

**DON SAHONG HYDROPOWER  
PROJECT, LAO PDR  
(DSHPP)**

**ENVIRONMENTAL MANAGEMENT and  
MONITORING PLAN**

**FINAL**

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Prepared for:

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## ABBREVIATIONS AND ACRONYMS

AECOM	An international infrastructure engineering and consulting firm, author of the Final Feasibility Study and Engineering Status Report
APW	Australian Power and Water an author of the 2007 Draft EIA
ASEAN	Association of South East Asian Nations
CESVI	Cooperazione e Sviluppo (World Aid from Italy)
CIA	Cumulative Impact Assessment
CMPE	Centre of Malariology, Parasitological and Entomology
DAFEO	District Agriculture and Forestry Extension Office
DOE	Department of Electricity
DPRA	Development Project Responsible Agency
DSHPP	Don Sahong Hydropower Project
ED	Essential Drugs
EDL	Electricité du Laos
EIA	Environmental Impact Assessment
EMO	Environmental Management Office
EMMP	Environmental Management and Monitoring Plan
ESR	DSHPP Engineering Status Report (supersedes Final Feasibility Study (FFS))
EU	European Union
FCZ	Fishing Control Zone
FFS	Final Feasibility Study
FishMAP	DSHPP Fisheries Monitoring and Action Plan
FS	Feasibility Study
GFL	Great Fault Line
GMS	Greater Mekong Sub region
GOL	Government of Lao People's Democratic Republic
GWh	Gigawatt hours
ha	Hectare
HC	Health Center
IEE	Initial Environmental Examination
IPP	Independent Power Producer
IUCN	International Union for Conservation of Nature
JMP	Joint Monitoring Program for Water Supply and Sanitation by WHO/UNICEF
MA95	Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin made in 1995
MAF	Ministry of Agriculture and Forestry of Lao PDR
MDG	Millennium Development Goals
MEM	Ministry of Energy and Mines of Lao PDR
MFCB	Mega First Corporation Berhad
MIH	Ministry of Industry and Handicrafts of Lao PDR
MOH	Ministry of Health of Lao PDR
MoNRE	Ministry of Natural Resources and Environment of Lao PDR (formerly WREA)
MOU	Memorandum of Understanding

MRC	Mekong River Commission
MW	Megawatt (1 million watts of power)
NAFRI	National Agriculture and Forestry Research Institute of Lao PDR
NBCA	National Biodiversity Conservation Area
NCC	National Consulting Company
NEAP	National Environmental Action Plan
NGPES	National Growth and Poverty Eradication Strategy
NTFPs	Non-Timber Forestry Products
PAP	Project Affected Persons
PEC	PEC Konsult Sdn Bhd
PRC	People's Republic of China
RAP	Resettlement Action Plan
RESDALAO	Renewable Energy for Sustainable Development Association
SIA	Social Impact Assessment
SMMP	Social Management and Monitoring Plan
SOW	Statement of Work
STD	Sexually-transmitted disease
TBA	Traditional Birth Attendant
TOR	Terms of Reference
UNICEF	United Nations Children Fund
VHK	Village Health Kit
VHV	Village Health Volunteer
WHO	World Health Organization
WREA	Water Resources and Environment Administration (now MoNRE)

### **GLOSSARY OF COMMON LAO WORDS FOR GEOGRAPHICAL LOCATIONS**

Don (e)	Island
Hang	tail / downstream tip (of the island)
Hou	River Channel
Hua	head or upstream tip (of the island)

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# 1 INTRODUCTION AND BACKGROUND

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## 1.1 Background

This Environmental Management and Monitoring Plan (EMMP) has been devised for the DSHPP according to the MEM-DoE's Environmental Management Standard (EMS) (EM05/00). This is considered an integral part of the Final Environmental Assessment process. It is needed for project implementation. The construction contractor(s) will be required to develop their construction EMMP for approval by the developers.

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## 1.2 Project Need and Rationale

The Project Need and Rationale is fully explained in Section 1.3 of the associated EIA 2013 (NCC 2013).

## **2 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK**

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### **2.1 Policy Framework**

The environmental policies of the GOL are clearly presented in the Political Report of the Lao People's Revolutionary Party, as follows:

To promote the capacity and potential of the country and the regions alike, our Party continues to implement the policies of establishing agroforestry economy, closely linking it to industry and services. We will consider agriculture and forestry as fundamental while focusing on some urgent and potential industrial activities. On the other hand, we will strongly promote the services sector, corresponding to the modern trend.

In materializing the policies of building the infrastructure for these economic sectors, our Party considers the socioeconomic development of the regions as important, and it continues to encourage it. We will be able to appropriately determine the production force for all parts of the country, and exploit the rich natural resources of each region in the most efficient manner. Simultaneously, efforts will be made to protect and rehabilitate them to become the wealthy assets and heritage of the nation.

Further, the Lao Constitution of 1991 states that environmental protection is the responsibility of everyone, and that it is against the law to degrade natural resources that are in principle owned by the State.

The Government's intention is very clear: The Lao PDR Government will take the necessary actions to protect the environmental and natural resources in the process of economic development.

Besides the above policy, GOL has set up development strategies for developments and environmental natural resources protection as following:

- The National Growth and Poverty Eradication Strategy (NGPES),
- The National Environmental Strategy (NES) with the National Environment Action Plan,
- The National Biodiversity Education and Awareness Strategy and Action Plan.
- The Provincial Environmental Strategy (PES),
- National Policy on Environmental and Social Sustainability of the Hydropower Sector in Lao PDR,
- etc.

### **2.2 Institutional Framework for EMMP**

These needs are outlined in Requirement 4 of the EMS and set the regulatory framework and administrative needs that the project must comply with and outlines jurisdiction of the agencies involved. It includes references to the following:

- GOL's National Policies and Environmental Regulations
- The jurisdiction of agencies involved such as line ministries or departments at the national, provincial and district levels and any NGOs
- The organizational framework and the enforcement regime of the project
- Any International Treaties (e.g. Ramsar) or Agreements of which Lao PDR is a signatory and are applicable
- Details set out or established during the EIA process.

The principal institutions involved include:

- GOL agencies at all levels including MONRE and MEM-DOE, and any Advisory or Steering Committee or Independent Panel of Experts (POE)
- The DSHPP or its representatives such as a project - established Environmental Management Office (EMO) operating on its behalf
- Consulting Engineer's representative or Environmental Advisor (EA)
- Various Environmental Officers associated with the main Contractors

All these parties' roles and responsibilities as executing agencies will be allocated for the entire EMMP.

Measures for monitoring and managing potential environmental and socio-economic impacts have been developed based on Lao PDR legislation, regulations, decrees, standards and guidelines. The following legislation now in force, and supporting regulations (promulgated or in draft) in Lao PDR are relevant to ensuring environmental and socio-economic issues are addressed during design, construction, and operation of the project.

### **2.3 Legal Framework**

The promulgation of the Environmental Protection Law (EPL) in 1999 has advanced the implementation of the above policies. Environmental protection measures in the form of requirements for EIAs are outlined in Part II, Chapter 1, Article 8, of the Law as follows:

- a) The Science, Technology and Environment Organization must issue general rules regarding a regime and a methodology for environmental impact assessment;
- b) Sectors related to development projects and activities related to these sectors must issue rules regarding a regime and a methodology for environmental impact assessments based upon [overarching] general rules issued by the Science, Technology and Environment Organization;
- c) Before establishing development projects and other activities that are seen to have an impact on the environment, an environmental impact assessment drafted in compliance with prescribed regulations in clause one and clause two of this Article must be submitted to an environmental management and inspection agency assigned to consider and issue environmental certificates.

Based on the provision in the Environmental Protection Law that development projects and activities that have the potential to affect the environment shall require an EIA, the GOL has issued EIA regulation for Lao PDR (2010) No.112/PM. This regulation specifies the overall principles for the EIA effort and prescribes the thematic issues to be covered and the outputs expected at the different stages of the EIA process.

MONRE has also instructed the Ministries to develop sectoral guidelines for the project categories within their respective area of responsibilities. The Ministry of Mines and Energy responded promptly to this request and have issued the following guidelines for power and transmission line projects:

- Decree on Environment Assessment No.112/PM, (2010)
- Regulation on Implementing Environmental Assessment for Electricity Projects in Lao PDR, No. 447, 20.11.2001
- Power Sector Environmental Policy, No. 581, 4.10.2001
- Environmental Management Documents for the Department of Electricity, No. 582, 4.10.2001

- Department of Electricity Environmental Records Management, No. 583, 4.10.2001
- Environmental Management Plans for Electricity Projects, No. 584, 4.10.2001
- Environmental Management Standard for Electricity Projects, No.0366/  
MIH.DOE, 2003
- National Environmental Standard of WREA 2009 (now MoNRE)

## 2.4 Institutional Framework

Because of the cross-sectoral nature of environmental issues, various Ministries and Agencies are involved in environmental affairs.

The Government Agencies most concerned with environmental protection and natural resource management are as in the table below:

Agency	Responsibility
Ministry of Natural Resources and Environment (MoNRE), formerly WREA	Overall coordination; oversight of environmental affairs; environmental management (setting policy and regulatory framework; setting standards; monitoring state of the environment and compliance with policies and regulations)
Ministry of Energy and Mines	Electricity/industrial environmental management; mineral resource management
Ministry of Agriculture and Forestry (MAF)	Forest resource management; biodiversity conservation; soil resource management; water resource management
Center for Protected Area and Watershed Management (CPAWN) under MAF	Forestry/wildlife/watershed management and conservation
Ministry of Communications, Transport, Post and Construction (MCTPC)	Management of communication infrastructure
Ministry of Health (MOH)	Population's health management

### 2.4.1 Environment Protection

The Lao PDR has a well integrated and comprehensive system of laws to protect the environment. Many of them impinge upon big water resource use projects, such as the Nam Lik 1-2 Hydropower Project. The basic legal framework is laid down in the Environmental Protection Law of 1999, which was approved by the implementation decree of 2002. The law includes provisions for EIA for projects and activities that might affect the environment, and regulations for all enterprises for the control of pollution and compliance with environmental quality standards. According to the Law:

- Environmental protection shall be the priority consideration. Environmental mitigation and restoration are considered to be less preferable, but necessary if protection is not possible
- All social-economic development plans shall include provisions to protect the environment and national resources;
- All persons and organisations residing in the Lao PDR have an obligation to protect the environment;
- Whoever damages the environment is responsible under the law; and will be sanctioned
- Natural resources, raw materials and energy shall be used conservatively, minimising pollution and waste, and promoting sustainable development.

The Environmental Protection Law is executed by MONRE (formerly WREA), which is also charged with reviewing EIAs. MONRE developed specific guidelines for the content and process of environmental assessment, including the preparation of environmental management plans.

MONRE has the mandate to co-ordinate all government activities in the environmental sector. Central line Ministries are responsible for environmental management and monitoring within their respective sector - five ministries have established separate environmental monitoring units.

At provincial level, the policy body is the Provincial Environmental Committee (PEC) under the chairmanship of the Vice-Governor in each province. The responsibility for national policy implementation has been devoted to the provincial governments, and these responsibilities are undertaken through Provincial Water Resources and Environmental Office, (WREO).

