE and it includes the appropriate mitigation measures as developed in the EMP and the SDP and any other similar requirements required for the natural, social, economic and cultural components.

- Providing fair and prompt compensation to all persons or households affected by the project.

- Provision of in-kind compensation (basically land for land), and only exceptionally replace this by a cash compensation.

- Improving the economic condition of the project affected persons at the first three years or, whenever possible. It also includes the development of alternative livelihood strategies for affected households in the downstream Villages.

- Providing technical assistances to households in the downstream villages and other villages in the watershed area to ensure that economic activities are not subject to interrupt the watershed.

  Maintaining the social structure and networks of the affected communities. While the SDP aims at least at restoring pre-project conditions for the affected households and communities, and at bringing some improvement in the overall situation wherever possible, its objective is clearly not to force the local population to accept any major change in their lifestyle. Where, triggered by the project, development takes place, it should be gradual and in line with the perceived needs, the capabilities and the aspirations of the population.

9.1.2 The physical environment

9.1.2.1 Site Water Management

9.1.2.1.1 Specific objective

The main objectives of site water management objectives for the Nam Nga 2 Hydropower project activities are to:

- Ensure that the quantity and quality of water, abstracted from the catchment and discharged from the project, complies with regulatory requirements; and
- Minimize impacts on local and downstream water users and environmental values.

9.1.2.1.2 Management Measures

The clean runoff up gradient of disturbed, erosion prone land (i.e. construction camps, quarries, borrow pits and spoil dumps) will be intercepted by diversion channel and directed around the disturbed areas and back into natural drainage lines.

Dirty water from disturbed, erosion-prone land will be collected in interception channels and, if necessary, directed to sedimentation ponds, prior to being released to the environment. Camp and construction areas will need to be provided with septic sanitation facilities. No untreated human waste should be allowed to enter any watercourse where this will affect water quality, aquatic environments and human health.

Fuel, oil and lubricant storage areas should be located well away from any watercourses and store it in the concrete tanks. All hydrocarbons (e.g. fuels and lubricants) and chemical reagents will be stored in safe places, fully bundled areas constructed and managed in accordance with relevant International Standards and Material Safety Data Sheets. Project owner will ensure that containers of reagents and drums of used oil or grease are stored under cover at all times.

Potentially oily runoff from areas such as vehicle maintenance bays, equipment lay down areas, or refueling stations will be contained by perimeter bundling or interception drains. Oily runoff will be directed through appropriately designed and sized oil/water separators prior to discharge to the environment. Oil/water separators will be regularly cleaned and maintained.

Emergency response and clean up procedures following hydrocarbon and reagent spills will be developed. Project Owner will ensure that staff and contractors are adequately trained in hydrocarbon and reagent transportation, handling and emergency response and that appropriate equipment is available and regularly maintained for spill response.

9.1.2.2 Erosion and sedimentation control

9.1.2.2.1 Specific objective

The management of erosion and sedimentation load during project construction will be based on:

- Minimizing the erosion of sediment from areas directly and indirectly disturbed by the project; and
- Minimizing impacts on local and downstream land and water users and environmental values due to erosion, sedimentation or increased suspended sediment levels.

9.1.2.2.2 Management Measures

The area of land disturbed by the project will be minimized, and the time of exposure to erosion processes will be minimized by implementing a progressive approach to land clearing and rehabilitation. Vegetation buffers will be retained around cleared areas to provide a habitat corridor for local fauna and a natural source of seed and organic matter that will facilitate later rehabilitation of these areas. Vegetation buffers will also be maintained along streams to help minimize the release of eroded sediments to watercourses.

Topsoil will be progressively stripped during land clearance and retained in stockpiles for use in rehabilitation. The potential for erosion of landforms such as spoil dumps, topsoil stockpiles, channel verges and other engineered slopes will be reduced by ensuring that:

- Batter angles will be limited to a maximum of 30-45 degrees, wherever possible and overall constructed slopes will be a maximum of 20 degrees.
- Runoff infiltration will be encouraged by ripping engineered slopes parallel to contour, before or after top-soiling and prior to re-vegetation.
- Diversion canal and sedimentation ponds will be constructed to reduce the potential for sediment to become entrained in surface runoff and to encourage the deposition of eroded sediment within the project area. Contour banks, filter fences, vegetative or mulch barriers will be used to reduce the velocity of runoff entering dirty water channels. Where flow velocity cannot be reduced sufficiently to prevent erosion, channel surfaces will be protected with erosion resistant lining materials (e.g. rip rap). Grassing or concreting (e.g. stone pitch drains) may be required for longer-term protection of slope stability.
- Sedimentation ponds will be designed to reduce flow velocities sufficiently to allow for required sediment deposition. The design of sedimentation ponds will include the following erosion and

sedimentation control measures that embankments will be constructed with suitable materials to minimize the risk of failure due to erosion or excessive seepage rates.

- Soil and spoil removed during the construction process should be stockpiled separately and stabilization measures implemented. The stockpiles should be constructed with stable batters and grassed to prevent erosion. Ridges maybe created on topsoil stockpiles to provide for moisture retention to assist re-growth and slow run off to avoid the areas of drainage lines should be control drainage and erosion from the stockpiles. The erosion of the base of the dump should be considered in planning the location of the site.

9.1.2.3 Waste management

9.1.2.3.1 Specific objectives

The objectives for management of solid and liquid waste material from construction activities of the project include:

- Reducing potential health and environmental risks associated with waste generation and disposal;
- Minimizing the use of hazardous materials on site and seek safer alternative materials where possible; and
- Promoting the efficient use and conservation of resources, reduce the need for waste treatment facilities, and reduce the requirement for raw materials.

9.1.2.3.2 Management Measures

Waste management procedures will be based on the following hierarchy (in decreasing order of preference): (i) Minimize the production of waste and maximize waste recycling and reuse; and (ii) Promote safe waste disposal.

The volume of waste generated will be minimized by:

(i) Procuring supplies that produce less waste by virtue of the way they are produced, packaged or consumed.

(ii) Maximizing the efficiency of all on-site activities,

(iii) Non-hazardous materials will be used in preference to hazardous materials, wherever possible.

Project owner will educate staff, contractors and the local community on the need to minimize litter generation and procedures will be established for segregating different types of waste at the location where they are generated to maximize the recovery of recyclables. Solid waste will be segregated into four categories, based on available markets/viable-end products for the materials (although an economic return will not be a pre-requisite). The suggested categories are as follows:

Biodegradable materials – vegetation and food scraps; recyclable materials – processed timber; hard plastic; glass; metal; paper and cardboard; and tires: Non-hazardous residue waste; Hazardous waste. Clearly labeled, color-coded bins will be placed at designated locations for temporary storage of Segregate materials.

To maintain sanitary conditions, materials to be temporarily stored for reuse or recycling will be emptied and cleaned of residue waste. Recyclable and reusable waste will be collected regularly and transported to the site waste management facility for segregation prior to reuse or to sending off-site for recycling. Any proceeds from the sale of recyclable materials will be donated by Project owner to the local community.

Plastic containers that have been used for chemicals must be destroyed so that these do not re-enter use as household water containers. Any non-hazardous residue waste that cannot be reused or recycled will be deposited in general litter bins located around the project site. Waste from these bins will be collected regularly and transferred to a site for deep burial in a location away from project and community dwellings and at least 50 m from surface waters.

Disposal of hazardous waste will be undertaken to ensure that the long-term risk to employees, contractors, the local community and environment, is minimized. Project Owner will return hazardous waste items to the suppliers, where possible. If on-site disposal of hazardous waste is unavoidable, disposal will be in accordance with the material safety data sheets that the suppliers are required to supply with the item. If burial of hazardous waste is unavoidable, it will be buried in a designated waste landfill, constructed with a synthetic or compacted clay basal liner to minimize the long-term risk of contaminant escape.

