

# Environmental Management Plan

## Trung Son Hydropower Project (TSHPP)

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Prepared for:

Trung Son Project Management Board (TSHPMB)

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## Abbreviations

Abbreviation	Description
B/C	Benefit-Cost
BP	Bank Procedure
BOD <sub>5</sub>	Biological Oxygen Demand
CEC	Cation Exchange Capacity
CLIP	Community Livelihood Development Plan
COD	Chemical Oxygen Demand
DO	Dissolved Oxygen
DONRE	Department of Natural Resources and Environment
DPA	District Protected Area
DSF	Dam Safety Framework
DWL	Dead Water Level
EA	Environmental Assessment
EIA	Environmental Impact Assessment
EMDP	Ethnic Minority Development Plan
EMP	Environment Management Plan
EMPF	Ethnic Minority Policy Framework
EP	Ethnic Minority Plan
EPC	Environmental Protection Commitment
ERR	Economic Rate of Return
ESF	Environmental Safeguards Framework
ESIA	Environmental and Social Impact Assessment
EVN	Electricity of Vietnam
FSL	Full Supply Level
FLMEC	Forests of Lower Mekong Eco-region Complex
GDP	Gross Domestic Product
GHG	Greenhouse Gases
HPP	Hydropower Projects

Abbreviation	Description
ICB	International Competitive Bidding
IDA	International Development Association
IEBR	Institute of Ecology and Biological Resources
IRR	Internal Rate of Return
IUCN	International Union for Conservation of Nature & Natural Resources
MASL	Meters Above Sea Level
MODIS	Moderate Resolution Imaging Spectroradiometer
MOF	Ministry of Finance
MoIT	Ministry of Industry and Trade
MOL	Minimum Operating Level
MONRE	Ministry of Natural Resources and Environment
MOU	Memorandum of Understanding
NBCA	National Biological Conservation Area
NGO	Non-governmental Organization
NO <sub>x</sub>	Nitrogen Oxides
NPA	National Protected Area
NPV	Net Present Value
NR	Natural Reserves
OM	Operation Manual
OP	Operational Policy
PB	Participating Bank
PHAP	Public Health Action Plan
PIB	Project Information Brochures
PMB	Project Management Board
PMP	Probable Maximum Precipitation
PPA	Power Purchase Agreement
PPC	Provincial People Committee
QCBS	Quality and Cost Based Selection
RCC	Roller-compacted Concrete

Abbreviation	Description
RE	Renewable Energy
REDP	Renewable Energy Development Project
RLDP	Resettlement Livelihood Development Plan
ROW	Right of Way
RP	Resettlement Action Plan
SA	Social Assessment
SEA	Strategic Environmental Assessment
SESIA	Supplementary Environmental and Social Impact Assessment
SO <sub>x</sub>	Sulphur Oxides
SPPA	Standard Power Purchase Agreement
TA	Technical Assistance
TSHPP	Trung Son Hydropower Project
TSHPMB	Trung Son Hydropower Project Management Board
WWF	World Wildlife Fund

## Units

Unit Symbol	Unit Description
$^{\circ}\text{C}$	degrees Celsius
%	percent
$10^6\text{m}^3$	million cubic meters
$10^6\text{m}^3/\text{year}$	million cubic meters per year
cells/l	cells per liter (used for vertical distribution and concentration)
dBA	decibel
GWh	gigawatt hour
g	grams
$\text{g}/\text{m}^3$	grams per cubic meters
ha	hectares
km	kilometer
$\text{km}/\text{km}^2$	density (for stream network)
$\text{km}^2$	square kilometers
kg/s	kilograms per second
kV	kilovolts
$\text{l}/(\text{s}\cdot\text{km}^2)$	liters per second per kilometer squared
m	meter
meq/100g	milli-equivalents per 100 grams
mm	millimeters
mg/mL	milligrams per milliliters
$\text{mg}/\text{m}^3$ milligrams	milligrams per cubic meters
m/s	meters per second
$\text{m}^3$	cubic meters
$\text{m}^3/\text{day}$	cubic meters per day
$\text{m}^3/\text{ha}$	cubic meters per hectare
$\text{m}^3/\text{s}$	cubic meters per second
$\text{m}^3/\text{year}$	cubic meters per year



Unit Symbol	Unit Description
MPN/mL	most probable number of coliform per 100 mL
MW	megawatt
pH	potential of hydrogen
ton/m <sup>3</sup>	tons per cubic meter
USD	U.S. Dollars
V	volts
VND	Vietnam Dong

## Technical Parameters

Parameter Unit	Parameter Description/Application
$Al_2O_3$	Aluminum oxide
b	Crest width
$C_s$	Coefficient of asymmetry
$C_v$	Flow Coefficient
E	Accumulated sediment ratio
F	Area
$Fe_2O_3$	Ferric oxide
$F_n$	Basin area
$H_{max}$	Maximum water head (m)
$H_{min}$	Minimum water head (m)
$H_{tt}$	Design head
L	Discharge canal length
$L_c$	Crest length
M	Average flow per unit area
N	Capacity
$N_T^*$	Turbine type and number
P	Frequency
Q	Daily flow discharge
$Q_0$	Average annual discharge to dam site ( $m^3/s$ )
$Q_p$	Peak discharge
$Q_{tb}$	Discharge through turbine ( $m^3/s$ )
$R_o$	Suspended sediment volume (kg/s)
$V_{dd}$	Total accumulated volume of river bed sediment ( $m^3/year$ )
VII	Total accumulated volume of suspended sediment ( $m^3/year$ )
W	Volume
$W_{nl}$	Capacity with NRWL
$W_{pl}$	Useful capacity prevention flood
X axis	Horizontal line

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$X_0$	Year average rainfall
Y axis	Vertical axis
Z	Depth
$\alpha$	Correlation coefficient
$\gamma_{dd}$	Weight of river bed sediment ( $t/m^3$ )
$\gamma_{ll}$	Weight of suspended sediment ( $t/m^3$ )
$\delta$	Average muddy level

## Glossary of Terms

Term	Definition
Adaptive management	The implementation of new or modified mitigation measures in response to an unanticipated environmental effect.
Baseline	A description of the biophysical and socio-economic state of the environment at a given time, prior to development of a particular project.
Alternatives	The evaluation of alternatives to project development in EIA (timing, location, technologies etc) including the no go, or no development option.
Biota	All living plants and animals in a given area.
Biodiversity	The variety of life on earth.
Biophysical	Pertaining to the natural environment.
Contamination	Pollution.
Conservation	The preservation of natural resources for use by future generations.
Cost-benefit analysis	A method used to determine the monetary consequence of project impacts.
Consultation	A process of communication with those potentially affected by a project, policy, plan or program.
Cumulative effects	Changes to the environment that are caused by an action in combination with other past, present and future actions.
Endangered species	An animal or plant in danger of extinction.
Environment	The combination of elements whose complex interrelationships make up the settings, surroundings and conditions of life of the individual and society as they are or are felt.
Ecology	A branch of science dealing with the interrelationships of organisms and their environment.
Ecosystem	An interconnected and symbiotic grouping of microorganisms, fungi, plants and animals.

Term	Definition
Environmental audit	An environmental management tool consisting of a periodic and objective evaluation of an organization and installations to assess compliance with regulatory and other requirements, as defined by audit criteria.
Environmental impact assessment	A critical evaluation of the likely effects of a project on the environment, including the prescription of mitigation and management actions.
Environmental management plan	A comprehensive plan for the implementation of mitigation measures prescribed in the environmental impact assessment.
Fauna	The total animal population in a given area.
Flora	The total vegetation assemblage in a given area.
Global warming	The increase in average temperature of the surface of the earth.
Groundwater	Water found beneath the Earth's surface.
Habitat	The home of a plant or animal.
Impact	The consequence of a action or activity on the human or natural environment. Impacts may be positive, negative or neutral.
Intact Rivers	A management approach to ensure that entire river sequences, from headwaters to sea, are kept free from barriers, allowing for the protection of a full sequence of habitats and migratory routes.
Irreversible	A result whereby once occurred cannot be changed or reverted to its prior state.
Issue	A question or concern regarding an environmental impact, consequence or effect.
Landfill	A disposal area for waste that is eventually covered with soil.
Life cycle assessment	An assessment of a project and its effects from inception, through startup, operation and closure phases.
Magnitude	The size or degree of a predicted impact.
Mitigation	Prescribed actions taken to prevent, avoid, reduce or minimize the impacts, or potential adverse effects, of a project.

Term	Definition
Monitoring	A combination of observation and measurement to assess the environmental and social performance of a project and its compliance with the EIA/EMP, or other approval and regulatory conditions.
Natural habitats	Land and water areas where most of the native plant and animal species are still present, and either are legally protected, officially proposed for protection, or unprotected but of known high conservation value.
Physical cultural resources	Important sources of valuable historical and scientific information, assets for economic and social development, and integral parts of a people's cultural identity and practices.
PM <sub>10</sub>	Particulate matter less than 10 microns in diameter.
Proponent	The proposer, or applicant, of a project.
Protected Area	A clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values.
Reservoir	An artificial water body created and used for water storage for irrigation, flood control, flow regulation or power generation purposes.
Residual impact	Those impacts that remain after the application of mitigation measures.
Risk	The likelihood of occurrence of an adverse project effect.
Runoff	Precipitation falling on the ground that is not absorbed and eventually reaches rivers, lakes or other water bodies.
Safeguard Policy	A set of ten policies of the World Bank with the objective to prevent and mitigate undue harm to people and their environment in the development process.
Scoping	A tool to assess, evaluate and prioritize relevant issues or concerns arising from a project.
Screening	Process to assess which projects require an environmental impact assessment and to what extent.
Significance	The relative importance of an issue or impact to society.
Social impact assessment	A component of EIA that assesses the impacts of a project, policy, plan or program on people and society.

Term	Definition
Stakeholder	Someone who has an interest in the outcome of a project, or a decision affecting them.
Strategic Environmental Assessment	A systematic process for evaluating the environmental consequences of proposed policy, plan or program initiatives in order to ensure they are fully included and appropriately addressed at the earliest appropriate stage of decision-making on par with economic and social considerations.
Tiger Action Plan	A plan of World Wildlife Fund to improve the protection and management of key tiger populations and their habitats in top priority conservation landscapes, through measures that can be sustained and supported over the long term by governments, local communities and stakeholders.
Water quality	A measurement of the purity of water, or drinking water.
Watershed	The entire region or area where water flows into a lake, river, stream or other water body.
Wetland	An area of land saturated with water that has high biodiversity importance.

# 1. Executive Summary

The Environmental Management Plan (EMP) for the Trung Son Hydropower Project (TSHPP) identifies the principles, approach, procedures and methods that will be used to control and minimize the environmental and social impacts of all construction and operational activities associated with the project. It is intended to complement the project Supplementary Environmental and Social Impact Assessment (SESIA) and is a companion document to the Resettlement and Livelihood Development Plan (RLDP).

The Trung Song Hydropower Project (TSHPP) is located in the Quan Hoa district of Thanh Hoa province, North Central Vietnam, approximately 9.5 km from the Laos Border. The project consists of a dam on the Ma River, a reservoir area of 13.13 km<sup>2</sup> and a 260 MW hydropower plant. The TSHPP is a multipurpose project, providing both power generation and flood control benefits. The proposed dam and reservoir will be downstream from Lao PDR and the regulated flow will be entirely within Vietnamese territory. The dam is classified as a Class II dam under the Vietnamese Classification and a large dam under World Bank OP 4.37.

In addition to the dam, other project components include a 20.4 km access road, a 4000 person construction work camp and a number of borrow pits and quarries.

The project's main environmental issues are related to the upstream and downstream impacts on water quality, hydrology, health, fish and fisheries; the impact of a 4000 person construction work camp over the construction period; the impacts of auxiliary project components, including the access road and borrow pits; and indirect impacts on the areas' natural resources and biodiversity, including impacts within three adjacent natural reserves. The project will also relocate some 1,691 households. A Resettlement and Livelihood Development Plan (RLDP) consisting of a Resettlement Plan (RP), Community Livelihood Improvement Plan (CLIP) and an Ethnic Minority Development Plan (EMDP) will be completed to address project related social and community impacts.

Total project costs are estimated at \$386 million, of which \$24.6 million is allocated for compensation and resettlement purposes. A total of US\$2.45 million has been allocated for the implementation of the environmental management plan.

The EMP involves multiple organizations and responsibilities shared between EVN, the Trung Son Project Management Board (TSHPMB), the Engineering Supervisor, the Construction Contractor, the Independent Environmental Monitoring Consultant and Local Authorities.

A number of management plans will be implemented throughout the construction and operation phases of the TSHPP including the following plans:

- Construction Impact Management Plan – measures to minimize negative impacts of construction activities on local communities and the natural environment, to reduce the induced impacts of camp followers, to prevent pollution and ensure that hazardous materials are stored properly without risk to the environment;



- Biodiversity and Protected Areas Management Plan – measures to ensure protection of local and regional biodiversity and minimize project impacts on three adjacent protected areas;
- Reservoir Clearing Plan – measures to minimize biomass loss as a result of reservoir clearing and to coordinate the timing of vegetation removal to allow salvage benefits to local communities;
- Environmental Monitoring Plan – measures to ensure project compliance, measure the success of proposed mitigation, continue baseline monitoring and review environmental and social performance;
- Community Relations and Safety Plan – measures to inform local communities about the progress of the project and ensure community safety;
- Regional Health Management Plan – PMB shall prepare a regional health plan to mitigate project impacts on the health of local populations;
- Physical Cultural Resources Management Plan – measures to prevent any inadvertent loss of physical and cultural resources during project construction and operation;
- Additional Studies – additional studies are planned to provide more baseline information for the project; and
- Training and Capacity Building – training and capacity shall be provided in all aspects of the EMP.

Environmental and social supervision shall be completed during project construction to ensure compliance of the construction contractor with EMP provisions and other Vietnamese regulatory requirements. Monitoring shall also be done during construction and operations to verify the success of mitigation measures and to conduct additional baseline sampling.

The EMP outlines reporting and communication procedures to ensure that EMP provisions are communicated and reported at all levels of the project, including local communities.

A key component of EMP success depends on effective capacity building of the TSHPMB and the training of staff and all others involved in the EMP. These efforts will also be assisted by the implementation of technical assistance by outside consultants.

The EMP shall be considered a controlled document and should be updated annually, following a reportable incident or plan update.

A number of additional studies, complementary to the EMP, are proposed including further monitoring, sampling and investigations of water quality associated with the implementation of an intact rivers management approach.

Initial start-up costs of the EMP costs are estimated at US\$ 2.45 million.

## 2. Introduction

### 2.1. Background

This Environmental Management Plan (EMP) for the Trung Son Hydropower Project (TSHPP) identifies the principles, approach, procedures and methods that will be used to control and minimize the environmental and social impacts of all construction and operational activities associated with project development. It is intended to complement the project Supplementary Environmental and Social Impact Assessment (SESIA) and ensure that commitments made by the Trung Son Project Management Board (TSHPMB) to minimize project related environmental and social impacts are upheld throughout all project phases.

The EMP is also a companion document to the Resettlement and Livelihood Development Plan (RLDP) which aims to mitigate resettlement impacts and avoid or minimize social impacts arising from the project. The RLDP is an integrated plan consisting of a Resettlement Plan (RP), a Community Livelihood Improvement Plan (CLIP) and an Ethnic Minority Development Plan (EMDP). A separate EIA of construction resettlement sites has also been prepared (EVN, 2010).

As part of their ongoing commitment to excellence in environmental and social performance for hydroelectric projects, Electricity of Vietnam (EVN), through the TSHPMB will ensure the following:

- Fulfill all environmental and social conditions associated with project approvals;
- Develop, promote and foster a shared sense of responsibility for environmental and social performance of the project;
- Promote environmental awareness and understanding among employees and contractors through training, identification of roles and responsibilities towards environmental and social management and linking project performance to overall environmental performance;
- Encourage an understanding of social and cultural sensitivities in local communities and the importance of minimizing project impacts on local lifestyles and culture;
- Monitor environmental and social performance throughout the project and implement an adaptive management approach to continuous improvement;
- Work with local communities and project affected stakeholders to ensure that they benefit as a result of project development; and
- Maintain an ongoing commitment to informing, engaging and involving local stakeholders throughout all phases of the project.

## 2.2. EMP Structure and Organization

This EMP is designed as an overriding document in a hierarchy of control plans, and sets out the overarching framework of environmental management principles that will be applied to the project. It is directly related to the accompanying Supplementary Environmental and Social Impact Assessment (SESIA) for the TSHPP.

The EMP contains guiding environmental principles and procedures for communication, reporting, training, monitoring and plan review to which all EVN and TSHPMB staff, contractors and subcontractors are required to comply with throughout the preconstruction, construction and operation phases of the TSHPP.

The EMP should be also be considered as an overall framework document that establishes the terms of reference for all project environmental and social sub-plans that will completed including the following:

- Construction and Worker Camp Management Plan (construction);
- Environmental Supervision Plan (construction);
- Environmental Monitoring Plan (construction and operation); and
- Public Health Management Plan (construction and operation).
- Camp Follower Management Plan
- Biodiversity and Protected Areas Management Plan
- Reservoir Clearing and Salvage Plan
- Environmental Monitoring Plan
- Community Relations and Safety Plan
- Physical Cultural Resources Management Plan

The terms of reference (ToR) for preparation of these contractor plans are presented in the Appendices of the EMP. Further details of plan contents are provided in Chapter 6.

The EMP is structured as follows:

- An overview of the project description is provided in Chapter 3.
- Roles and responsibilities for environmental and social management are described in Chapter 4.
- Key environmental and social risks as identified from the project SESIA are presented in Chapter 5.

- A summary of plan contents is provided in Chapter 6.
- Mitigation measures for construction and operation phases are presented in Chapter 7.
- A framework for Environmental Supervision is presented in Chapter 8.
- A framework for Environmental Monitoring is presented in Chapter 9.
- Communication and reporting procedures are described in Chapter 10.
- Training and capacity building requirements are discussed in Chapter 11.
- Plan monitoring and review procedures are presented in Chapter 12.
- Additional studies are discussed in Chapter 13.
- EMP Implementation is outlined in Chapter 14.
- Preliminary EMP costs are estimated in Chapter 15.
- Additional information is presented in the Annexes as follows:
  - Annex A contains the Construction Worker Camp Management Plan Bid Specifications to be included in Contractor documents;
  - Annex B contains the Worker Health Management Plan Bid Specifications to be included in Contractor Documents;
  - Annex C presents a TOR for Environmental Supervision during Construction
  - Annex D contains guidelines for Safety and Community Relations Plans;
  - Annex E presents Chance Find Procedures;
  - Annex F is the TOR for Approach to Intact Rivers Management;
  - Annex G contains Decommissioning and Abandonment requirements;
  - Annex H is the Camp Follower Management Plan;
  - Annex I contains a TOR for a Cumulative Effects Assessment of the TSHPP in conjunction with other activities and/or projects; and
  - Annex J contains information on the Tiger Action Plan.

### 2.3. EMP Source Documents

In addition to accompanying Supplementary Environmental and Social Impact Assessment, a number of supporting environmental studies and social initiatives have been prepared. These documents form an important source of information for the EMP. A full list of these documents is presented in the Reference section.

Feasibility studies were conducted to identify the optimal location to maximize power generation and minimize environmental and social impacts. Several aquatic surveys were conducted to document water quality and aquatic ecology of the Ma River. Impacts to fish biodiversity, aquaculture income, erosion and sedimentation and displacement of affected people were addressed and mitigation measures were proposed.

The *Trung Son Hydro Project – Economic Analysis* report describes the hydrology and estimated power generation of the proposed TSHPP and examines the potential effects of climate change on hydrology. The report also reviews the potential benefits from Trung Son's incremental methane and carbon dioxide offsets. The economic analysis was completed according to the standard World Bank format and finally, the analysis of alternatives, reviewed the main policy choices underlying the circumstances which combined cycle gas or coal represented a realistic alternative to Trung Son.

*The Assessment of Impacts Caused by Trung Song Hydropower Project to Protected Areas and Terrestrial Biodiversity* was completed to illustrate the high number of vascular plant species, numerous species of mammals and amphibians and a high diversity of avian species within the three Natural Regions of the Trung Son area. Mitigation measures have been incorporated into the EMP to address indirect and direct project-related impacts on regional biodiversity.

*The Reservoir Clearing Plan* studied the vegetation within the proposed reservoir. The report documents the current landscape within the TSHPP area, identifies losses to bamboo and other forests and its impact on local communities. As a result of clearing and inundation, the report also highlights potential problems associated with the build-up of debris and eutrophication.

*The report on Investigation of Tangible Cultural Resources in the Area of the Trung Son Hydropower Project* documents the current archaeological, historical and culturally significant landscapes within the TSHPP area. Several burial sites, holy places and artifacts will be directly affected and potential salvage methods and proposals are outlined.

A number of research reports and data analyses on biodiversity of fish and fisheries were completed. Initial fisheries studies identified a variety of important ecological attributes and fisheries species inhabiting the Ma River, to address a lack of basic biological and ecological understanding presented in preliminary assessment reports, the *Fisheries Development Plan for the Trung Son Hydropower Project* report was written to ensure management decisions would be made with the minimum amount of adverse affects to these biological and ecological features. The report also focuses on methods to enhance fisheries by taking advantage of the newly created reservoir system.

*The Impact Assessment report of Trung Son Hydropower Project to Fish-biodiversity and Suggested Migitation Measures* was implemented. The report summarized five spatial regions of the Ma River system: upstream of the reservoir; flooded areas; river sections between the dam and power station; river sections between the power station and the confluence of the first major tributary; and downstream of the project. Each area will be indirectly and/or directly influenced by the construction and operation of the dam. The report identifies these major influences and describes their likely effects on various environmental processes.

*The Public Health Report of Trung Son Hydropower Project* assesses the health of individuals living within the proposed project area, campsite and adjacent areas. The associated Public Health Action Plan (PHAP) describes the Resettlement and Regional Health Programs which are responsible for preventing and mitigating adverse health impacts.

*The Report on Construction and Worker Camp Reinstatement Study* for the Trung Son Hydropower Project report defines, analyzes and estimates the waste quantity, composition and characteristics and details methods to minimize impacts due to waste management.

*A Construction and Camp Management Report* was prepared to assess the impacts of construction-related activities and the operation of approximately 4,000 workers in the construction camp. Mitigation measures were designed to minimize the potential impacts on the surrounding environments and lifestyles of local villagers.

The report on *Public Consultation Results on Affected Households of the Trung Son Hydropower Project* documents consultation efforts. Since the initiation of the TSHPP, three rounds of public consultation have occurred. The results of this initial consultation have been documented and recorded by the TSHPMB.

*The Resettlement Action Plan for the Construction of the Access Road and Bridges – Trung Son Hydropower Project* discusses potential impacts associated with the construction of the Co Luong-Co Me access road and bridges. The Plan was based on the Land Law, Decree No 197-ND-CP and World Bank's policy OP 4.12 to mitigate any potential impacts to local villagers and surrounding environment.

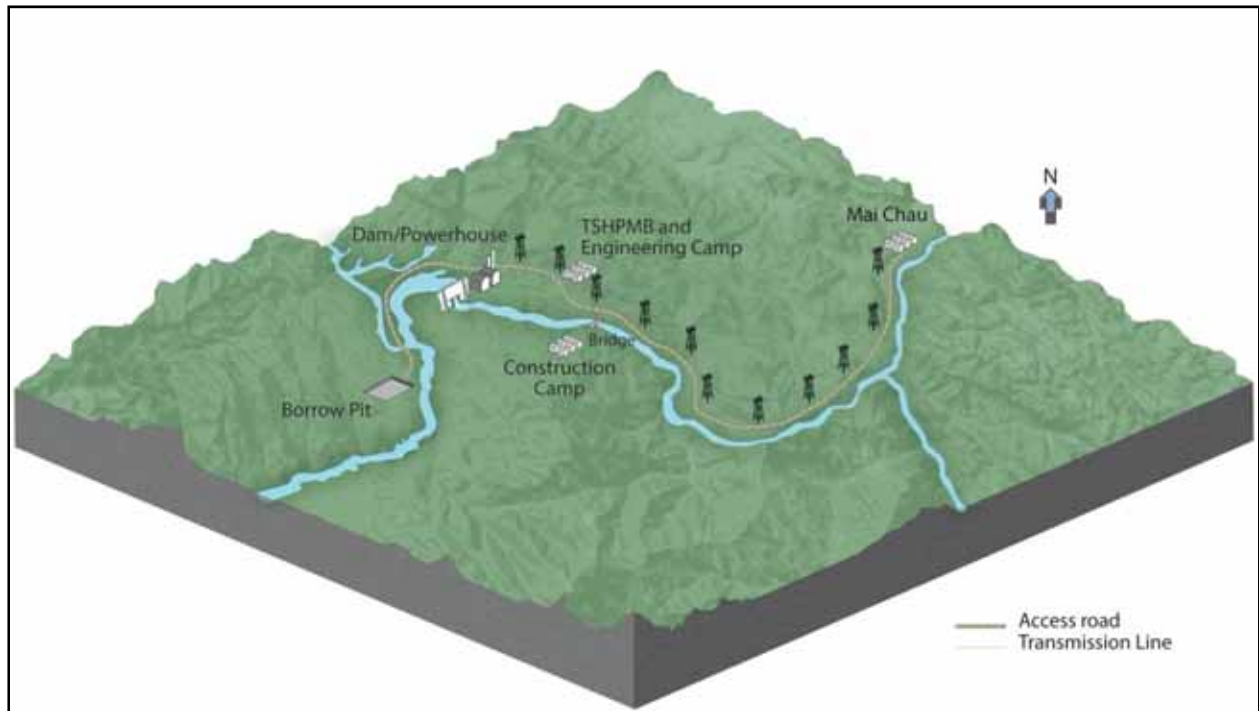
An *Environmental Assessment of Resettlement Sites* was also completed to evaluate the impacts of resettlement activities associated with the project (EVN, 2010).

*The Resettlement Plan, Livelihood, and Ethnic Minority Development Plan* encompasses three parts: the RP which identifies those communes and villages that will require relocation and their proposed resettlement communes; the CLIP which addresses land acquisition impacts and support programs for livelihood development which will be implemented; and finally, the EMDP which is designed to maintain people's ethnic cultural identity throughout the resettlement transition period.

