

# Initial Environmental Examination

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November 2013

## Viet Nam: Renewable Energy Development and Network Expansion and Rehabilitation for Remote Communes Sector Project

### Nam Pay Hydropower Project

Prepared by Northern Power Company for the Asian Development Bank.

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# **NAM PAY HYDROPOWER PROJECT**

## **DRAFT INITIAL ENVIRONMENTAL EXAMINATION**

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**LOAN 2517-VIE: RENEWABLE ENERGY DEVELOPMENT AND NETWORK EXPANSION  
AND REHABILITATION FOR REMOTE COMMUNES SECTOR PROJECT**

**NORTHERN POWER COMPANY**

April 30, 2012

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## **CURRENCY EQUIVALENTS**

(as of 31 March 2012)  
Currency Unit Vietnamese Dong  
US\$1.00 = 20, 837 VND  
1 VND = 0.000048 US\$

## **ABBREVIATIONS**

ADB	Asian Development Bank
CEP	Commitment to Environmental Protection
DARD	Department of Rural Development
DONRE	Department of Natural Resources and Environment
DPC	District People's Committee
EA	Executing Agency
ESDC	Environmental and Social Development Cell
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
HH	Household
IEE	Initial Environmental Examination
LEP	Law on Environmental Protection
MARD	Ministry of Rural Development
MOIT	Ministry of Industry and Trade
NPC	Northern Power Corporation
NO <sub>x</sub>	Oxides of Nitrogen
O&M	Operation and Maintenance
PDPMB	Power Development Project Management Board
PPC	Provincial People's Committee
RP	Resettlement Plan
RoW	Right of Way
SC	Supervision Consultant
SEA	Strategic Environmental Assessment
SONRE	Section on Natural Resources and Environment
SO <sub>x</sub>	Oxides of Sulphur
TA	Technical Assistance
TCVN	Vietnam Standards
QCVN	Vietnam parameter

## **WEIGHTS AND MEASURES**

ha	hectare
km	kilometre
km <sup>2</sup>	square kilometres
l/s	litres per second
m	metre
m <sup>3</sup>	cubic metre
m <sup>2</sup>	square metre
mm	millimetre
s	seconds

## **EXECUTIVE SUMMARY**

### **Objectives and Approach**

1. As part of the Loan 2517-VIE: Renewable Energy Development and Network Expansion and Rehabilitation for Remote Communes Sector Project, ADB will provide funding for specific mini hydropower projects for rural electrification in mountainous provinces of Viet Nam. The planning for individual hydropower projects is carried out in two stages. The first of these stages consists of identification of projects and development of feasibility studies and the second involves the construction of these projects. Nam Pay project has been identified for consideration under the programme.

2. The project is a small (7.5 MW) hydropower dam scheme designed to provide electricity to the rural electricity system of Mung Chung commune. The project is located in Nam Pay stream in Mun Chung commune of Tuan Giao district, Dien Bien province (Figure 1) and will affect the villages of Pa Tong (between dam and power plant) and Nam Pay (down stream of the hydropower plant). Under ADB guidelines, Nam Pay hydropower project is a Category B project, and as such, an Initial Environmental Examination (IEE) is required.

3. The project consists of a gravity dam, an overflow spillway, a tunnel to pipe water to the penstock, a powerhouse and tail race. Water is taken from the Nam Pay river and delivered to the powerhouse and returned to the river 3.5km downstream. The water delivery system is designed to provide a maximum water flowrate of 4.23m<sup>3</sup>/s to the three turbines in order to supply power (7.5 MW) to the national grid system.

4. The construction of the hydropower plant is expected to be completed in 2.5 years, upon commissioning and is planned to provide electricity to Mun Chung commune in Tuan Giao district in 2013.

### **Environmental Concerns and Impacts**

5. The construction of the dam with the option of 580m of water level in the reservoir will cause the displacement of two households and loss of productive land. The main potential environmental impacts of the project are:

- Human impacts with the loss of a small amount of residential land (900 m<sup>2</sup>), displacement of 18 persons (2 HHs in the reservoir area and in the penstock), and 397 persons (65 HHs) will suffer permanent loss of agriculture and forest production land. One of the important impacts of the project is the loss of permanent houses. The affected families should be properly compensated before the start of the project construction.
- The tunnel, penstock, project construction and access roads are on steep land. Construction along some steep and hilly slopes with landscape will result to scarring and loss of trees. There is also potential for scarring and encroachment on existing land on downhill slopes that could result to siltation of the Nam Pay, Nam Tong river bed and agricultural land in Pa Tong and Nam Pay villages.
- As a result of the subproject, a 3.5 km section of river between dam and powerhouse will be denied of water flow for approximately nine months of the year. Reduced water flow in the river has implications for fish and aquatic life, hence, a minimum environmental flow of 82 l/s will be maintained downstream of a dam.

## Environmental Mitigation

6. The major environmental mitigation measures included in the EMP are indicated below:

**Table 1: Summary of Impacts and Mitigation**

No	Potential Impact	Mitigation
1	Construction impacts with destruction and scarring of land in steep mountain terrain	Implementation of detailed EMP attached to the IEE to include provision of catchments/cut-off drains, silt traps, masonry retaining structures, spoils planning, planting of grass and revegetation of disturbed areas.
2	Use of borrow materials	Borrow materials will not be derived from cultivable and arable lands but only from permitted and existing quarry areas.
3	Loss of agricultural and production forest land	Resettlement plan to be implemented with compensation package for loss of land & trees.
4	Reduced water flows in the 3.5 km section of the Nam Pay stream.	82 l/s will be retained in the river system downstream of the dam to benefit fish and other aquatic life in the dry season. Conduct regular monitoring of river flow and the provision of environmental flow during the dry season.
5	Tree planting program	10 ha of tree planting area at penstock, roads and borrow and fill areas
6	Erosion in riverbed from tailrace discharge	Repair and/or extend the reinforcement of the downstream riverbed, as necessary. Provide stilling basin at the tailrace to prevent erosion and scouring.

7. Aside from compensation for the loss of land and for the temporary use of land during the 2.5- year construction period, funding is also incorporated in the budget for an environmental cell to strengthen the capacity the Power Development Project Management Board (PDPMB) which is the body which will implement the project on behalf of NPC.

## Conclusions

8. The project will have impacts on the Nam Pay river and on the loss of agricultural and forest production land. The main impacts identified in this environmental examination are the temporary and reversible impacts as a result of the construction activities and the potential impact on aquatic species of the long-term removal of water flow, resulting to a reduced flowrate in the 3.5 km stretch of the Nam Pay river for more than half of the year.

9. There is a need to ensure mitigation for impacts brought about by construction activities for the hydropower plant facilities including the building of 3.28 km of access roads are implemented. The proposed Environmental Management Plan (EMP) attached to this IEE outlines the mitigating measures for the impacts during the construction activities of the project. The proposed retention of 0.082 l/s environmental flow in the river system will also help reduce impact to the downstream ecosystem.

10. It is important, also, that NPC as the EA develops its internal capacity to implement and monitor the measures in the EMP. This has been designed into the project by requiring the setting up of an Environmental Monitoring Unit in NPC and the appointment of environmental & resettlement specialists.



## **I. INTRODUCTION**

### **A. Purpose and Scope of Environmental Report**

11. The Government of Vietnam has requested ADB for a loan to develop a project that will provide reliable and affordable supply of electricity to remote, mountainous and poor communes in Viet Nam. Nam Pay Hydropower project is a sub-project which has been identified under Loan 2517-VIE: Renewable Energy Development and Network Expansion and Rehabilitation for Remote Communes Sector Project of ADB. The overall project will finance the development of between 5 and 10 mini-hydropower plants, each with a capacity of less than 7.5 MW in the northern, central, and southern provinces of Vietnam. The loan will finance the connection of these mini-hydropower plants to the national grid and the expansion of the low voltage network to supply nearby villages which are currently not electrified. The Project is expected to contribute over 30 MW of combined power generation capacity to the national power system, and extend the medium voltage power network in remote areas of Viet Nam by 800 –1000 kilometers (km).

12. This Initial Environmental Examination (IEE) is undertaken as part of the feasibility study of the Nam Pay Hydropower project and is designed to meet the requirements for environmental assessment under ADB's Safeguard Policy Statement (SPS) (2009). According to ADB's SPS, the sub-project is considered as a "Category B" requiring an IEE. This study looks at the potential impacts of the construction and operation of the project on the Nam Pay river as well as its watershed and to the community in the project area. It will also assess the impacts during the construction of the lines, which will link Nam Pay hydropower project to the national grid at Mun Chung substation. The Resettlement Plan (RP) and Ethnic Minorities Development Plan (EMDP) will also be considered in the project.

## **II. DESCRIPTION OF THE PROJECT**

### **A. Category of the Project**

#### **1. ADB Categorization**

13. The 7.5MW Nam Pay hydropower plant project was screened, classified and assessed based on ADB's SPS 2009 and the Government of Viet Nam's Law on Environmental Protection (LEP). Using ADB's Rapid Environmental Assessment Checklist for hydropower projects (Annex 1), the project was classified as Category "B". An IEE is required to determine if there are significant impacts and if a more detailed impact assessment is necessary.

#### **2. Vietnamese Environmental Assessment Requirements and Regulation**

14. The relevant laws and decrees in Vietnam are as follows:

- a. The Law on Environmental Protection (LEP) No 52/2006/QH11, dated November 29, 2005;
- b. The Law on Cultural Heritage, June 29, 2011;
- c. Government's Decree No. 80/2009/ND-CP, dated August 09, 2006 detailing and guiding the implementation of the number of LEP's articles;
- d. Government's Decree No. 21/2008/ND-CP, dated February 08, 2008, amending and supplementing a number of articles of Government's Decree No. 80/2009/ND-CP, dated August 09, 2006 detailing and guiding the implementation of the number of LEP's articles
- e. MONRE's Circular No. 05/2008/TT-BTNMT, dated December 08, 2008 guiding the preparation of SEA, EIA and Commitments on Environmental Protection.
- f. Government's Decree No. 24/2008/ND-CP, dated July 31, 2000 providing detailed regulations in executing the Law on Foreign Investment in Vietnam specifically Article 82 concerning environmental protection;
- g. The Vietnam's standard and National Technical Regulations on environment currently in effect;
- h. Government's Decree No. 106/2005/ND-CP, dated August 17, 2005 detailing and guiding the implementation of some articles of the Electricity Law regarding the safety and security of high-voltage power grids;
- i. MOI's Circular 06/2006/TT-BCN, dated September 26, 2006 guiding the implementation of several provisions of Government's Decree No. 106/2005/ND-CP, dated August 17, 2005, detailing and guiding the implementation of some articles of the Electricity Law regarding the safety and security of high-voltage power grids; and
- j. National Technical Regulations on electrical safety (QCVN 01: 2008/BCT) according to Decision No 12/2008/QD-BCT, dated July 17, 2008.

15. **Environmental Impact Assessment.** Requirements for environmental assessment in Vietnam are laid down in Article 18 of the Law on Environmental Protection, which states when an Environmental Impact Assessment (EIA) must be prepared. Projects that are likely to impose risks or have adverse impact to national reserves, national parks, historical-cultural relics, natural heritage and on water resources of river basins, coastal areas and protected ecosystems areas are subject to an environmental assessment. A Circular issued by the Ministry of Natural Resources and Environment entitled "Guiding Strategic Environmental Assessment, Environmental Impact Assessment and Environmental Protection Commitment"<sup>1</sup> gives detailed guidelines for Strategic Environmental Assessment

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<sup>1</sup> GOV's Circular No.05/2008/TT-BTNMT dated 08 December 2008

(SEA), Environmental Impact Assessment (EIA) and Commitment to Environmental Protection (CEP) including SEA, EIA and CEP report preparation, review and appraisal, monitoring, and confirmation of implementation of the mitigation measures.

16. The regulations<sup>2</sup>, published in 2008, categorize which type of projects are required to undertake an EIA. With respect to the requirements for environmental assessment of hydropower projects, an EIA report is required for hydropower plants having reservoir capacity of 300,000 m<sup>3</sup> or above and for high voltage transmission lines with a length of over 100 km.

17. Nam Pay hydropower project has reservoir capacity of 370,000 m<sup>3</sup> and 32.8 km of 35 kV transmission lines, which connect to the national electricity grid system. Therefore, pursuant to laws and regulations of Vietnam, the project requires an EIA.

18. Nam Pay subproject has obtained the necessary approval of the EIA from Dien Bien Province under decision No 08-xn-NRE on 28/1/2009 (Annex 2)

### **3. Other Vietnamese Approval Requirements and Regulations.**

19. The Section on Natural Resources and Environment (SONRE) at District level is responsible for environmental management in the district/town territory. District People's Committees (DPCs) are responsible for approving CEPs<sup>3</sup> and Provincial level environment protection agencies are responsible for certification of registration<sup>4</sup>. SONRE is also responsible for conducting environmental monitoring during project implementation. However, given the current limited capacity of district level SONREs to undertake evaluation of environmental assessment reports, the MOIT shall coordinate with the Provincial People's Committees (PPC) to ensure that the respective SONREs are assisted by provincial DONREs during the review and approval of written CEPs. EIA reports shall be submitted to the district PCs for approval.

