

NAM NGUM 5 HYDROPOWER PROJECT



UPDATE OF ENVIROMENTAL MANAGEMENT PLAN (EMP)



SINOHYDRO CORPORATION LTD.



DONGSAY COMPANY LTD.

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Environmental Management Plan

For Nam Ngum 5 Hydropower Construction Project

1. INTRODUCTION

The Nam Ngum 5 Hydropower Development Project (NN 5 HDP) was investigated at *Pre-Feasibility Study* level in February 1997 by Lahmeyer International (Germany), in association with ENERGY EQUITY Corporation LTD of Australia, and the “*Preliminary Review of Environmental Issues on Nam Ngum 5 Hydropower Project in Lao PDR*” carried out in December 1997 by Melkyma Pty Ltd. (Australia).

A detail EIA was prepared in accordance with the National EIA regulation and followed the format of the EdL and STEA.

The Nam Ngum 5 Hydropower Project is located on the Nam Ting, into which Nam Phat and Nam Sout flow. Nam Ting is one of the main tributary of Nam Ngum where the confluence is approximately 15 Km down stream from the proposed dam site, 150 km north of Vientiane Capital City in Lao PDR. The area straddles over southern Louangpabang and southwestern part of Xiengkhouang province and part of Ketphiset Special zone.

The 104.5 m dam with crest length of 258 m and crest level 1104.5 masl to develop on the Nam Ting River, will create a 15 km² reservoir in order to stock and divert the water towards the Nam Ting River through a 120 MW power station located approximately 12km due south of the dam site on the right bank of Nam Ngum into which the water from the powerhouse is discharged situates in Phoukut District, Xiangkhouang Province.

NN 5 HDP is a component of the power development strategy adopted by the Government of Lao PDR (GOL) in order to develop the supply of electricity in the rural areas of the country.

The project’s main objectives are to:

- Increase generating capacity to meet local demand which is part of the Lao government Power Development Strategy which plan to achieve 90% electrification target throughout the country by the year 2020.
- Supplement electricity supply for Central and Northern region of the country; especially replace or lessen the high cost power import from Vietnam, in particular in Xiang Khouang province.
- Provide “waterway” access for communities living within the reservoir basin which would not otherwise be possible by land access; hence forming a vital contribution to the government’s endeavor in the implementation of its poverty eradication programs.

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This Environmental Management Plan (EMP) is prepared for Electricite du Laos (EdL). Its content specifies the mitigation and monitoring measures applicable to the parties involved in the project development. Together with the EIA report, it is part of the documentation prepared to meet the requirements of the Department of Electricity, Ministry of Energy and Mines (MEM) and Water Resources and Environment Agency (WREA). The EMP plan does not set out all the details of the proposed measures but identifies where and when these measures are required and which organization is responsible for funding, implementation or supervision.

Therefore, this plan must be read in conjunction with other relevant project documents, mainly the detailed design reports and the EIA report.

This report details the general content of the EMP in a main text and the environmental obligations of the Contractor in the Appendix.

2. PROJECT COMPONENTS

The NN5 HDP will divert most of flow from upper reaches of the Nam Ting, Nam Sout and Nam Phat to the Nam Ngum reservoir for the generation of electricity. The general project layout is presented in Figure 1 and key features of the project components are listed in Table 1.

2.1. Dam and Reservoir

The proposed dam is a Roller-Compact Concrete Dam (RCC), located about 8 km east of the centre of Muang Chim village, and some 12.5 km north-east of the centre of Xiangdet village. It will be approximately 104.5 m high; 258 m crest length at 1,104.5 masl dam. The catchments area above the main dam site is 483 km² and contains three rivers Nam Phat, Nam Soud and Nam Ting. The reservoir will have an area of some 15 km².

2.2. Powerhouse

The powerhouse would contain 2 Vertical Francis turbines with maximum combine output of 120 MW. Weathering depths are likely to be in the range of 5 m to 10 m on slopes and at power sites, excavation is likely to be one or some combination of alluvium, slope wash debris (colluvium) and weathered rock. Tailrace excavation is likely to be in alluvium and colluvium.

Key Features of the Proposed Nam Ngum 5 Hydropower Project

1). RESERVOIR

Name of River:	Nam Ting
Name of River Basin:	Nam Ting
Catchment Area:	483 Km ²
Full Supply Level (above sea level):	1100 m asl
Minimum Operating Level:	1060 m asl

Reservoir Area at Full Supply Level: 14.74 km²
 Gross Reservoir Storage: 314 Mm³

2). DAM

Dam type: Roller-Compact Concrete Dam (RCC)
 Dam Height (above present riverbed): 104.5 m
 Crest Length: 258 m
 Crest Level: 1,104.5 m

3). POWER FACILITIES

Power station rated output: 120 MW
 Installed Capacity: 2 X 60 MW
 Annual Energy Production: 421 GWh
 Gross head: 340 m
 Headrace tunnel diameter: 4 m
 Headrace tunnel length: 89.6 m
 Penstock diameter: 3.5m
 Penstock length: 2,442 m
 Surge tank diameter: 6m
 Surge tank length: 93.3 m
 Surge tank level: 1,109 m
 Turbine: 2 X 60 MW
 Maximum Turbine flow: 17.7 m³/s

4). ACCESS ROADS

New all weather road from Road No 7, 18 km (from Ban Somboun nearby RN7) to dam site and 14 km (from Dam Site) to Powerhouse

Construction: 32 km

5). RESETTLED PERSONS

Resettled Persons: None

6). BASIC COSTS

Estimated Project Cost (As-built Cost): US\$170 Million

2.3. Water Intake

The water intake is located at a significant distance upstream the dam, where the Nam Ting changes its direction (subject to final design, this arrangement may be altered). With the minimum operation level (MOL) at 1060 m asl, the storage upstream the intake is 30 to 65 Mm³, more than enough to accommodate the expected siltation over 50 years of project economic life.

The intake will comprise a bell-mouth entrance and a gate tower, and will be provided with roller gate and trash rack. The operating maximum discharge will be 35.4 m³/s

2.4. Headrace Tunnel and Other Underground Work

The headrace tunnel alignment has been set by the location of the intake and the surge tank. The tunnel will be 89,6 m long with tunnel diameter of 4 m.

The penstock with the total length of 2,442 m and the excavated diameter of 3.5 m, if surface option, instead of underground type is selected then steep slope and stability of the rock as well as erosion protection should be considered.

Other underground works include the surge tank, the valve chamber etc., would form a significant component of the above works

2.5. Transmission Line

Two likely options have been considered, and are summarized as below:

- A 26 km of new 115 kV transmission line, from Nam Ngum 5 Power Station to new collector 115 kV Substation at Phoukhoun, and 72 km of 115 kV transmission line, from Banging Substation to Phoukhoun Substation, would be upgraded in the order of 60 to 70 MW.
- A 80 km of new 115 km transmission line following mainly the alignment of the southern access route to Vangvieng Substation, and would be in the order of 60 to 70 MW.

2.6. Access Roads

The construction of the Nam Ngum 5 Hydropower Project will require considerable upgrading of existing access roads and construction of new all weather roads, both for temporary access as well as permanent access. The followings are access routes considered viable and has minimal potential impact on the environment as well as beneficial to local community:

- **Access road to dam site:** two alternatives routes have been considered and based on the distance and their potential environmental impact :
 - **Access road to dam site (option 1):** Upgrading of the existing road, from Ban Longmiang on RN7, (11 km east of RN13/RN7 junction) to Ban Chim, Phoukhoun District, Luang Prabang Province with the total length of 23Km. The road alignment follows Nam Soud on the ridge before it reaches Ban Chim. From Ban Chim to the dam site with the total distance of 12 km, the alignment follows the edge of the future reservoir and crosses Nam Ting and part of the reservoir before it reaches the dam site. Overall the road from RN7 to the dam site will be 35Km long (including two bridges crossing part of the reservoir and Nam Ting).

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- **Access road to dam site (option II):** Taking into consideration the unfavorable locations and shape of the future reservoir with respect to access from Meuang Chim Village to the dam site, the most promising route alignment is from the north. The alignment starts some additional 12 km to the east of Phou Soung (or some 24 km to the east of NR 13 north) following the Nam Phat valley to the south on its left side. In total the road would have a length of some 18 km to the dam site.

 - **Access road to powerhouse site:** The distance from the dam site to the powerhouse site is approximately 14 km. During construction, one temporary bridge to cross the Nam Ting river at the downstream of the dam site will needed to be constructed. Later, after construction of the dam is completed, the dam crest will be used as a bridge to cross the Nam Ting River from dam site to powerhouse site.

2.7. Operator’s Village

The facilities for each site shall include 12 two-bedroom houses, 3 buildings for junior staff, canteen, offices, and first-aid station. They will be used by the Employer and the Engineers during the construction and after commissioning by the operator and the maintenance staff.

3. PROJECT IMPLEMENTATION SCHEDULE

Project construction is scheduled to start at the end of 2007 (if approved) and to last no more than 45 months, with the commissioning of the units in June 2011 and finishing works completed in September 2011. This organization takes into consideration the constraint of the rainy Season (mid-June to mid-October) during which only limited outdoor works can be performed. Underground works (tunnels, surge shaft) can be performed all year long. Details are presented in Table 3.

Table 3: Summary of Environmental Management Plan (EMP) for NG 5 HPDP

Activities/Year	Pre-	Construction Phase					Operation Phase				
	1	2	3	4	5	6	7	8	9	10	
1. Compensation implementation and monitoring											
- Payment for all compensation to PAs	←→										
- Monitoring of the compensation	←→										
2. Vegetation and Transmission Line Corridors clearing											
- Cutting vegetation in the flooding area	←→										
- Clearing all trees along the transmission line corridors			←→								
3. Water quality Monitoring											
- Construction phase	←→										
- Operation phase						←→					
4. Watershed Management											
		←→									
5. Environmental Management Program in Construction Land											
	←→										
6. Other Environmental Monitoring Program											
- Construction phase		←→									
- Commissioning phase						←→					
- Operation phase							←→				

4. MAIN CONTENT OF THE PLAN

4.1. Proposed Measure

The measures proposed in the EMP are basically related to mitigation and monitoring activities, which constitute the core strategy of this plan.

Mitigation measures are proposed during both construction and operation phases. They include diversified activities as additional studies, technical sub-projects, and financial compensation. These measures are detailed in section 4.2.

Monitoring measures are basically related to 2 types of activities: regular acquisition of additional data for the quantification of Project impacts and the follow-up of the appropriate implementation of the mitigation measures and Contractor's obligations. These measures are detailed in section 4.3.

The EMP components are listed in Table 4.1 which provides the potential impacts, the measures proposed and where individual executing responsibilities lie.