Electrical equipment that uses PCB's should not be used as these are particularly difficult to dispose of as high temperature incineration is required which is not available in Lao PDR. This will need to be included within the Electrical Equipment Specifications.

9.1.2.4 Dust, noise and vibration

9.1.2.4.1 Specific objective

The objective of dust, noise and blast management of the Nam Nga 2 Hydropower Project is to prevent nuisance, health and safety effects on the community and impacts on the natural environment, particularly during project construction.

9.1.2.4.2 Management Measures

Land clearing and topsoil removal will be kept to a minimum, and rehabilitation will be undertaken progressively, to reduce the potential for dust generation associated with wind erosion (particularly during the dry season). Where possible, activities such as loading and dumping of topsoil will be scheduled to coincide with favorable winds and weather conditions.

Gravel crushing and screening areas and concrete batching plants should be sited at least 1500 m away from camp sites and construction areas so that dust and

noise generated by these operations does not impact on workers health. Washings from these areas should be intercepted and treated. Bulk cement delivery rather than bags should be used wherever possible so as to reduce dust emissions and eventual problems with disposing of the large number of bags.

To manage dust generation associated with project-related vehicle movements: (i) Roads used by project-related vehicles will be regularly watered (at least once per day in dry conditions) and the roads will be surfaced with a suitable aggregate material, where required to minimize dust generation, (e.g. through villages).

All employees and contractors will be instructed to comply with Project Owner designated speed limits. The watering of spoil dumps, topsoil stockpiles and disturbed areas will be undertaken, if necessary, to suppress dust under dry and windy conditions.

The construction areas, including quarries should have restricted working hours, including restricted times for above ground blasting. Construction workers exposed to noise levels of 80 bB or more than should be provided with adequate hearing protection, in accordance with the requirements of the health and safety plan. The Noise control options such as exhaust and radiator silencers will be fitted to construction equipment, in particular, trucks and loaders. Construction activities and use of heavy vehicles will be minimized during night time. Emissions from reversing alarms may be regulated to reduce intrusiveness, particularly at night.

9.1.2.5 Reservoir clearance

To mitigate water quality in the reservoir should be reduced of residual biomass level. The salvage logging and reservoir clearance should be taken before impounding the reservoir and monitoring to determine the economics and means for continuing the removal biomass, including diameter and poorly formed logs which may be economically harvested for sawn timber, plywood, and chip board from the inundation zone. Firewood collection should be undertaken during the construction, stockpiling fuel for future use by local villages. This methodology to be clears the reservoir before inundation to reduce the impact of the biomass.

It needs to ensure that water quality releases at the fall should be investigated and concentrations exceed pre determined trigger levels. In the area adjacent to the Nam Nga 2 Hydropower Project downstream of the dam and powerhouse and river confluence and area adjacent to the downstream channel, direct impacts on local people should be mitigated through alternative means if water qualities from pre impoundment level.

The project owner will closely coordinate with Provincial Agriculture and Forestry Office (PAFO) and District Agriculture and Forestry Office (DAFO) to undertake the reservoir clearance.

9.1.2.6 Soil Disposal

9.1.2.6.1 *Objective* is to minimize impact of disposal of spoil from excavation activities.

The Activity: When the spoil disposal needs to finalize, the project owner will

undertake consultations and studies at least one month prior to commencement of the Construction Phase. The studies will determine the locations of the various spoil disposal sites and determine if those sites might affect flooding in the adjacent areas. Determination of the effects to flooding will include evaluation of historical land use, frequency of inundation, reduction in flood storage volume and significance of impact.

The HCC will determine specifications for control of erosion from the spoil areas that will be incorporated into the construction contracts. When a spoil disposal area is closed, the construction contractors will grade the area to conform to local topography and ensure stabilization of the spoil materials with vegetation and other control facilities.

Implementation: the HCC will be designed the Spoil Disposal Planning and Management Plan before project started and *Responsibility:* Project owner will be responsible for the pre-construction survey. The HCC and the construction contractors will consult with Project owner for the selection of the spoil disposal sites. The ESMO will conduct a monitoring programme to assure that the spoil is placed in the appropriate areas, to evaluate the potential for failure of the slopes, and to monitor the effectiveness of erosion control at each of the sites.

9.1.2.7 Rehabilitation

9.1.2.7.1 Specific objectives

The rehabilitation for the Nam Nga 2 Hydropower Project aims to:

- Provide vegetative groundcover to help stabilize land disturbed or modified by project activities as soon as possible after such disturbance ceases; and

- Minimize impacts on and risks to public safety, land and water resource use and the environment during the life of the project and post-closure. Wherever possible, return productive land capability, environmental value or other benefits to the government and local community.

9.1.2.7.2 Approach to rehabilitation

Project Owner's approach to rehabilitation will be as follows: (i) land disturbance will be restricted to the dry season; (ii) re-vegetation programs will recognize the need to stabilize disturbed surfaces prior to the onset of the wet season; (iii) Constructed slopes will be battered to safe and stable angles, with drainage provided as required controlling erosion; (iv) top-soil will be stripped and reused, as outlined below and disturbed land will be rehabilitated as soon as practicable after it is no longer active; and (v) re-vegetation will be undertaken in accordance with short-term requirements for ground stabilization and the longer-term achievement of designated end land uses. Newly re-vegetated areas will be fenced to protect them from grazing or disturbance by animals.

9.1.2.7.3 Revegetation

Depending upon rehabilitation objectives, plant species will be established on disturbed areas from one or a combination of the followings: the propagates (seeds, lignotubers, corms, bulbs and roots) stored in the topsoil (i.e.natural establishment) sowing seed.

The Project Owner will grow in a nursery or purchased from the community. Transplanting individual plants is from areas to be disturbed, or from natural areas. Spreading prostrate grass species should be considered as well as the selection of suitable grass species will need checking with local authorities. The re-vegetation will take into account the seasonal distribution of rainfall and temperature to optimize, as far as possible, conditions for germination and survival.

Planting along contours to maximize moisture availability and limit erosion. Ensuring the pit hole sides are not glazed to allow for good root development and infiltration of water to ensure that the Project Owner are sun 'hardened' before being planted in the field.

Clearing the area around the Project Owner and placing much over the exposed surface to minimize competition from weeds. Placing protective guards around individual the Project Owner to prevent animal damage and/or fencing-off re-vegetated areas to prevent livestock access.

Watering is required after planting if necessary, and watering during the initial dry season is also required to ensure the plant viability. In most cases, seed will be sown immediately prior to the expected onset of reliable rains (i.e. April or May). Seed beds will be carefully prepared to ensure that the soil is well aerated, free of weeds, and loose enough for the Project Owner to grow up through the soil and send down roots. The seed will be located at the optimal depth for germination and placed in good contact with the soil to ensure it can take up water easily. If the seed is to be broadcast (hand sown), it should be done before the seed bed has the chance to consolidate and form a surface crust.

All re-vegetated areas must be fenced immediately after planting to protect them from grazing or disturbance by animals.

9.1.3 The Biological Environment

9.1.3.1 Disturbance to Vegetation & Land in the Vicinity of the Construction Areas

9.1.3.1.1 Specific Objective

The general objective of biodiversity and conservation management for the Nam Nga 2 Hydropower Project is to minimize project impacts on local flora and fauna and to minimize vegetation clearing for construction activities and control sedimentation and erosion from disturbed sites

All land and forest/vegetation clearing activities will be carried out according to a Site Plan, which enforces the minimization of vegetation disturbance. Prior to the start of construction, a Vegetation-Clearing Plan will be developed as part of the

head contractor environmental management plan (HCCEMP).

9.1.3.1.2 Management Measures

The Project Owner is committed to protect and manage the existing environment to prevent further degradation of species. This will be achieved through effective planning and management of site activities to minimize the disturbance of significant vegetation or wildlife habitat. Where possible, Project Owner will site infrastructure away from potential areas of conservation value to ensure that overall impacts to vegetation and wildlife habitat are minimized. Project Owner will ensure vegetation clearance is kept to a minimum so as to reduce the impacts on existing vegetation and fauna habitats. A Catchment Management Plan will be developed to assist in catchment land use planning and to discourage uncontrolled vegetation clearance.

