

My Ly - Nam Mo Hydropower JSC



Environmental and Social Impact Assessment

NAM MO 1 HYDROPOWER PROJECT

VOLUME VII
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(ESMP)

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ABBREVIATIONS AND ACRONYMS

ACBP	Awareness and Capacity Building Plan
AI	Area of Influence
BEESRP	Biodiversity Enhancement and Environmental Services Restoration Plan
DIA	Direct Impact Area
EHSP	Environmental, Health and Safety Plan
EMRU	Emergency Medical Response Unit
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMP Unit	Environmental and Social Management Project Unit
GM	General Manager
GoL	Government of Lao PDR
GoV	Government of Vietnam
GRU	Grievances Redressal Unit
HIV/AIDS	Human Immunodeficiency Virus Infection/Acquired Immune Deficiency Syndrome
HPP	Hydropower Project
ICS	Improved Cooking Stoves
IFC	International Finance Corporation
LRU	Livelihoods Restoration Unit
MARD	The Ministry of Agriculture and Rural Development
M&E Unit	Monitoring and Evaluation Unit
MOIT	Ministry of Industry and Trade
MONRE	Ministry of Natural Resources and Environment (both Vietnam and Laos)
PAP	Project Affected People
PCDP	Public Communication and Disclosure Plan
RAP	Resettlement Action Plan
RCA	Reservoir Catchment Area (RCA)
RCMP	Reservoir Catchment Management Plan
REMLRP	Resettlement and Ethnic Minority Livelihoods Restoration Plan
RPF	Resettlement Policy Framework
SEMD	Social and Environmental Management Division
SMP Unit	Social Management Project Unit
SBZ	Safeguard Buffer Zone
SBZM	Safeguard Buffer Zone Management
STDs	Sexually Transmitted Diseases
WMP	Waste Management Plan

CHAPTER 1. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

1.1 Introduction

An integrated Environmental and Social Management Plan (ESMP) has been prepared for the Nam Mo 1 HPP to set out environmental management requirements¹. Besides, it also proposes procedural frameworks to ensure that all mitigation measures and monitoring requirements specified in the Environmental and Social Impact Assessment (ESIA) report will actually be carried out in subsequent stages of Project construction and operation.

1.2 Environmental programs

The ESMP as written now is to function as a framework for the formulation of in-depth plans, programs and specific mitigation measures during construction phase. When its contents are fully formulated it is envisaged to serve as an environmental operation manual for the Nam Mo1 HPP management group and staff employed by the management. In addition, it will be an advisory document to the regulatory authorities such as Ministry of Industry and Trade (MOIT), Ministry of Natural Resources and Environment (MONRE, both Vietnam and Laos) and The Ministry of Agriculture and Rural Development (MARD).

The ESMP will require a revision during the detailed design and tender stage and the development of specific contract clauses concerning the required environmental and social mitigation; the revision will also address any required changes to the current design of Nam Mo 1 HPP.

The basic objectives of the ESMP are to:

- formulate environmental management requirements to ensure that all mitigation measures and monitoring requirements specified in the ESIA report is actually be carried out in different stages of Nam Mo1 HPP implementation;
- define environmental management principles and guidelines for the pre-construction, construction, post construction and operation phase of Nam Mo1 HPP;
- establish environmental resource needs;
- recommend a plan of action and a means of testing this plan to meet existing and projected environmental problems;
- establish the roles and responsibilities of all parties involved in project environmental management;
- describe mitigation measures that shall be implemented to avoid or mitigate adverse environmental impacts by maximizing the positive ones;
- establish a supervision, monitoring, auditing and reporting framework;
- ensure implementation of recommended corrective actions aimed for environmental management and its enhancement; and

¹ MIGA and MIGA. Performance Standards (MIGA, 2013) and Guidance Notes (MIGA, 2012). <https://www.miga.org/projects/environmental-and-social-sustainability/performance-standards>

- ensure that the environment of Nam Mo1 HPP construction sites and the region of influence is protected and developed to meet the needs of the local people, the stakeholders and safeguard the national interest.

1.3 Implementation approach and mechanism

The Proponent will be the overall responsible for the implementation of the ESMP. It will hire the experts and staff necessary to formulate the proposed plans in the ESMP through consultative processes with relevant stakeholders. Each plan/programs/measure will be disclosed to the stakeholders and agreements made with them to ensure implementation viability. The ESMP is meant to be adaptable to changes that may occur in the Project area, policy and regulatory mechanisms, and stakeholder concerns and views. An Environmental and Social Management Plan Unit (ESMP Unit) of the Social and Environmental Management Division (SEMD) of the Proponent will actively liaison with the state agencies to assure that implementation is smooth. The Public Communication and Disclosure Plan (PCDP) will provide a frame for consultative and disclosure during the ESMP formulation and implementation.

Different parties to be involved directly and indirectly for environmental management of the proposed Nam Mo1 HPP components include among others:

- Ministry of Industry and Trade (MOIT), Vietnam
- Ministry of Natural Resources and Environment (MONRE), Vietnam
- The Ministry of Agriculture and Rural Development (MARD), Vietnam
- Committee on Ethnic Minority Affairs, Vietnam
- Ministry of Energy and Mine, Laos
- Ministry of Natural Resources and Environment (MONRE), Laos
- Ministry of Agriculture and Forestry, Laos
- Ministry of Labor and Social Welfare, Laos
- Environment and Social Management Plan Unit of Proponent
- Supervising Engineers for Nam Mo1 HPP implementation;
- Construction Contractor; and
- Provincial, District and Commune level state institutions, etc.

The effective implementation of ESMP will require a continuous monitoring of its environmental performance, and where necessary initiate appropriate planning and implement corrective actions to rectify any shortfalls in performance that may occur. The standard is based on the methodology known as Plan-Do-Check-Act principle, which can be briefly described as follows:

- Plan: establish the objectives and processes necessary to deliver results in accordance with the organization's environmental policy.
- Do: implement the processes.
- Check: monitor and measure processes against environmental policy, objectives, targets, legal and other requirements, and report the results.
- Act: take actions to continually improve performance of the environmental management system.

To complete this cycle, Nam Mo1 HPP will adopt the following approaches in the implementation of the ESMP:

Partnership approach: The partnership principle implies close cooperation between the Nam Mo1 HPP and the state agencies at commune, district, provincial and national stakeholders, village level committee at local level at different stages of the implementation cycle of the Project. Although, Nam Mo1 ESMP Unit will lead the environmental project under the SEMD, it will accommodate all the concerned people and institutions that have roles and responsibilities in the planning, implementation and monitoring of environmental mitigations. Similarly, a monitoring committee will be developed in the district to perform joint monitoring of the impact mitigation measures carried out by different service providers. Basically the service providers will be commune agencies and contractors and their roles should be defined in the elaborated mitigation plan based on agreements.

Community based: Community organizations, e.g., village level committees are non-profit based made civil-group representatives that operate within a single local community. The recent studies and understanding of roles of community organizations has strengthened the view that these bottom-up organizations are more effective addressing local needs than larger charitable organizations. Local involvement from villages in all decision making is essential and the Proponent can foster local community groups/committee to be formed to be part of, e.g., final definition of mitigation decisions, decision on relocation areas, resettlement and mitigation monitoring, grievance redress and equitable resource use.

Capacity building: Capacity building is a key strategy within all Nam Mo1 HPP programs focus on both individual and institutional development, understanding that both must be addressed together in order to achieve meaningful change. The Nam Mo1 HPP will design and run training programs by coordinating with the district and commune line agencies and experts working in similar fields elsewhere. The main aim of it is to help in achieving the Project's objectives. The local Government, communities and village level committees are the main clients of Nam Mo1 HPP, but the private sector also needs support.

Information sharing: Throughout the project period, Nam Mo1 HPP ESMP Unit will play coordinating roles with aforementioned line agencies and stakeholders in the commune and district. Information sharing is another important aspect to building cooperation between the stakeholders and the project.

1.4 Institutional arrangement

1.4.1 Institutional arrangement and responsibility

My Ly -Nam Mo Hydropower JSC headed by a General Manager (GM) will implement the proposed Project. There will be a provision for Nam Mo1 HPP Board which will guide the implementation of the Project during construction and operation phase. Under the GM, among with other divisions, the SEMD will be established and later will have Resettlement and Livelihoods Restoration Unit (RLRU), Grievances Redressal Unit (GRU), Monitoring and Evaluation Unit and Environmental and Social Management Project Unit (ESMP Unit). The organizational setup for environmental management is shown in Figure VII. 1.

1.4.1.1 Nam Mo1 HPP General Manager Office

The Nam Mo1 HPP General Manager Office will establish Nam Mo1 HPP SEMD as implementing agency for environmental programs. The GM will coordinate and make final decisions on the implementation of environment mitigation and monitoring plan, however, the GM may delegate some authority to Nam Mo1 HPP SEMD. Most of the mitigation

measures will be implemented during the construction phase as part of tender document clauses and by the Project with technical assistance or in partnership with line agencies, and Village Level Committees. The GM will approve the Contractors ESMP and other relevant environmental programs prepared by the Contractors as recommended by Nam Mo1 HPP SEMD. The Nam Mo1 HPP Board may authorize the Project Director Office to stop work or penalize Contractors for breaching environmental tender clauses, non-compliance or non-performance. The GM Office will ensure timely and quality implementation of mitigation and enhancement measures as well as monitoring. The GM will sign agreements with public and private agencies to implement approved environmental and social programs as recommended by Nam Mo1 HPP SEMD.

1.4.1.2 Nam Mo1 HPP Social and Environment Management Division

The Nam Mo1 HPP SEMD headed by the Social and Environmental Manager will be established in the GM Office at the very beginning of the Project implementation. SEMD will report directly to the GM Office. As shown in Figure VII. 1, SEMD will have four sections namely Resettlement and Livelihoods Restoration Unit (RLRU), Grievances Redressal Unit (GRU), Monitoring and Evaluation Unit and Environmental and Social Management Project Unit (ESMPU). Since the ESMP implementation will also need to cover Laos there is a need to assure that units are represented by individuals from both nations having both language and cultural knowhow to implement and conduct themselves. In this regard the Proponent will compose two terms where required, i.e., covering Laos and Vietnam.

The ESMP Unit will be responsible for implementing physical and biological mitigation and enhancement programs while the RLRU will work on land acquisition and compensation, resettlement and rehabilitation, community development, livelihood programs, health related programs and other social activities. The Monitoring and Evaluation Unit will be responsible for monitoring of environmental and social programs implemented by the Project and the contractors as per contractual agreement, and will report on compliance. (See Volume V-PCDP and Volume VI - REMLRP for related details of organization).

During the Project construction phase, SEMD will be a full-fledged office but it will be reduced in size as SEMU during the operation phase. Functions and responsibility of SEMU will be influenced by the findings of an environmental audit conducted by the Project through outsourced agency within three months of the completion of the construction work, which will assess the environmental compliance during construction phase, identify the emerging problems, assess the environmental and social works to be done, and recommend mitigation and enhancement measures to be implemented during the operation phase. After the environmental audit, regular works of SEMD may be considerably reduced or cease. My Ly-Nam Mo Hydropower JSC can opt to have certain aspects on monitoring to be managed by the SEMD (or if reduced, SEMU). These aspects have to be formulated during the pre-construction stage.

The Nam Mo1 HPP SEMD will review the Contractor's EMP and other social plans prepared by the contractors and assist the GM Office for their timely approval. The SEMD will prepare annual ESMP for implementation, coordinate with Nam Mo1 HPP Divisions and other commune, district, provincial or national level, private agencies for program implementation, and prepare monthly, quarterly and annual reports (as required). Liaison with local communities, agencies, and other major stakeholders will be the major task of SEMD Environment Manager. The Nam Mo1 HPP SEMD will manage the Project Information Centre established in Hanoi, project districts, and project sites.

1.4.1.3 Staff positions and responsibility

The staff positions and their qualification, staff responsibilities, duration of staff, reporting types and frequencies, and other related matters will be developed during the design phase of the Project.

1.4.1.4 Construction contractors

Environmental and social responsibility of construction contractors, contractual agreements, mitigation measures to be implemented by contractors as per contractual

agreement, and contractual notification procedures will be developed during the design phase.

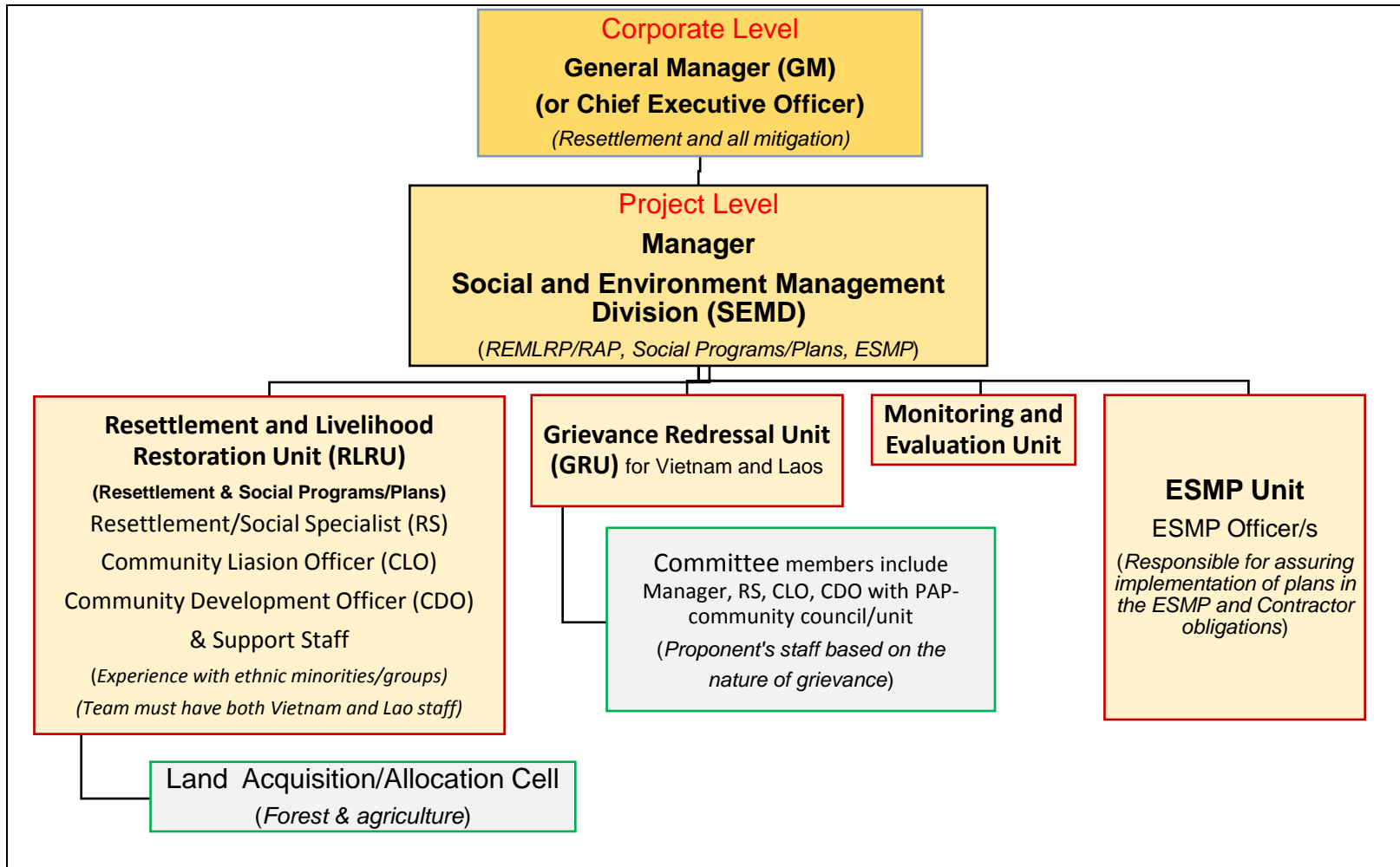


Figure VII. 1 Organizational Set-up for Social and Environmental Management

1.4.2 Regulatory mechanism and environmental permits and approval

Implementation of environmental and social mitigation measures will be regulated by the Government of Vietnam (GoV) and Government of Laos (GoL) policies and legal framework (see Chapter 2 on policy, ESIA) which have made provisions for the compliance of ESIA Report, monitoring and evaluation, environmental audit, and restrict discharge of radio-active emission and other waste materials in convention to the criteria fixed by the Government. There are many other Acts, Rules and policies which directly or indirectly regulate the socio-economic and environmental activities to be implemented by the Project. The detail will need to be reviewed in detail during design phase.

The Nam Mo1 HPP GM will acquire permits for clear felling or cutting trees in the national forests in the Project area from the Forest Protection Department, Vietnam and Department of Forestry, Laos. In the Project construction sites, contractors will make request to the GM through Nam Mo1 HPP SEMD for the approval for clear felling or felling few trees, and with the recommendation of SEMD, the GM would make official request to District/Commune Forest Office for tree felling approval.

1.4.3 Environmental standards

Benchmarks for limits must be established based on GoV, GoL, and MIGA.

1.4.4 Construction contractor

Construction contractor will prepare specific plans based on the Project ESMP, labor, health, safety plans, among others. The contractor will ensure (i) properly and timely implementation of all mitigation measures as mentioned in ESMP; (ii) timely inform emerging environmental and social problems during construction works to ESMP Unit; and (iii) implement corrective actions to safeguard environment in response to requests made by the Project.

The Contractor will be responsible for the implementation of spoil disposal, waste management, occupational safety, structural bioengineering measures, air, noise and water quality protection measures, etc. The Contractor will provide Quarterly and Annual Reports regarding their performance on these issues to SEMD.