#### **2.4.2 Nature Conservation**

The Forestry Law of 1996 outlines general provision for the management of all forest related resources, including all plants, wildlife, and watercourses. The Department of Forestry, Ministry of Agriculture and Forestry, has the overall responsibility for its enforcement. GOL is responsible for allocating and determining the use to which forest land and forest resources be put. Forests are grouped into the following five categories: Protection, Conservation, Production, Regeneration, and Degraded, and each has a specific management policy. In 2005, the forestry strategy for the period 2005 -2020 was completed.

#### **2.4.3 Water Management**

The Law on Water and Water Resources of 1996 is intended to ensure sustainable use of water, whether it be small medium or large in scale. The legislation prescribes the rights and permit procedures controlling water use. Development of all large-scale user projects will require the preparation of an EIA. The Water Resources Coordination Committee in the Prime Minister's Office has responsibility for administering the Water Law.

#### **2.4.4 Mekong River Commission**

Lao PDR is one of the four signatories to the 1995 Agreement on the Co-operation for Sustainable Development of the Mekong River Basin and is a member of the Mekong River Commission (MRC). The Commission succeeded the Mekong Committee, which, among other things, was instrumental in the planning of the Nam Ngum, the first large hydropower project in Lao PDR. They were also instrumental in early investigations related to the

hydropower project. Whereas the Committee was primarily focussed on hydrology, navigation and hydropower, the mandate of the Commission's focus is more on co-operation for the promotion of sustainable development, utilisation, management and conservation of water and related resources in the Mekong River Basin.

The primary purpose of the Agreement is to promote the economic and social well-being of people in all the riparian countries. This is to be achieved - in part by the protection of the environment, improvement of navigation and the cooperation in the maintenance of flows and intra-and inter-basins diversions. The MRC has initiated several basin-wide planning and research programmes, including the Water Utilisation Plan (WUP), the Environmental Programme (EP), the Basin Development Plan (BDP) and the Fisheries Programme.

#### **2.4.5 ASEAN Membership**

Lao PDR became a member of the Association of Southeast Asian Nations (ASEAN) in 1997. In 1985, ASEAN adopted an agreement on the Conservation of Nature and Natural Resources, which was ratified by only three countries, and is therefore not in force. ASEAN has provisions which assist member countries to establish trans-boundary nature reserves.

#### **2.4.6 Greater Mekong Sub-region (GMS) initiative**

In 1992, with the assistance of the Asia Development Bank (ADB), Cambodia, the Lao PDR, Myanmar, Thailand, Viet Nam, and Yunnan Province in the People's Republic of China, entered into a program of sub-regional economic cooperation, designed to enhance economic relations among the countries. The program has contributed to infrastructure development, and better use of the resource base in the sub-region.

#### **2.4.7 International Conventions and Treaties**

##### ***Convention on Biological Diversity (CDB)***

Lao PDR became a signatory to the CDB in 1992, following up the ASEAN Agreement of the Conservation of Nature and Natural Resources, which was signed in 1985. The policy and legislative obligations to the CDB have been fulfilled, with the establishment of the national protected areas.

##### ***Convention on the Protection of World Cultural and Natural Heritage***

This convention was ratified by GOL in 1987. The convention addresses the protection of cultural and natural objects, as well as sites of high national and international value.

##### ***Convention on International Trade in Endangered species (CITES)***

Lao PDR ratified this convention in early 2004. Prior to the ratification, the Ministry of Agriculture and Forestry (MAF) issued a regulation (MAF 0360) that banned all hunting for trade. Hunting for consumption was still allowed. This is a signal that GOL is now committed to increasing efforts to halt the extensive trade in wildlife from Lao PDR to neighbouring countries.

### **2.5 Relevant Laws, Decrees, Regulations and International Conventions**

Refer to Section 1.4 of the associated EIA 2013.

### **2.6 Best Practice and Relevant International Agreements**

Refer to Section 1.4.4 of the associated EIA 2013. And to Section 1.4.5 of the associated EIA 2013 respectively

### 3 PROJECT DESCRIPTION

The DSHPP is a run-of-river project situated entirely within the Hou Sahong, a 5 kilometre long channel between the islands of Don Sadam and Don Sahong (see figure below). The project layout envisaged is a concrete box-like structure comprising the dam and powerhouse to be constructed about 130 meters upstream of the downstream junction of the Hou Sahong with the main channel. The foundations for this structure will be about 15 m below the existing channel bed and will extend from bank to bank across the Hou Sahong channel.



**Figure 1 Locations of DSHPP Barrage Power station and embankment on the Hou Sahong**

Construction of the dam and powerhouse will cause water to back up in Hou Sahong, creating a small headpond, the level of which will vary with the level of the Mekong upstream. The crest of the barrage is set at RL 76.9m, which exceeds the maximum level of the Mekong at the upstream entrance to the Hou Sahong. Because the topography of the two islands that form the banks of the Hou Sahong reservoir is below this level, embankments will be built on both sides and roughly parallel with the channel to retain the water.

At present the bed levels in the upper reaches of the Hou Sahong restrict flow into the channel during periods of low flow. To improve flow through the Hou Sahong the river bed will be excavated to an average of 3 m and 1.5 m depth at the upstream and downstream ends of the channel, respectively. A limited area will also be excavated downstream of the powerhouse. Excavated material will be used for concrete aggregate and to construct the retaining embankments. Any excess rock will be disposed of at carefully pre-selected

locations on Don Sadam and Don Sahong. Excavation and other channel modifications are also proposed in Hou Xang Pheuak and in Hou Sadam to provide alternative fish migration routes to replace the Hou Sahong, which will be blocked to upstream movement of fish. This will be a vital component of the DSHPP fish migration mitigation program.

More details of the DSHPP are provided in Section 2.1 of the associated EIA (NCC, 2013).

### **Environmental Setting**

The environmental features of the DSHPP area are described in detail in the Final EIA (NCC 2013). The Engineering Status Report (AECOM 2011) also contains data on the hydrology of the Mekong River and DSHPP site geology.

### **Physical Features of the Project Areas**

The DSHPP is located on the Hou Sahong, a 5 km long channel that flows year-round between the islands of Don Sadam and Dong Sahong (Figure 1). These islands are of relatively low relief with the only prominent features being a hill at the south end of Don Sahong. The islands support three communities and approximately one-third of the land area is agricultural, primarily rice paddy. The Hou Sahong remains a dominant feature of the local landscape as its levels vary by approximately 2.5 to 3.0 m between the dry season and the wet season. It is also a fundamental environmental element and very important to the population, productivity and ecology of the two islands and the greater Si Phan Don Wetlands complex.

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## **4 IMPACT ANALYSIS AND MITIGATION MEASURES**

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Refer to Section 5 of the associated EIA 2013 for a full and detailed description of all the project environmental impacts and proposed mitigation measures.

### **4.1 Summary of Impacts**

Table 1 is a summary of the potential environmental and social impacts presented as an Impact Matrix with the proposed mitigation measures to be managed with this EMMP during the project construction, operation and decommissioning periods.

**Table 1 Impact Matrix**

Potential Impact	Impact Areas	Impact Duration and Period	Impact Significance	Required Mitigation/Management Measures	Meas. # (see Annex B)	Potential Residual Impacts
<b>Construction Phase</b>						
<b>Physiochemical</b>						
Noise and vibration due to construction and transportation	Construction areas; movement of vehicles, blasting, excavation, construction activities	During the construction	Potential minor negative impact, can be mitigated	Adopting International standards on occupational Health and safety as well as noise minimization program (in Contractor's EMMP). Acceptable noise levels to be specified.	<b>1</b>	<b>No Significant Impact</b>
Air Pollution; dust due to the construction and transportation	Construction areas and surrounding villages	During the construction	Potential minor negative impact, can be mitigated	Develop site management program prior the construction Appropriate road engineering; good compacting and runoff design, reduce speed limits, developing watering schedule for all roads (in Contractor's EMMP)	<b>2</b>	<b>No Significant Impact</b>
Water Pollution; soil erosion and siltation	Construction areas, And embankment areas subjected to drawdown.	During the construction and operation	Potential minor negative impact, can be mitigated	Develop best management practice on soil erosion and sedimentation at all constructed areas as well as pollution control technique -Maximize the use of excavated rocks, develop runoff system , installing sediment traps, rehabilitate construction areas by planting shrubs and trees Develop appropriate monitoring program (in Contractor's EMMP)	<b>3</b>	<b>No Significant Impact</b>
Handling and Storage of Fuel and Explosive materials	Mainland and island sites	Temporary/ During the construction	Potential minor negative impact, can be mitigated	Develop specific policy, safety, emergency response and SOP which comply to international standards, install oils and grease aggregators and separators and appropriate storage facilities (in Contractor's EMMP)	<b>4</b>	<b>No Significant Impact</b>
Disposal of earth, rock spoils	Construction areas and dump sites	Temporary/ During the construction	Potential minor negative impact, can be mitigated	Identify earth rock disposal sites and develop best practice management program (in Contractor's EMMP)	<b>5</b>	<b>No Significant Impact</b>

Potential Impact	Impact Areas	Impact Duration and Period	Impact Significance	Required Mitigation/Management Measures	Meas. # (see Annex B)	Potential Residual Impacts
Solid wastes	Construction sites and workers camps	Temporary/ During the construction	Potential minor negative impact, can be mitigated	Constructing approved-offsite disposal facilities and develop management program. (in Contractor's EMMP)	5	No Significant Impact
<b>Biological</b>						
Terrestrial Vegetation: Loss of forest, plantation trees and wild life	Power house, switch yards, camps, embankments, transmission lines, building access roads and resettlement	Temporary and Entire project life	Potential minor negative impact can be mitigated: 29.4 ha of paddy land, 169.9 ha of forest	Mapping and inventory of impacted areas including village areas, project works areas, spoil disposal, quarry and temporary land use Consulting with local villagers and forestry provincial government to minimize impact Setting reforestation and wildlife life conservation program	6	No Significant Impact
Impact to Irrawaddy Dolphin	Downstream of the DSHPP	During the construction	Potential minor negative impact can be mitigated	Excavation not to include underwater blasting. Fish food supply to be maintained Mekong flows and water quality essentially unchanged in dolphin areas	7	No Significant Impact, with FishMAP
Reduced fish migration	Hou Sahong water channel	During the construction	Potential major negative impact can be mitigated	Implement FishMAP, (DSHPP Fisheries Monitoring Action Plan)	7	No Significant Impact
<b>Human (Health and Safety)</b>						
Unexploded Ordnance	Constructed areas	During the construction	Very low incidence of UXO	Develop appropriate technical measure for safe infrastructure development and resettlement	8	No Significant Impact
Parasitic, water borne and communicable, sexual transmitted disease due to influx workers, project employees	DSHPP area	During the construction	Potential minor negative impact can be mitigated	Establishing health care system to prevent, control and provide medical treatment Screening and medical surveys of all employees before engagement Provide education on health and hygiene Work closely with local and provincial health Departments	9	No Significant Impact
Safety hazards for villagers, workers and project employees at	Workers, project employees, surrounding villagers	During the construction	Potential minor negative impact can be mitigated	Develop or adopt the international best practices on occupational Health and safety at the work place (in Contractor's	10	No Significant Impact