### 3. Project Overview

The Trung Song Hydropower Project (TSHPP) is located in the Quan Hoa district of Thanh Hoa province, North Central Vietnam; the reservoir tail is approximately 9.5 km downstream from the Laos Border. The TSHPP consists of a dam on the Ma River, a reservoir area of 13.13 km<sup>2</sup> and a 260 MW hydropower plant. The TSHPP is a multipurpose project, providing both power generation and flood control benefits. The dam and reservoir will be downstream from Lao PDR and the regulated flow will be entirely within Vietnamese territory.

Figure 3-1 is a schematic representation of the proposed TSHPP and its associated project components (construction camp, borrow pits, transmission lines, access road etc.).



**Figure 3-1: Schematic of the TSHPP**

The dam is classified as a Class II dam under the Vietnamese Classification and a large dam under World Bank OP 4.37. Key project characteristics are as follows:

- Basin area – 14,660 km<sup>2</sup>
- Reservoir volume – 348.5 million m<sup>3</sup>
- Crest length – 513 m
- Height of dam – 84.5 m

The TSHPP will be installed with a capacity of 260 MW, generating a total of 1.018 GWh annually to supply energy to the national grid. The project will also control flooding downstream of the reservoir by using a normal flood-prevention capacity of 112 million m<sup>3</sup>. The TSHPP will provide a non-carbon based energy supply that may assist in reducing GHG emissions.

In addition to the headworks, other civil works of this project include a 20.4 km access road from Co Luong (Mai Chau, Hoa Binh province) to Co Me (Trung Son, Thanh Hoa province), a 4000 person construction camp during peak and a number of borrow pits and quarries.

The project's main environmental issues are related to the upstream and downstream impacts on water quality, hydrology, health, fish and fisheries; the impact of a approximately 4000 construction workers at the peak construction period; the impacts of auxiliary project components, including the access road and borrow pits; and indirect impacts on the areas' natural resources and biodiversity, including impacts within three adjacent natural reserves.

An estimated 1,691 households (7,546 people) will be affected by the main project components. The population within the project area is comprised of three main ethnic groups: Thai, the Muong and the Mong (Tercia Consultants, 2010). The Co Luong to Co Me access road will affect approximately 451 people (Tercia Consultants, 2010). A Resettlement and Livelihood Development Plan (RLDP) consisting of a Resettlement Plan (RP), Community Livelihood Improvement Plan (CLIP) and an Ethnic Minority Development Plan (EMDP) will be implemented to address project social and community impacts.

The total project cost is estimated at \$386 million U.S. dollars (USD), of which \$24.6 million USD has been allocated for compensation and resettlement purposes, two million USD for livelihood development and approximately \$2.45 million USD for implementation of the Environmental Management Plan.



## 4. Key Environmental Impacts

The SESIA (IEL 2010) was used to develop the key environmental and social impacts associated with the construction and operation phases of the TSHPP.

This impact evaluation (see Chapter 7 of the SESIA) forms the basis of environmental and social mitigation measures that are outlined in this environmental management plan. Social impacts associated with resettlement, livelihood restoration and ethnic minorities are addressed in the accompanying Resettlement and Livelihood Development Plan (RLDP) and not addressed in this EMP. This also includes Environment Impact Assessment of the resettlement sites (EVN, 2010), which has been prepared separately and presented in Annex A of the SESIA (EVN, 2010).

### 4.1. Construction Phase

The following key environmental and social impacts have been identified for the construction phase of the project. These are identified below in Table 4-1.

**Table 4-1: Summary of Key Environmental Construction Phase Impacts**

Impact Agent	Issue	Impact	
Reservoir Preparation (Clearing, grading, excavation, leveling, truck hauling, etc.)	Noise creation	Impact to local villagers, livestock breeding and wildlife	
	Dust creation	Decreased air quality can impact construction workers, local villagers and surrounding environment	
	Impact forest cover	Impact productive land	Loss of potential income
		Impact to biodiversity and habitat	
	Road Traffic	Dust creation	
		Increased road traffic	
		Deterioration of roads	
	Accidents and unplanned events	Noise and vibration	Increased risk to personal health and safety during construction activities
	Vehicle and equipment maintenance and storage	Gas emissions and particulate matter decrease air quality	
Storage and discharge of oils, lubricants and other hazardous materials during operation and maintenance			
Domestic waste (garbage, litter, human waste, etc.)		Impact to ecosystems (water, soils, vegetation, etc.)	
Natural organic debris (unsalvageable wood, vegetation, etc.)		Impact to ecosystems (water, soil, vegetation, etc.)	
Impact or alteration of cultural / archaeological / historical sites		Damage or destruction of site contents	
		Damage or destruction of newly discovered sites	

Impact Agent	Issue	Impact
	Resettlement of households and villagers as a result of reservoir creation	Loss of homes Disturbance to family networks, community structure and cultural and ethnic identities
	Expansion of households in host-communes	Alteration to community culture and ethnic heritage
		Increase demand for shared natural resources
		Increased demand on community & health services
		Increased disease transmission
		Disturbance to family networks, community structure and cultural and ethnic identities
<b>Dam Site Construction (Clearing, grading, excavation, leveling, blasting, truck hauling, stockpiling, waste disposal, road development, river diversion, transport vehicles, camp site construction, labor force and camp followers).</b>	Noise and vibration creation	Disturbance to local households, livestock and wildlife species
	Loss of forest cover	Refer to above section on “Loss of forest cover”
	Soil erosion	Increased sedimentation
		Slope instability
		Loss of productive topsoil
	Dust creation	Refer to above section on “Dust creation”
	Domestic waste and Natural organic debris	Refer to above sections “Domestic wastes” and “Natural organic debris” for further details
Borrow pit and quarry creation	Removal of subsurface and creation borrow pit and quarry	
	Dust and debris created during transportation of materials	
	Abandonment of borrow pits and quarries	
In-stream construction activities (installation of coffer dams, river diversion, machinery / equipment operating etc.)	Decreased water quality (sedimentation, pollution, etc.) and impacts on aquatic ecosystems	
<b>Construction Camp Creation (site clearing, camp site construction, labor force and camp followers)</b>	Site clearing	Refer to above sections in “Dam Site and Reservoir Preparation” for additional details on clearing impacts
	Construction of new camp buildings	Increased demand for building materials
		Installation requirement for sanitation services
		Noise and dust creation
	Construction job creation	Domestic waste
		Potential exploitation of local workforce as available labor
		Change in livelihood and traditional activities
“Boom-town” effect from rapid population and resource demand increase	Rapid population causes regional inflation on resource demands	

Impact Agent	Issue	Impact
	Increased demand for infrastructure and utilities	Increased demand for building materials may cause social conflicts
		Increased demand for community services staff (medical, emergency, safety, etc.)
		Increased demand for domestic water (drinking, food preparation, bathing, etc.)
		Domestic wastewater production and sanitation services may cause social conflicts
		Increased power/fuel demands may cause social conflicts
	Health Impacts on Construction Workers/Camps	Increased disease transmission rates Increased drug use and trade
	Health Impacts to local villagers and communes	Increased disease transmission rates Increased demand for sanitation and health in resettlement sites
	Biodiversity impacts and protected areas	Change in biodiversity and increased pressure on protected areas
	Changes to ethnic and cultural identities	Impact on cultural custom and identities Increased social conflict and illegal activities
<b>Access Road Construction (Co-Luong to Co Me road)</b>	Disturbance in biodiversity and increased pressure on protected area	Decreased forest cover Increased road traffic Noise and vibration disturbance to local villagers, livestock and wildlife species
<b>Auxiliary Project Transmission Line Construction (transmission lines, operation roads etc.)</b>	Dust creation	Refer to above section on “Dust creation”
	Noise and vibration creation	Refer to above section on “Noise and vibration creation”
	Loss of forest cover	Refer to above section on “Loss of forest cover”
	Alteration of cultural / archaeological / historical sites	Refer to above section on “Alteration of cultural / archaeological / historical sites”
	Soil Erosion	Refer to above section on “Soil erosion”
	Increased road traffic	Refer to above section on “Increased road traffic”
	Accidents and unplanned events	Refer to above section on “Accidents and unplanned events”
	Vehicle and equipment maintenance and storage	Refer to above section on “Vehicle and equipment maintenance and storage”
	Resettlement of affected households and local people	Refer to above section on “Resettlement of affected communes and villagers”
	Changes to cultural and ethnic identities	Refer to above section on “ Changes to cultural and ethnic identities”

## 4.2. Operation Phase

The following key environmental and social impacts have been identified for the operation phase of the project. These are identified in Table 4-2 below.

**Table 4-2: Summary of Key Environmental Operation Phase Impacts**

Impact Agent	Issue	Impact	
Hydroelectric Plant Operation (Stockpiles, powerhouse, truck hauling)	Noise	Continuous, low level noise affecting local communes	
	Road Traffic	Increased noise, dust, and vehicles movements affecting people and communities	
	Increased levels of floating debris, waste	Interference to turbines	
	Decomposition and decay of vegetation biomass		Reduction of oxygen levels
			Increased odors Eutrophication
	Sedimentation in reservoir	Increased sediment buildup behind impoundment	
	Changes to hydrological flow	Increased peak flows and flood duration can lead to erosion and degradation of ecosystems	
	Downstream impacts to aquatic species	Changes to local species breeding and spawning grounds	
	Fisheries of economic value	Decrease of number of economically valuable species	
	Alteration of existing fish species	Changes to local species breeding and spawning grounds	
Alteration of fish production	Changes to fisheries sector production Increased recreational and tourism opportunities		
Plant Operation (turbines, downstream volume outflow, etc.)	Change in natural flows	Impact to ecosystem and downstream habitants	
	Flood control benefits	Reduction of flood damages	
	Decreased sediment transport downstream (erosion)	Impacts to agricultural areas and aquaculture downstream	
	Impacts on downstream water quality	Changed water quality downstream	
	Historical / culturally significant artifacts	Risk of downstream erosion impact to historical/cultural artifacts	
	Salinity levels in tidal zones	Changes to salinity could affect agricultural production	
	River transportation	Impeded river transportation activities	
Alteration of aquaculture and fisheries sector	Loss of food source and income		
Operational Staff	Increased demand on usage of resources, health services	Impacts to natural vegetation, protected areas and biodiversity	

Impact Agent	Issue	Impact
		Increased demand for community and health services
		Impact to existing cultural and ethnic minority groups
Co Luong – Co Me Road operation	Dust	Decreased air quality for affected communes and households
	Noise and vibration	Refer to “Noise and vibration creation” sections under “Construction Impacts” for further details
	Increased traffic	Improved access into more remote and/or protected areas Improved transportation Increased trespass and drug trade

## 5. EMP Roles and Responsibilities

### 5.1. Roles and Responsibilities for EMP Implementation

This section describes the organizational structure and responsibilities for implementation of the EMP as shown below in Table 5-1.

**Table 5-1: Responsibility for EMP Implementation**

Organization	Responsibility	
<b>EVN – Electricity of Vietnam</b>	<ul style="list-style-type: none"> <li>▪ Overall responsibility for environmental performance of TSHPP</li> <li>▪ Decision-maker on applicable policies to the TSHPP</li> <li>▪ Oversight supervisory role during the construction phase</li> <li>▪ Overall responsibility for EMP implementation during the operation phase</li> <li>▪ Review reports of the Independent Environmental Monitoring Consultant (IEMC)</li> <li>▪ Approves changes to the EMP, as necessary, as part of an adaptive approach to environmental and social management of the TSHPP</li> <li>▪ Responsible for working with stakeholders in developing an Intact Rivers Approach</li> </ul>	
	<b>TSHPMB</b>	<ul style="list-style-type: none"> <li>▪ Develop an environmental unit, headed by the Project Environmental Officer to implement EMP responsibilities</li> </ul>
		<ul style="list-style-type: none"> <li>▪ Management, implementation, monitoring and compliance of the EMP, SESIA and any approval conditions, including construction supervision and performance of all TSHPMB staff, contractors and subcontractors</li> </ul>
		<ul style="list-style-type: none"> <li>▪ Review of EMP performance and implementation of correction actions, or stop work procedures, in the event of breaches of EMP conditions, that may lead to serious impacts on local communities, or affect the reputation of the project</li> </ul>
		<ul style="list-style-type: none"> <li>▪ Ensure effective communication and dissemination of the content and requirements of the EMP to contractors and subcontractors</li> </ul>
		<ul style="list-style-type: none"> <li>▪ Assisting the contractor with implementation of EMP sub-plans</li> </ul>
		<ul style="list-style-type: none"> <li>▪ Monitoring of EMP and SESIA performance</li> </ul>
<ul style="list-style-type: none"> <li>▪ Ensuring compliance to all project social commitments, including implementation of the social management and resettlement plans</li> </ul>		
<ul style="list-style-type: none"> <li>▪ Report environmental performance of the TSHPP directly to EVN</li> </ul>		
<ul style="list-style-type: none"> <li>▪ Report on environmental performance also to DONRE, MONRE, the World Bank, and other government regulators as required</li> </ul>		
<ul style="list-style-type: none"> <li>▪ Prepare environmental reports summarizing project activities, as required</li> </ul>		
<ul style="list-style-type: none"> <li>▪ Representing the project at community meetings</li> <li>▪ Ensuring effective community liaison and fulfilling commitments to facilitate public consultation throughout the project cycle</li> </ul>		

Organization	Responsibility
	<ul style="list-style-type: none"> <li>▪ Monitoring of downstream impacts and any reports downstream of decreased fish yields</li> </ul>
<b>Supervising Engineer</b>	<ul style="list-style-type: none"> <li>▪ Preparation and implementation of the Environmental Supervision Plan during construction</li> </ul>
	<ul style="list-style-type: none"> <li>▪ Preparation and implementation of the Environmental Monitoring Plan during construction</li> </ul>
	<ul style="list-style-type: none"> <li>▪ Supervision of contractor performance of implementation of the Construction and Work Camp Management Plan</li> </ul>
	<ul style="list-style-type: none"> <li>▪ Reporting any incidents or non-compliance with the EMP to the TSHPMB</li> </ul>
	<ul style="list-style-type: none"> <li>▪ Ensuring adequate training and education of all staff involved in environmental supervision</li> </ul>
	<ul style="list-style-type: none"> <li>▪ Making recommendations to the TSHPMB regarding EMP performance as part of an overall commitment to continuous improvement</li> </ul>
<b>Construction Contractor</b>	<ul style="list-style-type: none"> <li>▪ Preparation and implementation of the Construction and Worker Camp Management Plan</li> </ul>
	<ul style="list-style-type: none"> <li>▪ Prepare and maintain records and all required reporting data as stipulated by the EMP, for submission to the Supervising Engineer Consultant</li> </ul>
	<ul style="list-style-type: none"> <li>▪ Ensure that all construction personnel and subcontractors are informed of the intent of the EMP and are made aware of the required measures for environmental and social compliance and performance</li> </ul>
	<ul style="list-style-type: none"> <li>▪ During construction, maintain traffic safety along access roads, with special emphasis on high trafficked areas</li> </ul>
<b>Independent Environmental Monitoring Consultant (IEMC)</b>	<ul style="list-style-type: none"> <li>▪ Report to TSHPMB, EVN and the World Bank on project compliance with environmental and social commitments in the EMP, SESIA and other applicable standards</li> </ul>
<b>Local Authorities</b>	<ul style="list-style-type: none"> <li>▪ Local authorities, communities and individuals shall take part in the supervision of both the SESIA and EMP, where applicable</li> </ul>

## 6. Plan Components and Structure

This chapter discusses the specific components of each of the various environmental management plans, their structure, objectives, timing and responsibility for implementation. EMP costs are presented in Chapter 15.

Figure 6-1 shows the organizational structure of the EMP for the Trung Son Project. The EMP has the following component areas:

- Construction and Worker Camp Management Plan (Annex A)
  - Construction Camp Management Plan
  - Construction Management Plan
  - Other Management Plans (Waste Management Plan, Pollution Prevention Plan, etc.)
  - Safety during construction
  - Environmental training for construction workers
- Camp Follower Management Plan
- Biodiversity and Protected Areas Management Plan
- Reservoir Clearing and Salvage Plan
- Environmental Monitoring Plan
- Community Relations and Safety Plan
- Public Health Management Plan
- Physical Cultural Resources Management Plan
- Additional Studies
- Training and Capacity Building
- The Project's Plan Costs



### 6.1. EMP Responsibilities

Table 6-1 below describes the responsibilities of various organizations and project stakeholders towards the implementation of the Environmental Management Plan.

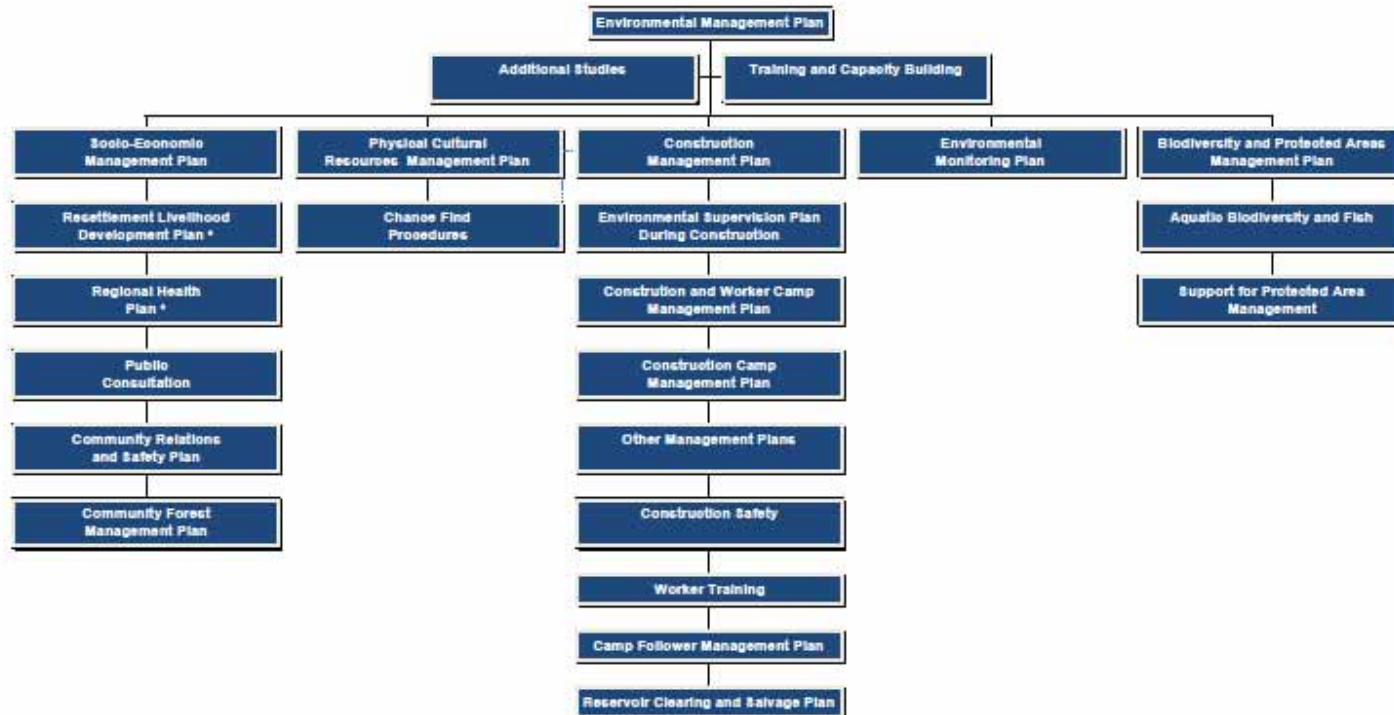
### 6.2. EMP Structure, Organization and Content

The tables that follow describe the objectives, content, timing and responsibility for each of the management plans presented in Table 6-1. Figure 6-1 shows the overall structure of the EMP and the relationships between each of the sub-plans.

**Table 6-1: Primary Responsibilities of the TSHPP EMP**

Plan	Sub-Plan	Primary Responsibility for Implementation			
		TSHPMB	Eng. Supervisor	Contractor	IEMC
Construction and Worker Camp Management Plan	Worker Camp Management Plan			√	
	Construction Management Plan			√	
	Waste Management Plan			√	
	Pollution Prevention Plan			√	
	Safety during construction			√	
	Environmental training of construction workers			√	
Camp Follower Management Plan		√		√	
Biodiversity and Protected Areas Management Plan		√			
Reservoir Clearing Plan				√	
Environmental Monitoring Plan	Environmental Sampling	√			√
	Oversight		√		√ As needed
Community Relations and Community Safety Plan				√	
Public Health Management Plan	Construction Worker Health Management Plan	√			
	Regional Health Management Plan	√			
Physical Cultural Resources Management Plan		√		√	
Additional Studies		√			
Training and capacity building	√	√	√	√	√

Figure 6-1: Organization of the TSHPP EMP



\* Not included in EMP

## Construction and Worker Camp Management Plan

### Objectives:

Minimize negative impacts of construction activities on local communities and the natural environment.

### Description:

Preparation of the Construction and Worker Camp Management Plan will be responsibility of the construction contractor. Specifications for preparation of this plan are presented in the construction bid. The detail is presented in Annex A.

The plan addresses the following elements:

- Construction Worker Camp Management Plan (Annex A-1)
- Construction Management Plan (Annex A-2)
- Other Management Plans: Waste Management Plan, Pollution Prevention Plan, etc (Annex A-3)
- Safety during construction (Annex A-4)
- Environmental training on construction workers (Annex A-5)
- Camp Follower Management Plan (Annex H)

### Timing/Schedule:

- Pre-construction: Design requirements, safety and security, camp maintenance, worker code of conduct, provisions for construction camp followers
- Construction: erosion/sedimentation, particulate emissions/dust, noise, earthworks, stockpiles/borrow pits, waste management, pollution prevention
- Operation: revegetation and site restoration
- The plan shall be in place two months prior to the onset of site construction works for the main project site.

### Responsibility:

- Preparation and implementation of the Construction and Worker Camp Management Plan will be the responsibility of the Construction Contractor.
- The environmental management unit of the TSHPMB will prepare bid documents incorporating plan provisions.
- The Supervising Engineer will oversee implementation of the plan.
- The Independent Environmental Monitor will review compliance of plan implementation against the plan terms of reference.

## Biodiversity and Protected Areas Management Plan

### Objectives:

Ensure protection of local and regional biodiversity and minimize project impacts on protected areas.

### Description:

The biodiversity and protected areas management plan shall contain measures to protect biodiversity and protected areas in the vicinity of the Trung Son project area including all, or a combination of the following:

- Improvements to the physical demarcation of reserve areas;
- Coordination of the implementation of protected area management plans;
- Capacity building and training for protected area's wardens and patrols;
- Additional ecological baseline studies, as required;
- Coordination of establishment of necessary infrastructure – control posts, toll gates, staff housing, trails;
- Installation of signage and fencing, as required;
- Development of an access management strategy including control of ingress and egress of vehicles to the project area, gates and access barriers;
- Development and implementation of a worker code of conduct prohibiting hunting, fishing and possession of wildlife for human consumption (bush meat);
- Development of mechanisms for inter-agency cooperation between the provincial forest management department and natural reserve management board;
- Environmental education and awareness in local communities and project personnel; and
- Coordination of activities in the protected areas buffer zone.

### Timing/Schedule:

- The Biodiversity and Protected Areas Management Plan shall be in place prior to the onset of construction two months prior to the onset of site construction works for the main project site.

### Responsibility:

- TSHPMB shall be primarily responsible for development and implementation of the Biodiversity and Protected Areas Management Plan in conjunction with the Natural Reserve Management Board.
- The Construction Contractor shall be responsible for implementation of a worker code of conduct and arrangements with the catering contractor and local restaurants to prohibit consumption of illegally caught fish and wildlife.

## Detailed Reservoir Clearing Plan

### Objectives:

Minimize biomass loss as a result of reservoir clearing. Coordinate timing of reservoir clearing to allow benefits to local communities from salvage.

### Description:

A preliminary Reservoir Vegetation Cover Clearance Plan has been prepared (Center of Hydrography Application and Environment Engineering n.d). The Construction Contractor should use this document to prepare a detailed Reservoir Clearing Plan.

The Reservoir Clearing Plan shall contain provisions to minimize biomass loss as a result of vegetation clearing and ensure benefits to local communities, including the following:

- Only clearing area where approved to avoid unnecessary cutting and removal of vegetation;
- Consideration of reservoir filling in regard to timing of clearing to maximize the efficiency of vegetation removal and salvage, while minimizing the opportunity for vegetation re-growth;
- Minimize potential impacts associated with vegetation clearing – e.g. dust
- Coordination of local communities for the removal and salvage of cut vegetation;

### Timing/Schedule:

- The Reservoir Clearing and Salvage Plan shall be in place two months prior to the onset of site construction works for the main project site.

### Responsibility:

- The Construction Contractor shall prepare and implement the Reservoir Clearing Plan;
- As part of the RLDP, TSHPMB shall provide oversight to implementation of the plan, including coordination and liaison with local communities.

## Environmental Monitoring Plan

### Objectives:

The objectives of the environmental monitoring plan are to a) ensure project components are compliant with all laws and approval conditions; b) measure the success of proposed mitigation measures; c) continue baseline monitoring and d) facilitate a continual review of post-construction and operation activities.

### Description:

Environmental monitoring will be done during construction and operation. Details of the proposed environmental monitoring program are presented in Section 9 of the EMP.

#### *Construction*

The focus of monitoring during the construction phase will be to implement systematic observations to periodically measure the success of proposed mitigation measures and continue baseline data collection.

Environmental sampling during the construction phase will be done by the TSHPMB Environmental Unit and/or IEMC. Specific monitoring aspects to be addressed during construction include:

- Noise
- Air quality
- Water quality and water resources
- Sedimentation and erosion
- Protected areas
- Physical cultural resources
- Access roads
- Resettlement of displaced persons
- Reclamation and revegetation

Oversight and performance assessment of monitoring activities shall be carried out by the Independent Environmental Monitoring Consultant (IEMC).

#### *Operation*

Monitoring during the operation phase shall be conducted by the TSHPMB and reflect those environmental and socio-economic issues that may persist upon completion of construction activities. Monitoring shall focus on evaluating the effectiveness of project mitigation measures and continue baseline monitoring and sampling. Monitoring activities should focus on the following:

- Hydrology
- Water quality

## Environmental Monitoring Plan

- Sedimentation
- Downstream erosion
- Aquatic biodiversity and fish
- Resettlement of displaced persons
- Downstream users
- Auxiliary project components

### Timing/Schedule:

- Environmental monitoring shall start as soon as the project is given the go-ahead, and monitors shall be ready to be mobilized prior to the onset of construction activities.