20. **Utilization of Water Resources.** The project must obtain permit on water resources use. Article 24 of The Law on Water Resources<sup>5</sup> entitled "Issuing permits for exploitation and use of water resources" requires organizations and individuals that exploit and use water resources to get permission from the competent State agencies.

21. Article 64 of the Act on "the Management of the river basin planning" specifies that the agency managing the planning of river basins is the Ministry of Agriculture and Rural Development (MARD).

22. Decree No 149/2004<sup>6</sup>, Article 4 defines permit issuance principles. Permits are granted initially for 20 years (Article 7). Permits for smaller projects are usually granted at Provincial People's Committee level (Article 14). The permitting authority will also manage the permit and the dossiers of required information for the project.

23. Permit owners, among other requirements, are obliged to pay fees, take measures for safety prevention, keep data and information on water resources and make reports to the People's Committee (Article 18).

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<sup>2</sup> GOV's Circular No. 21/2008/ND-CP dated 28 February 2008 and Article 24 of the LEP

<sup>3</sup> Article 26 of the LEP

<sup>4</sup> Article 17c of Decree 21-2008

<sup>5</sup> Law on Water Resources No. 8/1998/QH10 May 20, 1998

<sup>6</sup> Decree no 149/2004/ND-CP of Jul 27 2004 on the Issuance of Permits for Water Resource Exploration, Exploitation and use, or for discharge of Wastewater into Water Sources.

24. Article 21 “Order and procedures for issuance of surface water exploitation and use permits” defines what is required for a permit application i.e. what should be in the dossier accompanying the permit application. Details of scheme are required and certain other information including an analysis of quality of water sources according to State’s regulations. Also papers must be attached regarding land use rights and there must be a written agreement on land use between the organization or individual exploiting the water and the organization or individual having the land use right. The agreement must be certified by the competent People’s Committee.

25. **Environmental Flow.** Decree No 112/2008<sup>7</sup> prescribes the scope of environmental management protection requirements for integrated exploitation of hydropower and irrigation reservoirs (Article 1). It establishes the need for a minimum flow which is defined as “the lowest level of flow required for maintaining a river or a river section to ensure the aquatic ecosystem’s normal development and the minimum level for the exploitation and use of water resources by water users according to the priority level set in the river basin planning.”

26. Reservoir construction must conform with the river basin planning approved by a competent state agency (Article 4) and exploitation and use of natural resources and environment in reservoir protection corridors and reservoir zones must be based on approved master plans (Article 8).

27. Dam owners shall annually formulate a water regulation plan for reservoirs and notify the People’s Committee at all levels of the relevant localities in order to reduce adverse impacts on people’s production and life and the environment (Article 9.3). Water regulation plans for reservoirs shall be formulated on the basis of minimum flow requirements, among other things (Article 9.4).

28. Ministry of Natural Resources and Environment (MONRE), according to Article 12.2, are to assume responsibility for and coordinate with the concerned ministries, branches and localities in specifying minimum flow requirements for reservoirs.

29. Land use permit for the project will be applied to the District People’s Committee and water use permit will be applied to Dien Bien Department of Natural Resource and Environment later when financing is approved for the project.

30. Cultural and Archaeological Resources. In Vietnam, there are procedures set down relating to chance discoveries of an archaeological nature. The relevant laws and regulations are as follows:

- a. Cultural Heritage Law, June 2001,
- b. Decree No. 92/2002/ND-CP November 11, 2002 relating to the implementation of some articles of the Law on Cultural Heritage,
- c. Regulation on exploration of archaeological excavations Decision No. 86/2008/QD-BVHTTDL December 30, 2008 of the Ministry of Culture, Sports and Tourism.

31. Chapter II of the 2008 Regulations (Responsibilities of Organizations and Individuals when detecting archaeological sites) states that if Organizations and Individuals find archaeological sites and/or artifacts, they have the responsibility to protect, maintain the status quo at the location and promptly notify and hand the archaeological relics to the closest office of the Department Culture, Sports and Tourism or the Department of Culture and Information.

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<sup>7</sup> Decree No 112/2008/ND-CP of Oct 20, 2008 on Management, Protection and Integrated Exploitation of Resources and Environment of Hydropower and Irrigation Reservoirs.

## B. Location and General Description

### 1. Description of sub-project

32. The project is located in Nam Pay stream in Mun Chung commune of Tuan Giao district, Dien Bien province (Figure 1) and will affect the villages of Pa Tong (between dam and power plant) and Nam Pay (immediately down stream of the hydropower plant). It is planned to be constructed on the Nam Pay River which is the influent level I of Nam Mu river and the influent of Nam Muc river. The rivers originate from a mountainous region with the height of more than 1,000 m at coordinates of 103°22'30" East and 21°55' North. The rivers flow from the North toward the South, then merge into Nam Mu river. The Nam Pay hydropower project is positioned at 103°24'01" East and 21°47'24" North. The reservoir of the Nam Pay hydropower project has a small catchment area of 68 km<sup>2</sup>.

33. The reservoir, headwork route, and energy route are in Pa Ca, Pa Tong, Na Tong, Nam Pay, Nong Tong villahe, Mun Chung Commune, Tuan Giao District, Dien Bien Province.

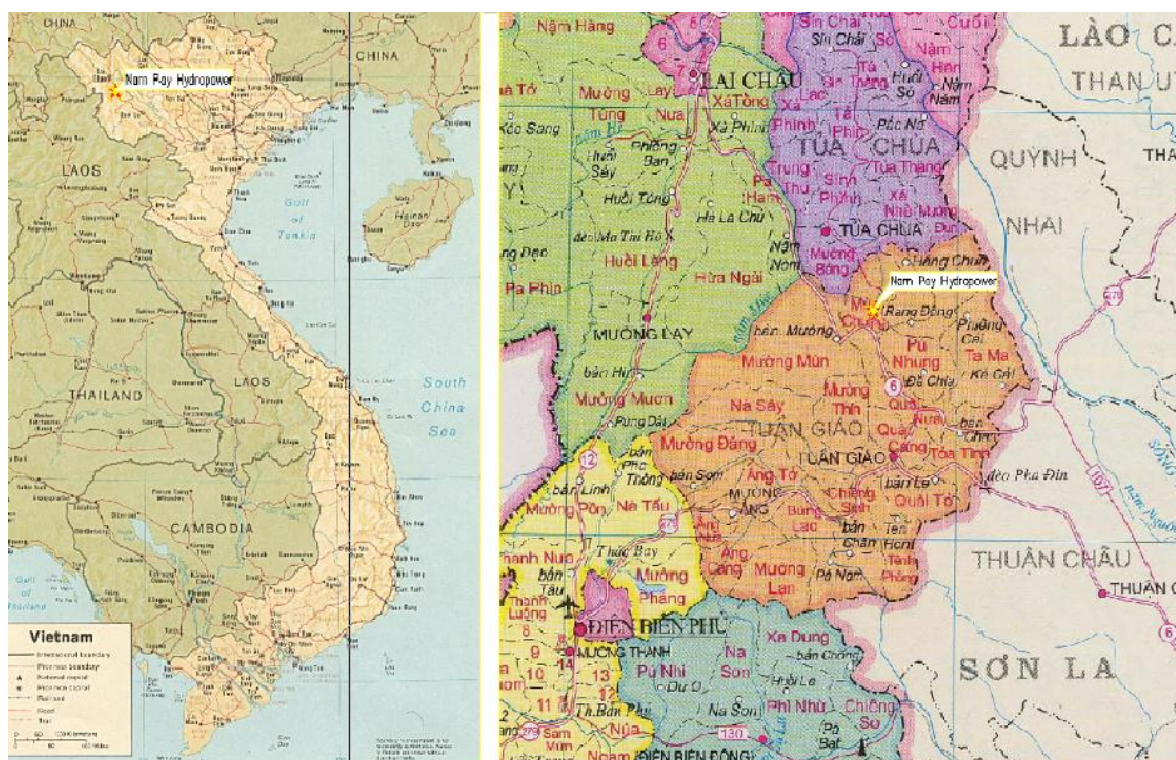


Figure 1: Project location in the region

34. The sub-project is part of the small hydropower plant development plan in Dien Bien up to 2020, which was approved through Decision No 99/QĐ-UBND on January 25, 2010 by the PPC.

35. The Nam Pay Hydropower sub-project will have 7.5 MW generating capacity and an annual average electricity production of 27.93 million KWh. The main elements are shown in Figure 2 and described as follows:

- A dam with maximum height of 25.8 m and reservoir with volume of 370,000m<sup>3</sup>;
- A 1,246-m reinforced concrete tunnel;
- A penstock of 843.7m in length, pipe section of 1.2 m and pipe-thickness from 1.2 to 2.0 cm;

- d. A powerhouse with three Francis - horizontal turbines;
- e. Outdoor electricity distribution station;
- f. A 35-KV transmission line to transfer electricity to the national grid through Tuan Giao-Tua Chua; and
- g. Administration and management building.

36. Below the dam, all the project components are on the right bank of the Nam Pay river. The power from the Nam Pay hydropower plant will provide electricity to the Mun Chung Commune with a population of 5,580 persons, 62% of which are ethnic Thai.

37. To connect the Nam Pay hydropower plant to the national electricity system, a new 35- kV line connection line is required, including two circuits:

- First Circuit: about 32 km in length, wire AC-150 connecting to the busbar 35kV substation 110/35/22 kV-16 MVA Tuan Giao (E21.1);
- Second Circuit: about 0.8 km in length, wire AC-150 35kV lines connected to Tuan Giao - Tua Chua.

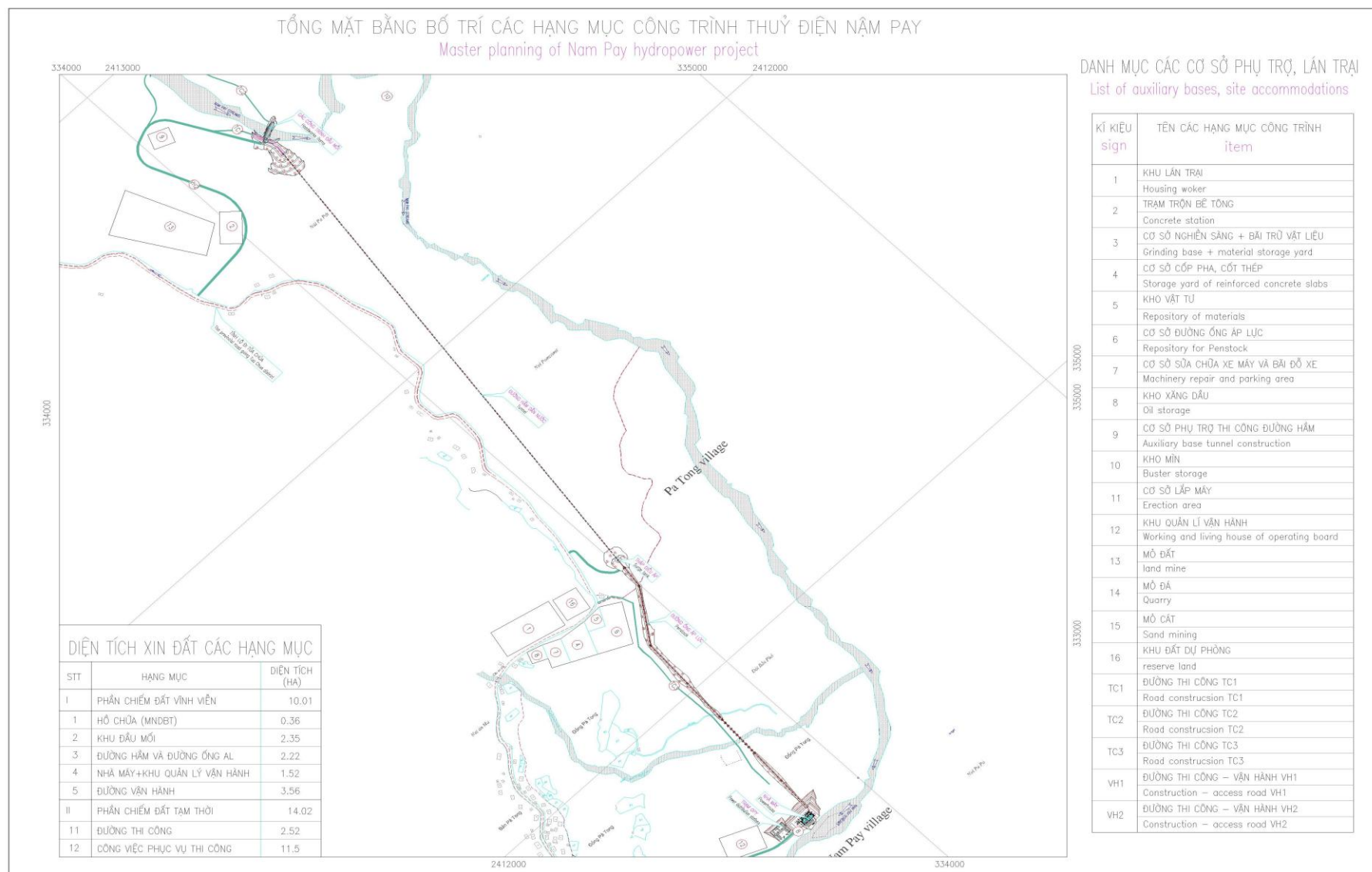
38. The water delivery system of the dam has a calculated head of 224.4 m, which is designed to deliver a maximum of 4.23 m<sup>3</sup>/s to three turbines and generate 7.5 MW of power. As a result of the project, in the dry season, the Nam Pay River will experience loss of water flow for approximately eight to nine months over the 3.5 km of the river between dam and powerhouse.