Table 4.1: Summary of Mitigation Plan

Phase	component Concerned	Potential Impacts	Mitigating Measure	Responsibility
DESIGN AND CONSTRUCTION PHASES	AIR QUALITY			
	Vehicle and engine emission	Increase of air emission	<ul style="list-style-type: none"> - Reduce vehicle travel distance between camp and work sites - Maintain of engine 	Engineer
	Dust emission	Increase airborne dust along the roads during dry season	<ul style="list-style-type: none"> - Control with water spraying in concerned villages and work sites 	Contractor
		Dust from crushing plants	<ul style="list-style-type: none"> - Respiratory protection devices for workers at crushing site 	Contractor
	SOILS			
	Land use	Lost of farm land and forest	<ul style="list-style-type: none"> - Preserve top soil, rehabilitate and revegetate after use - Village land use plan (if necessary) 	Contractor/ESMD
	Road construction	Alter drainage, cutting of slope, loss of vegetation cover, risk of erosion	<ul style="list-style-type: none"> - Road design to satisfy national or international standards 	ESMD/Engineer
			<ul style="list-style-type: none"> - Construction methods to follow present best practice 	Contractor
			<ul style="list-style-type: none"> - Slope protection measures with revegetation 	Contractor
	Spoil damps	Creation of sterile fill areas, loss of vegetation cover	<ul style="list-style-type: none"> - Select site within reservoir area 	ESMD/Engineer
			<ul style="list-style-type: none"> - Use spoil as backfill of borrow areas 	Contractor
	Quarry and borrow areas	Alter drainage, cutting of slope, loss of vegetation cover and farmland	<ul style="list-style-type: none"> - Submit detail plan for quarry operation and rehabilitation prior to excavation 	Contractor
			<ul style="list-style-type: none"> - Fill borrow area with excavation spoil from tunnel 	Contractor
			<ul style="list-style-type: none"> - Compensate farmers for loss of agriculture land 	ESMD/NN5 EMC

Phase	component Concerned	Potential Impacts	Mitigating Measure	Responsibility	
	Temporary camps and permanent facilities	Alter land-use, loss of land and vegetation cover	- Submit detail plan for approval before implementation	Contractor	
			- Compensate farmers for temporary or permanent loss of agriculture land	ESMD/NN5 EMC	
			- Implement when possible temporary facilities within future reservoir limits	Contractor	
	WILDLIFE				
	Wildlife	Loss of habitats and local disturbance of breeding sites	- Organize animal rescue during clearing operation	Provincial and District forestry office	
	AQUATIC				
	Water quality	Increased sediment load in river	- Trap sediments on construction sites	Contractor	
			- No direct runoff to river from vehicles/engines maintenance areas	Contractor	
		Water pollution during construction	- No direct runoff to river from toilet and waste disposal sites	Contractor	
	SOCIO-ECONOMY				
	Workforce and population movement	Concentration of workers with associated risk	- Provide adequate housing facilities	Contractor	
			- Provide fair opportunities of work for local population especially women	Contractor/ESMD EMC	
			- Recruitment and training of local residents as staff for project operation	ESMD	
			- Discourage antisocial behavior (gambling, fighting, alcohol, drugs)	Contractor/ESMD/NN5 EMC	
		Uncontrolled settlements	- Strict control of settlement development next to workers camps	Contractor	
			- Awareness campaign for temporary settlement of workers	NN5EMC	
	Public Health and safety	Introduction and spreading of diseases	- Carry out workers pre-employment screening	Contractor/ district health office	
			- Malaria control for workers	Contractor/ district health office	
			- Malaria control for near-by population	NN5EMC/MOH	
			- Support health service both facilities and human resources in Ban Chim	MOH/District health office	
			- Non-formal education campaign for hygiene and prevention of sexually transmitted diseases (STD)	MOH/LWU	
- Carry out malaco-ecological survey			MOH		
Road accident cause by traffic congestion		- Proper road system design - Control the driver behavior, - Signboard where dangerous areas	Contractor		

Phase	component Concerned	Potential Impacts	Mitigating Measure	Responsibility
		Worker injury during construction	<ul style="list-style-type: none"> – Elaboration and enforcement of safety regulation – Implementation of an emergency evacuation procedure 	Contractor/project owner
		Encroach into area contaminated by UXO	<ul style="list-style-type: none"> – UXO pathfinder survey and clearance before construction 	Constructor and UXO Supervisor/specialist
	Land tenure	Temporary or permanent acquisition of farmland	<ul style="list-style-type: none"> – Creation and financial support of the NN5EMC 	Project owner
			<ul style="list-style-type: none"> – Land titling in Ban Chim 	District land office
			<ul style="list-style-type: none"> – Land acquisition and compensation 	ESMD/NN5EMC
Education and Culture	Increase in students during construction	<ul style="list-style-type: none"> – Assist improving existing facilities to required standard and capacity to accommodate student population from workers families 	Contractor/project owner	
OPERATION PHASE	AQUATIC			
	Hydrology	Dam will alter downstream discharges mainly in wet season	<ul style="list-style-type: none"> – Monitoring exiting gauging stations 	ESMD
		Sudden changes in Nam Ting (Minor impact)	<ul style="list-style-type: none"> – Awareness information among local fishermen 	ESMD/NN5EMC
	Water Quality	Alteration of water quality after impoundment by flooded vegetation (Minor impact)	<ul style="list-style-type: none"> – Total logging and clearing of the reservoir 	ESMD/provincial & district forestry office
	Fisheries	Disruption of upstream fish movement (minor impact) and possible reduction of some fish species	<ul style="list-style-type: none"> – Preparation of a reservoir fisheries management plan 	ESMD/DiF
	FOREST			
	Forest cover	Flooding or clearing of forest (minor impact)	<ul style="list-style-type: none"> – Reforestation of degraded areas 	ESMD/Provincial and District forestry Office
	WILDLIFE			
	Operation of facilities	Easier access to area leading to increase hunting and poaching pressure	<ul style="list-style-type: none"> – Destruction of temporary access and reforestation 	Contractor
			<ul style="list-style-type: none"> – Provide long-term financial resources for Phou Da Phor and Phou Pha Day conservation management operation 	Project proponent
			<ul style="list-style-type: none"> – Implementation of long-term Phou Da Phor and Phou Pha Day management plan 	District conservation office
	SOCIO-ECONOMY			
	Population movement	Uncontrolled settlements	<ul style="list-style-type: none"> – Strict control of settlement development 	ESMD/NN5EMC
			<ul style="list-style-type: none"> – Monitor and control population movement in other areas 	ESMD/NN5EMC
Rural electrification	-	<ul style="list-style-type: none"> – Provide free electrical connection to Ban Chim 	Project proponent/ESMD	

Phase	component Concerned	Potential Impacts	Mitigating Measure	Responsibility
	Education	Children drop out school	<ul style="list-style-type: none"> - Develop a new secondary school - Promote and support local teacher to study and come back to teach in their hometown. 	Project proponent/MOE

4.2. The Mitigation Plan

4.2.1. Construction Phase

Mitigation measures during construction phase will be carried out by range of agencies depending on the nature of the measures. There are 3 principal categories of the mitigation measures:

a) Construction Contracts

Construction contracts contain obligations for environmental mitigation measures, including both preventive measures, working methods and social measures specific to certain conditions prevailing in the project area. These obligations are detailed in Appendix 1, which set out the principles for the Contractor will be expected to observe as far as applicable.

The main Contractor will be required to prepare, for the approval of the Environmental Manager and the Project Manager, a Health and Safety Plan, and an Environmental Management Plan detailing general construction measures applicable to preserve land use, soils, water quality, biodiversity and local socio-economy.

The borrow areas in charge by the Contractor will be requested to prepare a detailed Management Rehabilitation Plan of the area, in accordance with the obligation detailed in Appendix 1.

All works by the Contractor with potential impacts on the environment and land-cover will be subjected to prior approval by the Environmental Manager (EM) and the Project Manager.

b) Specific Measures

These measures are under the responsibility of EdL or of any sub-contracted executing Agencies from GOL. These measures are mainly related:

- The creation of financial supports of the Nam Ngum 5 Environmental Management Committee (NN5EMC), which includes representative from local population and authorities and from the Project Manager (see section 5.1.4). This Committee will provide the main information and coordination link between the Project and population concerned.
- The organization of reforestation in order to preserve water quality in the future reservoir.
- The preparation of a reservoir fisheries management plan.
- The wildlife conservation of the Phou Da Phor and Phou Pha Day Mountains.
- The organization of awareness campaigns for temporary settlers and workers concerning the status of their temporary presence in the project area.

- The implementation of Non Formal Education Campaign for local population regarding hygiene and prevention of sexual transmitted disease (STD).
- The implementation of malaria control program for the local population not directly involved in the Project activities.
- The implementation of UXO pathfinder survey and clearance before construction.
- The organization of a malaco-ecological survey in the project area, in order to assess the risk level regarding potential development of Schistosomiasis.

c) Improvement Measures

The improvement measures take the opportunity of the Development Project that need to be concerned by the project proponent to restoration/ rehabilitation of the effected people and village based on the Degree on the Compensation and Resettlement of the Development Project. The main measures proposed in the mitigation plan concern:

- The financial support provided by the Project to appoint an Integrated Development advisor for a 2 years period to prepare a long-term management plan, train the local staff and assists the Project in the monitoring activities during and after construction, especially in the field of forestry, wildlife, conservation and extension.
- The construction of secondary school in Ban Chim, support facilities and human resources for health centre.
- Provide free electrical connection to Ban Chim, which is the priority issue concerned by village community.

4.2.2. Operation Phase

After impoundment of the reservoir and the beginning of operation, several mitigation measures will be implemented under the responsibility of EdL or sub-contracted agencies. The major measures will be as follows:

- ❖ The project will try to recruit as much as possible manpower for local residents as permanent staff for the operation of the project.
- ❖ The operation budget of the NN5EMC will be supported by the project proponent for the first two years of operation. This period of time is considered as necessary for the completion of the compensation procedure of Ban Chim in case of grievance regarding the rehabilitation of paddy fields and others.
- ❖ Provide long-term financial resources for Phou Da Phor and Phou Pha Day conservation management operation and reforestation of degraded areas around the project.
- ❖ Strict control of settlement development by outsiders.
- ❖ Awareness raising program will be implemented among the fishermen in order to inform them about possible changes of the Nam Ting current when the power plant starts operation. An alert procedure will be set up as part of the safety operation guidelines of the project.

4.3. Grievance Procedure and Resolution

The "Project Environmental Management Unit" will provide "Ban Chim Village Mitigation Committee" with standard Complaints Forms to be issued to all households. Household, or groups of households wishing to complain about the effects of construction works on their property, production systems, economic well-being, spiritual life, quality of water or air, health, safety, welfare or any other facet of their lives shall make their complaint using these Complaints Forms.

The Process of Grievance Investigation and Resolution will follow these steps:

- 1) Complaint Forms will be sent by households or groups of households to the "Ban Chim Village Mitigation Committee"
- 2) Within 30 days the "Ban Chim Village Mitigation Committee" will investigate the complaint. If it is judged by them to be valid the Complaint Form will be forwarded to the "Project Environmental Management Unit"
- 3) Within 30 days the "Project Environmental Management Unit" "Ban Chim Village Mitigation Committee" and the complainant will decide how to resolve the matter.
- 4) The "Project Environmental Management Unit" shall take such measures as are agreed in step 3 above to resolve the complaint within 30 days, or some other period acceptable to the parties referred to in step 3.
- 5) When the complaint has been resolved the Complaint Form, signed and annotated at each stage of the process, will be filed by the "Project Environmental Management Unit", with copies to be sent to WREA.
- 6) The "Project Environmental Management Unit" will keep vouchered accounts of any expenditures made in resolving complaints,

4.4. The Monitoring Plan

4.4.1. Construction Phase

During the construction phase, the monitoring activities will mainly focus on the regular follow-up of EMP measures for compensation with performance standards. These activities will be based on a day-to-day follow-up and various levels of technical reviews.