Potential Impact	Impact Areas	Impact Duration and Period	Impact Significance	Required Mitigation/Management Measures	Meas. # (see Annex B)	Potential Residual Impacts
work places				EMMP and Health and Safety Plan) Establish local and village security committee		
<b>Social and Economics</b>						
Employment opportunities	Project areas, and surrounding villages	During the construction	Positive major positive impacts	Required by RAP	<b>RAP</b>	<b>Positive Impact</b>
Housing and Resettlement need	Project areas; 11 families & houses on Don Sahong and Don Sadam need to resettle	Entire project life	Potential minor negative impact can be mitigated	Implement resettlement program and provide compensation per RAP Establish grievance and other committees as per the RAP	<b>RAP</b>	<b>No Significant Impact, with RAP and SMMP</b>
Loss of infrastructure	Project areas, and surrounding villages		Potential positive impact. Infrastructure will be improved by Project.	Inventory all existing infrastructure, developing management program prior to construction. Carry out DSHPP infrastructure improvements	<b>N.A.</b>	<b>Positive Impact</b>
Loss of fishery	Hou Sahong, Hou Sadam, Hou Xang Pheuak	Entire project life without mitigation	Potential major negative impact that can be mitigated	Implement FishMAP, (DSHPP Fisheries Monitoring Action Plan) and SMMP Dependency on fishery will be replaced with alternative livelihood systems	<b>7</b>	<b>No Significant Impact, with FishMAP and SMMP</b>
Loss of paddy lands	29.4 hectares	Entire project life	Potential minor negative impact can be mitigated	Establish committees to identify measures and options for compensation	<b>6</b>	<b>No Significant Impact, with SMMP</b>
ROW for Access roads	Affected and surrounding villages	Entire project life	Potential major positive impacts; having new access roads	Require a separate IEE	<b>IEE</b>	<b>Positive Impact</b>
Power supply	Affected and surrounding villages	Entire project life	Potential major positive impacts on local and surrounding villages	Required by RAP and SMMP	<b>RAP /SMMP</b>	<b>Positive Impact</b>
<b>Aesthetic and cultural</b>						
Landscape and visual impacts	Hou Sahong and constructed areas	Entire project life	No Impact anticipated	None required	<b>N.A.</b>	<b>No Significant Impact</b>

Potential Impact	Impact Areas	Impact Duration and Period	Impact Significance	Required Mitigation/Management Measures	Meas. # (see Annex B)	Potential Residual Impacts
Impacts to Religious places and Structures	Constructed areas	Entire project life	No Impact anticipated	None required	N.A.	No Significant Impact
<b>Operations Phase</b>						
<b>Surface Water</b>						
Flow variation	Mekong River	Entire project life	No Impact anticipated	None required	N.A.	No Significant Impact
Water Quality	Mekong River	Entire project life	No Impact anticipated	None required	N.A.	No Significant Impact
Water Balance	Mekong River	Entire project life	No Impact anticipated	None required	N.A.	No Significant Impact
Flooding	DSHPP area	Entire project life	No Impact anticipated	None required	N.A.	No Significant Impact
Existing Use	DSHPP area	Entire project life	No Impact anticipated	None required	N.A.	No Significant Impact
<b>Biological/Ecological</b>						
Impacts to fish migration and aquatic habitats	Mekong River at the GFL	Entire project life without mitigation	Potential major negative impact that can be mitigated	Implement FishMAP, (DSHPP Fisheries Monitoring and Action Plan).	7	No Significant Impact, with FishMAP
Impact to Irrawaddy Dolphin	Downstream of the DSHPP	Entire project life	Potential minor negative impact can be mitigated	Fish food supply to be maintained through FishMAP Mekong flows and water quality essentially unchanged in dolphin areas	7	No Significant Impact, with FishMAP
<b>Human</b>						
Aesthetic and cultural	DSHPP area	Entire project life	No Impact anticipated	None required	N.A.	No Significant Impact
Landscape and visual impacts	Hou Sahong	Entire project life	No Impact anticipated	None required	N.A.	No Significant Impact
Dam failure	Mekong River downstream	May never occur	Major impact, but unlikely to occur	No major impoundment. Dam failure plan for maximum flood based on designed overflow portion western embankment into the Mekong.	N.A.	No Significant Impact

Potential Impact	Impact Areas	Impact Duration and Period	Impact Significance	Required Mitigation/Management Measures	Meas. # (see Annex B)	Potential Residual Impacts
<b>Decommissioning Phase</b>						
<b>Physiochemical</b>						
<b>Land</b>						
Flood plain/swamp	Hou Sahong	After decommissioning	Potential minor positive impact	None required	N.A.	No Significant Impact
Seismic	Hou Sahong	During and after decommissioning	Potential minor negative impact	Minimize the potential effects of seismic events in the design of the decommissioning	N.A.	No Significant Impact
<b>Surface Water</b>						
Flow Variation	Mekong River	After decommissioning	No change anticipated	None required	N.A.	No Significant Impact
<b>Noise</b>						
Increasing traffic level	Project areas and nearby villagers	During decommissioning	Potential minor Negative impact	Adopting International standards on occupational Health and safety as well as noise minimization program	1	No Significant Impact
Blasting and removing dam and concrete infrastructure	DSHPP area	During decommissioning	Potential minor Negative impact	Blasting may affect aquatic animals. Other methods to be used.	11	No Significant Impact
<b>Air quality</b>						
Dust and air pollutants due to truck movement, removing dam and concrete infrastructure	Project areas and nearby villagers	During decommissioning	Potential minor Negative impact	Develop site management program for dust suppression prior to decommissioning.	2	No Significant Impact
Increasing transport network	Project areas and nearby villagers	During decommissioning	Potential minor Negative impact	Appropriate road engineering; good compacting and runoff design, reduce speed limits, developing watering schedule for all unpaved roads	N.A.	No Significant Impact
<b>Biological/Ecological</b>						
Fish migration	Hou Sahong	During decommissioning	Potential minor positive impact	Restore fish ability to move freely through the channel. Short-term negative impacts possible during dam removal until natural conditions are restored	N.A.	Positive Impact
Terrestrial vegetation	Project areas	After the project	Potential Minor	Restore original plant communities.	N.A.	Positive Impact

Potential Impact	Impact Areas	Impact Duration and Period	Impact Significance	Required Mitigation/Management Measures	Meas. # (see Annex B)	Potential Residual Impacts
and wildlife		decommissioning	Positive Impact	Short-term negative impacts possible during dam removal until natural conditions are restored		
Endangered species	Mekong River	After the project decommissioning	No Impact Anticipated	None required	<b>N.A.</b>	<b>No Significant Impact</b>
Aquatic habitat	DSHPP area	After the project decommissioning	Potential Minor Positive Impact	Restore aquatic habitat.	<b>7</b>	<b>Positive Impact, with FishMAP</b>
<b>Human</b>						
Fisheries	DSHPP area	After the project decommissioning	Potential Minor Positive Impact	Restore fishery activities	<b>7</b>	<b>Positive Impact, with FishMAP</b>
Employment	Project areas and nearby villages	During decommissioning	Potential Minor Positive Impact	Creating work and job opportunity	<b>N.A.</b>	<b>Positive Impact</b>
Employment		After the project decommissioning	Potential Minor Negative Impact	Apply the SMMP during construction and operation	<b>SMMP</b>	<b>No Significant Impact, with long-term results of the SMMP</b>
Landscape	DSHPP area	After the project decommissioning	Potential Minor Positive Impact	Restore/rehabilitate visual landscape	<b>N.A.</b>	<b>Positive Impact</b>
Tourism	Project areas and nearby villages	During and after the project decommissioning	No Impact Anticipated	None required	<b>N.A.</b>	<b>No Significant Impact</b>

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## **5 DSHPP MANAGEMENT ARRANGEMENTS AND STAFFING**

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### **5.1 Environmental Management Office**

The make-up of the DSHPP Environmental Management Office (EMO) is important as it ensures that the project conforms with the environmental criteria by the legislation and as required by the Final EIA. A full-time experienced Environmental Manager (EM) will be appointed who will be responsible to the DSHPP Project Manager. His/her role would include:

- Liaison with the GOL agencies including MoNRE, DOE, Provincial and District agencies and other parties concerned with day-to-day EMMP matters
- Represent the DSHPP interests at meetings on all environmental matters
- Coordination of the EMMP activities and supervision of parties involved, including temporary staff from government agencies and consultants
- Responsibility for all environmental reports
- Responsible for public relations and communication, including stakeholders meetings and involvement with local communities and authorities on environmental matters.

Minimum requirements for the Environmental Manager will include an advanced degree in environmental science or social science and ten years' experience in similar assignments. Lao language required and ability to communicate verbally and in writing in English.

The Environmental Manager will require a staff to assist him in these duties and this has been included in the budget for the EMMP. It is anticipated that staff will include one junior environmental expert, an administrative assistant, and a driver.

### **5.2 Project Environmental Management Plan including Monitoring**

#### **5.2.1 Environmental Management Measures**

The EMMP defines the proposed environmental protection measures and monitoring programs in terms of ensuring that impacts are properly managed and the project is sustainable. Each management measure requires details to be provided according to a schedule and includes

- Clear and distinct description of the measure
- Methods and their implementation
- Maps and drawings to assist with implementation
- Arrangements for data collection, analysis and storage.

Please refer to Annex B for the required detailed information for each management measure.

#### **5.2.2 Monitoring Measures**

Details are provided on the type of monitoring (ambient, validation, effectiveness and compliance), the sampling parameters, locations, frequency and timing of monitoring and reporting schedules for each monitoring task. This includes whether they are physical, biological or social aspects. Reporting is a major requirement of all monitoring and requires that recipients be identified in the EMMP and there are provisions for additional monitoring requirements. Details on monitoring and reporting requirements are found in Annex B.

**Table 2 Information Required for each Environmental Management Measure**

<b>INFORMATION REQUIRED</b>	<b>DETAILS</b>
<b>Project Phase</b>	<i>Design, Construction, Operation, or Decommissioning</i>
<b>Environmental Aspect</b>	<i>e.g. road construction, land clearing, transmission line erection, reservoir filling, release of water from dam etc.</i>
<b>Environmental Component</b>	<i>e.g. water quality, soil, wildlife, cultural, resettlement etc...</i>
<b>Environmental Impact and its Significance</b>	<i>as per the EIA</i>
<b>Cause</b>	<i>Something or event that produces an environmental impact.</i>
<b>Consequence</b>	<i>Potential effect or result of the impact if it is not managed.</i>
<b>Environmental Objective/s or Standard/s to be met.</b>	<i>The objective to be achieved by implementing an environmental management measure. It can involve standards such as the water quality standards or objectives such as e.g. all resettled peoples will have an improved standard of living. There can be more than one objective for each environmental management measure. These should, as much as practicable, be measurable.</i>
<b>Environmental Management Measure.</b> <b>This is the environmental protection measure, monitoring measure (ambient or validation monitoring measure) and other measures required to ensure the impact is appropriately managed.</b>	<i>This will include providing details of</i> <ul style="list-style-type: none"> <li>• <i>Clear distinct description of the measure, design details</i></li> <li>• <i>The methodology to implement the measure and involving a step by step process, the frequency, location etc, operating procedures</i></li> <li>• <i>Locality Maps, drawings and other descriptive measures to assist implementation</i></li> <li>• <i>Parameters, sampling technique, data collection, analysis and storage requirements.</i></li> </ul>
<b>Performance Criteria/Targets</b>	<i>The criteria/targets that the performance of the environmental management measure can be measured against.</i>
<b>Effectiveness Monitoring</b>	<i>Monitoring requirements to ensure the environmental management measure is effective and meeting its objective/s. Shall include methodology, parameters to be monitored, sampling technique, frequency and timing, location, data collection, analysis and storage, reporting requirements.</i>
<b>Manpower</b>	<i>Both technical and administrative (non technical) manpower (including details of the required experience and qualifications) needed for implementation of the requirements.</i>
<b>Training</b>	<i>The training required of those involved in the implementation of the environmental management measure to ensure the measure is effectively implemented.</i>
<b>Facilities, Equipment, Material and Supply</b>	<i>The facilities, equipment, material and supply requirements that are needed to ensure the management measure and its requirements are effectively implemented.</i>
<b>Responsibility</b>	<i>Details of all responsibilities of the project owner, contractors etc. That is who will be responsible for each aspect or stage of implementing the Environmental Management Measure. For many management measures there will be more than one responsibility e.g. coordination, implementation, monitoring, corrective action etc.</i>
<b>Stakeholders</b>	<i>Details of the stakeholders relevant to the implementation of the environmental management measure</i>
<b>Public Involvement Activity/ies</b>	<i>Details of all the public involvement activities that are associated with the implementation of the environmental management measure</i>
<b>Implementation Schedule</b>	<i>Environmental management measure commencement date, duration and frequency. To include procurement (equipment, materials &amp; supply), training and reporting schedules.</i>
<b>Costs</b>	<i>Detail costings of all requirements, including the timing of the costs to ensure the measure's effective implementation</i>
<b>Reporting Requirements</b>	<i>What aspects of the measure and its monitoring that need reporting, the frequency, to whom, timing etc.</i>

