Environment Assessment Report

Summary Initial Environmental Examination
Project Number: 42182
November 2008

Socialist Republic of Viet Nam:
Renewable Energy for Remote Commune Sector Project – Nam Nghe Mini-Hydropower Subproject

Prepared by Power Company 1 of Viet Nam Electricity for the Asian Development Bank (ADB).

A. INTRODUCTION

1. The Nam Nghe Mini Hydropower Project (MHP) is the core subproject of the Renewable Energy for Remote Commune (RERC) Sector Project which is being considered for financing by the Asian Development Bank (ADB). The RERC Project aims to increase the number of households connected to the grid and to generate the power required by means of renewable energy sources. The Project will be prepared in a manner consistent with the government's strategy for electrification of remote communes through investments by provincial authorities under the supervision and coordination of the Ministry of Industry and Trade (MOIT). Viet Nam Electricity's (EVN) Power Company 1 (PC1) will be the executing agency for the Nam Nghe subproject. The proposed sector loan will focus on the communes that are considered too remote to be connected to the national grid and has potential for electrification using renewable energy such as micro to mini hydropower (0.5 to 7.5 MW capacity). The sector loan will also finance grid extensions consisting of medium and low voltage transmission and distribution lines. An environmental assessment and review framework (EARF) has been prepared for future micro and mini hydro subprojects.

2. Nam Nghe MHP is planned to be constructed on the Nam Nghe stream west of Hua Bum commune. Hua Bum is a mountainous commune of Muong Te district in Lai Chau province – a remote mountainous province in the Northwestern Vietnam. The subproject is designed with a generation capacity of 5.2 MW to provide electricity for 5 communes.

B. DESCRIPTION OF THE PROJECT

3. The various facilities of Nam Nghe MHP will cover an estimated area of 4 to 5 ha. The total land to be acquired for the subproject is about 8.3 ha. The construction duration is 24 months and the subproject is expected to be operational around 2011. The general hydropower layout is based on the following considerations:

(i) The potential of the Nam Nghe stream is exploited in a run-of-river mini hydropower plant without storage facilities.
(ii) An overflow weir about 14 meters high will be built in the river to divert the flow towards the intake. During operation, the raised water level will not cause flooding of adjacent areas since the river runs through a very steep gully.
(iii) The headrace canal with a total length of 1,400 m is located on the right bank of the river and the penstock will have a total length of 340 m.

4. To connect the households in the hamlets and the national grid to the Nam Nghe MHP, a mini-grid consisting of 17 km medium voltage (35 kV) and 10.5 km low voltage (0.4 kV) backbones and low voltage (220 V) house connections will be set up.

C. DESCRIPTION OF THE ENVIRONMENT

5. The weir will be located at 22º24'30.7" N and 103º56 55.5" E while the powerhouse will be at 22º23'43.5" N and 103º56'44.4" E. The size of the catchment area at the proposed intake is 35 km^2. Muong Te is one of the regions of highest rainfall in Lai Chau province with the rainy season lasting from April to October. Rainfall on high mountains may reach 3,000 mm per year; whereas rainfalls on medium and low mountains are 2,000 – 2,500 mm per year and 1,500 – 1,800 mm per year, respectively. The dry season starts in November and ends in March with mist and hoarfrost (white ice crystals) frequently occur in January and February. Hua Bum commune is located on medium and high mountains with the highest peak of 1,238 m. With influence of topography, annual rainfall in this commune is high. Annual average temperature at Muong Te is 22.4°C with the highest of 39°C and the lowest of 1°C.

6. Muong Te district is located in the basin of the Da (Black) river, the second largest

river in Northern Vietnam. Hua Bum commune is where the Nam Bum stream originates. The Nam Bum stream is a tributary to the Da River. The Nam Bum stream is created by three small streams, *i.e.*, Nam Nghe, Nam Pacheo and Nam Den Thang, originating from a mountain in the border with China.

7. The Nam Nghe stream where the Nam Nghe MHP will be located has a total basin area of 35 km^2, and average annual discharge of 2.6 – 3.0 m^3/s. The maximum discharge of the stream is over 10 m^3/s in the flood months (September to October) and it is only under 1.0 m^3/s in the driest months (February to April).