Some minor monitoring activities will be related to specific monitoring, for the acquisition of additional technical data which were not obtained during the EIA and which are deemed necessary for eventual quantification of impacts or mitigation measures.

4.4.1.1. Proposed Plan for Regular Monitoring

(a) Day-to-Day monitoring

Monitoring on a day-to-day basis will be implemented by the Environmental Manager (EM) and his assistant and by the personnel of some concerned Agencies, mainly the agriculture, forestry and extension office and Land office. The main tasks for the EM and assistant will include:

- General follow-up all task of EMP
- Review and approval of Environmental Plans submitted by the Contractor.
- Maintenance of appropriate records of the monitoring results.

These monitoring activities will be partly complemented by the monitoring obligation of the Contractors.

The agriculture and forestry extension office and land office will mainly monitor the progress and implementation of the land acquisition and compensation process in Ban Chim, monitor the logging and enforcement of hunting ban.

(b) Quarterly or 6 Monthly Reviews

When carrying out the monitoring, the EM will be assisted by the Resident Engineer and the Consultant Engineer specialists on an informal basis. However, formal missions of the Consultant Engineer Specialists will provide the expertise for a critical review of results obtained during the last period and a re-adjustment, when required, of the monitoring and mitigation strategies, methodologies and work plan.

It is anticipated one specialist(s) mission every 4 months (3 times per year) during the first 2 years of construction and one mission every 6 months (2 times per year) the remaining year of construction and the first year of operation.

Each review will include basically:

- The review of published data, reports, guidelines and plans available at the time of the review.
- The setting-up of monitoring criteria and the selection of quantitative and qualitative indicators.
- Field inspection including direct observations and data collection, interviews with selected local and project groups, individuals.
- Evaluation and comment on Project performance, with recommendations and remedial actions.
- Definition of the scope of work for the period before the next review
- Recommendations for additional tasks or changes to the present EMP.

(C) Annual Review

The annual review will involve, in addition to the representatives from the project, Provincial STEO, DOE/MEM and EdL, representative from lenders (if any).

The annual review will be combined with one of the 4 monthly or 6 monthly reviews every year. The scope of work will be basically identical to the one describe above.

(d) Audit

Government of Lao PDR through Division of Environmental (DOE)/Department of Electricity/Ministry of Energy and Mines (MEM), EdL, NN5EMC and WREA or lender organization (if any) may visit the project site at any time and when deemed necessary during the construction period.

(e) Personnel Involved

The consultant Engineer will provide one qualified Environmental Specialist who will assist informally the EM and will participate to the 4 monthly, 6 monthly and annual reviews.

This specialist will be assisted where necessary by other specialists having expertise in forestry, agriculture, extension, wildlife, social science, civil engineering (construction practices, slope stability, drainage, run-off and silt control), fishery and watershed management.

(f) Reporting

Day-to-day monitoring activities will be recorded in daily, weekly and monthly reports by the EM.

Reviews will involve the production of Review Reports which will be supplied to NN5EMC, Sinohydro, DOE/MEM, WREA and lender (if any).

The basic format for the report will include:

- o Overview of the review
- o Specialist personnel involved
- o Status of work progress
- o Overall conclusion
- o Specific points requiring attention
- o Performance indicators for the monitoring
- o Specialist reports, if any

(g) Compliance

Compliance will be evaluated through the adherence to the mitigation measures, to other criteria also presented in the EMP and to the Contractor environmental obligations as detailed in Appendix 1.

(h) Notification Process

In case of non-compliance with environmental protection measures as required in the EMP and in the Construction contractors, the Project Manager can serve the following types of notices depending on the severity of the environmental damages (Table 4.4.1.1):

Table 4.4.1.1: Proposed Types of Notice

No.	Type of Notice	Issued By:
1	Verbal notification for minor infraction	EM
2	Written Instruction	EM signed by PM

3	Notice to comply	PM
4	Application of fine	PM through WREA
5	Order to stop work	PM through WREA

4.4.1.2. Specific Monitoring Activities

These tasks are related to the acquisition of additional technical data. The mainly concern:

- o Agriculture Product Monitoring

The survey will provide the technical basis to set up with NN5EMC the compensation level for permanent lost of paddy field. It will also provide the performance criteria for land rehabilitation and livelihood restoration.

- o Hydrological Monitoring

EdL will monitor the existing and future gauging stations implemented on the Nam Ting River. Data will be recorded, interpreted and kept available whenever required by specialists or Agencies.

- o Water Quality Monitoring

EdL (EM) will monitor water quality in Nam Ting River and various places in order to confirm the efficiency of water quality protection measures set up by the Contractors.

- o Fish Monitoring

Survey on fish population, especially Pa Nhoi and other rare species mention in EIA will be carried out by Department of Fishery. These data will provide the criteria to quantify the impact of the project on future fishes and allow the elaboration of mitigation measures if necessary.

4.4.2. Operation Phase

During the first few years of operation, monitoring activities will be carried out and will concern:

(a) Monitoring of Water Quality

This monitoring will focus on the reservoir in order to follow up the progressive improvement of water quality after the impoundment. It will provide the basis to identify the occurrence of stratification with deoxygenated bottom layers and to adjust the reservoir management to the observed quality constraints, it any. The EdL will be responsible for the monitoring which will be performed at least 5 stations on a monthly basis.

(b) Monitoring of Livelihood Restoration

Monitoring of livelihood restoration will be carried out for at least 2 years on the rehabilitated paddy fields and livestock of Ban Chim. The monitoring will be performed by the NN5EMC, especially the District agriculture, livestock and irrigation offices. The cost will be supported by the project proponent.

(c) Monitoring of Fish

Fish monitoring will continue in the villages of the lower Nam Ting in order to identify any decrease in Pa Nhoy and other species which could result for NN5 HDP implemented. In case a significant decrease is confirmed, mitigation measures will be considered and supported by the project owner. The monitoring will be performed by Department of Fishery.

4.5. Cost Estimation

The total budget required for the implementation of the Environmental Management Plan is estimated at US\$ 1,471,845. The estimated budget for each major component of the plan and per year of disbursement is detailed in the following Table 4.5.

Table 4.5: Estimated Budget for Environmental and Social Management Plan (USD \$)

Item/Year	Pre-	Construction				Operation					Total (USD)
	1	2	3	4	5	6	7	8	9	10	
Compensation for paddy field	180,541	-	-	-	-	-	-	-	-	-	180,541
Affected restoration	2000	10,750	10,750	10,750	10,750	24,500	24,500	24,500	24,500	24,500	167,500
Village Restoration	-	70,000	12,500	12,500	12,000	12,500	12,500	12,000	12,500	12,500	170,000
“Seed funding” for “self-help”	-	5,000	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	25,000
Fisheries	-	10,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	50,000
Water Quality	-	10,000	4,000	4,000	2,000	2,000	2,000	2,000	2,000	2,000	30,000
Reforestation for watershed Management	15,120	17,920	18,320	19,920	20,520	20,920	21,320	21,720	22,120	22,120	200,00
Wildlife		15,000		15,000		15,000		10,000		10,000	65,000
Erosion and Spoils		10,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	50,000
Public Health	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	20,000
School Education	-	30,000	-	-	-	-	-	-	-	-	30,000
Extension	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	200,000
Development of village operation ecotourism	-	-	-	-	-	-	30,000	30,000	20,000	20,000	100,000
EMP Management and Monitoring	30,000	30,000	30,000	30,000	30,000	30,000	20,000	20,000	20,000	10,000	250,000
Contingency 10%											133,804
TOTAL											1,471,845

Note: Road/bridge and rural electrification need to be discussed and negotiated with EdL and province

5. INSTITUTIONAL ARRANGEMENT

5.1. Roles and Responsibilities

The responsibilities of implementation for Environmental Management Plan will be jointly shared between Sinohydro and Government of Laos (GoL). Organization to undertake these responsibilities will need to be set-up and should employ two ways communication of different levels of management.

For the NN5 DHP, there will be various institutions involved in the process of EMP planning and implementation. The first organization is the government agency called Nam Ngum 5 Environmental Management Committee (NN5 EMC), which consists of officials from relevant key Departments and relevant sectors of the Luang Prabang and Xiengkouang provinces that might be chaired by Provincial Governor (or Vice), including the members such as sectors relevant from two provinces (Cabinet, WREO, Land office, Energy and Mines, Industry and Commerce, Forestry, and Security), Districts and villages head men.

The second is the project proponent agency called Environmental and Social Management Division (ESMD) which will be responsible for overall planning, implementation of environmental management, resettlement for the project and coordination with local authorities as well as the affected households.

These two organizations will form the institutional network to ensure smooth implementation of mitigation, management and monitoring measures during the construction and operation stages of project development, especially the resettlement activities in according to Decree 192/PM on Compensation and Resettlement of People Affected by Development Projects. Refer to diagram (Figure 1) and Table 6 for institutional organizational structure and the roles and responsibilities of each unit.

5.1.1 Government of Laos (GoL) Organisations

In accordance with GoL regulations covering environmental standards and procedures and technical guidelines (2003, MIH/DOE) and resettlement policy (2006, STEA), the involvement of GoL at all implementing levels must be ensured. This applies to institutional augmentation and capacity building for existing organisations, as well as for project-specific organisations. In order to ensure long-term sustainable compensation and development support, guidance and training will be provided by the project developers as partners in a comprehensive resettlement plan integral to the hydropower scheme. There are four levels of the GoL involved starting from National level to provincial/district and village levels which are set up into 6 committees.

1. NN5 Environmental Management Committee (NN5EMC)
2. Resettlement and Compensation Committee (RCC)
3. Forest Clearing Committee (FCC)
4. Grievance Committee (GC)
5. District Working Group (DWG)
6. Village Development Committees (VDCs) / or Villages Level working Committee

5.1.1.1 NN 5 Environmental Management Committee (NN5EMC)

The NN5EMC is the national body that oversees all GoL activities and commitments that needs to be established for the NN 5 Hydropower Development Project in order to provide a formal link between the Project and residents. The committee will be implemented at least 1 month before the start of the Project and will operate for 8 years, 1 year for pre-construction, 4 years to cover the construction stage and 3 years to monitor post impoundment impacts and take action where necessary. The suggested composition of the NN5EMC is as follows:

- Provincial Vice Governor/Cabinet Officer
- Provincial Water Resource and Environmental Office (WREO),
- Provincial Energy and Mines
- District Energy and Mines Officer
- District Forestry Officer
- District Land Officer
- Lao Woman’s Union representative
- District Education Officer
- District Health Officer
- Village chief from affected villages

The operational costs of the NN5EMC will be supported by the project proponent. Specifically, the roles of the NN5EMC are:

- Review and approval of the Social Action Plan for the NN 5 HEP.
- Provide organisational support and direction for the RCC.
- Liaise with GoL organisations on the national, provincial and district levels, including the allocation of roles and responsibilities of the different GoL agencies.
- Ensure compliance with GoL laws, regulations and policy.
- Liaise with the Sinohydro regarding GoL concerns and priorities.
- In collaboration with the Sinohydro carry out national level consultations.
- Appoint a Panel of Experts as external monitors – to be decided.