Source: Appendix A, Table 1 of the document EM/05/00 ENVIRONMENTAL MANAGEMENT STANDARD, ENVIRONMENTAL MANAGEMENT PLANS FOR ELECTRICITY PROJECTS, issued by Department of Electricity 26 July 2001

### **5.2.3 Contractor's Environmental Management Plans (CEMMP)**

All main contractors on hydropower projects are required to develop and implement a CEMMP for their respective works and these should conform with the overall EMMP, as approved for the project. Of necessity this overall EMMP by the Project Proponent will be completed prior to tender documents being prepared for the DSHPP. The DOE, MoNRE and the EMO are responsible for approving and monitoring of all the CEMMPs associated with the DSHPP construction and operation.

Annex C contains a series of special specifications that will become part of the tender documents. These cover environmental and social issues. Also included in this section is an outline of the requirements for the CEMMPs.

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## **6 PUBLIC INVOLVEMENT / CORRECTIVE ACTIONS FOR EMMP**

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A Public Involvement Process for developing and implementing the EMMP is outlined in Requirement 10. It should be noted that this process is indicated to be part of the EIA process but for the DSHPP this is considered to be an evolving process with changes during EMMP implementation. However, none of the proposed management measures have been discussed at Stakeholders' Meetings held to date and public involvement is to include, as examples:

- All stakeholders including directly and indirectly affected persons
- Information on the proposed activities and consultation with stakeholders
- Any changes proposed to the EMMP and stakeholders' opinions on these
- Reporting requirements for the EMMP.

There are provisions in the EMS for corrective actions to be applied to the EMMP, if the results of monitoring indicate problems or inaccuracies exist in the project design, construction and implementation. Appropriate corrective actions can be applied and the responsibilities for undertaking and reporting on these actions are defined in this document.

## 7 EMMP IMPLEMENTATION COSTS

While preparation of the EMMP for DSHPP is dependent on the final configuration of the Project to be negotiated with the GOL there are five (5) different phases in developing and implementing the EMMP:

- Organization of the DSHPP's Environmental Management Office and Advisory Committees
- Design Phase and Pre-impoundment Environmental Measurements as indicated in the EIA
- Environmental Measures During the Construction Phase
- Environmental Measures During the first ten years of the Operation Phase
- Long-Term Environmental Measures during the life of the project.

Table 3 lists the various environmental measures important for each project phase, the agencies responsible for and executing each measure, the duration of the activity, initially budgeted unit costs and total costs. This table is not definitive and should be treated as preliminary and representative at the time of publication of this EMMP. The overall cost estimate in the table will be revised on the basis of the final proposal and implementation plan for the respective works, and negotiations with GOL and local authorities. The other major costs are detailed within the associated RAP and SMMP documents.

Detailed description of activities and costs for the FishMAP program are shown in Annex A. The cost of future refinements or modifications to the Hou Xang Pheuak and Hou Sadam channels cannot be determined until the ongoing monitoring program demonstrates the extent of additional construction required.

**Table 3 Estimated Cost of Basic DSHPP Environmental Management Plan**

No	Environmental Measures	Responsible Agency	Executing Agency	Duration of Activity (months)	Cost Estimate LS or per month	Total Cost for Period (US\$)
<b>A. Organization of the Environmental Management Office (EMO) &amp; Committees</b>						
1	Appointment of EM & Constitution of EMO	GOL/PP	MONRE/ SEMD	3	LS	\$25,000
2	Create & capacity building of EMO and creation of Advisory Committees	MONRE/PP	EMO, consultants	6	LS	\$45,000
3	Preparation of detailed EMMP tasks & working program including budget	GOL/PP	EM/ MONRE/ SEMD	6	LS	\$30,000
4	Preparation of detailed environmental specifications for Tender Contractors	GOL/ PP	EMO/ SEMD / consultants	3	LS	\$25,000
5	Presentation of EMMP to Stakeholders and Finalization of EMMP	GOL/ PP	EMO/ MONRE/ SEMD	3	LS	\$40,000
<b>SUB TOTAL A</b>						<b>\$165,000</b>

No	Environmental Measures	Responsible Agency	Executing Agency	Duration of Activity (months)	Cost Estimate LS or per month	Total Cost for Period (US\$)
<b>B. Design Phase and Pre-impoundment Environmental Measurements as per EIA 2013</b>						
1	Monitoring of DSHPP water quality and reporting – 2 sites X 6 times	GOL/ MRC/PP	EMO & consultant	12	\$ 2,000	\$24,000
2	FishMAP costs - pre-construction (see FishMAP cost detail table)	Various	Various	12	LS	\$650,000
3	Appoint PESMU & DCRC	GOL/ PP	EMO/ SEMD/consultants	3	\$ 10,000	\$30,000
4	Initiate Implementation of RAP	GOL/ PP	EMO/ SEMD/consultants	5	\$ 10,000	\$50,000
5	Consultation and mapping of Project Affected Persons (PAP), and development of detailed resettlement and livelihood restoration implementation programs.	GOL/ PP	EMO/ SEMD/consultants	5	\$ 20,000	\$100,000
<b>SUB TOTAL B</b>						<b>\$854,000</b>
<b>C. Measures During Construction Phase</b>						
1	Provide operating budget for EMO	GOL/ PP	EMO	60	\$ 5,000	\$300,000
2	Monitoring of contractor's construction sites and camps – 4 times per year	GOL/ PP	EMO & CEMMP	20	\$ 3,000	\$60,000
3	Provision for compensation for accidental spill or downstream pollution	MONRE/EMO/ PP	EMU	When justified		\$50,000
4	Monitoring of quarries, borrow, spoil banks and embankments – 6 times per year	EMO	CEMMP/ consultants	30	\$ 1,500	\$45,000
5	Monitoring of timber clearing and salvage by local communities – 2 times only	EMO	EMO /Dept Forestry	2	\$ 2,000	\$4,000
6	Construction and monitoring of water supply facilities for local villages – 6 times per year	EMO	CEMMP/ Dept Health	120	\$ 500	\$60,000

No	Environmental Measures	Responsible Agency	Executing Agency	Duration of Activity (months)	Cost Estimate LS or per month	Total Cost for Period (US\$)	
7	Water quality monitoring in Hou Sahong and around construction sites – 4 sites x 6 times per year	MRC/EMO	Vientiane Laboratory/CEMMP	120	\$ 500	\$60,000	
8	FishMAP costs - Construction Phase (see FishMAP cost detail table)	Various	Various	12	LS	\$1,925,000	
9	All other monitoring of construction activities @ USD 20,000 per year	EMO/CEMMP	EMO / Consultants	60	LS	\$100,000	
10	Miscellaneous monitoring, reporting and stakeholders meetings etc @ USD 10,000 per year	EMO	EMO / CEMMP/ Consultants	60	LS	\$50,000	
<b>SUB TOTAL C</b>						<b>\$2,654,000</b>	
<b>D. Measures During Operation Phase (First ten years)</b>							
1	Provide operating budget for EMO (ten years)	GOL/PP	EMO	120	\$ 5,000	\$600,000	
2	Water quality monitoring at DSHPP 2 sites @ 2 times per year	EMO	Vientiane Laboratory	20	\$ 500	\$250,000	
3	Monitoring of 3 year culture development in DSHPP pondage -	EMO	EMO/ Consultant/ Dept. of Fisheries	As Determined	LS	\$100,000	
4	FishMAP costs - first ten years of operation (see FishMAP cost detail table)	Various	Various	12	LS	\$2,425,000	
5	Monitoring of entire DSHPP incl. reports on restoration and forestry plantation resources for 2 years	EMO/ MONRE & SMED	EMO/ POE	24	LS	\$30,000	
<b>SUB TOTAL D</b>						<b>\$3,405,000</b>	
<b>Total of Items A, B, C, D :</b>						<b>\$7,078,000</b>	
<b>Other Mitigation Costs:</b>							
					<b>Contingency:</b>	<b>30%</b>	<b>\$2,123,400</b>
						<b>RAP:</b>	<b>\$967,500</b>
						<b>SMMP:</b>	<b>\$1,555,600</b>
<b>Estimated Construction Cost for Xang Pheuak and Sadam modifications (see note below):</b>						<b>\$12,000,000</b>	
<b>Total Mitigation Cost:</b>						<b>\$23,724,500</b>	

No	Environmental Measures	Responsible Agency	Executing Agency	Duration of Activity (months)	Cost Estimate LS or per month	Total Cost for Period (US\$)
<b>Percent of total project cost:</b>						<b>3.5%</b>
<b>Total project cost:</b>						<b>\$680,000,000</b>
<b>Note: Construction Costs to be determined after final design and receipt of bids.</b>						

Notes :

- CEMMP = Contractor's Environmental Management Plan
- DCRC = District Compensation and Resettlement Committee (Khong District)
- EM = Environmental Manager
- EMO = Environmental Management Office
- EMMP = Environmental Management Plan
- FishMAP = DSHPP Fisheries Monitoring Action Plan (see Annex A)
- GOL = Government of Laos
- MRC = Mekong River Commission
- PP = Project Proponent
- PESC = Provincial Environment and Social Committee (Champasak Province)
- PESMU = Provincial Environment and Social Management Unit
- SEMD = Social and Environmental Management Division (Department of Electricity)
- MoNRE = Ministry of Natural Resources and Environment (Prime Minister's Department)

### 7.1 Preliminary RAP Budget

Refer to Section 9 of the associated RAP.

### 7.2 Preliminary SMMP Budget

Refer to Section 11 of the associated SMMP.

## **8 REFERENCES**

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AECOM (2011). Don Sahong Hydropower Project - Engineering Status Report. September, 2011.

NCC (2013). Final Environmental Impact Assessment, Don Sahong Hydropower Project, Lao PDR.

## ANNEX A: DSHPP FISHERIES MONITORING AND ACTION PLAN (FISHMAP)

The tables below illustrate the specific actions to be taken as part of the FishMAP plan during the pre-construction, construction, and operation (first ten years). The costs of modifications to the Hou Xang Pheuak and Hou Sadam are included in the overall Project Construction Costs and a preliminary estimate is shown in Table 3 of the main EMMP report.