39. During low flow months with a flowrate of less than 0.5 m<sup>3</sup>/s, the plant will operate for only a few hours per day to provide for peak hour power requirements. The water regime will change immediately downstream of the dam.

40. Various access roads are required by the project:

- a. At the dam, 1.5 km of road with the upgrading of existing track road and about 800m temporary road on right and left bank for temporary construction access;
- b. At the surge tank, upgrading of the existing 140-m track road;
- c. For powerhouse, upgrading of the existing 940-m track road to provide permanent access to the plant; and
- d. A 700-m track road along the penstock route for construction purposes.





**Figure 2: Master Plan of Nam Pay Hydropower Project**

41. In addition to the main components, there are also auxiliary components for the Nam Pay Hydropower project which are described in the table below:

**Table 2: Auxiliary components**

<b>Components</b>	<b>Area (ha)</b>
Accommodation of workers	1.05
Concrete batching plant	0.4
Base crushing and screening material storage yard	0.75
Steel formwork base	0.4
Blasting materials warehouse	0.04
Park management and operation	0.6
Inventory	0.15
Base of underground components	0.5
Maintenance base and parking area	0.2
Oil storage	0.1
Installed machine base	0.03
Reserve land	0.4

42. The proposed campsite is between the area above Pa Tong village and some houses along the highway. The campsite is close to local communities in Pa Tong village.

## **2. Total investment of the project**

43. The proposed project will have an investment cost of VND 223 Million.

**Table 3: Project Investment Cost**

<b>Item</b>	<b>Amount (VND)</b>
Cost of construction	112,760,216
Cost of Equipment	41,452,245
Compensation, resettlement (estimated cost)	500,000
Administrative management cost	2,405,833
Cost of construction consultancy	11,604,431
Others	15,224,524
Cost of the establishment of local power network (estimated)	22,355,561
Contingency (10%)	17,242,637
<b>Total investment</b>	<b>223,545,447</b>

## **3. Offices and Camps**

44. To operate the hydropower plant, 36 personnel will be required, as outlined in the table below:

**Table 4: Human Resources Requirement of the Plant**

<b>Personnel</b>	<b>Numbers of persons</b>
Executive manager	1
Vice-manager	1
Team leader of a shift work	3



<b>Personnel</b>	<b>Numbers of persons</b>
Workers of mechanical component	8
Workers of energy network component	8
Workers of headwork	2
Workers fixing the construction, station and transmission alignment*	3
Personnel for material planning and health and safety department*	2
Financial department*	2
Driver and firefighter*	2
Helper and office assistant	2
Security guard	2
<b>Total workers</b>	<b>36</b>

Note: \* Refers to office personnel which are in-charge of administrative work.

45. The above personnel will be assigned at the new facility, next to the hydropower plant site (see Figure 2).

46. The construction camp and construction activities will be located in the temporarily acquired paddy land at both side of the main road in Pa Tong village.

#### **4. Construction methods and materials**

##### **a) Soil filling material – Soil field No.1**

47. The soil field is located on the mountainous range to the west of the dam route with an area about 0.06 km<sup>2</sup> (see Figure 2). The soil types include clay, clay loam, and clay mixed with hard stone. It is easy to exploit soil from Soil field No.1 by mechanical means. The exploitation does not cause significant harmful effects to the environment. It is recommended that the exploitation should focus on the east of the field due to its far distance from the road works and the residential areas of Na Tong town.

##### **b) Construction rock – Quarry No.1**

48. The rock field is located on the left of the road from Mun Chung to Tua Chua which is one km away from the plant to the West and 1.8 km away from the dam site to the South West. The main area of the field is 150-200m away from the road.

49. Exploitation shall be performed by mechanical means and detonation. However, due to the relatively sloping topography of the surrounding limestone, it is impossible to crush rock at the extraction site.

50. During the exploitation, distance from the foundation to the road will be maintained to about 200-300m for safety reasons. The exploitation should observe the safety procedures in order to protect people and vehicles travelling near the field.

##### **c) Sand and stone for construction**

51. Gravel for concrete aggregate: it is proposed to crush the limestone extracted from rock field No.1 for gravel. In addition, it may make use of the stone distributed along the alluvial flat and Nam Pay river bed.

52. Sand for concrete aggregate: According to the preliminary investigation, there is a limited amount of sand for exploration along Nam Pay stream. The small scale sand bank

and sand field are distributed on Nam Pay River, passing from the south of Nam Pay town to Tua Chua.

## **5. Construction facilities in the project area**

53. The excavation works shall be conducted in compliance with the applicable regulations of Vietnam and particular technical conditions for Nam Pay Hydropower project.

### **a) Excavation works**

54. The excavation works are mainly carried out at the left and the right bank of the dam and at the tunnel gates. The excavation roof is high but it goes along the natural ground surface so that the depth of the excavation layer is not much and the excavation plan is narrow. The main method of excavation at area with thin excavating layer is to use the bulldozer to excavate downward, and use the excavator with 1-2m<sup>3</sup> bucket to pick up the excavated material to the hauling truck to be transported to the dumping site. For thick excavating layer, the excavator with 2-3m<sup>3</sup> bucket will be used to shovel the soil directly to the hauling truck to be transported to the dumping site. The reshaping works of the excavation roof, as per the design, shall be carried out by the excavator with flat bucket.

55. The bulldozer and excavator with bucket of 1.5m<sup>3</sup> will be used for the excavation works at the service road because of the thin excavation layer and requires only a short distance of 0.5 km to transport the materials.

56. The excavated soil, a part from a small portion used to directly embank the coffer dam, service road, and the spillway, will be gathered to the dumping site so as not to affect the flow of the river and cause sedimentation to the downstream and the environmental surroundings.

### **b) Rock excavation**

57. The rock excavation works is carried out by means of shothole drilling. The excavated rock shall be transported to the yard for use or to the dumping site.

### **c) Tunneling**

58. It is recommended to use the conventional manual shothole drilling as follows: detonation; gathering and transporting; and temporary strengthening.

### **d) Concrete works**

59. **Open concrete works.** The concrete works shall be conducted based on the regulations of Vietnam and temporary construction condition issued by Song Da Ucrin Consulting Engineering Co., Ltd.

60. The concrete works is mainly at the spillway and the power station. The concrete works at the spillway require a large structure and high construction capacity. It may use the chain crane and wheel crane combined with tower crane FO 100 for the concrete works at the lower area.

61. The concrete works at the power station is not much but because of the complex structure, it will require lots of reinforcement and built-in equipment in the concrete. This will require the use of concrete pump.

62. **Underground concrete works.** The concrete is supplied by the concrete pump and portable formwork. The steel grids are connected together and connected with the anchor end by welding.

**d) Cement drilling works**

63. The cement drilling works shall be conducted as per applicable regulation of Vietnam and temporary construction condition for surface strengthening, drilling and water proofing issued by Song Da Ucrin Consulting Engineering Co., Ltd.

**e) Equipment installation**

64. The hydraulic mechanical equipment of the plant shall be installed by tower crane, Dek 251 crane, and specialized crane for the engine chamber.

65. The hydrotechnics mechanical equipment of the plant and the spillway shall be installed by tower crane, Dek 251 crane.

**6. Construction Schedule**

66. Nam Pay hydropower plant is expected to be built in 2.5 years, which includes six months of preparation and two years of construction activities.

67. Preparation works include the following activities:

- a. Land clearance and mine exploration.
- b. Building of access road to the powerhouse.
- c. Building of storages, warehouses, auxiliary components, communication system, electricity and water supply for the project construction.
- d. Gathering materials, human resources, machineries.

68. During the first year of project construction, the following activities will be undertaken:

- a. Groundbreaking ceremony.
- b. Creation of diversion flow through the waterway.
- c. Continuation and completion of all activities for construction preparation.
- d. Initiation of the construction of waterway, excavation of the abutment and the concrete reinforcement in the left bank of the dam.

69. During the dry season, the following works will be undertaken:

- a. Excavation of the waterway area.
- b. Initiation of the concrete reinforcement work in all areas of waterway, start construction of left bank of dam up to design elevation.
- c. Excavation of the area for intake gate.

70. During rainy season, with the occurrence of flood, the right bank of the dam will be excavated.

71. During the second year of construction, the following activities will be implemented:

72. In dry season, filling of reservoir dam will be done by blocking the stream and diverting the flow through the waterway.

73. During rainy season, the following will be implemented:

- a. Excavate right bank of the dam, diverting flow through waterway.
- b. Initiation work on the foundation, concreting of the dam on the right bank, and construction of the spillway.

- c. Construction of the discharge tunnel.
- d. Completion of the concrete reinforcement of dam, intake tunnel and discharge tunnel of sand.
- e. Completion of the installation of mechanical equipment in the discharge tunnel of sand and intake gate

74. During the third year, the proposed project is expected to be finished and Units 1 and 2 are ready for commissioning.

### III. DESCRIPTION OF THE ENVIRONMENT

#### A. Provincial and District Context

75. Dien Bien Phu is the Provincial capital of Dien Bien and is administratively the only settlement in the Province classified as a town. The Province has nine Districts, which includes Tuan Giao. Mun Chung, is located in Tuan Giao District, and is one of the 112 Communes in the Province. The population, land area, and population density of the Dien Bien Province, Tuan Giao District, and Mun Chung Commune is presented in Table 5.

**Table 5: Population and Land Area**

	<b>Population 1000's</b>	<b>Area (Km<sup>2</sup>)</b>	<b>Density (Persons per Sq Km)</b>
Vietnam	86,024.6	331,051.4	260
Dien Bien Province	49.1	9,560	51
Tuan Giao District	7.43	1,137.77	65.29
Mun Chung Commune	5580	87.8	63.5

Note: Figures for Vietnam and Province come from the 2009 Census; District figures from the 2008 District Statistics Book

76. Of the 113,777 ha which comprise the District area only 2% (1,654.93 ha) is classified as residential and 85% (95,121.4 ha) is agricultural (including 23% agricultural land; 62% natural and plantation forestry land; and 0.14% aquaculture land) and 13% (17,000.49ha) is unused land.

77. There is one protected area in Dien Bien Province, the Muong Nhe Nature Reserve, which is located in Muong Nhe District. The reserve is about 700 km to the Northwest of Hanoi area. Muong Nhe Nature Reserve has a total area of about 310,262 ha, including ten border communes and near 118,000 ha of natural forest cover rate of 43% - the highest in Dien Bien province, of which there are many such primitive forests: lowland evergreen forest, lower montane evergreen forest, evergreen forest on high mountains and bamboo forests being preserved. It is also the habitat of many rare animals. With rich ecosystems like forests, parks Muong Nhe Nature Reserve is considered a protected area with high biodiversity index in Vietnam.

78. The Muong Nhe Nature Reserve is 300km away from Nam Pay and the Nam Pay project is not situated inside nor in the buffer zone of the protected area.

79. Tuan Giao district has a number of tourist spots such as Pha Din pass at Ta Phinh plateau, Commune Courts charge, Tuan Giao district, Dien Bien province which pass through Highway 6, from Hanoi to Dien Bien Phu city, at the boundary between the provinces of Son La and Dien Bien. The district also has the Tham Pua cave and archaeological stone roof sites in Tham Khuong, also known as cave hooks in the Po, Chieng Sinh commune; archaeological stone roof sites in Tham Pua in Po, Chieng Sinh commune; drum relics discovered in 1995 in Muong Dang commune; and stone roof sites in Tham Khuong, Chieng Sinh commune.