5.1.1.2 Resettlement and Compensation Committee (RCC)

The central task of the Resettlement and Compensation Committee Management Unit (RCC) is to provide leadership and coordination for GoL organisations involved in a myriad of implementation activities from project start-up. The responsibilities of RCC the will be as follows:

- Coordination of all GoL organisations and ensuring RC priorities are addressed.
- Ensuring that GoL policies, procedures and regulations are being followed in the day-to-day management of GoL involvement in implementation.
- Facilitating involvement in carrying out resettlement/compensation activities, such as consultations and livelihood restoration programs.

- Monitoring and auditing funds that are earmarked by the Company for GoL activities.
- Ensuring that all GoL staff involved in the Project are aware of relevant regulations and have undergone proper orientation and training in gender, ethnic, poverty alleviation and participatory planning and implementation concerns.
- Ensuring prompt evaluation of land and assets (crops, production, market values, etc.) for compensation for project-affected persons and resettlers.
- Organisation of Provincial and District level meetings and consultations.
- Participation in and follow through of claims lodged via established Grievance Procedure.

Since the RCC is primarily a coordination body with a few specific tasks, and the District organisations are partners in implementation, it is recommended that the RCC be composed of the following members:

- RCC Manager – a senior, qualified manager with proven effective experience with resettlement, compensation and rural development issues.
- Deputy Managers from Khoun and Puokout Districts to oversee coordination of GoL agencies involved in resettlement, Headpond, Catchment, Downstream and Project Construction Land areas.
- Support staff to be located at the District Project Offices where project reports and documents are kept for public viewing.
- A representative of the Land Asset Registration and Titling Unit for Khoun and Phoukout Districts with sufficient delegation to facilitate evaluations of assets and deal with claims and complaints about compensation.

Figure 1 : Nam Ngum 5 Environmental Management Committee Organization Chart

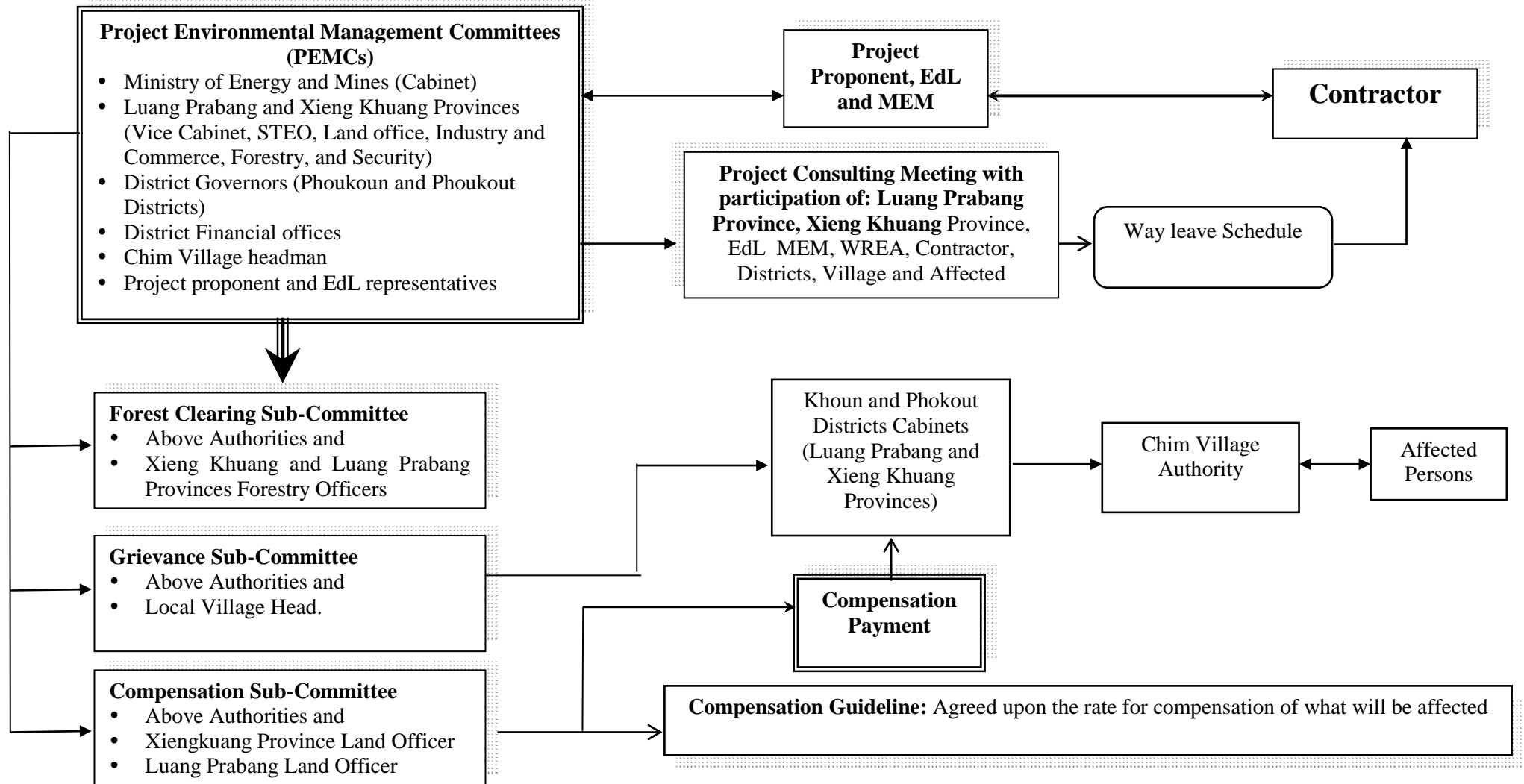


Table 5.1: Institutional Set-Up and Responsibilities for Environmental and Social Tasks

Institution/Organisation	Participants	Tasks
NN5 Environmental Management Committee (NN5EMC)	<ul style="list-style-type: none"> • Ministry of Energy and Mines • Luang Prabang and Xieng Khuang Provinces (Vice Cabinet, STEO, Land office, Industry and Commerce, Forestry, and Security), • Project proponent (Manager), • District Governor (Phou Koun and Phoukout) • Chim Villages head man 	<ul style="list-style-type: none"> • Project consultation meetings • Monitoring, evaluate review environmental plan and implementation work • Negotiating compensation unit costs, supervision and authorization of compensation payment
Forest Clearing Committee (Sub NN5EMC)	<ul style="list-style-type: none"> • ESMD • Luang Prabang/Xieng Khuang/District Cabinets • Luang Prabang/Xieng Khuang Energy and Mines Dept. • Luang Prabang/Xieng Khuang STEO • Luang Prabang/Xieng Khuang /District Forestry Officer 	<ul style="list-style-type: none"> • Determination of timber value • Monitoring of clearing process • Provide guidance and authorization of timber sale and or relocation, appoint contractor in timber handling activities
Compensation Committee (Sub NN5EMC)	<ul style="list-style-type: none"> • ESMD • Luang Prabang/Xieng Khuang/District Cabinets • Luang Prabang/Xieng Khuang Energy and Mines Dept. • Luang Prabang/Xieng Khuang Land Officer 	<ul style="list-style-type: none"> • Determination, negotiation of value of land • preparation of compensation guidelines • monitoring of disbursement of compensation payments • Participation in Compensation Committee • Certification of transfer of land ownership • Payment of compensation
Grievance Committee (Sub NN5EMC)	<ul style="list-style-type: none"> • ESMD • Luang Prabang/Xieng Khuang/District Cabinets • Luang Prabang/Xieng Khuang Energy and Mines Dept. • Village Authority 	<ul style="list-style-type: none"> • Settlement of complaints about compensation payments, as well others arise from the project implementation discrepancies and conflicts
Phoukoun District Working Group (Sub DWG)	<ul style="list-style-type: none"> • District Agriculture and Forestry • District Energy and Mines • District Transport Post and Communication 	<ul style="list-style-type: none"> • Provide technical input to the resettlement and livelihood restoration and improvement process. • Participate in capacity building for village facilitators • Provide human resource and informational input to infrastructure and livelihood activities, as required. • Assist with training activities.
Village Development Committee or Villages Level working Committee	<ul style="list-style-type: none"> • Village head man • Elder committed • Village Woman Union and Youth Organisation • Village Security 	<ul style="list-style-type: none"> • Act as the formal contact point • Responsibility for selecting and supervising the village facilitators, and represent the village in inter-village meetings to discuss, monitor and evaluate progress.

5.1.1.3 District Working Groups (DWGs)

District Working Groups (DWGs) will be established in Khoun and Phoukout Districts and will serve as counterparts to the Environment and Social Management Division (ESMD) within Sinohydro Company. The actual type and number of staff will be determined upon a detailed needs assessment prior to implementation. District staff involvement in ESMD implementation will be primarily task-based. In some cases provincial staff will be involved in implementation arrangements when district staff is not available or adequately qualified. In some programs, such as consultations, both provincial and district staff have been members of Sinohydro Company teams.

The tasks of the DWGs will be to:

- In collaboration with the ESMD team, provide technical input to the resettlement and livelihood restoration and improvement process.
 - Participate in capacity building for village facilitators – at times as trainers and at other times as trainees.
 - Provide human resource and informational input to infrastructure and livelihood activities, as required.
 - Assist with training activities.
- **District Communications, Post, Transport and Construction Office (DCPTC)** will be intermittently involved in the planning stages, it is envisaged that full-time members will be integrated with the ESMD infrastructure teams in order that effective implementation of roads, buildings, rural electrification, bridges, water supply and other infrastructure projects related to resettlement occurs.
 - **District Agriculture and Forestry Office** will be required to provide assistance in the form of agricultural extension workers and other inputs to resettlement and livelihood improvement programmes.
 - **District Health Office (DHO)** will work closely with NN 5 health specialists in order to ensure carry out resettler health programs, and ensure preventative health measures, monitoring and training of local health workers to fulfil the need of affected communities. In addition, GoL will provide adequate staffing for new and refurbished health centres to ensure improved services.
 - **District Education Office (DEO)** The DEO's role will be similar to that of the DHO's, in that there will be a series of key inputs relating to the establishment of new services and training of staff (teachers). DEO will be responsible for supplying additional teachers if and when required, and to upgrade the existing teaching staff when required.
 - **Lao Front for National Construction (LFNC)** The LFNC will have a number of roles in the project in relation to mobilisation of communities for collective work projects, and, in particular, to ensure that all ethnic groups, are involved in activities. In particular, the LFNC will be involved in training of village leaders, monitoring and consultation work as required.
 - **Youth Organisation** will have intermittent input in the consultation process, youth mobilisation, income generation programmes and preventative health campaigns. Members of the village Youth Organisation might become Village Facilitators.

