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Trung Son Hydropower Project
Environmental Management Plan

September 2009

Integrated Environments

Environmental Management Plan

Trung Son Hydropower Project

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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_5	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_x	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	Probably 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_x	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
^0C	degrees Celsius
%	percent
10^6m^3	million cubic meters
10^6m^3/year	million cubic meters per year
cells/l	cells per liter (used for vertical distribution and concentration)
dBA	decibel
GWh	gigawatt hour
g	grams
g/m^3	grams per cubic meters
ha	hectares
km	kilometer
km/km^2	density (for stream network)
km^2	square kilometers
kg/s	kilograms per second
kV	kilovolts
$l/(s.km^2)$	liters per second per kilometer squared
m	meter
meq/100g	milli-equivalents per 100 grams
mm	millimeters
mg/mL	milligrams per milliliters
mg/m^3milligrams	milligrams per cubic meters
m/s	meters per second
m^3	cubic meters
m^3/day	cubic meters per day
m^3/ha	cubic meters per hectare
m^3/s	cubic meters per second
m^3/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^3	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
Lc	Crest length
M	Average flow per unit area
m	upstream slope
m	downstream slope
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)
Ro	Suspended sediment volume (kg/s)
Vdđ	Total accumulated volume of river bed sediment (m^3/year)
Vll	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
X_o	Year average rainfall
Y axis	Vertical axis
Z	Depth
α	Correlation coefficient
γdđ	Weight of river bed sediment (t/m^3)
γll	Weight of suspended sediment (t/m^3)
δ	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. with other past, present and future human 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 flows	The water regime provided within a river, wetland or coastal zone to maintain ecosystems and the benefits of ecological goods and services they provide, where there are competing water uses and where flows are regulated. The goal of environmental flows is to provide a flow regime that is adequate in terms of quantity, quality and timing for sustaining the health of the rivers and other aquatic ecosystems.
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.

Term	Definition
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.
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_{10}	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.

Term	Definition
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.
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 than 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.

Introduction

1.1. Background

This Environmental Management Plan (EMP) for the Trung Son Hydropower Project (TSHPP) identifies the principles, 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),

Community Livelihood Improvement Plan (CLIP) and an Ethnic Minority Development Plan (EMDP).
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.

1.2. 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
- Social and Health Management Plan (construction and operation).

The terms of reference for preparation of these contractor plans are presented in the Appendices of the EMP.
The EMP is structured as follows:

- An overview of the project description is provided in Chapter 2.
- Roles and responsibilities for environmental and social management are described in Chapter 3.
- Key environmental and social risks as identified from the project SESIA are presented in Chapter 4.
- Mitigation measures for construction and operation phases are presented in Chapter 5.
- A framework for Environmental Supervision is presented in Chapter 6.
- A framework for Environmental Monitoring is presented in Chapter 7.
- Communication and reporting procedures are described in Chapter 8.
- Training and capacity building requirements are discussed in Chapter 9.
- Plan monitoring and review procedures are presented in Chapter 10.
- Preliminary EMP costs are discussed in Chapter 11.
- 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 is the Camp Follower Management Plan;
    - Annex D is the TOR for Environmental Supervision;
    - Annex E contains guidelines for Socio-economic Management Plans;
    - Annex F contains information on Chance Find Procedures;
    - Annex G is the TOR for the Intact Rivers Approach;
    - Annex H contains information on the Tiger Action Plan;
    - Annex I contains TOR for a Cumulative Effects Assessment of the TSHPP in conjunction with other activities and/or projects; and
    - Annex J contains Decommissioning and Abandonment requirements.

1.3. 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 Vegetation Cover Clearance 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 Investigation of Tangible Cultural Resources in the Area of the Trung Son Hydropower Project report 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 additional research initiatives are outlined.

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 r*eport 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 2008 Impact Assessment of Trung Son Hydropower Project to Fish-biodiversity and Suggested Migitation Measures 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 Health Impact Assessment of Trung Son Hydropower Project report 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 Reinstatement Study on Construction Activities and Worker Camps for the Trung Song 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.
Since the initiation of the TSHPP, two rounds of public consultation have occurred and a third is planned. The results of this initial consultation have been documented in the *Public Consultation Results on Affected Households of theTrung Son Hydropower Project r*eport.
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 OP 4.12 to mitigate any potential impacts to local villagers and surrounding environment.
The Resettlement Livelihood 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 which will be implemented; and finally, the EMDP which is designed to maintain people's ethnic cultural identity throughout the resettlement transition period.

Project Overview

The Trung Song Hydropower Project (TSHPP) is located in the Quang Hoa district of Thanh Hoa province, North Central Vietnam, approximately 9.5 km from the Laos Border. The TSHPP consists of a dam on the Ma River, a reservoir area of 13.2 km^2 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.
Figure 0-1 is a schematic representation of the proposed TSHPP and its associated project components (construction camp, borrow pits, transmission lines, access road etc.).

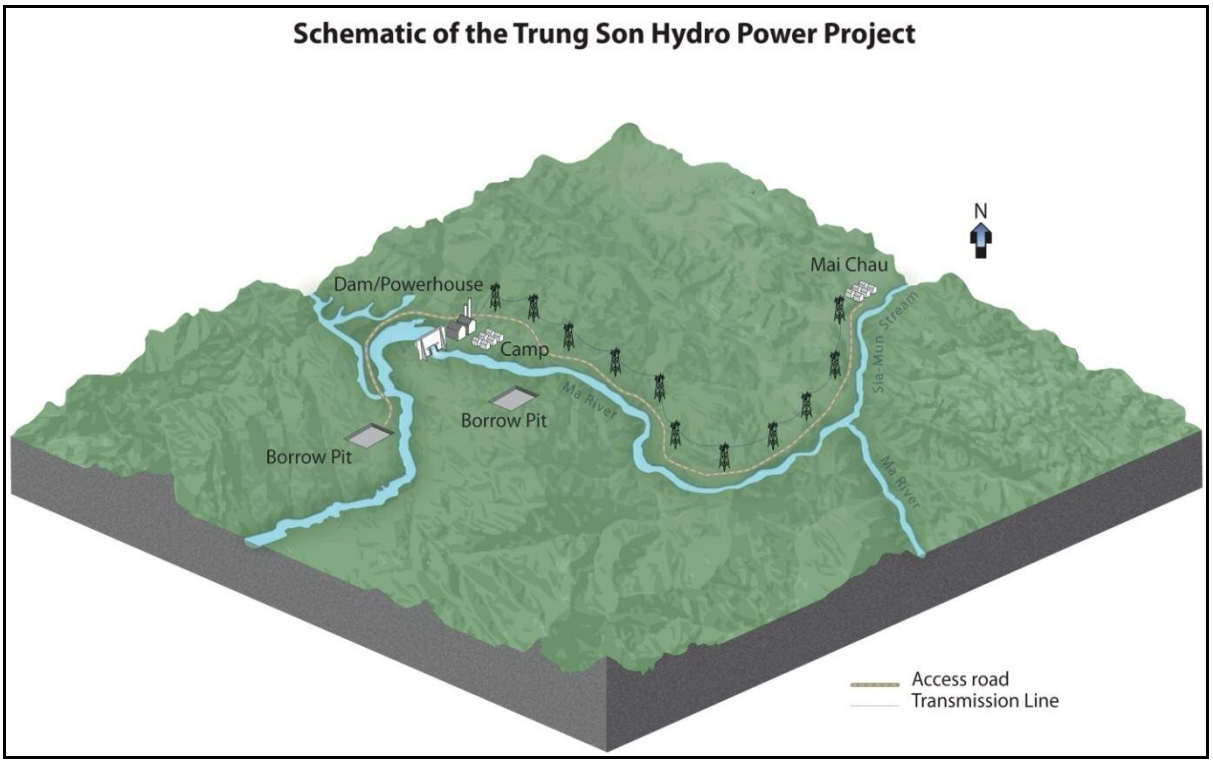

Figure 0-1: Schematic of the TSHPP

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 – 13.1 km^2
- Reservoir volume – 348.5 million m^3
- 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 1.06 GWh annually to supply energy to the national grid. The project will also control flooding downstream of the reservoir by using 112 million m^3 of the reservoir's capacity. The TSHPP will provide a non-carbon based energy supply that may assist in reducing GHG emissions.
In addition to the dam, 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 work camp and a number of borrow pits.
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 structures including the access road and borrow pits; and indirect impacts on the areas' natural resources and biodiversity, including within three adjacent natural reserves.

An estimated 1,691 households (7,546 people) will be affected by the main project components, most of who are of Thai minority descent and Muong; Muong account for 90% of the total affected (DRCC, 2008a). Of these, the Co Luong to Co Me access road will affect approximately 451 people (Tercier Consultants, 2009). 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 social and community impacts.
Total project costs are estimated at $368 million, of which $24.6 million is allocated for compensation and resettlement purposes.

Key Environmental Risks

The ESIA (IEL 2009) was used to develop the key environmental and social risks associate with the construction and operation phases of the TSHPP. Each is discussed below.

1.4. Construction Phase

The following key environmental risks have been identified for the construction phase of the project. These are identified below in Table 0-1.

Table 0-1: Summary of Key Environmental Construction Phase Impacts

Issue	Impact/Risk
Construction of the project and associated components	③ Noise creation
	③ Dust creation
	③ Road traffic
	③ Accidents and unplanned activities
	③ Hazardous and chemical waste storage
	③ Solid and liquid waste
	③ Borrow pit and quarry creation
Auxiliary Project (Road, Transmission lines, etc.)	③ Noise and vibration creation
	③ Dust
	③ Increased road traffic
	③ Improved access
Introduction of Construction Work Force	③ Construction of new building camps
	③ Job creation
	③ Increased demand for infrastructure and utilities
	③ Loss of biodiversity and increased pressure on protected areas (refer to Annex A)
	③ Loss of cultural and ethnic identities
Health	③ Increased disease transmission rates
	③ Increased drug use and trade
	③ Increased demand for health services
Natural Resources	③ Loss of forest cover
	③ Loss of biodiversity and habitat
Cultural Property	③ Loss or alteration of cultural/archeological historical sites
Social	③ Resettlement of affected communes and villagers
	③ Loss of ethnic and cultural identities

Cumulative Effects	③ Effects of the project in combination with the affects of other projects and land uses adjacent to the TSHPP – to be defined

1.5. Operation Phase

The following key environmental risks have been identified for the operation phase of the project. These are identified in Table 0-2 below.

Table 0-2: Summary of Key Environmental Operation Phase Impacts

Issue	Impact/Risk
Social	③ Addition of 130 permanent residents and impacts on local culture and services
River Ecosystem	③ Reduction in environmental flows and downstream impacts
	③ Flood control benefits
	③ Lack of sediment transport downstream
	③ Impacts on downstream water quality
	③ Impacts on fish and aquatic habitats
	③ Alteration of aquaculture and fisheries sector
	③ Impacts on river transport
	③ Downstream impacts to cultural resources
Reservoir Creation and Powerplant Operation	③ Vegetation management of reservoir
	③ Loss of wildlife habitat
	③ Increased levels of floating debris
	③ Decomposition of decay and vegetation biomass
	③ Sedimentation in reservoir
	③ Changes to the fish fauna
	③ Changes in production of fish
Natural Resources	③ Impacts on adjacent protected areas and biodiversity
Auxiliary Project (Road, Transmission lines, etc.)	③ Noise and vibration creation
	③ Dust
	③ Road Traffic
	③ Improved access

EMP Roles and Responsibilities

1.6. Roles and Responsibilities for EMP Implementation

This section describes the organizational structure and responsibilities for implementation of the EMP as shown below in Table 0-1.