1.4.5 Public communication and disclosure

The ESMP implementation reports prepared by ESMP Unit will be disclosed to local community, commune and district agencies. They will regularly prepare disclosure documents (flyers, bulletin, etc.) also in the local language that will cover Project activities including environmental and social mitigation measures and monitoring works. In addition, a regular meeting will be conducted with district-level line agencies, Commune Office and Village level Committees at the Project site to brief them about the status of the Project, ongoing environmental and social activities and problems that have arisen during implementation. The PCDP of Nam Mo1 HPP will guide the stakeholder consultation and disclosure process.

1.5 Reporting

Nam Mo1 HPP ESMP Unit will prepare monthly, quarterly and annual progress reports (based on the agreed requirements), and send them to district line agencies. The Nam Mo1 HPP ESMP Unit will organize regular meetings, which can also be called as project coordination meeting. Frequency of progress reporting of the project activities can be reviewed and openly discussed. The Project will organize the annual meeting either in Hanoi or in Project's district headquarters, Ky Son district in Vietnam and Kouan district in Laos (and in Nonghed district in Laos if required) to review yearly progress of the Project activities. It will be targeted to concerned line ministries and departments and other principal stakeholders in the districts. The reporting may be altered to fit MIGA requirements.

1.6 Environmental monitoring

1.6.1 Rational for environmental monitoring

As per the regulatory requirements in Vietnam and Laos the proponent shall comply with the matters mentioned in the approved ESIA report while the concerned agency has to monitor the impact on environment, resulting from the implementation of the Project.

The effective monitoring of the mitigation measures requires a constant feedback between those charged with administering the compensation schedule and the intended beneficiaries. The monitoring should include, among other environmental and social aspects:

- Disbursement of compensation should take place promptly and according to procedures;
- Communities in the affected areas share some benefits from the implementation of the Project;
- Local population is engaged/hired whenever possible;
- Access to health care facilities is provided and clinics are staffed and stocked;
- Assure proper safety material, training and information meeting international standards (MIGA, World Bank Group);
- Rates of disease infection are monitored, with special attention to STDs; and
- Resettlement arrangements are effective and minimize the level of conflict between re-settlers and host populations.

1.6.2 Objectives of monitoring

Environmental monitoring is needed to ensure compliance of the implementation measures and to assess the actual effects of these measures as well as the emerging impacts during project construction and operation phases. Environmental monitoring for this Project will be undertaken to meet the following objectives:

- To fully comprehend the physical, social and environmental conditions in the Project area such as inundation area, safeguard buffer area and Project structure and activity area prior to the implementation of the Project;
- To understand the compliance status of the implementation of mitigation measures and other regulatory standards;
- To ensure effectiveness of mitigation measures implemented by contractors as per contractual clauses and obligations;
- To check the effectiveness of mitigation and enhancement measures, implemented by the Project; and,
- To verify the accuracy of ESIA predictions and assess the emerging and cumulative environmental problems, which could provide timely warning of potential environmental damage.

A more detailed monitoring plan in the form of a fully formulated ESMP based on formulated plans/programs/mitigation will be prepared at design phase. The SEMD will develop detailed monitoring for each programs in the ESMP as each plan is fully formulated, and will require that contractors adhere to the regime set-up and the recommended international standards.

1.6.3 Site inspections

The SEMD will carry out site inspections prior to construction, during construction and at the end of construction in coordination with the contractors. In general, the 'Initial Inspections' conducted in the pre-construction phase will brief the contractors of

environmental and social sensitivities in the Project area and document pre-project conditions. The 'Progress Inspections' of project sites during construction would refer to the compliance monitoring. The 'Final Inspection' will be carried out at the end of construction phase which documents that the contractors have met their contractual obligations with regard to environmental contract clauses.

1.6.3.1 Initial inspections

Nam Mo1 HPP ESMD will conduct the initial inspections:

- Nam Mo1 HPP SEMD will monitor the environmental and social condition of various Project sites prior to contractor's mobilization on the Project site. It will confirm the location of Project sites for temporary and permanent use;
- Under the guidance of the GM, it will establish standards for construction and required environmental controls. Sites will be surveyed jointly by Nam Mo1 HPP SEMD and Contractor's representative. Photographic record of the sites will be prepared; and,
- It will prepare the project site document.

1.6.3.2 Progress inspections

Nam Mo1 HPP ESMD will conduct the progress inspections:

- It will prepare environmental and social checklists and reporting procedures once construction works commence;
- Site inspections will put emphasis on early identification of any environmental and social problems and suitable remedial action;
- It will make a regular and frequent monitoring of Project sites without prior notification of the contractors. Daily, weekly and monthly site inspections of all works such as vegetation clearance, excavation and spoil disposal activities, blasting, tunneling, chemical storage, drainage and erosion hazards, and campsites will be carried out. The contractors will be notified to take necessary measures to minimize the level of impacts; and,
- It will give the inspection reports to the construction contractors for action. Any deficiency or inadequacy that is noted during inspection will be immediately drawn to the contractor's attention and reported to the Project Director. The Contractors will prepare a monthly site inspection report and submit to Nam Mo1 HPP SEMD.

1.6.3.3 Final inspection

Nam Mo1 HPP ESMD will conduct the final inspection:

- It will conduct final inspection of the Project sites at the end of Project construction which will determine whether assigned works are completed and necessary mitigation measures are implemented.
- Contractor's obligations and requirements as per the contractual agreement will be verified and deficiencies will be identified. In case of non-compliance, the contractors will be enforced to implement the remaining works.
- It will recommend the compliance of contractor's works to the Project Director, and it will prepare a 'Final Inspection Report' documenting site conditions and compliance with contractual obligations.

1.6.4 Monitoring types

Monitoring will be done throughout the Project life. Apart from external expert monitoring, internal monitoring by the Project, as well as participatory monitoring involving Government agencies or other stakeholders will be carried out. Below are the main types of monitoring that will be conducted.

1.6.4.1 Pre-construction monitoring

The Nam Mo1 HPP will have the principal responsibility for environmental and social monitoring during the pre-construction phase.

(a) Baseline monitoring

Data and information will be collected on key physical, biological and social aspects in the direct impacted project area such as inundation area, project structure and activity area, safeguard buffer area and other environmentally sensitive area, and the data provided by ESIA report will be updated. The Nam Mo1 HPP SEMD will be responsible for baseline monitoring during the pre-construction phase. Physical, biological and social aspects are highlighted here.

The primary concern during this phase will be to collect field data needed to enhance the knowledge of baseline conditions. Focus will be on gathering key physical, biological and sociological information needed to verify and update the data provided by the ESIA process such as river flow, river water quality, air quality in project sites, number of trees to be felled, number of project affected families and their assets etc. Some of the monitoring activities are given below:

Physical aspects

- Monitor river flow/discharge to establish environmental flow that can sustain the riverine life and river uses;
- Monitor river water quality and drinking water quality in settlements close to Project camps and sites for physical, chemical and biological parameters;
- Monitor air quality at the proposed dam and powerhouse sites, crushing plant, batching plant, haul and service road, quarry site and spoil disposal area; and
- Monitor geological/soil erosion hazards.

Biological aspects

- Pegging of forest sites to be used by contractors;
- Counting and marking the trees to be felled from the temporary and permanent sites; Concerned state agency at commune and district levels will jointly count and mark the trees to be felled.
- Approval from the concerned state agency at commune and district levels for felling the trees from forests;
- Wildlife habitat, and wildlife species and their abundance;
- Edible plants and wildlife;
- Medicinal plants;
- Population status of threatened species just before clearing forests in inundation area and project construction and activity areas; and,
- Monitoring spawning ground and fisheries activity.

Social aspects

- Monitor/update detailed information on land, buildings and other housing structures, and biological assets on land to be temporarily or permanently acquired by the Project. The Project Affected People (PAP) and village level committee will participate while carrying out such activity; and,
- The Resettlement and Ethnic Minority Livelihood Restoration Plan (REMLRP) will be discussed and agreed with the project affected families, village level committee and other stakeholders.

1.6.4.2 Construction monitoring

Environmental and social monitoring during project construction will include two major groups of activities:

- Review of the contractor's plans such as Material use and Site Waste Management Plan, Traffic Management Plan and Emergency and Response Preparedness Plan and other environmental plans, as the need arises. Monitor implementation arrangements, compliance and impacts.
- Systematic observation to check that contract arrangements by contractors, and other requirements of agencies of the GoV and GoL, and concerns (where relevant) of NGOs, community based organizations/committees or user groups are in fact complied with, and that emerging impacts are properly mitigated and concerns are addressed.

Both compliance monitoring and impact monitoring will be carried out.

(a) Compliance monitoring

During construction phase, compliance monitoring will be important and will play bigger role in checking whether recommended mitigation measures and environment management plans have been properly and timely implemented or not. It will determine the overall environmental and social performance of the Project. Compliance monitoring will mainly focus on:

- Compliance with tender clauses;
- Compliance with mitigation measures;
- Timely and adequate implementation of the ESMP; and
- The overall environmental and social performance of the Project.

(b) Impact monitoring

The impact monitoring will examine the effectiveness of the mitigation measures, identify the emerging impacts due to Project activities or natural process and develop remedial actions. Impact monitoring will focus on key indicators to assess whether the impacts have been accurately predicted, and whether the mitigation measures are sufficient and effective. The actual impacts caused by the project implementation and the emerging impacts will be closely monitored during the construction period.

A single summary table with the main aspects to be included in the Monitoring Plan of the ESMP will be developed. Salient features of monitoring physical, biological and socio-economic activities during construction phase are presented in tables, and need to be detailed according to location. The annual environmental monitoring report will be incorporated in the Annual Environment Report which would include the current status of environment in the Project area, emerging and cumulative impacts, and remedial tasks implemented.

1.6.4.3 Operational monitoring

Both compliance and impact monitoring will be carried out during the Project operation phase. The compliance monitoring will focus on determining that the prescribed mitigation and enhancement measures in the operation phase are being fully and properly carried out by the Project. Impacts of activities implemented during construction phase and operation phase will be monitored at regular intervals. However, the monitoring intensity will be much lower compared to the construction phase. Some of the monitoring tasks will be as follows:

- Discharge below the dam; the minimum flow which is agreed and approved by MOIT (in Vietnam);
- Reservoir shore erosion due to peaking operation;
- Physical stability in and around dam site, powerhouse site and other vulnerable areas;
- Siren warning system in low flow area and downstream of tailrace outlet;

- Vegetation cover in safeguard buffer area;
- Fish population and biodiversity in reservoir, low flow area and downstream of tailrace outlet;
- Agriculture and livestock improvement programs such as crop diversification, fertility enhancement, raising pigs and poultry under confinement and animal disease control; and,
- Socio-economic status of displaced people resettled in another place.

1.6.5 Environmental monitoring programs

All plans will have monitoring tailored to the final formulated ESMP.

1.6.5.1 Physical Environment Program

For the Physical Environment Program, the monitoring will implicitly be part of the biological, socio-economic and cultural environments. It is likely that upon full formulation that there will be a number of overlapping parameters which will allow more rational monitoring. The construction section will be involved in slope stabilization mitigation and monitoring should be worked out as appropriate based on the techniques used (see also relevant forest monitoring). In addition, the Environmental Health and Safety Plan (EHS) will address the monitoring of water, air and noise apart from all safety aspects.

1.6.5.2 Biological Environment Program

(i) Vegetation and forestry

Monitoring plan in vegetation and forestry includes both compliance and impact monitoring during construction and operation phase.

(ii) Wildlife and birds

Baseline monitoring will include population status of threatened and rare species and clearing forest area while impact monitoring will include incidents of wildlife killing and hunting.

(iii) Aquatic ecology and fisheries

Below is given a description and rationale for monitoring aquatic ecology and fisheries.

Monitoring during the construction phase

(a) Water quality

Samples from the river

It is relevant to monitor the water quality upstream and downstream of the construction area, due to high activity. There should be about six stations in the river stretch. In addition, possibly one or two stations in tributaries should be monitored as well as a control (no impact expected). Monitoring sites will be decided at design phase.

The sampling frequency should be once every second month. However, the frequency, the number of stations and sampling locations have to be evaluated, and should consider the location of heavy construction activities and its immediate impact areas. Physical, chemical and biological parameters will be measured. The limits of the different parameters suitable for drinking water are set by National Drinking Water Quality Standard of Vietnam and Laos and the drinking water standard of WHO (2008).

Waste water

The potential polluting construction sites situated close to the river and with high activity or with a runoff that can end in tributaries and the main river should be selected for sampling at least four times a year (or more) during the construction period. If this is sufficient should be evaluated after the first year. The indicative values for treated sanitary sewage discharges should follow the MIGA guidelines, and the standards of Vietnamese and Lao Governments, i.e. QCVN 08:2008/BTNMT and Lao PDR No 2734 respectively.

(b) Periphyton, phytoplankton, zooplankton and macroinvertebrates

Impacts due to chemicals, erosions or other incidents on aquatic life can be detected a long time after the incident happened, and are in that way more suitable than water quality samples. For example, a spill of chemicals ending up in the river will drift away with the flow and will not be detected in water quality samples a short time after the incident. Both species and abundance of periphyton, phytoplankton and zooplankton and macroinvertebrates should be analyzed. Samples should be collected at six stations two times a year, April and November (before and after rainy season). The number of stations and number of time might be reconsidered based on the experiences gained. The collectors have to be trained in sampling.

(c) Fish diversity / fishery

Fish is the most important topic regarding environmental impacts looked upon from livelihoods point of view. Due to little knowledge of the life history of most of the fish species, more information is needed to follow up with proper mitigation. To get an understanding of what is happening, several stations within the long river reaches are needed. Monitoring should be done twice a year (April and November, before and after rainy season). This will add information about the period after monsoon, which is limited. In addition, important spawning grounds should be examined during spawning time. Every second year, an estimate of density should be collected by electro fishing. This gives a more accurate measurement of density and collects important information about the fry which is the most sensitive to impacts. The ESMP proposes a fish adaptation study which will require regular seasonal sampling of fishes in the river body and the data will be similar to those required above and will serve as a baseline.

Monitoring in the operation phase

(a) Water quality

The water quality monitoring in the five first years of the operation phase should be the same as in the construction phase regarding samples taken from the river. This is because the biggest impacts in the operation phase are expected in this period. In addition, water samples should be taken in the reservoir at the deepest point; probably close to the dam (this should not be done when the power plant is operational).

The sampling of frequency should be once every second month. However, the frequency has to be evaluated. The samples in the reservoir will be taken in five different depths. The depths will vary from time to time depending on the filling degree of the reservoir. At each of the sampling sites, the depth should be decided as follows: The shallowest sample should be taken at 1m depth and the deepest one at 5m above the bottom, one sample at the depth of the turbine intake, and one sample midway between 1m and the intake depth, and one sample midway between the intake depth and the bottom.

The samples should be analyzed for the same parameters as above, and in addition the 1m sample should be analyzed for algal species composition.

(b) Greenhouse gas monitoring

The greenhouse gas monitoring will not be done with the aim of assessing the total amount of greenhouse gas emission, i.e. 1) the diffusion of gas from the reservoir surface and 2) the breakdown of the above-water biomass, will not be included. The release through the turbines, (spillway, if the deep water type is chosen), as well as through the minimum release, will be monitored. This will be done by measuring the concentration of methane and carbon dioxide in the reservoir at the same station and depth as in water quality monitoring in the reservoir. At the same time the corresponding concentration will be measured in the three effluents (turbine, spillway, minimum release) and the river downstream. The differences in concentration will indicate how much has stripped off into the atmosphere by pressure fall combined with turbulent mixing and heating.

To measure the surface diffusion of the gases from the reservoir and from the above water degradation of organic material, is regarded as a too big task for this monitoring program. The degree of super saturation of methane and carbon dioxide in the deep water of the reservoir will tell a lot of the total emission potential from the reservoir, and how it develops. One of the six sampling rounds should be right before the turnover time start to decrease (end of March) because the increased circulation of the water might release gas. The cost shall be included in the water quality programs.

(c) Periphyton, phytoplankton, zooplankton and macroinvertebrates

The monitoring of aquatic life in the first four years of the operation phase should be the same as in the construction phase regarding samples taken from the river. This is because the biggest impacts are expected in this period.

(d) Fish and fishery plans

The monitoring of fish and fishery in the first four years of the operation phase should be the same as in the construction phase regarding samples taken from the river. Adaption of flow regimes may be needed if populations decline (see fish adaption plan also). This is because the biggest impacts are expected in this period.

1.6.5.3 Social and Livelihoods Restoration Program

Under this program, the following will be monitored:

- Monitoring resettlement and livelihood restoration measures;
- Livelihoods status over time, e.g., improvement and enhancement of livelihoods;
- Enhanced forest resources and access to natural resources and continuity in daily cultural and livelihood activities; and,
- Overall wellbeing improvements.

Details are also given in the REMLRP.

1.7 Environmental auditing

In this ESIA, an Environmental Audit (EA) has been proposed to assess the actual environmental impact of the project, the accuracy of impact predictions, the effectiveness of environmental impact mitigation and enhancement measures applied during construction and operation phase, and the functioning of monitoring mechanisms. It is intended that EA should relate actual impacts with predicted impacts, which help in evaluating the accuracy and adequacy of ESIA predictions.

There is regulatory requirement both in Vietnam and Laos for conducting EA.

Besides fulfilling the formal requirements, an environmental audit is a good tool for promoting environmental best management practices and procedures. In general, environmental auditing is conducted with the following aim:

- Assessing compliance with formal requirement;
- Facilitating management control of environmental practices;
- Promoting good environmental management and minimizing the risks;
- Examining environmental changes arising from Project implementation; and
- Establishing the performance baseline for an environment management system.

1.7.1 Planning an environmental audit

Environmental audit critically examines the methods and approach assessment procedure adopted during the ESIA.

At the Project approval stage, both project proponent and authorizing agency should make a decision on implementation of one or more audits mentioned above with particular attention given to the project cost-effectiveness of audit and to technical difficulties likely to be encountered. The cost estimation for the task depends on the decision made of the number and types of environmental audits. Although the anticipated costs are included

into the ESMP, it is recommended that a detailed budget for the audit should be planned during the elaboration of the ESMP.