80. None of the above tourist sites are near the Nam Pay project site.

## B. Physical Environment

### 1. Topography

81. The basin of Nam Pay stream has an altitude ranging from 600m to 1000m, and located in the mountainous area in Tua Chua district, Lai Chau province. Elevation of the basin tends to decrease gradually from upstream to downstream, from north to south and from east to west. The topography of this area is rather complicated. Many parts of river are underflow. Rivers and streams in the basin have the tape fan form which widens at the upstream and narrows at the downstream (where dam will be constructed), then expands before entering the Nam Mu River.

### 2. Geology

82. From Son La dams site to Vietnam-China border located in the North-West geographic zone, the geological structure is composed of ancient land broken by several deep fault systems, these fault system created the structural zones. Nam Pay basin is small and far from those fault systems, therefore it shall bear negligible influences. **Nam Pay reservoir area** is located in a narrow valley, originating from an altitude of 900m in Tua Chua district, Dien Bien province. Average rolling terrain is from 25° to 40°. The rock walls in the basin are mainly carbonates, lime walls in the northwestern area, and carbonate deposits in the eastern region.

83. Project area is in the narrowing position of the valley where topographical and geological conditions for constructing average-height concrete dams are favorable.

84. **Minerals:** Minerals such as coal, gold, slate, mineral water, etc. have not been found in the reservoir area.

85. **Earthquake:** The Nam Muc basin, including the Nam Pay, is in the strong seismic region of the northwestern area, such as the 7 richter scale earthquakes (1914), Dien Bien earthquake (1920), and Son La earthquake (1962). Previous researches show that the Nam Pay area is located in the 8 richter-scale generation and propagation region.

### 3. Climate

86. There are only a few meteorological stations in Nam Muc river basin such as Tu Chua meteorological station, Nam Muc hydrographic station and other rain gauging stations. Documents of meteorological stations are very important, especially the flow data of Nam Muc from Tua Chua and Lai Chau meteorological stations in determining the hydrographic - meteorological characteristics.

87. Like other regions in Da river basin, the climate of Nam Pay stream basin have monsoon tropical pattern. There are two different seasons in a year: dry, rainless and cold winter – humid, rainy and hot summer.

#### a) Temperature

88. Annual temperature of Nam Pay basin is very stable with monthly average temperature varying very little over the years. Average temperature in the previous years in the region is reflected through measured data of Tua Chua meteorological station in Table 6.

**Table 6: Monthly average temperature at Tua Chua meteorological station**

Characteristic	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Year
Ttb	13.3	15.5	18.7	21.0	22.4	22.9	22.5	22.5	22.0	19.7	16.4	13.7	19.2
Tmax	25.1	29.3	32.3	34.2	34.3	34.3	31.2	31.2	29.8	29.8	29.2	29.2	34.3
Tmin	1.3	3.8	3.2	9.30	12.3	14.9	16.4	16.1	13.6	10.0	4.8	1.3	1.3

**b) Rainfall regime**

89. Due to the influence of topographical conditions, rainfall in Da river basin is irregular. The left side of the Da River basin are high mountains obstructing southwest monsoon, therefore, the range of rainfall can reach 2400-2800mm such as in Pusilang mountain chain and 2000-3200 mm in the Hoang Lien Son mountain range. On the other hand, the right side of Da river basin is sheltered from wind, resulting to a small amount of rainfall. Average annual rainfall ranges from 1800 to 2000 mm. The rainfall in Nam Muc river basin changes slowly and tend to gradually increase from upstream to downstream. Tua Chua station is near the center of the basin, therefore, the rainfall of the station represents the rainfall of the whole basin. Rainy season in the region lasts for six months from April to September. Highest rainfall usually occurs from June to August. The rainfall in the dry season is about 15% of annual rainfall. Lowest rainfall is in December and January, with 20 - 30mm. Monthly rainfall distribution at the stations in Nam Muc river basin are given in Table 7.

**Table 7: Monthly rainfall of stations adjacent to Nam Pay basin**

Station	Month												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Tua Chua	32.1	36.6	50.5	160	216	283	362	324	164	77.4	40.8	21.2	1768
Nam Muc	23.5	28.8	59.3	135	224	305	344	279	132	60.9	31.2	16.6	1640
Lai Chau	31.1	36.1	63.0	139	271	441	476	377	143	87.1	50.0	23.8	2138
TuanGiao	27.5	30.4	53.9	131.0	199.8	304.8	289.2	290.3	153.2	67.9	45.6	19.1	1613
Quynh Nhai	28.8	33.9	51.0	142.3	192.6	312.8	318.0	349.9	175.4	78.9	52.8	23.2	1760
Pha Din	31.1	30.7	60.2	132.3	224.0	301.3	327.0	369.6	181.2	88.4	51.0	21.0	1,818

**4. Hydrology****a) Regional characteristic**

90. Many parts of the Nam Pay river left bank of the stream flows underground in an unknown direction. Ucrin Construction Consulting Company has surveyed flow direction of the groundwater and found that it could flow into the Nam Pay stream.

91. The characteristics of the Nam Pay River basin are shown in Table 8.

**Table 8: Typical parameters of Nam Pay River Basin**

Characteristic	Dimension
Basin Area	68 km <sup>2</sup>
River Length	22.3 km
Basin Width	4.60 km
Average altitude of the basin	900 m
River slope	22.6

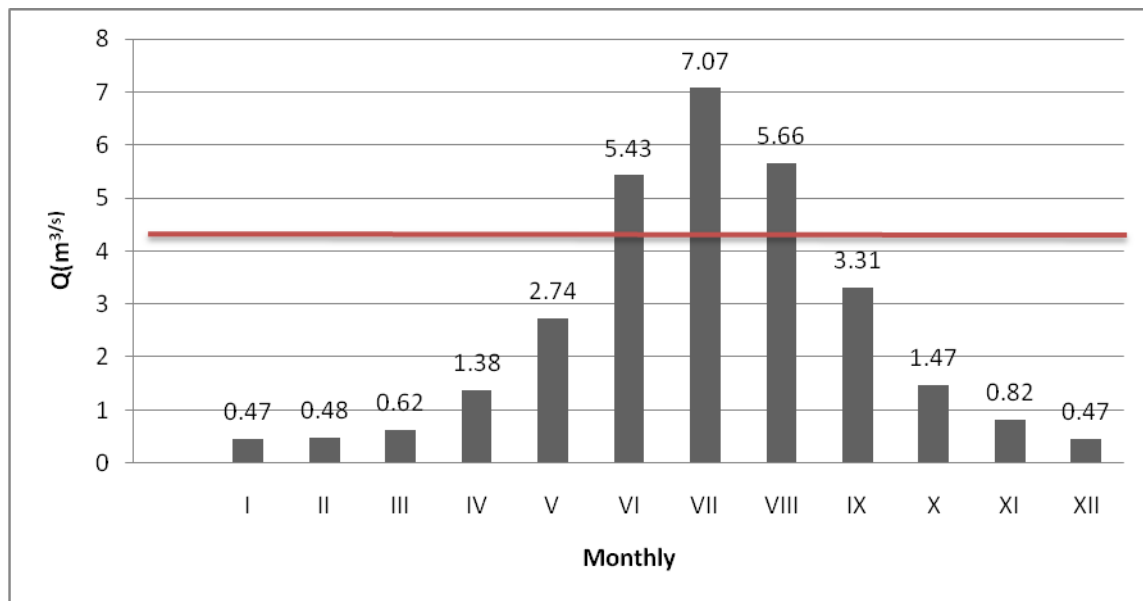
Source: Project Due Diligence Report, Ucrin Construction Consulting Company, June 2010.

## b) Flow characteristics

92. Annual flow is determined by two methods - similar basin method and TANK model method. The difference in the calculated values between the two methods is not more than 4%. In order to ensure safety and accuracy for calculating hydropower flows, the values calculated by TANK model method will be used. The calculated annual flow of Nam Pay dam site are shown in Table 9.

**Table 9: Annual flow of Nam Pay dam site**

Dam site	$Q_0$ (m <sup>3</sup> /s)	Cv	Cs	$Q_p$ (m <sup>3</sup> /s)						
				5	10	25	50	75	85	90
Nam Pay	2.51	0.26	1.04	3.72	3.37	2.85	2.39	2.02	1.87	1.77



**Figure 3: Average monthly flow at the Nam Pay Dam**

**Table 10: Average monthly flow at the Nam Pay Dam**

Monthly	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Q (m <sup>3</sup> /s)	0.47	0.48	0.62	1.38	2.74	5.43	7.07	5.66	3.31	1.47	0.82	0.47

93. Tables 9 and 10 and Figure 3 indicate that the plant will operate at full capacity for three months in a year and that only during these months (June to August) that there will be a significant reduced in water flow in the section of the river between the reservoir and the powerhouse. For the rest of the year, the plant will operate at a reduced capacity and on some months it will only operate for a few hours per day.



## **5. Environmental Condition: Air, Water and Land**

### **a) Air**

94. Baseline air sampling was conducted to assess the air quality in the project area on November 9, 2010. The results of the air quality analysis suggests that the quality of air at the project site is clean and has no potential adverse impact on people's health. The basic parameters of air quality and dust content in the project area and immediate surrounding area of hydropower plant are within the limit permitted by QCVN 26: 2010/BTNMT and QCVN 05:2009 / BTNMT. See Annex 3 for details of the atmospheric sampling and survey.

### **b) Water**

95. Water sampling was conducted as part of the baseline survey and the results of the water quality analysis of rivers and streams in the project site are within the range of permissible limits according to QCVN 08:2008 / BTNMT. Only microbiological criteria (Total Colifom) approximated the limits while  $\text{PO}_4^{3-}$  exceed the Standard QCVN 08:2008 / BTNMT. Therefore, water is not safe for drinking. See Annex 4 for details of water sampling and analysis.

### **c) Land**

96. The soil sampling was conducted as part of the baseline survey and the results showed that various indicators (phosphorous, potassium, pH, nitrogen, oil and metals) are within the permissible range compared to QCVN 03: 2008. See Annex 5 for detailed results of soil sampling.

## **C. Ecological Resources**

### **1. Forest Resources**

97. Distribution of forest resources along the Nam Pay river include evergreen tropical rain forest and mixed forest with bamboo. Due to human activities, forest here is strongly affected by slash burning and shifting cultivation, resulting to destroyed vegetation.

98. The forest area of the commune is 3,114.8 ha, composed of protected forest (2,824.0 ha), plantation forest (125.4 ha), recycling forest (233.2 ha). At present, the commune is preparing land for planting 23ha of production forest.

99. The vegetation consists mainly of tree species composed of bright, fast-growing species such as *Endospermum chinense*, *Litsea cubeba*, *Litsea mollis*, *Trema orientalis*, *Macaranga spp.*, *Sapium sp*, *Qercus spp*, Va, Phay, Nóng, Lầu. along streams mostly shrubs . There are many tree species in the project area, however, there are no identified valuable tree species. Forests here generally have one layer, with the forest cover rate of 38%. In many areas are forest without timber volume, tree diameter below 10cm, height 9-7m, and some trees were just 2-3m high.

100. At altitudes 700m, is closed moist tropical rain forests. However, this area is not near the project site. The density cover in the tropical rain forest is about 65% to 70% with several valuable types of wood such as: *Sindora tonkinensis*, *Sindora siamensis*, *Dacrydium pierei*, *Erythrophleum fordii*. This is the size of large trees with trunk diameter of 60cm or more. These trees are often hunted and illegal logging in the process of construction workers need to be managed to avoid illegal collection of the wood.

98. There are also cropland areas of Thai ethnic minority people at the project site. It is used by local people to cultivate paddy rice, cassava, soy-bean, banana, corn, peanut, upland rice and other crops for local use in the region.

## **2. Fauna**

99. The statistical survey in December 2006 by the Professional Animal Forest Inventory and Planning Institute, the province of Dien Bien has 291 animals of 95 species, 27 families, including 55 endemic species and 39 rare species listed in Decree 32/2006/ND-CP. There are 45 species listed in Vietnam's Red Book such as bears (*Ursus thibetanus* and *Ursus malayanus*), cheeks silvery gibbon (*Nomascus leucogenys*), gray langur (*Trachypithecus phayii*), the species of monkeys (*Macaca sp*), Industry (*Pavo munticus*), Niec neck hung (*Aceros nipalensis*), python mold (*Python molurus*), and the species of Otter fish.

100. None of the terrestrial fauna mentioned above are found close to the Nam Pay project site.

## **3. Fish and Aquatic Resources**

101. The freshwater river environments of Vietnam are rich with flora and fauna biodiversity including species of fish, shrimp, crab, snail, mussels, amphibians, insects and plants. In the country, there are 20 species of freshwater weeds; 1402 species of algae; 782 of invertebrates; 544 of fish species; and 52 species of crabs.