- **District Information and Culture Office** will be responsible for cultural issues, and for working with ethnic groups in the project area in cooperation with the consultation teams and the proposed Ethnic Specialist. During the relocation, cultural considerations, such as rituals for moving houses, relocating spirits and cemeteries and physical cultural resources, will need to be taken into account. At the local level this office will be the GoL organisation responsible for 'chance finds' and archaeological studies. It will liaise with the National Department of Archaeology and Museums, MIC in Vientiane, regarding important cultural issues and items of importance discovered before or during construction.
- **District Land and Taxation Office** will be represented in the RCC by full-time members for each District for some of the project preparation and implementation periods. This organisation to carry out a number of key tasks:
 - Assessment of Asset Survey and calculations of production losses in project-affected areas.
 - Payments of interim and full compensation to affected households.
 - Administering Grievance Procedures, including reassessments of claims and dialogue with affected households as required.
- **District Labour and Social Welfare Office** will be responsible for overseeing labour recruitment and labour conditions for local workers. It will work closely with Sinihydro staff members and contractors to ensure that the maximum number of local workers is recruited from affected households, and the wages and conditions are fair, and in accordance with Lao laws.
- **Police, Militia and Army Security forces** will be organised to augment local militia and village authorities in patrolling camp areas and areas where population influx occurs (notably near camps and construction activities in Headpond area). They will be responsible for enforcing laws and regulations and reporting any improper incident to District Authorities and Sinihydro staffs.

Several Government Agencies will be sub-contracted within the framework of the EMP to carry out specific technical investigations:

- **Ministry of agriculture and forestry (MAF)** cooperate with DAFO will be in charge of land allocation program for new resettlement and monitor the livelihood restoration of a new resettlement, evaluate clearly the present production of the affected paddy field and monitor production after rehabilitation.
- **Department of Land (DOL)** working with District Land Office will elaborate a land-titling program for new resettlement.
- **Division of Fisheries (DiF)**, assisted by a consultant will be in charge, to monitor fish in the villages of downstream and prepare a preliminary management plan of fisheries in the reservoir area.
- **Ministry of Health (MOH)** will have the responsibility to monitor the efficient implementation of the public health components of the Environment management Plan, particularly the worker's pre-employment of screening and implementation of a health centre in a new resettlement area.
- **The Institute of Malaria, Parasitology and Entomology** will carry out the implementation of all activities related to malaria control. It will carry out the additional malacological surveys.
- **Water Resources and Environment Agency (WREA)** will participate in the

plan as an observer from the central Government, to ensure that Lao PDR environmental policies are satisfied within the context of the NN5 HEP.

- **The Lao Women’s Union (LWU)** will be the main organization for grassroots activities with the affected people. Its involvement, in close relation with the NN5EMC, will cover all aspects regarding compensation for permanent losses of paddy land fields, monitoring of compensation process, public information to residents and women’s involvement in hygiene and child care. The LWU will have a number of roles in project implementation, including working with the Consultation Teams, women’s health (maternal and child health, sanitation and birth control) and development projects, like savings and credit groups and literacy programs.

5.1.1.4 Village-Level Organisations

In each relocated and host village it will be necessary to delegate to an existing organisation the responsibility for formulating village policy on resettlement, overseeing the resettlement process, recruiting village facilitators (see below), leading the community participation process and other identified tasks. Where they do not exist, a Village Development Committee (VDC) will be created.

The members of the VDC will receive a regular honorarium for this work and will have funds to engage a full- or part-time secretary to ensure that all delegated issues are tracked and addressed. The VDC, or its appointees, should act as the formal contact point and have responsibility for selecting and supervising the village facilitators, and represent the village in inter-village meetings to discuss, monitor and evaluate progress.

5.1.2 Sinohydro Company and Environmental/EdL and Social Management Division (ESMD)

5.1.2.1 Sinohydro Company (Project Proponent) and EdL

The Project Proponent and EdL must ensure that the Project conforms to the environmental criteria set out in the EIA and in this Plan. To achieve successfully this objective, Sinohydro will appoint an Environmental and Social Manager (ESM) on a full time basis. The ESM will report directly to the Sinohydro General Project Manager. His ultimate objective is to ensure that the mitigation and monitoring measures are effectively and adequately implemented, in accordance with performance standards and anticipated schedule.

The ESM will act on behalf of the project proponent in dealing with Government Agencies or other parties concerned. He will represent project proponent in the NN 5 Environmental Management Committee (NN5 EMC) and will be responsible for maintaining good relations and communication with the local communities.

The ESM will have to carry out basic activities namely: Coordination, supervision, monitoring and reporting. These activities cover the following aspects:

- Providing the liaison between the Project Manager with the Consultants, the

Government Agencies, the contractors and the NGOs concerned.

- Supervising and monitoring filed activities of sub-contracting parties, more especially of those under direct responsibility of the project proponent.
- Discussing contact obligations with sub-contracting parties and ensuring respect of contractual time schedules.
- Carrying out specific technical tasks (hydrology monitoring, water quality monitoring).
- Reporting (see detail in section 5.2)

To implement these tasks, the ESM will be assisted by a full time assistant and international/or national experts to be provided on a part time basis. This technical assistance will include the services of an environmental planner mainly at the beginning of the implementation of the EMP, and by specialists who will provide professional guidance at critical steps of the program (or on ad hoc basis according to problems encountered).

5.1.2.2 The Environmental and Social Management Division (ESMD)

The actual implementation of the project will be managed by Sinohydro (Project Proponent) and EdL. The Environmental and Social Management Division (ESMD) will be established for project monitoring and coordinating purposes. At least one official will be assigned for the ESMD that will be responsible for environmental and social aspects on the project in coordination with project proponent. The ESMD will prepare all required documentation concerning the environmental and social aspects following the Lao regulations, to monitor and supervise resettlement/compensation implemented by the NN5 EMC in order to ensure that the work is complied with this Resettlement Policy Frameworks.

The ESMD is responsible for all social and environmental activities and will work in close cooperation with GoL organisations and agencies. Social development activities under the guidance of ESMD will entail:

- Providing skilled and experienced international and national staff to carry out all prescribed mitigation measures and achieve income restoration targets.
- Allocating sufficient funding for implementation of resettlement and social development activities.
- Providing prompt and fair compensations for all Project Affected Persons (PAPs) in accordance with established policy and entitlements, including viable resettlement sites, adequate housing and sustainable livelihood systems.
- Providing for any other unforeseen costs and mitigation and compensation measures that may arise and be of consequence for the PAPs during resettlement and compensation periods, as a result of project construction and operation.
- Conducting effective consultations with PAPs that allow for participation in planning, implementation and monitoring by all affected groups, valuing and

incorporating local knowledge, and ensuring the full participation of women, ethnic minorities and vulnerable groups¹.

- Assisting GoL representatives to acquire necessary knowledge and skills during implementation through provision of on-the-job training and other forms of learning assistance.

The ESMD will have four units (see Figure 2, below):

- 1) Resettlement and Compensation Unit;
- 2) Social Development Unit;
- 3) Environment Unit, and
- 4) Downstream, Headpond and Catchment Unit

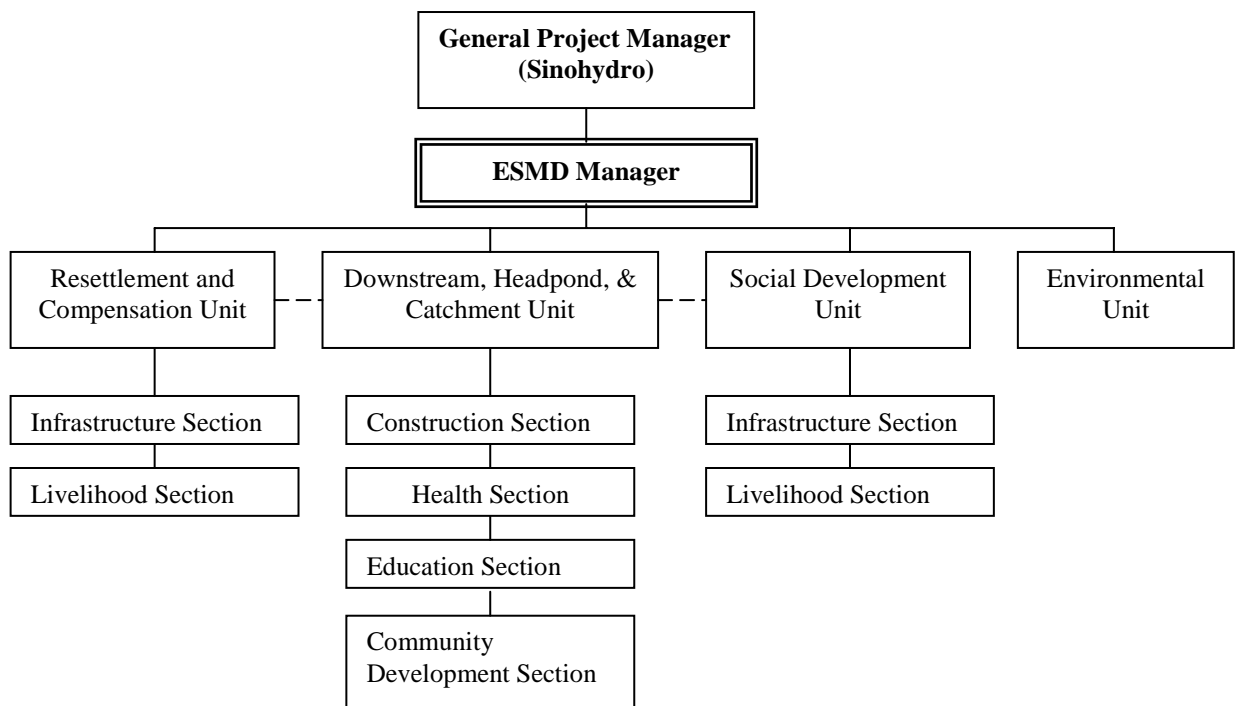


Figure 2: Overall Organisation of Environmental and Social Management Division (ESMD)

¹ Vulnerable groups include ethnic groups and female headed households and households with insufficient labour or handicapped members.

Resettlement and Compensation Unit

The Resettlement and Compensation will be responsible for all infrastructure and livelihood planning as well as implementation and monitoring of the relocation process for households in the new resettlement area. It will carry primary responsibility for livelihood restoration and improvement for the new and host villages. In addition, it will be responsible for compensation and relocation issues related to Project Construction Lands.

The Unit will be headed by a Manager with proven resettlement implementation experience, who will report directly to the ESMD Manager, and work closely with the Liaison Officer and GoL support staff (see Figure 3).