1.8 The ESMP

The Project will implement environmental programs as compensatory, protective and enhancement measures in the Project area and in the Project influenced villages in the direct impact area. These programs will be implemented directly by the Project in partnership /association with local and district level public and private stakeholders, and by contractors as per contractual agreement under the guidance and supervision of the Project Social and Environment Management Division (Nam Mo1 HPP SEMD).

Environmental and social programs are summarized in Table VII. 1.

Table VII.2. presents the matrix for environmental and social monitoring for the Nam Mo1 HPP.

1.9 Project costs

The costs of mitigation and enhancement measures will need to worked out as when the ESMP and other safeguards are elaborated.

Table VII. 1 Matrix for the environment and social management plan for Nam Mo1 HPP

Objective	Project Activity (reference to ESMP, REMLRP)	Mitigation/Enhancement/ Environmental and Social Management Plan (ESMP), Restoration and Ethnic Minority Livelihood Restoration Plan (REMLRP)	Standards	Institutional Responsibility	Time- line	Monitoring	Implementati on Route/Plan
Construction Phase							
Enhancement /Beneficial Impacts							
Livelihoods Enhancement	Employment to local people	Priority given to local people from affected villages and commune	MIGA GoV GoL	Contractor	C	Project- monitoring unit	Contractor's program
Skilled manpower development	Work experience	Contractor will provide on job skill enhancement training to semi-skilled workers	MIGA GoV GoL	Contractor	C	Project- monitoring unit	Contractor's program
Income generation	Increased economic activities	A large work force would create demand for agriculture and livestock products	GoV GoL	Contractor	C	Project- monitoring unit	Workforce and commune
Social safeguard of local community	Provision of drinking water, sanitation and health facility	Project will provide social services to DIA village and DIA households e.g. electricity, drinking water, sanitation facility, health service as compensatory activities	MIGA GoV GoL	Project	PC, C, O	Project- monitoring unit	Project to commune and DIA households
Improvement in mobility and transport	Road construction	Project will construct roads for HPP	GoV GoL	Project	PC, C, O	Project	Project's program ESMP, REMLRP
Adverse Impacts: Physical Environment							
Improvement in the landscape construction area and reservoir	Rehabilitation and revegetation of construction sites	Rehabilitation and revegetation in construction sites, auxiliary area and quarry site	GoV GoL	Contractor & Project	O	Project	Contractor's program
	Reservoir Catchment Management Plan, SBZ	The 50m buffer zone along the perimeter of the reservoir will enhance the reservoir landscape	GoV GoL	Project	O	Project	Involving district & commune state agencies

Objective	Project Activity (reference to ESMP, REMLRP)	Mitigation/Enhancement/ Environmental and Social Management Plan (ESMP), Restoration and Ethnic Minority Livelihood Restoration Plan (REMLRP)	Standards	Institutional Responsibility	Time-line	Monitoring	Implementation on Route/Plan
							and community
Slope stability in construction area	Rehabilitation and revegetation	<p>Implementation of slope reinforcement and erosion risk measures & regular monitoring of erodible areas</p> <ul style="list-style-type: none"> Minimize land clearance, proper disposal of mucks, slope protection methods such as retaining walls, slope stabilization and erosion control works. Bioengineering works in soil erosion prone area Avoidance of clearing vegetation along the high erosion prone areas Modification of slope geometry Well designed drainage system Retaining structures 	GoV GoL	Contractor	C, O	Project SEMD	Contractor's program
Minimize sediment load to reservoir	Management of reservoir immediate catchment	<p>Plan and implement the Reservoir Catchment Management Plan (RCMP) and establish Safeguard Buffer Zone (SBZ). Inventory of high erosion prone area and critical areas in reservoir catchment will be made during design phase and RCMP will be developed and implemented</p> <ul style="list-style-type: none"> Implementation of high risk erosion measures Bioengineering works to control erodible area Control of faulty road construction in catchment and activities triggering high erosion Maintain slope stability through using new and efficient slope engineering techniques 	GoV GoL	Project	C, O	SEMD	Project though contractor for physical work; collaboration with state agency and community

Objective	Project Activity (reference to ESMP, REMLRP)	Mitigation/Enhancement/ Environmental and Social Management Plan (ESMP), Restoration and Ethnic Minority Livelihood Restoration Plan (REMLRP)	Standards	Institutional Responsibility	Time- line	Monitoring	Implementati on Route/Plan
		<ul style="list-style-type: none"> • Install upstream sediment check structures, protect dam outlets • Forest plantation in degraded forest area and in vulnerable areas (See details in Biological Environment) 					
Muck and spoil management		<ul style="list-style-type: none"> • Avoid dumping mucks and spoils in river • Manage the spoil tip area 	GoV GoL, MIGA	Contractor	C	SEMD-Monitoring	Contractor's program
Management of air pollution	Construction works	<p>Prepare and implement Environmental Health and Safety Plan (EHSP)</p> <p>The following dust control mechanisms and construction good practices will be adopted:</p> <ul style="list-style-type: none"> • The aggregate crushing plants, batching plants and concrete mixing plants will be located far from the camp areas and provided with smoke/exhaust stacks. • Scrubbers will be installed in vehicles and other machines emitting air pollutants. Heavy vehicles, generators etc should have controlled smoke/exhaust stacks • Periodic maintenance of vehicles and other machinery and monitoring of engine emissions to comply with GOV and MIGA criteria • Reduce dust pollution and minimize dispersion of pollutants through frequently spraying of road surfaces with water during dry days in vulnerable areas • The borrow vehicles will be covered during the transportation of dusty materials in the construction sites. • Monitor air quality monthly at construction sites <p>(a) Health and sanitation program to prevent</p>	MIGA GoV GoL	Contractor	C	SEMD-Monitoring	Contractor's program

Objective	Project Activity (reference to ESMP, REMLRP)	Mitigation/Enhancement/ Environmental and Social Management Plan (ESMP), Restoration and Ethnic Minority Livelihood Restoration Plan (REMLRP)	Standards	Institutional Responsibility	Time- line	Monitoring	Implementati on Route/Plan
		and cure respiratory infection and other air-borne diseases. Avoid workforce camps in the air pollution prone area (b) Provision of masks to workforce working in air pollution prone area					
Management of water pollution	Construction works	<p>a) Prepare and implement Waste Management component including storage and construction waste of EHSP; this should include use and management of toxic and hazardous materials.</p> <p>b) Prepare and implement Community Health and Sanitation Plan which should include toilet facilities in camps and construction sites, waste management etc. including,</p> <ul style="list-style-type: none"> • Workshop facilities will be located at least 100m away from the water sources. Spilled oil and grease trapping systems will be built in the workshop. • Proper management and regular monitoring of storage sites and scrap-yard sites. Control of spillage of oils, chemicals and other substance. • Carry out the first tunnel flushing during high flow conditions or adopt appropriate measures to dilute polluted tunnel water for protection of downstream aquatic life. • Provision of sanitation and medical support; awareness program as preventive measures; free treatment of water borne diseases to workforce; compensation for the loss of life 	MIGA GoV GoL	Contractor	C	SEMD-Monitoring	Contractor's program

Objective	Project Activity (reference to ESMP, REMLRP)	Mitigation/Enhancement/ Environmental and Social Management Plan (ESMP), Restoration and Ethnic Minority Livelihood Restoration Plan (REMLRP)	Standards	Institutional Responsibility	Time- line	Monitoring	Implementati on Route/Plan
		Regular monitoring of water quality in river (See Biology Environment – Fishery)					
Management of noise pollution	Construction works	a) Control of blast related noise and vibration <ul style="list-style-type: none"> • Avoid blasting operation during nights, and control blasting using controlled limited detonators in small lot. • Provision of protective gears such as ear muffers or plugs to the laborers and other workforce working in vulnerable sites b) Control of noise producing vehicles and equipment <ul style="list-style-type: none"> • Minimize use of pressure horns. Pressure horns in the vehicles will be prohibited. • The noise generating machineries and equipment such as generators, crushers, concrete mixers will be placed far from the residential areas • Periodic maintenance of heavy machinery and generators • Monitor noise intensity level regularly in the major construction sites 	MIGA GoV GoL	Contractor	C	SEMD- Monitoring	Contractor's program
Adverse Impacts: Biological Environment							
Minimize loss of forest vegetation in construction site	Forest Inventory in construction site	<ul style="list-style-type: none"> • Mechanisms to control damages to standing trees and ground vegetation will be adopted • Avoid cutting saplings and poles for making pegs, • Marking of the trees by enamel or chalk rather than chopping the outer bark of the trees particularly in temporarily acquired forest areas 	GoV GoL MIGA	Proponent	PC	Project	Project with commune & district agency
	Construction in	<ul style="list-style-type: none"> • Clear felling shall be discouraged in 	GoV	Contractor	C	Project ESMP	Contractor-site

Objective	Project Activity (reference to ESMP, REMLRP)	Mitigation/Enhancement/ Environmental and Social Management Plan (ESMP), Restoration and Ethnic Minority Livelihood Restoration Plan (REMLRP)	Standards	Institutional Responsibility	Time- line	Monitoring	Implementati on Route/Plan
	powerhouse and auxiliary area	<p>project structure and activity areas of temporary nature. Permanently acquired forest areas for building housing and office complexes should not be clear felled; trees and shrubs will be planted in such facility sites</p> <ul style="list-style-type: none"> • Good phenotypic trees and matured trees will be retained for future seeding and regenerating purpose • Re-consideration of temporary project structures in good forest area 	GoL				preparation
Proper utilization of felled trees	Clear felling of vegetation in Inundation area	<p>A proper management of felled trees is recommended which includes:</p> <ul style="list-style-type: none"> • Contractor will clear fell the inundation area 962ha (20,400mt biomass); timber logs will be segregated and piled up in one place. Similarly, fuel wood will be stacked separately • All the felled trees and other forest vegetation will be handed over to the concerned commune • Project will pay approximately US\$20 (see GoV/GOL) for each ha as compensatory management cost to the concerned commune. Commune will use this money as well as sale of timber and firewood for forest protection in SBZ • The workforce will require about 450mt fuelwood/year; fuelwood demand of workforce could be met. • Project will consider support for the establishment of Fuelwood Supply Depot managed by commune for the sale of 	GoV GoL	Contractor	C	Project ESMP	Contractor-site preparation

Objective	Project Activity (reference to ESMP, REMLRP)	Mitigation/Enhancement/ Environmental and Social Management Plan (ESMP), Restoration and Ethnic Minority Livelihood Restoration Plan (REMLRP)	Standards	Institutional Responsibility	Time- line	Monitoring	Implementati on Route/Plan
		firewood and timber from the felled trees.					
Restoration of vulnerable plant species	Construction in powerhouse and auxiliary area, Inundation area	Seedlings of vulnerable species <i>Drynaria fortune</i> & <i>Hopea mollissima</i> and other species of high ecological value if found in inundation and construction site shall be transplanted in SBZ. Pole to matured plants would be left growing in construction site. See Endangered Species Restoration Plan .	MIGA GoV GoL	Contractor	PC C	Project ESMP	Contractor-site preparation
Forest biodiversity conservation & environmental services restoration	Plantation and management in Reservoir catchment area (RCA) including SBZ	Prepare the Forest Management Plan based on BEESRP . Compensatory plantation in SBZ, and in degraded reservoir catchment area (RCA). Plantation areas will be identified by concerned agency in district/commune. It could be made mandatory to plant at least 10 saplings for each tree felled. (This is to be agreed between the Proponent and GOL/GOV) Approximately 205,000 trees will be felled. The following activities will be implemented: <ul style="list-style-type: none"> • Almost 2.1 million tree seedlings will be planted in RCA and SBZ. This is equivalent to 1,050 ha area, if planting numbers are estimated at 2000 /ha. • Production of required number of saplings (20% more than to be planted) in the RCA. • Nurseries will be established in Safeguard buffer area. Village committee will be encouraged to establish nursery and produce saplings • Initially, for the first two years, project will 	MIGA GoV GoL	Contractor	C	Project ESMP	Contractor-site preparation

Objective	Project Activity (reference to ESMP, REMLRP)	Mitigation/Enhancement/ Environmental and Social Management Plan (ESMP), Restoration and Ethnic Minority Livelihood Restoration Plan (REMLRP)	Standards	Institutional Responsibility	Time- line	Monitoring	Implementati on Route/Plan
		<p>support establishing nurseries in all DIA villages & commune centers.</p> <ul style="list-style-type: none"> • Provision of logistic and technical support to Nursery; training will be provided to nursery men. • Replacement planting and management of planted areas up to 4 years from the plantation date • Project will sign Memorandum of Understanding (MOU) in line with the Government rules and regulations with district and province Forest Office and district/commune will implement the plantation program. • Species with larger ethno-botanical values will be grown & planted. The sapling species to be planted in the project area will represent the species of the trees felled 					
Reduce pressure on forest resources & enhance biodiversity quality	Distribution of smokeless oven	<p>Implementation of energy efficiency measures which could reduce pressure on forest resource such as:</p> <ul style="list-style-type: none"> • Distribution of improved smokeless oven to households in DIA villages. 	MIGA	Project	C	ESMP	Project's program with community
	Timber and fuelwood management in construction site	<p>The contractors will bring required timber from the timber depots outside the project area. Contractor may establish fuelwood depot in site.</p>	GoV GoL	Contractor	C	ESMP	Contractor's program
Minimizing disturbances to wildlife habitat	Construction work, traffic	<ul style="list-style-type: none"> • Develop and implement 'Wildlife and Fisheries Management Guidelines' in the project area. This would include working procedure during wildlife movement, control of poaching activity etc. 	MIGA GoV GoL	Contractor	C	ESMP	Contractor's program

Objective	Project Activity (reference to ESMP, REMLRP)	Mitigation/Enhancement/ Environmental and Social Management Plan (ESMP), Restoration and Ethnic Minority Livelihood Restoration Plan (REMLRP)	Standards	Institutional Responsibility	Time- line	Monitoring	Implementati on Route/Plan
		<ul style="list-style-type: none"> • Avoid blasting, heavy vehicular movement and excessive noise generating activities during the period of wildlife movement. • Awareness to local contractors, supervisors and labor force 					
Protection of vulnerable wild life species	Awareness and anti-poaching in construction area	<p>ACBP. Project will brief contractors, and the later to brief workers regarding GOV / GOL laws and regulations and project requirements (MIGA) for protecting wildlife resources. Project will penalize workforce for their non-compliance</p> <ul style="list-style-type: none"> • Posters, pamphlets, sign boards & hoarding boards in project area as awareness materials. 	MIGA GoV GoL	Project and contractor	C	ESMP	Contractor's program
Minimizing disturbance to fish habitat at dam site and downstream	Passage to fish movement during dam construction	Maintain river channel at dam site and further down during upward and downward movement of fish	MIGA GoV GoL	Contractor	C	ESMP	Contractor's program
Minimizing habitat disturbances to fish & other aquatic life	Reducing pollution level at dam site and downstream area	<p>Contractor should prepare waste management plans and get approval from Project and implement it. Contractor should:</p> <ul style="list-style-type: none"> • Maintain proper storage for used petrochemical and other toxic material • The water from the tunnel excavations should pass a sedimentation pond prior to be discharged into the river • Monitor sedimentation pond taking water quality samples both in the dam and downstream the dam in the river. • Runoff water from blasted tunnel material 	MIGA GoV GoL	Contractor	C	ESMP	Contractor's program

Objective	Project Activity (reference to ESMP, REMLRP)	Mitigation/Enhancement/ Environmental and Social Management Plan (ESMP), Restoration and Ethnic Minority Livelihood Restoration Plan (REMLRP)	Standards	Institutional Responsibility	Time- line	Monitoring	Implementati on Route/Plan
		should be controlled with respect to the content of nitrogen and particularly ammonia and pH.					
Control illegal & over fishing	Awareness and enforcement of regulatory conditions	<ul style="list-style-type: none"> Control Illegal fishing and overexploitation upstream and downstream of dam construction site Use posters and signboards/ hoarding boards for controlling excessive and illegal fishing. 	MIGA	Contractor Project	C	ESMP	Contractor's program
4. Adverse Impacts on Social Environment							
Management of sanitation	Health and sanitation	<p>Community Health and Sanitation Plan (CHSP)</p> <p>A health and sanitation program will be developed with the aim of improving health status of communities in the project area.</p> <p>Project will provide all households in the relocation villages with a toilet; support for construction of the toilets with septic systems and flushing mechanisms in other affected villages in the DIA.</p> <p>Project will launch health and sanitation awareness program as a component of 'Awareness Building Plan' in all DIA villages, focusing on water use and treatment practices, pollution of water sources, personal hygiene and households as well as community sanitation.</p>	MIGA	Project	PC C	ESMP	Project through contractor
Provision of drinking water	Health and sanitation	Household water supply will be provided in all the relocated villages with the same type of	MIGA	Project	C	ESMP	Project through

Objective	Project Activity (reference to ESMP, REMLRP)	Mitigation/Enhancement/ Environmental and Social Management Plan (ESMP), Restoration and Ethnic Minority Livelihood Restoration Plan (REMLRP)	Standards	Institutional Responsibility	Time- line	Monitoring	Implementati on Route/Plan
supply		system as in the existing villages, and with a proper filtering system to allow safer drinking water. Project will also support villages losing land in the DIA to develop drinking water systems. Such support will be in form of remediating and augmenting existing drinking water systems. Project will support drinking water quality analysis in villages.					contractor
Managing waste in villages	Health and sanitation	Community waste management Project will support developing simple waste management systems in relocated villages based on the local culture and designed together with the villagers. It would include construction of an open but fenced area for waste disposal outside the village, composting development for organic waste, and organization of community rubbish collection team.	MIGA GoV GoL	Project	C	ESMP	Project through contractor
Reduce pressure on forest resources	Forest conservation	Project will provide support for Improved Cooking Stoves (ICS) in the relocated households that should be included in the house kitchen design	MIGA	Project	C	ESMP	Project through contractor
Availability of emergency medical assistance	Construction, traffic	Project will establish an Emergency Medical Response Unit (EMRU) at the construction site with a medical doctor and trained staff with sufficient medicines for first aid and emergency assistance. See EHSP and Emergency Preparedness and Response Plan .	MIGA GoV GoL	Contractor	C	ESMP	Contractor's program
Labor management	Equal opportunity for	Plan and implement Community and Labor Plan which would include (i) work opportunity	MIGA GoV	Project / contractor	C	ESMP	Project - contractor