Summary of FishMAP Budget	
Time Period	Estimated Budget
Pre-Construction	\$650,000
Construction Period	\$1,925,000
Operation Period (first ten years)	\$2,425,000
Total	\$5,000,000

**Table 4 FishMAP Pre-Construction Activities and Budget**

Item	Action	Operations	Responsibility	Estimated Budget
PC1	Engage a long-term fisheries monitoring team with linkages to GOL line agencies.	Develop and have reviewed by the core expert group and the GOL a regular program for monitoring of fisheries activities in the area, and specifically the three main channels in the Project footprint area.	DSHPP and GOL	<b>\$250,000</b>
PC2	Long-term fisheries monitoring team to gather a fisheries baseline dataset for use as a bench mark during construction and operational phases to evaluate impact mitigation and alternative Livelihood development program success.	Monitor (pre-channel modification) daily fish catch-rates in fixed traps in the Hou Xang Pheuak, Sahong and Sadam channels as a measure of migration intensity and localized area density of migratory fish.	DSHPP and GOL	<b>\$50,000</b>
PC3		Monitor (pre-channel modification) peak larval fish downstream drift upstream and downstream of all the major channels to develop a model on drift intensity and survival across the GFL.	DSHPP and GOL	<b>\$50,000</b>

Item	Action	Operations	Responsibility	Estimated Budget
PC4		Monitor household fishing effort, fish-catch and subsistence or commercial production activities in the Siphandone area, and specifically the three main channels in the Project footprint area.	DSHPP and GOL	\$50,000
PC5		Monitor fish landings at Nakasang and Veunkham fish markets	DSHPP	\$50,000
PC6	Fund an annual trans-boundary fisheries workshop	Develop linkages between Cambodian and Lao fisheries line agencies by funding an annual workshop to promote an exchange of information and explore possible joint study opportunities and funding	DSHPP	\$75,000
PC7	Seek agreement with local communities on a system of annually renting fishing assets/areas	Negotiate with individual or collective households to rent (and not operate) fixed fish-traps in the three channels during Project construction and operational phase.	DSHPP and GOL	\$10,000
PC8		Negotiate with village and inter-village groupings to protect migratory pathway areas in and adjacent to the three channels during Project construction and operational phase (Ban Hou Sadam, Hang Sadam, Hou Sahong, Don Phapheng, Hang Khone and Esom).		\$15,000
PC9	Undertake Phase 1 modifications to improve fish passage	In Hou Sadam channel, excavate the upstream inlet to increase dry season flow/depth, and dredge the downstream exit of the channel and place rock guiding walls to direct the flow towards the center of the downstream main channel.	DSHPP	see note

Item	Action	Operations	Responsibility	Estimated Budget
PC10		In Hou Xang Pheuak, modify banks slopes at each channel constriction and modify the Khone Larne rock bar to provide year round fish passage channels.		see note
PC11	Assess fish passage after Phase 1 modifications	Assess success of fish passage improvements in Hou Sadam during the wet season by monitoring daily fish catch-rates in fixed traps and compare with pre-modification intensity and localized area density of migratory fish in both upstream and downstream areas of the channel.	DSHPP and GOL	\$50,000
PC12		Assess success of fish passage improvements in Hou Xang Pheuak during the wet season by monitoring daily fish catch-rates in fixed traps and compare with pre-modification intensity and localized area density of migratory fish in both upstream and downstream areas of the channel.		\$50,000
	total cost for <b>Pre-Construction</b> Activities			<b>\$650,000</b>
Note:	Modifications to Xang Pheuak and Sadam are included in the Project construction costs			

**Table 5 FishMAP Construction Activities and Budget**

<b>Item</b>	<b>Action</b>	<b>Operations</b>	<b>Responsibility</b>	<b>Estimated Budget</b>
C1	Compensate for Permanent Loss of Fishing Right in Hou Sahong	Rent all fixed fish-traps and general area fishing rights in Hou Sahong channels as per agreement made in PC7 and PC8 (based on annually declining payments linked to alternative livelihood development success).	DSHPP, GOL	<b>\$750,000</b>
C2	Compensate for Construction Disturbance by Protecting Migratory Fish Pathways	Rent all fixed fish-traps and general area fishing rights in Hou Xang Pheuak and Hou Sadam channels per agreement made in PC7 and PC8 for duration of construction period	DSHPP, GOL	<b>\$375,000</b>
C3		Monitor fishing pressure in areas adjacent (upstream) of all three channels for duration of construction period and recommend fishing control measures as needed.	DSHPP, GOL	<b>\$150,000</b>
C4	Modification of Xang Pheuak and Sadam channels	Modify the two channels and assess their ability to provide adequate fish passage during the onset of the wet season will be undertaken before any works commences in the Sahong channel in the following dry season.	DSHPP	<b>see note</b>
C5	Optimization of Xang Pheuak and Sadam channel modifications	After assessment the two channels will be modified if required before any works commences in the Sahong channel in the following dry season	DSHPP	<b>see note</b>

Item	Action	Operations	Responsibility	Estimated Budget
C6	Minimization of impacts during construction	Monitoring of fish, both in local villager fish-catch and by direct sampling, plus a comprehensive water quality monitoring programs, will be needed in areas adjacent to the construction areas to evaluate construction impacts and guide impacts reduction.	DSHPP	<b>\$400,000</b>
C7	Fisheries monitoring team to monitor and evaluate impact mitigation success compared to baseline dataset.	Monitor daily fish catch-rates in selectively operated (by employed traditional owners) fixed traps in the Hou Xang Pheuak and Sadam channels as a measure of migration intensity and localized area density of migratory fish.	DSHPP	<b>\$50,000</b>
C8		Monitor peak larval fish downstream drift upstream and downstream of all the major channels across the GFL.	DSHPP	<b>\$50,000</b>
C9		Monitor household fishing effort, fish-catch and subsistence or commercial production activities in the Siphandone area and document changes over time and investigate if project related.	DSHPP	<b>\$75,000</b>
C10		Monitor fish landings at Nakasang and Viengkham fish markets and document changes over time and investigate if project related.	DSHPP	<b>\$75,000</b>
total cost for Construction Activities				<b>\$1,925,000</b>
Note:	Modifications to Xang Pheuak and Sadam are included in the Project construction costs			

**Table 6 FishMAP Operations (first 10 Years) Activities and Budget**

<b>Item</b>	<b>Action</b>	<b>Operations</b>	<b>Responsibility</b>	<b>Estimated Budget</b>
O1	Upstream Passage	Monitor daily fish catch-rates in selectively operated (by employed traditional owners) fixed traps in the Hou Xang Pheuak and Sadam channels as a measure of migration intensity and localized area density of migratory fish, combined with direct sampling of accumulation zones.	DSHPP and DoL	<b>\$250,000</b>
O2	Downstream Drift	Monitor peak larval fish downstream drift of the three major channels across the GFL, and in particular monitor survival through the turbines.	DSHPP	<b>\$250,000</b>
O3	Fish Survival Rate Through Turbines	Monitor downstream passage of fish through turbines to quantify survival rate and evaluate fish-friendly performance. DSHPP commits to implementing fish screens and bypass channel if monitoring results indicate that 95% overall fish survival rate is not being achieved.	DSHPP	<b>\$150,000</b>
O4	Household Livelihood Development	Monitor household fish-catch to provide feedback on the success of alternative livelihood programs effect on reducing household's reliance on fisheries income.	DSHPP	<b>\$150,000</b>
O5	Ongoing Optimization of Fish Passage Mitigations	Evaluate the success of all Project mitigation efforts against pre-project conditions, and make modifications as required to reach those targets.	DSHPP and GOL	<b>see note</b>

Item	Action	Operations	Responsibility	Estimated Budget
O6	Community Co-management	Provide support to local villagers to ensure that community co-management groups are adequately resourced, trained, provided with technical monitoring and advice.	DSHPP and GOL	<b>\$750,000</b>
O7	General Area Fisheries Monitoring and Patrolling	Work with the Community Co-management groups, district and provincial fisheries offices to monitor and enforce fisheries regulations and exclusion zones established around the Project	DSHPP, Villagers and GOL	<b>\$450,000</b>
O8	Extension of Project Benefits and Lessons Learned	Provide funding for regular workshops and review studies by Lao fisheries resource managers, educators, community organizations, other riparian countries fisheries line agencies and international NGO's so that the benefits of the Project's experiences are made available to other communities and institutions	DSHPP	<b>\$425,000</b>
total cost for Operation Activities				<b>\$2,425,000</b>

## **ANNEX B: REQUIRED INFORMATION ON ENVIRONMENTAL MANAGEMENT MEASURES**

This annex contains the required information for the Environmental Management Measures presented in Table 2 of this EMMP.

The information for each management measure includes the following details:

- Clear and distinct description of the measure
- Methods and their implementation
- Maps, drawings or instructions to assist with implementation
- Arrangements for data collection, analysis and storage.

<b>Measure 1</b>	<b>NOISE ABATEMENT</b>
Project Phase	Construction, decommissioning
Environmental aspect	Movement of vehicles, blasting, excavation, other construction activities
Environmental Component	Noise and vibration
Environmental Impact and its significance	Potential minor negative impact, can be mitigated
Cause	Noise from all construction activities
Consequence	Annoyance, speech interference, etc.
Environmental Objectives / Standards to be met	Meet WHO guidelines for noise levels in residential areas: 55 dBA Leq
Description of Environmental Management Measure	Adopt International standards on occupational Health and safety as well as noise minimization program (in Contractor's EMMP and contract clauses, see Annex C). Acceptable noise levels per WHO as specified above.
Performance Criteria	Noise levels in residential areas meet standard
Effectiveness Monitoring	Random monitoring by DSHPP EMO or designee during construction. Monitoring will consist of one-hour continuous samples by a sound level meter (SLM) placed approximately 1.5 m above the ground in the center of affected residential area. Information to be archived by EMO. Violations will require action from Contractor to achieve compliance
Manpower	One person (from EMO)
Training	Person to be trained in operation of SLM and proper measuring techniques
Facilities, Equipment, Material and Supply	Type 1 recording sound level meter
Responsibility	DSHPP EMO during construction. GOL during decommissioning
Stakeholders	Villagers, Contractor
Public Involvement Activities	DSHPP EMO to discuss noise measurement procedure with affected residents. Residents encouraged to report high or persistent noise or vibration events.
Implementation Schedule	SLM to be purchased prior to start of construction. Monitoring once a month at random sites during construction
Costs	US\$ 5,000 for SLM. Manpower included in EMO budget
Reporting Requirements	Quarterly reports to be maintained by EMO and made available to MONRE or the public on request.