Table 0-1: Responsibility for EMP Implementation

Organization	Responsibility
EVN – Electricity of Vietnam	③ Overall responsibility for environmental performance of TSHPP ③ Decision-maker on applicable policies to the TSHPP ③ Overall supervisory role during the construction phase ③ Overall responsibility for EMP implementation during the operating phase ③ Review reports of the Independent Environmental Monitoring Consultant (IEMC) ③ Responsible for changes to the EMP as part of an adaptive approach to environmental and social management of the TSHPP ③ Responsible for implementation of the Intact Rivers management approach
TSHPMB	③ Develop an environmental unit, headed by the Project Environmental Officer to implement EMP responsibilities ③ Oversight, implementation, monitoring and compliance of the EMP, SESIA and any approval conditions, including construction supervision and performance of all TSHPMB staff, contractors and all subcontractors ③ Review of EMP performance and implementation of correction action, 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 ③ Ensuring effective communication and dissemination of the content and requirements of the EMP to contractors and subcontractors ③ Assisting the contractor with implementation of EMP sub-plans ③ Monitoring of EMP and SESIA performance ③ Ensuring compliance to all project social commitments, including implementation of the social management and resettlement plans ③ Report environmental performance of the TSHPP directly to EVN ③ Report on environmental performance also to MONRE, World Bank, independent environmental monitoring consultants and other government regulators as required ③ Prepare environmental reports summarizing project activities, as required ③ Representing the project at community meetings

	③ Ensuring effective community liaison and fulfilling commitments to facilitate public consultation throughout the project cycle
	③ Monitoring of downstream impacts and any reports downstream of decreased fish yields
Supervising Engineer	③ Preparation and implementation of the Environmental Supervision Plan during construction
	③ Preparation and implementation of the Environmental Monitoring Plan during construction and operation
	③ Supervision of contractor performance of implementation of the Construction and Work Camp Management Plan
	③ Reporting any incidents or non-compliance with the EMP to the TSHPMB
	③ Ensuring adequate training and education of all staff involved in environmental supervision
	③ Making recommendations to the TSHPMB regarding EMP performance as part of an overall commitment to continuous improvement
Construction Contractor	③ Preparation and implementation of the Construction and Worker Camp Management Plan
	③ Prepare and maintain records and all required reporting data as stipulated by the EMP, for submission to the Supervising Engineer
	③ 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 ③ During construction, maintain traffic safety along access roads, with special emphasis on high trafficked areas
Independent Environmental Monitoring Consultant (IEMC)	③ Report to EVN and the World Bank on project compliance with environmental and social commitments in the EMP, EIA and other applicable standards
Local Authorities	③ Local authorities/community representatives shall be involved in implementing mitigation measure aspects of both the SESIA and EMP, where applicable

Plan Components and Structure

This chapter discusses the specific components of each of the various environmental management plans, their structure, objectives, timing, responsibility and costs.
Figure 0-1 on the following page shows the organization and content of the EMP for the Trung Son Project. The EMP has the following component areas:

- ③ Construction Impact Management Plan

- Worker Camp Management Plan
- Worker Camp Follower Management Plan
- Waste Management Plan
- Pollution Prevention Plan

③ Biodiversity and Protected Areas Management Plan

③ Vegetation Clearing and Salvage Plan

③ Environmental Monitoring Plan

③ Socio-Economic Management Plan

③ Regional Health Management Plan

③ Physical Cultural Resources Management Plan

③ Additional Studies

③ Training and Capacity Building

③ Plan Costs

1.7. EMP Responsibilities

Table 5.1 on the following page describes the responsibilities of various organizations and project stakeholders towards the implementation of the Environmental Management Plan.

1.8. 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 5.1.

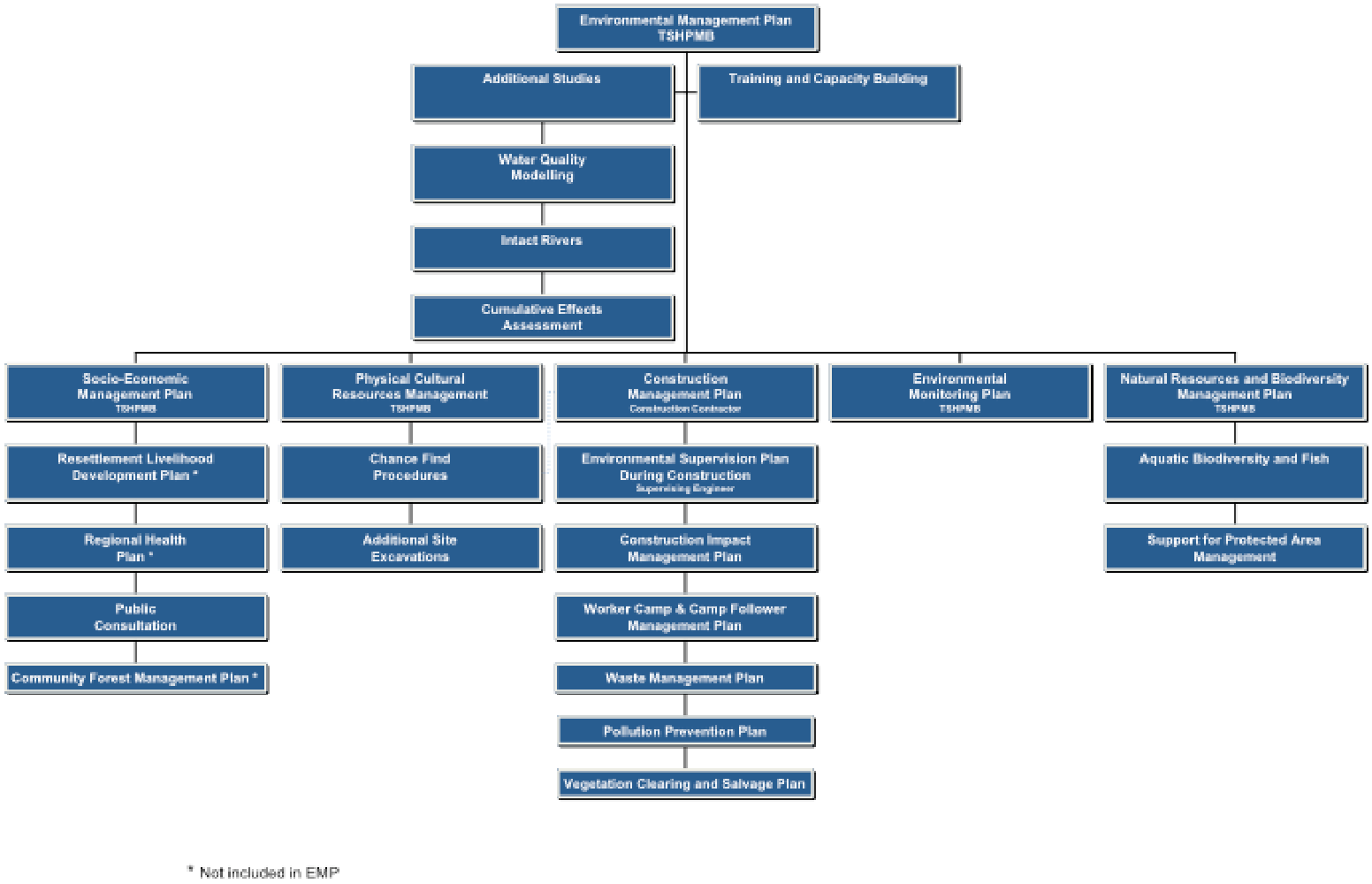

Figure 0-1: Organization of the TSHPP EMP

Table 0-1: Primary Responsibilities of the TSHPP EMP

Plan	Sub-Plan	Primary Responsibility for Implementation			
		TSHPMB	**Engineering Supervisor**	**Contractor**	**IMC**
Construction Impact Management Plan	Worker Camp Management Plan		√	√	
	Worker Camp Follower Management Plan	√			
	Waste Management Plan		√	√	
	Pollution Prevention Plan		√	√	
Biodiversity and Protected Areas Management Plan		√			
Vegetation Clearing and Salvage Plan			√	√	
Environmental Monitoring Plan		√	√		√
Socio-Economic Management Plan		√			√
Regional Health Management Plan		√			
Physical Cultural Resources Management Plan		√	√	√	
Additional Studies		√			
Training and Capacity Building		√		√	
Plan Costs		√			

Construction Impact Management Plan

Objectives:

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

Description:

Preparation of the Construction Impact Management Plan will be responsibility of the construction contractor; a detailed TOR is presented in Annex A. The plan addresses the following elements:

- Design requirements and environmental protection measures for construction camps;
- Security and safety;
- Maintenance of camp facilities;
- Worker code of conduct;
- Provisions for camp followers;
- Erosion and sedimentation;
- Particulate emissions and dust;
- Noise;
- Earthworks, cut and fill slopes;
- Stockpiles and borrow pits;
- Waste management;
- Pollution prevention;
- Vegetation removal, revegetation and site restoration.

Timing/Schedule:

- Pre-construction: Design requirements, safety and security, camp maintenance, worker code of conduct, provisions for camp followers
- Construction: erosion/sedimentation, particulate emissions/dust, noise, earthworks, stockpiles/borrow pits, waste management, pollution prevention
- Operation: revegetation and site restoration
- The timing of specific activities is shown in Figure .

Responsibility:

- Preparation and implementation of the Construction Impact 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 adjacent protected areas.

Description:

The biodiversity and protected areas management plan shall contain compensatory 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;
- Development of protected area management plans;
- Establishment and training of park wardens and patrols;
- Additional ecological baseline studies;
- Development of necessary infrastructure – control posts, toll gates, staff housing, boat docks, trails and interpretive facilities;
- 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 in Q4 2010.

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.

Vegetation Clearing and Salvage Plan

Objectives:

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

Description:

A 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 Vegetation Clearing and Salvage Plan.

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

- Delineation of area to be cleared to avoid unnecessary cutting and removal of vegetation;
- Scheduling in advance of reservoir operation to maximize the efficiency of vegetation removal and salvage, while minimizing the opportunity for vegetation regrowth;
- 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 Vegetation Clearing and Salvage Plan shall be in place 6 months prior to reservoir clearing in advance of reservoir operation.

Responsibility:

- The Construction Contractor shall coordinate the preparation and implementation of the vegetation removal and salvage 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 7 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.

The majority of construction monitoring shall be done visually and verified by the Construction Supervisor. An Independent Environmental Monitoring Consultant (IEMC) will be responsible for carrying out environmental sampling and monitoring on all environmentally related issues regarding the Construction Contractor's activities. Specific 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
- Reclamation and revegetation

Operation

Monitoring during the operation phase shall 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
- 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:

③ 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.

Community Relations and Community Safety Plan

Objectives:

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. Details of the Community Relations and Community Safety Plan are presented in Appendix E.

Description:

Community Relations

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

- ③ To inform the population about construction and work schedules, interruption of services, traffic detour routes and provisional bus routes, blasting and demolition, as appropriate;
- ③ To 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
- ③ To provide adequate notification - 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:

- ③ Means to maintain open communications between the local government and concerned communities;
- ③ Have a the mailing list to include agencies, organization, and residents that are interest in the project;
- ③ Provide a community relations contact from whom interested parties can receive information on site activities, project status and project implementation results;

Community Relations and Community Safety Plan

- 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;

- 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 6 months prior to initiation of construction.

Responsibility:

Community Relations and Community Safety Plan

③ The Construction Contractor shall be responsible for development and implementation of the Community Relations and Community Safety Plan**.**

Regional Health Program

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
- Build the capacity 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
  - Malnutrition prevention
  - Population and family planning

- Anemia prevention
- Community mental health care

③ 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.