Objective	Project Activity (reference to ESMP, REMLRP)	Mitigation/Enhancement/ Environmental and Social Management Plan (ESMP), Restoration and Ethnic Minority Livelihood Restoration Plan (REMLRP)	Standards	Institutional Responsibility	Time- line	Monitoring	Implementati on Route/Plan
	employment	to local people on the basis of capability in construction works on priority basis, emphasis on women on job, (ii) equal wages to man and women on similar job, (iii) separate toilet facility for men and women, (iv) drinking water and health facilities, and (v) general awareness to sexual harassment.	GoL				
STD management	Health improvement	Plan and implement construction workers HIV/AIDS awareness program to reduce the risk of the transfer of the HIV and other STDs between and among the construction personnel and the local communities. See Influx Management Plan .	MIGA GoV GoL	Project / contractor	c	ESMP	Project - contractor
Management of displaced families	Relocation and rehabilitation	The Proponent is responsible for preparing and implementing a Resettlement Action Plan (RAP) for each of the villages that have to be relocated due to the HPP, based on the Resettlement Policy Framework and the entitlement matrix for lost land and assets, provided in the REMLRP .	MIGA GoV GoL	Project	C	Project	Project and state agency at district and commune
Improvement in upland farming system and increase in crop production for enhancing livelihoods	Implementation of upland farming plan	Prepare and implement Upland Farming Diversification Plan, Soil Fertility Enhancement Plan, Animal Husbandry and Veterinary Services Plan and Fisheries Support Plan as components of the REMLRP in the Social Program. Crop diversification and multiple cropping sub-plan will compensate the	MIGA GoV GoL	Project	C	Project	Project and state agency at district and commune

Objective	Project Activity (reference to ESMP, REMLRP)	Mitigation/Enhancement/ Environmental and Social Management Plan (ESMP), Restoration and Ethnic Minority Livelihood Restoration Plan (REMLRP)	Standards	Institutional Responsibility	Time- line	Monitoring	Implementati on Route/Plan
		<p>production losses, enhance productivity, diversify production</p> <ul style="list-style-type: none"> • Capacity building of local community on growing multiple crops, and management of upland farms • Provide seeds, rootstocks, and some fertilizer to participating farmers 					
Improvement in upland farming system and increase in crop production for enhancing livelihoods	Implementation of upland farming plan	<p>Prepare and implement fruit and vegetable production sub-plan on upland farmlands, and at homesteads in all DIA villages. It will compensate for crop production losses, enhance productivity, and provide nutrition to families and some cash from sale</p> <ul style="list-style-type: none"> • Capacity building of local community on growing vegetables and fruits, and cultivation technique • Provide seeds, rootstocks, and fertilizer to participating farmers • Install drip irrigation or sprinkle irrigation on riverbank cultivation. 	MIGA GoV GoL	Project	PC C	Project	Project and state agency at district and commune
Livelihoods improvement of local community	Implementation of upland farming plan	<p>Prepare and implement Bee keeping in all DIA villages, based on available land and interest. It will enhance livelihoods of local community</p> <ul style="list-style-type: none"> • Capacity building of local community on rearing bees, and beehive management of upland farms • Provide beehives, bees and necessary gear to participating farmers 	MIGA GoV GoL	Project	PC C	Project	Project and state agency at district and commune

Objective	Project Activity (reference to ESMP, REMLRP)	Mitigation/Enhancement/ Environmental and Social Management Plan (ESMP), Restoration and Ethnic Minority Livelihood Restoration Plan (REMLRP)	Standards	Institutional Responsibility	Time-line	Monitoring	Implementation Route/Plan
Improvement in Soil productivity for increased crop production	Implementation of Soil Fertility Enhancement Plan	Prepare and implement the soil fertility enhancement plan . Upland soils are degraded and poor in quality. Its components are: (i) growing leguminous crops on upland usually intercropped with maize/cassava, and (ii) Compost making and mulching. <ul style="list-style-type: none"> • Implement this plan on pilot project basis as these are new concepts in ethnic minority. • Awareness raising and capacity building will make local farmers to adopt this technique. • Form groups each with 5 households, and practically train them in compost making • Encourage households to make compost pit in home garden and use all biodegradable residues as compost material. 	MIGA GoV GoL	Project	PC C	Project	Project and state agency at district and commune
Improvement in animal husbandry practices for household nutrition and cash income	Implementation of Animal Husbandry and Veterinary Services Plan	Prepare and implement animal husbandry in all DIA villages: Animal husbandry and Veterinary Services Plan . All kind of livestock is free-ranged and productivity is very low. Emphasis has been given on improving husbandry practices and use of improved breeds of small number of animals: 1) Project will financially support construction of pig sty for 5-6 pigs and a small poultry barn for 15-20 poultry birds to households in DIA villages, which express interest and	MIGA GoV GoL	Project	PC C	Project	Project and state agency at district and commune

Objective	Project Activity (reference to ESMP, REMLRP)	Mitigation/Enhancement/ Environmental and Social Management Plan (ESMP), Restoration and Ethnic Minority Livelihood Restoration Plan (REMLRP)	Standards	Institutional Responsibility	Time- line	Monitoring	Implementati on Route/Plan
		<p>have the basic requirements.</p> <p>2) Farmers would be encouraged to rear hybrid pigs in pig sties (pigpens) and be able to provide appropriate feed for the growth of these hybrid species. Thus managing resources for this would be necessary for the farmers.</p> <p>3) It is suggested to manage poultry at semi-free ranged systems. Few of the households will be persuaded to rear improved poultry.</p> <p>4) Awareness and capacity building would increase adoption of this program.</p> <p>5) As the households will be relocated, the Project will initially supply at least 2-3 pigs and 5-6 chicks to each household as well as some feed as part of the compensatory program.</p>					
		<p>Project will prepare and implement a comprehensive Extension and Veterinary Services program. Capacity, technical and support and knowhow is poor in the districts of the DIA.</p> <p>3 Support to extension service center at commune and district level both in terms of manpower and technology including medicines and vaccines to cater the needs of the DIA villages</p>	MIGA GoV GoL	Project	PC C	Project	Project and state agency at district and commune

Objective	Project Activity (reference to ESMP, REMLRP)	Mitigation/Enhancement/ Environmental and Social Management Plan (ESMP), Restoration and Ethnic Minority Livelihood Restoration Plan (REMLRP)	Standards	Institutional Responsibility	Time- line	Monitoring	Implementati on Route/Plan
		4 Awareness on livestock sanitation and health through pamphlets and other means 5 Training of at least 1 person from each DIA household on animal hygiene and primary treatment, 6 Provide basic tools needed for improved husbandry and treatment to all households involved, shared among households. 7 Basic animal health services, treatments and vaccines, to be provided at no cost, at least until households have established income generating activities (monitoring). 8 Prevention and control of diseases 9 Regular visits and extension services of commune animal health staff to DIA villages					
Operation Phase							
Enhancement /Beneficial Impacts: social, biological and physical							
Livelihoods enhancement of DIA community	Implementing livelihoods plans	Project will implement various livelihoods improvement plans, e.g., upland farming improvement, livestock and health program, bee-keeping	MIGA GoV GoL	Project	C O	Project	Project's program
Increased environmental resources for the use of local community	Improving forests, better riverine wildlife habitat implementing RCMP and	Various catchment protection (RCMP), revegetation and biodiversity conservation management plans implemented in DIA villages	MIGA GoV GoL	Project	C O	Project	Project's program

Objective	Project Activity (reference to ESMP, REMLRP)	Mitigation/Enhancement/ Environmental and Social Management Plan (ESMP), Restoration and Ethnic Minority Livelihood Restoration Plan (REMLRP)	Standards	Institutional Responsibility	Time-line	Monitoring	Implementation Route/Plan
	BEESRP						
Transformation in upland farming	Implementing the REMLRP	Project will implement soil restoration on upland farmland, crop diversification and other related plans in the REMLRP	MIGA GoV GoL	Project	C O	Project	Project's program
Greening of the Safeguard Buffer Zone	Implementing the RCMP	Project will plant trees and other vegetation in the SBZ to maximize a green belt around the reservoir	MIGA GoV GoL	Project	C, O	Project	Project's program
Adverse Impacts: Physical Environment							
Sediment collection and management in the reservoir	Removal of sediment	Remove sediments annually with flushing through bottom gates which are as close as possible to the river bed level to prevent build-up of sediments. A flushing model will be reviewed during design phase. <ul style="list-style-type: none"> • Develop appropriate flushing schedule – flushing should be done in rainy season (See Biology Environment –Fishery). • Install siren system in the low flow area 	GoV GoL	Project	O	Project -	Project's program
Management of water level fluctuation in reservoir	Reservoir shore	Preventive and corrective measures such as check dams, vegetation plantation and bioengineering works will be carried out to control erosion and landslides in the reservoir shore area. <ul style="list-style-type: none"> • Regular monitoring of reservoir shores 	GoV GoL	Project	O	ESMU	Project's program
Adverse Impacts: Biological Environment							
Forest biodiversity conservation & environmental services	Plantation and management in Reservoir catchment area (RCA) including	Continuation of mitigation and enhancement program as mentioned during Construction Phase	MIGA GoV GoL	Project	O	ESMU	Project's program

Objective	Project Activity (reference to ESMP, REMLRP)	Mitigation/Enhancement/ Environmental and Social Management Plan (ESMP), Restoration and Ethnic Minority Livelihood Restoration Plan (REMLRP)	Standards	Institutional Responsibility	Time- line	Monitoring	Implementati on Route/Plan
restoration	SBZ						
Minimizing stress on aquatic life habitat in reservoir and downstream area	Flushing sediments from reservoir	<ul style="list-style-type: none"> All flushing should be done during the onset of the wet season to ensure water availability for aquatic life in reservoir & to minimize stress on aquatic life habitat in downstream area due to high sediment load. Project must increase awareness among affected communities of flushing periods. There needs to be an agreement with cage fish farmers about flushing mechanisms and their impacts. 	GoV GoL	Project	O	ESMU	Project's program
Maintain aquatic life habitat in the immediate downstream area	Release of environmental flow	<ul style="list-style-type: none"> Compensatory release of environmental flow from the dam is recommended to be at least 10% of the monthly average water flow in the low flow season to maintain riverine ecosystems (water flow regime will be worked out during design phase). Lining riverbed on the immediate downstream stretch will be considered. Monitor water availability bimonthly in the low flow period and adjust release of environment flow accordingly. Monitor aquatic habitat at the immediate downstream annually Adaptation of the required flow based on data from downstream users and fish studies. Note that the exact release level may be 	MIGA GoV GoL	Project	O	ESMU	Project's program

Objective	Project Activity (reference to ESMP, REMLRP)	Mitigation/Enhancement/ Environmental and Social Management Plan (ESMP), Restoration and Ethnic Minority Livelihood Restoration Plan (REMLRP)	Standards	Institutional Responsibility	Time- line	Monitoring	Implementati on Route/Plan
		set once the final operation is decided.					
Minimize stress of peaking operation on riverine ecosystems in immediate downstream area	Peaking operation	<ul style="list-style-type: none"> • Peaking operation mechanism and its duration should be worked out in design phase. • Monitor spawning and feeding area, growth of planktons, fish species /population, stranded fish species in immediate downstream area. • Make the local people aware of the peaking releases downstream of the powerhouse for safety purposes. • Install siren warning systems and signboard warnings all along the riverbanks at critical areas about the peaking releases. 	MIGA GoV GoL	Project	O	ESMU	Project's program
Facilitating movement of migratory fish species	Picking fingerlings at the immediate downstream area	<ul style="list-style-type: none"> • Since movement of migratory species already blocked by Ban Ve HPP dam 80 km downstream area, a bypass <i>fish ladder</i> is not a viable option, due to the height of the dam. Fish data indicates that there are populations in the long stretch upstream from Ban Ve HPP dam. • Picking up fingerlings of migratory species at the downstream base of dam and manually transferring to upstream area of the dam may be an option to assure survival of mid- to long-range migratory species, which will be monitored in the fish adaptation study. 	MIGA GoV GoL	Project	O	ESMU	Project's program

Objective	Project Activity (reference to ESMP, REMLRP)	Mitigation/Enhancement/ Environmental and Social Management Plan (ESMP), Restoration and Ethnic Minority Livelihood Restoration Plan (REMLRP)	Standards	Institutional Responsibility	Time-line	Monitoring	Implementation on Route/Plan
Adverse Impacts: Social Environment and Livelihoods							
Improvement in fish resources, livelihoods enhancement	Implementation of Fisheries Support Plan due to loss of river resources	Project will plan Cage Fish Farming in reservoir during the design phase and implement it during operation period. Review experiences in other hydropower reservoirs. <ul style="list-style-type: none"> • An approach may be: form 20 fishermen groups with 5 households each. Each group having 5 fish cages to rear fish • Provide training, technical support, fish cages and fingerlings • Preference should be given to the use of native species of fish 	GoV GoL MIGA	Project in collaboration with district/commune agency	O	ESMU	Project's program
Livelihoods enhancement	Implementation of the REMLRP due to loss of river resources	Plan and implement " Community Fish farming " with the following components: <ul style="list-style-type: none"> • Form 15 community pond groups each having 5 households, provide them training and support on pond fish farming. • 15 community ponds, 10 in reservoir area and 2 in downstream area in the first 5 years. Total grant fund to local community • Each pond of up to 625 m² size with capacity to culture 1,000 fingerlings, assuming production of 625 kg of fishes annually. • Provide fingerlings and fish pellets in the first 2 years. Use fast growing fish species like carp 	GoV GoL MIGA	Project in collaboration with district/commune agency	O	ESMU	Project's program

Timeline: Prior to construction = PC; Construction = C; Operation = O

Table VII. 2 Monitoring matrix for Nam Mo1 HPP

Monitoring Aspect	Monitoring action and indicator	Location	Frequency	Monitoring criteria/indicators	Monitoring schedule PC, C, O	Responsible agency	Compliance (GoV, GoL, MIGA)
Physical							
Water quality	Water sampling	Reservoir, downstream of dam	Monthly, Quarterly or Biannually based on project activity during development. Ad hoc checks as well.	Water quality parameters (e.g., physical and biological)	PC, C, O	Proponent (ESMU) Contractor	GoV, GoL, MIGA)
Air Quality	Air sampling	Major construction sites	Monthly, Quarterly or Biannually based on project activity during development. Ad hoc checks as well.	TSP, PM ₁₀ , SO ₂ , NO _x , CO	PC, C, O	Proponent (ESMU) Contractor	GoV, GoL, MIGA)
Noise Quality	Air sampling	Major construction sites	Monthly, Quarterly or Biannually based on project activity during development.	Noise level	PC, C, O	Proponent (ESMU) Contractor	GoV, GoL, MIGA)
Geological Hazards	Observation	Construction site, reservoir shore, buffer zone, reservoir catchment area, immediate downstream area	Bi-annually, annually	Number of gully erosion, slides, river cutting	PC, C, O	Proponent (ESMU) Contractor	GoV, GoL, MIGA)

Monitoring Aspect	Monitoring action and indicator	Location	Frequency	Monitoring criteria/indicators	Monitoring schedule PC, C, O	Responsible agency	Compliance (GoV, GoL, MIGA)
Hydrology	Measurement	Reservoir, downstream of dam	Monthly, Quarterly or Biannually based on project activity during development.	Sediment load	PC, C,O	Proponent (ESMU) Contractor	GoV, GoL, MIGA)
Major programs /actions							
Effluent discharge	Measurements	Construction camps	Quarterly	pH, Arsenic, BOD, COD, Faecal E-Coli	PC, C,O	Proponent (ESMU) Contractor	GoV, GoL, MIGA)
Waste management	Observation	Permanent site Auxiliary sites	Monthly, Quarterly or Biannually based on project activity during development.	Assessment of Construction waste, solid waste and sanitary waste	PC, C,O	Proponent (ESMU) Contractor	GoV, GoL, MIGA)
Environmental Health and Safety Plan (EHSP)	Observation, interviews	Construction sites	Quarterly	Assessment of plan	C, O	Proponent (ESMU) Contractor	MIGA
Reservoir Catchment Management Plan	Observation, interviews	Reservoir catchment area (RCA)	Quarterly	Assessment of plan	C, O	Proponent (ESMU) Contractor	MIGA
Road and Transport Management Plan	Observation, interviews	Construction sites and	Quarterly	Assessment of plan	C, O	Proponent (ESMU) Contractor	MIGA
Waste Management Plan	Observation, interviews	Construction area	Quarterly	Assessment of plan	C, O	Proponent (ESMU) Contractor	MIGA
Emergency Preparedness and Response	Observation, interviews	Construction area	Quarterly	Assessment of plan	C, O	Proponent (ESMU) Contractor	MIGA