8. Muong Te district has a very complicated terrain with deep vertical and horizontal rifts by high ranges in the northwest – southeast direction with the dominance of high and medium mountains. The average elevation is 900 – 1,500 m above sea level with Phu Xi Lung as the highest mountain at of 3,076 m. The average slope is 25 – 30º.

9. As of January 2007, the forest cover in Muong Te district is about 172,480 ha consisting of (i) wood forests occupying 64.5%, (ii) wood-bamboo mixed forest and bamboo forest cover of about 2,262 ha or 1.6% (iii) premature forests (also called restored forests) occupy 33.4%, and (iv) 0.5% of planted forest.

10. According to the survey at the communes Mu Ca, Ta Tong, Hua Bum and the west sides of Muong Mo, Ka Nho, Nam Khao and Muong Te town in 2001, 24 large-size mammal species were found. The species listed in the Vietnam Red Book are *Bos gaurus* (gaur), *Panthera tigris* (tiger), and *Panthera pardus* (leopard). Other mammal species commonly found are deer (*Cervus, Muntiacus*), monkey (*Macaca assamensis*), wild boar, etc. Based on the 1991 study by the World Wildlife Fund, 222 bird species were observed in Muong Nhe with some rare and endangered ones such as *Lophura nycthemera* (silver pheasant), *Polyplectron bicalcaratum* (Grey peacock-pheasant), and *Anthracoceros albirostris* (oriental pied-hornbill). Various species of reptiles and amphibians are also commonly found in the district. To date, there have been no specific studies on biodiversity of Hua Bum commune. The abovementioned wild animals, however, may be found in mountainous communes in the locality (including Hua Bum), particularly where there is high cover of natural forest. Current threat to wild fauna is encroachment of local people into the forests.

D. FORECASTING ENVIRONMEMTAL IMPACTS AND MITIGATION MEASURES

11. The environmental impacts and corresponding mitigation measures during construction and operation phases of the road rehabilitation project are summarized in **Table 1.**

Table 1: Summary of Environmental Impacts and Mitigation Measures

Environmental Concern	Mitigation Measures	Implementation Responsibility	Monitoring / Supervision
Pre-construction			
1. Impacts to biodiversity due to site clearing.	- Careful planning and design of subproject components to ensure that vegetation clearing will only be undertaken as necessary. - Construction facilities such as materials storage, workers' camp, etc. shall not be located in forested areas. - Careful planning of route for transport of materials and equipment to the subproject site, by maximizing use of existing access roads and minimizing the need for creating area of a route traversing the forest. - Ensure that there will be no encroachment outside the planned subproject area. - Strictly define in the contract specifications the extent of vegetation clearing activities for hydropower facilities as well as for transmission and distribution line right-of-way.	Design Consultant Contractor Contractor Contractor Executing Agency (EA)	Project Management Unit (PMU) and Project Supervision Consultant (PSC)
2. Land acquisition impacts.	- Preparation and implementation of a resettlement plan that is consistent with ADB requirements to ensure just compensation and adequate support for affected persons.	Provincial People's Committee (PPC)	
Construction Stage			
3. Increased air pollution due to dust from earthworks during excavation, installation transmission and distribution lines, transport of construction materials, and gaseous emissions from equipment and vehicles	- Proper maintenance of vehicles, construction machines and equipment - Provision of cover on trucks transporting materials (soil, cement, stone, etc.) to minimize dust emission - Water spraying on road sections from the center of Muong Te district to the subproject areas, specially those near residential areas and other sensitive receptors, during dry periods.	Contractor	PMU and PSC
4. Increased noise and vibration levels due to construction activities such as civil works, operation of equipment and transport of materials and equipment	- Regular maintenance and timely repair of vehicles and trucks to reduce noise - Speed limits shall be imposed on construction vehicles when passing through residential areas.	Contractor	PMU and PSC
5. Water pollution due to domestic wastewater from workers' camps including oily wastewater, surface run-off from construction areas that may lead to siltation of surface water and	- Installation of sanitary toilets - Provision of a simple system of open ditches in the construction site in order to collect run-off water. Run-off water will be led to a settling pond for deposition prior to discharge to the receiving body of water.	Contractor	PMU and PSC