③ Implementation and planning will be integrated;

③ Capacity building is recognized as a key program component;

③ A referral system will be developed linking Commune Health Centers, District Hospitals and Provincial Hospitals;

③ One Commune Health Center in the resettlement area of Trung Ly will be developed

③ A monitoring and surveillance program will be developed;

③ The project area will be covered under the National Infectious Disease Outbreak Rapid Response Preparedness Plan; and

③ Camp followers will be addressed under the regional plan.

Timing/Schedule:

③ The Regional Health Management Plan will be implemented during the construction phase and continue through operations.

③ After a four year period, a mid-term review will be completed.

Responsibility:

③ Planning, coordination, management and supervision of both the Resettlement and the Regional Health Program will be assured by Trung Son Project Health Management Team (PHMT) of 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 construction and operation.
Description: ③ The Environmental Impact Assessment identified seven sites that require further excavation and mitigation. These activities will be undertaken in conjunction with authorities from the Ministry of ③ Additional physical and cultural resources 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. ③ Chance Find Procedures, which identify what measures should be taken in the event that physical cultural resources are encountered, are outlined in Annex G. ③ The plan should also address measures to monitor downstream erosion of physical cultural sites and implement measures to protect these sites.
Timing/Schedule: ③ The Physical Cultural Resources Management Plan shall be in place 6 months prior to reservoir clearing in advance of reservoir operation.
Responsibility: ③ 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.

Environmental and Social Impact Management

The environmental and social impacts of the TSHPP were identified in the Supplementary SESIA and are linked to specific mitigation and management measures identified as below in the EMP.

1.9. Construction

Standard mitigation standards and measures for minimizing the impacts during the construction phase of the TSHPP are shown in Table 0-1. More detailed construction specifications for environmental and social impact management are presented in Annex A.

Table 0-1: Mitigation Standards/Measures for Minimizing Impacts During Construction

Activity: General Construction Measures (including Access Road)		
Issue	Mitigation Objective / Standard	Mitigation Measure
Construction timing	Construction activities should be timed to avoid unnecessary environmental impact	③ Construction activities shall avoid adverse weather conditions
Dust creation	Dust created must not become a health hazard or nuisance to affected groups	③ Water work area and associated roads on an as needed basis. Frequency of watering should be increased in high traffic areas or adjacent to communities ③ Minimize traffic in local villages and observe imposed speed limits ③ Use exposed stockpiles and material as soon as possible
Vibration disturbance	Vibration levels should not affect local households, livestock or wildlife species	③ Construction activities should be confined to daylight hours ③ If activities occur outside of daylight hours, inform local villagers ③ Blasting should occur at the same time each day ③ Warnings shall be issued prior to blasting activities
Increased road traffic	There shall be no significant risk to local populations from increased levels of construction traffic Integrity of roads shall not be compromised	③ Contractor shall have overall responsibility for traffic safety during the construction phase, both for workers and communities ③ Contractor shall place emphasis on monitoring high traffic areas to ensure traffic safety ③ Minimize traffic in villages and other populated areas ③ Increase signage and posted speed limits ③ Roads shall be kept free from mud, debris and other obstacles ③ Community traffic awareness plan shall be prepared and implemented ③ Repair roads, as required ③ Road traffic should be confined to daylight hours; otherwise local communities should be notified in advance

Activity: General Construction Measures (including Access Road)		
Storage of hazardous materials (fuels, oils, lubricants, etc.) for construction equipment and vehicles	Hazardous material are prohibited to be drained, dumped or used adjacent to watercourses Accidental spills shall be cleaned, reported and monitored	③ Daily inventory on all hazardous materials ③ Provide appropriate storage and train staff on handling practices for hazardous materials ③ Material shall be stored at a minimum of 100 m from watercourses ③ All vehicle and equipment servicing shall occur in level ground, designated distance and area away from watercourses ③ Spill kits and emergency procedures should be used
Monitoring	Monitoring shall be implemented to ensure stakeholder concerns are recorded and addressed in a timely fashion	③ Incident and grievances reporting shall be implemented

Activity: Soil / Overburden Removal and Placement, Alluvial Mining for Aggregate		
Issue	Mitigation Objective / Standard	Mitigation Measure
Borrow pit and quarry creation	Land gradients and drainages are maintained All disturbed areas are properly reclaimed after construction	③ Excavated rock or gravel shall not compromise river bed and banks, or impede in stream flows ③ Confine activities to approved locations ③ Top soil layers shall be stored for reclamation and re-vegetation and reforestation at approved locations ③ Re-contour slopes ③ Ensure proper drainage is maintained ③ Refer to Reclamation Plan
Generation of suspended solids into watercourses	Minimize soil erosion and sedimentation Maintain slope integrity throughout construction	③ No direct discharge in adjacent watercourses shall be made ③ Implement soil erosion and sedimentation control measures, where required ③ Stockpiling shall occur at a specified distance from watercourses ③ Construction activities shall avoid working in adverse weather conditions ③ Re-vegetate, where feasible to contain runoff ③ Installation of rock or stabilization structures ③ Proper grading practices and water diversion structures
Introduction of invasive species	Fill material shall be inspected for invasive species prior to use	③ Machinery shall be cleaned to reduce weeds from spreading

Activity: Soil / Overburden Removal and Placement, Alluvial Mining for Aggregate		
		③ Minimize the amount of imported fill ③ Implement protective measures during transportation

Activity: Excavation and Blasting		
Issue	Mitigation Objective / Standard	Mitigation Measure
Blasting setback distance	Blasting shall not take place within 200m of persons or communities	③ Ensure proper notice and warnings are issued prior to blasting
Noise disturbance	Noise levels should not affect local households, livestock or wildlife species	③ Construction activities should be confined to daylight hours ③ If activities occur outside of daylight hours, inform local villagers ③ Blasting should occur at the same time each day ③ Warnings shall be issued prior to blasting activities ③ Blasting shall not be carried out under adverse weather conditions
Vibration disturbance	Vibration levels should not affect local households, livestock or wildlife species	③ Construction activities should be confined to daylight hours ③ If activities occur outside of daylight hours, inform local villagers ③ Blasting should occur at the same time each day ③ Warnings shall be issued prior to blasting activities
Storage of blasting materials	Blasting materials should be stored in a safe and secure location and not pose a threat to community safety	③ Blasting materials shall be managed and audited on a weekly basis

Activity: Material Stockpiling		
Issue	Mitigation Objective / Standard	Mitigation Measure
Sedimentation into watercourses	Minimize soil erosion and sedimentation Maintain slope integrity throughout construction	③ Implement soil erosion and sedimentation control measures, where required ③ Construction activities shall avoid

		working in adverse weather conditions ③ Re-vegetate, where feasible ③ Installation of rock or stabilization structures ③ Proper grading practices and water diversion structures ③ Compact stockpiles as much as possible ③ Reuse stockpiles as soon as possible
Dust creation	Dust created must not become a health hazard or nuisance to affected groups	③ Water work area and associated roads, increase frequency of watering when nearby communities ③ Minimize traffic in local villages and observe imposed speed limits ③ Use exposed stockpiles and material as soon as possible

Activity: Tunnel Dewatering and Tunnel Portal Construction		
Issue	Mitigation Objective / Standard	Mitigation Measure
Discharge of contaminants from tunnel	No direct discharges of tunnel water into any watercourse or water body Provide water treatment, where feasible, to reduce suspended solids	• Implement monitoring stations up and downstream of the discharge • Any discharges should occur during high flow and within close proximity to the outfall • Provide spill kits and have emergency procedures prepared when dealing with oils, fuels, etc. • Train staff for properly handling procedures when dealing with contaminants

Activity: Concrete Manufacture		
Issue	Mitigation Objective / Standard	Mitigation Measure
Siting of concrete batch plant	Concrete batch plants will not be sited within 500 m of local communities	③ Frequency of dust control measures shall be increased adjacent to communities ③ Fencing may also be required for dust control
Discharge of contaminants from concrete	No direct discharges of concrete batching water into any watercourse	③ Implement monitoring stations up and downstream of the discharge, especially for pH levels

manufacturing during construction	Provide water treatment, where feasible, to reduce suspended solids	③ Any discharges should occur during high flow and within close proximity to the outfall ③ Water is to be reused, where possible ③ Train staff for proper handling procedures when dealing with dehydrated cement material and wet cement
Noise and dust creation	Noise and dust creation must not become a nuisance or health hazard to local villagers, livestock and wildlife	③ Separate concrete batching areas from local villages and households

Activity: Storage and Handling of Hazardous Materials		
Issue	Mitigation Objective / Standard	Mitigation Measure
Storage of hazardous materials (fuels, oils, lubricants, etc.) for construction equipment and vehicles	Hazardous material are prohibited to be drained, dumped or used adjacent to watercourses Accidental spills shall be cleaned, reported and monitored	③ Daily inventory on all hazardous materials ③ Provide appropriate storage and train staff on practices to use hazardous materials ③ Material shall be stored at a minimum of 100 m from watercourses ③ All vehicle and equipment servicing shall occur in level ground, designated distance and area away from watercourses ③ Spill kits and emergency procedures should be used ③ Train staff for proper handling procedures when dealing with hazardous materials

Activity: Archaeological and Cultural Site Disturbance		
Issue	Mitigation Objective / Standard	Mitigation Measure
Discovery of a previously unknown site	No sites shall be disturbed until properly investigated	③ Undertake proper archaeological investigations as part of initial impact assessment ③ Discovery of new sites shall follow “Chance Find Procedures”

Activity: Work In and Nearby Rivers

Issue	Mitigation Objective / Standard	Mitigation Measure
Decreased water quality (sedimentation, contamination, pollution) from working within and/or near watercourse	Minimal disturbance to current water quality levels and aquatic ecosystems	③ Construction activities should occur during low water levels ③ Maintain river diversion structures throughout construction ③ Minimize in-stream activities ③ Construction of culverts to maintain water flow ③ Proper maintenance of vehicles and equipment ③ Implementation of clean-up activities and restoration of side channels
Changes to hydrological flow	A suitable by-pass of water flow shall be maintained during in-stream construction activities	③ Implement coffer dams to divert water flows

Activity: Community Impacts from Construction Activities		
Issue	Mitigation Objective / Standard	Mitigation Measure
Disturbance to family networks, community structure and cultural and ethnic identities	Resettled villagers shall re-establish their current way of life in new locations Social conflict issues will be addressed and resolved Local villagers hall not be disadvantaged by the introduction of construction camp workers	③ Provision of new homes in designated resettlement areas ③ Allowance for movement out of the project area during construction to avoid impacts and disturbance. Option should be allowed for even if their land or home is not lost to construction related activities ③ Communication network for discussing issues between local village authorities and the PEO and Contractor ③ Manage incident and grievance reports; formal reporting monthly to TSHPMB ③ Construction worker education and awareness of local ethnic minority groups ③ Construction camps are self-sufficient for resources ③ Increased village security ③ Separate living areas for construction workers ③ Education and awareness programs for local villagers, especially younger generations ③ Support programs and activities to maintain cultural and ethnic heritage ③ Implementation of RLDP
Health and safety risks from	Minimize any health and safety risks to local communities	③ Contractor shall assume all responsibility for community safety during the

Activity: Community Impacts from Construction Activities		
construction activities (traffic, blasting, machinery)	Local communes and villagers are informed of potential health and safety risks Social conflict issues will be addressed and resolved	construction phase ③ Refer to above sections on traffic and blasting hazards, noise and dust creation ③ Communities shall be notified in advance of all construction activities that may pose a risk to community safety