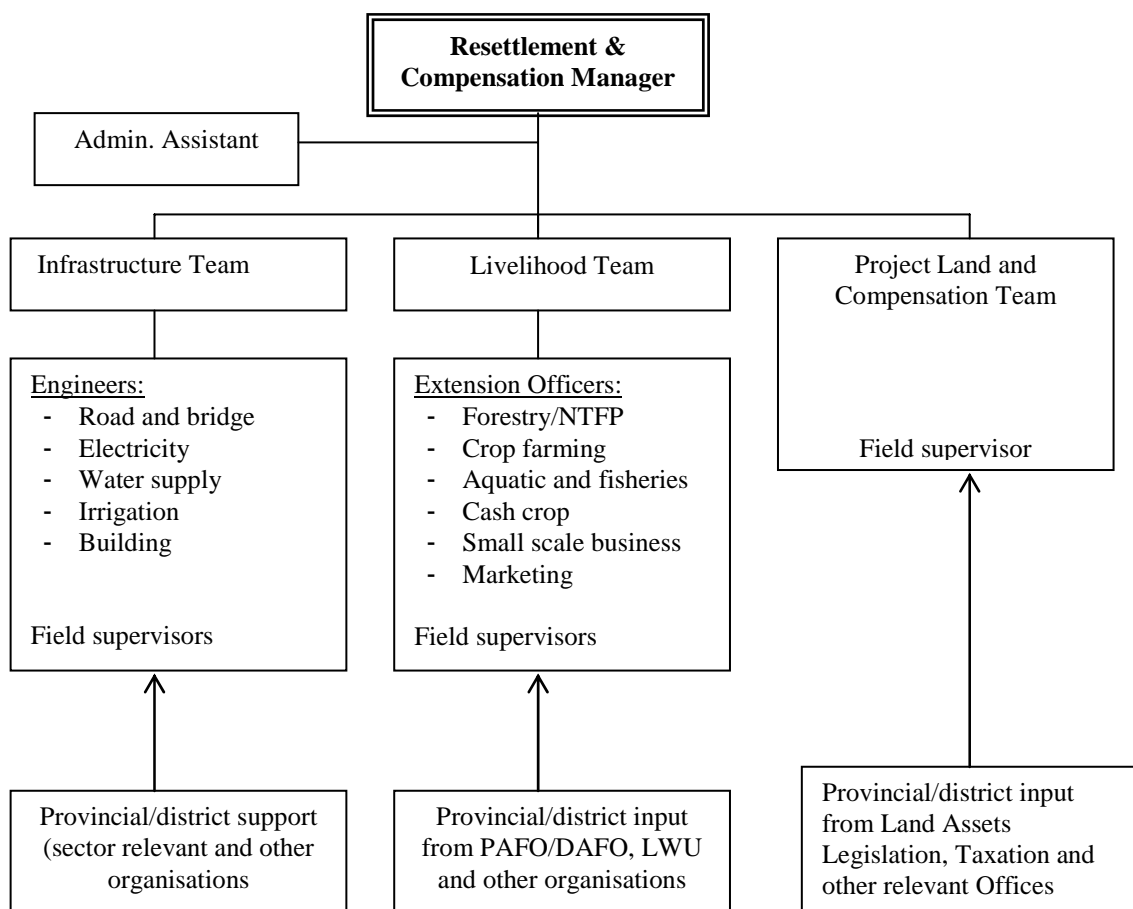


Figure 3: Organisation of the Resettlement and Compensation Unit.

The main tasks of the three sections will consist of the following:

Infrastructure Section

- Ensure access to new sites through the construction of new bridges and roads; and rehabilitation or upgrading of existing transportation facilities.
- Ensure effective water supply is provided to the village, through the installation of wells and piping systems.
- Ensure expansion land for housing construction for Ban Chim Village

- Ensure that all new sites have reliable electricity supplies and linked to the Lao grid where feasible, and in accordance with GoL planning.

Livelihood Section

- Develop suitable agricultural cropping systems, and carry out extension and technical support work to ensure food security and income targets for villagers.
- Ensure sustainable livestock and agriculture development for all households.
- Establish project nursery(s) for the development of tree crops and domesticated NTFPs and support their proliferation with extension work.
- Facilitate management of the village forest resources through zonation, regulations and awareness raising.
- Investigate markets and marketing-chains for agricultural produce and forge links with middlemen and cash crop companies.
- Develop handicraft and small-scale business opportunities and identify market channels.
- Together with the Monitoring Unit, monitor livelihood development until income targets are reached and sustained.

Project Lands Section

- Liaise with Infrastructure Section to ensure all infrastructures are in place for villagers who have to relocate from Project Construction Lands areas.
- Liaise with Livelihood Section to ensure PAP benefit from livelihood activities, where required.
- Valuate the assets lost due to construction activities in Project Construction Lands.
- Undertake cash compensation to entitled PAPs.

Social Development Unit (SDU)

The Social Development (SD) Unit will have primary responsibility for all consultations in the project area as well as community and human services aspects of the villagers and livelihood improvement process (see Figure 4). It will initiate and monitor consultations, health programs, education programs and a range of community development initiatives.

The Unit will be headed by an experienced Manager with proven social mitigation and development project experience, who will report directly to the ESMD Manager, work closely with the Liaison Officer and GoL support staff. The SD Unit will seek intermittent input from an Ethnic Specialist and a Gender Specialist, both during detailed planning, and the commencement of implementation, in order to ensure that ethnic and gender aspects are mainstreamed. The SD Unit will also ensure that the needs of vulnerable groups are addressed.

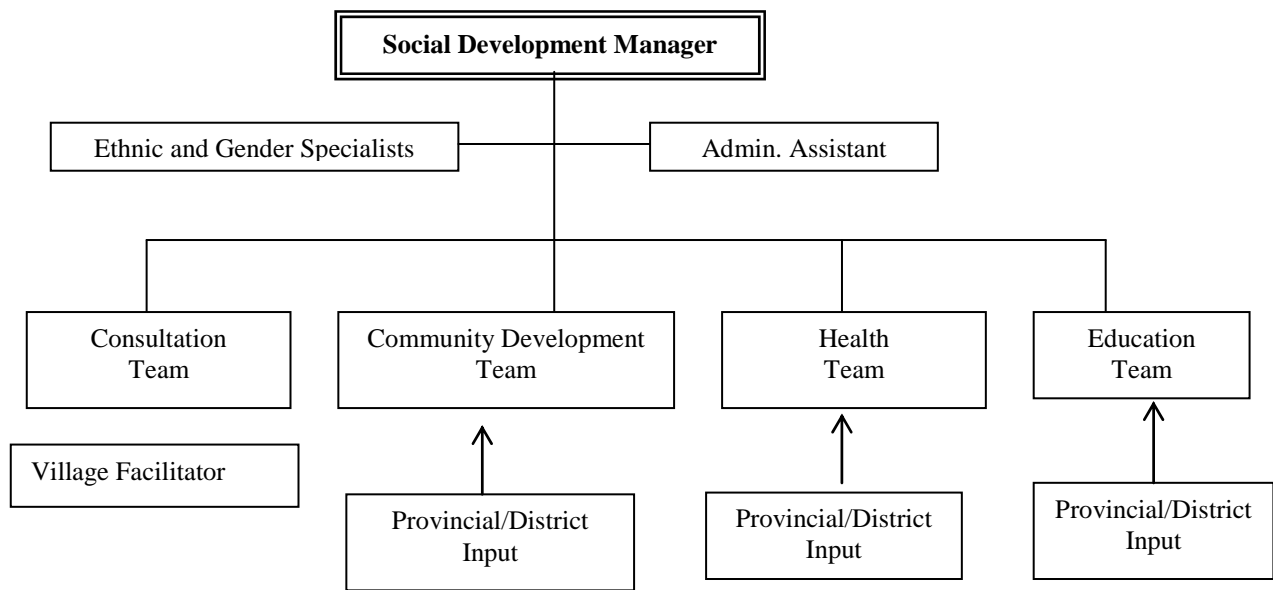


Figure 4: Organisation of the Social Development Unit

The main tasks of the four sections will consist of the following:

Consultation Section

- Participatory planning support for villagers, ensuring that local concerns and beliefs are incorporated.
- Participatory planning for Downstream, Headpond, Catchment and Project Construction Lands areas.
- Establish consultation feedback loops between affected households and project implementing organisations.
- Ensure that gender and ethnic issues are incorporated into planning procedures and implementation.
- Ensure that all affected households are familiar with content and mechanisms of the Grievance Procedure.

Community Development Section

- Prepare a comprehensive community development strategy for affected people and other project-affected groups.
- Facilitate the implementation of savings and credit schemes.
- Assist villagers in developing off-farm livelihood alternatives and cottage industries.
- Pay special attention to vulnerable groups in the resettlement and livelihood development processes.
- Link up with NGOs for community development initiatives.

Health Section

- Facilitate preparation of a comprehensive long-term health strategy and annual implementation plan for villagers and others.

- Oversee construction of new and upgrading of existing health facilities and the transfer to and orientation/training of MoH staff for these facilities.
- Establish baseline data on the health status and of the population in project-affected villages; facilitate annual surveys to measure changes in health status against the baseline; report to Sinohydro, MoH and any other relevant GoL line ministry on changes in health status.
- Liaise with MoH at national, provincial and district level to link project supported activities with GoL health initiatives.
- Provide direct mentoring and support to provincial Health Office (PHO) and District Health Office (DHO) staffs to conduct regular monitoring and supervision of health facilities and service delivery standards.
- Liaise with health and safety officers appointed by dam-site construction companies on issues related to effects on the population of adjacent villages of risks to health such as water pollution, dusts, and vehicular accidents.
- Liaise with multilateral, bilateral and NGO agencies active in health sector programs, to maximize cooperation and minimize duplication; participate in MoH activities to facilitate sector-wide coordination.

Education Section

- Facilitate development of a comprehensive education and training strategy and plan, for villagers and other project-affected groups.
- Oversee the reestablishment and upgrading of school facilities, carry out adult literacy programs and skills training.
- Assist District and Provincial education authorities in recruiting and training teachers and link up with GoL education initiatives.
- Monitor education programs and school attendance.

Downstream, Headpond and Catchment Unit (DHCU)

The DHCU will be responsible for all infrastructure and livelihood planning, implementation and monitoring for the Downstream and Headpond villages. Hence, many activities will parallel those of the Resettlement Unit in terms of livelihood development (see Figure 5). The unit will also carry out monitoring in all these areas, including the Catchment area.

The Unit will be headed by an experienced Manager with proven livelihood implementation experience and will report directly to the ESMD Manager and work closely with the Liaison Officer and GoL support staff.