Environmental Concern	Mitigation Measures	Implementation Responsibility	Monitoring / Supervision
haphazard disposal of excess soil/excavation spoils	- Proper collection and storage of used lubricant and oil. Off-site disposal of such wastes shall be consistent with national and local regulations. - Compliance with the Government Decision N59/2007/ND-CP April 9, 2007 and Circular N12/2006/TT issued by MONRE on December 26, 2006 on proper management of solid waste, oily waste and batteries. - Spoils shall not be dumped in or near water courses and shall only be disposed in areas approved by local authorities. - Implementation of slope stabilization measures (e.g., planting of grass and other fast growing indigenous species)		
6. Pollution due to solid wastes generated by workers	- Provision of waste bins at construction sites and workers' camps - Collection and disposal of solid wastes twice a week. Disposal sites shall be those approved by local authorities.	Contractor	PMU and PSC
7. Loss of vegetation cover and increased hunting due to presence of construction workers.	- Strict prohibition of hunting and poaching of wildlife - Revegetation of disturbed areas and slopes using indigenous species of trees, shrubs and grasses within subproject site and along access roads - Avoid locating temporary construction facilities such as materials storage, workers' camp, etc. in thickly vegetated areas - Ensure that there will be no encroachment outside the planned subproject area, particularly in densely forested areas - Disposal of excavation spoils shall not cause damage to forested areas	Contractor	PMU and PSC
8. Adverse impacts on aquatic life due to high turbidity	- Provision of a simple system of open ditches in the construction site in order to collect run-off water. Run-off water will be led to a settling pond for deposition prior to discharge to the receiving body of water.	Contractor	PMU and PSC
9. Damage to existing roads	- Contractor shall rehabilitate access roads upon completion of site works	Contractor	PMU and PSC
10. Workers shall be exposed to safety hazards.	- Workers to undergo safety orientation program - Provision of appropriate personal protective equipment - Proper maintenance of vehicles and equipment - Observe regulations on electric safety (TCVN 4086-95), prevention of fire and explosion (TCVN 3254-89) during construction. - Setting up of a first-aid station at the construction site.	Contractor	PMU and PSC
11. Conflict between construction workers and local inhabitants	- Employ, as much as possible local inhabitants, to provide project labor. - Educate workers on proper relations with local people - Registration of workers (as temporary residents) with the police of Hua Bum Commune	Contractor	PMU and PSC

Environmental Concern	Mitigation Measures	Implementation Responsibility	Monitoring / Supervision
Operation Stage			
12. Changes to downstream hydrology	- Careful operation of the reservoir and power generation system plus regular hydrological monitoring to ascertain if the subproject is causing significant adverse impacts so that appropriate mitigation measures could be formulated and implemented.	Operator	Lai Chau PC and EVN
13. Generation of oily wastewater, domestic wastewater, oil spills and leaks and surface run-off could contribute to pollution loading of surface water.	- Effluent from mechanical repair shops and wash water of machines, handling equipment, bottoms of oil tanks shall be treated by an oil-skimming system, and then discharged into the drainage system of the plant. - Use of septic tanks for domestic sewage - Fuel oil will be stored in an area with a concrete basin to contain spills and leaks. The main drain of the storage area will be provided with an oil-water separator. - Maintenance of vegetation cover in areas surrounding plant facilities and along stream embankments	Operator	Lai Chau PC and EVN
14. Generation of solid wastes	- The operator will assign 1-2 workers to handle cleaning of the plant site and and collection of garbage from plant facilities. - Provision of waste collection bins in various locations within the plant facilities - Solid wastes shall be segregated and properly disposed of consistent with national and local regulations - Disposal of used oil and waste batteries shall comply with the Governmental Decision N59/2007/ND-CP April 9, 2007 and Circular N12/2006/TT – CTNMT issued by MONRE on December 26, 2006.	Operator	Lai Chau PC and EVN
15. Damage to the weir	- Regular inspection of the weir and other subproject structures and facilities - Immediate repair of damaged structures	Operator	Lai Chau PC and EVN

E. INSTITUTIONAL REQUIREMENTS AND ENVIRONMENTAL MONITORING PLAN

12. PC1 will establish a project management unit (PMU) which will be responsible for the day-to-day implementation of the subproject. The Nam Nghe MHP will be operated by a joint venture company to be formed by EVN and the Lai Chau PC.