Monitoring Aspect	Monitoring action and indicator	Location	Frequency	Monitoring criteria/indicators	Monitoring schedule PC, C, O	Responsible agency	Compliance (GoV, GoL, MIGA)
Plan							
High Erosion Risk Management	Observation, interviews	Construction area	Quarterly	Assessment of plan	C, O	Proponent (ESMU) Contractor	MIGA
Safeguard buffer zone	Observation, interviews	RCA	Quarterly	Assessment of plan	C, O	Proponent (ESMU)	MIGA
Biological							
Forest vegetation	Observation and measurement	Permanent construction site, auxiliary area, inundation area, SBZ	Quarterly, Annually	Tree/shrub/herb species, tree/pole/sapling/seedling counts, biomass, ethno-botanical status, forest ecosystem services, biodiversity status	PC, C,O	Proponent (ESMU) Contractor	GoV, GoL, MIGA)
Wildlife	Observation	Construction area, SBZ, the whole reservoir catchment area	Quarterly, Annually	Habitat, species distribution, abundance, biodiversity status (only of conservation species), ecosystem services	PC, C,O	Proponent (ESMU) Contractor	GoV, GoL, MIGA)
Fish	Fish catch, Focus Group Discussion	Reservoir, downstream area	Quarterly, Bi-annually	Habitat, species distribution, abundance, biodiversity status	PC, C,O	Proponent (ESMU) Contractor	GoV, GoL, MIGA)
Aquatic life	Measurements	Reservoir, downstream	Quarterly, Bi-annually	Phytoplankton, zooplankton, zoo -	PC, C,O	Proponent (ESMU)	GoV, GoL,

Monitoring Aspect	Monitoring action and indicator	Location	Frequency	Monitoring criteria/indicators	Monitoring schedule PC, C, O	Responsible agency	Compliance (GoV, GoL, MIGA)
		area		benthos		Contractor	MIGA)
Environment services from forests and river/stream	Interview at household level	Forests, river/reservoir, streams	Quarterly and adapted as needed	Vegetation: kind, season, quantity Wildlife: kind, season, quantity	PC, O	Proponent	Information for Project
Biodiversity Enhancement and Environment Services Restoration Plan	Observation, interviews	Reservoir catchment area (RCA), SBZ	Quarterly and adapted as needed	Assessment of plan	C, O	Proponent (ESMU)	MIGA
Endangered species Restoration Plan	Observation, interviews	Reservoir catchment area (RCA), construction sites	Quarterly and adapted as needed	Assessment of plan	C, O	Proponent (ESMU)	MIGA
Fisheries Support Plan	Observation, interviews	Reservoir and DIA villages	Quarterly and adapted as needed	Assessment of plan	C, O	Proponent (ESMU)	MIGA
Social							
Agriculture	Measurements /interview at household level	DIA villages	Quarterly and adapted as needed	Land: land cover under various crops, single crop, multiple crop Crops: types, area, production Disease/pest: Use: Home consumption, feed to	PC, O	Proponent	Information for Project

Monitoring Aspect	Monitoring action and indicator	Location	Frequency	Monitoring criteria/indicators	Monitoring schedule PC, C, O	Responsible agency	Compliance (GoV, GoL, MIGA)
				livestock, sale			
Livestock	Counts at household level	DIA villages	Quarterly and adapted as needed	Livestock kind and their numbers: Cattle, buffaloes, goats, pigs, poultry Diseases: Mortality: no. In one yr Use No.: home consumption, sale	PC, O	Proponent	Information for Project
Demography	Count at household level	DIA villages	Quarterly and adapted as needed	Adult: male/female Children: male/female	PC, O	Proponent	Information for Project
Upland farming Diversification Plan	Observation, interviews	Reservoir catchment area (RCA)	Quarterly and adapted as needed	Assessment of plan	C, O	Proponent (ESMU)	MIGA
Soil Fertility Enhancement Plan	Observation, interviews	Reservoir catchment area (RCA)	Quarterly and adapted as needed	Assessment of plan	C, O	Proponent (ESMU)	MIGA
Animal Husbandry and Veterinary services Plan	Observation, interviews	Reservoir catchment area (RCA)	Quarterly and adapted as needed	Assessment of plan	C, O	Proponent (ESMU)	MIGA

Monitoring Aspect	Monitoring action and indicator	Location	Frequency	Monitoring criteria/indicators	Monitoring schedule PC, C, O	Responsible agency	Compliance (GoV, GoL, MIGA)
Resettlement and Compensation	Assessment of RAP implementation progress	Inundation area and Project Structure and Activity Area	Internal: Monthly & Quarterly, Independent: Bi-annual	Relocation and compensation based on the Entitlement matrix;	PC, C, O	Proponent (SEMD: RLRU) Independent third-party monitoring agency	MIGA, GoV, GoL
Community health and sanitation plan (CHSP)	Assessment of the implementation progress of the programs of the CHSP	Resettlement villages and DIA	Internal: Monthly & Quarterly, Independent: Bi-annual	Number of activities and beneficiaries according to a detailed plan to be prepared by Proponent	PC,C	Proponent (SEMD: ESMP) Independent third-party monitoring agency	MIGA, GoV, GoL
Community labor and employment plan	Employment of local labor in HPP construction	Project construction area	Internal: Monthly & Quarterly, Independent: Bi-annual	Gender separated data on construction workers and paid wages	C	Proponent (SEMD: ESMP) Contractor	GoV, GoL, MIGA
HIV/AIDS, STDs and human trafficking prevention plan	Assessment of the implementation progress of the (i) community program and (ii) construction workers' program	DIA	Internal: Quarterly, Independent: Bi-annual	Number and locality of program information meetings; number of information materials distributed, area of distribution	PC, C	Proponent (SEMD: ESMP) Contractor	MIGA

Monitoring Aspect	Monitoring action and indicator	Location	Frequency	Monitoring criteria/indicators	Monitoring schedule PC, C, O	Responsible agency	Compliance (GoV, GoL, MIGA)
FPIC	Assessment of the Free, Prior and Informed Consent process Grievance Redress Process	DIA	Internal: Quarterly, Independent: Bi-annual	Number and locality of HHs and PAPs consulted, meetings and information disclosure Review the Grievance Redress process. Time taken to address grievances.	PC, C, O	Proponent (SEMD) Independent third-party monitoring agency	MIGA

Note: PC – Pre-construction phase; C-Construction phase; O-Operation phase

GoV – Government of Vietnam; GoL – Government of Lao PDR; MIGA – Multilateral Investment Guarantee Agency

CHAPTER 2. SUMMARY OF MITIGATION, ENHANCEMENT AND SAFEGUARD MEASURES

2.1 General overview

This chapter provides the summary of the mitigation and enhancement measures proposed in the preceding section (Chapter 11, various potential Project impacts). In addition to these safeguard measures, note that part of the impact mitigation process has already taken place during the Project design and optimization phase. As part of the Project optimization process, a number of measures have been taken to minimize the social and ecological footprint of the proposed HPP. For instance, among the alternative locations for the different Project components (dam site, powerhouse location etc.), the technical team has selected optimal locations taking into account multiple criteria (e.g. social, environmental, economic, and bio-physical, etc., See Chapter 4 - Analysis of alternatives).

This chapter provides the details of the mitigation and enhancement measures proposed during the ESIA process. A summary of the measures are provided in Figure VII. 2. The measures listed in the matrix combine and integrate measures across different themes presented below. There are three umbrella programs which encompass thematic plans (see Figure VII. 2).

- Physical Environment Program;
- Biological Environment Program; and
- Social Program

The plans within each programs are listed in the respective sections in this chapter. There is however four plans placed under the Physical Environment Program which span across all programs but may have different degrees of requirement or may not need all the components and these are:

- (a) Reservoir Catchment Management Plan (RCMP)
- (b) Environment, Health and Safety Plan (EHSP)
- (c) Awareness and Capacity Building Plan (ACBP)
- (d) Emergency Preparedness and Response Plan (EPRP)

There is also mitigation measures which are specific and stand-alone actions proposed and these are listed in the sections of concern.

Environment & Social Management Plans

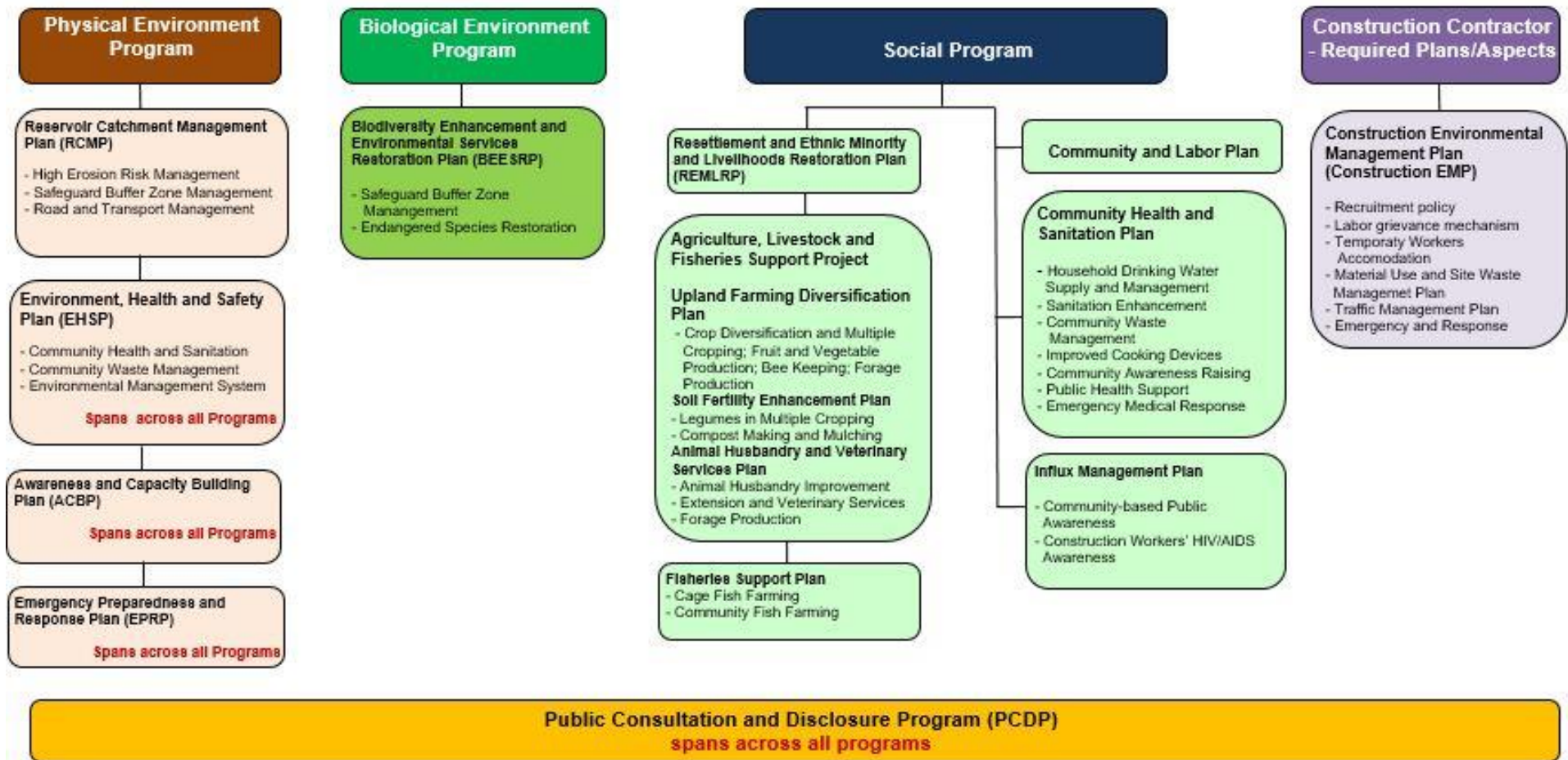


Figure VII. 2. Environmental Social Management Plan

2.2 Physical environment

2.2.1 Land use, degradation, soil erosion and geological hazards

Slope stability and risk assessment techniques for the high risk slopes in the reservoir area are recommended and include modification of slope geometry, drainage, retaining structures and internal slope reinforcement. The mitigation measures are as follows:

- (i) Toe embankments and/or toe buttressing and/or slope angle reduction;
- (ii) Drainage galleries/tunnels and/or sub-horizontal drains to lower groundwater level;
- (iii) Removal of potential slides either by excavation or by triggering them under controlled conditions (e.g. during reservoir filling);
- (iv) Erosion protection measures in the water fluctuation zone (rip rap) and upslope (drainage trenches and vegetation planting); and
- (v) Soil nailing / ground anchors.

The final mitigation techniques chosen will be part of the detailed design phase (pre-construction phase). The above mitigating measures can all be included in a plan. The development and formulation of the Reservoir Catchment Management Plan (RCMP) is highly recommended.

Reservoir Catchment and Management Plan

The maintenance of the stability and integrity of slopes of the reservoir, and the immediate catchment is essential for human safety, upland land-in-use stability, and reducing potential erosions and mass movement. The life of the Nam Mo1 HPP Project is dependent on securing slopes, reducing erosion, and halting to the degree possible, landslides. All mitigation extended to secure slopes and Project construction and other used areas (e.g., auxiliary, roads, labor and construction camps) will directly and indirectly increase security and enhancement to natural resources and arable lands in the immediate vicinity of the Project.

This would foster also wellbeing of local people. All reservoir catchment management will contribute to watershed stability and maintain ecosystem functioning. A sub-plan for roads is also proposed under this plan, the framework of which is provided below. The cost of the slope stability mitigation is included in the Project costs in the feasibility study.

The slopes that need revegetation above the reservoir level are dealt with in the vegetation and forest resources section of this report. In addition, strict regulation of the reservoir level fluctuations and local communities using the land resources have to be taken into account.

The CRMP has key sub-plans and salient features are given below:

High Erosion Risk Management Sub-plan

The RCMP will be securing the Safeguard Buffer Zone (SBZ) and all areas identified as 'erosion risk area'. In addition, it will include measures to increase landscape stability. Forest management, protection and planting should follow established practices based on the experiences of similar conditions. Compensatory planting is also included as part of this plan. The Project proposes the reservoir catchment area to be mapped and identified for its vulnerability during detailed design phase.

Safeguard Buffer Zone Management Subplan

The concept of a safeguard buffer is to make the area completely vegetated (covered with forest) maintaining vegetation at different strata so that it will function to reduce erosion, and infiltrate sediments before water is discharged into the reservoir. The proposed SBZ has secondary mixed evergreen and deciduous forest, secondary scrub, mixed broadleaf and bamboo, grassland, cultivated and uncultivated fallow land, rocky areas and streams. Currently, it is over exploited for grazing, collecting food materials and hunting for rodents, birds, lizards and amphibians for home consumption.

'Greening' the safeguard buffer zone and safeguarding high risk erosion areas.

The safeguard buffer covering an additional 50m elevation and contouring above 235 - 285masl full supply level of the reservoir has been mapped for land cover but not for soil erosions and vulnerability status. In order to ensure safety from the reservoir to local people and to protect the reservoir shoreline (catchment stability) through planting forests (afforestation and reforestation including fodder and fruit trees and other vegetation used by local community. The Project has proposed to maintain a buffer area between settlements and the upper contour of SBZ (285m). This strip is recommended to be 50m with the understanding that it will be jagged as it can be significantly narrower in rocky areas (where no protection is needed) and in stable forest areas but can include the adjoining high risk soil erosion area. The latter may increase the width of the buffer strip to secure slopes to decrease sediments in the reservoir and enhance safety.

To reduce the erosion risks and sediment flow to the river, upland cultivation on slopes inside SBZ will not be allowed, however, riverbank cultivation on more favorable slopes could be practiced with clearance and allowance from the commune authorities. Grazing will have to be stopped but the non-timber forest products and small size wildlife like rodents, birds, lizards, frogs and similar species could be harvested in a sustainable manner for home consumption since this is related to livelihoods of the ethnic minorities. Similar to Protection Forest, the SBZ could be managed by a group of local community.

The SBZ is therefore proposed as a 'green' belt of the Project/reservoir to enhance catchment stability (reduce erosion and landslides) and thus function to provide ecosystem services (e.g., forest products, soil stability, nutrient retention, carbon storage).

Road and Transport Management Subplan

One of the potential impact of the Project is road traffic and safety especially those associated with heavy vehicle movements along the transport corridors. The Project will require widening of roads, strengthening of bridges, special slope stabilization and erosion measures, special warning systems, land acquisition, and fulfillment of national requirements, and acceptance by and interaction with the national road authorities, some of which has already been considered in the FS, and details will be worked up in the detailed design. In addition and importantly, the issue of the loss of connectivity and its mitigation has to be included. It is recommended that a bespoke transport plan be commissioned for the Project at the detailed design phase looking at logistics and engineering requirements of the Project, and assessing environmental and social impacts, as appropriate.

Vehicle movement during the construction phase in connection to spoil disposal activities, machinery movement within the Project Direct Impact Area (DIA) can be harmful to local populations and domestic/wild animals. Potential impacts of such traffic have been addressed in this ESIA in the respective sections. Precise impacts and detailed mitigation measures, however, are not possible to delineate at this time due to the fact that the final planning and alignment of roads is not complete. However a framework for a road plan is suggested below.

A sub-plan for the planned roads within the RCMP should be formulated after the road alignments are finalized. A framework for the development of such a sub-plan is provided here. The plan should include guidelines for integrating environmental considerations into constructing and maintaining roads supported by the Project as good engineering practice. The guidelines will be included in all contractor's bidding documents and operating contracts. The guidelines will cover all aspects of road construction, such as (i) clearing and grubbing; (ii) roadway excavation; (iii) channel excavation; (iv) excavation and backfill of structures; (v) embankment; (vi) sub-base and base; (vii) pavements; (viii) drainage, pipes, and outlets; (ix) grassed areas; (x) slope protection; and (xi) mortared stonework. In addition the guidelines describe the maintenance and environmental management required in relation to roads, including monitoring needs.

Excavation of roads in steep sides with soft soil leaves large areas of denuded soil open for rain and water erosion. This problem applies to the inner side of the roads with the drain ditch, the road itself and the outward facing of the road. Even for temporary roads, this will create wounds in the terrain that will slide and erode during the construction period if no stabilization is done. The construction of roads, and permanent and temporary housings and camps should begin at the onset of the dry season with the excavating and bulldozing. Before the wet season starts, the road sides should be sowed with grass.