102. Commercial fishery is an important contribution to export industry in Vietnam, with an average annual revenue of US\$ 2.25B. The major part of this figure is from marine fisheries, but aquaculture has become increasingly important. Freshwater aquaculture production environments include ponds, ditches, cages, net enclosures and pens in reservoirs, rivers channels and paddy fields. In the north, pond poly culture is the most important farming system using carp and bighead. The main area for aquaculture, however, is in the south of Vietnam and especially with the use of cage culture. In the Mekong and Bassac rivers catfish, carp and snakehead are the main species. In the Mekong Delta, prawn monoculture is practiced extensively in rice fields. Tilapia in cultured ponds has also become popular. Pond culture has been encouraged nationwide as part of the programs against poverty, diet improvement and the malnutrition prevention. The Government provides free extension services to farmers.

103. While there is an increase of introduced species in aquaculture, the number of native aquatic species in natural rivers and lakes decreased. There is a limited available data in quantifying the environmental condition of inland ecosystems and the extent of the decline of biodiversity index in freshwater. However, it had been observed and documented that there is a general decline in aquatic species in various reservoirs and lakes like the disappearance of 20 species in Ba Be in the years 1998 to 2001.

104. There are approximately 3 600 reservoirs of various sizes in Vietnam. Most dams and reservoirs are multi-purpose dams for flood control, irrigation, hydropower, and water supply. Most of these reservoirs are more than 20 years old and only 15% are classified as large or medium size (capacity of over 1 million m<sup>3</sup> or a height of more than 10 meters). These structures have been constructed without provisions to allow migratory fish movement up and down the river and with little consideration on environmental flows to protect aquatic life.

105. Stream and reservoir in project area contains seaweed, algae and some other plant plankton. Aquatic fauna system includes Anopheles as the main species and crustacean species in many periods (*Nauplius*, *Mysis*, *Copepod*, etc.,)

106. The biodiversity of bottom animals is not high. These are mainly shrimp and small fish species (*Nipponense*), field crab (*Somanialthelphusma*), and snail (*Lynema swinhoeni*).

107. The aquatic resource includes the natural freshwater fish such as Carp, anabas, Thac Lac fish, black fish and some common fish species in Dien Bien Province. Apart from natural fish species in stream, there are some types of fish like: *Carp*, *amur*, *Ctenopharyngodon idella*, *Labeo rohita*, *Cirrhina molitorella*, *Mrigan*, *Aristichthys nobilis*, *Hypophthalmichthys moltrix*, and *Cyprinus cetralus* that are raised on river reservoir and in aquaculture ponds of people to develop household economy. The number of fish, however, is not much.

108. There are no rare fish in the Nam Pay river which is listed as threatened in the Red Data Book of Viet Nam. The fish catch in the stream is not significant since the number of fish is small and the local people only catch fish for food consumption.

## **D. Socio-Economic and Cultural Environment**

### **1. Socio-economic features**

#### **a) Population**

109. Inhabitants in Nam Pay project area live in 15 villages and 01 hamlet, 3-16 km far from centre of Mun Chung commune. Total population of the commune is 5,580 persons. The commune has a population density of 63.5 persons per square kilometer. There are 1,184 households and the average household size is 4.7 persons. The proportion of men and women is almost equal with 99 women per 100 men.

110. In the Project area, there will be 67 affected households. Two households will be physically and economically affected in the reservoir area and in the penstock and 65 households will only be economically affected. This is equivalent to a total of 415 persons or an average household has 6.1 members, which is bigger than the average household at the commune level with 4.7 members per household. The smallest household has one member while the biggest has nine members. The affected people represent 24.6% of the total population of the five villages constituting the project site (Pa Tong, Pa Ca, Na Tong, Nam Pay and Nong Tong). All of them belong to the Thai ethnic minority group. Consistent with the gender distribution of the Mun Chung Commune, the affected people are almost equally divided between male (51.8 %) and female (48.2 %). The resulting gender ratio is 93 women for every 100 men.

111. With a total affected area of 240,300 square meters, the average household will lose about 2,825 square meters or 0.28 hectares. About 57 of them will lose a paddy rice land. All in all, one household will lose a house and some trees, another household will lose a house, some trees and a farm land and 66 households will lose a farmland and some trees. There will be 312 persons (50 households) who will be permanently affected and 103 (17 households) who will be temporarily affected. Around 13 persons (2 households) will be both permanently and temporarily affected.

112. **Ethnic Minorities.** According to the population statistics of September 2009, the following are in the Nam Pay project area: Thai ethnic people represents about 62.4% (with 776 households and 3 611 persons); Mong represents about 19.72% (with 243 households and 1141 persons); Kho mu represent about 14.22% (with 181 households and 823 persons); and Kinh represents 3.65% (with 29 households and 211 persons).

## **b) Household income and poverty**

113. The average annual income in the commune is about VND2.04 million/person/year. The main source of income in the commune is agriculture (96% of the HHs). Other sources of income are aquaculture, fishing, trading and services.

114. The average income in Mun Chung is higher than the poverty threshold of 2.40 million VND per person set by the Ministry of Labour for agricultural area (2005-2010). It is even higher than the poverty threshold for urban area of 3.12 million per person per year. Based on this poverty threshold, 46.28% of the population of Mun Chung Commune is considered poor as of 2009. This is higher than the percentage of poor people in Tuan Giao District (35.02%). Being largely agricultural, most poor people in Mun Chung Commune belong to farming household who usually have limited land.

115. But the percentage of poor people in both the Mun Chung Commune and Tuan Giao District drastically fell from 2006 level of 67.85% and 50.43%, respectively. But while the percentage of poor people fell by only 15.41% points in Tuan Giao District between 2006 and 2009, in Mun Chung Commune, the reduction is 21.57% points. The difference indicates that rate of poverty reduction is higher in Mun Chung Commune compared to Tuan Giao District as a whole.

## **2. Land Use**

116. The Mun Chung commune has a total of 8,782.1ha. The largest percentage of the area is used for agriculture comprising 39.3% of the total land area of the commune. The loss of 15.42ha of agricultural land to the project will reduce the commune's agricultural land by 0.5%. Forests comprise 35.5% of the commune's total area. The conversion of 3.42ha of forest land for project use will reduce the commune's forest area by 0.1%. The reduction is smaller for residential land, which composes 1.4% of the commune's total area. The loss of about 0.1ha of residential land will only reduce the commune's residential area by 0.07%.

117. The total affected area of 24.03 hectares (240,300 square meters) has three main uses: residential (0.37 percent); agricultural (85.4 percent) and forest (14.23 percent). In the agricultural area, the area planted to paddy rice is composed 70.83 percent of the total area affected. The most affected area in terms of size is the paddy rice land. Those planted to dry area crops is around 14.57 percent. These crops include maize, cassava, and soy beans, peanut and upland rice.

118. The permanently affected area 100,100m<sup>2</sup> is mainly paddy rice land (85.73%) and some forest area (14.26 %). The residential land that will be temporarily affected includes two houses and entails the resettlement of the household. The largest affected area will be agricultural land accounting for 84.91% of the total temporarily affected area. There is also equal proportion of paddy rice land and the area planted to dry crops. Around 14.19% of the temporarily affected area is forest land. One of the HHs who will be temporarily affected is at the reservoir site along paddy crop land. The other HHs is located at the near the penstock alignment in Pa Tong village where the construction camp is located. Paddy land is also affected temporarily during the construction phase. Nam Pay village is downstream of the power plant. There is no significant loss of land here but there may be downstream in Nam Pay village from changes in daily river flow conditions in the dry season.

### 3. Infrastructure

119. The Nam Pay Hydropower Project is two kilometers away from residential areas and will not affect rural infrastructure facilities.

120. **Electricity network.** 796 households (nine of the villages in the commune out of a total of 16 use the national grid, representing 64.95%; 55 households use Pico small-size hydropower, representing 4.82%. Electricity use of hamlets is ensured. However, power failure occurs once or twice in four seasons. Power failure occurs for households using Pico in the dry season due to lack of water and in the rainy season as Picos are entrained.

121. **Household infrastructure.** There are about 797 households in the commune with cement-roof houses that represent 67.31%; 62.35% households use telephone; about 40% households have radio; 64.95% households have electricity for lighting from the national grid; 7.97% household have televisions; 11.3% households have transportation means by motorbikes, 0.07% households have cars (Mun Chung Commune 2010).

122. **Rural road.** Inter-commune traffic road is a level-4 road and paved with asphalt. However, some sections have potholes due to long use, leading to difficulties in people's travel. Inter-hamlet roads and roads from all hamlets to commune center are earth roads, therefore, during rainy seasons, it is difficult for people to travel and to transport agricultural products from hamlets to the market or other areas.

123. **Telephone.** There are 195 telephone subscribers as of December 31, 2009, with an average of 3.57 subscribers per 100 people. The commune is served by the two mobile networks of Viettel and Vinaphone, thus, facilitating the people's communication.

### 4. Agriculture

124. Agriculture is the main source of income of the local people. Agricultural land is mainly planted with rice and farm products such as maize, cassava, soybean, peanut, upland rice and some other industrial crop. However, the production yield for these crops is low because of primitive agricultural techniques and the irregular pattern of weather conditions. Productivity of rice is less than 3700kg/ha.

125. Agricultural activity in the project area is focused on the right bank of the river and fed from the Nam Pay perennial right bank Nam Toong tributary of the Nam Pay. The stretch of river below the dam is steep and the only agricultural activity in the highland is the planting of corn, which is fed by left bank side streams. No water is used from the main Nam Pay stream on the 3.5 km section below the dam for agriculture.

126. **Animal Husbandry.** On land, the raised animals include buffalo, cow, goat, pig, horse and poultry. Animal husbandry in the commune is not developed and follows the model of commodity service. Animals are reared mainly for consumption needs of the villagers while the sale of animals is an important source of cash for households. Total estimated animal flock as of 30 September 2010 of the commune is 1,737, composed of cow (295), goat (605), pig (4,660), poultry (15,150), and horse (12).

127. **Aquaculture.** The area for aquaculture in the commune about 10ha.

128. **Forestry.** Forestry development is significantly developed in the commune. However, for the past years, the potential of forestry is not fully developed equivalent to its potential. Forestry outputs mostly serve the demand within the province.

129. **Irrigation system.** The irrigation system at Mun Chung commune is poorly developed. The source of water for agricultural production is mainly from side streams rather than from irrigation facilities. There are no irrigation offtakes from the Nam Pay river along the section of the river between dam and power plant.

## 5. Education

130. Education level of Mun Chung commune inhabitants is mostly primary education level, making up 24.43% and junior secondary education level accounting for 24.57%.

131. The total number of primary students represents 25.35% of total the commune's students. There are a total of 395 primary students, including 200 girls and 159 boys.

132. The total number of secondary and high school students is 51.55% of total the commune's students, including 370 secondary students, representing 23.81% and 431 high school pupils that represent 27.74% of the total number of pupils.

133. There are 45.04% (700 girls) of female students and 54.96% (854 boys) male students. The number of male students is higher than the female students at all levels with the exception at the primary level, but the difference is statistically insignificant.

## 6. Public Health

134. **Medical station.** Commune medical stations do not have enough medical supplies and equipment. There are only two patient beds at the medical station. Commune medical officers include a doctor and a nurse. The doctor and nurse belong to the Kinh/Thai/H'Mong/Kho Mu people. They are trained twice a year to update their skills in medical examination and treatment.

135. **Medical conditions in hamlets.** In Mun Chung Commune, all 16 hamlets in the project area have medical officers. Annually, hamlets' medical officers are trained to enhance their professional qualification. However, health care services encounter many difficulties due to the scattered population density.

136. **Water supply.** All hamlets in the project area use upstream water that use pipeline conduit and water self-flowing system. The villagers in Mun Chung commune receive their drinking water by a pipe system which has been organized through the Commune and pipes water from side streams above the Nam Toong. No water is used for drinking from either the Nam Pay or Nam Toong rivers. According to District statistics, the number of HHs who uses clean water is 95.0 % for Tuan Giao District and 62 % for Mun Chung Commune.

137. The paddy land in the right bank area is all fed from the perennial right bank stream, Nam Toong, and this stream also supplies the agricultural right bank land immediately below the powerhouse site.

138. Water from springs in Nam Pay is not used for agriculture and for other purposes. Therefore, the 3.5 km stretch of river from the dam to the plant does not affect the lives of people in the project area.

139. **Solid waste management.** There is no official system for solid waste collection and waste is scattered or dumped in informal areas where it pollutes ground water and water sources in the area.

## **6. Site of Archaeological and Historic Importance**

140. Various archaeological locations and remains are to be found in Viet Nam and the Southeast Asia mainland, including prehistoric (Neolithic, Bronze-Iron Age) pre-Ankorian and Ankorian sites.

141. According to field investigations and interviews, no archaeological or cultural sites have been identified to be in the project area.