### Responsibility:

- Monitoring shall be implemented throughout all project phases and managed by the TSHPMB.
- The TSHPMB will also be responsible for ensuring that the surrounding environment and social communities are protected throughout the life of the TSHPP.
- The Independent Environmental Monitoring Consultant shall be responsible for oversight and performance assessment of all environmental monitoring activities.



## Community Relations and Community Safety Plan

### Objectives:

The Construction Contractor will be required to complete a Community Relations and Community Safety Plan. Details of the Community Relations and Community Safety Plan are presented in Annex E.

### Description:

#### *Community Relations*

The Contractor shall prepare a Community Relations and Community Safety Plan aimed at the following:

- To inform the population about construction and work schedules, interruption of services, traffic detour routes and provisional bus routes, blasting and demolition, as appropriate;
- To ensure that construction activities shall occur mainly during daylight hours. If necessary, night work shall be carefully scheduled and local communities shall be properly informed so they can take necessary measures;
- To provide adequate notification - at least five days in advance of any service interruption (including water, electricity, telephone, and transportation routes) the community must be advised through postings at the project site, at bus stops, and in affected homes and businesses.
- Maintain open communications between local governments and communities;
- Maintain a mailing list to include agencies, organization, and residents that are interested in the project;
- Provide a community relations contact form whereby interested parties can receive information on site activities, project status and project implementation results;
- Provide all information, especially technical findings, in a language that is understandable to the general public and in a form of useful to interested citizens and elected officials through the preparation of fact sheets and news release, when major findings become available during project phase;

## Community Relations and Community Safety Plan

- Monitor community concerns and information requirements as the project progresses;
- Respond to telephone inquiries and written correspondence in a timely and accurate manner;
- Provide a grievance mechanism and means for addressing disputes or concerns; and
- Modify the Community Relation Plan for changes in community needs as necessary to be accurate during different project implementation phases.

### *Community Safety*

The contractor shall be responsible for addressing community safety concerns concerning the following:

- Reservoir filling
- Traffic safety
- Blasting

### *Worker Code of Conduct*

As discussed in Annex A, the Contractor shall be responsible for the preparation of a Worker Code of Conduct. This shall be made available to local communities at project information centers or other place easily accessible to the communities.

### *Timing/Schedule:*

- The Community Relations and Community Safety Plan shall be in place two months prior to the onset of site construction works for the main project site.

### *Responsibility:*

- The Construction Contractor shall be responsible for development and implementation of the Community Relations and Community Safety Plan.

## Public Health Plan

### Objectives:

As presented by Ly and Kaul (2008) a Public Health Action Plan will be developed by TSHPMB for the project. The PHAP will have three components:

- Resettlement Health Program (see RLDP)
- Regional Health Program
- Construction Workers Health Program (see Annex B)

The objectives of the Regional Health Program are as follows:

- Prevent and mitigate effects of construction and of operation on the local population
- Prevent and mitigate effects of the population influx (workers & camp-followers) on the local population
- Improve the health situation of the local population
- Assist in capacity building of the Public Health Institutions for addressing their target populations' health needs

### Description:

- The Regional Health Program will address key national health priorities as follows:
  - Expanded Program of Immunization
  - Tuberculosis control and prevention
  - Malaria control and prevention
  - HIV/AIDS control and prevention
  - Fresh water and environmental sanitation
  - Food hygiene and safety
  - Diarrhea prevention
  - Acute Respiratory Infection Prevention

## Public Health Plan

- Malnutrition prevention
- Population and family planning
- Anemia prevention
- Community mental health care
- The Regional Health Program will support improvement of public health institutions and programs through capacity building, infrastructure, equipment, transport, medicine and supplies and operational costs.
- Implementation and planning will be integrated;
- Capacity building is recognized as a key program component;
- A referral system will be developed linking Commune Health Centers, District Hospitals and Provincial Hospitals;
- One Commune Health Center shall be relocated to a new site
- A monitoring and surveillance program will be developed;
- The project area will be covered under the National Infectious Disease Outbreak Rapid Response Preparedness Plan; and
- Camp followers will receive benefits under the regional health plan.

### Timing/Schedule:

- The Regional Health Management Plan will be implemented during the construction phase and continue through operations.
- After a four year period, a mid-term review will be completed.

### Responsibility:

- Planning, coordination, management and supervision of both the Resettlement and the Regional Health Program will be assured by the TSHPMB.

## Physical Cultural Resources Management Plan

### Objectives:

The objective of the Physical Cultural Resources Management Plan is to prevent any inadvertent loss of physical and cultural resources during project construction and operation.

### Description:

- The Environmental Impact Assessment identified seven sites which has vestiges and artifacts, in which two sites are recommended for excavation. These activities will be undertaken in conjunction with authorities from the Ministry of Culture, Sports and Tourism.
- Additional physical and cultural resources (chance finds) may be encountered during construction. The Contractor will develop a Physical Cultural Resources Management Plan that identifies what measures shall be taken to protect these cultural resources.
- Chance Find Procedures, which identify what measures should be taken in the event that physical cultural resources are encountered, are outlined in Annex C.
- The plan should also address measures to monitor downstream erosion of physical cultural sites and implement measures to protect these sites.

### Timing/Schedule:

- The Physical Cultural Resources Management Plan shall be in place two months prior to the onset of site construction works for the main project site.

### Responsibility:

- For construction phase: The Construction Contractor shall coordinate the preparation and implementation of the Physical Cultural Resources Management Plan for review by the TSHPMB and the Ministry of Culture, Sports and Tourism.
- For operation phase: The TSHPMB shall coordinate the preparation and implementation of the Physical Cultural Resources Management Plan for review by the Ministry of Culture, Sports and Tourism.

## 7. Environmental and Social Impact Management

The environmental and social impacts of the TSHPP were identified in the SESIA and are linked to specific mitigation and management measures identified as below in the EMP. Assessment of construction impacts on resettlement sites are discussed in EVN (2010).

### 7.1. Construction

Standard mitigation standards and measures for minimizing the impacts during the construction phase of the TSHPP are shown in Table 7-1. More detailed construction specifications for environmental and social impact management are presented in Annex A.

**Table 7-1: Mitigation Standards/Measures for Minimizing Impacts During Construction**

Impact Agent	Issue	Impact	Mitigation Objective / Standard	Project Mitigation Measures
Reservoir Preparation (Clearing, grading, excavation, leveling, truck hauling, etc.)	Noise creation	Impact to local villagers, livestock breeding and wildlife	Noise levels should not affect local households, livestock breeding or wildlife species	<ul style="list-style-type: none"> <li>Construction activities shall occur mainly in daylight hours</li> <li>If activities occur outside of daylight hours, local villagers will be informed and agreement will be sought from local authorities</li> </ul>
	Dust creation	Decreased air quality can impact construction workers, local villagers and surrounding environment	Dust level created must not impact the health of construction workers, local villagers and surrounding environment	<ul style="list-style-type: none"> <li>Water work area and associated roads.</li> <li>Transportation vehicles shall follow in the designated area and road.</li> <li>Use exposed stockpiles and material as soon as possible</li> <li>Cover any exposed materials during transportation</li> </ul>
	Loss of forest cover	Impact productive land	Construction activities to be confined to designated areas to minimize loss of forest cover	<ul style="list-style-type: none"> <li>RLDP will allow affected villagers to remove economic valuable trees on their land.</li> <li>Avoid excess clearing for project requirements</li> <li>Vegetation debris shall be either disposed and/or burned at designated sites</li> </ul>
		Alteration of potential income	No long term impacts to those households	<ul style="list-style-type: none"> <li>Organizations and individuals affected shall be fully compensated for their land and damage to assets.</li> </ul>

Impact Agent	Issue	Impact	Mitigation Objective / Standard	Project Mitigation Measures
			dependent on forestry production	<ul style="list-style-type: none"> <li>Resettlement households shall be provided productive land for cultivating bamboo and forestry production</li> <li>RLDP will have training programs to diversify incomes</li> </ul>
		Impact to biodiversity and habitat	No impact to listed species, biodiversity and habitat	<ul style="list-style-type: none"> <li>Avoid clearing in restricted and protected areas.</li> <li>Education and training to enhance contractors and construction worker's awareness on necessity of protection of surrounding areas and biodiversity.</li> <li>Assist in protected areas management</li> </ul>
	Road Traffic	Dust Creation	Refer to above section on "Dust creation"	
		Increased road traffic	Minimize impacts to local villagers	<ul style="list-style-type: none"> <li>Minimize traffic in villages and other populated areas</li> <li>Install traffic signage</li> <li>Roads shall be kept free from mud, debris and other traffic obstacles</li> <li>Education for increasing community traffic awareness</li> </ul>
		Deterioration of roads	Minimize road damage	<ul style="list-style-type: none"> <li>Repair and maintain roads, as necessary,</li> </ul>
		Noise and vibration	Minimize noise and vibration levels affecting local households, livestock breeding or wildlife species	<ul style="list-style-type: none"> <li>Road traffic shall operate mainly in daylight hours</li> <li>If road traffic occurs outside of daylight hours, inform local villagers</li> <li>Machines should be periodically examined to comply with requirements of technical specifications</li> </ul>
		Accidents and unplanned events	Increased risk to personal health and safety during construction	Minimize risks to local villagers or construction workers' personal health and safety

Impact Agent	Issue	Impact	Mitigation Objective / Standard	Project Mitigation Measures
Impact Agent		activities		<ul style="list-style-type: none"> <li>• Protective equipment and tools are to be provided to workers by the construction contractor</li> <li>• Implement regular inspection of equipment and machinery</li> </ul>
	Vehicle and equipment maintenance and storage	Gas emissions and particulate matter decrease air quality	Air quality standards are maintained throughout construction	<ul style="list-style-type: none"> <li>• Maintain vehicles in accordance with manufacturer specifications</li> <li>• Repair vehicles and equipment, as necessary</li> </ul>
		Storage and discharge of oils, lubricants and other hazardous materials during operation and maintenance	No hazardous materials shall be released into the environment.	<ul style="list-style-type: none"> <li>• Provision and maintenance of designated storage and fuelling areas</li> </ul>
	Domestic waste (garbage, litter, human waste, etc.)	Impact to ecosystems (water, soils, vegetation, etc.)	Waste production shall not impact surrounding ecosystems	<ul style="list-style-type: none"> <li>• Domestic waste is properly collected and disposed of at approved locations</li> <li>• Implement recycling program where possible.</li> </ul>
	Natural organic debris	Impact to ecosystems (water, soil, vegetation, etc.)	Waste production shall not impact surrounding ecosystems	<ul style="list-style-type: none"> <li>• Natural debris shall be either disposed and/or burned at designated sites</li> </ul>
	Impact or alteration of cultural, archaeological or historical sites	Damage or destruction of site contents	Minimize damage during excavation activities	<ul style="list-style-type: none"> <li>• Follow procedures in “Chance Find Procedures” and “Reservoir Clearing Plan”</li> <li>• Coordinate planning of cemetery sites with local authorities to ensure that they are suitable with local cultural custom</li> </ul>
		Damage or destruction of newly discovered sites	Minimize impact to newly discovered sites until properly investigated	<ul style="list-style-type: none"> <li>• Discovery of new sites shall follow “Chance Find Procedures”</li> </ul>



Impact Agent	Issue	Impact	Mitigation Objective / Standard	Project Mitigation Measures
	Resettlement of households and villagers as a result of reservoir creation	Loss of homes	Villagers shall be either resettled or compensated	<ul style="list-style-type: none"> <li>Provision of new homes in designated resettlement areas according to resettled households' expectations</li> <li>Compensation in cash shall be provided for self-relocation</li> <li>Initiation of community livelihood plan (CLIP) to diversify household income.</li> <li>Information, education and communication activities and social programs shall be put in place to assist both resettled households and those that are currently in resettlement areas.</li> </ul>
		Disturbance to family networks, community structure and cultural and ethnic identities	Resettled villagers shall re-establish their current way of life in new communes	<ul style="list-style-type: none"> <li>Information, education and communication activities and social programs shall be put in place to assist both resettled households and those that are currently in resettlement areas.</li> </ul>
	Expansion of households in host-communes	Alteration to community culture and ethnic heritage	Villagers in affected communes shall maintain current way of life	<ul style="list-style-type: none"> <li>Information, education and communication activities and social programs shall be put in place to assist both resettled households and those that are currently in resettlement areas.</li> </ul>
		Increase demand for shared natural resources	Exploitation of natural resources is confined	<ul style="list-style-type: none"> <li>Coordination with local authorities, and protected area management board to enhance the awareness of local communities of natural resource management</li> </ul>
		Increased demand on community & health services	Adequate services shall be provided	<ul style="list-style-type: none"> <li>Support on facilities, training and capacity shall be provided to improve and maintain public service</li> </ul>
		Increased disease transmission	No increase in disease transmission rates	<ul style="list-style-type: none"> <li>Initiation of regional health plan</li> <li>Expansion or creation of new sanitation facilities</li> </ul>
		Disturbance to family networks, community	Existing villagers shall maintain their current way	<ul style="list-style-type: none"> <li>Initiation of community livelihood plan (CLIP) to diversify household's income.</li> </ul>

Impact Agent	Issue	Impact	Mitigation Objective / Standard	Project Mitigation Measures
		structure and cultural and ethnic identities	of life	<ul style="list-style-type: none"> <li>Information, education and communication activities and social programs shall be put in place to assist both resettled households and those that are currently in resettlement areas.</li> </ul>
<b>Dam Site Construction</b> (Clearing, grading, excavation, leveling, blasting, truck hauling, stockpiling, waste disposal, road development, transport vehicles, river diversion, transport vehicles, camp site construction, labor force and camp followers).	Noise and vibration creation	Disturbance to local households, livestock and wildlife species	Noise and vibration levels should not interfere with daily activities	<ul style="list-style-type: none"> <li>If construction is required outside of working hours, community and households shall be informed.</li> <li>Blasting activities should be implemented within the designated time and local people shall be informed prior to blasting.</li> </ul>
	Alteration of forest cover	Refer to above section on "Alteration of forest cover"		
	Soil erosion	Increased sedimentation	Minimize soil erosion and sedimentation	<ul style="list-style-type: none"> <li>Implement soil erosion and sedimentation control measures at susceptible locations (i.e. Steep slopes, sandy soils, etc.)</li> <li>Construction activities shall avoid working in wet conditions</li> </ul>
		Slope instability	Slope integrity shall be maintained throughout construction	<ul style="list-style-type: none"> <li>Installation of rock or stabilization structures</li> <li>Proper grading practices and water diversion structures</li> </ul>
		Alteration of productive topsoil	Maintain topsoil stockpiles for future use	<ul style="list-style-type: none"> <li>Implement the Construction and Worker Camp Management Plan for reinstatement</li> </ul>
	Dust creation	Refer to above section on "Dust creation"		
	Domestic waste and Natural Debris	Refer to above sections "Domestic Wastes" and "Natural Debris" for further details		
	Borrow pit and quarry creation	Removal of subsurface and creation borrow pit and quarry	Land gradient and drainages are maintained	<ul style="list-style-type: none"> <li>Excavated rock or gravel shall not compromise river bed and banks or impede flows</li> <li>Confine activities to approved locations</li> </ul>

Impact Agent	Issue	Impact	Mitigation Objective / Standard	Project Mitigation Measures
		Dust and debris created during transportation of materials	Minimize the creation of dust and debris during transportation	<ul style="list-style-type: none"> <li>Implement protective measures during transportation (i.e.covering loads, reduced travel speeds, etc.)</li> </ul>
		Abandonment of borrow pits and quarries	All disturbed areas are properly reclaimed after construction	<ul style="list-style-type: none"> <li>Implement the Construction and Worker Camp Management Plan for reinstatement</li> </ul>
	In-stream construction activities (installation of coffer dams, river diversion, machinery / equipment operating etc.)	Decreased water quality (sedimentation pollution, etc.) and impacts on aquatic ecosystems	Minimal disturbance to water quality and aquatic ecosystems	<ul style="list-style-type: none"> <li>Construction activities should occur during low water levels</li> <li>Maintain river diversion structures throughout construction</li> <li>Minimize in-stream activities</li> <li>Proper maintenance of vehicles and equipment</li> <li>Implementation of clean-up activities and restoration of side channels</li> </ul>
<b>Construction Camp Creation (site clearing, camp site construction, labour force and camp followers)</b>	Site clearing	Refer to above sections in “Dam Site and Reservoir Preparation” for additional details on clearing impacts		
	Construction of new camp buildings	Increased demand for building materials	Exploitation of local natural resources shall be minimized for construction purposes	<ul style="list-style-type: none"> <li>Make use of excavation site and reservoir clearing materials for construction</li> </ul>
		Installation requirement for sanitation services	Adequate provision of sanitation and disposal services	<ul style="list-style-type: none"> <li>Provide adequate and compliant sanitation services</li> <li>Designated discharge points for sanitation shall be addressed as procedures stipulated prior to discharging to environment</li> </ul>
		Noise and dust creation	Refer to previous “Noise” and “Dust” section for further details	
		Domestic waste	Refer to above section on “Domestic waste” for further details	
	Construction Job creation	Potential exploitation of local workforce as available labor	Equal employment opportunities	<ul style="list-style-type: none"> <li>Salaries and work details shall be agreed to by the contractor and local workers.</li> <li>Implement the community livelihood development plan for job creation and increase income</li> </ul>

Impact Agent	Issue	Impact	Mitigation Objective / Standard	Project Mitigation Measures
Impact Agent		Change in livelihood and traditional activities	Standard of living shall be improved and traditional activities shall be supported	<ul style="list-style-type: none"> <li>• Providing services for both local workers and outside construction workers</li> <li>• Financial support to maintain traditional activities</li> </ul>
		Diversion of household and manual labor (agricultural, forestry, etc.)	Women, youth and elderly shall not be overburdened in maintaining homes	<ul style="list-style-type: none"> <li>• RLDP shall implement financial support programs to assist women in household activities (such as cooking, cleaning, raising children, agricultural activities, etc.).</li> <li>• Encourage unemployed males to share household responsibilities</li> </ul>
	"Boom-town" effect from rapid population and resource demand increase	Rapid population causes regional inflation on resource demands	Minimize inflation	<ul style="list-style-type: none"> <li>• Encourage provision of materials, food stuff and others from outside of the local region</li> </ul>
	Increased demand for infrastructure and utilities	Increased demand for building materials may cause social conflicts	Construction activities shall not affect existing natural resources	<ul style="list-style-type: none"> <li>• Ensure construction camp resources do not conflict with local commune supplies</li> <li>• The TSHPMB shall coordinate with local authorities and the protected area management board to increase security around protected areas</li> </ul>
		Increased demand for community services staff (medical, emergency, safety, etc.)	Construction workers shall receive adequate services and local people shall receive benefits from these	<ul style="list-style-type: none"> <li>• Coordinate with local authorities in establishment of services forms.</li> <li>• Financial assistance to support services and maintain operations</li> </ul>
		Increased demand for domestic water (drinking, food preparation, bathing, etc.)	Construction workers and local villagers shall receive clean, reliable water supplies	<ul style="list-style-type: none"> <li>• Provision of domestic water supplies for the construction camp shall be assured and not conflict with local water usage.</li> </ul>
		Domestic wastewater production and sanitation services may	Construction workers shall be provided with proper facilities for on environment	<ul style="list-style-type: none"> <li>• Domestic wastewater in worker camp shall be directed to a holding tank before discharging environment.</li> <li>• Domestic wastewater in construction</li> </ul>

Impact Agent	Issue	Impact	Mitigation Objective / Standard	Project Mitigation Measures
		cause social conflicts	sanitation and waste disposal	sites shall be collected and treated in agreement with local government
		Increased power/fuel demands may cause social conflicts	Power/fuel shall be supplied without compromising existing resources or exploiting natural areas (i.e. firewood)	<ul style="list-style-type: none"> <li>• Enforce regulations to prevent exploitation of natural resources (firewood)</li> <li>• Provide additional fuel supplies to prevent conflict with local villagers</li> <li>• Increase security around protected areas, especially along roads</li> </ul>
	Health Impacts of Construction Worker Camps	Increased disease transmission rates	Decreased disease transmission rates	<ul style="list-style-type: none"> <li>• Contractor shall be required to regularly test of health of construction worker and construction local worker according to Vietnam Law as stipulated.</li> <li>• Construction workers and local workers shall receive necessary health care services. Camp clinics shall be established</li> <li>• Education and promote awareness on personal hygiene and sexually transmitted disease</li> </ul>
		Increased drug use and trade	Construction worker are strictly prohibited to use, trade and transportation drug	<ul style="list-style-type: none"> <li>• Contractor construction workers and local worker shall be routinely healthy tested</li> <li>• Increase security in construction campsite, especially on roads and rivers</li> <li>• Drug education and awareness programs</li> </ul>
	Health Impacts to local villagers and communes	Increased disease transmission rates	Minimize the risk of exposure to local villagers	<ul style="list-style-type: none"> <li>• Healthy facility is supported by local medical centers</li> <li>• Educate and promote awareness on personal hygiene and disease transmission</li> </ul>
		Increased demand for sanitation and health in resettlement	Resettled individuals have proper access services	<ul style="list-style-type: none"> <li>• Educate and promote awareness on personal hygiene and disease transmission</li> </ul>

Impact Agent	Issue	Impact	Mitigation Objective / Standard	Project Mitigation Measures
		sites		<ul style="list-style-type: none"> <li>Resettled households shall be ensured to use health services in the region.</li> </ul>
		Change in biodiversity and increased pressure on protected areas	Decreased forest cover, impact on species and integrity of protected areas	<ul style="list-style-type: none"> <li>Enhance protection and management measures for protected areas</li> <li>Implement worker code of conduct</li> <li>Prohibit hunting and consumption of wild meat in construction camps</li> </ul>
	Change in unity of ethnic and cultural identities	Impact on cultural custom and identities Increased unlawful behaviors	Minimize effects on cultural custom and identities and reduce opportunity for unlawful behavior	<ul style="list-style-type: none"> <li>Establish programs and assistance for activities to preserve ethnic and cultural heritage identities</li> <li>Education and awareness program on ethnic identities for local people, especially youth</li> <li>Increased village and community security</li> <li>Separate living areas for construction workers</li> <li>Implement mitigation measures of the RLDP</li> </ul>
<b>Access Road Construction (Co-Luong to Co Me road)</b>	Disturbance to biodiversity and increased pressure on protected areas	Decreased forest cover, increased road traffic noise and vibration creating disturbance to local villagers, livestock and wildlife species	Minimize disturbance to protected areas, people, livestock and wildlife	<ul style="list-style-type: none"> <li>The TSHPMB shall assist the protected area management board in coordination with local authorities to strengthen protection and management measures for protected areas in the vicinity of the access road</li> <li>Construction activities shall occur in daylight hours. Inform the local authority, community and the protected area management board if construction activities occur outside of daylight hours</li> <li>Install road signs and signals.</li> </ul>
<b>Auxiliary Project Transmission Line Construction (transmission lines, operation)</b>	Dust creation	Refer to above section on "Dust creation"		
	Noise and vibration creation	Refer to above section on "Noise and vibration creation"		

Impact Agent	Issue	Impact	Mitigation Objective / Standard	Project Mitigation Measures
roads etc.)	Alteration of forest cover	Refer to above section on "Alteration of forest cover"		
	Alteration of cultural / archaeological / historical sites	Refer to above section on "Alteration of cultural / archaeological / historical sites"		
	Soil Erosion	Refer to above section on "Soil erosion"		
	Increased road Traffic	Refer to above section on "Increased road traffic"		
	Accidents and unplanned events	Refer to above section on "Accidents and unplanned events"		
	Vehicle and equipment maintenance and storage	Refer to above section on "Vehicle and equipment maintenance and storage"		
	Resettlement of affected households and local people	Refer to above section on "Resettlement of affected communes and villagers"		
	Change in cultural and ethnic identities	Refer to above section on "Change in cultural and ethnic identities"		

## 7.2. Operation

Standard mitigation standards and measures for minimizing the impacts during the operation phase of the TSHPP are shown in Table 7-2.