Activity: Worker Camp		
Issue	Mitigation Objective / Standard	Mitigation Measure
Increased demand for infrastructure and utilities	Construction activities shall not exploit existing natural resources Construction workers and local villagers shall receive clean, reliable water supplies Power/fuel shall be supplied without compromising existing resources or exploiting natural areas (i.e. firewood)	③ Ensure construction camp resources do not conflict with local commune supplies ③ Trained and educate staff in EMP/EIA requirements and conditions ③ Ensure construction camp resources do not conflict with local commune supplies ③ Provision of water storage facilities ③ Ensure water reserves are available, especially during dry seasons ③ Camps shall be properly equipped with sanitation services with one toilet for every 25 workers ③ Enforce regulations to prevent exploitation of natural resources (firewood). ③ Provide additional fuel supplies to prevent conflict with local villagers ③ Increase security around protected areas, especially along roads ③ Provide awareness and training of measures to protect adjacent natural reserve areas
Health impacts associated with a high concentration of people	Camp workers are vaccinated and monitored for diseases All non-compliant and/or illegal activities shall be reported and resolved Social conflict issues will be addressed and resolved	③ Provision of health care services and programs for construction workers and local villagers ③ Provision of trained medical staff and medical supplies ③ Educate and promote awareness on personal hygiene and sexually transmitted disease ③ Clean/sanitize publicly shared areas (camp kitchens, etc.) ③ Implementation of regular drug test screenings ③ Increase security, especially on roads and waterways

Activity: Worker Camp		
		③ Drug education and awareness programs for local villagers and construction workers

1.10. Operation

Standard mitigation standards and measures for minimizing the impacts during the operation phase of the TSHPP are shown in Table 0-2.

Table 0-2: Mitigation Standards/Measures for the TSHPP During Operation

Activity: Reservoir Impoundment		
Issue	Mitigation Objective / Standard	Mitigation Measure
Local community safety during filling and reservoir operation	No physical harm to local communities	③ All households within the flood and buffer zone shall be removed and relocated ③ All community members shall be safely relocated prior to flooding activities ③ All community members shall be notified prior to reservoir flooding throughout reservoir lifespan
Increased levels of debris and decaying biomass	Debris shall not obstruct water intake devices Nutrient and oxygen levels in the reservoir shall be maintained	③ Follow procedures outlined in the Vegetation Clearing and Salvage Plan
Sedimentation	Maximize useful life of reservoir	③ Develop reservoir sedimentation model and erosion management to maximize the reservoir's lifespan ③ Implement Intact River approach to watershed management (see Annex G)
Alteration to fish species and fish production	No net loss of fish species Fisheries production is maximized without compromising species	③ Implement research and monitoring initiatives ③ Promote regional aquaculture awareness and educate locals on proper harvesting methods
Reduction in environmental flows and	Maintain downstream environmental flows	③ Implement policies and operation procedures to maintain environmental flows

Activity: Reservoir Impoundment		
downstream impacts	Maintain water quality in accordance with Vietnamese standards Ensure integrity of downstream habitats (ie. Mangroves)	③ Adopt Intact River approach to watershed management ③ Implement water quality modeling program downstream and monitor downstream habitats
Flood control benefits	Prevention of downstream flooding	③ Adopt operating procedures for maintaining environmental flows while maximizing flood control benefits ③ Implement Intact River approach to watershed management
Impeded river transportation and change from small upstream river to reservoir	River transportation shall be maintained	③ All local communities shall be notified of the change from small river system to reservoir operation ③ Proper signage shall be posted along the river (both upstream and downstream) ③ Interconnect roads to maintain traffic over catchment area ③ Construct wharf or landing area at dam site location to connect with access roads
Noise creation	Noise levels should not affect local households, livestock or wildlife species	③ Proper operation of facility equipment and sounds barriers
Increased access to protected areas	Preserve protected areas and biodiversity	③ Implement Worker Code of Contact ③ Implement
Road Traffic	Operation vehicles shall not interfere or affect local villagers	③ Proper maintenance of vehicles ③ Installation of speed limits and road signage ③ Proper maintenance or road and repair, as required

Activity: Dam Operation and Power Generation		
Issue	**Mitigation Objective / Standard**	**Mitigation Measure**
Addition of 130	Cultural and ethnic minority groups shall	③ Education and awareness on natural

permanent residents to local communes	not be permanently affected Sustainability of natural resources shall be maintained Utility services and infrastructure shall adequately support operational staff	resource management ③ Co-management of existing natural resources ③ Provision of communication networks and social programs to assist minorities

Activity: Operation of Co-Luong – Co-Me Road		
Issue	Mitigation Objective / Standard	Mitigation Measure
Noise creation	Noise levels should not affect local households, livestock or wildlife species	③ Proper operation of facility equipment and sounds barriers
Improved access	Natural resources shall not be exploited for personal consumption Roads shall be maintained to facilitate local transportation Local roads shall not be used for illegal activities	③ Enhance security along roads ③ Restrict access into natural and protected areas ③ Repair roads, as necessary ③ Implement access management plan ③ Monitor roadside activities for exploitation and misuse

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.

1.11. 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 (Figure 0-1, see also Annex A). Enforcement shall be completed through the Contractor's Terms of Reference for Construction and Camp Management (Annex A) and contractual clauses relating to socio-economic and environmental performance.

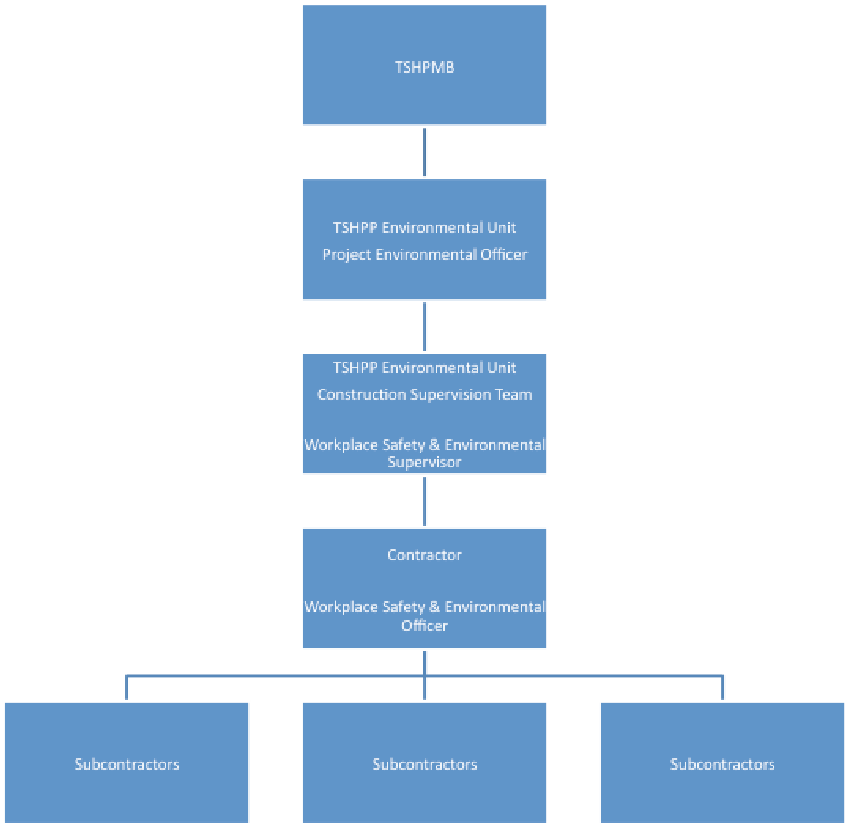

Figure 0-1: Supervision Structure for TSHPP

1.12. Construction Supervision – TSHPP Environmental Unit

The TSHPMB shall be responsible for ensuring that:

- 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 Construction Supervision Team (CST) of the TSHPP environmental unit will be responsible for supervising and monitoring all construction activities. The CST will be equipped with:

- Workplace Safety and Environmental Supervisors (SES) – individuals knowledgeable in environmental management, supervision and monitoring within environmental legislative requirements in Vietnam who will provide day to day oversight; and

- Environmental Engineers – individuals who will supervise Contractor's performance.

1.13. 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 7-1 describes the supervision framework for overseeing environmental and socio-economic parameters for the construction of the TSHPP.

Table 0-1: Construction Supervision Framework

Issue	Location: *Where is the issue?*	Parameter: *What is being overseen?*	Procedure: *How is the issue managed?*
Forest / vegetation clearing	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
Noise	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
Dust	Construction site Access Roads Water withdrawal sites	Amount of dust generated during construction activities Exploitation of water resources for spraying	Daily observations Incident reporting Monthly reporting to TSHPMB
Management of hazardous materials (fuels, lubricants, explosives, etc.)	Hazardous materials storage site	Storage facility location, security and maintenance	Inventory checklists Reporting incidents or accidents Quarterly reporting to TSHPMB
Solid waste	Designated landfill Construction site	Amount of waste generated at construction and camp sites	Waste tracking sheets or register

Issue	Location: *Where is the issue?*	Parameter: *What is being overseen?*	Procedure: *How is the issue managed?*
	Camp sites	sites Amount of waste disposed at the landfill Recycling of material Littering and contamination of environment	Incident reports Monthly reporting to TSHPMB
Sewage waste	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
Potable Water	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
Construction equipment and vehicle maintenance	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
Worker Code of Conduct and	Construction site	Safety, security and orderly conduct of	Environmental and safety meetings held

Issue	Location: *Where is the issue?*	Parameter: *What is being overseen?*	Procedure: *How is the issue managed?*
Safety	Camp site	construction workers Accidents and unplanned events Conflict with local villagers	regularly Incident report forms Quarterly reporting to TSHPMB

Environmental Monitoring Framework

The TSHPP Environmental Monitoring Framework outlines the responsibilities of the TSHPMB 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.

1.14. Monitoring Objectives

The objectives of the Environmental Monitoring Framework are:

- ③ To ensure project components are conducted in compliance with the Government of Vietnam's laws and regulations and approval conditions of the SESIA;
- ③ To measure the success of proposed mitigation measures in minimizing and/or reducing potential environmental and socio-economic impacts;
- ③ To continue baseline monitoring of environmental and social conditions;
- ③ To facilitate a continual review of post-construction and operation activities based on performance data and consultation feedback; and
- ③ 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.

1.15. 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.

1.16. Construction Phase

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

- ③ Implement systematic observations to periodically measure the success of proposed mitigation measures; and

- ③ 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.
An Independent Environmental Monitoring Consultant (IEMC) will be responsible for carrying out environmental sampling and monitoring on all environmentally related issues regarding the Construction Contractor's activities. The IEMC will review, verify and validate the performance of environmental mitigation measures 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 TSHPP 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 8.1 identifies the monitoring activities to carried out during the Construction Phase.