Table 2: Institutional Responsibilities

Organization	Responsibilities
PC1	– Prepare contractual requirements ensuring that there are provisions requiring contractors to implement environmental mitigation measures indicated in the IEE – Ensure that environmental protection measures proposed in the IEE will be incorporated in the detailed design
PMU	– Monitor the contractors environmental performance on a quarterly basis and prepare monitoring reports – Document and address comments or complaints from the local residents – Conduct spot checks to ensure that contractors are implementing the environmental mitigation measures. – Report any environmental incidents to the Project Director. – Through PC1, submit environmental monitoring reports to DONRE and ADB on a quarterly basis
Design Consultants	– Ensure that environmental protection measures are incorporated into the design – Update the mitigation measures during the detailed design phase
Project Supervision Consultant (PSC)	– Train staff of PMU on environmental monitoring – Assist the PMU in monitoring and preparing reports on the environmental performance of contractors – Recommend additional mitigation measures during the construction stage, if necessary
Contractor	– Implement environmental mitigation measures specified in the IEE – Implement additional mitigation measures, as necessary
Operator*	– Implement mitigation and monitoring measures during operation phase – Prepare quarterly environmental monitoring reports and submit these to DONRE – Implement mitigation measures, as necessary

* joint venture company to be formed by EVN and Lai Chau PC

13. The total marginal cost of the environmental monitoring program from the start of construction through to the end of the first year of operation is about 200,000,000 VND. The identified mitigation measures in Table 3 shall be included in the tender documents to ensure that associated costs for specific measures (e.g., revegetation of disturbed areas, provision of septic tanks, etc.) will be included in the contractors' bid cost. The cost for environmental management training of PMU staff shall be included in the subproject cost under the contract of the PSC.

Table 3: Environmental Monitoring Program for the Nam Nghe MHP

No	Parameters	How to monitor	Frequency	Responsible agency
	Construction stage			
1.	Soil erosion	• Field observation to assess if: i. excavation and other site works cause soil erosion, ii. appropriate mitigation measures are applied by the contractor to avoid soil erosion.	Quarterly	PMU (with assistance from PSC)
2.	Spoils disposal	• Field observation to assess if the contractors: i. undertake proper stockpiling of excavated soil ii. dispose of spoils in areas approved by local authorities iii. do not cause damage to surrounding forests, agricultural land and water courses due to haphazard stockpiling and disposal of spoils	Quarterly	PMU (with assistance from PSC)
3.	Surface water quality	• Sample collection and testing for turbidity, total suspended solids, pH, dissolved oxygen and total coliform downstream of the weir. • Field observation to determine if the	Quarterly	PMU (with assistance from PSC)
4.	Encroachment on surrounding forests	• Field observation to assess if: i. vegetation clearing and site works are confined within the planned area/location of subproject facilities ii. no unnecessary vegetation clearing is being undertaken iii. illegal hunting is being undertaken by construction workers	Quarterly	PMU (with assistance from PSC)