**Table 7-2: Mitigation Standards/Measures for the TSHPP During Operation**

Impact Agent	Issue	Impact	Mitigation Objective / Standard	Project Mitigation Measure
Hydroelectric Plant Operation (Stockpiles, powerhouse, truck hauling)	Noise	Continuous, low level noise affecting local communes	Noise levels should be confined with designated levels not to interfere with daily activities of local people	<ul style="list-style-type: none"> <li>• Proper design and operation of vehicles and equipment in accordance with stipulated procedures</li> <li>• Proper maintenance of equipment and vehicles in accordance with stipulated procedures</li> <li>• Sound barriers shall be installed on the machines to reduce noise impacts, as necessary.</li> </ul>
	Road Traffic	Increased noise, dust, and vehicles to local people	Operation of vehicles shall not interfere with or affect local villagers	<ul style="list-style-type: none"> <li>• Proper maintenance of road and repairs, as required</li> <li>• Installation of road signage</li> <li>• Proper maintenance of equipment and vehicles in accordance with stipulated procedures</li> </ul>
	Increased levels of floating debris, waste	Interference to turbines	Debris shall not obstruct water intake devices	<ul style="list-style-type: none"> <li>• Follow prescribed measures in the Detailed Reservoir Clearing Plan</li> <li>• Operation of debris-bucket in intake devices in accordance with stipulated procedures</li> </ul>
	Decomposition and decay of vegetation biomass	Reduction of oxygen levels	Maintain oxygen levels for aquatic life	<ul style="list-style-type: none"> <li>• Follow approved Reservoir Clearing Plan</li> <li>• Regular monitoring of water quality parameters</li> <li>• Continuous monitoring, sampling and investigation of water quality as prescribed in the reservoir clearing plan</li> <li>• Propose additional measures as necessary</li> </ul>
		Increased odors	No generation of noxious odors	<ul style="list-style-type: none"> <li>• Follow prescribed measures in the approved Reservoir Clearing Plan to avoid generation of toxic odors</li> </ul>



Impact Agent	Issue	Impact	Mitigation Objective / Standard	Project Mitigation Measure
<p><b>Water Quality</b></p>		Eutrophication	Nutrient levels and water quality in reservoir shall be maintained	<ul style="list-style-type: none"> <li>• Follow prescribed measures in the approved Reservoir Clearing Plan .</li> <li>• Regular monitoring of water quality</li> <li>• Propose additional measures as necessary.</li> </ul>
	Sedimentation in reservoir	Increased sedimentation behind impoundment	Maximize useful life of reservoir	<ul style="list-style-type: none"> <li>• Maintain management and protection measures of watershed forest in the catchments area to minimize erosion and sedimentation in the reservoir</li> <li>• Maximize useful life of reservoir by continuous monitoring and use of sedimentation model for calculation of reservoir sedimentation</li> </ul>
	Changes to hydrological flow	Increased peak flows and flood duration lead to erosion and degradation of ecosystems	Erosion and impact is minimized downstream	<ul style="list-style-type: none"> <li>• Downstream flows shall be maintained regularly by minimum operation of one unit.</li> <li>• Maintain downstream flow based on following the approved reservoir operation procedures</li> </ul>
	Downstream impacts to aquatic species	Changes to local species breeding and spawning grounds	No net loss of fish and aquatic species	<ul style="list-style-type: none"> <li>• The aquaculture sector in the region shall be encouraged to enhance the fisheries sector</li> <li>• Compensatory breeding of young fish is encouraged in the first five years after the operation</li> <li>• Training programs shall be implemented on proper harvesting methods and techniques</li> <li>• In order to ensure no impact on the growth of fisheries and no affect to aquatic habitants, sustainable recreational and tourism activities shall also be encouraged</li> </ul>
	Fisheries of economic value	Decreased number of economic valuable species	Restoration of species of economic value	<ul style="list-style-type: none"> <li>• Economical valuable fishes are promoted and fish stocking shall be implemented for population restoration</li> <li>• Compensatory breeding of young fish is encouraged in the first five years after the operation</li> </ul>

Impact Agent	Issue	Impact	Mitigation Objective / Standard	Project Mitigation Measure
				<ul style="list-style-type: none"> <li>Assist in promotion of fish breeding and stocking to enhance productivity of decreased fish populations.</li> </ul>
	Alteration of existing fish species	Changes to local species breeding and spawning grounds	No net loss of fish species	<ul style="list-style-type: none"> <li>Promote regional aquaculture program</li> <li>Educate local people on proper harvesting methods and techniques</li> </ul>
	Alteration of fish production	Changes to fisheries sector production	Fisheries production is maximized without compromising species	<ul style="list-style-type: none"> <li>Promote regional aquaculture program</li> <li>Compensatory breeding of young fish is encouraged in the first five years after the operation</li> <li>Educate local people on proper harvesting methods and techniques</li> </ul>
		Increased levels recreational and tourism opportunities	Sustainable recreational and tourism activities shall not impact fish productivity	<ul style="list-style-type: none"> <li>Encourage sustainable recreational and tourism activities</li> </ul>
<b>The Plant's operation (turbines, downstream volume outflow, etc.)</b>	Change in natural flows	Impact to ecosystems and downstream habitants	Maintenance of downstream flows	<ul style="list-style-type: none"> <li>Maintenance of downstream flows based on approved reservoir operation procedures</li> </ul>
	Flood control benefits	Reduction of flood damages	Prevention of damaging floods downstream	<ul style="list-style-type: none"> <li>Follow approved reservoir operation procedures</li> </ul>
	Decreased sediment transport downstream (erosion)	Impact agricultural areas, aquaculture downstream	Ensure integrity of downstream habitats	<ul style="list-style-type: none"> <li>Implement regular water sampling and analysis to evaluate sediment downstream of dam</li> </ul>
	Impacts on downstream water quality	Changed water quality downstream	Maintain water quality in accordance with Vietnamese standards	<ul style="list-style-type: none"> <li>Follow requirements specified in the approved Environmental Impact Assessment and SESIA</li> </ul>
	Impact to historical and culturally significant artifacts	Risk of impact on downstream historical and cultural artifacts	No damage and/or loss of downstream historical and cultural sites	<ul style="list-style-type: none"> <li>Identified sites subject to potential erosion shall be monitored during dam operation</li> <li>Studies, surveys and preservation measures shall follow the Law on</li> </ul>

Impact Agent	Issue	Impact	Mitigation Objective / Standard	Project Mitigation Measure
				Cultural Heritage <ul style="list-style-type: none"> <li>Steps will be taken to preserve and/or relocate historical/cultural artifacts (i.e. additional surveys, consultation with Law on Cultural Heritage etc.)</li> </ul>
	Salinity levels in tidal zones	Changes in salinity may affect agricultural productivity	Maintain agricultural productivity	<ul style="list-style-type: none"> <li>Water quality shall be maintained in accordance with Vietnamese standards</li> </ul>
	River transportation	Impediment of river transportation	River transportation shall be maintained	<ul style="list-style-type: none"> <li>Interconnect roads to maintain traffic over catchment area</li> <li>Construct wharf or landing area at dam site location to connect with access road</li> </ul>
	Alteration of aquaculture and fisheries sector	Alteration of food source and income	No net loss of aquaculture and fish species	<ul style="list-style-type: none"> <li>Implement mitigation measures specified in the Impact Assessment Report on Fish and Fisheries</li> </ul>
Operational Staff	Increased demand on usage of resources, health services	Increased demand on usage of resources, public services	Sustainability of natural resources shall be maintained	<ul style="list-style-type: none"> <li>Education and awareness on management of natural resources.</li> <li>Co-management of existing natural resources between operational staff and communes</li> </ul>
		Increased demand for community and health services	Services shall adequately support operational staff and local villagers	<ul style="list-style-type: none"> <li>Facilities and services shall be provided to operational staff</li> </ul>
		Impact to existing cultural and ethnic minority groups	Cultural and ethnic minority groups shall not be permanently affected	<ul style="list-style-type: none"> <li>Provision of communication networks and social programs shall be introduced to assist minority groups, if necessary</li> </ul>
Co Luong – Co Me Road operation	Dust	Decreased air quality for affected commune and households	Minimize affects of dust created on health of affected groups	<ul style="list-style-type: none"> <li>Continuous maintenance of roads</li> <li>Pave roads, if necessary</li> </ul>

Impact Agent	Issue	Impact	Mitigation Objective / Standard	Project Mitigation Measure
	Noise and vibration	Refer to “Noise and vibration creation” sections under “Construction Impacts” for further details		
	Traffic system	Easy access into more remote and/or protected areas	Natural resources and protected areas shall not be exploited for personal consumption	<ul style="list-style-type: none"> <li>• Enhance security along roads and restrict access into protected areas</li> </ul>
		Improved transportation	Roads shall be maintained to facilitate local transportation	<ul style="list-style-type: none"> <li>• Road maintenance and repair</li> </ul>
		Increased trespass and drug trade	Local roads shall not be used for illegal activities	<ul style="list-style-type: none"> <li>• Protected Area management board and local authorities shall enhance security along roads and access shall be restricted into natural and protected areas. Security shall be increased along roads to monitor roadside communes and their export of natural resources and other illegal activities.</li> </ul>

## 8. Environmental Supervision Framework

Environmental supervision is a process to ensure project-related construction activities are completed in compliance with the Government of Vietnam's regulations and mitigation measures as outlined in the SESIA and EMP. With respect to the TSHPP, supervision is required primarily during construction activities.

### 8.1. Construction Supervision Framework

Construction supervision is a daily process whereby a designated individual or group provides oversight to the Contractor and sub-contractors to ensure that environmental commitments identified within the SESIA and EMP are complied with (see Figure 8-1, also Annex A).

Environmental and Socio-economic supervision shall be implemented as part of overall project engineering supervision.

Enforcement shall be implemented through the Contractor's technical proposals based on the TSHPMB's Terms of Reference (ToR) for Construction and Camp Management (Annex A) and contractual clauses relating to socio-economic and environmental performance.

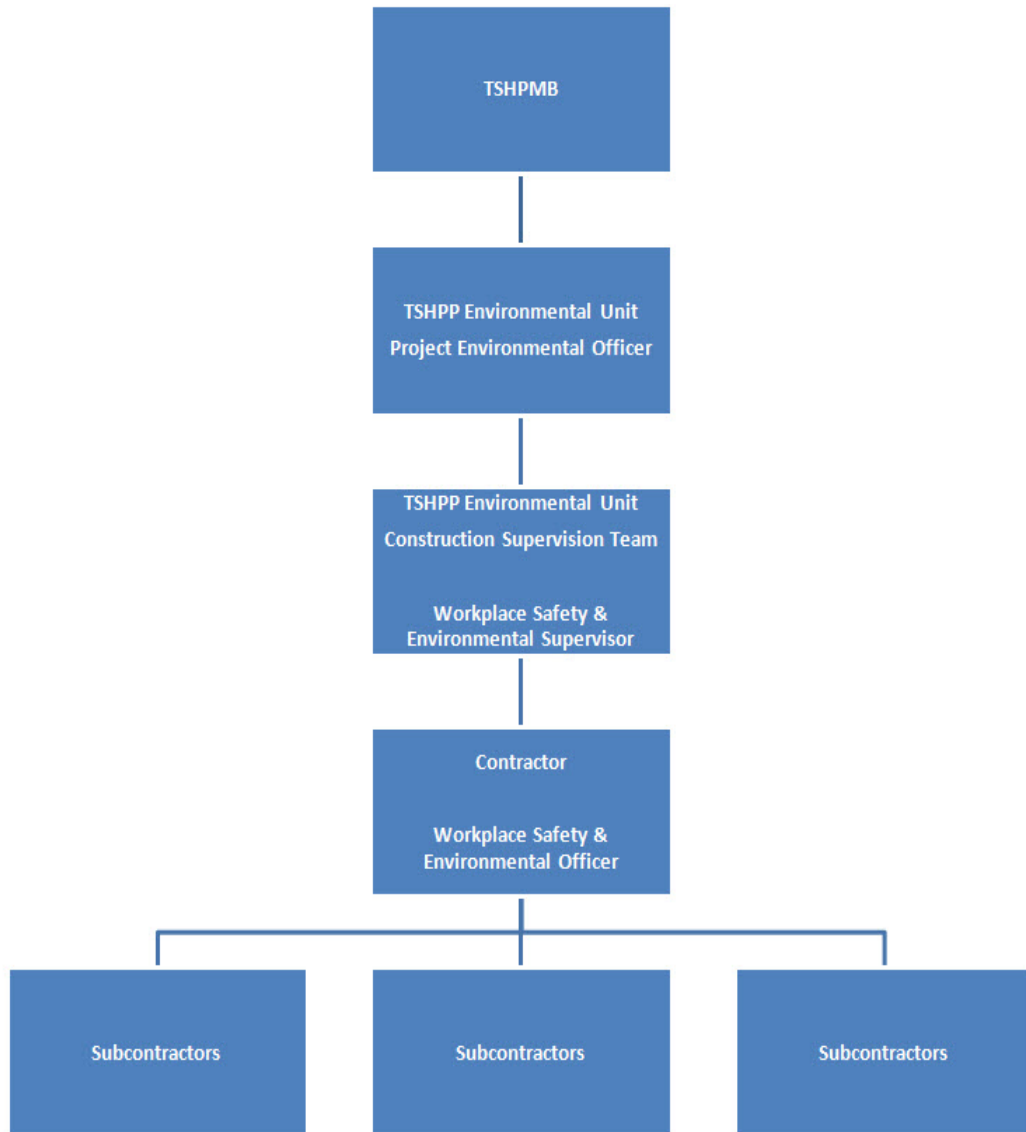
### 8.2. Construction Supervision – TSHPP Environmental Unit

The TSHPMB shall be responsible for ensuring that:

- EMP/SEIA provisions are incorporated into contractor documents;
- Adequate resources and personnel are in place to supervise EMP/SESIA performance;
- Contractor and all sub-contractors comply with EMP/SESIA regulations on a daily basis;
- Audits or compliance reviews are completed on a scheduled basis and the results provided to either the World Bank or Government of Vietnam; and
- All monitoring resources are properly implemented and data is adequately recorded for reporting purposes.

The Project Environmental Officer (PEO) will represent the TSHPMB for project-related matters and will be responsible for ensuring the SESIA and EMP mitigation measures are employed. They will also lead the TSHPP environmental unit.

The TSHPP environmental unit will be responsible for supervising and monitoring all construction activities.



**Figure 8-1: Supervision Structure for TSHPP**

### 8.3. Construction Supervision – Contractor Responsibility

The Contractor (and sub-contractors) shall organize representatives within an Environmental Team (ET), which shall be lead by the Workplace Safety & Environmental Officer (SEO). Collectively, the ET and SEO shall ensure construction activities abide by EMP/SESIA requirements.

For additional details on roles and responsibilities refer to the Construction Camp Management Plan in Annex A. Table 8-1 describes the supervision framework for overseeing environmental and socio-economic parameters for the construction of the TSHPP.

**Table 8-1: Construction Supervision Framework**

Issue	Location: <i>Where is the issue?</i>	Parameter: <i>What is being overseen?</i>	Procedure: <i>How is the issue managed?</i>
<b>Forest / vegetation clearing</b>	Boundaries of the reservoir  Storage and disposal sites	Harvesting techniques  Debris storage and disposal sites  Exploitation of natural resources  Involvement of local community in clearing as part of RLDP	Daily observations  Reporting incidences  Report provided to TSHPMB at termination of clearing
<b>Noise</b>	Construction site  Project –adjacent communes	Amount of noise being created during construction hours and days  Frequency of disturbance to local villagers	Visual and auditory observations  Report forms  Monthly reporting to TSHPMB
<b>Dust</b>	Construction site  Access Roads  Water withdrawal sites	Amount of dust generated during construction activities  Water resource use for spraying	Daily observations  Incident reporting  Monthly reporting to TSHPMB
<b>Management of hazardous materials (fuels, lubricants, explosives, etc.)</b>	Hazardous materials storage site	Storage facility location, security and maintenance	Inventory checklists  Reporting incidents or accidents  Quarterly reporting to TSHPMB

Issue	Location: <i>Where is the issue?</i>	Parameter: <i>What is being overseen?</i>	Procedure: <i>How is the issue managed?</i>
<b>Solid waste</b>	Designated landfill  Construction site  Camp sites	Amount of waste generated at construction and camp sites  Amount of waste disposed at the landfill  Recycling of material  Littering and contamination of environment	Waste tracking sheets or register  Incident reports  Monthly reporting to TSHPMB
<b>Sewage waste</b>	Construction site services  Camp site services	Quantity and quality of sanitation services provided  Misuse of sanitation services  Inappropriate disposal of human waste	Daily checklists  Incident reports  Monthly reporting to TSHPMB
<b>Potable Water</b>	Construction site  Camp site	Misuse of water reserves  Misuse of natural water sources  Contamination of water resources	Daily checklists  Incident reports  Monthly reporting to TSHPMB
<b>Construction equipment and vehicle maintenance</b>	Construction site  Vehicle/equipment storage area  Access roads	Vehicles/equipment operating at standard levels  Excess oil, fuel, lubricant leaks and gas emissions  Disorderly conduct or misuse of equipment / vehicles	Daily checklists  Incident reports  Quarterly reporting to TSHPMB



Issue	Location: <i>Where is the issue?</i>	Parameter: <i>What is being overseen?</i>	Procedure: <i>How is the issue managed?</i>
<b>Worker Code of Conduct and Safety</b>	Construction site Camp site	Safety, security and orderly conduct of construction workers  Accidents and unplanned events  Conflict with local villagers	Environmental and safety meetings held regularly  Incident report forms  Quarterly reporting to TSHPMB

## 9. Environmental Monitoring Framework

The TSHPP Environmental Monitoring Framework outlines the responsibilities of the TSHPMB, the IEMC and the Contractor to monitor the environmental and social mitigation measures of the TSHPP and to ensure it is constructed and operated in a manner that is compliant with Vietnamese government regulations and SESIA/EMP commitments.

### 9.1. Monitoring Objectives

The objectives of the Environmental Monitoring Framework are:

- To ensure project components are conducted in compliance with the Government of Vietnam's laws and regulations and approval conditions of the SESIA;
- To measure the success of proposed mitigation measures in minimizing and/or reducing potential environmental and socio-economic impacts;
- To continuously monitor changes to baseline environmental and social conditions during construction and operation activities;
- To facilitate a continual review of post-construction and operation activities based on performance data and consultation feedback; and
- To implement corrective actions or new adaptive management programs, as required, if proposed mitigation measures are unable to reduce and/or eliminate potential project-related impacts, or meet the predetermined level of performance.

### 9.2. Monitoring Framework

The monitoring framework is intended to provide guidance on the content of the environmental monitoring procedures and shall not replace any Government of Vietnam standards, regulations or laws that are mandatory during construction and operation activities. It is also recommended that the TSHPMB consider creating their own internal databases or registries to collect, document and present records as required.

Monitoring shall start as soon as the project is given the go-ahead, and monitors shall be ready to be mobilized prior to the onset of construction activities. Monitoring shall be implemented throughout all project phases and managed by the TSHPMB. The TSHPMB will also be responsible for ensuring that the surrounding environment and social communities are protected throughout the life of the TSHPP.

### 9.3. Construction Phase

Monitoring during the TSHPP construction phase will have two principle purposes:

- Implement systematic observations to periodically measure the result of proposed mitigation measures; and
- Continue data collection in order to compare baseline environmental conditions with conditions during construction and operation.

The majority of construction monitoring shall be done visually and verified by the Construction Supervisor. Checklists shall be conducted to identify potential environmental and social issues early. Proper courses of actions shall be proposed if any proposed mitigation measures are not in compliance with Government of Vietnam regulations or unable to properly reduce and/or eliminate environmental and/or socio-economic impacts.

The Environmental Unit of TSHPMB will be responsible for carrying out environmental sampling and monitoring on all environmentally related issues regarding the Construction Contractor's activities. If necessary, the Environmental Unit will hire outside consultants to undertake sampling. The Environmental Unit will develop and maintain a database of all project related monitoring and supervision data.

The IEMC will review, verify and validate environmental performance and identify those issues that require additional review and management adjustments.

Individuals required for water quality and any other environmental testing shall be trained according to the TSHPMB staffing and equipment plan.

Monthly reports shall be issued to the TSHPMB and where required, the World Bank, to summarize construction activities, document those that require amendment and to identify whether or not remedial actions are needed.

Table 9-1 identifies the monitoring activities to be carried out during the Construction Phase.

**Table 9-1: Construction Monitoring Plan Framework**

<b>Issue</b>	<b>Responsibility: <i>Who will monitor?</i></b>	<b>Duration: <i>When is monitoring done?</i></b>	<b>Parameter: <i>What is being tracked?</i></b>	<b>Location: <i>Where does monitoring occur?</i></b>	<b>Procedure: <i>How is the issued or recorded?</i></b>
<b>Noise</b>	IEMC/TSHMP	Daily observations	Frequency of disturbance to local villagers  Requirement for sound barrier installation, as required	Construction site  Adjacent communes	Auditory or with portable noise monitoring equipment  Reporting forms  Monthly reporting
<b>Air quality</b>	IEMC/TSHMPMB	Monthly tests	Amount of dust generated  Requirement for spraying roads, site to control dust and water supply	Construction site  Access roads  Water withdrawal sites	Visual  Reporting forms  Monthly reporting
<b>Water quality</b>	IEMC/TSHMPMB	Monthly testing for TSS, DO, conductivity and pH (using portable equipment)  Monthly testing for other parameters	Water quality standards in construction and camp sites (BOD, pH, COD, TSS, dissolved oxygen, temperature, coliforms, etc.)	Water reserves and resources  Sewage disposal sites	Water sampling  Laboratory testing  Monthly reporting

<b>Issue</b>	<b>Responsibility: <i>Who will monitor?</i></b>	<b>Duration: <i>When is monitoring done?</i></b>	<b>Parameter: <i>What is being tracked?</i></b>	<b>Location: <i>Where does monitoring occur?</i></b>	<b>Procedure: <i>How is the issued or recorded?</i></b>
<b>Water resources</b>	IEMC/TSHPMB	Weekly testing	Amount of water available for construction site, camp site and resettlement communes	Water reserves and resources  Construction and camp sites  Project-affected communes	Monthly reporting  Consultation with project-affected communes
<b>Sedimentation and erosion</b>	IEMC/TSHPMB	Daily, as required	Amount of erosion and sediments being released, particularly into water resources	Construction site  Borrow pit sites  Cleared areas	Visual observations  Daily environmental checklists  Monthly reporting
<b>Natural protected areas</b>	IEMC/TSHPMB	Monthly	Tress into Protected Areas  Exploitation of Natural Resources	Natural Protected Areas  Access roads	Visual observations  Security checks  Monthly reporting
<b>Chance finds of culturally significant artifacts or sites</b>	Contractor  IEMC/TSHPMB	Daily, as required	Accidental discovery of culturally significant artifact or site	Excavation sites  Borrow sites  Construction site	Visual  Implement Chance Find Procedures

Issue	Responsibility: <i>Who will monitor?</i>	Duration: <i>When is monitoring done?</i>	Parameter: <i>What is being tracked?</i>	Location: <i>Where does monitoring occur?</i>	Procedure: <i>How is the issued or recorded?</i>
<b>Auxiliary project components (roads, transmission lines, etc.)</b>	Contractor		Road traffic and associated issues (noise, dust, displacement of people, etc.)	Access roads  Transmission line areas	Visual  Refer to other sections for additional information (ie. Noise, Dust, etc.)
<b>Site reclamation</b>	IEMC/TSHMP	Post-construction  Salvage, re-instatement of land	Ability of soils, vegetation, water resources, fauna and biodiversity to replenish after construction	Construction site  Camp sites	Monthly assessments  Quarterly reporting

#### 9.4. Operation Phase

Monitoring during the operation phase shall reflect those environmental and socio-economic issues that may persist upon completion of construction activities (Table 9-2). For the TSHPP, the following are some of the issues that will require monitoring:

**Hydrology.** Hydrological monitoring stations shall be implemented to primarily measure the Ma River's inflow, the newly constructed reservoir's storage volume and the amount of water discharged downstream. Monitoring hydrological features of the TSHPP shall be used in conjunction with water quality data to identify how the Trung Son dam is affecting the Ma River and associated rivers and tributaries.

**Water Quality.** Measuring water quality is a rapid evaluation of the general condition of the water within the Ma River, reservoir and downstream of the dam site. The frequency and location of monitoring sites shall assist in providing an early detection if there are deviations from normal standards and help in determining if further actions are required.

**Sedimentation.** Sedimentation is a concern once the dam has been constructed and the reservoir has been inundated. Sediment monitoring shall assist in determining annual sediment volumes being introduced into the reservoir and the lack of sediments being transported

downstream. Continuous monitoring, sampling and calculation of sedimentation in the reservoir shall be undertaken.

**Downstream Erosion:** The possible erosion of downstream historical/cultural artifacts is a potential concern. Identified sites subject to potential erosion shall be identified and monitored during project operation.

**Aquatic Biodiversity and Fish:** The creation of a physical barrier due to the Trung Son dam shall directly impact aquatic life and alter species biodiversity. Routine monitoring would assist in creating species profiles and determine how species are adapting to the newly constructed dam site.

**Resettlement of Displaced People and Downstream Users:** The TSHPP project shall physically displace numerous people and alter the livelihoods of several upstream and downstream communes. Due to the high percentage of ethnic minority groups, the persistence of poverty in the area and housing of permanent operational staff, monitoring of the success of resettlement and compensation activities is critical to ensure potential impacts do not persist upon construction activities. Monitoring programs shall incorporate several phases of public consultation to verify if additional actions are required. This will be done as part of the RLDP.

**Auxiliary Project Components:** The Co-Luong to Co-Me road requires post-construction monitoring to ensure its operation does not negatively (ie. noise, dust, etc.) impact those adjacent-living communes, increase access into Protected Natural Areas and provides a medium for drug export and trade.

**Table 9-2: Operation Monitoring Plan Framework**

Issue	Responsibility: <i>Who will monitor?</i>	Duration: <i>When is monitoring being done?</i>	Parameter: <i>What is being monitored?</i>	Location: <i>Where is the parameter being monitored?</i>	Procedure: <i>How is parameter being monitored?</i>
<b>Hydrological flows of the Ma River</b>	TSHPMB	Weekly and monthly reporting  Quarterly reporting to the TSHPMB	Hydrological flows  Reservoir volume	TSHPP dam site and reservoir	Water gauge stations  Flow measuring devices
<b>Water quality levels in Ma River and</b>	TSHPMB	Monthly reporting by Environmental Inspectors	Numerous parameters which may include: pH,	TSHPP dam site and reservoir	Water quality forms and checklists

Issue	Responsibility: <i>Who will monitor?</i>	Duration: <i>When is monitoring being done?</i>	Parameter: <i>What is being monitored?</i>	Location: <i>Where is the parameter being monitored?</i>	Procedure: <i>How is parameter being monitored?</i>
<b>reservoir</b>	Trained laboratory staff	Quarterly reporting to TSHPMB	BOD, COD, coliforms, dissolved oxygen, temperature etc.		Laboratory testing
<b>Sedimentation</b>	TSHPMB	Weekly and monthly reporting by Environmental Inspectors  Quarterly reporting to TSHPMB	Decaying debris, nutrients, level of eutrophication, and TSS	TSHPP dam site and reservoir	Laboratory testing  Checklists and environmental reports
<b>Aquatic biodiversity</b>	TSHPMB	Monthly reporting by Environmental Inspectors  Quarterly reporting to TSHPMB	Aquatic communities (algae, vegetation, etc.) and fish species	TSHPP dam site and reservoir	Limnological sampling of microflora, microfauna and benthic communities  Electro-fish sampling  Consultation with upstream / downstream fishermen
<b>Erosion downstream</b>	TSHPMB	Quarterly reporting	Erosion impacts downstream on historical and cultural artifacts	Buildings, historical and culturally significant sites	Visual  Photos  Reporting forms
<b>Noise</b>	TSHPMB	Quarterly reporting	Noise created operating Hydroelectric Plan  Noise created	Hydroelectric plant and access roads  Adjacent	Auditory  Visual  Reporting forms



Issue	Responsibility: <i>Who will monitor?</i>	Duration: <i>When is monitoring being done?</i>	Parameter: <i>What is being monitored?</i>	Location: <i>Where is the parameter being monitored?</i>	Procedure: <i>How is parameter being monitored?</i>
			from traffic on access roads  Frequency of disturbance to local villagers	communes	
<b>Dust</b>	TSHPMB	Quarterly reporting	Amount of dust being generated  Nuisance / disturbance to r households	Access roads	Visual  Reporting forms

## 10. Communication and Reporting

The following section describes the communication and reporting mechanisms to be implemented as part of the EMP.