Table 0-1: Construction Monitoring Plan Framework

Issue	Responsibility: *Who will monitor?*	Duration: *When is monitoring done?*	Parameter: *What is being tracked?*	Location: *Where does monitoring occur?*	Procedure: *How is the issued or recorded?*
Noise	IEMC/TSHMP	Daily observations	Frequency of disturbance to local villagers Requirement for sound barrier installation	Construction site Adjacent communes	Auditory or with portable noise monitoring equipment Reporting forms Monthly reporting
Air quality	IEMC/TSHMP	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
Water quality	IEMC/TSHMP	Weekly testing	Water quality standards in construction and camp sites (BOD, pH, COD, TSS,dissolved oxygen, temperature, coliforms, etc.)	Water reserves and resources Sewage disposal sites (outfalls, etc.)	Water sampling Laboratory testing Monthly reporting
Water resources	IEMC/TSHMP	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

Issue	Responsibility: *Who will monitor?*	Duration: *When is monitoring done?*	Parameter: *What is being tracked?*	Location: *Where does monitoring occur?*	Procedure: *How is the issued or recorded?*
Sedimentation and erosion	IEMC/TSHMP	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
Natural protected areas	IEMC/TSHMP	Weekly	Tress into Protected Areas Exploitation of Natural Resources	Natural Protected Areas Access roads	Visual observations Security checks Monthly reporting
Chance finds of culturally significant artifacts or sites	Contractor IEMC/TSHPMP	Daily, as required	Accidental discovery of culturally significant artifact or site	Excavation sites Borrow sites Construction site	Visual Implement Chance Find Procedures
Auxiliary project components (roads, transmission lines, etc.)	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.)
Resettlement of affected people and land compensation	IEMC/TSHMP	Throughout construction	Emigration of affected people from project site Provision of relocation assistance (ie. Travel,	Resettlement communes	Consultation with resettled households to ensure successful relocation of communes Reporting forms

Issue	Responsibility: *Who will monitor?*	Duration: *When is monitoring done?*	Parameter: *What is being tracked?*	Location: *Where does monitoring occur?*	Procedure: *How is the issued or recorded?*
			accommodations, food caches, water, etc.) and financial compensation		for incidences and grievances Database creation to track individuals and social impacts Monthly reporting
Expansion of designated resettlement areas	IEMC/TSHMP	Throughout construction Quarterly reporting to TSHPMB	Livelihood and economic status of current residents in resettlement communes	Resettlement communes	Consultation with current residents of resettlement communes Reporting forms for incidences and grievances Database creation to track individuals and social impacts
Site reclamation	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

1.17. Operation Phase

Monitoring during the operation phase shall reflect those environmental and socio-economic issues that may persist upon completion of construction activities. 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. Subsequent sediment modeling could be a potential monitoring technique to anticipate fluctuations with the TSHPP reservoir.
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 dam operation.
Aquatic Biodiversity and Fish: The creation of a physical barrier due 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. Based on monitoring results, water being discharged from the reservoir could be altered to manage species populations.
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 the successfulness 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 0-2: Operation Monitoring Plan Framework

Issue	Responsibility: *Who will monitor?*	Duration: *When is monitoring being done?*	Parameter: *What is being monitored?*	Location: *Where is the parameter being monitored?*	Procedure: *How is parameter being monitored?*
Hydrological flows of the Ma River	TSHPMB	Weekly and monthly reporting by Environmental Inspectors Quarterly reporting to the TSHPMB	Hydrological flows Reservoir volume	TSHPP dam site and reservoir	Water gauge stations Flow measuring devices
Water quality levels in Ma River and reservoir	TSHPMB Trained laboratory staff	Weekly and monthly reporting by Environmental Inspectors Quarterly reporting to TSHPMB	Numerous parameters which may include: pH, BOD, COD, coliforms, dissolved oxygen, temperature etc.	TSHPP dam site and reservoir	Water quality forms and checklists Laboratory testing
Sedimentation	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
Aquatic biodiversity	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

Issue	Responsibility: *Who will monitor?*	Duration: *When is monitoring being done?*	Parameter: *What is being monitored?*	Location: *Where is the parameter being monitored?*	Procedure: *How is parameter being monitored?*
					fishermen
Erosion downstream	TSHPMB	Quarterly reporting	Erosion impacts downstream on historical and cultural artifacts	Buildings, historical and culturally significant sites	Visual Photos Reporting forms
Noise	TSHPMB	Quarterly reporting	Noise created operating Hydroelectric Plan Noise created from traffic on access roads Frequency of disturbance to local villagers	Hydroelectric plant and access roads Adjacent communes	Auditory Visual Reporting forms
Dust	TSHPMB	Quarterly reporting	Amount of dust being generated Nuisance / disturbance to road-side households Water resources required for spraying	Access roads	Visual Reporting forms
Resettlement of affected people and land compensation	TSHPMB	Quarterly reporting to TSHPMB	Maintenance and/or improvement of ethnic minority groups and displaced people's	Resettlement communes	Consultation with resettled households to ensure successful relocation of communes Reporting forms for incidences and

Issue	Responsibility: *Who will monitor?*	Duration: *When is monitoring being done?*	Parameter: *What is being monitored?*	Location: *Where is the parameter being monitored?*	Procedure: *How is parameter being monitored?*
			livelihood		grievances Database creation to track individuals and social impacts
Downstream user's livelihood	TSHPMB	Quarterly reporting to TSHPMB	Maintenance and/or improvement of downstream users' livelihood	Downstream communes	Consultation with downstream users to ensure their livelihood's (income, transportation, fishery resources, etc.) have not be permanently impacted Reporting forms for incidences and grievances Database creation to track individuals and social impacts

Communication and Reporting

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

1.18. Communication Process

Table 0-1describes 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 0-1: Communication Pathway

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

Stakeholder	Potential Interest / Concern	Means of Contact	Key Contact
Government stakeholders	Chronic environmental and socio-economic impacts	Monitoring Committee	TSHPMB
Construction workers and camp sites	Workers code of conduct Social conflicts between local villagers and workers Behaviour issues (gambling, drugs, etc.) Environmental issues (exploitation of natural resources, etc.)	Weekly meetings with construction workers Individual meeting with disorderly workers	Contractor

1.19. Reporting

Reports shall be produced through the course of iimplementaiton 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 0-2 describes the types of reports that shall be produced.

Table 0-2: External Reporting Schedule

Responsibility	Type of Report	Purpose of Reporting	Frequency of Submission	Submit to:
Contractor & Workplace Safety and Environmental Officer	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 Government Ministry
	Monthly Compliance Report	Report to the Construction Supervision Team	Report of compliance and non-compliance measures on a monthly basis	CST

Responsibility	Type of Report	Purpose of Reporting	Frequency of Submission	Submit to:
Construction Supervision Team	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
Project Environmental Officer & Independent Environmental Monitoring Consultant	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
Social Safeguard Team of Project Management Board	Resettlement Development Plan, Livelihood Development Plan and Ethnic Minority Development Plan	Ensure resettled/displaced households transition successfully into resettled sites	On-going	TSHMP, EVN, World Bank

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.

Capacity Building and Training

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.

1.20. Trung Son Hydropower Project Management Board

The TSHPMB shall establish an environmental management 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).

1.21. 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:

③ Principles and procedures for environmental impact assessment;

③ Fundamentals of environmental management;

③ Compliance assessment, monitoring and follow-up;

③ Air, soil and water sampling procedures;

③ Construction impacts, including civil works, sediment and erosion control, soil handling and vegetation removal;

③ Waste management;

- ③ Fuel and hazardous materials management;
- ③ Fundamentals of aquatic ecology and environmental flows;
- ③ Construction camp management; and
- ③ Auditing and follow-up.

1.22. 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:

- ③ Principles and procedures for environmental impact assessment;
- ③ Fundamentals of environmental management;
- ③ Compliance assessment, monitoring and follow-up;
- ③ Air, soil and water sampling procedures;
- ③ Construction impacts, including civil works, sediment and erosion control, soil handling and vegetation removal;
- ③ Waste management;
- ③ Fuel and hazardous materials management;
- ③ Construction camp management;
- ③ Community relations and public consultation procedures; and
- ③ Auditing and follow-up.

1.23. Independent Environmental Monitor

The independent environmental monitor 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:

- ③ Principles and procedures for environmental impact assessment;
- ③ Fundamentals of environmental management;
- ③ Compliance assessment, monitoring and follow-up;
- ③ 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.

Training costs are estimated in Section 0.

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.

1.24. 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; and
- The EMP should be reviewed on an annual basis.

The EMP will 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 MONRE, 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, MONRE reports,

consultation meeting minutes and t aining 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 11.2.

1.25. 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:

- ③ Issued copies by the Environmental Unit of TSHPMB shall be numbered;
- ③ The Environmental Unit shall initiate a review of any relevant sections following modification to the EMP
- ③ 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.

Additional Studies

A number of additional studies are proposed for completion and associated with implementation of this EMP.
presents a list of issues that require additional clarification and information in the construction and operation phase.

Table 0-1: Construction Phase Issues That Require Additional Clarification

Impact Agent	Impact	Additional information/details
Reservoir Preparation	Disturbance to local villagers, livestock and wildlife	Machinery used for clearing needs to be identified in Vegetation Clearing and Salvage Plan (Vegetation Clearing and Salvage Plan (Reservoir Clearing Plan))
	Loss of homes and livelihood impacts	Implementation of RLDP
	Disturbance to family networks, community structure and cultural and ethnic identities	Implementation of RLDP
	Increase demand for shared natural resources	Implementation of RLDP
	Disturbance to family networks, community structure and cultural and ethnic identities	Implementation of RLDP
	Biodiversity and protected areas impacts	Biodiversity and Protected Areas Management Plan
	Loss of productive land	Vegetation Clearing and Salvage Plan

Impact Agent	Impact	Additional information/details
Dam Construction **Clearing**	Loss of productive land	Vegetation Clearing and Salvage Plan
	Loss or damage to physical cultural resources	Physical Cultural Resources Management Plan
River diversion	Increased sedimentation	Construction Impact Management Plan
	Decreased water quality (sedimentation, pollution, etc.) and impacts on aquatic ecosystems	Construction Impact Management Plan
Stripping and grading	Loss of productive topsoil	Construction Impact Management Plan
Transport vehicles	Dust and debris created during transportation of materials	Construction Impact Management Plan
Excavation	Abandonment of borrow pits and quarries	Reclamation in Construction Impact Management Plan
Construction Camp Creation **Camp site construction**	Increased demand for building materials	Construction Impact Management Plan
Labor force	Change in livelihood and traditional activities	Construction Impact Management Plan
	Distortion of household and manual labour (agricultural, forestry, etc.)	Construction Impact Management Plan
Camp workers and followers	Increased demand for community services staff (medical, emergency, safety, etc.)	Worker and Regional Health Management Plan
	Increased disease transmission rates	Worker and Regional Health Management Plan
Truck Hauling	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 0-2: Operation Phase Issues That Require Additional Clarification

Impact Agent	Impact	Additional information/details

Impact Agent	Impact	Additional information/details
Hydroelectric Plant Operation **Powerhouse**	Continuous, low level noise affecting local communes	Confirm noise abatement measures if required
Truck hauling	Increased noise, dust, and vehicles on community roads	Traffic Management Plan
Reservoir Impoundment	Displacement, isolation or loss of wildlife species	Additional mitigation required in Vegetation Clearing and Salvage Plan (Vegetation Clearing and Salvage Plan (Reservoir Clearing Plan))
	Interference to turbines	Clarification required in Vegetation Clearing and Salvage Plan (Reservoir Clearing Plan)
	Impacts on water quality	Water Quality Model required both for reservoir and downstream. Additional water quality measurements.
	Intact Rivers Management Plan and additional fisheries studies	Impacts on fisheries
	Increased sedimentation behind impoundment	Sedimentation model for reservoir needed
Dam Operation and Electrical Generation **Turbine**	Alteration of environmental flows	Further analysis required on downstream impacts and impacts on downstream flows
Volume outflow	Loss of important habitats e.g. mangroves and agricultural areas	Insufficient consideration of impact
	Impeded water quality downstream	Insufficient consideration of impact
	Decreased agricultural productivity, especially rice	Insufficient consideration of impact
	Loss of food source and income	Clarification required
	Greenhouse gas emissions	Further clarification on means to reduce GHGs.