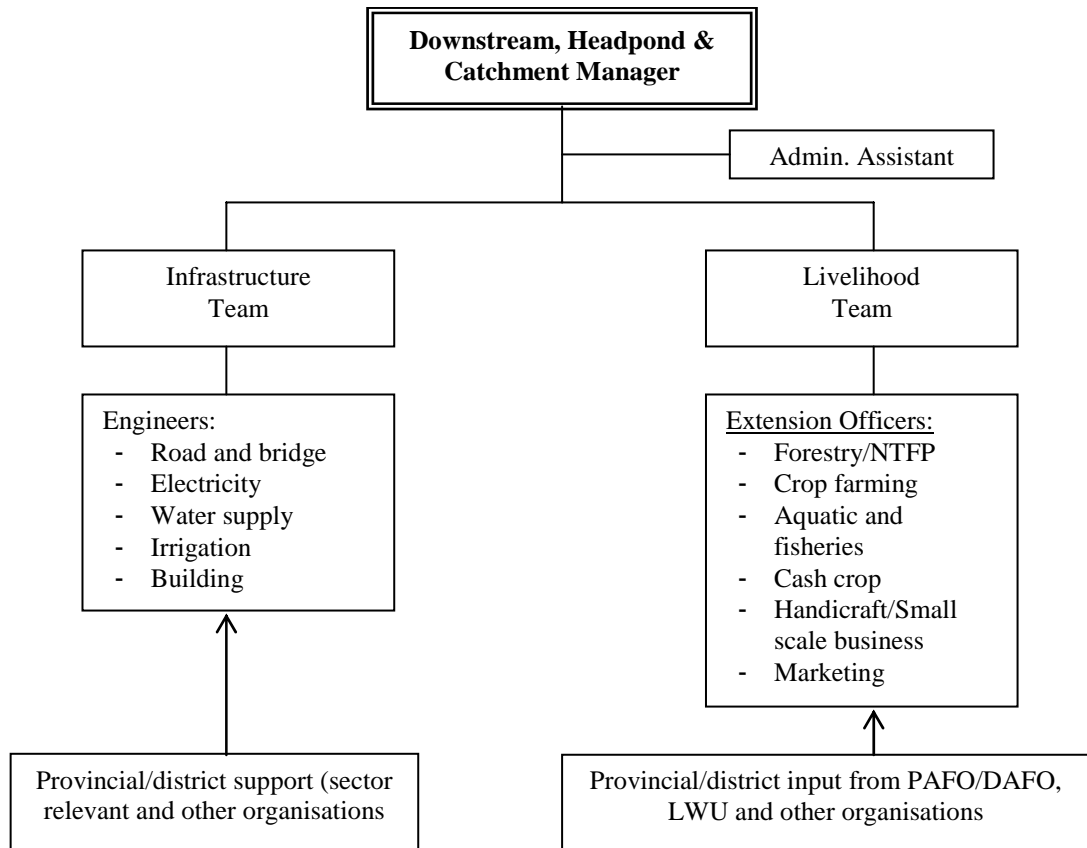


Figure 5: Organisation of Downstream, Headpond and Catchment Unit.

The main tasks of the two sections will consist of the following:

Infrastructure Section

- Facilitate physical relocation of villages along the Recipient Rivers.
- Establish erosion protection measures.
- Improve water supplies to affected villages through the installation of wells, boreholes and other systems.
- Establish roads and bridges.
- Improve and/or introduce irrigation to affected villages where appropriate and feasible.
- Install electricity in villages.

Livelihood Section

- Development of reliable agricultural cropping systems and carry out extension work to improve food and income security for affected villages.
- Engage PAPs in livestock and aquaculture development to suit needs and ambitions.
- Promote orchard and domesticated NTFP planting for income generation and consumption.
- Identify and develop handicraft and cottage industry operations in affected villages.
- Investigate markets for agricultural and other products and develop links

with middlemen and commodities trading companies.

- Ensure fair and prompt cash compensation for loss of land and production in areas where livelihood improvement activities and land replacement are not possible.
- Monitor livelihood improvement until income targets are reached and sustained.

5.2. Reporting

The reporting program must satisfy 3 objectives:

- To provide a regular distribution of information through the several parties involved in the project.
- To set up a formal framework for performance achievement evaluation
- To assist a fast decision making procedure in order to implement within the shortest time any decision taken by concerned parties

The system is based on 7 types of reports:

- a) **Day to day report:** filled by the Environmental and Social Manager (ESM) in order to take formal notes of daily events, decisions, actions. These reports are only registered for further consultation when necessary.
- b) **Weekly report:** prepared by the ESM and submitted to the Project Manager (PM).
- c) **Monthly report:** prepared by the ESM for submission to PM, the reports will summarize:
 - Activities carried out during the month, task completed, personnel involvement, schedule of activities,
 - Problems encountered, decisions taken,
 - Major issues under debate, proposed solutions,
 - Proposed activities for the coming months,
 - Budget situation: expenses, invoices, fund reallocation...etc.
 - List of major meeting held during the month,
- d) **Meeting reports:** minute of monthly (or ad-hoc) coordination meetings held with NN5 EMC and others). To be prepared by Secretary of the NN5 EMC, signed by the Chairman and counter signed by the EM. For submission to ESMD, Project Manager and NN5 EMC members.
- e) **Review reports:** to be submitted to ESMD and lender (if any), every four months the first 2 years and every 6 months after (see proposed review program in section 4). These report will summarize major issues addressed, major achievements, major pending problems, budget situation, recommended strategy and work plan until the next review. They will be prepared by the review team.
- f) **Annual review report:** to be submitted by ESMD to Sinohydro, EdL, DoE (MEM), WREA and lender (if any), summarizing the progress of environmental mitigation

and monitoring activities during the last 12 months of activity and presenting strategy and work program for coming 12 months.

g) Technical report: prepared by sub-contracted Agencies or consultants. Submitted to ESM according to schedule.

Table 5.2: Summary reporting program

Report Types	By:	To:	Purpose
Daily Report	ESM	Project files	Registration of daily events. For consultation only
Weekly Report	ESM	PM	Follow-up of social and environmental activities
Meeting Reports (monthly and ad-hoc)	NN5 EMC	ESM	Signed by concerned parties & summarized in monthly report
Technical Reports	GOL Agencies, consultants	ESM, Cons. Engineer	According to technical
Monthly Report (Project)	ESM	PM, ESMD, EdL DoE/MEM, WREA	Monitoring of EMP implementation
Monthly Report (Contractor)	ESM	PM, ESMD, EdL DoE/MEM, WREA	Follow-up of contract obligations
Interim Review Reports (4 to 6 monthly)	Review mission member	ESMD, DoE/MEM, EdL WREA, Lenders (if any)	Progress in EMP implementation, issues & achievement
Annual Review Report	Review mission member	ESMD, DoE/MEM, EdL, WREA, Lenders (if any)	Annual status of EMP achievement

APPENDIX 1: MITIGATION AND MONITORING PLAN FOR CONTRACTORS

This Appendix details the environmental obligations of the Contractors and sub-contractors who will be appointed to carry out the construction of the NN5HDP.

The mitigation and monitoring Plan for the Contractors includes 3 parts:

- I. General Environmental Protection Obligations
- II. Health and Safety Plan
- III. Quarry Area Management Plan

I. GENERAL ENVIRONMENTAL PROTECTION OBLIGATION

1.1. Organization and Responsibilities

The Construction Manager will be directly responsible for the respect of the environmental protection guidelines and the compliance with safeguards and standards required.

The main Contractor in charge of construction and civil engineering will nominate a representative (Environmental Officer, EO) with appropriate experience in the environmental field and fluent in English.

The main task of Environmental Officer (EO) will

- monitor environmental activities of the Contractor
- assist in resolution of no-conformance
- identify the need for and recommend corrective actions
- liaise with the Environmental Manager from EdL
- prepare a monthly report.

The EO will report to the Contractor Construction Manager.

The EO will prepare a monthly report, including (when required) photographic record of implemented environmental protection measures. The report will be submitted to the Construction Manager with a copy (in English) to the EM.

The monthly report will summarize any relevant special sites investigations and monitoring activities.

1.2. Sequence of Construction Activities

General sequence of activities will include:

- The preparation of plans in accordance with obligations detailed hereafter and their submission to the Project Manager for discussions and approval.
- The construction of sediment and pollution control measures prior to major earthworks.
- Site clearing and commencement of earthworks and construction of structure.
- Site rehabilitation where required.

The first step in the sequence of operations is to plan the environmental management activities as well as the construction activities. In general, the planning requires the Contractor to:

- Prepare erosion and sediment control plans.
- Schedule earthwork to retain as much protection from ground cover vegetation as possible.
- Plan the stabilization and vegetation work to follow as quickly as possible after the completion of the earthwork.
- Minimize noise generated by construction.
- Prepare chemical incident management procedures.

In practice, this leads to the following during construction:

- Construction work is phased so the land disturbance is confined to areas of manageable size.
- Stripping and stockpiling of topsoil is the first step in the construction process.
- Stockpiles to be protected from erosion.
- Drainage works, sediment traps, diversions, culverts and related structures are installed prior to major earthwork taking place and prior to storage of harmful chemicals.
- Stabilization measures are installed progressively as each area is developed. For example, as works achieve their final land form, they shall, where appropriate, be progressively revegetated.
- Area which will remain disturbed for some time such as topsoil dumps shall have a temporary vegetative cover established.
- All sediment and erosion control structure are inspected regularly and maintained or cleaned out to ensure their effectiveness.
- Use of water carts for dust suppression in appropriate area (villages, work sites).
- Appropriate maintenance of engines (generators, trucks, heavy machinery)

1.3. Water Quality, Erosion and Sedimentation Control

1.3.1. Guidelines and Plan Preparation

Soil and water management plans will be developed to meet acceptable and appropriate standards. Under these plans, drainage works, sediment traps, diversions, culverts and related structures will be specified and designed to treat water to an acceptable quality and will be installed prior to the commencement of earthworks in any area and inspected regularly to ensure effectiveness.

Soil erosion and sedimentation controls would be the first measures installed at any new work and stabilization measures will be progressively installed as area are developed. Drainage systems for the construction area will be designed and located to restrict alteration of water regimes in adjacent areas to a practical minimum.

1.3.2. Erosion and Sedimentation Control Measures

Specific erosion and sediment control measures applicable to the construction sites outlined below:

a) **Drains and Banks**

Catch drains, diversion drains, table drains, windrows and associated drop-down drains shall be used to ensure runoff from the works is directed into existing water courses. Periodic inspections are conducted to repair damage caused by scour, sediment deposition, channel obstruction, excessive traffic can loss of vegetative cover.

Temporary banking shall be used when required to divide slope lengths into non-erodible segments through the interception of runoff and its diversion to stable outlets at non-erosive velocities. Temporary baking shall be utilized from the time of initial clearing to the time of the final landform is attained.

Stable outlets for such temporary banking shall be located at natural drainage lines such as the point where cut and fill sections meet at natural ground level. Temporary banking shall be constructed with adequate capacity to cater for

runoff from high intensity storm flows and to ensure channel grades are not excessive.

b) Sediment Controls

Silt entering drains shall be controlled where appropriate by either of two devices depending on the size of the catchment, intended duration of the structure, and other local physical and environmental constraints.

- **Silt trap fences**

Silt trap fences may be placed across minor drainage lines to control sheet flows. They require regular maintenance to ensure that the toe of the filter fence remains buried and anchored.

- **Sedimentation basins**

Sedimentation basins are constructed off-stream and are used to remove the sediment load generated on construction sites. They shall be installed prior to development activity and remain in place until such activity is completed.

Silt shall be removed from the basins on a regular basis such that the capacity of the pond remains adequate to control the runoff generated within each catchment area. This is generally when the capacity of the basin has been reduced by 30%.