### 10.1. Communication Process

Table 10-1 describes the lines of communication for construction workers, local villagers, employees and other project-related individuals with respect to filing grievances or incidences throughout the construction and operation of the TSHPP.

**Table 10-1: Communication Pathway**

Stakeholder	Potential Interest / Concern	Means of Contact	Key Contact
<b>Local villagers (displaced, resettled, downstream user)</b>	<p>Adequate compensation package (financial assistance, food cache, water reserves, etc.)</p> <p>Location of resettled household</p> <p>Disturbance from construction camp and associated activities (drugs, alcohol, prostitution, disease, environmental issues, etc.)</p> <p>Loss of productive lands, fisheries, etc.</p> <p>Access to community services (medical, education, telephone, market, etc.)</p> <p>Maintenance of cultural heritage</p> <p>Safety and security of local villages and communes</p> <p>Information broadcasts on potential hazards (blasting, road closures, reduced river access, etc.)</p>	<p>Complaints/concerns shall be communicated to local village leaders and authorities through a grievance process</p> <p>Information broadcasts and project updates shall be provided by the Contractor to local village leaders</p>	Social safeguard unit of TSHPMB

Stakeholder	Potential Interest / Concern	Means of Contact	Key Contact
<b>Potential employees</b>	Employment opportunities Adequate resources (food, water, etc.) and shelter Competitive wages	Recruitment of locals at the project site and through word of mouth Issues shall be conveyed to site foremen	Contractor
<b>Government stakeholders</b>	Chronic environmental and socio-economic impacts	Monitoring committee	TSHPMB
<b>Construction workers and camp sites</b>	Worker code of conduct Social conflicts between local villagers and workers Behavior issues (gambling, drugs, etc.) Environmental issues (exploitation of natural resources, etc.)	Weekly meetings with construction workers Individual meeting with disorderly workers	Contractor

## 10.2. Reporting

Reports shall be produced through the course of implementation of monitoring programs, collecting incident/grievances forms, consulting with local villages and project-affected communes and auditing performance of existing programs/mitigation measures within the SESIA and EMP.

Table 10-2 describes the types of reports that shall be produced.

The TSHPMB should provide the World Bank with report updates, frequency of reporting to the World Bank will vary depending on the nature of the non-compliance and monitoring schedule.

Table 10-2: Types of external reports

Responsibility	Type of Report	Purpose of Reporting	Frequency of Submission	Submit to:
<b>Contractor &amp; Workplace Safety and Environmental Officer</b>	Accidents/Incident Report	Filing/notification of accidents or unplanned events	Within 24 hours of the incident	TSHPMB/CST
	Non-compliance Report	Detail the cause, nature and effect of any environmental and/or socio-economic non-compliant act performed	Within one week of the event	TSHPMB/CST
	Chance Discovery Report	Documentation and registry of newly discovered artifacts	Within 24 of archaeological site, old human remains or artifact	TSHPMB/CST Competent agencies
	Monthly Compliance Report	Report to the Construction Supervision Team	Report of compliance and non-compliance measures on a monthly basis	CST
<b>Construction Supervision Team</b>	Daily Compliance Checklist	Checklist of environmental and social compliance of construction	Daily	Internal
	Monthly Compliance Report	Monthly report of compliance within 10 days of receipt of report from Contractor	Monthly	TSHPMB
<b>Project Environmental Officer &amp; Independent Environmental Monitoring Consultant</b>	EMP updates, including any changes in management or monitoring procedures	For approval prior to implementation	As required, prior to implementation	TSHPMB
	Key changes in project activities that may trigger Environmental Approvals	Ensure compliance with environmental regulatory approvals	As required, prior to implementation	TSHPMB
	Environmental monitoring reports	Notification of non-compliance with standard environmental guidelines and parameters	Dependent on environmental parameter: weekly, monthly, quarterly or annually	TSHPMB
<b>Environmental Unit of Project Management Board</b>	RDLP and sub-plans	Ensure resettled/displaced households transition successfully into resettled sites	On-going	TSHMP, EVN, World Bank

## 11. Capacity Building and Training

A key component of EMP success depends of effective capacity building of the TSHPMB, the training of staff and all others involved in the EMP, including the construction contractor and all sub-consultants. These efforts will also be assisted by the implementation of technical assistance by outside consultants.

All those responsible for the management, implementation and operation of any aspect of the EMP shall be adequately trained for their role. Training records shall be maintained on site, for each employee, to provide evidence for auditing/inspection purposes.

The following training shall be considered for each organization.

### 11.1. Trung Son Hydropower Project Management Board

The TSHPMB shall establish an environmental unit to oversee the preparation, implementation and oversight of the EMP and its associated sub plans. The environmental unit shall be provided with enough technical and financial resources to complete this oversight role; external resources or contractors may be required. Specific training to the environmental unit should be provided as follows:

- Principles and procedures for environmental impact assessment;
- Fundamentals of environmental management;
- Compliance assessment, monitoring and follow-up;
- Environmental audits;
- Social impact assessment and public consultation; and
- Fundamentals of aquatic ecology and environmental flows associated with construction and operation of hydroelectric projects (including trained expertise in water quality testing and analysis).

### 11.2. Supervising Engineer

The supervising engineer shall have environmental staff trained to ensure contractor compliance with EMP requirements. Alternately, the Supervising Engineer can subcontract this responsibility to adequately trained personnel. Training records, including attendance and specific course, shall be maintained for inspection by the TSHPMB. Specific training to the environmental unit should be provided as follows:

- Principles and procedures for environmental impact assessment;

- Fundamentals of environmental management;
- Compliance assessment, monitoring and follow-up;
- Air, soil and water sampling procedures;
- Construction impacts, including civil works, sediment and erosion control, soil handling and vegetation removal;
- Waste management;
- Fuel and hazardous materials management;
- Fundamentals of aquatic ecology ;
- Construction camp management; and
- Auditing and follow-up.

### 11.3. Construction Contractor

The construction contractor shall have environmental staff trained to ensure contractor and all subcontractor compliance with EMP requirements. The construction contractor shall maintain training records, including attendance and specific course, for inspection by the TSHPMB. Specific training to the construction contractor environmental unit should be provided as follows:

- Principles and procedures for environmental impact assessment;
- Fundamentals of environmental management;
- Compliance assessment, monitoring and follow-up;
- Air, soil and water sampling procedures;
- Construction impacts, including civil works, sediment and erosion control, soil handling and vegetation removal;
- Waste management;
- Fuel and hazardous materials management;
- Construction camp management;
- Community relations and public consultation procedures; and
- Auditing and follow-up.

#### 11.4. Independent Environmental Monitoring Consultant

The Independent Environmental Monitoring Consultant shall be trained in the oversight and compliance assessment of large infrastructure projects, including the preparation of compliance reports and environmental sampling procedures, including the following:

- Principles and procedures for environmental impact assessment;
- Fundamentals of environmental management;
- Compliance assessment, monitoring and follow-up;
- Air, soil and water sampling procedures;
- Construction impacts, including civil works, sediment and erosion control, soil handling and vegetation removal;
- Waste management;
- Fuel and hazardous materials management;
- Construction camp management;
- Community relations and public consultation procedures; and
- Auditing and follow-up.

#### 11.5. Technical Assistance

In addition to staff training, technical assistance for outside consultants has been included into the training budget. Technical assistance could be full-time onsite within the TSHPMB or include short visits by outside consultants to provide training seminars and workshops.

Training costs are estimated in Section 15.

## 12. EMP Monitoring and Review

The environmental unit of the TSHPMB shall periodically review, monitor and audit the effectiveness of the EMP, including all sub-plans. The audit program should adequately cover the scope, audit frequency and methods that are typically required for large infrastructure projects. The frequency of audits should reflect the intensity of activities (typically more common during construction), severity of environmental and social impacts and non-compliances raised in prior audits.

### 12.1. Review of the EMP

The environmental unit of the TSHPMB shall review the EMP to assess its effectiveness and relevance as follows:

- A full review shall be undertaken annually;
- Following a reportable incident, or a significant non-compliance; and
- Following an addition, up-date or change order to the EMP, or a sub-plan.

The review of the EMP should consider the following:

- Adequacy of data collection, analysis and review;
- Reporting;
- Non-compliances; and
- Corrective actions implemented.

The EMP shall also be reviewed periodically to evaluate environmental controls and procedures to make sure they are still applicable to the activities being carried out. Reviews will be undertaken by the TSHPP Environmental Unit as follows:

- The full EMP shall be reviewed at least annually;
- Relevant parts of the EMP shall be reviewed following a reportable incident;
- Relevant parts of the EMP shall be reviewed following the receipt of an updated sub-plan; and
- At the request of stakeholders, including DONRE, MONRE, EVN, Contractor, Supervising Engineer, World Bank or the host communities.

The review shall include analysis of the data collection and analysis of data, monitoring reports, incident reports, complaints/grievances and feedback from stakeholders, DONRE, MONRE



reports, consultation meeting minutes and training records to evaluate the effectiveness of EMP procedures. Site visits, interviews and other auditing methods may also be used.

Updates to the plan shall follow the procedure in Section 12.2.

### 12.2. Control and Update of the EMP

This document will be issued as a controlled document all relevant staff and organizations. The procedure to be followed to control the issue of the documents, provide a review of its effectiveness and provide updates will be as follows:

- Issued copies by the Environmental Unit of TSHPMB shall be numbered;
- The Environmental Unit shall initiate a review of any relevant sections following modification to the EMP
- Environmental Approval, issue of a new approval, receipt of written requirements by MONRE/DONRE, or a change to internal procedures based on corrective actions or improvements in methodologies or analytical procedures.

### 13. Additional Information to the EMP

In order to ensure adequate information during the implementation of EMP, a number of studies will be added as necessary to ensure adequate completion and implementation of this EMP.

Tables 13-1 and 13-2 presents a list of additional information requirements that are required during construction and operations.

**Table 13-1: Additional information to the EMP required during construction**

Impact Agent	Impact	For further information/details
<b>Reservoir Preparation</b>	Disturbance to local villagers, livestock breeding and wildlife	The contractor shall prepare a detailed Reservoir Clearing Plan
	Loss of homes and livelihood impacts	RLDP
	Disturbance to family networks, community structure and cultural and ethnic identities	RLDP
	Increase demand for shared natural resources	RLDP
	Biodiversity and protected areas impacts	Biodiversity and Protected Areas Management Plan
	Loss of productive land	RLDP, and the Reservoir Clearing Plan
<b>Dam construction &amp; clearing</b>	Alteration of productive land	RLDP, and the Reservoir Clearing Plan
	Impact to physical cultural resources	Physical Cultural Resources Management Plan
<b>River diversion</b>	Increased sedimentation	Construction and Worker Camp Management Plan
	Decreased water quality (sedimentation, pollution, etc.) and impacts on aquatic ecosystems	Construction and Worker Camp Management Plan
<b>Stripping and grading</b>	Loss of productive topsoil	Construction and Worker Camp Management Plan

Impact Agent	Impact	For further information/details
<b>Transport vehicles</b>	Dust and debris created during transportation of materials	Construction and Worker Camp Management Plan
<b>Excavation</b>	Abandonment of borrow pits and quarries	Construction and Worker Camp Management Plan for reinstatement studies for TSHPP
<b>Construction camp</b>	Increased demand for building materials	Construction and Worker Camp Management Plan
<b>Labor force</b>	Change in livelihood and traditional activities	RLDP, Construction and Worker Camp Management Plan
	Distortion of household and manual labor (agricultural, forestry, etc.)	RLDP, Construction and Worker Camp Management Plan
<b>Camp workers and followers</b>	Increased demand for community services staff (medical, emergency, safety, etc.)	Construction Worker and Regional Health Management Plan
	Increased disease transmission rates	Worker and Regional Health Management Plan
<b>Truck hauling</b>	Increased road traffic	Traffic Management Plan
	Storage and discharge of oils, lubricants and other hazardous materials during operation and maintenance	Hazardous Material Management Plan

**Table 13-2: Additional information to EMP required during operation**

Impact Agent	Impact	For further information/details
<b>Hydroelectric plant operation</b>	Continuous, low level noise affecting local communes	Confirm noise abatement measures, if required
<b>Truck hauling</b>	Increased noise, dust, and vehicles on community roads	Traffic Management Plan
<b>Reservoir impoundment</b>	Displacement, isolation or loss of wildlife species	Reservoir Clearing Plan
	Interference to turbines	Reservoir Clearing Plan

Impact Agent	Impact	For further information/details
	Impacts on water quality	Implement water quality monitoring periodically following schedules which detailed in Table 9-2. Additional parameters will be measured for calibration of water modeling.
	A plan on Approach on Intact Rivers Matter and additional fisheries studies	Fish and fisheries studies
	Increased sedimentation behind impoundment	Implement sediment monitoring periodically following schedules which detailed in Table 9-2. Additional parameters will be measured for calibration of sedimentation modeling.
<b>Dam operation and electrical generation</b>	Alteration of natural flows	Implement monitoring of hydrological flows periodically following schedules which detailed in Table 9-2.
<b>Volume outflow</b>	Impeded water quality downstream	Implement water quality monitoring periodically following schedules which detailed in Table 9-2. Additional parameters will be measured for calibration of water modeling.
	Alteration of agricultural productivity, especially rice	Collection of information and verification.
	Alteration of food source and income	Collection of information and verification.

Suggested additional studies to be undertaken by the TSHPMB are indicated in the following sections.

### 13.1. Additional Water Quality and Quantity Baseline Data Collection

Additional water quality and quantity baseline data will be collected at two locations, upstream and downstream of the TSHPP, to calibrate water modeling as per ERM (2009) and for further environmental assessment purposes. In particular, the following will be completed:

- Upstream data will be collected daily or other intervals as required and integrated with hydrological station upstream of the dam (Mường Lát gauging station).
- Downstream data will also be collected daily or at other intervals, as required by a gauging station.
- Data collected at both upstream and downstream stations will include DO, Temperature, pH and conductivity. These measurements will start one year before reservoir filling and extend to year two after operation.

In addition, an assessment of downstream water usage shall be conducted to address stakeholder concerns expressed during project consultation.

### 13.2. Intact Rivers Management

EVN, through the TSHPMB, shall work with stakeholders to promote an intact rivers management approach to hydroelectric development that looks at environmental and social impacts over the entire Ma River watershed. This would include management of conflicting land uses upstream of the TSHPP and also management of downstream impacts associated with construction and operation of the TSHPP (see also Annex F).

### 13.3. Cumulative Effects Assessment

As noted in the SESIA, a cumulative effects assessment of all project components was completed as part of the initial TSHPP EIA. However, a broader cumulative assessment including the impacts of all other activities in the project affected area, including impacts of the TSHPP shall be considered. TSHPMB shall implement a cumulative effects assessment framework that will evaluate cumulative impacts of other developments in association with construction and operational impacts of the TSHPP. An example of a cumulative effects assessment framework is provided in Annex I.

By the end of the first year of construction, TSHPMB will develop a cumulative effects assessment framework and an initial assessment of cumulative effects of the TSHPP in conjunction with other projects and activities. The cumulative effects study should also incorporate measures for biodiversity protection and intact rivers management.

## 14. Implementation Plan and Schedule

### 14.1. Implementation

The TSHPMB shall assume overall responsibility for the implementation of the EMP as described including the following activities:

- Oversight of Contractor EMP requirements
- Preparation of management plans
- Formation of an environmental unit
- Training

TSHPMB should prepare an implementation plan for the EMP considering the requirements identified in Table 14-1.

### 14.2. Schedule

The proposed schedule for the EMP is shown in Figure 14-1.

- Implementation of access road
- Main work
- Impoundment

**Table 14-1: EMP Implementation Plan<sup>1</sup>**

<b>Implementation Item</b>	<b>Description</b>	<b>By When</b>
<b>Formation of an Environmental Unit for Access Road</b>	A Environmental Unit shall be formed to implement the EMP for the access road for: <ul style="list-style-type: none"> <li>▪ Construction supervision</li> <li>▪ Environmental monitoring</li> </ul>	3 months before initiation of the access road
<b>Formation of an Environmental Division</b>	An Environmental Division shall be formed to implement the EMP based on scaling up of the environmental unit: <ul style="list-style-type: none"> <li>▪ Construction supervision</li> <li>▪ Environmental monitoring</li> </ul>	6 months before initiation of preparation of construction site for the main work
<b>Prepare Bid Specifications for Construction Contractor</b>	To prepare environmental and social requirements for the Construction Contractor	Before finalization of the bidding process
<b>Contractor Management Plans</b>	The Construction Contractor shall be responsible for in the preparation of the following management plans for approval by the TSHPMB: <ul style="list-style-type: none"> <li>▪ The Reservoir Clearing Plan</li> <li>▪ Community Relations and Community Safety Plan</li> <li>▪ Construction and worker camp management Plan</li> </ul>	Before initiation of any construction activity
<b>Preparation of TSHPMB Management Plans</b>	To prepare the following management plans (see Section 2) <ul style="list-style-type: none"> <li>▪ Environmental Monitoring Plan</li> <li>▪ Biodiversity and Protected Areas Management Plan</li> <li>▪ Public Health Management Plan</li> <li>▪ Physical Cultural Resources Management Plan</li> </ul>	2 months before initiation of preparation of construction site for the main project works
<b>Training</b>	<ul style="list-style-type: none"> <li>▪ Develop a training plan outlining training requirements, topics, and areas of capacity building</li> <li>▪ Identify courses/seminars</li> <li>▪ Identify staff requiring training</li> <li>▪ Implement training plan</li> </ul>	Upon project approval

<sup>1</sup> This is a preliminary schedule that will be finalized after project approval and financing arrangements and selection of the construction contractor

Year	2009				2010				2011				2012				2013				2014				2015				2016			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
<b>1. Main Project Phases</b>																																
Planning																																
Preparation																																
<b>World Bank Loan Approval</b>																																
Construction																																
Reservoir filling																																
Operation																																
<b>EMP Milestones</b>																																
Formation of Environmental Unit for the Access Road																																
Formation of Environmental Division for the Project																																
Prepare Contractor Bid Specification - EMP related																																
<b>Capacity Building</b>																																
Training																																
Technical Assistance																																
Additional Studies																																
<b>EMP Implementation</b>																																
Contractor management plans																																
TSHPMB management plans																																
<b>Supervision and Monitoring</b>																																
Construction supervision																																
Independent Environmental Monitoring Consultant																																
EMP evaluation - Annual																																
EMP evaluation - Construction Phase																																

Figure 14-1: EMP Schedule



## 15. EMP Costs

Estimated costs for the initial implementation of the EMP are presented below in Table 15-1. Costs have been defined on an initial set up basis. TSHPMB will revise these costs and develop annual operating costs for the EMP.

**Table 15-1: Preliminary Estimate of EMP Costs**

EMP Component	Estimated Cost (\$US)
Contractor – built into contract	
Supervision – environment – to be built into the contract for Engineering Supervision (includes sampling for environmental quality)	10-25% of engineering supervision cost  plus  \$250,000 ( separate estimate for environmental quality monitoring)
Independent Environmental Monitoring	\$250,000 (3-5 years)
Institutional Strengthening, Training and Capacity Building <sup>2</sup> <ul style="list-style-type: none"> <li>▪ Formation of TSHPMB environmental unit</li> <li>▪ Local authorities, communities and other stakeholders</li> <li>▪ On-site training</li> <li>▪ Offsite training</li> <li>▪ Local capacity building</li> <li>▪ Equipment and logistics</li> </ul>	\$250,000
Technical Assistance to TSHPMB environmental unit <ul style="list-style-type: none"> <li>▪ Provision of outside consultants</li> <li>▪ Manual of functions and procedures</li> <li>▪ Assist in development of environmental database</li> <li>▪ Special issues – e.g. water quality</li> <li>▪ EMP protocols and procedures</li> <li>▪ Assist in development of TSHPMB Environmental Unit</li> </ul>	\$300,000 (2 years)

<sup>2</sup> Costs of salaries, administration and function of the environmental unit paid by TSHPMB

EMP Component	Estimated Cost (\$US)
<ul style="list-style-type: none"> <li>▪ Assist in implementation of updated management plans</li> <li>▪ Contractor liaison</li> <li>▪ TORs</li> </ul>	
Chance Finds Procedures and Cultural Property Salvage (including downstream erosion assessment)	\$200,000
Biodiversity and Protected Areas <ul style="list-style-type: none"> <li>▪ Support to Protected Areas Management Plans</li> <li>▪ Provision of wardens</li> <li>▪ Infrastructure and equipment</li> <li>▪ Education</li> <li>▪ Tiger Action Plan</li> </ul>	\$550,000
Regional Health Program	\$300,000
Additional Studies	
Intact Rivers Management	\$150,000
Water Quality Modeling	\$100,000
Cumulative Effects Assessment	\$100,000
<b>Total Initial EMP Costs</b>	<b>\$2,450,000<sup>3</sup></b>

<sup>3</sup> Note: The EMP costs do not include costs of environmental supervision which are included in the engineering supervision costs of the project

## 16. References

- Center for Applied Hydrology and Environmental Engineering Director (CAHAEE). 2008. *Trung Son Hydropower Project Report Plan for Reservoir Cleaning*. Prepared for Trung Son Hydropower Management Board. Hanoi, Vietnam.
- Center of Planning and Rural Development No. 1 (CPRD). (2008). *Resettlement Action Plan for the Construction of Access Road and Bridges – Trung Son Hydropower Project – Final Report*. Prepared for Trung Son Hydropower Management Board. Hanoi, Vietnam.
- Council on Environmental Quality. 1997. *Considering Cumulative Effects Under the National Environmental Policy Act*. Council on Environmental Quality, Executive Office of the President, Washington D.C.
- Development Research and Consultancy Centre (DRCC). (2008a). *Resettlement – Livelihood Development Plan and Ethnic Minority Development Plan – Trung Son Hydropower Project*. Prepared for Trung Son Hydropower Management Board. Hanoi, Vietnam.
- Development Research and Consultancy Centre (DRCC). (2008b). *Social and Economic Survey and Assessment Report – Trung Son Hydropower Project*. Prepared for Trung Son Hydropower Management Board. Hanoi, Vietnam.
- Duc, N. (2008a) *Impact Assessment of Trung Son Hydropower Project to Fish Biodiversity and Fisheries Mitigation Measures Suggest*. Vietnam Electricity Group, Trung Son Hydroelectric Project Management Unit PMU. Hanoi: Vietnam Electricity.
- Duc, N. (2008b). *Final Report – Survey Results and Analysis Data of Fish Biodiversity and Fisheries*. Prepared for the Trung Son Hydroelectric Project Management Unit. Hanoi, Vietnam.
- Duinker, P.N., and L.A. Greig. 2006. *The impotence of cumulative effects assessment in Canada: Ailments and ideas for redeployment*. Environmental Management Vol. 37, No. 2, pp. 153–161.
- Electricity of Vietnam. Trung Son Project Management Board. 2010. *Environmental assessment for construction resettlement sites*. Hanoi, Vietnam
- FPD Son La, 2003. *Revised investment plan for development of Xuan Nha NR, Son La Province*. Un-published document, In Vietnamese.
- Ha Ngoc, L., and Kaul, S.(2009). *Health Impact Assessment and Public Health Action Plan for Trung Son Hydropower Project*.

- Hanoi Civil Engineering University, Institute of Environment Science and Engineering (IESE). (2008). *Planning on Environment Management Road and Bridge Accessing Trung Son Dam – Road into Dam Report*. Hanoi, Vietnam.
- Health and Environment Services Development Investment JSC (HESDI). (2008). *Health Impact Assessment of Trung Son Hydropower Project*.
- Hegmann, G., C. Cocklin, R. Creasey, S. Dupuis, A. Kennedy, L. Kingsley, W. Ross, H. Spaling and D. Stalker. 1999. *Cumulative Effects Assessment Practitioners Guide*. Prepared by AXYS Environmental Consulting Ltd. and the CEA Working Group for the Canadian Environmental Assessment Agency, Hull, Quebec.
- Hegmann, G., Eccles, R. and K. Strom. 2004. *A practical approach to assessing cumulative effects for pipelines*. Unpublished paper, Axys Environmental Consulting Ltd., Calgary, Alberta, Canada.
- IEBR (Institute of Ecology and Biological Resources). (2006). *Xuan Nha NR, Son La Province*. A scientific research work- managed by Tran Huy Thai. Un-published document.
- Infrastructural Technology & Urban Environmental Centre-Architectural University (ITUEC). (2008a). *Construction and Camp Management – Contents of Main Works. 1<sup>st</sup> Stage 3 Draft Report*. Trung So'n Hydropower Project.
- Infrastructural Technology & Urban Environmental Centre-Architectural University (ITUEC). (2008b). *Report of Construction and Camp Management of Trung Son Hydropower Project*.
- Integrated Environments (2006) Ltd. (IEL). 2010. Supplementary environmental and social impact assessment (SESIA). Trung Son Hydropower Project. Prepared for the Trung Son Project Management Board. Hanoi, Vietnam.
- Macleod Institute. 1998. *Cumulative effects assessment: current practices and future options*. Prepared by Angela Griffiths, Elaine McCoy of the Macleod Institute, and Jeffrey Green, and George Hegmann, of Axys Environmental Consulting Ltd. Calgary, Alberta, Canada.
- Meier, P. 2009. *Trung Son Hydro Project: Alternatives. 3 December 2009*. Prepared for Trung Son Hydropower Project Management Board.
- Minister of Industry (MoIT) - The Socialist Republic of Vietnam. 2008. *Reservoir Operation Procedure of Trung Son Hydropower Project*. Enclosed to the Decision No 5134/QD-BCT dated September 23, 2008.
- Minister of Industry (MoIT) - The Socialist Republic of Vietnam. 2005. Decision by the Minister of Industry on the approval to the Ma River Hydropower Terraced Master Plan.