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

1.26. Additional Water Quality Baseline Data Collection

ERM (2009) recommended additional water quality monitoring be undertaken upstream and downstream of the TSHPP. In particular, the following was recommended:

- ③ Temperature and dissolved oxygen monitors should be installed upstream and downstream of the TSHPP. Temperature monitors should be installed in several of the large tributaries to the Trung Son Reservoir and in the Ma River upstream of the proposed impoundment and downstream of the dam. The temperature monitors can be set to obtain and store temperatures recorded at 15 minute intervals. Dissolved oxygen monitoring should be conducted downstream of the dam and upstream of the impoundment on the Ma River on a daily basis and for a diurnal cycle for different climatological seasons.
- ③ The temperature and dissolved oxygen data at the upstream stations would be useful model input, as a way of calibrating the response temperature model, and assessing in a general way upstream nutrient loads. Secondly all the data, both the upstream and downstream stations, would provide baseline data for any subsequent environmental assessment beyond that already collected in synoptic form.

1.27. Intact Rivers Management

TSHPMB in conjunction with EVN and MONRE/DONRE should look at means of promoting 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 D).

1.28. Green House Gases

The World Commission on Dams considers dam reservoirs as the emitters of greenhouse gases (mostly CO_2, and Methane, CH_4), with large variation between countries and between situations (DRGG, 2000). TSHPMB in conjunction with EVN should look at a unified approach on the subject of reservoirs and greenhouse gases and consider alternatives to reduce GHG emissions.

1.29. 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 should be considered. TSHPMB should 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 G.
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.

Implementation Plan and Schedule

1.30. Implementation

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

- ③ Oversight of Contractor EMP requirements
- ③ Preparation of management plans
- ③ Formation of an environmental unit
- ③ Training

TSHPMB should prepare an implementation plan for the EMP considering the requirements identified in Table 13-1.

1.31. Schedule

The proposed schedule for the EMP is shown in Figure 13-1.

Table 0-1: EMP Implementation Plan

Implementation Item	Description	By When
Formation of an Environmental Unit	An Environmental Unit shall be formed to implement the EMP consisting of a Project Environmental Officer and required staff for: ③ Construction supervision ③ Environmental monitoring	March 2010
Prepare Bid Specifications for Construction Contractor	To prepare environmental and social requirements for the Construction Contractor	June 2010
Oversight of Management Plans	To oversee the Construction Contractor in the preparation of the following management plans: ③ Vegetation Clearing and Salvage Plan ③ Socio-economic Management Plan	September 2010
Preparation of Management Plans	To prepare the following management plans (see Section 2) ③ Environmental Monitoring Plan ③ Biodiversity and Protected Areas Management Plan ③ Regional Health Management Plan ③ Physical Cultural Resources Management Plan	June 2010
Training	③ Develop a training plan outlining training requirements, topics, and areas of capacity building ③ Identify courses/seminars ③ Identify staff requiring training ③ Implement training plan	June 2010

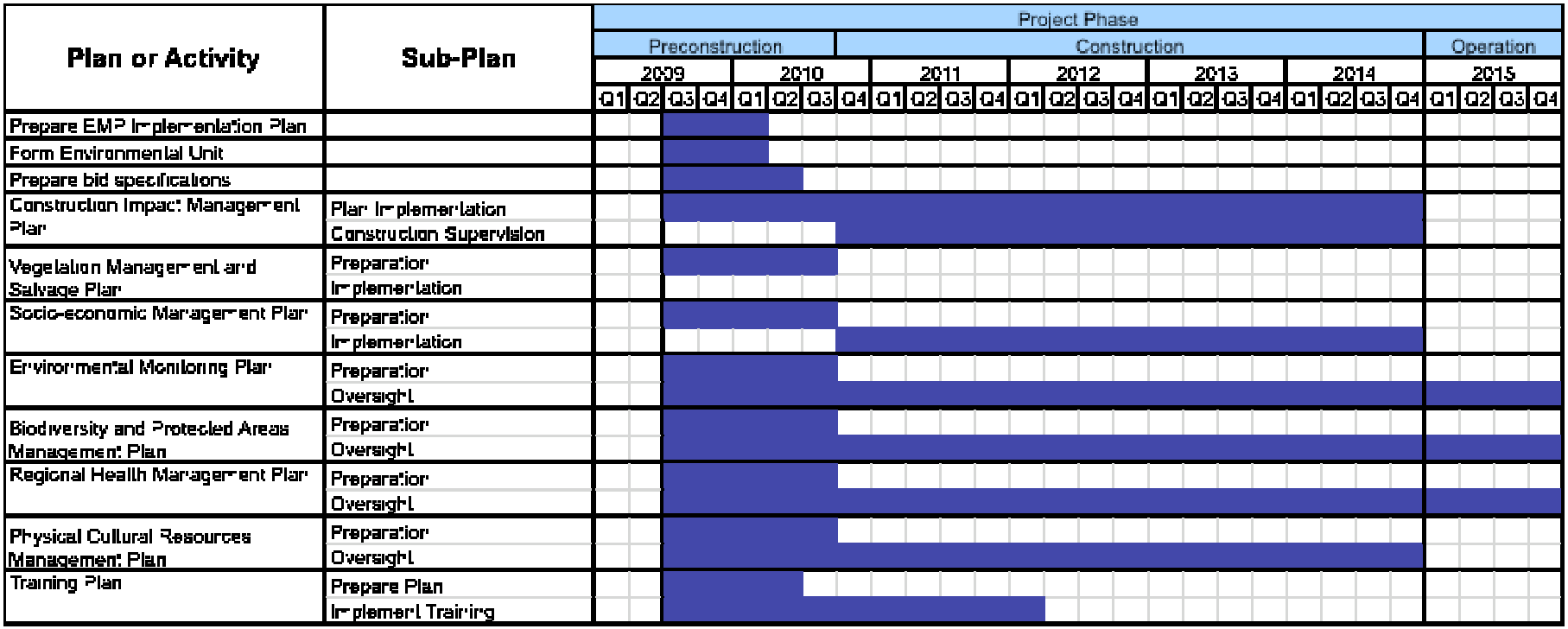

Figure 0-1: EMP Schedule

EMP Costs

Estimated costs for the initial implementation of the EMP are presented below in Table 13-1. Costs have been defined on an initial set up basis. TSHPMB will revise these costs and develop annual operating costs for the EMP.

Table 0-1: Preliminary Estimate of EMP Costs

EMP Component	Estimated Cost ($US)
Contractor – built into contract	
Supervision	250,000
Monitoring	350,000
Training	250,000
Institutional Strengthening	300,000
Chance Finds Procedures and Cultural Property Salvage (including downstream erosion assessment)	200,000
Biodiversity and Protected Areas	550,000
Additional Studies	
H20 Modeling	100,000
Intact River Management	150,000
CEA	100,000
Total Initial EMP Costs	2,250,000

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Annexes

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 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:

1. The construction camp site will have to be approved by the local authority.

2. 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.

3. The Contractor shall provide adequate and suitable facilities for washing clothes and utensils for the use of contract labor employed therein.

4. 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.

5. Camp areas shall be located to allow effective natural drainage and landscaped so as to avoid erosion.

6. The Contractor shall provide suitable, safe and comfortable accommodation for the workforce.

7. 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.

8. 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.

9. 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.

10. The Contractor shall provide safe potable water for food preparation, drinking and bathing.

11. 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.

12. 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.

13. 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.

14. 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;

15. 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.

16. 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.

17. 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.

18. Concrete batching plants shall not be located within 500 m of any residence, community or work place.

19. The Contractor shall provide medical and first aid facilities at each camp area; and

20. 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:

1. Access to the camp shall be limited to the residing workforce, construction camp employees, and those visiting personnel on business purposes.

2. Prior approval from the construction camp manager shall be required for visitor access to the construction camp.

3. Adequate, day-time night-time lighting shall be provided.

4. A perimeter security fence at least 2m in height shall be constructed from appropriate materials; and

5. 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:

1. A designated camp cafeteria shall be established under strict sanitary and hygiene conditions;

2. Designated meal times shall be established;

3. Cooking or preparation of food shall be prohibited in accommodation quarters;

4. Designated rest times shall be established;

5. Designated recreational hours shall be put in place;

6. Smoking shall be prohibited in the workplace;

7. Procedures shall be implemented to maintain the condition of the construction camp and facilities and ensure adequate cleanliness and hygiene;

8. The latrines and urinals shall be adequately lighted and shall be maintained in a clean sanitary condition at all times;

9. Water shall be provided in or near the latrines and urinals by storage in drums; and

10. A complaint register to receive and respond to complaints from the construction camp residents regarding facilities and services provided.

Code of Conduct

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):

1. All workers and subcontractors shall abide by the laws and regulations of Vietnam.

2. Illegal substances, weapons and firearms shall be prohibited.

3. Pornographic material and gambling shall be prohibited.

4. Fighting (physical or verbal) shall be prohibited.

5. Workers shall not be allowed to hunt, fish or trade in wild animals.

6. No consumption of bush meat shall be allowed in camp.

7. No pets shall be allowed in camp.

8. Creating nuisances and disturbances in or near communities shall be prohibited.

9. Disrespecting local customs and traditions shall be prohibited.

10. Smoking shall be prohibited in the workplace.

11. Maintenance of appropriate standards of dress and personal hygiene shall be in effect.

12. Maintenance of appropriate hygiene standards in accommodation quarters shall be set in place.

13. Residing camp workforce visiting the local communities shall behave in a manner consistent with the Code of Conduct; and

14. 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 installation 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:

1. 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.

2. 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.

3. 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.

4. 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.

5. Apply local, native grass seed and mulch to barren erosive soil areas or closed construction surfaces.

6. Apply erosion control measures before the rainy season begins, preferably immediately following construction. Install erosion control measures as each construction site is completed.

7. 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.

8. Control water flow through construction sites or disturbed areas with ditches, berms, check structures, live grass barriers, and rock.

9. The ground surface at the construction site offices shall be concreted or asphalted in order to minimize soil erosion.

10. Erosion control measures shall be maintained until vegetation is successfully re-established.

11. Water shall be sprayed as needed on dirt roads, cuts, fill material and stockpiled soil to reduce wind-induced erosion and dust, and

12. 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:

1. Minimize production of dust and particulate materials at all times, to avoid impacts on surrounding communities, and especially to vulnerable people (children, elderly people).

2. Time removal of vegetation to prevent large areas from becoming exposed to wind.

3. Place screens around construction areas to minimize dust proliferation, paying particular attention to areas close to local communities.

4. 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.

5. Pave access roads with gravel in the sections which near the communities and other sensitive receptors to reduce generation of air-borne dust.

6. Provide an adequate ventilation system and other measures to control concentration of air pollutants within tunnels.

7. 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.

8. 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.

9. 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

10. 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:

1. Maintain all construction-related traffic on project access roads at established speed limits.

2. Maintain all on-site vehicle speeds at or below 30 kph, or otherwise designated.

3. To the extent possible, maintain noise levels associated with all machinery and equipment at or below 90 db.

4. 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.

5. Apply proper measures to minimize disruptions from vibration or noise coming from construction activities.

6. 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.

7. Maintain the construction equipment in its best operating conditions and lowest noise levels possible.

8. Use temporary noise barriers to minimize the noise caused by construction equipment;

9. Provide hearing protection to workers who must work with highly noisy machines such as piling, explosion, mixing, etc., for noise control and workers protection.

10. 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.

11. The construction supervision team shall be equipped with portable noise detection devices to monitor the noise level at the sensitive receptors.