The Project Owner will restrict the access of workers to forested or protected areas and will prohibit hunting and forest product collection as a condition of employment Adequate food (including meat) will be provided to workers (including contractors) and alternative cooking fuels to wood (e.g. bottled gas, kerosene) will be provided. Electricity will continue to be supplied to local villages, which is expected to further reduce reliance on fuel woods over time.

The Project Owner will support and encourage activities aimed at increasing the biodiversity within the region (e.g. by providing financial or logistical support to village conservation program through SAP). To help control logging activity, Project Owner will minimize access roads through areas of intact forest and rehabilitate disused access roads. As far as possible, the Project Owner will ensure that easements for transmission lines, pipelines etc. avoid areas containing economic timber.

Implementation: The HCC will include specifications for the removal of vegetation from the construction areas and specifications for management of runoff from the disturbed areas during the Construction Phase.

A monitoring programme will be established to ensure that the clearing of vegetation does not exceed the requirements of the contract and that erosion control measures are in place. Included in the monitoring plan will be a water quality monitoring programme, discussed later.

At the end of the construction period, the disturbed areas will be inspected to ensure that the areas have been re-graded to conform to the natural topography and that appropriate grasses and shrubs have been planted to start the re-vegetation process. The construction contractors will be responsible for the stabilization of the construction areas before they are allowed to vacate the construction areas.

Responsibility: The primary responsibility for this action will be the various construction contractors. The HCC is responsible for determining the locations of the areas that will be disturbed during the construction period. The HCC will also be responsible for maintaining the construction areas as described above.

The ESMO of Nam Nga 2 Hydropower Project will ensure the adequacy of the

vegetation removal provisions are incorporated into the contract and be responsible for ensuring the compliance of the construction contractors with specifications set forth in the respective plans.

9.1.4 The Transmission Line Construction

The construction of 22 kV distribution line from powerhouse to the connection point with EdL grid and transmission line route will follows the existing road due to easy for operation and maintenance of the line, the following management plan will be taken by project owner or contractors:

- Clearing of vegetation for Right of Way (ROW) are not permit over than 20 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.

- To gain access to the alignment, access tracks will be cut from various points along the main roads to which the Transmission Line (TL) runs more or less parallel. Where soil conditions dictate, the tracks will be surfaced with suitable road topping material. The rehabilitation of access road will be restricted and incorporated in the contractor's agreement.

- 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.

To avoid any impact on social and culture of the people along the distribution line route and the appropriate measures will be direct implemented and managed by ESMO.

9.1.5 Contractors Environmental Management Plan

All contractors and sub contractors that work on the project including design, construction and operation and decommissioning will be required by Project owner to develop and implement a Contractors Environmental Management Plan (CEMP) for their works. The CEMP must be consistent with all management and mitigation measures and other environmental and social provisions of the projects approved EMP&SAP. All relevant sections of the EMP&SAP will be provided to contractors bidding for works on the project

The setting out of the Contractor's responsibilities and obligations with regard to meeting the requirements of the EMP & SAP will be incorporated as a condition of Contract documents.

Project Owner Funding for WREA Capacity Building, Monitoring and Inspections:

The Project Owner will allocate and provide a total of USD 40,000 during construction period and USD 5,000 per year during operation period (28 years) for capacity building of WREA/ESIA Dept at central, provincial or district level and for WREA/ESIA Dept's environmental monitoring and inspection.

The Project Owner will disburse the funds in accordance with a budget plan prepared and submitted by WREA and in accordance with a mechanism to be advised by WREA.

9.2 Social Action Plan

9.2.1 Socio-Economic Management

The objectives of socio-economic management will be to: (i) ensure that the local community is able to benefit and derive opportunity from the project and that such benefits and opportunities are distributed as equitably as possible, (ii) minimize adverse project-related impacts (both direct and indirect) on the local community and ensure that, where significant adverse impacts are unavoidable, adequate compensation is provided or mitigation measures implemented.

The project will provide direct compensation to affected households and provide a contribution the funding towards implementation to support economic development program for the people living in downstream area to minimize press the natural forest. The exact nature of these programs will depend upon the possibilities given in the area, but also on input, suggestions and requests for the villagers themselves, as it is recognized that such projects need to be developed out of the communities' own initiatives in order to be successful and sustaining to watershed area.

One of the main concerns related to the ability of the affected households and people in downstream area to permanently re-establish household incomes and livelihoods following the loss of land and associated impacts to agricultural production.

It is anticipated that the Livelihood Improving Plan (LIP) will have three main phases of work:

- Investigations, surveys and community consultation to establish baseline information;
- Construction of agro-economic and alternate economic models which will form the basis for development program and other assistance aimed at restoring livelihoods;

- Implementation of the livelihood improvement actions and monitoring. The monitoring will be tied into the overall monitoring program.

The development and implementation of the LIP will have a high priority within the overall SAP schedule. Actions must be initiated as early as possible so that systems are in place and beginning to function at the time relocation occurs. This is essential to minimize the length of the transition period between when losses are incurred and when households recover from those losses.

The LIP Plan itself will be developed by the Developer with assistance and input as may be necessary from other parties such as the GOL, Village Committee, government agencies, the District Development Committees, NGOs or technical specialists. A number of possible programs and projects for community development and the LIP Plan have been suggested and others will be added based on the concerns and recommendations, which will be made by the affected villagers during interviews, surveys and public meetings. The suggested activities are described in the following sections.

9.2.2 Agricultural Promotion Programs

Agricultural support will be provided to assist with the improving the existing agriculture of villagers in watershed area. Seeds or seedlings will be supplied for tree species and vegetables. Tools will be provided and a technical assistance or advice to farmers in dealing with agriculture and rural development will be used regarding the provision of support and training in agricultural production. There could also be a community development plan for the region and project environmental management office (ESMO) could examine a regional program to extend agricultural courses out to the farmers of the region. Such a regional program could also be adapted to benefit farmers in the villages, such as by conducting classes or training sessions in the villages or by selecting villagers to set up demonstration farms. Budgets and an action plan for implementation of the agricultural support program will be prepared as part of the LIP Plan. The agriculture promotion program will be through ***village's Micro-Credit and Training, m***ost people are living in the project area have limited opportunity to earn income, generally involved only in agriculture and none timber forest production. A micro-credit loan scheme will be established to allow villagers to expand their income generating capacity. The initial step will be the selection of targeted group of people although the program may be expanded with time. The villagers will be trained in simple book keeping and financial management as well as other skills. Budgets and an action plan for implementation will be prepared as part of the LIP Plan.

One opportunity that could be explored will be whether villagers in the village have considered forming a society or cooperative. This could be for the achievement of a specific goal or purchase to benefit all members, for sharing of effort and resources, or as a forum for sharing experience and training. The villagers, if interested, would need to be the driving force in setting up and running the society. The objective of the society or cooperative would be derived and set from the women's own interests and goals. The Project would assist through provision of resources, skills, training or funding depending on the objective of the group. ESMO and the Village Resettlement Committee will contact the District

Development Committee for assistance in this project.

A Community Trust Fund is recommended to be implemented by project owner. This will return a small percentage (proposed at 0.25%) of the generated net income to the project area for use in improving social support facilities and for maintaining the environment in the area. The community will decide how best to allocate these funds for their use via a committee established for that purpose. The committee will comprise elected community representatives, together with representatives of the district government and project owner.

The Community Trust Fund will be supplementary to, not a replacement for, government programs using project-generated funds. The Community Trust Fund will therefore only fund programs considered likely to be self-supporting within two years. As the Community Trust Fund will not be running until project operations commence and project and revenue is generated, project owner will provide funds for a separate community assistance program during the construction phase.