- Phong, N.T. (2008). *Reservoir Operation Procedure, Trung Son Hydroelectric Power*. Part 2: Basic Design, Book 7. Vietnam Electricity, 4 Electricity Construction Consultancy Joint Stock Company. Nha Trang, Vietnam.
- Power Engineering Consulting Company No. 4 (PECC4). (2009). *Feasibility Study: Operation Model of Reservoir, Trung Son Hydropower Project*. Electricity of Vietnam, Trung Son Hydropower Project Management Board. Hanoi: Electricity of Vietnam. Thanh Hoa, Vietnam.
- Power Engineering Consulting Company No. 4 (PECC4). (2008a). *Environmental Impact Assessment Report, Trung Son Hydropower Project*. Electricity of Vietnam, Trung Son Hydropower Project Management Board. Hanoi: Electricity of Vietnam. Thanh Hoa, Vietnam.
- Power Engineering Consulting Company No. 4 (PECC4). (2008b). *Summary Report, Trung Son Hydropower Project*. Electricity of Vietnam, Trung Son Hydropower Project Management Board. Hanoi: Electricity of Vietnam. Thanh Hoa, Vietnam.
- Power Engineering Consulting Company No. 4 (PECC4). (2008c). *Calculation of Probable Maximum Flood. Feasibility Study Report*. Trung Son Hydropower Project. Electricity of Vietnam, Nha Trang, July 2008.
- Power Engineering Consulting Company No. 4 (PECC4). (2005). *Book 4.1: Main Report of Basic Design*. Trung Son Hydropower Project, Volume 2: Basic Design, Book 4. Electricity of Vietnam. Thanh Hoa, Vietnam.
- Protected Areas and Terrestrial Biodiversity (PATB). (2008). *Assessment of impacts caused by Trung Son hydropower project to protected areas and terrestrial biodiversity – Final report*. Prepared for Trung Son Hydropower Management Board. Hanoi, Vietnam.
- Strategic Environmental Assessment Plan VI (SEA). (2009). *Strategic Environmental Assessment of the Hydropower Master Plan in the Context of the Power Development- Final Report*.
- Tercia Consultants. 2010. *EVN Trung Son Hydropower Project Management Board, Resettlement and Livelihood Development Plan*. Prepared for the Trung Son Hydropower Project Management Board. Montpellier, France.
- VICA (n.d.). *Reinstatement studies on construction activities and worker camps for the Trung Son Hydropower Project*. Technical Assistance Project. TF 090495.
- Vietnam Institute of Archaeology (VIA). (2008). *Investigating tangible cultural resources in the area of Trung-Son Hydro-electric Project, Thanh Hoa province*. Hu Néi, Vietnam.
- World Bank. (2007). *Integrated Safeguards Data Sheet – Concept Stage*. VN-Hydropower Development Project. Report No.: AC3056.

World Bank. (2006). *Vietnam Hydropower Development Project – Project Concept Note*. East Asia and Pacific EASEG.

## 17. Annexes

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## **Annex A: Bid Specifications: Construction and Worker Camp Management Plan**

### **A-1: Construction Camp Management Plan**

To help address potential negative impacts on local communities through the introduction of a approximately 4000-person construction work force, the Construction Contractor (Contractor) shall implement a series of activities related to the construction workforce and camps as follows.

#### **Workforce and Camps**

##### *General Requirements*

The Contractor shall, wherever possible, locally recruit the available workforce and shall provide appropriate training as necessary. The Contractor shall consider all aspects of workforce management and address potential ethnic tensions between workers and the local communities, increased risk of prostitution and communicable diseases, theft, drug and alcohol abuse, market distortion due to temporary inputs to local economy and other local tensions such as unemployment, ethnicity and divergent cultural values.

The following general measures shall be considered for construction camps:

- The construction camp site will have to be approved by the local authority.
- The Contractor shall present the design of the camps including details of all buildings, facilities and services for approval no later than two months prior to commencement of any construction work. Approvals and permits shall be obtained in accordance with applicable laws, applicable standards and environmental requirements for the building and infrastructure work for each camp area.
- The Contractor shall provide adequate and suitable facilities for washing clothes and utensils for the use of contract labor employed therein.
- Camp site selection and access roads shall be located so as to avoid clearing of major trees and vegetation as feasible, and to avoid aquatic habitats.
- Camp areas shall be located to allow effective natural drainage and landscaped so as to avoid erosion.
- The Contractor shall provide suitable, safe and comfortable accommodation for the workforce.
- The Contractor shall provide adequate lavatory facilities (toilets and washing areas) for the number of workers expected on site, plus visitors. Toilet facilities should also be provided with adequate supplies of clean or potable water, soap, and toilet paper. Separate and adequate bathing facilities shall be provided for the use of male and female workers. Such facilities shall be conveniently accessible and shall be kept in clean and hygienic conditions at all times.



- The Contractor shall implement effective sediment and erosion control measures during construction and operation of the construction work camps in accordance with the environmental requirements as stipulated by the EMP and SESIA, especially near rivers.
- The Contractor shall provide recreational facilities to the workforce. Such facilities will help mitigate against potential conflict and impact on the local population as the incentive to go outside the camp will be reduced.
- The Contractor shall provide safe potable water for food preparation, drinking and bathing.
- The Contractor shall install and maintain a temporary septic tank system for any residential labor camp, without causing pollution of nearby watercourses. Wastewater should not be disposed into any water bodies without treatment, in accordance to applicable Vietnamese standards.
- The Contractor shall establish a method and system for temporary storage and disposal or recycling of all solid wastes generated by the labor camp and/or base camp.
- The Contractor shall not allow the use of fuel wood for cooking or heating in any labor camp or base camp and provide alternate facilities using other fuels.
- The Contractor shall ensure that site offices, depots, and workshops are located in appropriate areas as approved by the appropriate TSHPMB environmental officer or the Supervisory Engineer;
- The Contractor shall ensure that storage areas for diesel fuel and lubricants are not located within 100 meters of watercourses, and are operated so that no pollutants enter watercourses, either overland or through groundwater seepage, especially during periods of rain. A ditch shall be constructed around the area with an approved settling pond/oil trap at the outlet.
- Areas for the storage of fuel or lubricants and for a maintenance workshop shall be fenced and have a compacted/impervious floor to prevent the escape of accidental spillage of fuel and or lubricants from the site. Surface water drainage from fenced areas shall be discharged through purpose designed and constructed oil traps. Empty fuel or oil drums may not be stored on site. Waste lubricants shall be recycled, and not disposed to land or adjacent water bodies.
- The Contractor shall ensure that site offices, depots, and workshops are located in appropriate areas as agreed by local authorities and approved by the TSHPMB or supervisory engineer. They shall not be located within 200 meters of existing residential settlements
- Concrete batching plants shall not be located within 500 m of any residence, community or work place.

- The Contractor shall provide medical and first aid facilities at each camp area; and
- All medical related waste shall be disposed off in proper containers, or dealt with accordingly with established procedures for safe disposal.

### *Security*

Security measures shall be put into place to ensure the safe and secure running of the camp and its residents. As a minimum, these security measures should include:

- Access to the camp shall be limited to the residing workforce, construction camp employees, and those visiting personnel on business purposes.
- Prior approval from the construction camp manager shall be required for visitor access to the construction camp.
- Adequate, day-time night-time lighting shall be provided.
- A perimeter security fence at least 2m in height shall be constructed from appropriate materials; and
- Provision and installation in all buildings of firefighting equipment and portable fire extinguishers.

### *Maintenance of Camp Facilities*

The following measures shall be implemented to ensure that the construction camp and its facilities will be organized and maintained to acceptable and appropriate standards:

- A designated camp cafeteria shall be established under strict sanitary and hygiene conditions;
- Designated meal times shall be established;
- Cooking or preparation of food shall be prohibited in accommodation quarters;
- Designated rest times shall be established;
- Designated recreational hours shall be put in place;
- Smoking shall be prohibited in the workplace;
- Procedures shall be implemented to maintain the condition of the construction camp and facilities and ensure adequate cleanliness and hygiene;
- The latrines and urinals shall be adequately lighted and shall be maintained in a clean sanitary condition at all times;

- Water shall be provided in or near the latrines and urinals by storage in drums; and
- A complaint register to receive and respond to complaints from the construction camp residents regarding facilities and services provided.

#### *Code of Conduct (Behavior)*

A major concern during a construction of a project is the potentially negative impacts of the workforce interactions with the local communities. For that reason, a Code of Conduct shall be established to outline the importance of appropriate behavior, drug and alcohol abuse, and compliance with relevant laws and regulations. Each employee shall be informed of The Code of Conduct and bound by it while in the employment of the Client or its Contractors. The Code of Conduct shall be available to local communities at the project information centers or other place easily accessible to the communities. The Code of Conduct shall address the following measures (but not limited to them):

- All workers and subcontractors shall abide by the laws and regulations of Vietnam.
- Illegal substances, weapons and firearms shall be prohibited.
- Pornographic material and gambling shall be prohibited.
- Fighting (physical or verbal) shall be prohibited.
- Workers shall not be allowed to hunt, fish or trade in wild animals.
- No consumption of bush meat shall be allowed in camp.
- No pets shall be allowed in camp.
- Creating nuisances and disturbances in or near communities shall be prohibited.
- Disrespecting local customs and traditions shall be prohibited.
- Smoking shall be prohibited in the workplace.
- Maintenance of appropriate standards of dress and personal hygiene shall be in effect.
- Maintenance of appropriate hygiene standards in accommodation quarters shall be set in place.
- Residing camp workforce visiting the local communities shall behave in a manner consistent with the Code of Conduct; and
- Failure to comply with the Code of Conduct, or the rules, regulations, and procedures implemented at the construction camp will result in disciplinary actions.

## **A-2: Construction Impact Management Plan**

In order to reduce the impact of the construction activities on local communities and the environment, the Construction Contractor shall implement the following Sub-Plans in accordance with the following stipulations:

### **Erosion and Sedimentation**

In a mountainous region, such as the Trung Son area, the project must include measures to reduce or halt erosion and landslide problems. This might include the use of erosion control structures, protective re-vegetation and reforestation, slope stabilization, etc.

Site activities shall be carefully managed in order to avoid site erosion and sedimentation of downstream waterways. In order to minimize negative erosion impacts in the project area, the following activities shall be carried out by the Contractor:

- Erosion and sedimentation shall be controlled during the construction. Areas of the site not disturbed by construction activities shall be maintained in their existing state.
- Disturb as little ground area as possible, stabilize these areas as soon as possible, control drainage through the area, and trap sediment onsite. Install erosion control barriers around perimeter of cuts, disposal pits, and roadways.
- Slope works and earth moving/excavation shall be conducted in order to minimize exposure of the soil surface both in terms of area and duration. Temporary soil erosion control and slope protection works shall be carried out in sequence to construction.
- Conserve topsoil with its leaf litter and organic matter, and reapply this material to local disturbed areas to promote the growth of local native vegetation.
- Apply local, native grass seed and mulch to barren erosive soil areas or closed construction surfaces.
- Apply erosion control measures before the rainy season begins, preferably immediately following construction. Install erosion control measures as each construction site is completed.
- In all construction sites, install sediment control structures where needed to slow or redirect runoff and trap sediment until vegetation is re-established. Sediment control structures include windrows of slash, rock berms, sediment catchment basins, straw bales, brush fences, and silt fences.
- Control water flow through construction sites or disturbed areas with ditches, berms, check structures, live grass barriers, and rock.
- The ground surface at the construction site offices shall be concreted or asphalted in order to minimize soil erosion.

- Erosion control measures shall be maintained until vegetation is successfully re-established.
- Water shall be sprayed as needed on dirt roads, cuts, fill material and stockpiled soil to reduce wind-induced erosion and dust, and
- Larger changes in the landscape from quarries, tunnel spoil tips, etc. should be landscaped and replanted, both to reduce erosion problems and to reduce the visual impact of construction.

### **Particulate Emissions and Dust**

The Contractor shall propose methods and actions to control dust resulting from construction related activities, including quarry sites, crushing and concrete batching plants, earthworks including road construction, embankment and channel construction, haulage of materials and construction work camps. In particular the Contractor shall undertake the following:

- Minimize production of dust and particulate materials at all times, to avoid impacts on surrounding communities, and especially to vulnerable people (children, elderly people).
- Time removal of vegetation to prevent large areas from becoming exposed to wind.
- Place screens around construction areas to minimize dust proliferation, paying particular attention to areas close to local communities.
- Spray water as needed on dirt roads, cut areas and soil stockpiles or fill material. Spraying shall be carried out in dry and windy days, at least twice a day (morning and afternoon). The frequency of spraying near local communities shall be increased as needed.
- Pave access roads with gravel in the sections which near the communities and other sensitive receptors to reduce generation of air-borne dust.
- Provide an adequate ventilation system and other measures to control concentration of air pollutants within tunnels.
- Transportation of materials by vehicles and construction of access roads shall be properly designed. For example, the access road can be constructed and paved by concrete/asphalt, or laid with small graded rocks, prior to major earthworks which may require transportation of substantial amount of materials on-site and off-site.
- Ensure adequate maintenance of all vehicles. Construction plant/vehicles that generate serious air pollution and those which are poorly maintained shall not be allowed on site.

- Transport of chemicals or materials such as cement, sand and lime shall be covered entirely with clean impervious material to ensure that these materials shall be contained. Overflow of material shall be avoided; and
- The exhaust gases from construction machinery and vehicles are accepted. However, the engines shall be inspected and adjusted as required to minimize pollution levels.

## Noise

To minimize noise the Contractor shall:

- Maintain all construction-related traffic on project access roads at established speed limits.
- Maintain all on-site vehicle speeds at or below 30 kph, or otherwise designated.
- To the extent possible, maintain noise levels associated with all machinery and equipment at or below 90 db.
- In sensitive areas (including residential neighborhoods, hospitals, rest homes, schools, etc.) more strict noise abatement measures may need to be implemented to prevent undesirable noise levels.
- Apply proper measures to minimize disruptions from vibration or noise coming from construction activities.
- Design a transportation schedule for entry of construction materials to minimize the adverse impact on residents, as well as the traffic on the existing roads. The transportation vehicles shall be required to slow down and banned from using horns when passing sensitive areas. Transportation during peak hours should be minimized. . The Contractor shall provide the transportation route in advance to the Engineering Supervisor.
- Maintain the construction equipment in its best operating conditions and lowest noise levels possible.
- Use temporary noise barriers to minimize the noise caused by construction equipment;
- Provide hearing protection to workers who must work with highly noisy machines such as piling, explosion, mixing, etc., for noise control and workers protection.
- Areas for the storage of fuel or lubricants fenced and have a compacted/impervious floor or other surface to prevent the escape of accidental spillage of fuel and/or lubricants from the site. Surface water drainage from fenced areas shall be discharged through an oil skimmer or other appropriate device to remove hydrocarbons. Empty fuel or oil drums may not be stored on site. Proper MSDS labeling shall be in place and training provided to workers handling these materials.

- The construction supervision team shall be equipped with portable noise detection devices to monitor the noise level at the sensitive receptors.
- Materials leaving the construction site shall be transported during non-peak hours in order to minimize traffic noise due to the increase in traffic volumes.
- Use of properly designed silencers, mufflers, acoustically dampened panels and acoustic sheds or shields, etc. shall be made. Mufflers and other noise control devices shall be repaired or replaced if defective.
- Use of electric-powered equipment when applicable instead of diesel-powered or pneumatic-powered equipment.
- Equipment known to emit a strong noise intensity in one direction, shall when possible, be oriented to direct noise away from nearby sensitive receptors.
- Machines and equipment that may be in intermittent use shall be shut down between work periods or throttled down to a minimum operation.

#### *Nighttime Construction Noise Mitigation*

Although in general, nighttime construction shall be banned near sensitive receptors, some construction may still occur for technical and other reasons (e.g., bridge piles required and continued around clock concrete pouring). Because nighttime construction, if occurring near local communities, will result in significant impacts to residents and other sensitive receptors, the following special measures shall be taken during the construction phase:

- People living within potentially impacted areas shall be notified ahead of time of the length and noise intensity of the proposed nighttime construction. Residents shall be informed as to why night construction is necessary and they shall be provided with the mitigation measures that are going to be implemented to obtain their understanding. These residents shall be allowed to express their concerns, difficulties, and suggestions for noise control prior to the commencement of night time construction. These concerns shall be addressed and suggestions adopted where appropriate;
- Concrete batching plants, generators and other stationary equipment shall be carefully placed as far away from local communities to reduce noise impacts from these machines. Where possible, municipal power supply shall be used for nighttime construction as diesel generators are extremely noisy and avoiding their use is the best mitigation possible.
- Equipment with lower noise levels shall be used for concrete pouring operations, which may require 24 hour non-stop operation.
- Temporary noise barriers shall be installed at the appropriate locations to avoid nighttime noise impacts, and

- Notification boards shall be posted at all construction sites providing information about the project, as well as contact information about the site managers, environmental staff, telephone numbers and other contact information so that any affected people can have a channel to voice their concerns and suggestions.

### **Blasting**

- The contractor shall warn local communities and/or residents that could be disturbed by noise generating activities such as blasting well in advance and shall keep such activities to a minimum;
- In sensitive areas (including residential neighborhoods, hospitals, rest homes, schools, etc.) more strict measures may need to be implemented to prevent undesirable noise levels;
- Blasting shall not be carried out within 200 m of residences or local communities;
- Blasting shall not be carried out under adverse weather conditions;
- Prior to a blasting event, water shall be sprayed on the surface of the blast area to increase its moisture content. Wire mesh gunny sacks and sandbags shall be used on top of the blast area at each shot to prevent flying rocks and dust;
- Before blasting is carried out, a detailed survey shall be conducted at nearby communities to evaluate the degree of impacts due to the blasting activity (e.g. possible damage to structures or infrastructure due to vibration, effects on animals, local residents, etc.);
- No blasting shall be allowed during nighttime unless prior approval is obtained from the government authority and the PEO.
- All persons shall be at least 200m away from the blasting point;
- Except for blasting equipment all electricity shall be turned off within 50m of the blasting location prior to and during the blast; and
- The quantity of blasting materials shall be managed in a secure manner and audited weekly.

### **Earthworks, Cut and Fill Slopes**

The contractor shall ensure that the following procedures are undertaken:

- All earthworks shall be properly controlled, especially during the rainy season.
- The Contractor shall maintain stable cut and fill slopes at all times and cause the least possible disturbance to areas outside the prescribed limits of the works.



- The Contractor shall complete cut and fill operations to final cross-sections at any one location as soon as possible and preferably in one continuous operation to avoid partially completed earthworks, especially during the rainy season.
- In order to protect any cut or fill slopes from erosion, in accordance with drawings, cut off drains and toe-drains shall be provided at the top and bottom of slopes and be planted with grass or other plant cover. Cut off drains should be provided above high cuts to minimize water runoff and slope erosion.
- Any excavated cut or unsuitable material shall be disposed of in designated disposal areas as agreed to by the Supervisory Engineer, and
- Disposal sites should not be located where they can cause future slides, interfere with agricultural land or any other properties, or cause runoff from the landfill towards any watercourse. Drains may need to be dug within and around the landfills, as directed by the Supervisory Engineer.

### **Stockpiles and Borrow Pits**

The Contractor shall prepare and overall Stockpiles and Borrow Pits Management Plan for the total works. Operation of a new borrowing area, on land, in a river, or in an existing area, shall be subject to prior approval of the Environmental Supervisor, and the operation shall cease if so instructed by the Supervisory Engineer.

Borrow pits shall be prohibited where they might interfere with the natural or designed drainage patterns. River locations shall be prohibited if they might undermine or damage riverbanks, or carry too much fine material downstream.

The location of crushing plants shall be subject to the approval of the Supervisory Engineer , and not be adjacent to environmentally sensitive areas, or to existing residential settlements, and shall be operated with approved fitted dust control devices.

Rock or gravel taken from a river shall be far enough removed to limit the depth of material removed to one-tenth of the width of the river at any one location, and not to disrupt the river flow, or damage or undermine the riverbanks.

The Plan shall include:

- A map showing the extent of the area to be developed.
- A method statement defining the proposed working methods.
- The proposed access and haulage routes between the borrow pits and the destination for the extracted materials.
- A justification for the quantities of materials to be extracted, an estimation of the waste material to be generated and disposal details for such waste materials.

- Details of the measures taken to minimize the borrow pit areas and their visual impact on the surrounding area, and
- Details of the measures to be taken for the long-term rehabilitation of the borrow pit areas in order to avoid situations that could constitute a threat to health and safety and cause environmental degradation.

In general terms, the Contractor shall:

- Identify and demarcate locations for stockpiles and borrow pits, ensuring that they are 15 meters away from critical areas such as steep slopes, erosion-prone soils, and areas that drain directly into sensitive water bodies.
- Limit extraction of material to approved and demarcated borrow pits.
- Stockpile topsoil when first opening the borrow pit. After all usable borrow has been removed, the previously stockpiled topsoil should be spread back over the borrow area and graded to a smooth, uniform surface, and adequately sloped for drainage. On steep slopes, benches or terraces may have to be established to help control erosion.
- Excess overburden should be stabilized and re-vegetated. Where appropriate, organic debris and overburden should be spread over the disturbed site to promote re-vegetation. Natural re-vegetation is preferred to the best extent practicable.
- Existing drainage channels in areas affected by the operation should be kept free of overburden.
- Once the job is completed, all construction -generated debris should be removed from the site to an approved disposal location.
- The Contractor shall ensure that all borrow pits used are left in an appropriate condition with stable side slopes, re-establishment of vegetation, restoration of natural water courses, avoidance of flooding of the excavated areas wherever possible so no stagnant water bodies are created which could breed mosquitoes, and
- When the borrow pits or the local depressions created by the construction activities *cannot be refilled or reasonably drained, the Contractor shall consult with the local community to determine their preference for reuse such as fish farming or other community purposes.*

### **Disposal of Construction Waste**

The Contractor shall carry out the following activities:

- Establish and enforce daily site clean-up procedures, including maintenance of adequate disposal facilities for construction debris.
- Debris generated due to the dismantling of the existing structures shall be suitably reused, to the best extent feasible (e.g. as fill materials for embankments). The disposal of remaining debris shall be carried out only at sites identified and approved by the Supervisory Engineer. The Contractor should ensure that these sites (a) are not located within designated forest areas; (b) do not impact natural drainage courses; and (c) do

not impact endangered/rare flora. Under no circumstances shall the Contractor dispose of any material in environmentally sensitive areas.

- In the event any debris or silt from the sites is deposited on adjacent land, the Contractor shall immediately remove such, debris or silt and restore the affected area to its original state to the satisfaction of Supervisory Engineer.
- All arrangements for transportation during construction including provision, maintenance, dismantling and clearing debris, where necessary, will be considered incidental to the work and should be planned and implemented by the contractor as approved and directed by the Supervisory Engineer.
- Consult with local communities, if any, living close to spoil disposal sites that may be affected. The consultation shall provide local stakeholders with detailed information of the potential spoil disposal site, and provide an opportunity for them to express their opinions and concerns with the proposed plans. Information and feedback from the consultation process shall be incorporated into the final design for each spoil disposal site.
- Include provisions for incorporating the most appropriate stabilization techniques for each disposal site.
- Assess risk of any potential impact regarding leaching of spoil material on surface water.
- Include an appropriate analysis to determine that the selected spoil disposal sites do not cause unwanted surface drainage, and
- Stabilize spoil disposal sites to avoid erosion in accordance with the requirements of the Landscape and Re-vegetation Plan.

### **Demolition of Existing Infrastructure**

The Contractor shall implement adequate measures during demolition of existing infrastructure to protect workers and public from falling debris and flying objects. Among these measures, the Contractor shall:

- Set aside a designated and restricted waste drop or discharge zones, and/or a chute for safe movement of wastes from upper to lower levels.
- Conduct sawing, cutting, grinding, sanding, chipping or chiseling with proper guards and anchoring as applicable.
- Maintain clear traffic ways to avoid driving of heavy equipment over loose scrap.
- Use of temporary fall protection measures in scaffolds and out edges of elevated work surfaces, such as hand rails and toe boards to prevent materials from being dislodged.
- Evacuate all work areas during blasting operations, and use blast mats or other means of deflection to minimize fly rock or ejection of demolition debris if work is conducted in proximity to people or structures.
- Provide all workers with safety glasses with side shields, face shields, hard hats, and safety boots or shoes.

### A-3: Other Management Plans

The contractor shall be responsible for preparing the following management plans in accordance with the stipulated terms of reference:

#### **Waste Management Plan**

During the construction stage, the Contractor shall prepare a Waste Management Plan before commencement of project works. The Plan shall include:

##### *Water and Wastewater*

- A review of the preliminary site drainage design prepared during the detailed design.
- An update of the preliminary design based on the actual construction program and site specific conditions (e.g. the geographical conditions, location of slopes and the nature of construction work).
- Detailed design including drawings, location maps, specifications of drainage collection channels and wastewater treatment facilities.
- Proposed discharge locations and treatment standards.
- A detailed implementation program of the proposed drainage system.
- As part of the design of the site drainage system, surface runoff within the construction site shall be diverted in order to avoid flushing away soil material and the water is treated by device such as sediment trap before discharge.
- Domestic sewage from site offices, toilets and kitchen shall either be collected by a licensed waste collector or treated by on-site treatment facilities. Discharge of treated wastewater must comply with the discharge limits according to Vietnamese legislation.
- A Wastewater treatment device such as a sediment tank can be installed near each of the constructions activities that may generate wastewater. Alternatively, sedimentation ponds can be constructed on-site to settle out excessive suspended solids (SS) before discharging into a discharge outlet.
- Retaining walls and sandbags barriers shall be constructed surrounding the bored piling machine in order to trap bentonite and wastewater within the piling location. The collected spent bentonite or the wastewater shall be pumped for treatment before discharge.
- Prior to the rainy season, all exposed surfaces and slopes shall be properly covered or landscaping shall be provided to minimize run-off of sediment laden. Slope protection can be carried out in sequence to construction and in advance of the rainy season.
- Drainage control devices such as sediment traps shall be installed at each discharge outlet, and they shall be cleaned regularly, and
- Chemical toilets can be provided on each work site employing 5 workers or more.

- At least one toilet shall be installed per 25 workers. Domestic sewage collected from the site office and chemical toilets shall be cleaned up on regular basis. Only licensed waste collectors shall be employed for this disposal. The sludge shall be treated according to the requirements of the Contractor's Waste Management Plan.