<b>Measure 2</b>	<b>AIR POLLUTION ABATEMENT</b>
Project Phase	Construction, decommissioning
Environmental aspect	Movement of vehicles, blasting, excavation, other construction activities
Environmental Component	Air quality
Environmental Impact and its significance	Potential minor negative impact, can be mitigated
Cause	Air pollution from various construction activities, particularly trucks and heavy machinery
Consequence	Potential exposure of residents and workers to unhealthy levels of various air pollutants, particularly dust and diesel exhaust
Environmental Objectives / Standards to be met	Meet WHO impact significance criterion for ambient air pollution for fine particulate matter (PM10): 50 µg/m <sup>3</sup> averaged over 24 hours.
Description of Environmental Management Measure	Develop site management program prior the construction Appropriate road engineering; good compacting and runoff design, reduce speed limits, developing watering schedule for all roads (in Contractor's EMMP and contract clauses, see Annex C)
Performance Criteria	PM10 levels in residential areas meet standard
Effectiveness Monitoring	Random monitoring by DSHPP EMO or designee during construction. Monitoring will consist of 24-hour continuous samples by a PM10 monitor in the center of affected residential area. Information to be archived by EMO. Violations will require action from Contractor to achieve compliance
Manpower	One person (from EMO)
Training	Person to be trained in operation of PM10 monitor and proper measuring techniques
Facilities, Equipment, Material and Supply	PM10 monitor
Responsibility	DSHPP EMO during construction. GOL during decommissioning
Stakeholders	Villagers, Contractor
Public Involvement Activities	DSHPP EMO to discuss air quality measurement procedure with affected residents. Residents encouraged to report incidences of high or smoke or other emissions from the construction zone that affect their village.
Implementation Schedule	PM10 to be purchased prior to start of construction. Monitoring once a month at random sites during construction
Costs	US\$ 6,000 for PM10 monitor and supplies. Manpower included in EMO budget
Reporting Requirements	Quarterly reports to be maintained by EMO and made available to MONRE or the public on request.

<b>Measure 3</b>	<b>WATER QUALITY PROTECTION</b>
Project Phase	Construction and Operation
Environmental aspect	Earth moving activities, blasting, excavation, other construction activities
Environmental Component	Water Pollution, soil erosion and siltation
Environmental Impact and its significance	Potential minor negative impact, can be mitigated
Cause	Inappropriate earthwork activities throughout project site, including embankments, road, bridge, and areas subjected to drawdown. Accidental spills.
Consequence	Potential large loads of silt or other pollutants entering the Mekong affecting fish and other wildlife
Environmental Objectives / Standards to be met	Meet international best management practices for control of erosion and accidental spills during construction.
Description of Environmental Management Measure	Develop best management practice on soil erosion and sedimentation at all constructed areas as well as pollution control technique Maximize the use of excavated rocks, develop runoff system , installing sediment traps, rehabilitate construction areas by planting shrubs and trees Develop appropriate monitoring program (in Contractor's EMMP) Develop site management program prior the construction Appropriate road engineering; good compacting and runoff design, reduce speed limits, developing watering schedule for all roads (in Contractor's EMMP and contract clauses, Annex C)
Performance Criteria	No erosion or pollutants from spills reach the Mekong
Effectiveness Monitoring	Random visual monitoring by DSHPP EMO or designee during construction. Violations will require action from Contractor to achieve compliance
Manpower	One person (from EMO)
Training	Person to be trained in the identification of erosion, siltation, or improper management of fuels or other substances that are subject to spillage and contamination of water courses.
Facilities, Equipment, Material and Supply	None
Responsibility	DSHPP EMO
Stakeholders	Villagers, Contractor
Public Involvement Activities	DSHPP EMO to discuss water quality monitoring procedures with affected residents. Residents encouraged to report incidences of erosion or uncontrolled spills from the construction zone.
Implementation Schedule	Monitoring once a month at random sites during construction
Costs	Manpower included in EMO budget
Reporting Requirements	Quarterly reports to be maintained by EMO and made available to MONRE or the public on request.

<b>Measure 4</b>	<b>HANDLING/STORAGE OF FUEL AND EXPLOSIVE MATERIALS</b>
Project Phase	Construction
Environmental aspect	Blasting, excavation, other general construction activities
Environmental Component	Hazardous materials
Environmental Impact and its significance	Potential minor negative impact, can be mitigated
Cause	Inappropriate handling, transportation and storage of hazardous materials
Consequence	Potential exposure of residents as well as local flora and fauna to dangerous levels of hazardous contaminants, fires, or explosions.
Environmental Objectives / Standards to be met	Meet international best management practices for Handling and Storage of Fuel and Explosive materials
Description of Environmental Management Measure	Develop specific policy, safety, emergency response and SOP which comply to international standards, install oils and grease aggregators and separators and appropriate storage facilities, including secondary containment for fuel depots (in Contractor's EMMP and contract clauses, Annex C)
Performance Criteria	No incidents of exposure to hazardous materials or wastes
Effectiveness Monitoring	Random visual monitoring by DSHPP EMO or designee during construction to ensure compliance with Contractor's EMMP and contract clauses. Violations will require action from Contractor to achieve compliance
Manpower	One person (from EMO)
Training	Person to be trained in the identification of proper handling, transport, and storage of hazardous materials to be used for construction.
Facilities, Equipment, Material and Supply	None
Responsibility	DSHPP EMO
Stakeholders	Villagers, Contractor
Public Involvement Activities	DSHPP EMO to discuss hazardous materials management procedures with affected residents. Residents encouraged to report incidences of unsafe hazardous materials management in the construction zone or access roads.
Implementation Schedule	Monitoring once a month at random sites during construction, especially at construction and staging camps.
Costs	Manpower included in EMO budget
Reporting Requirements	Quarterly reports to be maintained by EMO and made available to MONRE or the public on request.

<b>Measure 5</b>	<b>DISPOSAL OF SPOILS AND SOLID WASTE</b>
Project Phase	Construction
Environmental aspect	Earth-moving, blasting, excavation, other general construction activities
Environmental Component	Disposal of earth, rock spoils and solid waste
Environmental Impact and its significance	Potential minor negative impact, can be mitigated
Cause	Inappropriate handling, transportation and disposal of waste materials
Consequence	Impact on the utility of land where spoils are to be dumped, especially if land is in productive use by individuals or community. Construction solid wastes may contain hazardous materials that may contaminate the soil or ground water.
Environmental Objectives / Standards to be met	Reduce as possible the amount of spoils to be disposed. Meet international best management practices for spoils and solid waste disposal associated with construction. Achieve agreement with local leaders regarding the location of disposal sites.
Description of Environmental Management Measure	Attempt to reduce the amount of spoil by using it for Project construction purposes where this meets engineering criteria. Through negotiations with local village leaders, identify earth, rock, and solid waste disposal sites and develop best practice management program (in Contractor's EMMP and contract clauses, Annex C)
Performance Criteria	No incidents of improper disposal of spoil or solid waste
Effectiveness Monitoring	Random visual monitoring by DSHPP EMO or designee during construction to ensure compliance with Contractor's EMMP and contract clauses. Violations will require action from Contractor to achieve compliance
Manpower	One person (from EMO)
Training	Person to be trained in the identification of proper spoil and solid waste disposal
Facilities, Equipment, Material and Supply	None
Responsibility	DSHPP EMO
Stakeholders	Villagers, Contractor
Public Involvement Activities	DSHPP EMO to discuss appropriate spoil and solid waste management procedures with affected residents. Residents encouraged to report incidences of unsuitable disposal sites or if disposal takes place without the agreement of the local village leaders.
Implementation Schedule	Monitoring once a month at random sites during construction, especially at embankment construction sites and staging camps.
Costs	Manpower included in EMO budget
Reporting Requirements	Quarterly reports to be maintained by EMO and made available to MONRE or the public on request.

<b>Measure 6</b>	<b>PROTECTION OF TERRESTRIAL VEGETATION</b>
Project Phase	Construction and during project life
Environmental aspect	General construction activities around the power house, switch yards, camps, embankments, transmission lines, access roads and resettlement village site. Estimated 29.4 ha of paddy land, 169.9 ha of forest will be used for the construction.
Environmental Component	Loss of forest, plantation trees and wild life
Environmental Impact and its significance	Potential minor negative impact, can be mitigated
Cause	Inappropriate clearing and grubbing. Unnecessary felling of trees or burning underbrush.
Consequence	Losses to the channel ecosystem, particularly of trees of use to the local communities. These forest resources include bamboo and suitable species for poles and firewood.
Environmental Objectives / Standards to be met	Achieve agreement with local leaders regarding the management of terrestrial vegetation in the vicinity of the construction area.
Description of Environmental Management Measure	<p>Include forest management measures in Contractor's EMMP and contract clauses (Annex C).</p> <p>Map and inventory impacted areas including village areas, project works areas, spoil disposal, quarry and temporary land use</p> <p>Consult with local villagers and forestry provincial government to minimize impact</p> <p>Establish committees to identify measures and options for compensation where appropriate</p> <p>Set up a reforestation and wildlife conservation program</p>
Performance Criteria	No incidents of improper destruction of terrestrial vegetation
Effectiveness Monitoring	Random visual monitoring by DSHPP EMO or designee during construction to ensure compliance with Contractor's EMMP and contract clauses. Violations will require action from Contractor to achieve compliance
Manpower	One person (from EMO)
Training	Person to be trained in the identification of valuable trees and other vegetation. Training support to be requested from the GOL agencies involved in these issues, or from the National University of Laos.
Facilities, Equipment, Material and Supply	None
Responsibility	DSHPP EMO
Stakeholders	Villagers, Contractor
Public Involvement Activities	DSHPP EMO to discuss appropriate management of vegetation resource management procedures with affected residents. Residents encouraged to report incidences of vegetation destruction that takes place without the agreement of the local village leaders.
Implementation Schedule	Monitoring once a month at random sites during construction, especially at embankment construction sites, transmission line corridors, resettlement village area, and staging / construction camps.
Costs	Manpower included in EMO budget
Reporting Requirements	Quarterly reports to be maintained by EMO and made available to MONRE or the public on request.

<b>Measure 7</b>	<b>PROTECTION OF AQUATIC HABITATS AND RESOURCES</b>
Project Phase	Construction, operation and during project life
Environmental aspect	Completion of the Project, General construction activities in or near the Mekong River and the affected channels.
Environmental Component	Reduced Aquatic Habitats; Impact to Irrawaddy Dolphin downstream of DSHPP; Reduced fish migration
Environmental Impact and its significance	Potential major negative impact, can be mitigated
Cause	Permanent closure of the Hou Sahong by the DSHPP dam.
Consequence	Potential losses to the channel ecosystems. Interruption of fish migration across the GFL causing losses to the fisheries industry of the Lower Mekong Basin
Environmental Objectives / Standards to be met	Lack of impact to the fish migration process. Establishment of a sustainable fisheries management program in the area. Lack of impact to the habitat of the Mekong dolphin population.
Description of Environmental Management Measure	For dolphins, excavation not to include underwater blasting. Ensure that Mekong flows and water quality essentially unchanged in dolphin areas Implement FishMAP, (DSHPP Fisheries Monitoring Action Plan) – See Annex A
Performance Criteria	Achievement of Environmental Objectives through various monitoring programs described in the FishMAP
Effectiveness Monitoring	FishMAP (Annex A) has detailed process of monitoring during a ten-year program with adaptive changes made as necessary to the fish passage modifications.
Manpower	FishMAP will include construction of modifications to the Hou Xang Pheuak and Hou Sadam. Detailed monitoring over the ten-year period will require two qualified individuals with a long-term contract. The Environmental Manager of the EMO will provide oversight.
Training	The staff carrying out the FishMAP monitoring and adaptive modification planning will be experts in the field who have developed the program and carried out the earlier studies.
Facilities, Equipment, Material and Supply	Construction of the modifications to be carried out by Contractor using equipment already available for the Project implementation. No additional equipment needed for monitoring, other than transport.
Responsibility	DSHPP, Contractor, FishMAP Consultants
Stakeholders	Villagers, Contractor, fishers in the Lower Mekong River basin.
Public Involvement Activities	FishMAP includes numerous public involvement activities. In addition, the DSHPP SMMP (bound separately) also includes extensive public involvement activities to support an alternative livelihoods program.
Implementation Schedule	FishMAP will be implemented over a period encompassing the pre-construction time, construction, and for ten years following commissioning of the Project.
Costs	Included in FishMAP (Annex A), SMMP and RAP Construction Budgets.
Reporting Requirements	Quarterly oversight reports to be maintained by EMO and made available to MONRE or the public on request.