No	Parameters	How to monitor	Frequency	Responsible agency
5.	Noise and vibration around construction site and residential areas adjacent the road used for material transportation	• Field observation to determine if: ○ noise and vibration levels are unacceptable at the residential areas close to the project site, ○ construction machines annoy or cause nuisance to local people, and ○ appropriate mitigation measures are applied by the contractor to minimize noise and vibration impacts. • Field measurements of noise and vibration levels when there are complaints from local people.	Quarterly	PMU (with assistance from PSC)
6.	Dust	• Field observation to determine if: i. construction activities are causing heavy dust emission, and ii. appropriate measures are implemented by contractors to minimize dust emission. • Field measurements of dust levels when there are complaints from local people.	Quarterly	PMU (with assistance from PSC)
7.	Solid waste and site clean up after completion of construction	• Field observation to determine if the contractor: i. conducts proper collection and disposal of domestic wastes, construction wastes and cleared vgetation ii. cleaned up the construction sites after completion of site works, and iii. disposed of construction wastes in areas approved by local authorities iv. rehabilitated damaged access roads	Quarterly	PMU (with assistance from PSC)
8.	Safety measures	• Field observation to determine if the contractor: i. conducted safety orientation for workers, ii. provides workers with suitable personal safety equipment, and iii. abides by technical and safety regulations.	Quarterly	PMU (with assistance from PSC)
9.	Construction material	• Field observation to determine if the contractor	Quarterly	PMU (with assistance from PSC)

No	Parameters	How to monitor	Frequency	Responsible agency
	management (including oil/lubricant)	properly handles and stores construction materials.		
	3. Operation Stage			
	Soil erosion	• Field observation to determine if erosion-prone areas such as slopes and stream embankments are adequately protected.	Semi-annually	Operator
	Water pollution	• Field observation to determine if domestic wastewater generated by employees are adequately treated using septic tanks. • Field testing (pH, SS, turbidity, DO, EC, temperature) and laboratory analysis (NH4+, NO3-, total N, total P, Fe, Al, Zn, BOD, oil, total coliform) of water samples to be analyzed for assessment of water quality of the reservoir and downstream of the power house.	Semi-annually	Operator
	Aquatic resources	- Field observation and interviews with regard to fish catch upstream of the weir and downstream of the power house	Semi-annually	Operator

Table 4: Cost Estimates for Environmental Monitoring for Nam Nghe MHP

No	Item	Amount (VND)
Pre-Construction Stage		
Construction Stage		
1	Labour requirement: 2 man-months x 10,000,000 VND/month	20,000,000
2	Cost for environmental analysis (water quality, air quality and noise)	20,000,000
3	Supporting cost (lump sum): accommodations, transportation, sample collectors, writing report	80,000,000
Operation Stage (per one year)		
1	Labour requirement: 2 man-month/year x 10,000,000 VND/month	20,000,000
2	Cost for environmental analysis	20,000,000
3	Supporting cost (lump sum)/year: accommodations, transportation, sample collectors, report writing	40,000,000
	Total	**200,000,000**

F. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

14. Public consultations were carried out through organization of meetings with the local authorities and interviews with local people. On July 2008, separate meetings were conducted by the environmental specialist with representatives from the People's Committee of Muong Te District, Section on Natural Resources and Environment of Muong Te District, Department of Industry and Trade of Laichau Province, Section of Industry and Trade of Muong Te District, Project Management Board of Muong Te District, and People's Committee of Hua Bum commune. To document the local people's socio-economic condition and concerns with regard to environmental implications of the subproject, household interviews were conducted involving 6 individuals from Hua Bum commune.

15. The local officials support the subproject since it will provide energy for the remote areas of Lai Chau province, contributing to poverty alleviation and promotion of cultural, and social development of local people particularly the ethnic minorities. While they recognize that the subproject is not anticipated to cause significant environmental impacts, they expressed the need for just compensation of affected people and proper management of construction works to minimize adverse environmental effects.

16. Except for one respondent who is not aware of the social and environmental issues related to the subproject, the interviewed residents consider that the Nam Nghe MHP will not cause significant environmental problems provided affected persons are adequately compensated and contractors implement measures to mitigate impacts due to dust, noise, road damage and forest clearing during construction of the hydropower plant.

17. These concerns raised by the local officials and residents will be addressed through implementation of a resettlement plan based on ADB requirements and implementation of environmental and mitigation measures indicated in this IEE.

G. CONCLUSIONS

18. During construction and operation phases, the Nam Nghe MHP may cause some negative environmental impacts which are considered minor and mitigable. Environmental mitigation measures and monitoring plan as well as corresponding institutional responsibilities have been identified to address such impacts. This IEE is sufficient for environmental assessment of this subproject and a full EIA is not necessary.