9.2.3 Medical Care Support

9.2.3.1 Principle

The current medical service center in Meung Long required to be improved. This Provision of medical services at an affordable cost may be a request raised by the communities. There are several options that the Project could investigate to provide support of Medicare in the local communities. Communities with health clinics could be assisted through equipment improvements or through the provision of medicines to be sold on at cost. The Project provides support for health and sanitation education program to be implemented in an appropriate manner and it could be prepared for implementation prior to the physical activities.

9.2.3.2 Community health, amenity and safety

Develop policies and programs to limit threat of STD spread (especially HIV/AIDS), ensuring that prevention and control programs are sensitive to cultural practices and taboos. Support malaria prevention strategies within the area surrounding the project. This will provide benefit in reducing the incidence of malaria within the workforce. Support and assist the Xay District governments in the development of medical services and facilities.

Ensuring that alternative water supplies of at least equivalent quality and accessibility are provided and maintained to replace any water sources adversely affected by the project. Support attempts to improve hygiene in the area surrounding the project. This will provide benefit in reducing the incidence of sickness within the workforce. Apply appropriate mitigation strategies to minimize dust and noise impacts on the local community.

Establish and implement a policy whereby all project construction camps are alcohol-free. Provide appropriate driver training and careful planning of haulage routes and times to minimize risks to the local community.

Considering the ethnic diversity of the project area during all stages of health and nutrition planning to ensure that community harmony is maintained and particular

groups are not inadvertently disadvantaged.

Regularly monitor indicators of health and nutritional status amongst the mine workforce and local community to ensure that project impacts (both positive and negative) are identified and appropriate management and mitigation measures are implemented and refined.

9.2.4 Emergency Response

The objective of environmental emergency response management is to ensure that it considers environmental and community issues as well as health and safety issues.

Project Owner will undertake regular (at least three yearly) environmental risk assessments to identify and rank (in terms of severity) potential environmental emergency situations that may arise and result in impacts on environment and community. Management measures will be developed to minimize each specific risk and implemented according to risk ranking (e.g. highest risk areas will be managed first). If an environmental emergency occurs, then emergency response will be prioritized according to the following hierarchy:

- Protection and rescue of human life.
- Minimization of the area impacted by the incident.
- Protection of the environment, plant and property.
- Rendering the area safe in which the emergency has occurred.
- Restoration of all disrupted services.
- Decontamination and rehabilitation of the incident scene and surrounding area.

The following groups will be immediately informed by phone of the environmental emergency:

- Provincial WREO.
- Project Owner head office.
- District and provincial government.
- Village chiefs.
- Local community.
- Anyone potentially affected by the emergency (e.g. fishermen, farmers).

Depending on the severity of an environmental incident, emergency response may also require notification of the following groups (as outlined in the Emergency

Response Manual):

- Site medical practitioners.
- Police.
- Ambulance.
- Department of Electricity.
- WREO, WEAR.

Project Owner will develop environmental emergency response procedures to cover the specific environmental emergencies. The procedures should cover:

- Unplanned or uncontrolled discharge of project waters
- Major flood event or earthquake (e.g. at limit of, or exceeding, project design capacity).
- Fire within project facilities or in surrounding vegetation.
- Uncontained spill of fuel or other environmentally harmful reagent.
- Security or terrorist threat.

In addition, a general environmental emergency response procedure will be developed to cover unforeseen environmental emergencies

9.2.5 Community Safety

9.2.5.1 Objective

The main objective is to integrate sound environmental management into all project construction and operations activities and keep the community informed on a regular basis of the Project Owner's activities and consult with the community in relation to the Project Owner's operations.

9.2.5.2 Management measures

Potential safety hazards include: (i) Traffic accidents. (ii) Access to the headrace canal, power station and the construction area. A key aspect of this management responsibility is controlling the access of local communities and livestock to hazardous areas. Control measures will include various levels of fencing and signage supported by community training and education programs.

Project owner's approach to environmental and social safety will be to:

- Identify the environmental and social safety risks of all project activities;
- consult with local communities and authorities to develop appropriate control measures for community safety; and

- Conduct ongoing awareness and capacity building programs to ensure local communities are adequately informed and empowered on issues of safety.

All employees and contractors working for the Nam Nga 2 Hydropower Project will be instructed to comply with the speed limits and all road rules generally as part of the safety plan for the project. Disciplinary measures or fines will be imposed on all employees and contractors who break the road rules.

Traffic signs will be installed by Project owner in coordination with local district as follows:

- Signs indicating speed limits will be installed at regular intervals along the roads.
- Signs indicating sharp bends.
- Signs indicating that the vehicle is approaching a one lane bridge.
- Signs indicating that the vehicle is approaching a school area.
- Signs indicating that there is a construction site ahead.

Where public vehicles are observed to be driving dangerously and breaking road rules, they will be reported to the District Police Authority for further action.

Project owner will conduct driver-training programs to maintain good driving skills and practices f all project's employees.

Project owner will develop and implement a community road safety education program. The education program will contain information on:

- Hazards from vehicles and trucks in villages.
- Safe driving practices for vehicles and tractors.
- Safe use of bicycles on the road.
- Walking on the road.
- Supervision of children in villages.
- Livestock management.
- Road signs.
- Road rules.
- Night time use of the road.

The need for additional safety measures associated with the canals will be assessed, in consultation with the community, during the Canal Safety Investigation

9.2.6 Literacy and skill development

9.2.6.1 Principle

Literacy levels are low in the affected villages and village in watershed area as a whole. Adult literacy classes will be established at a school, if it is necessary. Other educational support will include provision of learning materials, teaching materials, etc.

9.2.6.2 Development program

Programs for skills and knowledge development may be divided into 4 sub-components.

A combination of health enhancement through activities such as capacity building of health workers, family planning, disease prevention, etc. thus ensuring healthy villagers who would be productive and benefit their own community.

Provision of education will include basic literacy, innumeracy and fluency for those who never had access to formal schooling. Once education has been received, participants would confidently take interest in economic activities and other community activities.

Micro-credit training: This will involve book keeping, savings and credit systems, small and medium business skills. Participants will be encouraged to work in groups, to encourage group responsibility when credit is given and Marketing skills training for products whose value has been increased.

9.2.7 Archaeology and Culture

9.2.7.1 Objective

The objectives of archaeology and culture management are to (i) minimize project impacts on sites of archaeological and cultural significance, and relocate or excavate any sites where disturbance is unavoidable, (i) Ensure that artifacts uncovered during project activities are appropriately recorded, documented and submitted to the Ministry of Information and Culture.

9.2.7.2 Management measures

Project owner will comply with relevant Lao PDR regulations and will develop procedures to protect and conserve sites and artifacts of archaeological and cultural significance. A representative from the District or Provincial Department of Information and Culture will be present during construction earthworks and land clearance. In the event that an artifact of archaeological or cultural significance is discovered, project staff and contractors will report the discovery in accordance with the following reporting procedures:

- Project will report the finds to the Ministry of Information and Culture and forward the artifact for analysis. If the artifact is large, or cannot be removed easily, the National Museum will be informed as soon as possible to allow them to investigate the find in site.
- All staff, particularly foreign staff, will undertake a specific training and

induction program in regard to local customs and lifestyles, including the significance of particular sites. Assistance for this training will be sought from local elders.

The project staff and contractors should come across significant archaeological artifacts during engagement with the local community, the following procedures will be followed:

- Project staff will document and photograph the artifact then report it to the Site Manager.
- Project owner will report the finds to the Ministry of Information and Culture.
- All project staff and contractors will be informed during their site induction that the trade or purchase of historic artifacts is illegal.

9.2.8 Village Water Supply Program

A Village Water Supply Program will be established to compensate the community in the downstream Villages for the reduction in river water resource. This includes losses of river water for uses such as drinking, laundry, cooking etc.

9.2.9 Compensation agreements

Each project affected person (PAP) will be receiving compensation of any kind will have to sign an agreement, acknowledging that compensation has been received. Such an agreement will specify what has been received as compensation and third parties should witness this. They may include: (i) a government representative at village level; (ii) the implementer's representative; and (iii) legal counsel.