<b>Measure 8</b>	<b>PROTECTION AGAINST UNEXPLODED ORDNANCE</b>
Project Phase	Construction and during project life
Environmental aspect	General construction activities around the powerhouse, switch yards, camps, embankments, transmission lines, access roads and resettlement village site.
Environmental Component	Unexploded Ordnance (UXO)
Environmental Impact and its significance	Very low incidence of UXO in the DSHPP area according to available studies
Cause	Aerial bombing during the Indochina War, although the DSHPP area was not affected
Consequence	Potential loss of life or injuries to residents, resettlers, or workers. Damage to infrastructure.
Environmental Objectives / Standards to be met	Prevent UXO incidents during construction of the DSHPP, including the Project, the resettlement village, the access roads, and the transmission lines.
Description of Environmental Management Measure	Undertake a technical survey of the actual construction works areas before construction starts Develop appropriate technical measures for safe infrastructure development and resettlement
Performance Criteria	No uncontrolled UXO incidents during DSHPP implementation
Effectiveness Monitoring	DSHPP EMO to be responsible for monitoring UXO investigation and tracking any discovery of UXO or other incident
Manpower	One person (from EMO)
Training	Person to be trained in UXO management (not UXO identification and clearance) by qualified organizations working on UXO clearance in Lao PDR.
Facilities, Equipment, Material and Supply	None
Responsibility	DSHPP EMO
Stakeholders	Villagers, Contractor personnel, others accessing the site.
Public Involvement Activities	After appropriate training, DSHPP EMO to discuss appropriate UXO management with affected residents.
Implementation Schedule	UXO technical survey prior to construction. Management program throughout the construction period.
Costs	US\$25,000 for technical survey by qualified organization
Reporting Requirements	Monthly incident reports to be maintained by EMO and made available to MONRE or the public on request.

Measure 9	PROTECTION AGAINST HEALTH IMPACTS
Project Phase	Construction
Environmental aspect	General construction activities around the powerhouse, switch yards, camps, embankments, transmission lines, access roads and resettlement village site.
Environmental Component	Parasitic, water borne and communicable, sexually transmitted disease.
Environmental Impact and its significance	Increase in the above diseases due to the influx of workers and project employees in the DSHPP area
Cause	Infections transmitted to islanders from outside sources
Consequence	Deterioration of local residents' health.
Environmental Objectives / Standards to be met	Prevent negative health impacts
Description of Environmental Management Measure	<ul style="list-style-type: none"> <li>• Medical surveys of all employees as a condition of engagement and treatment of any infections</li> <li>• Provision of treated mosquito nets to all local communities and to all camps, residual spraying of all worksites and camps and monitoring programs of disease vectors and diseases</li> <li>• Elimination of small standing pools as breeding habitat</li> <li>• Routine treatment program for <i>S. mekongi</i> and other intestinal disease with appropriate drugs for both the local communities and workers in camps</li> <li>• Discouragement of worker bathing in the Mekong River at all times</li> <li>• Discouragement of workers through public awareness programs of linkage of eating local raw fish</li> <li>• An active program including community and worker awareness and treatment for Sexually Transmitted Infection (STI) and HIV infection.</li> <li>• Coverage of these issues in the Contractor EMMP and contract clauses (Annex C)</li> </ul>
Performance Criteria	No deterioration of residents' health during and after construction
Effectiveness Monitoring	DSHPP EMO to be responsible for oversight monitoring of health issues, in cooperation with provincial and district health authorities
Manpower	One person (from EMO), and a qualified medical consultant to prepare a detailed plan for their construction operation to be engaged by the Contractor and included in the Contractor's EMMP/EHS plan.
Training	EMO person to be trained in medical reporting procedures
Facilities, Equipment, Material and Supply	None
Responsibility	DSHPP EMO and Construction Contractor; local Health Officials and the Champasak Provincial Health Department (PHD)
Stakeholders	Villagers, Contractor personnel, health professionals, and others accessing the site.
Public Involvement Activities	After appropriate training, DSHPP EMO and contractor's medical consultant to discuss appropriate health issues with local people.
Implementation Schedule	Management program throughout the construction period.
Costs	EMO costs included in oversight budget. Medical consultant costs included in Contractor budget
Reporting Requirements	Quarterly incident reports to be maintained by EMO and made available to MONRE or the public on request.

Measure 10	SAFETY MEASURES
Project Phase	Construction and Operation
Environmental aspect	General construction activities around the powerhouse, switch yards, camps, embankments, transmission lines, access roads and resettlement village site.
Environmental Component	Safety hazards for villagers, workers and project employees at work places
Environmental Impact and its significance	Increase in accidents due to construction activities, including traffic on access roads.
Cause	Unsafe construction practices
Consequence	Increased accidents resulting in social and economic costs to villagers and DSHPP
Environmental Objectives / Standards to be met	Prevention of construction-related accidents
Description of Environmental Management Measure	<ul style="list-style-type: none"> <li>• Develop or adopt the international best practices on occupational Health and safety at the work place (in Contractor's EMMP and Health and Safety Plan, and in contract clauses: Annex C)</li> <li>• Establish local and village security committee</li> </ul>
Performance Criteria	No construction-related accidents during and after construction
Effectiveness Monitoring	DSHPP Contractor responsible for establishing and implementing an effective EH&S plan, including monitoring. EMO to be responsible for oversight monitoring of safety issues.
Manpower	One person (from EMO) for oversight, and a H&S team on Contractor's staff.
Training	EMO person to be trained in accident reporting procedures
Facilities, Equipment, Material and Supply	None
Responsibility	DSHPP EMO and Construction Contractor; local traffic police.
Stakeholders	Villagers, Contractor personnel, health and safety professionals, and others accessing the site. Villagers encouraged to report unsafe practices to EMO
Public Involvement Activities	After appropriate training, DSHPP EMO and contractor's H&S staff to discuss appropriate safety issues with local people.
Implementation Schedule	Management program throughout the construction period.
Costs	EMO costs included in oversight budget. H&S plan implementation costs included in Contractor budget
Reporting Requirements	Quarterly incident reports to be maintained by EMO and made available to MONRE or the public on request.

Measure 11	BLASTING FOR DAM REMOVAL MEASURES
Project Phase	Decommissioning
Environmental aspect	General construction activities to remove the powerhouse, switch yards, camps, embankments, and transmission lines. Blasting and removing dam and concrete infrastructure.
Environmental Component	Ecological impacts and increased local noise levels
Environmental Impact and its significance	Blasting will affect aquatic animals. Blast noise will disturb local residents. Underwater blasting may affect fisheries
Cause	Blasting
Consequence	Blasting will affect aquatic animals. Blast noise will disturb local residents. Underwater blasting may affect fisheries
Environmental Objectives / Standards to be met	Prevention of blasting
Description of Environmental Management Measure	Removal of dam, embankments, and other features to be done using non-blasting techniques.
Performance Criteria	No blasting during decommissioning
Effectiveness Monitoring	GOL to ensure that decommissioning activities do not include blasting.
Manpower	GOL, DOE decommissioning manager
Training	None
Facilities, Equipment, Material and Supply	None
Responsibility	GOL, DOE decommissioning manager
Stakeholders	Villagers, Decommissioning Contractor personnel, GOL DOE
Public Involvement Activities	GOL Doe to discuss decommissioning process with local residents and public officials.
Implementation Schedule	Management program throughout the decommissioning period.
Costs	Personnel costs included in GOL budget. Decommissioning Contractor costs included in bid.
Reporting Requirements	Quarterly incident reports to be maintained by GOL DOE

## **ANNEX C: ENVIRONMENTAL AND SOCIAL CLAUSES FOR CIVIL WORKS' CONTRACTS**

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The Mitigation Measures of the EMMP provide general and specific guidance on protection and mitigation of potential environmental damage. The EMMP is attached to the Technical Specifications and shall be considered as binding on the Contractor. All necessary measures on protection of the environment shall be carried out by the Contractor in accordance with the order of competent authorities, the EMMP, and instructions of the Engineer (MFCB Engineer).

### **1. Obligations of the Contractor**

The general environmental and social obligations of the Contractor within this Contract, without prejudice to other official provisions in force, include the following:

- Respecting and abiding by the environmental, health, safety and labor regulatory provisions in force in Lao PDR (including those announced during the execution of the works if imposed by the Engineer), the contractual provisions of this Contract as well as the conditions fixed by the various authorizations or approvals required;
- Respecting and abiding by national and international labor codes, including the ILO Conventions ratified by Lao PDR and ensure that it and its sub-contractors make available employment opportunities for both men and women and ensuring a gender-sensitive work environment;
- Assuming full responsibility for the consequences of its choices and actions; in particular, and without prejudice to the regulatory provisions in force, it guarantees, if necessary, the repair at its cost and according to the most appropriate technologies and deadlines, notably with regard to the level of sensitivity of the site concerned, of damage caused to the environment and residents by failure to respect regulatory and/or administrative provisions and/or the applicable technical specifications, as well as the payment of fines, damages or other penalties which may be incumbent upon it;
- Agreeing with the Engineer and implementing technical approaches and solutions to the design of the DSHPP where the Project will encroach on private or communal lands. Preference shall be given to the technical solutions that do not require taking or demolition of temporary and permanent properties. In case the taking or demolition of property cannot be avoided the Contractor shall notify the Engineer and cease the works in that particular section of the Project. Construction activities may only proceed with approval of the Engineer.
- Taking all measures to ensure the environmental quality of operations which are the subject of this contract and not disrupt the quality of life of the adjacent villages, in particular by applying the applicable specifications and provisions. The Contractor shall consider the execution of works or the implementation of environmental and social provisions as an integral part of the operations relating to the general construction program of the works;
- Providing appropriate information and training for Contractor personnel, including management staff, with regard to the environmental and social quality of operations;
- Informing the local authorities (village heads, district governor) and the affected population on planned construction activities, sites and schedule at least 2 weeks in advance of any planned construction activities (including signage);
- Holding information meetings at least 2 weeks before entering any village area for planned construction activities, to inform and consult with the villagers regarding the nature of the forthcoming works, their duration and all effects such as dust, smoke, or noise that will be felt in the village, the mitigation measures that will be applied, and provide villagers with opportunities to ask questions and express concerns;