### *Solid Wastes*

Waste such as those listed below are expected due to construction activities:

- Surplus excavated materials requiring disposal due to earth moving activities and slope cutting.
- Disposal of used lumber for trenching works, scaffolding steel material, site hoarding, packaging materials, containers of fuel, lubricant and paint.
- Waste generated by demolition of existing houses / buildings affected by the project or breaking of existing concrete surfaces.
- Waste from on-site wastewater treatment facility (e.g. treatment of bentonite from tunneling works by sedimentation process), and
- Domestic waste generated by construction workers, construction campsite and other facilities.

The above wastes must be properly controlled through the implementation of the following measures:

- Minimize the production of waste that must be treated or eliminated.
- Identify and classify the type of waste generated. If hazardous or chemical wastes are generated, proper procedures must be taken regarding their storage, collection, transportation and disposal. (See Emergency Plan for Hazardous Materials and Chemical Waste Management Plan).
- Identify and demarcate disposal areas clearly indicating the specific materials that can be deposited in each, and
- Control placement of all construction waste (including earth cuts) to approved disposal sites (>300 m from rivers, streams, lakes, or wetlands). Collect and recycle and dispose where necessary in authorized areas all of garbage, metals, used oils, and excess material generated during construction, incorporating recycling systems and the separation of materials.

The Contractor shall make a commitment to waste recycling and re-use methods in consideration of the following;

- A method statement on waste recycling, re-use and minimization of waste generation.
- Excavated material shall be re-used on-site or the nearby road segment / other projects as far as possible in order to minimize the quantity of material to be disposed of.
- Recyclable materials such as wooden plates for trench works, steel, scaffolding material, site holding, packaging material, etc. shall be collected and separated on-site from other

waste sources. Collected recyclable material shall be re-used for other projects or sold to waste collector for recycling, and

- Collected waste shall be disposed of properly through a licensed waste collector.

## **Pollution Prevention Plan**

### *Emergency Plan for Hazardous Materials*

If the construction site is expected to have or suspected of having hazardous materials (chemicals, asbestos, hydrocarbons, or other similar hazardous materials), the Contractor will be required to prepare a Hazardous Waste Management Plan and Emergency Response Plan to be approved by the Environmental Supervisor. Removal and disposal of existing hazardous wastes in project sites should only be performed by specially trained personnel following national or provincial requirements, or internationally recognized procedures.

The Contractor shall:

- Make the Hazardous Waste Management Plan available to all persons involved in operations and transport activities;
- Hazardous waste (or chemical waste) shall be properly stored, handled and disposed of in accordance with the local legislative requirements. Hazardous waste shall be stored at designed location and warning signs shall be posted;
- Inform the Environmental Supervisor, or Construction Supervisor of any accidental spill or incident in accordance with the plan;
- Prepare a companion Emergency Response Plan outlining all procedures to be undertaken in the event of a spilled or unplanned release;
- Initiate a remedial action following any spill or incident; and
- Provide a report explaining the reasons for the spill or incident, remedial action taken, consequences/damage from the spill, and proposed corrective actions. The Emergency Plan for Hazardous Materials shall be subsequently updated and submitted to the PEO for no objection.

### *Chemical Waste*

During construction there will be a potential for pollution to adjacent habitat areas and watercourses caused by chemical wastes such as spent waste oil, spent lubricant, contaminated soil material due to leakage of hydraulic oil, fuel from construction plant or vehicles, etc.

The following measures shall be put into place in order to minimize the damage caused by chemical waste:

- All refueling of heavy equipment and machinery shall be undertaken by a service vehicle to prevent any spillage or contamination by chemical wastes such as maintenance oils, lubricants, etc.

- All the fuel and hazardous material storage shall be adequately enclosed to prevent any spillage problems;
- Storm water runoff from open workshops, repair areas, and enclosed storage areas shall be collected and treated in hydrocarbon separation pits/tanks before discharge to drains and waterways.
- All explosives shall be transported, stored and handled in accordance with applicable laws and good design engineering and constructions practices. The contractor shall provide details of proposed storage and security arrangements, and
- Pesticides and shall be packaged, labeled, handled, stored and disposed of according to standards acceptable to the World Bank and the government of Vietnam.

#### *Maintenance of Construction Equipment*

The Contractor shall:

- Identify and demarcate equipment maintenance areas (>15m from rivers, streams, lakes or wetlands). Fuel storage shall be located in proper areas and approved by the PEO.
- Ensure that all equipment maintenance activities, including oil changes, are conducted within demarcated maintenance areas; never dispose spent oils on the ground, in water courses, drainage canals or in sewer systems, and
- All spills and collected petroleum products shall be disposed of in accordance with standard environmental procedures/guidelines. Fuel storage and refilling areas shall be located at least 100m from all cross drainage structures and important water bodies or as directed by the PEO.

#### **Reservoir Clearing and Salvage**

##### *Clearing of Construction Areas*

Areas proposed for clearing shall be included in the Vegetation Clearing and Salvage Plan. Only those proposed areas shall be cleared in accordance with the Plan and approved by the Engineering Supervisor. The Vegetation Clearing and Salvage Plan shall consider the existing usage of the project land to allow its existing usage to continue as long as is practicable, without interference with the Contractor's activities. Vegetation shall not be disturbed in those areas not submitted with the Plan.

The Contractor shall also arrange to coordinate with local communities as part of the Livelihoods Development Plan to clear the reservoir area.

The following measures shall be implemented:

- Large or significant trees in camp areas and access roads should be preserved wherever possible.
- The application of chemicals for vegetation clearing shall be minimized. To the best extent possible, non-residual chemicals shall be selected and with negligible adverse effects on human health.

- Herbicides use in the project shall be shown to be effective against the target vegetation species, have minimum effect on the natural environment, and be demonstrated to be safe for inhabitants and domestic animals in the treated areas, as well for personnel applying them.
- Herbicides shall be appropriately packaged, labeled, handled, stored, disposed of, and applied according to international standards proposed by the Contractor for the TSHPMB non-objection, and
- The design of roads, including temporary and permanent access roads shall avoid crop areas where reasonable and practical.

#### *Landscape, Visual impacts and Re-vegetation*

The construction program of the project shall be executed in phases, particularly in those locations where severe or high landscape and visual impacts are expected.

The following measures shall be implemented:

- Construction shall be programmed in sequence so that the scale of earth moving activities and area of exposed surface can be minimized.
- Re-vegetation shall start at the earliest opportunity. Appropriate local species of vegetation shall be used.
- The requirement of compensatory planting shall be included in the design and project contract. A Master Landscaping Plan and requirements of ecological monitoring or survey during different stages of the project shall be prepared during the design stage that shall be implemented during the construction and maintained during operation.
- Facilities and structures shall be located according to the terrain and geographical features of the project site.
- Restoration, of cleared areas such as borrow pits no longer in use, disposal areas, construction roads, construction camp areas, stockpiles areas, working platforms and any areas temporarily occupied during construction of the project works shall be accomplished using landscaping, adequate drainage and re-vegetation.
- Existing trees and plants within the construction boundaries shall be tagged to indicate whether the trees are to be retained transplanted or removed. Transplantation of existing trees affected by the project works shall be carried out prior to the commencement of construction.
- Excavations shall avoid damage to the root systems. Mitigation measures are also required to prevent damage to trunks and branches of trees.
- Temporary hoarding barriers shall be of a recessive visual appearance in both color and form.
- Upon completion of the construction, the affected areas shall be immediately restored to their original condition, including the re-creation of natural and rocky shoreline, footpath and re-establishment of disturbed vegetation.



- At the highly visually sensitive zones, construction may be scheduled where possible at the low tourist seasons.
- Construction trucks shall operate at night when possible and kept cleaned and covered when shipping bulk materials.
- Construction sites shall be surrounded with fence if located at the scenery zones to avoid direct visual sights of the construction sites.
- There shall not be construction camps in scenic areas.
- Random disposal of solid waste in scenic areas shall be strictly prohibited.
- All mixing stations and concrete batching plants shall not be located near rivers or in scenic areas. The stockpiles shall be located in hidden areas, and outside of the sight from tourists;
- Use the existing roads as access road if possible to minimize the need for new access roads which lead to damage existing landforms and vegetation.
- Land use for agricultural activity prior to use for construction activities shall be, as much as possible, restored to a state to allow the same agricultural activity to continue.
- Spoil heaps and excavated slopes shall be re-profiled to stable batters, and grassed to prevent erosion.
- Topsoil stripped from the work areas shall be used for landscaping works, and
- Watercourses, which have been temporarily diverted by the construction activities, shall be restored to their former flow paths.

#### *Site Restoration*

- At the completion of construction work, all construction camp facilities shall be dismantled and removed from the site and the whole site restored to a similar condition to that prior to the commencement of the works, or to a condition agreed to with local authorities and communities.
- Remedial actions that cannot be effectively carried out during construction shall be carried out on completion of the restoration works (and before issuance of the acceptance of completion of works).

Various activities to be carried out for site restoration are:

- The construction campsite shall be grassed and trees cut replaced with saplings of similar tree species.
- All affected areas shall be landscaped and any necessary remedial works shall be undertaken without delay, including grassing and reforestation.
- Water courses shall be cleared of debris and drains and culverts checked for clear flow paths.

- All sites shall be cleaned of debris and all excess materials properly disposed.
- Borrow pits shall be restored.
- Oil and fuel contaminated soil shall be removed and transported and buried in waste disposal areas.
- Saplings planted shall be handed over to the community or the land owner for further maintenance and watering, and
- Soak pits and septic tanks shall be covered and effectively sealed off.

#### **A-4: Safety During Construction**

The Contractor's responsibilities include the protection of every person and nearby property from construction accidents. The Contractor shall be responsible for complying with all national and local safety requirements and any other measures necessary to avoid accidents, including the following:

- Present details regarding maximum permissible vehicular speed on each section of road;
- Establish safe sight distance in both construction areas and construction camp sites;
- Place signs around the construction areas to facilitate traffic movement, provide directions to various components of the works, and provide safety advice and warning. All signs shall be in English and Vietnamese language and be constructed according to Vietnamese specifications;
- Estimate maximum concentration of traffic (number of vehicles/hour);
- Use selected routes to the project site, as agreed with the PEO, and appropriately sized vehicles suitable to the class of roads in the area, and restrict loads to prevent damage to local roads and bridges used for transportation purposes;
- Be held responsible for any damage caused to local roads and bridges due to the transportation of excessive loads, and shall be required to repair such damage to the approval of the PEO;
- Not use any vehicles, either on or off road with grossly excessive, exhaust or noise emissions. In any built up areas, noise mufflers shall be installed and maintained in good condition on all motorized equipment under the control of the Contractor;
- Maintain adequate traffic control measures throughout the duration of the Contract and such measures shall be subject to prior approval of the PEO;
- Carefully and clearly mark pedestrian-safe access routes;
- If school children are in the vicinity, include traffic safety personnel to direct traffic during school hours;
- Maintain a supply for traffic signs (including paint, easel, sign material, etc.), road marking, and guard rails to maintain pedestrian safety during construction;

- Conduct safety training for construction workers prior to beginning work;
  - Provide personal protective equipment and clothing (goggles, gloves, respirators, dust masks, hard hats, steel-toed boots, etc.) for construction workers and enforce their use;
  - Provide post Material Safety Data Sheets for each chemical present on the worksite;
  - Require that all workers read, or are read, all Material Safety Data Sheets. Clearly explain the risks to them and their partners, especially when pregnant or planning to start a family. Encourage workers to share the information with their physicians, when relevant;
  - Ensure that the removal of asbestos-containing materials or other toxic substances be performed and disposed of by specially trained workers;
  - During heavy rains or emergencies of any kind, suspend all work; and
  - Brace electrical and mechanical equipment to withstand seismic events during the construction.

#### **A5: Environmental Training for Construction Workers**

During construction there will be a potential for workers to damage protected areas and waterways adjacent to camps and work areas. The Contractor shall prepare an Environmental Training Plan for all construction workers: the Plan shall address the following items:

- All Contractor's employees shall be required to comply with environmental protection procedures and they shall be able to provide evidence that they attended the training sessions detailed in the Plan;
- The Plan shall educate all construction workers on the following issues but not limited to them: fire arm possession, traffic regulations, illegal logging and collection of non-timber forestry products, non disturbance of resettlement communities, hunting and fishing restrictions, waste management, erosion control, health and safety issues, all prohibited activities, the Code of Conduct requirements and disciplinary procedures, and general information on the environment in which they will be working and living;
- Establishment of penalties for those who violate the rules; and
- Proposed methods for conducting the training program, which shall include formal training sessions, posters, data in newsletters, signs in construction and camp areas and 'tool box' meetings.

## **Annex B: Regional Health Management Plan**

### **B-1: Main Diseases in the Project Affected Area**

According to the Health Study<sup>4</sup> conducted by Ha and Kaul (2009), the most common diseases in the northwest provinces are tuberculosis (TB), malaria, HIV, traffic accidents, and other mental disorders (schizophrenia and epilepsy).

In the districts affected by the TSHPP (Quan Hoa, Muong Lat, Mai Chau, and Moc Chau), the most common diseases are flu, food poisoning, pneumonia, diarrhea, traffic accident, bronchitis, dysentery, tuberculosis, malaria, goiter, mental disorders, and HIV/AIDS. The districts are also “hot spots” for illicit drugs. The area not only sells and transports drugs, but local drug consumption is very high. The northwest region of Vietnam, where there is disproportionately high incidence and prevalence of HIV/AIDS, exposes workers to the dangers of contracting HIV, both through intravenous drug use and unprotected sex.

### **B-2: Diseases Brought by Construction Workers and Camp Followers**

Most of construction workers and camp followers come from different locations and they can bring other diseases to the area. Common health issues that can come with these groups are: STIs, HIV/AIDS, tuberculosis, respiratory infections, diarrhea, helminth, vector-borne diseases such as malaria and dengue fever, alcohol abuse, drug addiction, zoonoses, schistosomiasis, leptospirosis, etc.

### **B-3: Health Management Plan**

The Contractor shall prepare and enforce a Health Management Plan to address matters regarding the health and safety of construction workers and project staff. The Contractor shall include in his proposal the outline of the Health Plan. The Environmental Supervisor will issue a certificate of compliance to the Contractor prior to the initiation of Construction.

The following measures shall be implemented by the Contractor to ensure an adequate Project Health Program:

- Screening of all workers on recruitment and annually;

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<sup>4</sup> “Health Impact Assessment and Public Health Action Plan for Trung Son Hydropower Project”. Ly Ngoc Ha MD, MPH National Public Health Consultant and Surinder Kaul MBBS, MFPHM, FFPHM (UK) International Public Health Consultant. April 21, 2009

- Implementation of a comprehensive vaccination program including but not limited to hepatitis A and B, tetanus, polio, etc.;
- Implementation of anti-malaria measures following current accepted practice at the camp area and establishment of facilities for the early diagnosis and treatment of patients with the disease;
- Storing sufficient medicines for malaria treatment;
- Collecting and testing sputum of individuals who are at risk for Tuberculosis(TB) infection;
- Storing antibiotics for treatment of respiratory infections;
- Storing medicines and transfusion fluid to treat food poisoning and diarrhea;
- Develop solutions for mass outbreaks of food poisoning;
- Periodic monitoring of public kitchen in construction camps;
- Storing and distributing vermifuges to workers;
- Implementation of a disease control and pest management measures at the time the construction camps are built;
- Distribution of free condoms to camp workers;
- Monitoring of health indicators to follow the trends;
- When buildings cannot be made mosquito proof, pyrethroid-treated nets shall be provided;
- Appropriate measures shall be taken subject to risk assessment and review of potential environmental affects to address mosquito control including dengue fever control;
- Implementation of a program for the detection and screening of sexually transmitted infections, especially with regard to HIV/AIDS, amongst laborers;
- Establishment of a medical center located at the main construction camp for the diagnosis and treatment of communicable diseases, simple medical complaints, and the handling of medical emergencies and accidents, prior to transportation to the hospital. The medical center shall have:
  - A 7-10 bed health facility fully equipped to provide emergency medical care to stabilize emergency patients before they can be referred to district or provincial hospital;

- Essential medical equipment for the center to provide emergency care;
- Short term care of patients requiring hospitalization;
- Isolation room (one bed) for any infectious disease patient (in epidemic situations, district and provincial facilities will have to be used);
- The center shall include one medical officer, one trained nurse of senior level, two medical auxiliaries, one laboratory technician (who may be also responsible for monitoring water quality in construction camp areas), one driver, and one ambulance (4WD).
- The smaller construction camps shall have subsidiary treatment or first aid posts staffed by either a trained nurse or a locally trained personnel, as required;
- Examine and screen construction workers before employment for schistosomiasis;
- Selection of suitable workers from the workforce who shall receive additional training in occupational health and first aid and shall form teams of two or three personnel at each work site. They shall be under the supervision of the medical officer; and
- Provisions shall be made for health checks of employees, including checks, where required, for drug abuse and sexually transmitted diseases in accordance with the International Labor Organization (ILO), and the World Health Organization (WHO) resolutions (“ILO Code of Practice on STD HIV/AIDS and the World of Work”. ILO, Geneva, June 2001).

The Contractor shall include a Pest Management Program for the construction areas, including construction work camp areas, in the Project Health Program, which shall provide for:

- Controlling pests primarily through environmental methods. When environmental methods are not sufficient, the use of pesticides shall be considered;
- Promoting the safe use of all pesticides;
- Incorporating pest management strategies when feasible;
- Pesticides and shall be packaged, labeled, handled, stored and disposed of according to standards acceptable to the World Bank (OP 4.09: Pest Management) and the government of Vietnam.

The Contractor shall employ a sanitation and pest management officer who shall work full time to:

- Control vector borne and other diseases;

- Ensure the continued safe disposal of all solid waste and sewage;
- Implement fly and other insect pest control at construction camp facilities;
- Implement and monitor the Pest Management Program throughout the project area including construction camps and spontaneous resettlement areas;
- Provide appropriate information and education to the workforce on basic personal hygiene, prevention of diseases, including respiratory diseases, vector-borne diseases such as malaria and dengue, water and food borne diseases such as diarrhea, STIs, and HIV/AIDS, tuberculosis, etc.;
- Distribute educational materials including brochures, and leaflets which provide information of TB, HIV/AIDs symptoms and counseling and treatment services;
- Investigate and document disease outbreaks within the Contractor's workforce;
- Ensure correct maintenance of water and sewage treatment plants; and
- To reduce the risk of workers contracting malaria, the following measures shall be followed:
  - Education of workers about problems and preventive measures;
  - Use of protective clothing;
  - Repellents applied to clothing;
  - Minimize containers full of water;
  - Keep storm water drains and borrow pits free of vegetation; and
  - Use insecticides as a last control method and only after studies indicate the primary location of mosquitoes.

## **Annex C: TOR for Environmental Supervision During Construction**

### **C-1: Supervisory Roles**

#### **TSHPMB**

The TSHPMB shall create an environmental unit to manage the environmental and social effects of the Trung Son Hydroelectric project throughout its life.

The TSHPMB shall employ a Project Environmental Officer (PEO) who will represent the TSHPMB for all matters related to the project and will be responsible for overall coordination of EMP implementation.

The Construction Supervision Team (CST) is responsible for supervising and monitoring all construction activities and for ensuring that contractors comply with the requirements of the contracts and the EMP. The CST shall engage sufficient number of qualified staff (e.g. Environmental Engineers) with adequate knowledge on environmental protection and construction project management to perform the required duties and to supervise the Contractor's performance.

#### **Contractor**

An Environment Team (ET) shall be established by the Contractor. The Contractor shall ensure adequate resources are available to the ET for the implementation of the EMP throughout the construction and maintenance period. The Contractor can either establish the ET and Workplace Safety and Environmental Officer (SEO) of suitably qualified and experienced staff within their organization or sub-contract to an institution experienced in EMP who would provide an ET and SEO.

### **C-2: Qualifications**

The PEO shall have extensive experience (at least five years experience) in environmental management, supervision and monitoring on construction projects, and be familiar with Vietnam environmental legislatives requirements.

The Environmental Engineers shall be lead by a Workplace Safety and Environmental Supervisor (SES) who shall have extensive experience (at least 5 years experience is required) in environmental management, supervision and monitoring on construction projects and be familiar with Vietnam environmental legislatives requirements.

The ET shall be led by a SEO with extensive environmental management, training and monitoring experience (at least 5 years experience) in construction projects and familiar with the environmental legislatives requirements. The qualification of the proposed SEO shall be approved by the PEO prior to commencement of the project. The SEO shall be supported by a team of qualified staff. Both the SEO and ET members are required to work full time on-site. Sufficient number of staff shall be included in the team in order to carry out the duties specified in the EMP.



### C-3: Responsibilities

The responsibilities of the CST include the following:

- Supervise the Contractor's compliance with contract specifications, including the implementation and operation of environmental mitigation measures and ensure their effectiveness, and other aspects of the EMP Implementation Plan. Major non-compliance by the Contractor will be cause for suspension of works and other penalties until the non-compliance has been resolved to the satisfaction of the PEO. Contractors are also required to comply with national and municipal regulations governing the environment, public health and safety;
- Regularly monitor the performance of the ET, verifying monitoring methodologies and results. In case the SES considers that the SEO or any member of the ET fails to discharge duties or fails to comply with the contractual requirements, instruct the Contractor(s) to replace the SEO or the member of the ET;
- Instruct the Contractor(s) to take remedial actions within a specified timeframe, and carry out additional monitoring, if required, according to the contractual requirements and procedures in the event of non-compliances or complaints;
- Supervise the Contractor's activities and ensure that the requirements in the EMP and contract specifications are fully complied with;
- Instruct the Contractor(s) to take actions to reduce impacts and follow the required EMP procedures in case of non-compliance / discrepancies identified;
- Instruct the Contractor(s) to stop activities which generate adverse impacts, and/or when the Contractor(s) fails to implement the EMP requirements / remedial actions instructed by the SES or the IEMC;
- Participate in the joint site inspection undertaken by the ET; and
- Adhere to the procedures for carrying out complaint investigation.

The SEO and ET are responsible for implementation and management of the EMP program. Regular environmental monitoring works, as required by the environmental legislation, shall be carried out by qualified laboratories and monitoring team. The laboratories and the monitoring team shall be considered members of the ET. The roles and responsibilities of ET and SEO are:

- Sampling, analysis and evaluation of monitoring parameters with reference to the EMP recommendations and requirements;

- Carry out environmental site surveillance to investigate and audit the Contractors' site practice, equipment and work methodologies with respect to pollution control and adequacy of environmental mitigation implemented;
- Review the success of the EMP Implementation Plan to cost-effectively confirm the adequacy of mitigation measures implemented;
- Monitor compliance with environmental protection, pollution prevention and control measures, and contractual requirements;
- Monitor the implementation of environmental mitigation measures;
- Audit and prepare audit reports on the environmental monitoring data and site environmental conditions;
- Complaint investigation, evaluation and identification of corrective measures;
- Advice to the Contractor on environment improvement, awareness, proactive pollution prevention measures;
- Engage a qualified staff, preferably a Landscape Architect to review and monitor the Contractor's submitted Landscape, Visual Impacts and Re-vegetation Plan, and to supervise the Contractor's landscaping works;
- Follow the procedures in the EMP and recommend suitable mitigation measures to the Contractor in the case of non-compliance / discrepancies identified. Carry out additional monitoring works within the specified timeframe instructed by the PEO; and
- Liaison with the Contractor and PEO on all environmental performance matters, and timely submission of EMP Implementation Plan reports to the PEO, SES, and relevant administrative authorities, if required;

#### **C-4: Prohibitions**

The following activities are prohibited on or near the project site;

- Cutting of trees for any reason outside the approved construction area;
- Hunting, fishing, wildlife capture, or plant collection;
- Buying of wild animals for food;
- Having caged wild animals (especially birds) in camps;
- Poaching of any description;
- Explosive and chemical fishing;

- Building of fires;
- Use of unapproved toxic materials, including lead-based paints, asbestos, etc.;
- Disturbance to anything with architectural or historical value;
- Use of firearms (except authorized security guards);
- Use of alcohol by workers in office hours;
- Washing cars or machinery in streams or creeks;
- Maintenance (change of oils and filters) of cars and equipment outside authorized areas:
- Driving in an unsafe manner in local roads;
- Working without proper safety equipment (including boots and helmets);
- Creating nuisances and disturbances in or near communities;
- The use of rivers and streams for washing clothes;
- Disposing garbage in unauthorized places;
- Indiscriminate disposal of rubbish or construction wastes or rubble;
- Littering the site;
- Spillage of potential pollutants, such as petroleum products;
- Collection of firewood;
- Urinating or defecating outside the designated facilities; and
- Burning of wastes and/or cleared vegetation.

Any construction worker, office staff, Contractor's employees, the Client's employees or any other person related to the project found violating these prohibitions will be subject to disciplinary actions that can range from a simple reprimand to termination of his/her employment depending on the seriousness of the violation.

## **Annex D: Guidelines for Safety and Community Relations Plans**

In addition to the RLDP (and its 3 components Resettlement Plan, Community Livelihood Improvement Plan and Ethnic Minorities Development Plan, the contractor will be required to complete a Community Relations and Community Safety Plan.

### **D-1: Community Relations and Community Safety Plan**

#### ***Community Relations***

To enhance adequate community relations the Contractor shall:

- Inform the population about construction and work schedules, interruption of services, traffic detour routes and provisional bus routes, blasting and demolition, as appropriate;
- Limit construction activities at night. When necessary ensure that night work is carefully scheduled and the community is properly informed so they can take necessary measures; and
- At least five days in advance of any service interruption (including water, electricity, telephone, and bus routes) the community must be advised through postings at the project site, at bus stops, and in affected homes/businesses.

A separate Community Relation Plan for the Project will be prepared by the Contractor, which will include:

- Means to maintain open communications between the local government and concerned communities;
- Have a the mailing list to include agencies, organization, and residents that are interest in the project;
- Provide a community relations contact from whom interested parties can receive information on site activities, project status and project implementation results;
- Provide all information, especially technical findings, in a language that is understandable to the general public and in a form of useful to interested citizens and elected officials through the preparation of fact sheets and news release, when major findings become available during project phase;
- Monitor community concerns and information requirements as the project progresses;
- Respond to telephone inquiries and written correspondence in a timely and accurate manner; and

- Modify the Community Relation Plan for changes in community needs as necessary to be accurate during different project implementation phases.