The road ditch should be lined in erosion prone areas. The water in the road ditch should be released into existing brooks/streams. The road ditch should be released as often as possible, i.e. wherever there is a natural brook/flood brook. Road ditch outlets should not be allowed to be discharged into places where there has been no waterway before. If this is necessary in some places, relevant enforcements should be made to prevent erosion.

All road construction (access roads and broadening of roads) will require similar procedures adjusted to the specific sites. The permanent roads and sites should be paved as soon as possible after the construction. The team responsible for this should work out a strategy for structured procedures for bio-engineering and revegetation allowing for adjustment based on site specifics. Parking lots, camp areas and construction sites should be subjected to the same mitigation measures as recommended for roads.

2.2.2 Hydrology, sediments and reservoir

Mitigations presented here are for the Operation phase:

2.2.2.1 Reduction of sediment inflow

At present it seems the most realistic place candidate for check dams etc. is the tributaries of Nam Mo River. Check dams here, if properly constructed may trap some of the heavy bed load in the streams. Yet it has to be verified that the cost is reasonable when measured against the benefits / sediment volume that is trapped. The local sediment load from its tributaries has not been assessed at this stage.

2.2.2.2 Flushing

It is suggested to remove sediments annually with flushing through bottom gates which are as close as possible to the river bed level to prevent build-up of sediments. Flushing may be performed at beginning of the monsoon season, when reservoir is drawn down and when pre-monsoon floods with initially high sediment loads can be used to flush sediments.

A large majority of the incoming sediments can be flushed within approximately one week during a normal year, provided there are low level flushing gates with sufficient capacity. Also in years with substantially higher sediment load it will be possible to remove nearly all incoming sediment. Most of the time, water will be used to flush the last few percent of sediment which are coarse gravel and stones and which require high discharge / high energy gradient to be mobilized. The time required for flushing will therefore depend how much of the reservoir volume one will maintain.

2.2.3 Air, water and noise

See section on Community Health and Sanitation (Section 2.4.2.1) where mitigation includes these components.

2.2.4 Seismic hazards

As part of further studies, possible mitigation measures should be considered. Measures that should be in place must include procedures for evacuation as part of the Project's Environmental Health and Safety Plan (EHSP), which must be finalized before the construction period.

Environmental, Health and Safety Plan (EHSP)

This plan spans across all programs and sectors of the Project. Health and safety is a key issue seen from both an occupational and local public perspective. The EHSP should be made in compliance with MIGA Performance Standards and national requirements. This plan should be formulated during the pre-construction stage.

The plan must include, among others: (i) setting the EHS policies and requirements for the Project covering all components of the Project (including project activity areas and workers, vehicle usage, dam and road safety, waste, visitors and local people in the Project DIA, etc); (ii) training local persons; (iii) ensuring subcontractors complete work to international standards; (iv) develop processes and mechanisms for increasing environmental, health and safety awareness working across the Project's programs and plans; (v) assisting the corporate office with any other environmental, social, health or safety problems and coordinate across other plans of the Project (e.g. Community Health and Sanitation Plan, Community Waste Management Sub-plan, etc); (vi) include or coordinate with the risk/hazard and warning plans, and evacuation planning groups of the Project; (vii) cover all safety measures for the Project and (ix) have regular drills (four times a year) and provision of information to workers and the public.

The Project is expected to adopt an Environment and Social Management System (ESMS) as part of the EHSP in line with international practice which will include, but not limited to, the following key components,: (1). increase the environmental awareness of all employees (see also the Awareness and Capacity Building Plan (ACBP) below); (2). train employees, especially the environmental manager and the section heads; (3). establish procedures within the company for recording, monitoring and reducing pollutants emitted in the atmosphere and water, as well as for improving the handling of toxic waste and hazardous materials; (4). elaborate emergency plans and issue relevant instructions.

The EHSP should ensure that the contractors and sub-contractors carry out their work in accordance with the environmental, labor and safety policies and commitments of the company, and comply with applicable Vietnam and international requirements. Thus the plan should also build on awareness campaigns and modes established in the ACBP.

Community Waste Management Subplan

The Community Waste Management Plan (WMP) will identify key sources and types of wastes and the expected management of Project wastes streams, which can be a subplan under EHSP. The construction and subsequent operation of the Project has the potential to create several impacts resulting from the management of wastes (e.g., water quality, sanitation),

The principal materials for construction include excavated materials, cement and steel. The exact quantities of materials will need to be calculated during the detailed design. There would also so be number of other materials such as paint, lubricants plastics and timber, among others. The 1750 estimated construction employees will also generate solid and liquid wastes and need to be managed.

The WMP will identify predicted waste stream streams, appropriate handling, reuse and recycle opportunities and as a last resort, disposal. The WMP will be prepared in accordance with Vietnam's regulations and international best practices.

Awareness and Capacity Building Plan (ACBP)

The Awareness and Capacity Building Plan (ACBP) is a Plan that can span across the different environmental programs. Capacity can be defined as the ability of individuals and organizations to perform functions effectively, efficiently and sustainably. Capacity building, or rather capacity development, should be a dynamic process building upon an existing capacity base. Human resources and the way in which they are utilized are central to capacity development, as is the overall context within which organizations undertake their functions. All plans proposed in this ESIA will require the advice of experts, authorities and the training of the stakeholders, especially those directly involved in a particular mitigation or enhancement measures. The degree to which this will be required will need an assessment when each plan is drawn out. All stakeholders, including

those not directly involved in mitigation measures, must be kept aware of measures implemented in the Project. More importantly awareness on programs and plans in the ESIA has to be done as proposed in the PCDP. Awareness will also include all protocols and guidelines outlined in the EHSP and awareness campaigns will have to be carried out throughout the life of the Project, with higher frequency during the construction phase. Such campaigns will include among others, for example: road safety; pollution and sanitation; forest and wildlife enhancement; warning systems and drills; etc. Local communities are vulnerable and need to be prioritized in the campaigns through the use of modes of communication that can be easily understood and those that are practical. Where relevant this plan is elaborated upon in the thematic sections.

2.3 Biological environment

2.3.1 Vegetation and forest resources

The impacts during Project construction and operation phases have been assessed in the preceding chapter and came up with the following appropriate mitigation measures. The timing for implementation of the proposed measures is categorically specified as far as it is practicable. Project impacts, mitigation measures, organization responsible for implementation in the environmental and social management matrix. Mitigation actions/measures presented below are elaborated in the environmental mitigation matrix and ESMP as well.

The mitigation and enhancement for forest and wildlife placed in a Biological Environmental Program will include the following plans:

- Reservoir Catchment Management Plan(RCMP)
- Biodiversity Enhancement and Environmental Services Restoration Plan (BCESRP)
- Awareness and Capacity Building Plan (ACBP)

2.3.1.1 Pre-construction Phase

Control damage to standing trees and ground vegetation

Forest surveys and inventory work carried out in forests require alignments to be cleared to maintain good sight and visibility between the pegging points and this implies removal of obstructing tree branches and clearing of shrubs. Chances are the forest survey teams may chop down saplings and branches of trees for the making of pegs and trees. Trees are marked by chopping the bark to denote locations and counted numbers. This practice should avoid unnecessary damage to saplings, shrubs and trees.

2.3.1.2 Construction Phase

The following mitigation measures are to be considered and developed as part of the RCMP (See RCMP). Relevant aspects are also included under the next section on wildlife and birds.

(a) Re-consideration of Project sites to reduce loss of forest areas

The primary impact of the Project is the loss of 24.2ha of lands permanently due to construction of dam, powerhouse and permanent housing and structures. Another 55ha will be lost temporarily due to forest areas used for camp sites and establishment of other facilities in auxiliary area. The reservoir will occupy about 962ha. These are secondary forests, scrubs and grasslands, and thus the biodiversity loss would be minimal. The Project does not see any alternatives for land areas for the construction of reservoir, dam and other structures and activities in the planned areas. The impact is largely consolidated along one stretch of the river.

(b) Discourage clear felling

The quality of land in auxiliary areas will depreciate after the construction work and regeneration will take time. Particularly, the forest lands temporarily used will result in permanent loss of vegetation cover and plants. It is recommended that where possible

pole size to matured trees are left. A conscious choice to leave trees where possible would also add to the general greening atmosphere of workers camps, permanent and temporary work areas.

(c) Management of felled trees and areas used for temporary and permanent areas

The total biomass estimated in the main work area (dam, powerhouse, permanent constructions) and auxiliary area is 21,397MT. As the area has disturbed secondary forest, wood standing biomass and yield is low, and is approximately 50-60% of the total biomass. Project laborers and contractors residing in and around the forest areas may cut trees for various reasons – including cooking and heating in winter. The Project workforce is estimated to be about 1,750 persons during the peak period and approximately 750 workers will be residing all year round and these would require almost 450MT of fuel wood per year for cooking daily. Alternative sources must be used for cooking and heating in the project areas – no wood must be used.

(d) Safeguard Buffer Zone Management

See RCMP

(e) Implementing forest management practices

Managing forests can function as a preventive as well as remedial measure to the Project's impact on the existing forests. Management of forests is required to not only protect the forest resources but also to supply forest products in a sustainable manner to the users. The Project shall contribute to improvement and management of this forest area. A forest management plan should be made with the GoV institutions so that pressure of existing forests in the project Area of Influence (AI) are not further deteriorated. It is proposed that this forest management plan will focus on enhancement of biodiversity and restore environmental services.

Biodiversity Enhancement and Environmental Services Restoration Plan (BEESRP)

The main objective of Biodiversity Enhancement and Environmental Services Restoration Plan (BEESRP) is to protect forests and conserve biodiversity in an effective manner, with the active participation of local communities and enhance the contribution of environmental services from forests. This plan is elaborated in key subplans:

Forest Management Subplan

The Project has proposed plantation (revegetation) in the permanently acquired area in dam site /powerhouse and other facility areas and maintaining the area with vegetation on using a landscape approach.

The Proponent will prioritize the greening of the safeguard buffer and adjoining areas through carrying out afforestation or reforestation and enrichment plantation. The buffer area covers 559ha out of which 248ha is scrub and grasslands with few shrubs and other non-woody plants and this degraded area could be available for plantation. Besides, vegetation enrichment could be done in buffer area between settlement and buffer zone. In the DIA villages, local communities largely depend on forests for leafy vegetables, mushroom/fungi, bamboo shoots, roots, etc., for their daily consumption. In the plantation area emphasis should be given to include species which can be used by the local people as food. This would encourage local community to participate in forest protection and management.

(b) Forest protection

During construction of the Project, forests in the adjoining area of campsites would be overused by workforce for fuelwood and other uses such as temporary construction. It is difficult to check as project staff and camp followers themselves, may be involved in such activities. The Project shall seek ways to ensure that forests are not overexploited. The Forest Management subplan must include awareness on avoidance of deforestation, wood collection for fuel use and forest area designations (e.g., protection forests which the local communities are assigned to manage by the commune/province).

(c) Management of forest fire hazards

Incidences of forest fires may occur due to workforce or local communities. The Project shall implement code of conduct and organize orientation programs to its workforce and supervisors on regular basis. This should be included in the Forest Management Subplan.

Endangered Species Restoration Subplan

(a) Relocation of Protected Plant species

Drynaria fortunei, (Gu Sui Bu) an epiphytic medicinal herb species listed as endangered species and *Hopea mollissima*, endemic to Vietnam and Yunan – China, naturally growing in the Evergreen Rainforest are listed in the IUCN and Vietnam red list. Both are heavily exploited for their uses. Impacts on these plant species shall be mitigated by relocating them in the SBZ before felling activities begin in the reservoir. There are continuous belts of forested areas extending from the proposed inundation area to the SBZ which can also be areas where the above species may be relocated. Saplings of the hardwood species are likely to survive replanting as the trees are not possible or costly to replant. These species in the non-affected areas should be protected and awareness of their conservation status be made known to communities, contractors and Project workers. A species plan for relocation of protection plant species and their monitoring should be made and implemented.

Awareness and Capacity Building Plan (ACBP)

See also the main description of ACBP. In the Project DIA, like most parts of upland landscape in Vietnam and Laos, forests serve as the key pillar for the provision and maintenance of ecosystem services. Forest resources are the major source of food for the family (vegetation and small size wild animals e.g. rodents, birds, reptiles and amphibians), medicinal plants and fungi, household energy, construction and other uses, forage for their ruminants, and household economy to sell small size wild animals. Forest catchment area serves as the main source of water used for hydroelectricity power generation and domestic consumption. Despite these benefits, forest resources are exploited and subject to human - caused fires, illegal felling and extract valuable plants for trading.

The reservoir catchment is important nationally in terms of electricity generation and locally as an important source of providing materials for their livelihoods. Therefore its protection, management and sustainable use is primary.

The ACBP will serve to increase awareness of forest protection and management policies, and benefits of reforestation, develop materials for publicity on forest, land and biodiversity enhancement and land (soil) protection in the Project affected areas and in the reservoir catchment in general. The Project will provide funds for producing posters and pamphlets.

2.3.1.3 Operation Phase

Forest protection and management

With the completion of Project construction works, most of the workforce will leave for their respective places and there remain small numbers of skilled man power. They will stay mainly for the maintenance and operation of the Project. Obviously, less pressure on the forest environment is expected during Project operation phase. The Project will continue forest re-vegetation and greening in critical areas in SBZ and high risk erosion areas. This will be a regular work continued at least five years of the operation phase.

2.3.2 Wildlife and birds

2.3.2.1 Construction phase

RCMP, SBZ Management Subplan and BEERSP

The same measures proposed under the section above on forest vegetation are relevant to the mitigation measures for wildlife and birds. To minimize the habitat loss, trees which are not felled need to be protected from logging especially in the SBZ. Native tree species should be prioritized in reforestation regimes. There are no large wild mammals in the Project AI and surrounding forests, however, the reservoir catchment area serves as a good habitat for small mammals like rodent species, bat species and reptiles. The above programs would improve the quality of wildlife habitat and will include the following features:

(a) Establishment of wildlife habitat

Protection of safeguard buffer zone and adjoining areas in the reservoir catchment will improve habitat quality. The approximately 33km (x2) long SBZ and the adjoining riverine area would provide a habitat for small mammals, bat species, reptiles, amphibians and bird species.

(b) Enforcement of laws

Local communities and workers are to be made aware about the regulations for endangered and vulnerable species and conservations needs. Related information about rules and regulations about wildlife killing/hunting must be displayed in several areas. Where possible, disturbance to wild animals and birds must be avoided.

ACBP

During construction phase, blasting, drilling, heavy vehicle movement and high sound would interrupt normal movement, feeding and other activities of mammals and birds leading to their temporary displacement, and there is high potential for illegal hunting, trapping, poaching for food and trading.

The following aspects are proposed for inclusion into the ACBP. See also the main description of the ACBP.

(a) Production of awareness posters and pamphlets.

General awareness posters and pamphlets enhancement of wildlife species will be published and distributed to the construction workers and to the local community. People support unknowingly in illegal hunting practices due to lack of knowledge of the legal provisions. Such illegal hunting practices need to be informed to local people, workers, contractors and the Project staff. Awareness poster will provide educational information for minimizing negative impacts on wild animals during the Project construction.

(b) Training to local contractors, supervisors and labor force.

Local contractors, supervisors and even followers can influence on local labor force. Training manuals need to be developed for local contractors, supervisors and labor force about existing rules and regulations, importance of biodiversity enhancement, threats to wild fauna and vegetation (trees), responsibility of project implementing agencies, institutes and individuals.

(c) Local people's participation in enhancement

Without active participation of local people, wildlife enhancement is not possible. Formation of biodiversity enhancement groups from different Project impact families and dissemination of information about value of biodiversity and related ecosystem services will help in further participatory management in the area.

2.3.2.2 Operation phase

RCMP and SBZ Management, BEERSP and Endangered Species Restoration Sub-plan

The same measures proposed under the section above on forest vegetation and construction phase are relevant to the mitigation measures for wildlife and birds during the operation phase. Additional specific actions are listed below:

(a) Awareness and environmental protection

The programs set-up by the ESMU during the construction should be continued although the awareness campaigns can be reduced in number, and training would consist mainly of renewing knowledge bases and reviewing experiences to include in on-going programs.

(b) Regular monitoring on migratory birds

The formation of dams may serve as a favorable habitat for waterfowls and migratory wetland birds. Regular monitoring and seasonal counting of birds would be an essential contribution on the census information on migratory birds of global significance.

2.3.3 Aquatic ecology and fisheries

2.3.3.1 Construction phase

RCMP

Most of the impacts in this Project affecting the aquatic environment, impact the whole freshwater ecosystem. For example, increased erosion will affect water quality, increasing turbidity and reducing visibility. The increased amounts of sediments can change the habitat quality, impacting both macro invertebrates and fish. Reduced visibility will normally reduce primary production (algae and planktons) affecting the invertebrates and fish, thus eventually fishery activities. Water quality issues are also dealt with under the EHSP, and the section on the Social and Cultural Environment Program.

See sections under the Physical Environment Program, the RCMP covering erosion, ACBP and the EHSP. The RCMP will manage the following:

(a) Erosion in the reservoir – vegetation removal

To avoid erosion in the reservoir area, clearance of woody vegetation from the inundation zone prior to flooding (nutrient removal) should be carried out as well as weed control measures should be taken. In similar lines, sedimentation in the reservoir and subsequent loss of storage capacity may be minimized by control of land use in the watershed (especially prevention of conversion of forests to agriculture). These require reforestation and/or soil enhancement activities in watersheds coupled with the hydraulic removal of sediments (flushing, sluicing, release of density currents) and the operation of reservoir to minimize sedimentation (which can entail loss of power benefits).

(b) Runoff from tunnel blasting and tunnel drilling and sediment deposits

The water from the tunnel excavation performed either by blasting or full profile drilling, should pass a sedimentation pond prior to be discharged into the river, if the pressure is expected to be very high.