Regular maintenance shall be carried out to the basins themselves such that the integrity of the structure is maintained at all times.

Silt trap fences may be located at the lip of the spillway of each basin should the capacity of the basin be surcharged during storm events.

c) Clearing and stripping topsoil

Clearing and stripping shall be limited only to those areas where the commencement of work in that area is imminent having due respect for the progress on site and the construction program in general.

d) Stockpile construction and maintenance

Topsoil shall be stripped, separated and stockpiled for respreading on all exposed areas when final shaping has been completed.

Stockpiles shall be constructed to be smooth and free draining and better slopes shall not exceed 1.5: 1. The height of the topsoil stockpiles shall be limited to three meters and compacting of the stockpile shall be only by equipment necessary for the hauling, placing and spreading of the topsoil material (excessive compacting alters quality and fertility of topsoil).

All topsoil stockpiles shall be deep ripped to ensure the retention of moisture and the promotion of regrowth.

Erosion and sediment control shall be implemented around stockpiles. Stockpiles shall be located in areas of convenient access for recovery and away from drainage lines.

e) Construction site and storage depot protection

All earthworks shall be conducted in such a manner so as to mitigate the possibility of erosion.

To prevent the possibility of the discharge of storm and construction water into areas outside the limit of the works, the areas of excavation and fill shall be shaped in a concave manner, where possible, such that the water is contained within the works areas.

f) Road Construction

The locations of roadways shall be slightly off contour for drainage control and to aid in reducing erosion.

Apart from the erosion and control measures already mentioned, cleared areas shall remain in a rough condition to absorb water and minimize runoff.

Road development along the escarpment, between the water intake and the power plant, will require particular attention regarding slope stability. Construction techniques will require the approval from the Consulting Engineer prior to implementation. Cut materials will not be indiscriminately tipped along the downhill side of the road, as it can induce major instability on steep slopes. Wherever possible, cut material will be used as filling material for the road and for the eventual rehabilitation of the area.

1.3.3. Rehabilitation and Revegetation

Staged restoration will proceed as soon as possible following completion of construction.

The surfaces will be lightly tined to remove undesirable objects, stones, rocks to prevent ponding. These areas will then be topsoiled and revegetated.

The stabilization of the disturbed areas shall be commenced as soon as possible. Drains may be stabilized with vegetation, stone pitching, rip-rap or concrete lining depending on the circumstances.

All disturbed areas shall be seeded and fertilized if necessary progressively as structures are completed and as the final landform is achieved.

1.3.4. Water quality protection

i) Storage of engine oil, fuel and other chemicals.

All storage areas for fuels and other hazardous liquids will be bundled to an adequate capacity to mitigate potential spillage problems and pollution of surface water. A sump will be provided to allow pump out of any contained liquid.

To minimize the risks of pollution, refueling of heavy construction machinery will generally be undertaken using a service vehicle.

Workshop facilities will be kept at least 50 m away from watercourses, and will have grease and oil traps which are properly maintained to ensure clean runoff from the sites even during rain events. Field maintenance will be done as far as practicable from

the watercourses.

ii) Rubbish and sewerage disposal

All rubbish and sewerage will be kept away from any water course to avoid contamination through seepage or direct runoff. See also sections 1.3.6, 2.5 and 2.6 of the present guidelines.

1.3.5. Traffic Management

The safety of site access roads and intersections with the classified road network is paramount. Safe sight distances and appropriate signals will be maintained. Suitable vehicle parking and storage areas will be provided on site, and appropriate maintenance of cars and trucks will be provided, with regular inspection of lighting system, brakes and tires.

The road surface and shoulders of site access roads will be maintained at their designed standard.

1.3.6. Waste management

Bins and dumping facilities are to be provided at each site to avoid the proliferation of litter and construction waste and the potential for the escape of material off site. Waste is to be burned or buried.

Toilet and wash basin facilities will be provided on sites and at camps with appropriate treatment prior to effluent discharge. Toilet facilities will not be located where there is potential for drinking water contamination in the event of a spillage.

1.4. Biodiversity Conservation

The project site is covering the Phou Da Phor and Phou Pha Day conservation areas under responsibility of Khoum District. As a consequence, hunting and poaching are not allowed within conservation areas. The strict respect of this ban will be required from all workers appointed by the Contractors or Sub-contractors for the construction of the Project.

The Construction Manager will be responsible for the strict application of the rule and may be fined in case of non-compliance. The monitoring of the hunting ban enforcement will be carried out by the District ranger staff.

The Construction Manager is also requested to ban firearms within the premises of the workers camps and of all the working sites including the reservoir area. Some firearms may be required to ensure the security of the workers particularly when working in densely forested areas. In such case, those in charge of security will be clearly registered and the use of their arms strictly controlled.

Workers will be prohibited from fishing activities which may harm the river fisheries, e.g. using explosives or poison.

1.5. Air Quality

The air quality in the area is good. Two main factors from the Project construction may locally alter it: dust and exhaust fumes. Dust is potentially the most significant component,

at least during the dry season, from October to May. During this period it may be generated by wind action on cleared and bare soils, and by traffic on tracks and roads. To limit as much as possible this impact near populated areas (villages, camps, work sites), the following measures will be implemented:

- Minimization of bare areas at anyone time by appropriate work organization and progressive revegetation of sites.
- Provision for improved surfacing of roads in populated areas to reduce the production of dust.
- Appropriate maintenance of engines in order to generate as clean exhaust fumes as possible.
- Appropriate location of facilities (generators, crushers, waste disposal site for burning) under prevailing wind conditions.

II. HEALTH AND SAFETY PLAN

The main public health consideration during Project construction would relate to controlling introduction of new diseases in the area and out- breaks of malaria and other mosquito-related diseases. For that reason, the Contractor will be responsible for preparing and implementing a Health and Safety Plan, subject to the approval of EdL and MOH.

The Health and Safety Plan will address the following components:

2.1. Pre-employment Medical Screening

The Contractor will be required to carry out a pre-employment medical screening for all workers, national or foreign, employed on the Project sites. Health records will be filled for each worker, providing the health status resulting from the screening.

The following aspects will be covered by the screening:

- General physical examination: To determine fitness, gross defects and past health problems.
- Radiological examination: Strongly recommended for all workers as pulmonary tuberculosis is rather common in the region.
- Examination for detection of STD, if any suspected.
- Test for occupational hazards: Concerns workers anticipated to be assigned to hazardous/precision works. Additional tests should include hearing, visual acuity, heart condition, dexterity, blood and urine examination.
- Malarial parasite examination: Concerns all workers, and will use thin film method.
- Stool examination or blood examination for Schistosomiasis and skin tests for all workers coming from infested regions (southern Provinces of Lao PDR for instance).

2.2 Worker Safety

The following measures will be implemented:

- Elaboration and enforcement of safety regulations and measures in workers camps, construction sites and on roads.
- Implementation of medical facilities on each of the major working sites, (because of transportation difficulties in the area): 1 mobile medical unit with medical staff and equipment for first aid and emergency assistance will be placed at the operator's village.
- Facilities for first aid will be provided at the: dam site, water intake site, and river diversion site.
- Implementation of an emergency evacuation procedure in case of serious health/accident problems which cannot be managed on site: helicopter for transfer to surgical/I.C. units in Vientiane or in Thailand, and international assistance for repatriation of foreign workers.
- Follow-up medical examination: General physical examination including routine malarial, urine and stool tests will be performed
 - every 2 years for workers less than 45,
 - every year for workers older than 45 or all workers attached to hazardous works.
- Follow-up of curative treatment for any worker subject to identified health problems. This may concern especially malaria, respiratory diseases, digestive track diseases, intestinal parasites and STD.

2.3 Malaria Control Program

A procedure will be implemented to control risks of malaria break-out. It will cover.

- Malarial parasite examination (routine procedure within the Pre- employment medical screening).
- The use of Chloroquine, Fansidar or Quinine according to the parasite detected.
- Chemoprophylaxis based on 2 Chloroquine tablets (150 mg/tab) to be taken weekly. This is essential to limit risk of outbreak and loss of working days.
- Promotion of individual protection and reduction of mosquito development through:
 - A minimum health education program regarding malaria prevention (every 6 months, under the supervision of the Institute of Malaria, Parasitology and Entomology, Vientiane),
 - The supply of mosquito nets (with Permethrin) to workers,
 - Regular spraying of working buildings and workers camps (dormitories) with Sumithion.

2.4 Water Supply

Workers camps and working sites will be provided with clean and potable water, satisfying

recommended guidelines of World Health Organization for drinking water (1994 Standards).

If necessary the water source will be protected from any pollution risk from animal or human origin. The Contractor will carry out regular control of water quality.

In the workers camps, washing facilities including taps, wash basins and showers will be provided to the workers in compliance with the international standards generally applied.

2.5 Sanitation

In order to preserve the contamination of surface water by human waste and the transmission of water-related diseases, sanitation facilities will be provided in the workers camps and on the major working sites by the Contractor Facilities will be in conformity with WHO recommended technologies (at least VIP latrine type), and with a ratio of one toilet for no more than 20 workers. The designed capacity of the facilities will have to accommodate the expected load over the full construction period. A maintenance program of the facilities will be presented in the Contractor's Plan, to approval by EdL and MOH.

2.6. Domestic Wastes

Solid waste from domestic origin will be collected on a regular basis from work sites and workers camps, in order to avoid the development of unhealthy condition and the proliferation of insects nearby.

An appropriate area will be identified and developed by the contractor for the safe disposal and burning of the wastes. The plan will be submitted to the EM for approval. The area will be developed in such a way to avoid

- the pollution of surface water by run-off,
- the pollution of any underground source of drinking water by the leachate,
- the production of smokes' affecting directly working sites, workers camps or villages.

III. QUARRY AREA MANAGEMENT PLAN

3.1. Justification

During the field survey and study for preparation of this report, the location of suitable source of gravel and sand for the construction of the Nam Ngum 5 HEP has not been identified yet. However, the suitable source to provide gravel and sand for the construction will be identified and finalized by the project owner (SinoHydro Corporation Ltd.) soon, and then additional and separate study will be carried out by project owner or contractor. In order to do so, the project owner or Contractor is requested to prepare a detailed management plan for this area prior to start borrowing activities. The management plan will be submitted to the EM and Consulting Engineer for approval.

3.2. Content of the Plan

This plan will provide a technical study of the area, a detailed program of operation and supporting maps. It will be prepared in accordance with the following obligations:

- If technically possible, borrowing will preferably starts on areas which are not cultivated.
- Borrowing operations in cultivated areas will be organized into small I blocks in such a way that areas under excavation at the same time will be minimized. Borrowing and rehabilitation of successive blocks will be carried out simultaneously.
- Borrow areas previously under cultivation (paddy terraces) will be fully rehabilitated after use. The will be achieve through:
 - stock piling of top soil,
 - using the excavated volumes for the disposal of spoils from road, tunnel, power plant and tailrace channel,
 - filling and compacting of spoils in order to maintain levels of the original topography,
 - spreading and grading of stockpiled topsoil to an even surface, and reconstitution of irrigated terraces.

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