## **D-2: Community Safety**

### ***Reservoir Filling***

The Contractor shall, with no less than 30 days prior notice, inform the Environmental Supervisor and the local authorities of any planned construction events that will raise the water level in the reservoir and that could result in stranding or drowning any inhabitants in the area.

### ***Traffic Safety***

The Contractor will work with local communities and community leaders to implement a community traffic and safety program aimed at minimizing traffic related risks during the construction phase (see also Annex A-4). The community traffic safety program will consist of the following:

- Present the community with details regarding maximum permissible vehicular speed on each section of road;
- Establish safe sight distance in both construction areas and construction camp sites;
- Place signs around the construction areas to facilitate traffic movement, provide directions to various components of the works, and provide safety advice and warning. All signs shall be in English and Vietnamese language and be constructed according to Vietnamese specifications;
- Use selected routes to the project site, as agreed with the PEO, and appropriately sized vehicles suitable to the class of roads in the area, and restrict loads to prevent damage to local roads and bridges used for transportation purposes;
- Be held responsible for any damage caused to local roads and bridges due to the transportation of excessive loads, and shall be required to repair such damage;
- Not use any vehicles, either on or off road with grossly excessive, exhaust or noise emissions. In any built up areas, noise mufflers shall be installed and maintained in good condition on all motorized equipment under the control of the Contractor;
- Maintain adequate traffic control measures throughout the duration of construction;
- Carefully and clearly mark pedestrian-safe access routes;
- If school children are in the vicinity, include traffic safety personnel to direct traffic during school hours;

- Maintain a supply for traffic signs (including paint, easel, sign material, etc.), road marking, and guard rails to maintain pedestrian safety during construction;
- Conduct safety awareness programs in local schools and community facilities.

### **Blasting**

The contractor shall ensure that blasting does not pose a risk to local residents or communities through the implementation of the following (see also Annex A).

- The contractor shall warn local communities and/or residents that could be disturbed by noise generating activities such as blasting well in advance and shall keep such activities to a minimum;
- In sensitive areas (including residential neighborhoods, hospitals, rest homes, schools, etc.) more strict measures may need to be implemented to prevent undesirable noise levels;
- Blasting shall not be carried out within 200 m of residences or local communities;
- Before blasting is carried out, a detailed survey shall be conducted at nearby communities to evaluate the degree of impacts due to the blasting activity (e.g. possible damage to structures or infrastructure due to vibration, effects on animals, local residents, etc.);

### **D-3: Worker Code of Conduct**

As discussed in Annex A, the Contractor shall be responsible for the preparation of a Worker Code of Conduct. This shall be made available to local communities at project information centers or other place easily accessible to the communities. The Code of Conduct shall address the following measures (but not limited to them):

- All workers and subcontractors shall abide by the laws and regulations of Vietnam.
- Illegal substances, weapons and firearms shall be prohibited.
- Pornographic material and gambling shall be prohibited.
- Fighting (physical or verbal) shall be prohibited.
- Workers shall not be allowed to hunt, fish or trade in wild animals.
- No consumption of bush meat shall be allowed in camp.
- No pets shall be allowed in camp.
- Creating nuisances and disturbances in or near communities shall be prohibited.
-

- Disrespecting local customs and traditions shall be prohibited.
- Smoking shall be prohibited in the workplace.
- Maintenance of appropriate standards of dress and personal hygiene shall be in effect.
- Maintenance of appropriate hygiene standards in accommodation quarters shall be set in place.
- Residing camp workforce visiting the local communities shall behave in a manner consistent with the Code of Conduct; and
- Failure to comply with the Code of Conduct, or the rules, regulations, and procedures implemented at the construction camp will result in disciplinary actions.

## **Annex E: Chance Find Procedures**

If the Contractor discovers archeological sites, historical sites, remains and objects, including graveyards and/or individual graves during excavation or construction, the Contractor shall:

- Stop the construction activities in the area of the chance find;
- Delineate the discovered site or area;
- Secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be arranged until the responsible local authorities or the National Culture Administration take over;
- Notify the Project Environmental Officer who in turn will notify the responsible local authorities and the Ministry of Culture, Sports and Tourism immediately (within 24 hours or less);
- Responsible local authorities and the Ministry of Culture, Sports and Tourism would be in charge of protecting and preserving the site before deciding on subsequent appropriate procedures. This would require a preliminary evaluation of the findings to be performed by the archeologists of Ministry of Culture, Sports and Tourism. The significance and importance of the findings should be assessed according to the various criteria relevant to cultural heritage; those include the aesthetic, historic, scientific or research, social and economic values;
- Decisions on how to handle the finding shall be taken by the responsible authorities and by Ministry of Culture, Sports and Tourism. This could include changes in the layout (such as when finding an irremovable remain of cultural or archeological importance) conservation, preservation, restoration and salvage;
- Implementation for the authority decision concerning the management of the finding shall be communicated in writing by relevant local authorities; and
- Construction works could resume only after permission is granted from the responsible local authorities or the Ministry of Culture, Sports and Tourism concerning safeguard of the heritage.



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## **Annex F: Terms of Reference for Approach to Intact Rivers Management**

### **F-1: Background**

The Trung Son Hydropower Project (TSHPP) is a medium sized hydropower project that is intended to serve as a best practice example of future development of Vietnam's power sector. It will be installed with a capacity of 260 megawatt (MW), generating an annual total of 1.018 gigawatt hour (GWh) to the national power grid. The project will also provide downstream flood control benefits, supplement water supplies during the dry season and be used as an alternative energy resource for global greenhouse gas (GHG) emission reduction.

#### **Key components of the TSHPP include the following:**

- An 84.5m high dam with a crest length of 513 m;
- A total reservoir area of 13.13 km<sup>2</sup>, with a volume of 348.5 million m<sup>3</sup>;
- A 20.4 km long access road;
- A number of borrow pits;
- A construction work camp for approximately 4000 workers; and
- Transmission lines

The total project cost is estimated at \$386 million U.S. dollars (USD).

### **F-2: Fish Impacts Arising From Development of the TSHPP**

According to Duc (2008), the fish diversity in the Ma River basin affected by the Trung Son Hydropower Project is considered high. A total of 198 species, including 9 species listed in Vietnam Red data book, occur in the project affected area. All species are widely distributed in rivers of North and Northern Central Vietnam and some species are found in rivers of the middle central of Vietnam.

Though species richness is high, fish and aquatic resources are not in good condition and may even be in strong decline. Fish catches are only about 80% compared to the last 10 years. Nine species that have produced large catches in the past are now caught in much lower numbers. One species originally present now appears to be absent.

In the absence of hydropower development the following is expected regarding fisheries in the Ma River Basin:

- Fish production will continue to decline due to overexploitation, habitat loss and modification and pollution;
- Little change to migration patterns is expected;

- Habitat integrity is expected to remain good in upstream areas, but be modified in downstream freshwater, estuarine and coastal areas;
- Nutrient loads are expected to increase in downstream areas as a result of pollution leading to greater eutrophication.

In addition to these effects, the construction and operation of the Trung Son dam will result in a variety of upstream and downstream impacts on fish resources depending on timing and location, including the following:

### **Construction**

- Sedimentation during construction of the dam and access road;
- Water pollution from spills and chemicals;
- Use of explosives;
- Wastes from camps and other sources;
- Overfishing; and
- Improper clearing of the reservoir and increased eutrophication.

### **Filling and Operation**

- Conversion of riverine to lake habitat and impacts on fish composition;
- Impacts on water quality due to nutrient loading;
- Modification to river flows;
- Habitat modification and impacts on spawning and reproduction;
- Changes in fish production;
- Barriers to migratory species;
- Downstream impacts to aquatic species due to changes in flow and water quality;
- Impacts to fisheries of economic value;

### **F-3: Justification of an Intact Rivers Program in the Ma River**

One means of mitigating the effects of the Trung Son dam is to ensure that selected branches of the Ma River system remain unaltered and unaffected. This would need to consist of a complete unaltered sub-basin with no dams or barriers and a high level of protection from other impacts such as mining-related pollution, forestry, wastewater pollution from urban areas, and destructive fishing practices. Having a completely unaltered system would preserve the

ecological connectivity within one branch of the system and provide species with inter-habitat migration from one part of the basin to another.

Duc (2008) recommended that two complete river sub-basins of the Ma River should be kept free from barriers and activities that impact fish biodiversity. Keeping these two sub-basins “intact” will ensure that a full sequence of fish habitats and migratory routes is protected in the Ma River. Potential candidate sub-basins are: for such an intact rivers scheme are the Buoï River and the Luong River.

- The Buoï River has a length of 85 km. It originates in the Tan Lac district, flows across Lac Son district (Hoa Binh province), Thach Thanh district and Vinh Loc district (Thanh Hoa province) and then flows into Ma River at Vinh Hoa.
- The Luong River has a length of about 50 km. It originates in the Lao People’s Democratic Republic, enters Vietnam and then flows across Quan Son and Quan Hoa districts (Thanh Hoa) entering into the Ma River at Hoi Xuan.

Based on this evaluation, the following is a description of how an Intact Rivers program could be established for these two sub-basins.

### **Objective**

The objective of the study is to analyze the technical and legal feasibility for the establishment of an intact river program in the Buoï and Luong River sub-basins of the Ma River.

### **Legal feasibility**

There is no precedent in Vietnam for an intact rivers approach to river management and no legal basis for protection and management of a river as a whole ecosystem. The study will analyze the legal framework in Vietnam and suggest alternative legal options for establishing a protected ecosystem in the two selected sub-basins. The study will also analyze the institutional arrangements that will be necessary to implement such protection.

### **Technical feasibility**

In addition to the legal assessment, a technical assessment is necessary to determine the feasibility of an intact rivers approach in these two sub basins. The technical assessment should consider the following:

- Existing baseline conditions in each sub-basin: hydrology, land use, water quality (mainly based on existing information on the Ma river basin, Water Resources Institute for instance);
- Fish biodiversity within the sub-basins and their relationship with the entire Ma River system;
- Assessment of aquatic ecosystem quality – water quality and flow, benthos, phytoplankton, zooplankton and other variables important to fish;

- Fisheries: existing fisheries activities along the sub-basins: fishing effort, location, fishing practices, captures;
- Impacts of the Trung Son Dam, if any;
- Existing threats to aquatic biodiversity in each sub-basin such as: mining activities, habitat destruction, wastewater discharges, unsustainable fishing practices;
- Cumulative effects assessment and watershed mapping; and
- Existing institutional arrangements for the protection of biodiversity and specifically fish biodiversity in the two sub-basins;

### **Specific Details of the Intact Rivers Program**

The study will propose a series of legal, institutional and regulatory measures to protect fish biodiversity in the two sub-basins, including but not limited to the following:

- Identify data gaps in both sub-basins and how they should be filled;
- Commitments to prohibit the imposition of barriers (hydropower dams and other structures);
- Commitments to remove any human existing barriers already in place to by pass them with fish passage devices;
- Legally define an area of protection of the proposed streams, to protect riverine forests and habitats, where conflicting activities will be strictly controlled or regulated;
- Control, limit or prohibit sand and aggregate mining in the river channel and river banks for the length of the intact rivers, their embankments and branches of the rivers;
- Impose strict controls on terrestrial mining in the area of protection of the rivers to prevent pollutants and sediments from entering the intact river system;
- Prohibit the construction of roads and road infrastructure that may impact the integrity of the intact river watershed or establish the environmental criteria to allow such infrastructure to be built;
- Control, limit or prohibit the establishment of new settlements, industrial areas and other new human activities within the intact river watershed area;
- Manage, control or restrict human activities and industries already occurring in the intact river watershed to reduce any current impacts on the streams and prevent any new impacts;

- Propose bans on destructive fishing practices (use of explosives, for instance), impose seasonal fishing restrictions, and other measures, and establish mechanisms for enforcing this bans;
- Identify areas and opportunities for fisheries compensation such as stocking
- Environmental education, awareness and sensitivity programs for communities living along the intact rivers;
- Monitoring programs for fish biodiversity in the basins; and
- Development of inter-institutional and cooperative management mechanisms for program implementation.

Each proposed program will include:

- A technically detailed description of each mitigation measure;
- A timetable (chronogram) of planned activities;
- A budget of all necessary investment and recurrent costs
- A clear definition of institutional responsibilities (all levels of government, national, provincial, local for the implementation of each mitigation measure including (i) design; (ii) supervision; (iii) enforcement; and (iv) monitoring; and
- An analysis of the institutional capacity of all agencies that will participate in the intact river program.

### **Duration and Costs**

6 months, US\$100,000

## **Annex G: De-commissioning and Abandonment**

Initial decommissioning and reinstatement studies have been completed by VICA (n.d.). By the end of the construction phase, TSHPMB will prepare a formal dam decommissioning and abandonment plan, including the following:

- Removal of all structures and equipment
- Removal of all associated infrastructure – roads, transmission lines etc.
- Waste removal and management
- Safety issues
- Reclamation of disturbed land
- Land use
- Socio-economic and land redistribution
- Restoration of river flows
- Restoration of riverine habitats and ecological condition
- Restoration of other disturbed areas
- Flood protection

## **Annex H: Camp Follower Management Plan**

Hydropower projects typically initiate a construction “boom”. This will to some extent give opportunities for paid work for local people but there will always be an influx of outside workforce and camp followers (families, traders, merchants, etc.). The camp followers generally locate themselves in areas adjacent to camp locations, resulting in serious impacts not only on the local communities (loss of land), but also the environment (uncontrolled use of fuel wood, wildlife for food, and contamination of nearby waterways through inadequate waste management). Spontaneous settlement areas are also associated with increased risk for spread of HIV/AIDS and other Sexually Transmitted Infections (STI).

At the same time, camp followers can be exposed to endemic diseases such as dengue and malaria, respiratory diseases, tuberculosis, food poisoning and traffic accidents. These camp followers will require services such as housing, water and sanitation, and health services.

To avoid damage to the surrounding and agricultural areas, contamination to nearby waterways and to minimize the impact of these camp followers in the local communities, TSHPMB shall work with the Construction Contractor to provide areas outside formal construction camps for camp followers.

TSHPMB shall prepare a Camp Followers Management Plan which shall include the following:

- Selection of adequate areas for the settlement of camp followers.
- Camp followers shall be provided with health services and have access to local health facilities and clinics.
- Camp followers shall be provided with minimum services such as potable water (standpipes), latrines, collection and disposition of solid wastes, electricity, etc.
- The Contractor’s responsibilities with the camp followers shall be defined and established by TSHPMB.

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## **Annex I: Cumulative Effects Assessment Framework**

### **I-1: Background**

The following framework is intended to assist environmental and social professionals of the TSHPMB in undertaking a cumulative effects assessment of the TSHPP and its associated auxiliary facilities. This framework has been adapted to consider the specific needs and challenges associated with the cumulative effects assessment of development in the Trung Son area and vicinity.

### **I-2: Definition of Cumulative Effects**

Cumulative effects assessment is a means of determining the impacts of other projects and activities in addition to the project under consideration. The US Council on Environmental Quality (1997) defines CEA as follows: *“the impact on the environment which results from the incremental impact of the action when added to their past, present and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other action”*. Hegman *et al.* (1999) define cumulative effects as *changes to the environment that are caused by an action in combination with other past, present and future actions*.

A Cumulative Effects Assessment is simply an evaluation of those effects.

Cumulative effects address impacts not normally considered at the Project level, including the following:

- Effects on the environment from multiple projects in a larger, regional area which may have multiple jurisdictional or administrative responsibilities;
- Effects that extend into the past and also into the future;
- The impacts of multiple projects and activities on valued ecological and social components, not just the project under consideration; and
- Evaluates the significance of these effects and prescribes comprehensive management actions.

### **I-3: Completion of a CEA**

The Macleod Institute (1998) identified the following key elements that need to be considered in a CEA:

- Issue identification – a balanced approach to the identification of issues of concern through a thorough understanding of the project and its effects, involving a process of baseline characterization, expert involvement and consultation with affected parties;
- Valued Ecosystem Components (VECs) – the identification of social and environmental issues, resources and species of public concern;



- Indicators – the identification of key indicators;
- Spatial bounding – the determination of spatial limits of the analysis depending on projects and activities and valued ecosystem components.
- Temporal bounding – the setting of time limits including past (pre-development), present and future events;
- Included projects – the identification of all existing and reasonably foreseeable developments and activities that have the potential to affect the same resource or VEC as the TSHPP. Where possible, only those projects of known footprint should be considered;
- Assessment methods – the selection of qualitative and quantitative methods for conducting the CEA;
- Impact characterization – the characterization of the impact using standard EIA considerations (extent, duration, frequency, magnitude etc.) and considering probability of occurrence and uncertainty;
- Significance of cumulative effects – determination of the significance of the effect; and
- Future management options – identifying mitigation and management actions.

A modified five-step approach is suggested for conducting a CEA of other activities in conjunction with the TSHPP:

- Step 1: Describe the project, its setting and other projects and activities that may give rise to cumulative effects;
- Step 2: Identify key project related contributions to cumulative effects on selected resources of concern;
- Step 3: Assess the level of cumulative effects;
- Step 4: Determine the significance of cumulative effects; and
- Step 5: Prescribe mitigation or management action.

### ***Step 1: Describe the TSHPP and Its Setting***

The first step in the CEA is to describe the project and its phases (construction, operation and abandonment), including key components that may give rise to cumulative effects. This will include the following:

- Phases and timing of the project;
- Description of the dam and project area of influence;
- Description of offsite facilities – access roads, camps, borrow pits etc.;
- Areas sensitive to construction – steep slopes, wetlands, river crossings, protected areas, environmentally sensitive areas, geotechnical hazard etc.;

- Access roads; and
- Emission sources.

At the same time, the environmental and social setting should be described, based on work completed in the TSHPP EIA including the following (but not necessarily limited to):

- Air quality;
- Water – surface and groundwater;
- Soils and vegetation;
- Wildlife;
- Fisheries and aquatic resources;
- Land use;
- Protected areas;
- Cultural resources; and
- Socio-economic resources

Once the project issues have been considered, the next step is to consider the past, present and possible future projects and activities within a defined temporal and spatial framework. The evaluation of other projects and activities should consider the following:

- Include those projects of known footprint that can be assessed;
- Consider a time frame that extends backwards to a pre-development scenario and forwards as realistically as possible;
- Include projects that are approved, awaiting approval, announced or under design;
- Include those projects whose environmental and social impacts and contribution to cumulative effects can be reasonably predicted; and
- Discuss pending projects with regulators and incorporating the concerns of affected stakeholders.

***Step 2: Identify key project related contributions to cumulative effects on selected resources of concern***

The EIA and SESIA have identified key issues of concern associated with the design, construction, operation and abandonment of the project and its phases.

- Impacts associated with construction
- Impacts of increased access;

- Effects on native vegetation, wildlife and protected areas;
- Impacts on surface water quality and quantity;
- Downstream impacts on water quality, quantity and aquatic resources;
- Loss of archaeological and cultural resources;
- Impacts on land use and loss of productive land; and
- Resettlement and associated social and community impacts.

The CEA should identify key resources and issues that may be affected by the project throughout all phases in conjunction with other projects and activities. Hegmann et al. (2004) suggest the following questions should be answered:

- Are other projects and activities in the defined project area affecting the resource?
- Do the effects of the project overlap or increase the effects on the resource?
- Do the effects of the project have a potential to affect the long-term sustainability of the resource?

### ***Step 3: Assess the level of cumulative effects***

The next step in the CEA process is to assess the level of cumulative effects. This uses a similar methodology to that traditionally employed in the EIA, the difference being in that CEA assesses the impacts of other projects and activities, in addition to the project in a defined spatial and temporal framework. For each resource/issue in question the cumulative effects should consider typical components of an EIA assessment – extent, frequency, duration, magnitude, uncertainty and probability.

### ***Step 4: Determine the significance of cumulative effects***

Once the cumulative effect or impact has been determined, the significance of that effect must be considered relative to an established threshold limit, an established legal guideline or policy, or a qualitative assessment based on professional opinion and consultation. In any case, the significance of the cumulative effect must be defensible.

The significance of the cumulative effect and the contribution of the project must be subsequently evaluated by project decision makers. Hegmann et al. (2004) state that significance should be based on one of the following:

- The project has a measurable effect on the resource;
- The project acts in conjunction with the effects of past present or future projects and activities;

- The project in conjunction with other projects and activities shifts the resource to an unacceptable level or exceeds a threshold such that the impact is considered significant, in that:
- The project's contribution to cumulative effects is responsible for exceeding the threshold and therefore is significant; and
- The project is contributing with the effects of other projects and activities and the project contribution may or may not be significant, depending on the level of the contribution.

***Step 5: Describe mitigation and management actions***

Once the significance and responsibility for the cumulative effect is determined, mitigation can be applied at both the project and regional level. Mitigation and management actions may involve the following:

- Project level mitigation to reduce the significance of the contribution of the project to cumulative effects;
- Cooperative mitigation measures between project proponents to reduce cumulative effects, or
- Regional intervention on behalf of government or regulators to reduce the overall cumulative effect through the establishment of thresholds or policy intervention.
- Regional intervention should be done early on in the individual project decision-making process. Ideally proponents should be encouraged to assess cumulative effects with the full engagement of decision-makers to avoid the "straw that breaks the camel's back".
- Furthermore, the results of this study will provide updated information for government authorities in order to assist them to develop a management plan for the Ma River watershed.

Cumulative effects assessment has been described as EIA being done well. As such, it is an attempt to consider environmental and social impacts beyond the single project level, while providing proponents and government regulators a management framework from which to plan development at a regional scale.

## Annex J: Tiger Action Plan

World Wildlife Fund (WWF) is implementing a new and far-reaching strategy for tiger conservation based on a landscape approach. WWF has chosen 7 focal landscapes, where the chances of long-term tiger conservation are best and its involvement will be most valuable. These landscapes were selected at the WWF Tiger Conservation Strategy Workshop (September 2000, Anyer, Indonesia) using a number of prioritization criteria developed with the counsel of some of the most respected tiger experts from outside WWF. The selected focal landscapes are: 1) Russian Far East (Russia) 2) Terai Arc (India, Nepal) 3) Satpuda-Maikal Range (India) 4) Sundarbans (Bangladesh, India) 5) Lower Mekong Forests (Cambodia, Lao PDR, Vietnam) 6) Taman Negara-Belum-Halabala (Malaysia, Thailand) 7) Kerinci Seblat/ Bukit Barisan Selatan (Indonesia). In addition, the action plan will focus on the cross-cutting issue of international trade in tiger parts and products (WWF Tiger Action Plan, 2009).

The tiger in Vietnam belongs to the Indo-Chinese sub-species *Panthera tigris corbetti*. Based on the data gathered from previous surveys, it is estimated that tigers are present in 20 provinces with a total population of not more than 150 animals, which are primarily distributed along the borders of Vietnam, Laos and Cambodia (RTV, 2008).

Map J-1 highlights the tiger conservation landscapes in Vietnam and the proposed Trung Son Hydropower Plant (TSHPP). The Forest Protection Department (FDP), Ministry of Agricultural and Rural Development (MARD) of the Government of Vietnam has proposed a Tiger Action Plan (2005 – 2010) to ensure the survival of existing tiger populations and their habitats and prey as part of Vietnam's biodiversity conservation. Tigers are known to occur in the vicinity of the TSHPP, but their presence is unknown in the three natural adjacent to the proposed dam.

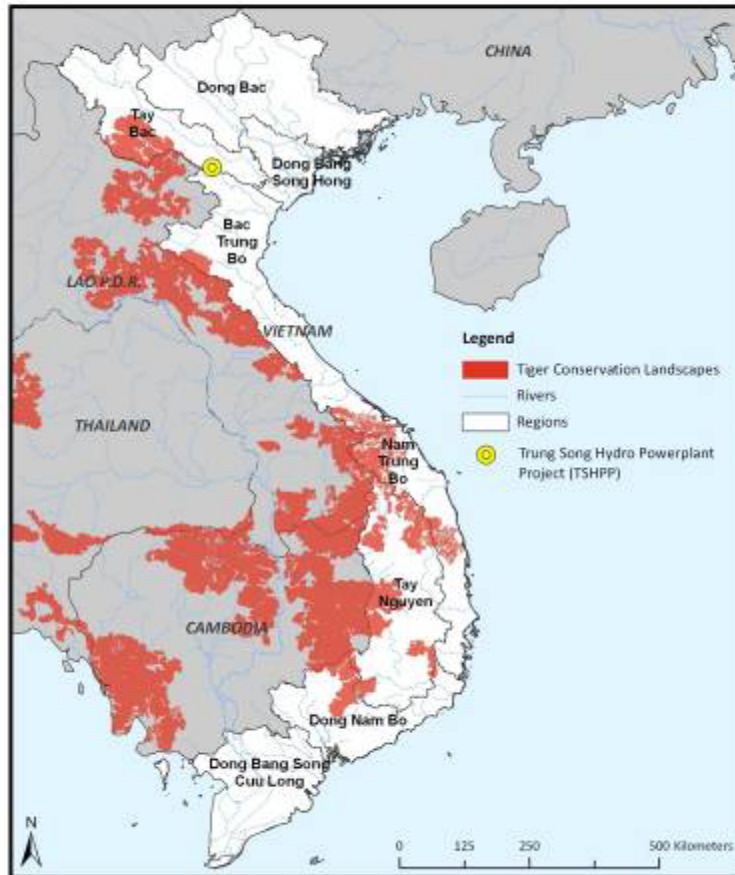
The long-term goal of the Tiger Action Plan is to improve the protection and management of key tiger populations and their habitats in top priority conservation landscapes, through measures than can be sustained and supported over the long term by governments, local communities and stakeholders.

TSHPPMB, in conjunction with the MARD and MONRE will commit to supporting the Tiger Action Plan as part of development of the TSHPP biodiversity and protected areas plan. The following activities are proposed:

- Establishment of TORs for this study that will be agreed to with MARD and MONRE;
- Undertake studies to determine the presence, if any, of tigers in the three natural reserves adjacent to the TSHPP;
- The results of this study will be reviewed by a joint group consisting of EVN, MONRE and MARD; and
- Recommendations from this study will be taken forward under the adaptive management approach by the appropriate agency, with support from EVN.

- Furthermore, the results of this study will provide updated information for government authorities in order to help them to carry out further management plan to protect tigers and their habitats.

### Tiger Conservation Landscapes and the proposed Trung Song Hydro Powerplant Project (TSHPP)



Map J-1: Tiger Conservation Landscapes of Vietnam