In the low flow period, the sedimentation pond should be monitored with respect to ammonium, free ammonia and pH. If necessary, pH should be adjusted to neutrality before any discharge into the river. In the wet season, the ammonia discharge will not harm the river biota.

In the first period after a major tunnel and hydropower construction work, the spoil rock deposit is normally used for construction purposes, filling material for road construction, quarries, etc. After some years they are abandoned, and should be closed in a proper way. To prevent impact on water environment, the location, water handling and the final rehabilitation are necessary. The sites for the soil and spoil deposits should be strategically positioned to avoid runoff directly in the river, and provide lining, if necessary.

Location and water handling. The deposits should not be placed in steep terrain. The best location would be in natural depression with infiltration outlet. Such depressions are, however, not always easy to find in the terrain near the construction area. The second best would be to place the spoil rock deposit in a flat area with little runoff (i.e. upstream catchment) and with good infiltration capacities (sandy soils). If the deposits are placed in a valley-like depression, incoming water shall be drained through by a pipeline of necessary capacity to safely by-pass storm runoff. Downstream of the deposits, a sedimentation pond to settle out as much as possible of the eroded particles should be constructed. The drainage from areas upstream of the deposit shall by-pass the

sedimentation basin. If possible the runoff from the spoil rock deposit should be infiltrated in the terrain.

Runoff from blasted tunnel material shall be controlled with respect to the content of nitrogen and particularly ammonia and pH. Water with high concentration of ammonia and high pH can cause fish kills in low flow periods. In such cases, the pH in the sedimentation pond shall be adjusted to neutrality before released from the pond.

Final rehabilitation of the spoil rock deposit. When there is no more use of the spoil rock, the deposit should be leveled and formed into nature-looking terrain and covered by vegetation. Deposits with material from full profile drilling can often be sowed and planted directly, while material from blasted tunnels must be covered by fertile top soil.

The top soil, gravel and soil from the tunnel ideally need to be separately deposited. Upon spoil deposition, top soil needs to spread unto the spoil material, and a multilayered technique ought to be used. This will allow roots of trees to reach and proliferate into rich soil zones within the spoil, thus increasing anchorage and overall stability of the spoil. Most of the top soil must be placed on top. Planting of tree species needs to be done immediately at edges and grass lines on contours. Open flat areas of the spoil deposits where top soil is deposited, should be immediately made available to the local people for agricultural practices of agro-forestry. It is vital that the rehabilitated areas is not open for grazing until all vegetation is established, six years minimum, as this will result in spoil slope weakening.

EHSP

See also the main description of this plan in the section on Physical Environment Program The following measures must be included in the EHSP.

(a) Sanitary effluents from the construction workers camp

During the construction phase there will be much activity at the different construction sites. There will partly be residential camps for construction workers, administration buildings, workshops, machine parks etc., as mentioned above. At these sites there have to be built sanitary systems with no direct discharge to the river. If possible, the camps shall be placed in areas with good infiltration capacity. In such areas standard pit latrines may prevent hygienic pollution to enter the river.

(b) Oil and chemical spill

During construction there will be a large park of machineries such as trucks, tractors, excavators, bulldozers, drilling machines, cars, etc. These will need diesel and gasoline, motor oil, hydraulic oil, battery acids, etc. Storage places for such chemicals must be established in secure areas where such compounds cannot enter the Ca river. The storage and fuel filling shall take place on paved area, which is water-tightly drained to a collecting tank in case of accident spills. Workshop floors shall be drained to a collecting tank from where the content can be removed and correctly treated. Parking areas shall consist of loose material with infiltration capacity which can absorb small spills. Such area shall be constructed of stones, gravel, sand and silt.

(c) Accidental water releases and dry-ups – testing and warning systems

The functioning of the spillway gates shall be tested out properly with respect to both opening and closing before filling the reservoir. A flood warning system to people living downstream the dam and the outlet of the power plant construction site shall be established. The initial filling of the reservoir is suggested to be done only in the wet season with bypass of at least of the proposed environmental flow. It is important that the river is not dry.

2.3.3.2 Operation phase

(a) Proper design of spillway or addition of structures to favor degassing

One of the problems of taking water from deep in the reservoir might be the super saturation of gasses in the deeper levels. If these gasses are not released before the water is in contact aquatic life – gas sickness will result. The design of the spillway, therefore, should be constructed to avoid these problems. The same problem might arise

if water for the minimum flow is taken from the bottom of the reservoir. Taking the water from this level will also involve a risk for toxic water and low water temperature. The final design and operation should take into account the above issues.

(ii) Compensatory environmental flow

Releasing of water flow for environmental requirements and downstream users is a new concept in Vietnam. There is no regulatory requirement for environmental release, however most of the large dams had a provision for releasing 10 % of the average minimum flow for ecosystem and social needs.

A minimum average monthly flow increasing down the river course of the dam would be required. This discharge from an ecological perspective must consider that it is sufficient for the maintenance of adequate wetness conditions to support the ecosystems that may exist in the boulder bed river, riparian vegetation, water resources, and fisheries. Provision shall thus be made to release such quantum of water which is able to sustain fish and local use of the river.

The fish and river use activities as such should be monitored and if the findings reveal that the recommended release is not adequate, the operator should be willing to adjust the minimum environmental flow. Thus an adaptive approach should be taken in the long run. Any adjustment to the environmental flow after 3-5 years of monitoring should reflect the building blocks (low flows, channel flushing, habitat maintenance and spawning/migration freshest).

(iii) Evaluating the building of a bypass system for fish at the dam

There are three species, *Anguilla mamorata*, *Bagarius rutilus* and *Hemibagrus guttatus*, listed as "Vulnerable" according to the Vietnam Red Data Book (2007). They are medium to long -range migratory species and they have already been impacted by Nam Mo, Nam Cun and Ban Ang dams constructed downstream; their migratory route has already been obstructed. Most other species found are residents and these resident species are known to undertake short distant migration within stretches of the river. In the case of Nam Mo1 HPP the likelihood that a bypass system like a fish ladder will work are remote. Consideration of screen as discussed below should be considered.

(iv) Consideration of a screen in front of the intake in the dam

One of the main risks of fish mortality occurs during the downstream migration phase of migratory fish species since all or a large part of the river flow is diverted through the turbines. Also fish that live in the reservoir meet the risk of being lost in the intake. Various techniques exist to prevent this, like fine meshed screens across the turbine inlets. This technique is however most effective if the fishes are diverted back to the river, e.g. if not all the water is diverted through the turbines. Furthermore, these screens impose a heavy maintenance burden that can reduce electric production. Thus there are alternatives to traditional fish screens like acoustic, louvre, bubble or electric screens that are considered in various places. Even if the dam design cannot allow for the fish to migrate downstream with the help of the screen system, it can be of considerable help to avoid the fish populations living in the reservoir to be caught in the intake. This has to be looked into during the design phase.

(v) Fish Adaptation Study

The three species, *Anguilla mamorata*, *Hemibagrus guttatus*, *Bagarius rutilus*, listed as "Vulnerable" according to the Vietnam Red Data Book (2007) are medium to long -range migratory species and they have already been impacted by Nam Mo, Nam Cun and Ban Ang dams constructed downstream; i.e., their migratory route has already been obstructed. These fish were reported from the river during the sampling reported in this ESIA pointing to their continued presence and likely adaptation. There were 80 fish species appear to inhabit the river system. Thus, there are several other fish which are already perceived to be adapted to the reservoir environment of the downstream dams especially to its length. Similarly the Nam Mo1 HPP may be expected to allow for adaptation of many of the fish species. It has to be noted that long-distant migrants are likely to disappear eventually due to the lack of stage of sea-water life-stage, if highly

dependent on having this stage. A study is proposed to monitor fish species diversity and populations in the Nam Mo1 reservoir and downstream stretches.

(vi) Mitigation against peaking

The daily peaking activity will degrade aquatic life, fish and fishery and be a risk to people, especially children downstream the outlet of the power plant.

(vii) Starting the peaking for the first time

Experiences from other peaking operations, shows that the first peaking operations should be gentler both in volume and have a long up and down peaking time. This gives especially the fish a possibility to adapt the rapid and high changes coming.

EHSP

The EHSP should include full guidelines for the set-up of a system for early warning of floods, spillway releases from the outlet and downstream the dam as well as rapid changes in water quality which can affect people and animals. The warning system should be based on direct warning from the operation staff at the Nam Mo1 HPP station to the people living along the Nam Mo river. This system could be based on battery/solar cell-operated sirens with wireless transmission.

(viii) Fish stocking programs

A common course is to promote aquaculture as mitigation. In many cases aquaculture actually exacerbates biodiversity losses, for example by introduction of exotic species which affect indigenous species negatively. Proper controls are advised through monitoring. A fisheries support programs and is part of the overall livelihoods restoration initiative is recommended and is detailed below:

Fisheries Support Plan (FSP)

This plan has two subplans to elaborate a more detailed approach.

Cage Fish Farming Sub-plan

Introducing fish cages in the reservoir face some of the same problems regarding exotic species as in dam projects. However by using fish cages the risk of escaping and introducing new species and possibly fish sicknesses in the river ecosystem is even higher than in fish dams. We therefore strongly recommend using local fish species because in many cases aquaculture actually exacerbates biodiversity losses, by affecting indigenous species negatively.

Big size fish species, with rapid growth and feed on planktons are used in cage fish culture. In Vietnam, cage fish culture in dams is common. During the construction phase which is assumed to take five years, a more close investigation should be done to evaluate the risk of using exotic species, and to evaluate new equipment that in a higher degree than what seems to be available today, can give a higher guarantee against escapes. Because of the high daily and yearly fluctuations of the water level and the flushing of the reservoir once a year the effect of this mitigation is somewhat uncertain. The recommendation is to start carefully with not more than 10 fishermen, each using five cages.

Community Fish Farming Sub-Plan

In all sections of the Project AI there is expected loss in fish production which will negatively affect the outcome for the fishermen. In some DIA villages, households have built fish ponds and are raising carp and other native species stocked from the river. This seems to work well. The experiences gained in by these farmers will be used as mitigation in the Nam Mo1 HPP.

From an ecological point of view, we strongly recommend using local fish species because in many cases aquaculture actually exacerbates biodiversity losses, for example by introduction of exotic species which affect indigenous species negatively and are virtually impossible to eradicate once established. Fingerlings are available outside the DIA area. Feeding fish pellets would provide a reasonable growth.

ACBP

Given that the water flow will be reduced substantially in the low flow season, the risk of over fishing and use of illegal fishing methods may increase. Similarly, during construction phase over fishing is expected. This may be managed through establishing controls and increasing awareness. An awareness programs dealing with over fishing and use of illegal fishing methods as well as other threats to the environment should be worked out. Workers, permanent and non-permanent technical project staff, project administrators, local people, children, district and local level Government personnel should be well informed.

2.4 Social environment**2.4.1 Agriculture improvement**

The loss of land and properties, and the displacement of population from their settlement areas are probably among the major social and cultural impacts of the Nam Mo1 HPP. Livelihoods of the local communities comprising mostly of ethnic minority population depend upon forest and water resources, and land resources in the form of upland farming. Forests provide the much needed food items like vegetables, materials for household energy, construction and other use, and animal protein through small mammals, lizards and amphibians for home consumption. River resources provide animal protein. Both these resources are helpful in generating some cash to maintain households through sale of small mammals and rodents. Livestock is another source providing animal protein and cash through the sale of live animals, but disease outbreaks cause immense loss. Agriculture in the form of swidden systems is influenced by weather patterns and poor soil quality, provides rice as a staple food, and maize and cassava for livestock feeding and some sale, however, rice production is not sufficient all year round for the many poor families. Farming practices are traditional and subsistence oriented, and all livestock are free-ranged; uncontrolled disease outbreaks cause immense loss to livestock. The ethnic minorities have little to no access to agricultural extension services of district or commune agencies, and moreover the local extension technical staff have poor technical capacity to manage livestock diseases.

In the context of Nam Mo1 HPP, the local community though resettled in new location, will not loss all their upland farming area. However, the loss of 765ha forests in the reservoir could significantly reduce grazing areas for their domestic animals.

All mitigation and enhancement measures are organized in integral plans. These plans are integral in the sense that they integrate both compensatory and enhancement measures in specific fields aiming to improve living conditions of the population in the DIA. In order to present the contents of each of these plans and avoid repetitions, a general introduction to the plans is made below and elaborations done in the sections that follow.

The compensatory and enhancement measures, in the context of agriculture and livestock are organized into three main areas of intervention under Agriculture and Livestock Support Program:

Agriculture, Livestock and Fisheries Support Program

- Upland Farming Diversification Plan (UFDP)
- Soil Fertility Enhancement Plan (SFEP)
- Animal Husbandry and Veterinary Services Plan (AHVSP)

These are also integrated across programs plans, namely the RCMP, BEESRP, SBZ Management Plan, and the ACBP.

2.4.1.1 Upland farming diversification plan

This programs includes measures and plans aiming to compensate the production losses, enhance productivity, diversify production and improve marketing in agriculture. These measures are organized into different sub-plans, including:

- Crop diversification and Multiple Cropping Sub-plan
- Fruit and Vegetable Production Sub-plan
- Bee Keeping Sub-plan
- Forage Production Sub-plan

The Project will implement these plans in the Project DIA in collaboration with the extension services at commune and district levels. The plans below are to be formulated during the design phase of the Project and implemented during the Project construction phase.

Crop Diversification and Multiple Cropping Sub-plan

The Crop diversification and Multiple Cropping Sub-plan will be executed as compensatory and enhancement measures in 20 households in each Project affected village as a pilot project in the first 2-3 years and then extended to other households. This will include growing crops such as ginger, peanuts, beans, pumpkins and other vegetables and similar other crops intercropped with traditionally grown maize and cassava. This would also include planting fodder trees.

The plan will include improved farming practices, improved drought tolerant seeds, fertilizers, and other necessary inputs such as capacity building of farmers. The Project will facilitate the farmers in order to effectively implement the proposed mitigation plan. The project will collaborate with state extension services for seeds and improved agronomic practices.

Capacity building of farmers (part of the ACBP)

A series of training programs will be organized, in collaboration with extension services at commune and district level. The training is expected to enhance the skills and capacity of farmers to efficiently utilize land resources adopting improved farming practices and change in cropping patterns. Training will also include the components of crops, vegetables, horticulture, beekeeping, soil fertility enhancement, compost making and related fields.

Implementation approach

Crop diversification on uplands will be a new initiative among the ethnic minorities as few households cultivate more than upland rice, maize and cassava. The Project will prepare a plan and introduce the local community to new farming approach, growing more types of crops alone or intercropped on uplands. Adoption of appropriate farming techniques and agronomic practices will be necessary.

The Project will select 5-6 households in each village, discuss with them about this new initiative, make a household group, provide training and involve them in the programs. A good technical support will be required. The Project will collaborate with state extension agencies at the commune and district levels for technology and materials as well as draw from other experiences in Vietnam and Laos. The Project will financially support extension services with manpower and technology.

Fruit tree and vegetable production sub-plan

The Project will implement the Fruit Tree and Vegetable Production Sub-plan on homestead areas and on river bank. The Project will collaborate with concerned communes to allocate suitable area with gentle topography in the SBZ on the riverbank or near streams in other areas for cultivation. Initially, five households will be involved in fruit tree production in riverbank cultivation and all other households in homestead area. Most households have a small plot for farming. The Project in collaboration with state extension agencies will provide improved seeds and fertilizers to participating farmers. If water source available, provision will be made for drip irrigation.

Bee keeping Sub-plan

This will be a new farming initiation in the ethnic minority. Honey production using forest vegetation is a common activity in upland areas. Initially, two willing households will be selected in each village, trained and provided with beehives and bees. (See capacity

building explained earlier). If successful, this will gradually involve more households. The Project will prepare and implement a Bee Keeping Plan.

Forage Production Farming Sub-plan

Forage scarcity was reported in most Project affected villages and very few farmers grow local maize seeds for fodder production. It has not been a common practice among ethnic minorities to grow forage crops. Since a large forest area covering 765ha will be inundated which would reduce grazing area, the Project will prepare and implement forage production programs in all the Project affected villages. In Laos, households have more access to grazing area than in Vietnam side. Forage crops will be grown on upland farms as a single crop or intercropped with cassava. Locally available fodder tree species will be planted on uplands.

2.4.1.2 Soil Fertility Enhancement Plan (SFEP)

This programs includes activities aiming to improve soil fertility, enhance crop productivity, and eventually increase crop production. Soils are very poor and less productive. Slash and burn just before rainy season and planting seeds at early rainy season aggravates soil erosion. Yields of hybrid maize in such areas are less than one third of its potential grain production. These measures are organized into different sub-plans, including:

- Growing Legumes and Similar crops in Multiple Cropping Sub-plan
- Compost Making and Mulching Sub-plan

Growing Legumes and Similar Crops in Multiple Cropping Sub-plan

Farmers are growing some beans in home garden and occasionally on uplands. Legumes such as soya bean, beans and similar crop could be grown inter cropped with maize and other plants. These legumes will provide some pulses as well their roots add nitrogen to the ground (See –Crop Diversification). Similarly, capacity building will be done.

Compost Making and Mulching Sub-plan

The Project will prepare and implement compost making plan. Simple compost making process will be adopted using biomass collected from nearby forests (only if needed), crop residue and cattle dung. Farmers usually have a temporary house in upland farming areas and live there during crop maturity and harvest. Cattle while grazing on fallow land could be put in paddocks at night and dung collected for compost. The simple technique would be making a ditch/pit and filling it with biomass and dung to decompose. This simple technique would take a time to decompose but it is easy and viable cost-free option. Compost can be used during crop planting. Compost making is to be introduced and practiced at homesteads asls, dumping all the organic waste in a ditch (or compost bins) and harvesting them after 3-4 months. This compost can be used in home gardens and field vegetable plots.