12. 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.

13. 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.

14. Use of electric-powered equipment when applicable instead of diesel-powered or pneumatic-powered equipment.

15. Equipment known to emit a strong noise intensity in one direction, shall when possible, be oriented to direct noise away from nearby sensitive receptors.

16. 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:

1. 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;

2. 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.

3. Equipment with lower noise levels shall be used for concrete pouring operations, which may require 24 hour non-stop operation.

4. Temporary noise barriers shall be installed at the appropriate locations to avoid nighttime noise impacts, and

5. 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

1. 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;

2. In sensitive areas (including residential neighborhoods, hospitals, rest homes, schools, etc.) more strict measures may need to be implemented to prevent undesirable noise levels;

3. Blasting shall not be carried out within 200 m of residences or local communities;

4. Blasting shall not be carried out under adverse weather conditions;

5. 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;

6. 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.);

7. No blasting shall be allowed during nighttime unless prior approval is obtained from the government authority and the PEO.

8. All persons shall be at least 200m away from the blasting point;

9. Except for blasting equipment all electricity shall be turned off within 50m of the blasting location prior to and during the blast; and

10. 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:

1. All earthworks shall be properly controlled, especially during the rainy season.

2. 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.

3. 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.

4. 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.

5. Any excavated cut or unsuitable material shall be disposed of in designated disposal areas as agreed to by the Supervisory Engineer, and

6. 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:

1. A map showing the extent of the area to be developed.

2. A method statement defining the proposed working methods.

3. The proposed access and haulage routes between the borrow pits and the destination for the extracted materials.

4. 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.

5. Details of the measures taken to minimize the borrow pit areas and their visual impact on the surrounding area, and

6. 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:

1. 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.

2. Limit extraction of material to approved and demarcated borrow pits.

3. 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.

4. 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.

5. Existing drainage channels in areas affected by the operation should be kept free of overburden.

6. Once the job is completed, all construction -generated debris should be removed from the site to an approved disposal location.

7. 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

8. 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:

1. Establish and enforce daily site clean-up procedures, including maintenance of adequate disposal facilities for construction debris.

2. 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.

3. 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.

4. 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.

5. 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.

6. Include provisions for incorporating the most appropriate stabilization techniques for each disposal site.

7. Assess risk of any potential impact regarding leaching of spoil material on surface water.

8. Include an appropriate analysis to determine that the selected spoil disposal sites do not cause unwanted surface drainage, and

9. 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:

1. 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.

2. Conduct sawing, cutting, grinding, sanding, chipping or chiseling with proper guards and anchoring as applicable.

3. Maintain clear traffic ways to avoid driving of heavy equipment over loose scrap.

4. 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.

5. 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.

6. Provide all workers with safety glasses with side shields, face shields, hard hats, and safety 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

- ③ A review of the preliminary site drainage design prepared during the detailed design.

- ③ 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).

- ③ Detailed design including drawings, location maps, specifications of drainage collection channels and wastewater treatment facilities.

- ③ Proposed discharge locations and treatment standards.

- ③ A detailed implementation program of the proposed drainage system.

- ③ 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.

- ③ 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.

- ③ Waste generated by demolition of existing houses / buildings affected by the project or breaking of existing concrete surfaces.

- ③ Waste from on-site wastewater treatment facility (e.g. treatment of bentonite from tunneling works by sedimentation process), and

- ③ 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:

- ③ Minimize the production of waste that must be treated or eliminated.

- ③ 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).

- ③ Identify and demarcate disposal areas clearly indicating the specific materials that can be deposited in each, and

- ③ 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;

- ③ A method statement on waste recycling, re-use and minimization of waste generation.

- ③ 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.

- ③ 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

- ③ 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:

- ③ Make the Hazardous Waste Management Plan available to all persons involved in operations and transport activities;

- ③ 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;

- ③ Inform the Environmental Supervisor, or Construction Supervisor of any accidental spill or incident in accordance with the plan;

- ③ Prepare a companion Emergency Response Plan outlining all procedures to be undertaken in the event of a spilled or unplanned release;

- ③ Initiate a remedial action following any spill or incident; and

- ③ 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:

- ③ 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..

- ③ All the fuel and hazardous material storage shall be adequately enclosed to prevent any spillage problems;

- ③ 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.

- ③ 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

- ③ 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.

Maintenance of Construction Equipment

The Contractor shall:

- ③ 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.

- ③ 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

- ③ 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.

Vegetation 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 SalvagePlan 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:

- ③ Large or significant trees in camp areas and access roads should be preserved wherever possible.

- ③ 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.

- ③ 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.

- ③ 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

- ③ 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:

- ③ Construction shall be programmed in sequence so that the scale of earth moving activities and area of exposed surface can be minimized.

- ③ Re-vegetation shall start at the earliest opportunity. Appropriate local species of vegetation shall be used.

- ③ 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.

- ③ Facilities and structures shall be located according to the terrain and geographical features of the project site.

- ③ 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.

- ③ 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.

- ③ Excavations shall avoid damage to the root systems. Mitigation measures are also required to prevent damage to trunks and branches of trees.

- ③ Temporary hoarding barriers shall be of a recessive visual appearance in both color and form.

- ③ 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.

- ③ At the highly visually sensitive zones, construction may be scheduled where possible at the low tourist seasons.

- ③ Construction trucks shall operate at night when possible and kept cleaned and covered when shipping bulk materials.

- ③ Construction sites shall be surrounded with fence if located at the scenery zones to avoid direct visual sights of the construction sites.

- ③ There shall not be construction camps in scenic areas.

- ③ Random disposal of solid waste in scenic areas shall be strictly prohibited.

- ③ 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;

- ③ 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.

- ③ 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.

- ③ Spoil heaps and excavated slopes shall be re-profiled to stable batters, and grassed to prevent erosion.

- ③ Topsoil stripped from the work areas shall be used for landscaping works, and

- ③ Watercourses, which have been temporarily diverted by the construction activities, shall be restored to their former flow paths.

Site Restoration

- ③ 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.

- ③ 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:

- ③ The construction campsite shall be grassed and trees cut replaced with saplings of similar tree species.

- ③ All affected areas shall be landscaped and any necessary remedial works shall be undertaken without delay, including grassing and reforestation.

- ③ Water courses shall be cleared of debris and drains and culverts checked for clear flow paths.

- ③ All sites shall be cleaned of debris and all excess materials properly disposed.

- ③ Borrow pits shall be restored.

- ③ Oil and fuel contaminated soil shall be removed and transported and buried in waste disposal areas.

- ③ Saplings planted shall be handed over to the community or the land owner for further maintenance and watering, and

- ③ 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:

- ③ Present details regarding maximum permissible vehicular speed on each section of road;

- ③ Establish safe sight distance in both construction areas and construction camp sites;

- ③ 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;

- ③ Estimate maximum concentration of traffic (number of vehicles/hour);

- ③ 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;

- ③ 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;

- ③ 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;

- ③ Maintain adequate traffic control measures throughout the duration of the Contract and such measures shall be subject to prior approval of the PEO;

- ③ Carefully and clearly mark pedestrian-safe access routes;

- ③ If school children are in the vicinity, include traffic safety personnel to direct traffic during school hours;

- ③ Maintain a supply for traffic signs (including paint, easel, sign material, etc.), road marking, and guard rails to maintain pedestrian safety during construction;

- ③ Conduct safety training for construction workers prior to beginning work;

    - ③ Provide personal protective equipment and clothing (goggles, gloves, respirators, dust masks, hard hats, steel-toed boots, etc.,) for construction workers and enforce their use;

    - ③ Provide post Material Safety Data Sheets for each chemical present on the worksite;

    - ③ 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;

    - ③ Ensure that the removal of asbestos-containing materials or other toxic substances be performed and disposed of by specially trained workers;

    - ③ During heavy rains or emergencies of any kind, suspend all work; and

    - ③ 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:

- ③ 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;

- ③ 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;

- ③ Establishment of penalties for those who violate the rules; and

- ③ 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: Construction Worker Health Management Plan

B-1: Main Diseases in the Project Affected Area

According to the Health Study[1] 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, Muang 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:

- ③ Screening of all workers on recruitment and annually;
- ③ Implementation of a vaccination program including but not limited to vaccination against yellow fever, hepatitis A and B, tetanus, polio, etc.;
- ③ 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;

[1] "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

- ③ Storing sufficient medicines for malaria treatment;
- ③ Collecting and testing sputum of individuals who are at risk for Tuberculosis(TB) infection;
- ③ Storing antibiotics for treatment of respiratory infections;
- ③ Storing medicines and transfusion fluid to treat food poisoning and diarrhea;
- ③ Develop solutions for mass outbreaks of food poisoning;
- ③ Periodic monitoring of public kitchen in construction camps;
- ③ Storing and distributing vermifuges to workers;
- ③ Implementation of a disease control and pest management measures at the time the construction camps are built;
- ③ Distribution of free condoms to camp workers;
- ③ Monitoring of health indicators to follow the trends;
- ③ When buildings cannot be made mosquito proof, pyrethroid-treated nets shall be provided;
- ③ 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;

- ③ 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

- ③ 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:

- ③ Controlling pests primarily through environmental methods. When environmental methods are not sufficient, the use of pesticides shall be considered;

- ③ Promoting the safe use of all pesticides;

- ③ Incorporating pest management strategies when feasible;

- ③ 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:

- ③ Control vector borne and other diseases;

- ③ Ensure the continued safe disposal of all solid waste and sewage;

- ③ Implement fly and other insect pest control at construction camp facilities;

- ③ 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: 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:

1. Selection of adequate areas for the settlement of camp followers.

2. Camp followers shall be provided with health services and have access to local health facilities and clinics.

3. Camp followers shall be provided with minimum services such as potable water (standpipes), latrines, collection and disposition of solid wastes, electricity, etc.

4. The Contractor's responsibilities with the camp followers shall be defined and established by TSHPMB.

Annex D: TOR Environmental Supervision during Construction

D-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.

D-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.

D-3: Responsibilities

The responsibilities of the CST include the following:

③ 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;

- ③ 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;

- ③ 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;

- ③ Supervise the Contractor's activities and ensure that the requirements in the EMP and contract specifications are fully complied with;

- ③ Instruct the Contractor(s) to take actions to reduce impacts and follow the required EMP procedures in case of non-compliance / discrepancies identified;

- ③ 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;

- ③ Participate in the joint site inspection undertaken by the ET; and

- ③ 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:

- ③ Sampling, analysis and evaluation of monitoring parameters with reference to the EMP recommendations and requirements;

- ③ 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;

- ③ Review the success of the EMP Implementation Plan to cost-effectively confirm the adequacy of mitigation measures implemented;

- ③ Monitor compliance with environmental protection, pollution prevention and control measures, and contractual requirements;

- ③ Monitor the implementation of environmental mitigation measures;

- ③ Audit and prepare audit reports on the environmental monitoring data and site environmental conditions;

- ③ Complaint investigation, evaluation and identification of corrective measures;
- ③ Advice to the Contractor on environment improvement, awareness, proactive pollution prevention measures;
- ③ 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;
- ③ 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
- ③ 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;

D-4: Prohibitions

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

- ③ Cutting of trees for any reason outside the approved construction area;

- ③ Hunting, fishing, wildlife capture, or plant collection;

- ③ Buying of wild animals for food;

- ③ Having caged wild animals (especially birds) in camps;
- ③ Poaching of any description;
- ③ Explosive and chemical fishing;
- ③ Building of fires;
- ③ Use of unapproved toxic materials, including lead-based paints, asbestos, etc.;
- ③ Disturbance to anything with architectural or historical value;
- ③ Use of firearms (except authorized security guards);
- ③ Use of alcohol by workers in office hours;
- ③ Washing cars or machinery in streams or creeks;
- ③ Maintenance (change of oils and filters) of cars and equipment outside authorized areas:
- ③ Driving in an unsafe manner in local roads;
- ③ Working without proper safety equipment (including boots and helmets);

- ③ Creating nuisances and disturbances in or near communities;
- ③ The use of rivers and streams for washing clothes;
- ③ Disposing garbage in unauthorized places;
- ③ Indiscriminate disposal of rubbish or construction wastes or rubble;
- ③ Littering the site;
- ③ Spillage of potential pollutants, such as petroleum products;
- ③ Collection of firewood;
- ③ Urinating or defecating outside the designated facilities; and
- ③ 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 theses 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 E: Guidelines for Socio-Economic Management 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.