- Providing a medium for ongoing communication with villagers, including a point of contact/ liaison to address any potential issues during construction with the physical works or with subcontractors, and provide a plan for mediation of any problems that arise in relation to the works under this Contract and documenting concerns and resolution of these.
- Refraining from destroying, removing or clearing trees, timber, scrub, crops and other flora to any extent greater than is approved by the Engineer as being necessary for the execution of this Contract and shall take such measures as may be necessary to prevent its employees from hunting, disturbing, capturing or destroying stock, crops and such flora as may be protected by relevant statutes;
- Siting borrow pits or other similar excavations as well as waste accumulation and disposal sites only in locations approved by the Engineer;
- Controlling pollution, noise and nuisances generated by the works;
- Re-using materials available on the existing site each time the technical and financial conditions allow for this in a satisfactory manner from the point of view of the Engineer. Recycling and reuse of wastes (e.g. lubricants, plastic bottles, paper) is encouraged where appropriate. Strictly banning the use of fire for clearing and grubbing and cleaning sites, except for the treatment of organic waste as approved by the Engineer;
- Preserving to the maximum extent possible natural resources and the minimizing the use of space, soil and vegetation, in particular by minimizing cleared and stripped surfaces, by the passage of blades at a high level (5 cm above the natural ground level) each time that a simple clearing or a provisional storage of material is required, by controlling logging, including any tree removals, by the appropriate management of the topsoil, by driving and working the machines perpendicular to the slope, by the maintenance on the sites of naturally grassed areas, and by the control of site erosion;
- As appropriate, systematically stripping topsoil of all work sites unless (with prior consent of the Engineer) the soil structure of the surface, predominantly organic matter ("topsoil" or mud), does not exist or has a thickness less than the working height adjustment of the blade of the excavator or machine used, taking into account the state of the terrain (eroded soil, gravel, soil with rocks that prevent the passage of the machine, etc.);
- Respecting, for the whole of its site (including borrow sites and disposal areas, quarries and installations) the zones, areas, elements and periods which are environmentally sensitive, including, but not limited to locations and areas identified in the EMMP. In the project areas adjacent to specially protected areas, machinery shall not go beyond the work zone as approved by the Engineer; there shall be no waste accumulations and waste disposal sites in the same areas; and there shall be no use and storage of explosives and toxic and chemical substances.
- Discharging or disposal of used water, mud, grout, bituminous products, pollutants of any kind, etc. into wells, boreholes, surface water or groundwater, water courses, natural streams, drains, ditches, etc. is strictly forbidden;
- Not creating a dam or altering a permanent or temporary watercourse for the requirements of the site (unless otherwise specified in the Design), without authorization of the Engineer;
- Ensuring that all construction vehicles shall travel at low speed (as specified in Lao PDR regulations) within 100 m on either side of any areas around villages where children are present;
- Controlling health risks relating to the works and personnel of the Contractor, in particular the adoption of minimum hygiene rules at the work sites and camps and for

the benefit of residents in the affected communities, the control of dust emissions in populated areas and the control of stagnant waters as specified in the EMMP;

- Exercising every reasonable precaution to protect persons or property from injury. The Contractor shall erect and maintain all necessary temporary fencing, barricades, barriers, signs and lights and provide fire alarm, fire extinguishing and firefighting services at strategic points on the Site. The Contractor shall also be responsible for erecting and maintaining structures for storage and containment of hazardous materials or liquids. The Contractor shall adopt and enforce such rules and regulations as may be necessary, desirable or proper to safeguard the public, all persons engaged in the work and its supervision. The Contractor shall be responsible for the flagging and control of traffic and he shall comply with the requirements of the Engineer and competent authority in these matters. The Contractor shall keep clear and in good working order all temporary access road structures, bridges, culverts, drains and other waterways necessary for the execution of the works during the term of the Contract;
- Providing for the safety of its personnel as well as nearby residents during blasting operations. This will include appropriate signage, fencing, or other means to keep the blasting area secure, and a warning system to ensure that its personnel and nearby residents are aware that a blast is about to occur.
- Ensuring, in as far as is reasonably practicable, the health, safety and welfare at work of its personnel including those of its subcontractors and of all other persons on the Site or crossing the site. The Contractor shall provide protective clothing and equipment to workers that are appropriate to the workers' tasks. The Contractor shall be fully responsible for ensuring necessary first aid services to its staff and workers, including transport for injured personnel to hospital or other appropriate accommodation as and when required. The organization of the construction sites and work places, and the Contractor's approach to the aspects listed below, shall be included in the Contractor's Environmental Management Plan (CEMMP) to be prepared by the Contractor and approved by the Engineer.
- Cleaning, restoring and then, if necessary, providing for the appropriate rehabilitation or redevelopment of work sites, camps, quarries and borrow pits released by the Contractor as the work progresses. This obligation, which includes possible drainage of stagnant water and the completion of compensatory tree plantations (if envisaged by the Design), is a condition of the acceptance of the works;
- Taking appropriate sanctions against personnel violating the applicable specifications and provisions on environmental and social matters;
- Checking, by regular inspection, that all stipulated environmental and social provisions are being adhered to;
- Systematically and in a timely manner informing the Engineer of each incident or accident, damage or degradation caused to the environment, workers or residents or their assets, in the course of the works. Contractor shall also take appropriate measures, as approved by the Engineer, to address the incident or accident in timely fashion; and
- Providing environmental and social monitoring of the works and the writing of corresponding monthly reports.

## **2. Contractor's Environmental Management Plan**

The Contractor shall establish a Contractor's Environmental Management Plan (CEMMP) in order to meet his obligations concerning this matter; the CEMMP shall include in particular the following:

1. Management Acknowledgements
2. Organization & Staffing
3. Communications and Reporting
4. Environmental, Health and Safety Management Provisions

The Contractor shall prepare and submit for the Engineer's approval a CEMMP within 30 days of the commencement date. The Engineer may require periodic reviews, including updating of the CEMMP during the Works.

## **2.1 Management Acknowledgement**

### **(i) Certification and Commitment**

The CEMMP submitted by the Contractor shall provide a signed statement from the Contractor's Managing Director(s) attesting to a commitment that all environmental protection, safety, and occupational health aspects of the Contract will be given highest priority in the discharge of contractual obligations and certifying a commitment to the provisions in the EMMP and CEMMP as approved by the Engineer.

### **(ii) Statutory Understanding and Compliance**

The Plan shall provide a statement attesting the firm's understanding of, and means of ensuring due compliance with, the statutory regulations relating to construction work in Lao PDR, specifically in regard to compliance with:

- (a) All safety and occupational health legislation including, without limitation, the Rules and Regulations of Lao PDR and the authorities having jurisdiction.
- (b) All current environmental laws and regulations, including both national and local regulations, related to the following, but not limited to:
  - Noise;
  - Vibration;
  - Air pollution;
  - Water contamination;
  - Solid and hazardous waste disposal;
  - Liquid waste disposal;
  - Sanitary conditions (water supply, sewerage, etc.);
  - Use of explosives;
  - Protection of public traffic,
  - Historical, cultural and archaeological monuments/sites,
  - Resettlement, land acquisition, servitude, temporary use of land and compensation, etc.

### **(iii) Availability of Documents**

The Plan shall state where copies of safety and occupational health regulations and documents will be available on the construction site and verify that all regulations and documents have been or will be available.

### **(iv) Management of Subcontractors**

The requirements of this and related sections and obligations therein shall be required for execution of parts of the Works by the approved subcontractors while the Contractor shall:

- (a) Provide subcontractors with copies of the CEMMP, incorporate such provisions into all sub-contracts, and ensure compliance with such plan under the Contract.
- (b) Require all subcontractors to appoint a safety representative who shall be available on the site throughout the operational period of the respective sub-contract and ensure as far as is practically possible that staff and employees of subcontractors are conversant with appropriate parts of the CEMMP and the statutory regulations.

## **2.2 Organization and Staffing**

### **(i) Organization Chart**

The Plan shall include an organization chart identifying (by job title and by the name of the individual) the personnel to be engaged solely for environmental protection, health, safety and traffic control. The chart and the supporting text shall identify participants and their areas of responsibility and contact details.

### **(ii) Appointment of Environmental Safety Officer (ESO)**

The Contractor shall submit for approval the name and details (full CV) of its proposal for an ESO to the Engineer within 14 days of the commencement date. The ESO shall be responsible for day-to-day issues of environmental management for the duration of the Contract. The Contractor shall obtain approval of such person being appointed, who shall be in position to carry out his duties prior to Works activities commencing on site except as may be agreed in exceptional circumstances in writing with the Engineer. The ESO will not be removed from the site without the express written permission of the Engineer. Within fourteen (14) days of any such removal or notice of intent of removal, a replacement ESO will be nominated for approval by the Engineer.

The ESO shall be empowered to instruct employees of the Contractor and Subcontractors to cease operations and shall take the appropriate action as is necessary and within his limits of delegation by informing others as may be appropriate to prevent unsafe working practices or other infringements of the Plan or the statutory regulations. The ESO shall maintain a daily site diary comprehensively recording all relevant matters concerning site environmental management, safety and traffic control, inspections and audits, related incidents and the like. The site diary shall be available at all times for inspection by the Engineer and his staff.

## **2.3 Communication and Reporting**

The Contractor shall prepare and submit to the Engineer for his approval monthly progress reports on compliance with implementation of EMMP and CEMMP. It is expected that these reports will include information on:

- Environmental, social, health, and safety management actions/measures taken, including approvals sought from local or national authorities;
- Problems encountered in relation to environmental, social, health, and safety aspects (incidents, including delays, cost consequences, etc. as a result thereof);
- Lack of compliance with contract requirements on the part of the Contractor;
- Changes of assumptions, conditions, measures, designs and actual works in relation to environmental, social, health, and safety aspects;
- Observations, concerns raised and/or decisions taken with regard to environmental, social, health, and safety management during site meetings;

- Chance historical, cultural and archaeological finds;
- Follow-up on the status and efficacy of remedial measures and/or corrective actions identified in Incident Reporting Forms included in EMMPs or otherwise; and
- Follow-up, including remedial measures, status of measures and their efficacy, related to lack of compliance with contract requirements.

## **2.4 Environmental, Health and Safety Management Provisions**

The CEMMP should include, as a minimum, the methodology and resources to meet the requirements of these Technical Specifications including but not limited to the following:

- Stakeholder communication (including nearby affected residents) and mechanism for documenting public concerns in relation to the works under this Contract and resolution of these.
- Relevant staff training;
- Maintaining farmers' access to irrigation water if the works are implemented during the irrigation season;
- Maintaining vehicle access to the communities;
- Pollution control (including spill prevention, dust abatement, noise, etc.);
- Provision of potable water and washing/toilet facilities to workers;
- Provision of lodging and insecticide-treated mosquito nets to workers as appropriate;
- Provision of health care to workers and treatment for injuries and infections; and providing workers with access to condoms;
- Assessing importance of, and reporting and investigating, chance historical, cultural and archaeological finds;
- Inspection and monitoring.

## **2.5 HIV-AIDS provisions**

The Contractor shall:

- Require its personnel to attend the HIV Awareness Program provided by the UNAIDS and/or the National Committee for the Control of AIDS (NCCA) which has developed and launched the National Strategic and Action Plan on HIV/AIDS/STI 2006-2010. Attendance shall be in the course of their employment and during their normal working hours or any period of overtime provided for in the relevant employment contracts and uses all reasonable endeavors to ensure this instruction is followed;
- Deliver to all employees an HIV/AIDS leaflets available through UNAIDS and/or the NCCA.
- Give all reasonable cooperation to the UNAIDS and/or the NCCA office on providing the HIV Awareness Program. if any planned, by providing suitable space for delivery of the Program and do nothing to dissuade the personnel from attending the Program;
- Encourage voluntary HIV/STD testing.

The Contractor shall not be required to undertake or pay for treatment or medication for personnel found to be suffering from HIV/AIDS. Such personnel shall not be discriminated against however (including discrimination in employment opportunities, employment retention, treatment, etc.)