All PAPs acquiring new land will also require registration certificates to ensure and verify that they own on that piece of new land and have the right to own, possess, use and right to transfer, as stipulated in the Constitution Article 15. The registration certificate will also indicate that in the case of couples both the husband and wife own the property. This makes it easy for property to be inherited, which is also in accordance with the law.

Both a Compensation Agreement and a Land Registration Form will be drafted in the next phase during project implementation.

9.2.10 Entitlements

The principle entitlements are summarized in the table below:

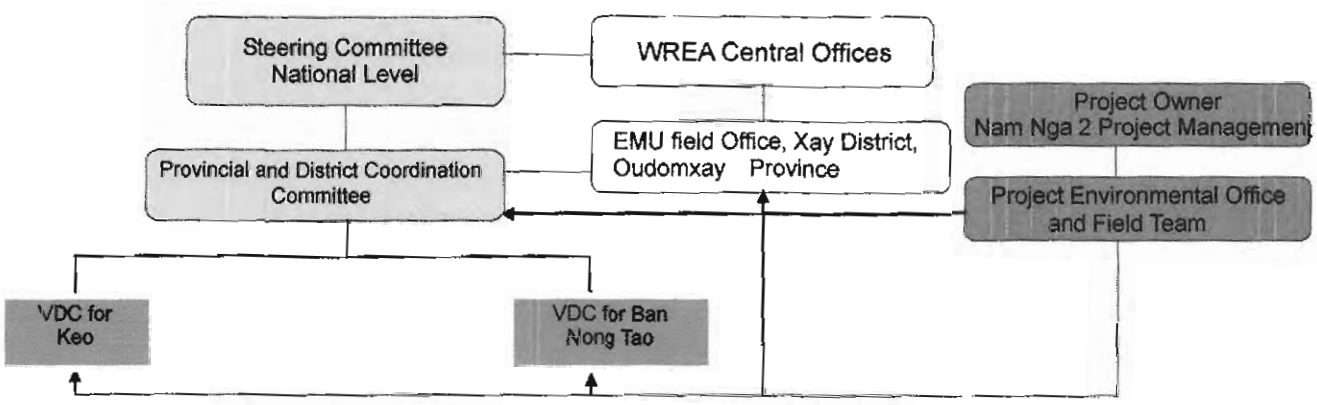
Impact / Issue	Entitlements for PAPs
Permanent loss of agricultural	- Replacement land of at least equal productive value, jointly owned by male and female household heads, at a location acceptable to the PAP.

land	- Replacement land will be cleared, fenced and prepared by the Project Owner or the new land owner through food for work program if the land owner so chooses. - In cases where replacement land is not available in sufficient area, the PAP may accept cash payment for the difference between land registered and land provided.
Loss of agricultural production system	- A range of feasible production and income generating options in order to meet household income targets. - Supply of basic tools and equipment for agriculture work. - Planting materials for three years, including tree saplings. - Fertiliser and agro-chemicals, as required.
Loss of fruit and industrial trees	- Cash compensation based on 5 years of production or estimated return on investment (based on professional studies and agreed by Project Compensation Committee, WREA and the Project Owner). And - Replacement trees at new village location as part of the livelihood restoration package.
Loss of common property resources	- Access to forests, grazing land and fisheries in the host area, livelihood restoration packages replace natural common property with more productive private assets. - Enhancement and development of common property resources of host villages.
Temporary loss of income or agricultural land	- Cash compensation for the loss of income of equal value the period of project impact.
health improvements	- Health centre or upgrading of existing health facilities. - Provision for equipment, medical supplies and water and sanitation arrangements. - Support for district and provincial health facilities to be of good standard and have trained staff. - Improvement of health prevention, diagnosis and treatment of common diseases. - Training of existing and new village health volunteers. - Project Owner to cover the health costs for all adverse health impacts caused by project-related activities.
Training and Support	- Training and support for livelihood restoration for five years after start of programs or until income targets are reached in a sustainable manner. - Skills training for all households based on consultations and agreed to by the community and individual households. - Support and advice from ESMO and District Line Agencies. - Priority for labour opportunities on project sites.
Vulnerable Households	- Households with insufficient labour force will receive special assistance for their individual needs. - Vulnerable households will receive assistance in the

	establishment of suitable production systems in relation to their needs and capacity.
Grievance	- All household to have access to Grievance Committee for complaints.

9.3 9.2.12 Institutional Responsibilities

Overview of Institutional Responsibilities



9.3.13 Provincial and District Coordination Committee (PDCC)

PDCC is appointed by the Governor of the relevant province to oversee all GOL activities and commitments, and liaise with all relevant ministries and organisations, including the highest levels of government.

The PDCC will comprise of the following members:

a) Vice Governor of Oudomxay province, Chairperson;
b) District Governor of Nga member;
c) Chief of Provincial Administration Office, member;
d) Heads of relevant provincial or district line departments, members;
e) Head of Provincial Water Resources and Environment Office, member;
f) Government Liaison Officer responsible for Project Coordination
g) Representative of the Project Owner, non-voting member;

PDCC will be responsible for:

a) Implementation of GOL social obligations;
b) Review and comment on the detailed plan for the implementation the Social Development Plan for the project;
c) Witnessing handover of housing, land, community facilities and infrastructure;

d) Reviewing and commenting on livelihood restoration programs;
e) Liaising with GOL organizations on the national, provincial and district levels, including the allocation of roles and responsibilities of the different GOL agencies at provincial level;
f) Liaising with the Project Owner regarding GOL concerns and priorities;
g) Prepare work plan and budget for their functioning;
h) Guide provincial and district line agencies in terms of policy and technical aspects and set up regular meeting to monitor the progress of work or according to the actual work;
i) Formulate policies guideline or framework to prevent any problems that may occur in implementation stage;
j) Investigate, consult, consider and resolve the potential problems on compensation and resettlement related to various local government agencies;
k) Approval of Financial Management Regulation for the management of compensation payments and livelihood programs;
l) To assign staff from the Relevant District Land and Taxation Office to be a member of ad hoc Task Teams set up by the Project Owner in order to:
    i. Conduct asset surveys for the loss of land and production in relation to Project Construction Lands as a joint member of ad hoc Task Teams;
    ii. Conduct asset surveys for the loss of immoveable assets for affected peoples as joint member of ad hoc Task Teams
    iii. Calculate production losses in project-impacted areas;
    iv. Determine payments of interim and full compensation to affected households;

The role of the Government Liaison Officer for the project will be to provide coordination for GOL organizations involved in the various implementation activities of the project. The responsibilities will be a follows:

a) Act as secretariat of PDCC
b) Coordination of all GOL organizations and ensuring the priorities of the PDCCC are addressed
c) Coordination with VDCs, EMU and Project Owner related to the implementation of SDP programs;
d) Ensuring that GOL policies, procedures and regulations are being followed in the day-to-day management of GOL involvement in implementation
e) Organizing GOL involvement in carrying out compensation and development activities, such as consultations and livelihood restoration programs;
f) Assist with organization of Provincial and District level meetings and consultations;
g) Participation in the Grievance Procedure.

9.3.14 Village Development Committee (VDC)

The PDCC will establish a VDC in each impacted village. The VDCs will represent the range of interests and opinions in the village and will facilitate consensus decision-making at the village level.

The VDCs will consist of:

a) Village authorities;
b) Village Elder representative;
c) Lao Women Union member;
d) Other skilled or influential members of the community;
e) Representatives of all ethnic groups, either in the above positions or in separate positions;
f) At least two women must be members of each VDC;

VDCs will be responsible for:

a) Representing the interests and voicing the concerns of villagers in Project Affected Areas;
b) In collaboration with ESMO and Government Liaison Officer conduct Public Involvement consultations at the village level;
c) Coordination of mass organizations in the village;
d) Participate in the preparation of Village Development Plans to be developed by the ESMO;
e) Monitoring and evaluating of the Compensation Process at the village level;
f) Organizing villagers for implementation of activities relating to relocation and rehabilitation of livelihood systems;
g) Facilitate participation in the Grievance Procedure;

9.3.15 Grievance Redress Committee (GRC)

PDCC in consultation with appropriate authorities will establish the Grievance Redress Committee (GRC) to address any complaints and grievances pertaining to land acquisition, compensation and resettlement that are brought forward by PAPs. The procedure of Grievance Redress is set forth in clause 9.