E-1: Community Relations and Community Safety Plan

Community Relations

To enhance adequate community relations the Contractor shall:

- ③ Inform the population about construction and work schedules, interruption of services, traffic detour routes and provisional bus routes, blasting and demolition, as appropriate;

- ③ 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

- ③ 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:

- ③ Means to maintain open communications between the local government and concerned communities;

- ③ Have a the mailing list to include agencies, organization, and residents that are interest in the project;

- ③ Provide a community relations contact from whom interested parties can receive information on site activities, project status and project implementation results;

- ③ 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;

- ③ Monitor community concerns and information requirements as the project progresses;

- ③ Respond to telephone inquiries and written correspondence in a timely and accurate manner; and

- ③ Modify the Community Relation Plan for changes in community needs as necessary to be accurate during different project implementation phases.

E-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;

- ③ If school children are in the vicinity, include traffic safety personnel to direct traffic during school hours;

- ③ Maintain a supply for traffic signs (including paint, easel, sign material, etc.), road marking, and guard rails to maintain pedestrian safety during construction;

- ③ 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).

- ③ 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;

- ③ In sensitive areas (including residential neighborhoods, hospitals, rest homes, schools, etc.) more strict measures may need to be implemented to prevent undesirable noise levels;

- ③ Blasting shall not be carried out within 200 m of residences or local communities;

- ③ 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.);

E-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):

1. All workers and subcontractors shall abide by the laws and regulations of Vietnam.

2. Illegal substances, weapons and firearms shall be prohibited.

3. Pornographic material and gambling shall be prohibited.

4. Fighting (physical or verbal) shall be prohibited.

5. Workers shall not be allowed to hunt, fish or trade in wild animals.

6. No consumption of bush meat shall be allowed in camp.

7. No pets shall be allowed in camp.

8. Creating nuisances and disturbances in or near communities shall be prohibited.

9. Disrespecting local customs and traditions shall be prohibited.

10. Smoking shall be prohibited in the workplace.

11. Maintenance of appropriate standards of dress and personal hygiene shall be in effect.

12. Maintenance of appropriate hygiene standards in accommodation quarters shall be set in place.

13. Residing camp workforce visiting the local communities shall behave in a manner consistent with the Code of Conduct; and

14. 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 F: 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.

Annex G: Terms of Reference for an Intact Rivers Approach

G-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 1.06 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 88 m high dam with a crest length of 513 m;
- A total reservoir area of 13.1 km^2, with a volume of 348.5 million m^3;
- 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 $368 million U.S. dollars (USD).

G-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

- ③ Sedimentation during construction of the dam and access road;
- ③ Water pollution from spills and chemicals;
- ③ Use of explosives;
- ③ Wastes from camps and other sources;
- ③ Overfishing; and
- ③ Improper clearing of the reservoir and increased eutrophication.

Filling and Operation

- ③ Conversion of riverine to lake habitat and impacts on fish composition;
- ③ Impacts on water quality due to nutrient loading;
- ③ Modification to river flows;
- ③ Habitat modification and impacts on spawning and reproduction;
- ③ Changes in fish production;
- ③ Barriers to migratory species;
- ③ Downstream impacts to aquatic species due to changes in flow and water quality;
- ③ Impacts to fisheries of economic value;

G-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 Buoi River and the Luong River.

- The Buoi 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 Buoi 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;

- ③ Impacts of the Trung Son Dam, if any;

- ③ Existing threats to aquatic biodiversity in each sub-basin such as: mining activities, habitat destruction, wastewater discharges, unsustainable fishing practices;

- ③ Cumulative effects assessment and watershed mapping; and

- ③ 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:

- ③ Identify data gaps in both sub-basins and how they should be filled;

- ③ Commitments to prohibit the imposition of barriers (hydropower dams and other structures);

- ③ Commitments to remove any human existing barriers already in place to by pass them with fish passage devices;

- ③ 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;

- ③ 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;

- ③ 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;

- ③ 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;

- ③ Control, limit or prohibit the establishment of new settlements, industrial areas and other new human activities within the intact river watershed area;

- ③ 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;

- ③ 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;

- ③ Identify areas and opportunities for fisheries compensation such as stocking

- ③ Environmental education, awareness and sensitivity programs for communities living along the intact rivers;

- ③ Monitoring programs for fish biodiversity in the basins; and

- ③ Development of inter-institutional and cooperative management mechanisms for program implementation.

Each proposed program will include:

- ③ A technically detailed description of each mitigation measure;

- ③ A timetable (chronogram) of planned activities;

- ③ A budget of all necessary investment and recurrent costs

③ 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

③ 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 H: 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 H-1 highlights the tiger conservation landscapes in Vietnam and the proposed Trung Son Hydropower Plant (TSHPP). The Forest Protection Department (FDP) 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 in the three natural adjacent to the proposed dam.

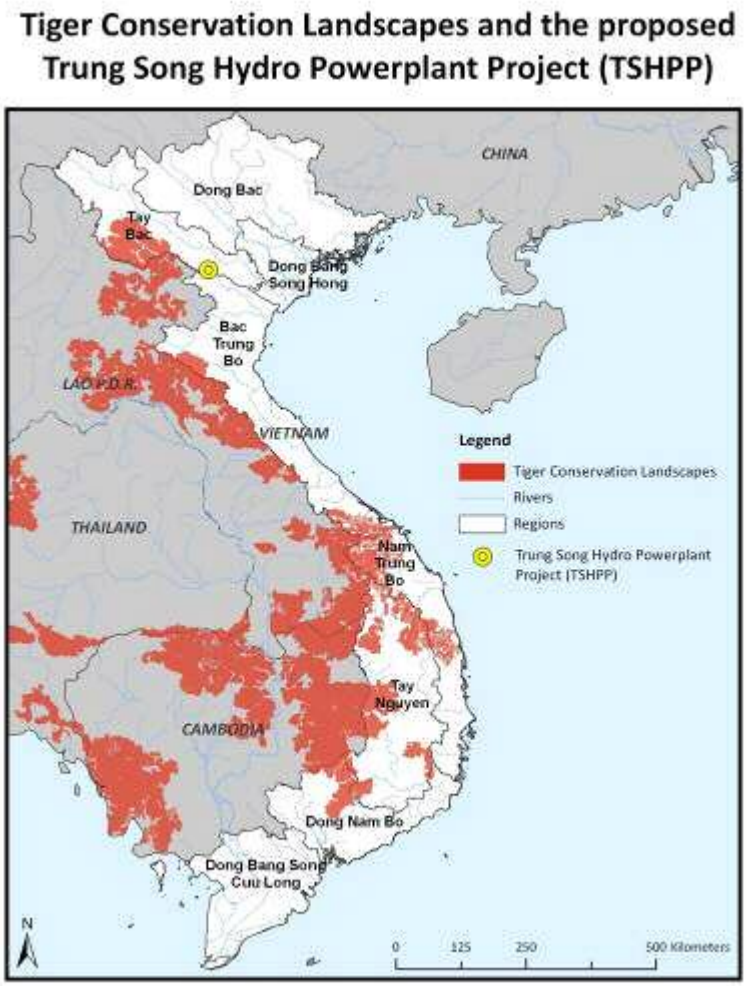
The long-term goal of the Tiger Action Plan is to improve the protection and management of key tiger populations and their habitats in top priority conservation landscapes, through measures than can be sustained and supported over the long term by governments, local communities and stakeholders.

TSHPMB, in conjunction with the Forest Protection Department will commit to supporting the Tiger Action Plan as part of development of the TSHPP. The following activities are proposed:

- ③ Undertake studies to determine the presence, if any, of tigers in the three natural reserves adjacent to the TSHPP;

- ③ If presence is established, develop a TSHPP Tiger Action Plan to ensure the long term survival of tigers in relationship to development of the TSHPP; and

- ③ Undertake an environmental outreach and education program to explain the Tiger Action Plan and the importance of maintaining tigers.



Map H-1: Tiger Conservation Landscapes of Vietnam

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:

- ③ Effects on the environment from multiple projects in a larger, regional area which may have multiple jurisdictional or administrative responsibilities;
- ③ Effects that extend into the past and also into the future;
- ③ The impacts of multiple projects and activities on valued ecological and social components, not just the project under consideration; and
- ③ 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:

- ③ 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;
- ③ Valued Ecosystem Components (VECs) – the identification of social and environmental issues, resources and species of public concern;
- ③ Indicators – the identification of key indicators;
- ③ Spatial bounding – the determination of spatial limits of the analysis depending on projects and activities and valued ecosystem components.
- ③ Temporal bounding – the setting of time limits including past (pre-development), present and future events;
- ③ 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;

- ③ Assessment methods – the selection of qualitative and quantitative methods for conducting the CEA;
- ③ Impact characterization – the characterization of the impact using standard EIA considerations (extent, duration, frequency, magnitude etc.) and considering probability of occurrence and uncertainty;
- ③ Significance of cumulative effects – determination of the significance of the effect; and
- ③ 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:

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

- ③ Air quality;
- ③ Water – surface and groundwater;
- ③ Soils and vegetation;
- ③ Wildlife;
- ③ Fisheries and aquatic resources;
- ③ Land use;
- ③ Protected areas;
- ③ Cultural resources; and
- ③ 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:

1. Include those projects of known footprint that can be assessed;
2. Consider a time frame that extends backwards to a pre-development scenario and forwards as realistically as possible;
3. Include projects that are approved, awaiting approval, announced or under design;
4. Include those projects whose environmental and social impacts and contribution to cumulative effects can be reasonably predicted; and
5. 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.

- ③ Impacts associated with construction

- ③ Impacts of increased access;
- ③ Effects on native vegetation, wildlife and protected areas;
- ③ Impacts on surface water quality and quantity;
- ③ Downstream impacts on water quality, quantity and aquatic resources;
- ③ Loss of archaeological and cultural resources;
- ③ Impacts on land use and loss of productive land; and
- ③ 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:

- ③ Are other projects and activities in the defined project area affecting the resource?
- ③ Do the effects of the project overlap or increase the effects on the resource?
- ③ 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:

- ③ The project has a measurable effect on the resource;
- ③ The project acts in conjunction with the effects of past present or future projects and activities;
- ③ 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:
- ③ The project's contribution to cumulative effects is responsible for exceeding the threshold and therefore is significant; and
- ③ 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:

- ③ Project level mitigation to reduce the significance of the contribution of the project to cumulative effects;
- ③ Cooperative mitigation measures between project proponents to reduce cumulative effects, or
- ③ Regional intervention on behalf of government or regulators to reduce the overall cumulative effect through the establishment of thresholds or policy intervention.
- ③ 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".

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: De-commissioning and Abandonment

By the end of the construction phase, TSHPMB will prepare a dam decommissioning and abandonment plan, including the following:

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