Farmers at present leave all crop residues after harvesting grain which get blown off due to wind. These crop residues could be collected, put aside and would be used during cropping as mulch or dumped into compost pits.

2.4.1.3 Animal Husbandry and Veterinary Services Plan

Farmers rear a range of domestic livestock e.g. cattle, goats, buffaloes, pigs and poultry. All animals are free-ranged although a few farmers rear hybrid pigs in confinement. During the HH survey, few households expressed intensions to keep their pigs and poultry confined (sheds and sties (pigpens)). Disease outbreaks are common and loss is high. Forage scarcity particularly during winter has been a major problem in the Nam Mo1 HPP Project affected areas, more so on the Vietnam side than in Laos.

This programs includes plans aiming to improve animal husbandry practices, management of livestock, improved feeding, reducing incidence of diseases and animal health services. Farming pigs and poultry in confinement could be considered as environmental programs. It will reduce litter and waste in the village area. Proposed measures are organized into three different sub-plans, including:

- Animal Husbandry Improvement Sub-plan
- Extension and Veterinary Services Sub-plan
- Forage Production Sub-plan

Animal Husbandry Improvement Sub-plan

This will include feeding, breeding and management of all kinds of livestock in the Project DIA villages (resettled in most cases) and it would involve a large number of households. Special attention will be paid to pig farming and poultry rearing in terms of feeding and management and breed improvement. The Project will prepare and implement an Animal Husbandry Improvement Plan giving emphasis to improve feeding, breeding, and management of livestock particularly pig and poultry.

The Project will financially support the construction of pig sties (piggens) for 5-6 pigs and a small poultry shed for 15-20 poultry birds to all the households in DIA villages, agreed with each households. Farmers would be encouraged to rear hybrid pigs in pig sty and additionally feed commercial livestock feed for better growth. Poultry could be managed at semi-free ranged system. Few of the households will be persuaded to rear improved poultry.

Extension and Veterinary Services Sub-plan

The Project will prepare and implement a comprehensive Extension and Veterinary Services programs which would include (i) support to extension service center at commune and district levels both in terms of manpower and technology including medicines and vaccines; (ii) awareness and training to at least one person from each DIA household on animal hygiene and primary treatment, (iii) equipment and appliances needed for improved husbandry and treatment.

This will be an important programs in the Project DIA and aims that its adoption rate by farmers will be very high.

Forage Production Sub-plan

See section 2.4.1.1, above on Forage Production Sub-plan

2.4.2 Social improvement

2.4.2.1 Community Health and Sanitation Plan

A Community Health and Sanitation Plan will be developed prior to Project construction with the aim of improving health status of communities in the Project DIA. The plan will be developed for both construction and post construction phases of the Project. The plan will incorporate the following specific programs that will be implemented in the Project villages:

(a) Household Water Supply and Management

Household water supply will be provided in all the relocated villages with the same type of system as in the existing villages, and with a proper filtering system to allow safer drinking water. The Project will also support villages losing land and in the DIA to develop drinking water systems. Such support will be in the form of remediating and augmenting existing drinking water systems. The Project will collaborate with villages to support the access to safe piped drinking water to relocated households. Similarly, the Project will support drinking water quality analysis in villages. The aim is that the Project will contribute to the establishment of treatment practices for safe drinking water to Project-affected households and bring the quality of drinking water up to the standard prescribed by the National Drinking Water Quality Standards.

(b) Sanitation Enhancement Sub-plan

Approximately more than 80% of the households in the Project DIA do not have toilet facilities. They use nearby forest areas, river/stream banks and open lands for open defecation. This low hygienic standard contributes to high prevalence of diarrhea and related health problems. In the relocation villages, every household will be provided with a toilet. The Project will also provide support for construction of the toilets with septic systems and flushing mechanisms in other affected villages in the DIA.

(c) Community Waste Management

Villages at present lack waste management practices and people dispose waste haphazardly in and outside the village. There is no awareness of the health risks from litter around the houses, which the free roaming animals are partly eating. The Project will support developing simple waste management systems in relocated villages that are sustainable, based on the local culture and designed together with the villagers in order to be managed by the community. Such a waste management system may include e.g., construction of an open but fenced area for waste disposal outside the village, composting development for organic waste, and organization of community rubbish collection team.

(d) Improved Cooking Devices

Smoke from traditional cooking oven open fire is a serious health hazard, especially for women, who are cooking inside the house and children staying with their mothers. The Project will provide support for Improved Cooking Stoves (ICS) in the relocated households that should be included in the house kitchen design. ICS has a range of benefits compared to traditional fuel wood stoves; ranging from reduced emission of smoke and noxious gases in the atmosphere consequently aiding in reduced incidence of respiratory diseases. ICS requires less fuel wood and accordingly also contributes to less firewood needed from the forest areas surrounding villages. Consequently, reduced firewood collection will contribute to lessen women's work load both physically and timewise.

(e) Awareness and Capacity Building Plan (ACBP)

The Project will launch health and sanitation awareness programs in different locations in the Project DIA. Such awareness programs will be conducted in villages. The awareness will focus on water use and treatment practices, pollution of water sources, personal hygiene and households as well as community sanitation. The Project will collaborate with state agencies at district/commune level to effectively implement such awareness and education programs.

(f) Public Health Support

Availability of health services is very poor in the Project DIA. Villages lack any health services, and the distance and travel to the available services in commune and district health centers is long, difficult and in many cases too costly for the poor people. There are trained health workers in many Vietnamese villages, but these are trained only in delivery of government health information and without medical training. It is proposed that the Proponent will: (i) develop health services availability for the local PAPs connected to the construction workers' health facilities, (ii) support training of health workers in villages, and (iii) develop mobile health services to the villages in cooperation with the commune/district health providers. Health services that are built up in the construction area will be in operation during the construction period, but could remain after the construction and run by a local administration.

(vii) Emergency Medical Response

An Emergency Medical Response Unit (EMRU) will be established in each construction site for first aid and emergency assistance. One medical doctor will be employed in the ESMU of the Project during construction.

2.4.2.2 Community Labor and Employment Plan

Most of the people in the Project DIA are farmers and there are hardly any labor opportunities apart from agriculture and forestry. Seasonal and permanent labor out-migration of especially young people, both men and women, from the affected villages to other provinces and major cities is high. There will be many labor opportunities for unskilled workers in the HPP construction and it is required that local workers from the affected communities will be prioritized whenever possible. Requirements for local employment among the unskilled labor force and measures to ensure are required to be included in all the procurement documents and construction contracts and sub-contracts. It is required that:

- Contractor has to prioritize employment of local unskilled labor force (through subcontracting) so that at least 30% of the unskilled labor force over the Project construction time are workers from the Project DIA communities.
- A total of 30% of the local unskilled labor force has to be women. Contractor has to implement measures to enhance employment of women, including awareness raising to prevent sexual harassment of women.
- Male and female unskilled workers will receive equal pay for equal work.
- Contractor is not allowed to use any child labor (workers under 16 years of age).
- Contractor has to provide basic facilities (such as water and latrines) separately for men and women in the construction sites. The quality of these facilities has to meet the locally acceptable standard.
- Contractor is required to provide adequate working conditions and facilities for their workers, as well as ensure health and safety measures in the workplace. Contractor is required to coordinate with local health centers in order to ensure that necessary arrangements will be made for prevention of accidents and epidemics, and that first aid facilities and access to basic health care and emergency care are available at all times for all employees at the construction site and at workers' camps.

2.4.2.3 Influx Management Plan, HIV/AIDS, STDs and Human Trafficking Prevention Plan

The HPP construction will contribute to an influx of people to the Project DIA who may far outnumber the local people. There will be large numbers of workers, mostly male, camp followers (entrepreneurs) and other people taking the appearing economic opportunities (small business, commercial sex-workers) in the Project DIA, especially around the construction area and in the existing local population centers². New people with culture and habits different from the local ones will greatly increase the risk of sexually transmitted diseases such as HIV/AIDS and the risk of human trafficking especially women and children. There is also an apparent risk of increasing drug trafficking and drug use added to the already existing problem of drug addiction in some Project-affected villages. Influx of people also can have a significant impact on local natural resources and can create conflicts with local communities who rely on the limited resources on a daily basis. Awareness of potential risk and social problems should be enhanced among vulnerable local people, especially women and girls. See also forest related plans on awareness raising.

(a) Increased people in project affected area: work force, camp followers etc.

A peak workforce presence over 1750 individuals will trigger related influx of entrepreneurs, commercial sex-workers, increase in entertainment centers (e.g., karaoke bars), food shops with local wild meats and forest medicinal herbs, etc. There is usually

² MIGA, 2009. Projects and People. A handbook for addressing project-induced in-migration. http://www.MIGA.org/wps/wcm/connect/topics_ext_content/MIGA_external_corporate_site/sustainability-at-MIGA/publications/publications_handbook_inmigration_wci_1319576839994

pressure on local resources, including wood, land and hunting. Both monitoring and a worker and community based awareness program has to be implemented (described below and in the Physical Program). Particularly vulnerable are the young girls and women from villages in the vicinity of camps and populated areas.

(b) Community-based Public Awareness Program in Project DIA communities

Experience shows that the risk of HIV/AIDS and other sexually transmitted diseases (STDs) as well as of human trafficking will increase during big infrastructure construction projects. With usually provided better connectivity leading to increased mobility, these risks remain even after the construction period.

In order to mitigate these potential negative consequences of the HPP, a community-based Public Awareness Program with two components will be implemented in the Project DIA:

- 1) HIV/AIDS and other sexually transmitted diseases prevention; and
- 2) Human trafficking prevention.

The intention of the Public Awareness Program is to increase the risk awareness of the local people through information dissemination in the Project-affected villages and communes. Better knowledge of the sexually transmitted infections and of protection against them is expected to obstruct the increase in HIV/AIDS and STD cases. Likewise understanding of the ways and methods of human trafficking will hinder individuals falling easy victim for it. The awareness programs will be designed to be appropriate for the local culture, using local language and appropriate communication methods for ensuring that the information is understandable and accessible for the local ethnic minority communities with low educational level; pictorial information is prioritized. The Project will provide funds for information materials and for engaging Women's Union at province, district and commune level for implementation of the Program.

(c) Construction Workers' HIV/AIDS Awareness Program

All Project contractors are required to implement an HIV/AIDS Awareness Program among construction workers and to undertake measures to reduce the risk of the transfer of the HIV virus and other sexually transmitted infections between and among the construction personnel and the local communities. Contractor is requested to subcontract an approved service provider, such as the Province HIV/AIDS Prevention Centre to:

- Carry out regular awareness raising among the employees throughout the construction time through information, education and communication activities that address HIV/AIDS and other STDs, transmission risks and promote preventive measures. The awareness programs shall cover all the contractor's employees, all subcontractors and any other employees, as well as all truck drivers and crew making deliveries to the construction site.
- Promote early diagnosis of HIV: Ensure workers have access to and know how to access voluntary counselling, screening and diagnosis for HIV/AIDS, so that all workers can find out their HIV status.
- Provide free condoms at the workers' camps.

The contractor will include the HIV/AIDS awareness programs as a sub-clause in the execution of the works, budget it as a lump sum covering all the costs related to the programs and clearly indicate when, how and at what cost the programs with all the required measures will be implemented. Contractor shall detail the resources to be utilized and the proposed sub-contracting arrangements and provide a cost estimate with supporting documentation. Payment to contractor for preparation and implementation of this programs shall not exceed the budgeted sum for the purpose.

The Project Owner will assure that the HIV/AIDS awareness programs is included in the construction bidding documents and accordingly included in the construction contracts and implemented by eligible contractors.

2.5 Resettlement Policy Framework (RPF)

The Proponent is responsible for preparing and implementing a Resettlement Action Plan (RAP) for each of the villages that have to be relocated due to the HPP, based on the Resettlement Policy Framework (RPF) and the Entitlement Matrix for lost land and assets, provided in the ESIA. Details are provided in Volume VI. In the ESIA, Chapter 8 provides a baseline assessment of the people to be physically and economically displaced, and the impacts assessment is included in Chapter 11. The RAP will be prepared through an informed consultation process with the affected communities and with each affected household according to the mechanism given in the PCDP enclosed in Volume V. The RAP will be prepared based on the applicable resettlement policy of the government and of MIGA on the outcome from the consultations with the PAP and following the Entitlements Matrix for resettlement and compensation.

2.5.1 Legal basis and standards

The Project Policy and Entitlement Matrix is based on the following legal documents and standards:

- Agreement Between the Government of the Lao Peoples Democratic Front and the Government of the Socialist Republic of Vietnam of 11 March 2016;
- Decree on Compensation and Resettlement of People Affected by Development Projects (Decree No. 84/GOL, 2016);
- Land Law 2013 which is effective from Jul. 1st, 2014 of the GoV and Decree No. 01/2017 / ND-CP amending the decree guiding the Land Law;
- Decree No.38/2013/ND-CP on management and utilization of official development assistance (ODA) and concessional loans from donors;
- Decree No.44/2014 of the Government regulating land prices, Decree No. 104/2014/ND-CP on land prices, and Circular detailing a number of articles of the Government's decree no. 43/2014/ND-CP and decree no. 44/2014/ND-CP dated May 15, 2014 (GoV);
- Decree No.47/2014/ND-CP of the Government of May 5th, 2014 on compensation, support and resettlement upon land expropriation by the State, which is effective from Jul. 1st, 2014 (GoV);
- Circular No. 37/2014/TT-BTNMT of June 30th, 2014 on detailed regulations on compensation, support, and resettlement upon land expropriation by the State (GoV);
- International Finance Corporation (MIGA, 2012) guidelines and Performance Standards (PS), PS 1, PS 5 and PS 7.

2.5.2 Proposed Nam Mo1 Hydropower Project Policy for PAPs in Vietnam and Laos

- Project impacts shall be avoided or minimized wherever possible by exploring viable alternatives in design and location.
- Full assessments shall be conducted to ensure all impacts are identified and mitigated.
- PAPs shall be compensated and resettled in order to improve their standard of living, including access to community services and resources.
- Land acquisition and resettlement shall be planned and implemented to cause least possible amount of social, cultural and economic disruption.
- All measures shall be implemented without detriment to the environment.

- Special measures shall be incorporated to protect socially and economically vulnerable groups, and groups that cannot for various reasons participate in restoration programs.
- All persons residing within the areas directly impacted by the Project shall be considered as PAPs and will be entitled to compensation and resettlement if the impact influences their residences and livelihoods negatively. Those without legal titles or required documentation shall be assisted in acquiring the necessary documents that will give entitlement to compensation or replacement.
- The previous level of community services and resources shall be improved after compensation and resettlement.
- The Project development costs take into account the costs of resettlement. The resettlement programs shall be planned and implemented with the consent and agreement of the affected people through a participatory involvement process.
- All households will have access to effective mechanisms for hearing and resolving grievances during the implementation of compensation and resettlement programs.
- Proponent will carry out monitoring of PAPs until compensation is completed and livelihoods are fully restored, and until development targets are achieved.

2.6 Public Consultation and Disclosure Plan (PCDP)

To guide future consultation and engagement activities a Public Consultation and Disclosure Plan (PCDP, see Volume V) according to MIGA (World Bank Group) guidelines has been prepared. The PCDP provides details on consultations that have been conducted, stakeholder concerns, policy and regulations, key principles for planned consultations, tasks for an effective PCDP, management organization, and a grievance redressal mechanism.

The PCDP aims to:

- Identify key stakeholders and ensure there are adequate mechanisms for stakeholder feedback and information sharing;
- Carry out *meaningful consultation* in accordance with PS1, PS5 and PS7, where PS7 calls for FPIC process where *broad community support* is confirmed;
- Provide a framework for consultation at the local, national and international levels;
- Ensure issues raised by key stakeholders are addressed in the ESIA report as well as in the project decision-making and detailed design phase;
- Provide mechanisms that ensure the formulation of the RAP based on the framework prepared as part of the Nam Mo1 HPP ESIA;
- Identify the level of resources required to implement the plan and procedures to monitor implementation; and
- Outline a grievance mechanism for local stakeholders.

In line with MIGA policies, as noted above, the PCDP is intended to enhance community benefits and related environmental issues by minimizing negative effects through engaging the community. The purpose of community engagement is to build and maintain over time a constructive relationship with communities. The nature and frequency of community engagement will reflect the Project's risks to and adverse impacts on the affected communities. Through functioning as a means to fully integrate with all phases of the project - planning, design and implementation - the PCDP goes beyond only describing what has already been undertaken and is thus proactive in nature. It more saliently sets out a roadmap for achieving the aims of the community plans, and guides the overall long term social and environmental management systems of the Project.

The PCDP has built on public consultation and disclosure procedures carried out during the ESIA period, and built on Project AI information in 2017 and experiences in the region.

2.6.1 Contractor's responsibility

The Contractor shall develop its own Environment Management Plan (Contractor's EMP). The Contractor shall ensure that the contractors and its sub-contractors carry out their work in accordance with the environmental, labor and safety policies and commitments of the company, and comply with applicable Vietnam and International requirements. It shall develop its own Environmental Health and Safety Procedures (EHSP) patterned according to the EHS policy of the Proponent. This shall be included in the contractual obligations of the Contractor.

An Emergency Preparedness and Response Plan (EPRP) will also be developed by the Contractor. Key hazards to the Project and to workers which present potential emergency situations will be considered in developing the EPRP and it shall have the following components:

- Landslides and rockfalls;
- Earthquakes;
- Cofferdam failure;
- Road traffic accidents;
- Flooding of tunnels during construction;
- Working in confined spaces;
- Flood discharges and impacts on major structures (especially those higher than the return period design flood level);
- Operational phase flushing (of sediment traps, if used based on final design) and significant increases in downstream levels / discharge rates
- Power cuts / outages;
- Storage, handling and use of explosives;
- Fuel and chemical storage, handling and use;
- Fire hazard;
- Weather and climatic events;
- Site security; and
- Border conflicts or civil unrest.