The GRC will comprise the following members:

a) Representative of District Authority;
b) Village headman;
c) Representative of PAPs;
d) Representative from mass organization e.g. LWU, elder council and
e) Representative from the Project Owner;

9.3.16 Environmental and Social Management Office (ESMO)

The Environmental Social Management Office, ESMO of the Project Owner:

a) The ESMO will be responsible for all environmental obligations of the Project Owner;

b) The Project Owner will be establish and maintain the ESMO with such numbers of staff that are suitably qualified and skilled to enable the Project Owner;

c) The ESMO will be responsible for providing WREA with information and data;

d) The ESMO will be responsible for preparing and submitting the reports to relevant authorities;

e) The ESMO will ensure that the CEMMP/EMP is implemented and that all conditions in the ECC are complied with;

f) The ESMO will ensure that the relevant Environmental Obligations are adequately reflected in the Project Documents including construction contracts;

g) Prepare plans for mobilizing subcontracts for studies that will need to be undertaken by the Project Owner;

h) Hold discussions with the Government Authorities participating in the Project such as, District authorities, WREA and the EMU so as to develop procedures for interagency coordination and reporting;

i) Ensure that the Construction Phase activities include appropriate environmental monitoring and surveillance;

j) Assist the EMU to plan and manage an environmental public consultation and information program to keep the Lao public informed of the Project activities; and

k) Provide any necessary background information to the EMU to allow it to respond to any public comments;

During the Construction Phase and the Operating Phase, the ESMO will be responsible for implementing and monitoring Environmental Obligations which are expressed as being obligations of the Project Owner including by:

a) Implementing or causing to be implemented the environmental mitigation measures of the CEMMP/EMP;

b) Developing and implementing the Monitoring Program;

c) Liaising and cooperating in good faith, with the Government Authorities given responsibility for implementing the GOL's Environmental Obligations;

d) Preparing work and cost schedules for the Monitoring Program;

e) Carrying out any appropriate testing to ensure that the Environmental Obligations have been effectively addressed;

f) Arranging for adequate reporting on a regular basis to be undertaken of the results of the Monitoring Program;

g) Undertake all necessary record keeping functions and make periodic reports to the Project Owner and to the EMU;

h) Create and implement programs for all of the budgeting and financial reporting for the operation of the ESMO ;

i) Undertake such internal and external audits as may be necessary to comply with the Concession Agreement and the procedures of the Project Owner; and

j) Assist the GOL in conducting public consultation programs, documenting the feedback and incorporating that feedback into program planning.

9.2.17 GOL Environmental Monitoring Unit (EMU)

WREA will establish an Environmental Management Unit (EMU). The EMU will be under the direction of WREA to monitor and inspect the compliance with the Social and Environmental Measures of the GOL and the Project Owner. The EMU's responsibilities in terms of monitoring and inspection of social measures while the EMU's responsibilities in terms of monitoring and inspection of environmental measures are stipulated in EMP.

The EMU will have the following responsibilities:

a) Assisting GOL with reviewing the SDP and any revisions or detailed plans thereof;

b) Conducting monitoring and field inspections of the social measures of the Project Owner and the GOL with respect to compliance with the social obligations of the Project Owner and the GOL set out in this Annex;

c) Assisting GOL with: i) Issuing instructions to the Project Owner regarding compliance with its social obligations including the law of the Lao PDR; ii) Issuing non-compliance notifications/enforcement notices to the Project Owner; and iii) Sanctioning the Project Owner in cases of non-compliance;

d) Coordinating with Government Authorities in relation to the implementation of the Social Objectives of the GOL and the Project Owner;

e) Advising relevant Government Authorities on the adequacy of proposed social measures and recommending amendments following findings from project monitoring;

f) Periodic reporting on the performance of the Social Measures, including the performance of the financial aspects of the Social Measures;

g) Following the provision of any required input from the ESMO, responding to any public comments, complaints and inquiries in relation to the Social Measures;

h) Coordinating the resolution of issues which arise among the various Government Authorities and the Project Owner relating to the Social Measures;

i) Developing and updating work schedules for the monitoring and inspections of the EMU;

j) Managing its financial and manpower resources;
k) Procuring technical assistance or other services or goods;
a) Assist GOL with reviewing all documents related to the social measures;
b) Monitoring and auditing funds for social obligations that are earmarked by the Project Owner for GOL activities;
c) Report to GOL about monitoring findings;

9.2.18 Compensation Process

Steps in the compensation process:

a) Each part will set up the necessary institutional framework described in item 9.2.18;

b) PDCC will declare the cut-off-date and the GOL in cooperation with the Project Owner will conduct information dissemination to the public at large

c) The Project Owner will carry out the confirmation survey of the PAPs including i) identification of PAPs, ii) loss of assets, and iii) who is entitled to receive assistance;

d) The Project Owner will present the results of the confirmation survey to the PAPs and when agreed by the PAPs the confirmation survey will be submitted to the PDCC for review and approval;

e) The Project Owner will disburse the agreed amount of cash compensation in accordance with the confirmation survey to the PDCC. The PDCC will disburse the agreed cash compensation to the individual PAPs;

f) The Project Owner will carry out self-monitoring of the implementation of the social measures and the Project Owner will review the social measures.

Compensation and Development Activities

Livelihood Restoration and Compensation Programs

a) The Project Owner in cooperation with the GOL (PDCC and VDCs) will undertake the following activities:

b) Provide compensation for or develop and implement agricultural programs to improve production in home gardens and rice paddies in impacted village areas;

c) Provide compensation for or develop suitable replacement rice areas or replacement land suitable for irrigated rice production for villagers impacted by project activities.

d) Develop and implement aquaculture strategies that includes fish and frog raising in ponds along impacted river systems as required;

e) Consultations with villages on livelihood packages and improvements; and

f) Monitor livelihood improvement process.

Community Development Programs

a) Establish Village Development Committees for the successful community development and livelihood restoration;

b) Ensure that religious and cultural needs are addressed;

c) Ensure positive gender equitable processes and outcomes in implementation and monitoring;

d) Preventative health programs for common diseases as required;

e) Relocation and expansion of health centers and improvement of facilities in the Project Area;

f) Ensure that curative services are safe, accessible, equitable and affordable and backed up by a well functioning referral system;

g) Provide health incentives and support to GOL health staff;

h) Monitoring of health status and changes;

i) Develop participatory training programs for local village-level organisations; and

j) Monitoring of community development programs, gender participation and vulnerable groups.

9.3.17 Reporting

During the period commencing with the month following the commencement of the Construction Works and until the end of the Concession Period, the Project Owner will prepare monthly reports covering the following items:

a) The progress made to implement the Environmental Measures against the implementation program;
b) Any difficulties encountered in implementing the Environmental Measures and recommendations for remedying those difficulties for the future;
c) The number and type of non-conformances with the Environmental Measures and proposed remedial measures;
d) Such information from reports from the Construction Contractors and the Project Operator, as the Project Owner considers relevant;
e) Any and all accidents or incidences that relate to the health, safety, and welfare of stakeholders and the environment; and
f) Monitoring data of environmental parameters and social conditions as committed in the IEE/CEMMP/EMMP.

Annual reports covering the following items:

a) A summary of the items covered by the Monthly Reports
b) Gantt diagram showing the activities (construction works, environmental measures, monitoring) carried out during the period against what was planned;
c) Description and analysis of hydrology and water quality (water flow, water level, inundation);
d) Progress of planned outputs and performance objectives;
e) Account of the environmental performance of the Project;
f) Significant problems encountered and remedial measures taken;
g) Identification of any deviation from the EMP/CEMMP/EMMP.