## IV. SCREENING OF ENVIRONMENTAL IMPACTS & MITIGATION

142. The ADB checklist for hydropower projects was used to screen for any potential impact and all impacts identified are provided with mitigation. The Rapid Environmental Assessment (REA) checklist is attached in Annex 1 of this document. Impacts, which were determined as having adverse environmental implications, are considered further and where significant impacts occur, mitigation has been provided.

### A. Project impacts

#### 1. Positive Impacts

143. As a result of the overall project under ADB Loan 2517-VIE, an additional 25–50 villages and about 3,000–5,000 households will be provided with electricity in Vietnam. Specifically, the Nam Pay project aims to supplement power to the electricity grid system to supply about 1,184 households with a total population of around 5,580 in Mun Chung commune. With the further development of the national electricity distribution system, the people of Mun Chung, Tuan Giao District and the Province of Dien Bien, as a whole, will have the convenience of reliable power twenty four hours a day for domestic and business activities. Main power supply will provide convenient means for cooking and domestic heating for those who can afford it and will reduce the pressure on the use of timber for heating and cooking purposes.

144. The project will also provide unskilled jobs during the construction phase and a limited number of jobs during the operational phase. This will be an additional benefit to the workforce in the community. However, training and capacity development are needed for the community to meet the technical skills required during the construction and operation stage of the project

145. Hydropower is considered as a clean and renewable source of energy. It is an alternative for the use of coal and fossil fuel to generate electricity. At present, gas is the main source of energy in the country (43.7%), followed by hydropower (35.3%), and coal (14.6%). The country also imported considerable amounts of energy from China. Thus, increasing hydropower generation could reduce the dependence on energy importation.

146. Thermal power generation plants are also known to produce toxic emissions of various pollutants i.e. carbon dioxide (CO<sub>2</sub>), particulate matter (PM), sulphur dioxide (SO<sub>2</sub>), carbon monoxide (CO) and Oxides of Nitrogen (NO<sub>x</sub>). The following table provides a comparative analysis of the estimated emissions of CO<sub>2</sub> from a power station generating the same amount of energy over a 30-year period if Nam Pay will be using gas & coal as its fuel source. Emissions of between 0.32 and 0.63 million tonnes of carbon dioxide are saved over a 30-year project life by using hydropower rather than fossil fuels. The Nam Pay project will therefore contribute to the reduction in carbon emissions by avoiding the alternative of burning of fossil fuels.

**Table 11: Nam Pay Comparative Analysis of CO<sub>2</sub> Emission using Gas & Coal Generation over 30 Years**

Parameter	Gas	Coal
Metric tons CO <sub>2</sub> /Gwh discharge	385	755
Total Discharge (million metric tons CO <sub>2</sub> ) generating 834.6 GWh	0.32	0.63

Notes: 1) Assumes generation of 27.82 GWh per year over a 30 year project life = 834.6 GWh.  
2) CO<sub>2</sub> discharge factors from Oxford Resource Group figures



## 2. Adverse Impacts

147. Two households will be physically and economically affected. There is one household to be affected when the reservoir is inundated and one on the penstock alignment. About 65 households will only be economically affected. This is equivalent to a total of 415 affected persons. With a total affected area of 240,300 m<sup>2</sup>, the average household will lose about 2,825 m<sup>2</sup>. About 57 of them will lose a paddy rice land. Only three households will lose a dry crop farm and six will lose a forest land. In summary one household will lose house only and some trees, one household will lose a house, a farmland and some trees and 65 households will lose a farmland and some trees. (Refer to Tables 12 and 13).

**Table 12: Total number of affected households**

Land Use	Permanently Affected	Temporarily Affected	Total	Percent
Residential	1	1	2	2.94
Paddy rice	47	11	58	85.29
Dry crops	0	3	3	8.82
Forest	2	3	5	7.35
Total	50	17	68*	100.00

Note: One household has land which is permanently and temporarily affected

Source: Due Diligence Report

**Table 13: Number of affected persons by type of impact**

Project Component	Number of Persons Affected			
	Permanent	Temporary	Permanent and Temporary	Total
Reservoir	7	0	0	7
Headworks	0	0	6	6
Plant administration/operation system	115	32	0	147
Prepared road combined with implementation	190	65	0	255
<b>Total</b>	<b>312</b>	<b>97</b>	<b>6</b>	<b>415</b>

Source: Due Diligence Report

148. Around 53.56% of the total affected land has traditional use rights for ethnic minorities as tenure instrument. The rest is public land. For the permanently affected area, 9.8ha is under the traditional land use rights and 5.4ha is public land. But public land in the temporarily affected area is smaller (3.1ha) compared to the area under the traditional land use rights (6.7ha).

149. The project will affect 100 fruit trees, 150 timber trees, 160,000 m<sup>2</sup> of rice crops and two houses.

## B. Construction Impacts and Mitigation

### 1. Impacts of Construction Activities

150. **Contamination of Water.** There is a potential for water contamination from construction activities and runoff materials into the river at the dam and hydropower sites.

The construction activities in or close to the river will be scheduled in the dry season and bunds will be created to channel the river away from the dam abutment construction and powerhouse construction activities.

151. **Loss of Topsoil and Erosion.** Soil will be impacted because of (a) loss of topsoil, (b) failure to refill and revegetate borrow areas and temporarily used land, (c) erosion, (d) soil contamination by materials used for the project, and (e) failure to utilize displaced earth during construction. The penstock will be constructed on steep slopes. There is the potential for the penstock construction to cause scarring of the landscape and for the road material to cause runoff of sediment on the slopes. The construction activities could also result to accumulation of wastes that need to be properly handled in a waste disposal area.

152. To avoid slippage of stone and earth material, stone gabions as retaining structures will be used to prevent slippage of soil adjacent to the penstock and on certain road sections. Maximum use will be made of materials in fill areas and there will be proper spoils planning particularly on steep slopes with bench terracing for high cut areas to avoid any erosion of materials down slopes. Trees will be planted to consolidate and re-vegetate the penstock, tunnel, roads and construction areas upon completion of work.

153. In all cases, erosion can be minimized by regular rehabilitation of areas not in use for project activities during construction. Rehabilitation may include (a) immediate vegetation of slopes to minimize erosion using fast-growing species and different functional groups of plants for keeping soil in place, (b) use of topsoil removed and stockpiled from project areas, (c) installation of sediment runoff control devices, and (d) erosion and revegetation success monitoring.

154. **Generation of dust.** The main impact on air quality during construction will be the general increased in dust levels from the construction machineries, tunnel construction, rock blasting, foundation excavation cement mixing, handling of materials, movement of vehicles, and road construction. The construction activities and movement of construction vehicles in earth-paved roads will likely result to the generation of dust. In addition, batching plant operation will likely generate dust emission. These construction activities could cause hazards to the communities and also affect vegetation in the construction area. Appropriate mitigating measures to reduce dust emission should be implemented.

155. **Noise.** During construction, noise and vibration will be generated from vehicular movements, sand and aggregate processing, concrete mixing, excavation machinery, construction noise, and blasting. Noise levels in the construction area may have minimal impact on the residential communities as these are located relatively far from the construction sites. However, movement of heavy-duty trucks on existing roads could cause nuisance to residents living near the roads.

156. Noise or any blasting works have the potential to cause adverse impacts to the flora and fauna species in the immediate surrounding area.

## **2. Road Access and Traffic**

157. The external roads include the National Road No.6 from Hanoi to Tuan Giao with 400km long and provincial roads from Tuan Giao to Tua Chua of 30 Km long which is 2 km away from the construction site.

158. The access and service roads within the project site including the access road from provincial road to the headwork area and the power station is 2.5 km long. This road route shall be used as service road during the construction period and as the main access road to the headwork area and the power station later on. The temporary road for the construction of

the headwork shall include two roads at the retaining dike and foundation pit. Phase I and II of the headwork areas and the service road along the penstock is shown on Figure 2.

159. There will be no problems of construction traffic affecting local activities, but any movement of soil and stone from quarries will be properly managed with traffic plans (such as: Erect the sign post at the construction site; Install sign post and lighting system for construction; To notify construction time and schedule for surrounding residential areas).

### **3. Construction Site and Camp Impacts**

160. The construction activities of the project will be manpower intensive, and where possible local labor force will be used. The contractor will require temporary labor camps at the dam and powerhouse sites. There will be a total of 150 workers during the peak months of the construction activities. The Contractors will employ manual labour from the District. The proposed campsite is between the area above Pa Tong village and houses along the highway higher up. (Figure 2)

161. The construction camp has the potential for environmental impacts in terms of solid and wastewater generation. Conditions will be placed in the construction sub-contracts requiring water supply, solid waste and sewage disposal arrangements in the workers' camps.

162. In the construction sites, there is a potential for dust emissions at the batching plant and material storage areas. The contractors will be required to minimize and control any dust hazards by the use of water spraying on roads and areas prone to dust emission. Hauling vehicles will be required to cover construction materials (soil, sand, gravel, etc.) during transport. These requirements will be included in the agreement with the contractors

163. The construction sites and any temporary camp areas will be cleaned of all debris and properly restored to its original condition upon completion of construction. Paddy land in Pa Tong Village used for construction will be restored to its original use upon completion of the project. Trees will be planted at various components including soil and stone borrow areas.

## **C. Impacts of Loss of Water to the River System**

### **1. Human Impacts**

164. The stream below the dam is cut into the rock and there are no irrigation channels in the stretch of the river between the dam and the approximately 3.5 km river length to powerhouse site. There are crops growing on the uphill area immediately below the dam site on the left bank but they are stream fed from side streams above the Nam Pay stream.

165. The paddy land in this right bank area is all fed from the perennial right bank stream, Nam Toong and this stream also supplies the agricultural right bank land immediately below the powerhouse site.

166. The villagers in Pa Tong, Nam Pay receive their drinking water by a pipe system which has been organized through the Commune and pipes water from side streams above the Nam Toong. No water is used for drinking from either the Nam Pay or Nam Toong rivers.

167. There will be no impacts on human activities in the stretch of water between the dam and powerhouse. Similarly, below the hydropower station there is no human use of water from the stream.

168. There may be impacts down stream of the powerhouse because of the change in the discharge regime in the dry season with discharge of a relatively large amount of water for a few hours per day. Nam Pay village is on the left bank downstream and some houses are on the riverbank with rice paddy supplied from side streams.

## 2. Fish Impacts

169. Fish and aquatic life will be likely to be affected if all the water is taken from the Nam Pay stream during the dry season. With the construction of the dam, any movement of fish upstream will be impossible. The river on the upstream of the dam is about 22.3 km in length. There are no substantial areas in the river for fish spawning.

170. At present, some catfish are caught in the Nam Pay river, but the fish are small and not an important part of the local peoples' source of food. The main source of fish for local people is from aquaculture sources.

## D. Specific Mitigation Measures

### 1. Compensation and Resettlement

171. NPC allocated 18.234 billion VND to cover the various elements of compensation and resettlement as covered in the RP. The area that will be permanently affected by the project is shown in Table 14.

**Table 14: Area Permanently Affected by Type of Use and Mitigation**

Land Use	Area (in square meters)	Percent	Mitigation
Residential	900	0.37	Compensation as per RP
Paddy rice	170,200	70.83	Compensation as per RP
Dry crops	35,000	14.57	Compensation as per RP
Forest	34,200	14.23	Compensation as per RP
Total	240,300	100.00	

Source: Project Due Diligence Report, June 2010

### 2. Residual River Water Flow

172. If the project is implemented, all the water in the river will be used for power generation, from September to May, (see Figure 3). There will be no water in the river system between the dam and the powerhouse for nine months in a year. While there will be no impacts on human activities in this section of the river, there will be impacts on aquatic life in the river.

173. With lack of available data, it is impossible to accurately quantify the impacts with respect to ecology and habitat loss. The impacts may be significant in the no water scenario, where a section of the river is totally deprived of flow for a large part of the year.

174. Various methods have been used to assess minimum environmental flows in river situations where flows have been regulated and water is denied for downstream uses. Simple hydrological and hydraulic methods have been employed where the level is set as a percentage of natural flow and takes into account the river morphology and water levels. More sophisticated methods rely on habitat simulation and the incorporation of the needs of river ecosystem components and the flow needs of other water users. Where data is

available, it is possible to develop hybrid models to estimate environmental impacts and determine an acceptable minimum flow which should be retained in the river system.

175. In the absence of any specific Vietnamese guideline for the amount of water to be retained in a stream when water is extracted from a river for hydropower purposes. It is recommended that an environmental flow of 82l/s will be retained in the river. The estimated value is based on the 10% average monthly flow during dry season

176. Most people in this region (from the dam to hydroelectric power plant) use the Nam Toong right bank side stream for their water uses and to service agriculture, rather than the Nam Pay stream. The effects of loss of water below the dam are insignificant.

177. Metal grills or screens will be provided to the weir intake. These screens have two centimeters gaps and will prevent larger fish from passing downstream into the power water delivery system to the powerhouse.