In case of accident or problem or non-compliance the Project will notify WREA as soon as practicable and in any event within 24 hours.

9.3.18 Schedule

9.3.18.1 Principle

A detailed household survey and a first step on the consultations with affected villagers should be the first activities before implementation of SAP takes off. District administrations have been informed in the initial stage but effected household and villages in watershed area that will actually be losing their lands have not officially been informed. Information on the Project was given to soothe villages prior to the household and village surveys.

Affected households in downstream village must be given as much notice as early as possible regarding compensation payment; therefore all planning activities will be initiated as soon as possible.

9.3.18.2 Time plan

All the necessary arrangement in respect of facilities and compensation for displacement and relocation must have been adequately taken care of before the actual construction of the dam can be implemented.

The relocation schedule is determined mainly by the construction schedule for the dam and power plant and by the necessity that relocation and all types of in-kind compensation (mainly replacement of land lost due to submersion) must be accomplished before the reservoir is filled.

9.3.19 Grievance Processing Mechanism

Structure of the Grievance Procedure:

Step 1 of the Grievance Procedure: Village Grievance Committee

The Project Affected People wishing to make a claim (a Claimant) must first make a claim to the Village Grievance Committee.

The Claim can be made orally or in writing, and should include:

a) Factual background;
b) Issues; and
c) Claimant's position on these issues.

The Village Grievance Committee must:

a) Review the claim within the context of the existing policy, regulations, procedures and entitlements for Project Affected People as provided for in the Concession Agreement and relevant implementation plans and activities;
b) Not award compensation that exceeds the budget set by the Project Owner for the relevant purpose;
c) Consult with the Project Owner representatives in considering the Grievance;
d) Respond within fifteen (15) days of receipt of the claim; and
e) Inform the Claimant of his or her right to take the claim to the District Grievance Committee for review and decision.

The GOL, through the Government Liaison Officer, will promptly inform the Project Owner, through the ESMO, of:

a) Any claim raised at this level within ten (10) days after the claim is first received; and
b) The final resolution of each claim resolved at this level.

Step 2 of the Grievance Procedure: District Grievance Committee

If the Claimant is not satisfied with the decision of the Village Grievance Resettlement Committee, he or she may submit the claim to the District Grievance Committee.

Upon receipt of the claim, the District Grievance Committee must conduct its own investigations and arrange to meeting with responsible agencies and the Claimant.

The District Grievance Committee must:

a) Consult with Project Owner representatives in considering the Grievance;
b) Make a decision within fifteen (15) days of receipt of the claim;
c) Inform the Government Liaison Officer of this decision;
d) Not award compensation that exceeds the budget set by the Project Owner for the relevant purpose; and
e) Provide reasons for this decision.

The findings of the District Grievance Committee are binding on the Project Owner.

The District Grievance Committee must maintain a public record of all claims received from Project Affected People and decisions made by the District Grievance Committee.

Step 3 of the Grievance Procedure: Provincial Grievance Committee

If the Claimant is not satisfied with the decision of the District Grievance Committee, he or she may submit the claim to the Provincial Grievance Committee.

Upon receipt of the claim, the Provincial Grievance Committee must conduct its own investigations and arrange to meeting with responsible agencies and the Claimant.

The Provincial Grievance Committee must:

a) Consult with Project Owner representatives in considering the Grievance;
b) Make a decision within fifteen (15) days of receipt of the claim;
c) Inform the Government Liaison Officer of this decision;
d) Not award compensation that exceeds the budget set by the Project Owner for the relevant purpose; and
e) Provide reasons for this decision.

The findings of the Provincial Grievance Committee are binding on the Project Owner.

The Provincial Grievance Committee must maintain a public record of all claims received from Project Affected People and decisions made by the Provincial Grievance Committee.

Step 4 of the Grievance Procedure: Lao Courts

A decision from the Provincial Grievance Committee may be appealed to the Lao PDR Courts in accordance with Lao law.

The GOL, through the Government Liaison Officer, will promptly inform the Project Owner, through the ESMO, of:

a) Any claim raised at this level; and
b) The final resolution of each claim at this level

The findings of the Lao Courts are binding on the Project Owner and GOL, and cannot be contested after a decision on the claim has been made.

9.3.20 Community Consultation and Awareness Program

A Community Consultation and Awareness Program will be developed to provide a basis for ongoing community consultation. An important focus of the liaison program will be raising awareness amongst the community of hazards introduced into the area as a result of the project (e.g. dangers associated with diversion canal access, increased traffic hazard) and potential, project-related disruptions to the community (such as reduced flows downstream of the head ponds). The program will also communicate to the local community about possible opportunities such as employment and recruitment procedures, business opportunities, and Community Trust Fund program initiatives. The program will provide a forum for the community and (and government where relevant) to raise, discuss and resolve issues associated with the project.

Consultation will occur both formally (e.g. meetings, presentations and workshops) and informally (e.g. visits to the local villages). ESMO staff will consult the community before making any significant decisions relating to: changes to landform or drainage (beyond the proposals currently contained in the IEE and ISA). Records will be kept of all consultation. Agreements will be written up and

signed by relevant parties. For a comprehensive overview of all community consultation to date and proposed ongoing consultation mechanisms, please see the separate report, Public Disclosure and Consultation Plan

9.3.21 Disclosure of Information

In accordance with Lao government Safeguard policy policies, disclosure of information to project stakeholders and the general public is necessary. This implies that reliable and up-to-date information on the project as it develops should be available through various media. The main aspects include:

The information disclosure will disseminated through Lao TV and radio to reach the general pubic - updates about progress on the project and public meeting announcements. Information bulletins will be through national and international newspapers and information to visiting journalists or international NGOs. Information Centres where reports are available.

Translation into Lao language is required for all major summary report of the final IEE, EMP and SAP. This is to facilitate GOL involvement and understanding where necessary.

9.4 Monitoring Program

9.4.1 Monitoring Requirments

The planning and implementation activities for EMP and SAP will be monitored to ensure that the process is carried out fairly and in accordance with the provisions of the plan. Two separate kinds of monitoring are envisioned:

- Monitoring of physical progress including reaching key benchmarks (acquisition of land, payment of compensation, construction measures
- Monitoring of non-physical performance - goal/outcome attainment on incomes, health, education, social issues and capacity building.

Monitoring of physical progress will be carried out by the Project's staff under the direction of the Community Development Facilitator, as well as by the VDC. Regular feedback on the SAP process and progress will be provided to the affected residents through formal or informal meetings and discussions. The reporting schedule will be monthly, however, more or less frequent progress updates may be warranted depending on the level of activity and as the relocation date nears.

An independent third party monitoring will be appointed by the project, will monitor non-physical performance. The third party will perform periodic reviews of the socioeconomic status of the affected households and watershed management plan, and will solicit feedback and comments from these households regarding the implementing process. A matrix of socio-economic indicators, mainly based on village wide statistics, will be collected as part of the monitoring; however, monitoring of individual households and comparison of their conditions to pre-relocation status will also be carried out. The consultants will provide a report

to the Project management presenting their findings including any identified problems, community views and any recommended measures or improvements that could be made.

The monitoring schedule will initially be set as twice a year and will continue for a minimum three years following physical relocation to the new villages. The monitoring period will be extended if necessary until equivalency to pre-relocation conditions can be demonstrated. Specific measurement tools for determining equivalency will be set as part of the monitoring indicators. The methodology used to evaluate equivalency must incorporate a degree of flexibility or be able to adapt to unforeseen or unanticipated events, which are beyond the control of the Developer and which have negative impacts on the populations affected by resettlement. Such events could include drought, floods (or other acts of nature), or sickness.