178. Any potential impact on the change in flows downstream of the powerhouse on Nam Pay village and on the agricultural land which is on the left bank downstream will be monitored.

### **3. Compensation for Loss of Trees and forest Land**

179. Forest land that will be lost is production forest and most of the trees that will be lost in the project area are bush and low value wood. These affected trees will be compensated by NPC, with an estimated cost of about 897,400,000 VND (Table 15).

**Table 15: Cost for compensation of tree and forest land**

<b>No</b>	<b>Item</b>	<b>Cost (Million VND)</b>
1	Compensation and Support for forest land (about 4.92ha)	728.4
2	Compensation and Support for tree	169
<b>Total</b>		<b>897.4</b>

### **4. Tree Planting Programme**

180. A tree planting programme will be implemented through either the District People's Committee or by a private company. It is estimated that ten hectares of land is required to be replanted at the project facilities. It is also necessary to rehabilitate the stone quarry, soil borrow areas and other sub-project components. The costs of planting and nurturing trees for a one hectare of land, which is estimated at VND 40 million will be included in the budget.

## **V. ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN AND INSTITUTIONAL REQUIREMENTS**

181. The proposed Environmental Management Plan (EMP) of the Nam Pay Hydropower project is presented in Table 16. The EMP outlines the mitigating measures to be implemented during the construction and operational phases to address any potential adverse environmental impacts of the project.

182. NPC will be responsible for ensuring that conditions are included in the contract documents of the construction project. It will also ensure that during the construction phase, environmental mitigation measures in the EMP are effective and are implemented. The EMP implementation will be coordinated with relevant Government Agencies such as Water Resources and Environment Departments at District level in monitoring environmental programs.

183. The NPC uses its Power Development Project Management Board (PDPMB) to manage projects in rural areas. This Board has personnel who will be responsible for the implementation of ADB projects. It has experience in undertaking World Bank funded projects but its engineering and support staff are not specialized and trained in the social, environment and resettlement disciplines. NPC will be responsible for other sub-projects under the ADB Loan 2517 sector project and will need to expand its capacity. To handle its general environmental responsibilities NPC and PDPMB will develop the necessary capacity and allocate manpower to specifically implement the Nam Pay environmental management plan and monitoring programme. Table 17 presents the institutional arrangements and the roles and responsibilities of the various organizations to ensure environmental compliance of the project.

184. NPC will create an Environmental and Social Development Cell (ESDC). The cell will consist of two members to cover environment, social and resettlement issues. The ESDC will work in close cooperation with the respective field-based office on the everyday activities of EMP Resettlement Plan implementation. ToR for the environmental specialist is attached in Annex 6.

185. As NPC does not yet have the expertise and full capacity required for implementing the IEE and Resettlement Plan, it will have to depend on outsourcing technical assistance and will hire the following additional expertise:

- a. A part-time Environmental Implementation Consultant to be directly hired by NPC, to provide technical assistance in the implementation of the environment program and the EMP;
- b. The Implementation Consultant will carry out internal on-the-job training and institutional capacity building for the Environmental and Resettlement Development Cell, thus, strengthening the NPC's technical expertise in the implementation of EMPs and resettlement plans that would be use on future projects. The cost for the Implementation Consultant is indicated below along with the monitoring costs.

**Table 16: Estimated Budget for Environment Specialist, Capacity Building and Monitoring**

Item No.	Description	Unit	Estimated Amount	
			VND (Million)	US \$
1	Environment Specialist	Annually	195	10,000
2	Environmental Monitoring & Evaluation	Annually	250	12,820
3	Environment Implementation Consultant (part time)	Annually	195	10,000
4	Training, Capacity building for NPC/ESDC/PMU Staff/Contractors on EMP and EMoP implementation	Once	120	6,154
<b>Total</b>			<b>690</b>	<b>38,974</b>

**Table 17: Institutional arrangement for EMP implementation**

Organization	Roles and Responsibilities for each phase of the project		
	Preparation	Implementation	Operation
EVN/NPC through ESDC	<ul style="list-style-type: none"> <li>Prepare IEE /CEP &amp; EIA according to ADB Environment Guidelines &amp; Vietnam Government Regulation</li> </ul>	<ul style="list-style-type: none"> <li>Provide advice to PDPMB (Power Development Project Management Board) Safeguards Officer on EMP implementation during construction;</li> <li>Monitor progress during construction;</li> <li>Review and consolidate PDPMB environmental reports for submission to ADB and DONRE/MONRE.</li> </ul>	<ul style="list-style-type: none"> <li>Monitor EMP implementation;</li> <li>Consolidate PDPMB environmental reports for submission to ADB (during loan effectivity) and DONRE/MONRE.</li> </ul>
PPC/DPC	<ul style="list-style-type: none"> <li>Review of environmental documents that are not subject to MONRE approval.</li> </ul>	<ul style="list-style-type: none"> <li>To resolve environmental complaint from local people based on Grivance Redress mechanism during construction phase</li> </ul>	<ul style="list-style-type: none"> <li>To resolve environmental complaints from local people based on Grivance Redress Mechanism during operation phase</li> </ul>
DONRE/ District Environmental Management	<ul style="list-style-type: none"> <li>Provide advice and guidance on environmental issues as required during Project</li> </ul>	<ul style="list-style-type: none"> <li>Monitor implementation of EMP through their own internal monitoring system</li> </ul>	<ul style="list-style-type: none"> <li>Monitor implementation of EMP through their own internal monitoring system</li> </ul>

Organization	Roles and Responsibilities for each phase of the project		
	Preparation	Implementation	Operation
Division	preparation		
PDPMB (PMU)	<ul style="list-style-type: none"> <li>Engage consultant and have overall responsibility for IEE preparation and submission for approval</li> <li>Ensure that contract specifications and bidding documents include environmental requirements</li> <li>Contract independent environmental monitoring consultants</li> <li>Ensure staff are adequately trained in environmental issues.</li> </ul>	<ul style="list-style-type: none"> <li>Responsible for EMP implementation during pre-construction and construction</li> <li>Conduct inspections and monitoring of environmental issues during construction;</li> <li>Coordinate with NPC on environmental monitoring and reporting</li> </ul>	<ul style="list-style-type: none"> <li>Responsible for EMP implementation during operation</li> <li>Conduct inspections and monitoring of environmental issues during operation.</li> </ul>
Management & Operation Unit of the HP Plant	n/a	n/a	<p>Operating hydropower plant, including management activities and environmental monitoring in operation phase according to IEE report</p> <p>Quarterly report for State management agency on environment</p>
Commune Supervision Boards (CSBs) and local	<ul style="list-style-type: none"> <li>Participate in public consultation activities to identify site and further improve project plans</li> </ul>	<ul style="list-style-type: none"> <li>Participate in environmental monitoring activities</li> </ul>	<ul style="list-style-type: none"> <li>Participate in environmental monitoring activities</li> </ul>



Organization	Roles and Responsibilities for each phase of the project		
	Preparation	Implementation	Operation
community members <sup>8</sup>	<ul style="list-style-type: none"> <li>Review and give comments and feedback on environmental assessment documentation upon disclosure.</li> </ul>		
Construction contractor	n/a	<ul style="list-style-type: none"> <li>Prepare detailed site EMP to meet the Project EMP general requirements;</li> <li>Implement mitigation measure during construction</li> <li>Conduct internal monitoring and reporting on environmental issues to PDPMB (PMU)</li> </ul>	n/a
Independent Environmental Monitoring Consultant	n/a	<ul style="list-style-type: none"> <li>Conduct inspection, monitoring and reporting on Project packages and on implementation of the EMP</li> </ul>	n/a

<sup>8</sup> CSBs have been established under Decree 80 Regulation for Participatory Investment Supervision. Article 8 of Decree 80 provides the community with opportunities to inspect compliance, monitor implementation and evaluate the results of investments in the commune, including environmental impacts.

**Table 18: Environmental Management Plan**

Environmental Aspect & Potential Impact	Remedial Measure	Means of Implementation	Institutional Responsibility	
			Implementation	Supervision
Design /Pre-construction Components				
Unexploded ordinance	- Bomb and mine detection and disposal	Special Contract	Design Consultants	NPC
Project construction & potential loss of agricultural, forestry & grazing land	- Design for maximize ratio of waste cut and fill materials. - Reservoir design and alignment of tunnel, penstock, power house and tail race to avoid existing land uses wherever possible - Compensation at market rates, prior to work commencement.	Proper planning and measures to be added in relevant parts of contract documents.  Proper resettlement planning.	Design consultants & NPC.	NPC
Excavation of construction materials and development of quarries & borrow areas causing loss of alternative land use	- Maximum use of existing quarry & borrow areas already in operation. - Degraded, barren, riverbeds & waste lands to be used for borrow materials.	Proper planning and measures to be added in the relevant parts of contract documents.	Design consultants & NPC.	NPC
Reduced water flows and reduction in water quality in the existing river course.	- Ensure that dam construction is phased to ensure diversion of the stream with cofferdams during separate construction of left & right abutments & ensure construction activities avoid soil & construction materials entering river flow.  - Ensure a minimum flow is retained in the stream	Planning & include mitigating measure to relevant parts of contract documents.	Design consultants & design engineers.	NPC
Water diverted from the river leaving reduced water flow impacting aquatic life.	- Design to keep residual water flow in river to meet aquatic needs.	Design weir & intake facilities to allow residual flow to the stream	Design consultants	
Construction Stage				
Earthworks for new access roads and construction of penstock on steep slopes leading to erosion & encroachment.	- Slopes along access roads & penstock will be provided with catchments/ cut-off drains & chutes to minimize soil erosion and masonry for retaining structures.  - Formation of sediment basins & slope drains.	Careful monitoring.	Contractor's Environment Engineer	SC, NPC reports to DONRE

Environmental Aspect & Potential Impact	Remedial Measure	Means of Implementation	Institutional Responsibility	
			Implementation	Supervision
	<ul style="list-style-type: none"> <li>- Maximum usage of material in fill areas.</li> <li>- Spoils planning particularly on steep slopes with bench terracing for high cut areas &amp; to avoid any soil erosion of material on down slopes</li> <li>- Tree planting programme on penstock areas and roads</li> <li>- Rehabilitate the temporary construction areas at the dam and powerhouse sites.</li> </ul>			
Quarrying of Borrow Materials with potential for loss and degradation of land	<ul style="list-style-type: none"> <li>- No earth will be borrowed from cultivable lands.</li> <li>- Borrowing to take place from barren, wastelands, &amp; riverbeds.</li> <li>- For new borrow areas, all measures will be taken avoid loss of any productive soil.</li> <li>- Any borrow areas will be refilled, re-vegetated &amp; landscaped with tree planting.</li> </ul>	Conditions included in contracts. Careful monitoring	Contractor's Environment Engineer	SC, NPC reports to DONRE
Taking of Quarry Materials with loss and degradation of land	<ul style="list-style-type: none"> <li>- Quarry materials will be obtained from existing operating sites with proper licenses &amp; environmental clearances.</li> <li>- New quarries to be opened only with permission of respective authorities.</li> </ul>	Careful monitoring	Contractor's Environment Engineer	SC, NPC reports to DONRE
Operation of construction equipment and construction activities and contamination of soils, loss of water quality & water pollution	<ul style="list-style-type: none"> <li>- Fuel storage &amp; refueling will have adequate containment away from water bodies/channel. Equipment will be properly maintained.</li> <li>- Precautions to be taken to prevent water pollution due to increased siltation &amp; turbidity for weir site &amp; road construction particularly in dry months when flows are low.</li> <li>- Approved sites defined for storage &amp; disposal of wastes materials</li> <li>- Any waste petroleum products will be collected, stored, &amp; disposed of at approved sites.</li> </ul>	Careful monitoring of conditions included in contracts	Contractor's Environment Engineer and NPC	SC, NPC reports to DONRE
Construction activities causing disruption of existing surface	<ul style="list-style-type: none"> <li>- Appropriate rain-storm-water channels will be constructed.</li> </ul>	Proper planning and measures to be added in	Design consultants & NPC.	NPC