The monitoring agency must be able to recognize such circumstances, evaluate their effect on compensation recovery process and develop alternative indicators for determining equivalency if necessary. Indicators based on the relation between the local circumstances and regional or national trends, such as farm plot sizes, production levels, Gross Domestic Product, household and personal incomes, purchasing power, should be considered by the monitoring consultants.

9.4.2 Monitoring Indicators

In preparation of this report, the consultant has set up a database of all interviewed PAPs and people in watershed area based on the socio-economic survey. The database will be expanded once the detailed socio-economic survey is carried out at the next stage. The sample survey addressed aspects of living standards of the PAPs through questions on monetary incomes. This makes up a set of indicators that should be defined in agricultural and non-agricultural sources. Additionally, questions on household assets e.g. radio, tractors and other equipment, plus food security and household expenditures were covered during the survey. The quantitative indicators emanating from questions on monetary incomes and welfare indicators should allow for crosschecking of data about living standards.

Monitoring indicators largely come from baseline data defining a measurable characteristic of activities to be monitored. Monitoring then aims at defining its state at the particular time of its observation, and to compare it with a previously defined standard. In this resettlement project, social and economic characteristics form the great majority of indicators. These indicators may include the following: agriculture; food production and marketing; crop production; livestock per household; incidence of animal disease/type; farmers' groups; involvement of women, etc. For education, the followings are included: (where applicable) primary and basic enrolment levels by gender; secondary (and possibly tertiary) enrolment levels by gender; pupil/teacher ratio; distance to primary school. Health: availability of and distance to safe drinking water and sanitation; incidence of main diseases/gender/age; death rates of main diseases/gender/age; trained health staff; percentage of catchment population; distance to health centre; child nutrition such as height for age (stunting), weight for age (wasting); possibly incidence of HIV/AIDS and other STDs by gender and age. Household economy including: housing, quality of roof, walls, floor, road to next village, tracks, dust/motor road.

Other important are: income per household; indebtedness; livelihood skill (i.e. capacity building, skills/vocational training, community infrastructure and improvement in production/income for women/youths).

These indicators may include the following:

- Agriculture: food production and marketing such as crop production (tonnage or bushels per hectare and land use type).
- Education: Where applicable, primary and basic enrolment levels by gender, Secondary (and possibly tertiary) enrolment levels by gender, pupil/teacher ratio and distance to primary school.
- Health including the followings: the availability of and distance to safe drinking water and sanitation, incidence of main diseases/gender/age, death rates of main diseases/gender/age, trained health staff in the catchment population, child nutrition: height for age (stunting), weight for age (wasting), possibly incidence of HIV/AIDS and other STDs by gender and age, household economy and housing, quality of roof, walls, floor.
- Safety regards due to traffic
- Capacity building, skills / vocational training.
- Water Quality
- Water Supply to the downstream village

9.4.3 Schedules for monitoring

Monitoring is part of project management in implementing the resettlement. It is relatively autonomous, serving as a data bank, both for the identification of baseline data (as benchmarks) and for inputs and outputs of the resettlement project. Monitoring therefore should start from the planning stage where the determination is made concerning the frequency of monitoring and of the types of indicators derived from baseline data.

The monitoring system need set up in accordance with monitoring plan will be carried out as following:

- Daily monitoring by ESMO
- Monthly monitoring by Provincial Water Resource and Environment Office (PWREO)
- Annaully Monitoring by Water Resource and Environment Administration

CHAPTER 10: IMPLEMENTING SCHEDULE AND BUDGET

10.1 Implementation Schedule

At pre-construction phase, the compensation for affected person, cultural value, tourist water supply program and land use must be done prior commencement of the project construction to avoid any raising social issues; the detailed implementation schedule is shown in Table 10.1

Table 10.1: the Implementing Schedule

Items No.	Activities	Pre-Construction	Constr. Year 1	Constr. Year 2	Operation 28 Years
	Set-up of Organization and Management				
1.	Environmental Management Plan				
1.1	Site water management				
1.2	Erosion and sedimentation control				
1.3	Waste management				
1.4	Dust, noise and vibration				
1.5	Reservoir clearance				
1.6	Rehabilitation				
1.7	Re-vegetation and reforestation				
1.8	Biological and conservation				
1.9	Management measures for transmission construction				
2.	Social Development Plan				
2.1	Agricultural promotion program				
2.2	Medical support				
2.3	Community safety				
2.4	Literacy and skill development				
2.5	Archaeology and culture				
2.6	Compensation for loss of cultural values				
2.7	Village water supply program				
2.8	Compensation for loss of agricultural and other land				
3.	Monitoring Program				
3.1	Surface water quality and erosion				
3.3	Aquatic biology and wildlife				

The main objectives are to quantify the direct and indirect impacts (both positive and negative) of the project on the surrounding community and to provide project owner, the government and the local community with information to assist in the planning and successful implementation of community development initiatives. For example the impacts of reduced downstream flows on drinking water, washing and bathing, fishing, irrigation and health and nutrition will be monitored monthly during the construction period and until the situation stabilizes.

The monitoring will be done as followings

- Project ESMO will be day to day monitoring the construction activity how the subcontractors or contracts being done or compliance with project Social Action Plan;
- Provincial Water Resource and Environment Office (EMU Field Office) will be monitored the monthly basic;
- Water Resource and Environment Administration will be monitored the quarterly basic or as required.

10.2 Budget

The budget for the environmental, social management and monitoring activities are identified in total costs are calculated to be USD 27.41×10^6. Key sections of the budget include:

- Administration Budget
- Compensation of Private Properties
- Social Development Program
- Environmental Management Plan
- Monitoring cost for the GOL

CHAPTER 11: CONCLUSION AND RECOMMENDATION

The potential environmental impacts within the project area have been assessed with regard to options, locations, design types, construction methods, operation and maintenance procedures. Consultation with affected local people and concerned local organizations is a crucial aspect in the impact assessment process. This has been performed accordingly.

In sum, the project Impacts can be classified as permanently and temporarily as follows:

Permanent Impacts – will be occurred mainly after the project completion phase and during the operation and maintenance period and these impacts are on going and lasting the life time of the project. The appropriate measures will be taken by design minimum flow release to downstream area at minimum flow in dry season. The secondary forest along river base and headrace canal, access road and powerhouse areas will be permanently loss.

Temporary Impacts – occurs mainly during pre-construction and during the construction period. These impacts will cease once the construction is fully completed and the project is entering its operational stage. Temporary impacts and its severity depend on the project location, design types and construction method employed.

The Nam Nga 2 Hydropower project will create minor impacts to social and culture during construction period such as noise and dust, influx of outside labors and others, these impacts can be mitigated by appropriate measures. On the other hand, the positive impacts will also be created by the project. These include social and culture conservation and local development by promotion of economic activity to improve the livelihood of the people in project areas as well as to reduce the poverty of rural population.

The project sites have been selected and designed on the basis that they will avoid environmentally sensitive areas. The ground survey indicates no project lands to be occupied in such sensitive areas as National Biodiversity Conservation Area (NBCA), Protected Area. Closed discussion with the District Governor Authority needs to be done in order to avoid the unexpected conflicts during construction period. Watershed management also needs to be concerned for the future sustainable use of the water resources.

The biophysical resources in the areas have been extensively exploited over the recent past by human activities such as logging, fuel wood collection, and shifting (slash and burn) cultivation, leaving degraded land that is only just recovering in some areas. Land allocation and agro-forestry extension need to be promoted in this area in order to protect the watershed area and improve the livelihood of the local people living around the project area.

Mitigation measures have been proposed and required effective implementation. This is to 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.

This IEE, including environmental management plan and monitoring program is considered sufficient to meet the environmental assessment requirements for this project. Therefore, further more detailed environmental assessment may not be required. With the project location and result of analysis and assessment of impacts for all significant components are considered consistency with national and international standard and guidelines it may not require for future full EIA study. However, the project manager will have to develop the appropriate manner and consistence with all activities as proposed and recommended including the preparation of separated environmental management and social action plans.