Environmental Aspect & Potential Impact	Remedial Measure	Means of Implementation	Institutional Responsibility	
			Implementation	Supervision
drains.	- Provision for cross drainage structures will be made.	the relevant parts of contract documents. Careful monitoring of site conditions	Contractor's Environment Engineer	
Construction Camp in Pa Thong village & residential colony. Loss of land. Social impacts & pollution from wastewater & solid waste	<ul style="list-style-type: none"> <li>- The camp is relatively small and manual and semi-skilled labour will be employed locally as much as possible.</li> <li>- Camps &amp; residential colony will have properly designed sewage system for wastewater effluent and solid waste collection.</li> <li>- Paddy land to be reinstated at the conclusion of the construction in Pa Thong Village.</li> </ul>	Careful monitoring of site conditions and implementation of contract conditions.	Contractor's Environment Engineer	SC, NPC reports to DONRE
Emission from Construction Vehicles & Equipment causing air pollution	<ul style="list-style-type: none"> <li>- Emission levels of all construction vehicles &amp; equipment will conform to Vietnamese emission standards.</li> <li>- Pollutant parameters will be monitored during construction.</li> <li>- Crushing &amp; concrete batching plant will be away from population centers at dam and power house sites.</li> </ul>	Careful monitoring	Contractor's Environment Engineer	SC, NPC reports to DONRE
Dust particulate causing health impacts for workers and villagers	<ul style="list-style-type: none"> <li>- All precautions to be taken to reduce dust level emissions from batching plants &amp; portable crushers at dam and powerhouse sites.</li> <li>- Regular water spraying at all mixing sites &amp; temporary service roads will be undertaken.</li> <li>- All delivery vehicles will be covered with tarpaulin.</li> </ul>	Careful monitoring	Contractor's Environment Engineer	SC, NPC reports to DONRE
Construction activity - Noise from Vehicles, Plant & Equipment causing noise pollution	<ul style="list-style-type: none"> <li>- All construction equipment &amp; plants will conform to Vietnamese noise standards.</li> <li>- All vehicles &amp; equipment to be fitted with noise abatement devices.</li> <li>- Construction workers will be provided with personal protection.</li> </ul>	Careful monitoring	Contractor's Environment Engineer	SC, NPC reports to DONRE
Noise pollution from any blasting activities at dam and power tunnel and penstock	- Any blasting works will be in accordance with Vietnamese Explosives Act.	Careful planning & monitoring	Contractor's Environment Engineer	SC, NPC reports to DONRE

Environmental Aspect & Potential Impact	Remedial Measure	Means of Implementation	Institutional Responsibility	
			Implementation	Supervision
	<ul style="list-style-type: none"> <li>- No blasting between dusk &amp; dawn.</li> <li>- Residents close by will be informed well in advance of blasting times.</li> <li>- Workers associated with blasting sites will be provided with earplugs, helmets &amp; other personal safety devices.</li> </ul>			
Construction of dam, reservoir, tunnel, penstock with loss of vegetation & tree cover.	<ul style="list-style-type: none"> <li>- No trees to be removed without prior approval.</li> <li>- Compensation for lost trees on private land.</li> <li>- Plantation Programme implemented at dam area, tunnel, penstock, temporary construction areas, roads and other elements of the project. Indigenous tree species being accorded priority over exotic species.</li> </ul>	Careful monitoring of measures to be implemented using Forestry Department of private contractor.	Contractor's Environment Engineer using District People's Committee or sub-contractor	SC, NPC reports to DONRE
Work force during construction causing impacts to wildlife	<ul style="list-style-type: none"> <li>- Construction workers to be educated for wildlife conservation with no hunting &amp; poaching to be allowed for workers.</li> </ul>	Contractor to enforce measures included in contract	Contractor's Environment Engineer	SC, NPC reports to DONRE
Construction Activities & Accident Risks	<ul style="list-style-type: none"> <li>- All blasting sites will have warning &amp; clearance signals. Site will be inspected prior/after blasting.</li> <li>- Workers will be provided helmets, masks &amp; safety goggles etc.</li> <li>- A readily available first aid unit will be available with dressing materials etc.</li> <li>- Road safety education will be given to construction vehicle drivers.</li> <li>- Traffic management will be ensured during road construction periods.</li> <li>- Information dissemination will take place through the Commune's People Committee regarding activities causing disruption.</li> </ul>	Inclusion of measures in contracts and follow up monitoring	Contractor's Environment Engineer	SC, NPC, EPA
Construction activities causing disruption to public utilities	<ul style="list-style-type: none"> <li>- Any public utilities likely to be impacted, such as water supply pipe system, power/phone lines etc. must be relocated to suitable places, in consultations with local beneficiaries.</li> </ul>	To be added in the relevant parts of contract documents.	Design consultants & NPC.	NPC
Any discovery of artifacts or articles of historic interest and	<ul style="list-style-type: none"> <li>- For all finds of an historic or cultural value, work will be stopped and the find reported to the nearest office of the Department Culture,</li> </ul>	To be added in the relevant parts of contract	Contractor's Environment	NPC

Environmental Aspect & Potential Impact	Remedial Measure	Means of Implementation	Institutional Responsibility	
			Implementation	Supervision
importance	Sport and Tourism or the Department of Culture and Information	documents.	Engineer	
<b>Operational Stage</b>				
Reduced water flow in river effecting aquatic life	<ul style="list-style-type: none"> <li>- Provide guaranteed minimum dry season flow of water in the stream</li> <li>- Regular monitoring of the quantity of daily water flows below the weir intake.</li> </ul>	Measurements Undertaken by NPC hydrology engineers	NPC Environment Engineer	NPC
Change nature of flows with peaking operations of the plant.	<ul style="list-style-type: none"> <li>- Monitor the impact of the change in flows on Nam Pay village which is immediately down stream left bank from the power plant.</li> </ul>	NPC to monitor and take necessary action	NPC Environment Engineer	NPC
Erosion in river bed from tail race discharge	<ul style="list-style-type: none"> <li>- Repair and/or extend the reinforcement of the down stream river bed as necessary</li> </ul>	NPC to monitor & undertake necessary action	NPC Environment Engineer	NPC reports to DONRE
Soil erosion, land degradation & vegetation loss particularly on steep slopes	<ul style="list-style-type: none"> <li>- Maintenance of trees and vegetative cover over initial five year of project around the dam, tunnel, penstock, access road and at other project infrastructure.</li> </ul>	Using sub-contractor or Government agency.	NPC Environment Engineer	NPC

**Table 19: Environmental Monitoring Measures**

<b>Aspects/Parameters to be Monitored and Applicable Standard</b>	<b>Location</b>	<b>Means of Monitoring</b>	<b>Schedule/Frequency</b>	<b>Responsible to Undertake Monitoring</b>	<b>Estimated Cost (VND)</b>
<b>Construction stage</b>					
Implementation of construction phase: environmental mitigation measures specified in EMP (Table 19)	Locations indicated in EMP Table 19 for specific mitigation measures	Site visit, interviews with local residents, coordination with concerned agencies	Quarterly (on a regular basis); Random checks and to validate any complaint	Social-Environmental Unit (ESDC)/and NPC	100,000,000– costs to be included in construction contracts
- Noise in dB(A) compared to standards specified in QCVN 26:2010/BTNMT - Dust in mg/l compared to standard specified in QCVN 05: 2009/BTNMT	Residential area in Mun Chung commune	Noise measurement	Quarterly (on a regular basis); Random checks and to validate any complaint	Contractor/ NPC	128,000,000
- Surface water quality (fecal coliform, dissolved oxygen, pH, TSP.oil and grease, BOD5) in QCVN08: 2008:BTNMT - Other parameters to be sampled, as appropriate, to validate complaints and pollution event(s) due to project activities	Upstream, downstream of dam, Downstream of Hydropower plant	Field sampling	Quarterly (on a regular basis); Random checks and to validate complaints	Contractor/ NPC	20,000,000
Landscaping tree planting programme	Roads, dam and hydropower sites and renovation of temporary camp and construction sites which are close to town	Site visit, interviews with local residents, coordination with concerned agencies	During construction and after construction completion	Social-Environmental Unit (ESDC)/ and NPC	400,000,000

Aspects/Parameters to be Monitored and Applicable Standard	Location	Means of Monitoring	Schedule/Frequency	Responsible to Undertake Monitoring	Estimated Cost (VND)
<b>Operation Stage</b>					
Reduced water flow/Minimum flow (m <sup>3</sup> /s)	Downstream of dam	Measurement of Discharge	Quarterly (on a regular basis) in the first year; Random checks and to validate complaints	NPC	35,000,000
Landscaping program maintained for five years	Various locations	Checking and replacing material if required	Quarterly	NPC Environment Officer	Included in Power plant budget
Down stream effects of changed water regime due to peak operations	Left bank downstream of power house – Nam Pay village	Physical observation	Regularly at times of discharge	NPC Environment Officer	Included in Power plant budget



## **VI. PUBLIC CONSULTATION, INFORMATION DISCLOSURE AND GRIEVANCE REDRESS MECHANISM**

186. NPC conducted public consultation meetings in November 6-7, 2010 to disclose information to the stakeholders about the social, environmental and resettlement issues of the proposed Nam Pay hydropower project.

### **A. Public Consultation Activities**

187. The public consultations were held in the community house of Mun Chung Commune. The consultations to the affected people were held on November 6, 2010 at the Pá Cá village's house and on November 7, 2010 at Mun Chung Commune's primary school.

#### **1. Objectives of the Workshop**

- Provide general information about the ADB Loan on Renewable Energy Development Projects and the Nam Pay Hydropower project in Dien Bien province.
- Provide relevant information of the project and policies of ADB on resettlement, environment, and on gender and ethnic minorities through speaker system in all villages or by distribution of leaflets.
- Discuss and distribute the socio-economic and project possible impacts study sheets to the local people in order to collect their information and thoughts on the project implementation
- At the counsel, discussion on the safety policies of ADB, collect the local's contributive ideas and feedbacks on design, resettlement as well as their expectations.
- Respond to the local's queries in relation with project matters and safety policies.
- Seek guidance from the Communal People's Committee and representative of Power Development Project Management Board and Provincial Project Management Board relative to local's specific queries on project details or the applicable local policies for local residents.
- Record all opinions of local people as well as representatives of People's Committee, other relevant sectors participating in the meeting for consideration in the project design and implementation.

#### **2. Participants**

188. There were 76 participants in the consultation meeting. They are composed of:

- NPC/PDPMBs representatives
- NPC's consultants
- Representative from Environment Division, district and commune level
- Leaders of mountainous village
- Representatives from non-governmental organizations (Women's Union, Fatherland Front, Youth Union, farmers Association, Veterans Organization
- Representatives of Mun Chung Commune

189. For the following vulnerable groups: women who are the head of influenced household, the poor, the older, the disable, the illiterate or persons who have lost his/her civil act capacity or have a restricted civil act capacity, families under preferential treatment policy, etc., they need the help of judicial organizations, representatives (family, relatives, social organizations etc.). Two private consultations of the influenced women and men were held separately so as to recognize their individual thoughts and expectations.

### **3. General comments from the participants**

#### **a. Consultation on feasibility study**

190. In the aspect of project implementation and resettlement compensation plans, all participants agree with the schedules, contents and procedures of compensation and site clearance plans submitted by Provincial Project Management Board. The following are the comments raised by the stakeholders:

- The Project should be completed in accordance with the proposed schedule.
- Inventory and site clearance compensation must be carried out in public.
- Implement measures to minimize affected land.
- Materials and machines should be gathered at site as scheduled.
- Construct the accommodation for workers and suitably arrange machine in conformity with specifications without impacting on the people's daily life.
- The local residents propose the Contractor to repair damaged roads caused by the transport of construction materials under the project.
- Due to the deep expectation for a hydropower, the influenced households whose agricultural land can be recovered do not request any compensation other than their impacted property compensation with reasonable price at this time.

#### **b. Consultation on resettlement plan**

191. After consideration, the locals agree with the price of land, property, plants, crops compensation proposed by the province because it is reasonable and equivalent to the market price. The influenced households whose land is requisitioned under the project accept the property compensation as the provincial common price.

192. The locals agreed to support the projects based on the following conditions:

- For households whose land is recovered, they expect to remove and re-build the new house by themselves
- Construction of fresh water reservoir (each reservoir shall supply enough fresh water for 3 or 4 households) or installation of the fresh water conduits running to each household
- Construction of irrigation structures-channels to ensure sufficient water for the local irrigation.
- Offer training courses on technology transfer, intensive farming methods to increase breeding and plant productivity
- Entertain questions about the compensation policies for agricultural land and residential land and special policy supporting for badly influenced households.
- Offer guidelines for technical breeding, cultivating methods and creating favorable conditions for vocational training.
- For households whose land is requisitioned, it is requested that women are allowed to participate in resettlement and compensation negotiation.
- Expectation for using free electricity for 5 years

193. All participants in the community meeting and local government authorities approve the project implementation and relevant policies. They wish the project shall be executed as soon as possible so that local people shall have access to electricity.

194. The local authorities, Provincial Project Management Unit, Consulting Companies have recognized and responded to the local questions as well as adopted its execution design and resettlement plans.

195. Upon the approval of the detailed design, the PPMU shall, in cooperation with compensation board of Tuan Giao District and People's Committee of Mun Chung Commune and the influenced households, will notify, investigate/verify and measure in detail. The following agreements were reached during the public consultation meetings:

- To minimize the area of affected land, design is adjusted to limit the acquisitioned land.
- The construction schedule and quality of works items shall be strictly monitored to ensure its sustainability
- The district compensation board is established to calculate the damages in association with the losses of land, assets of local people in details.
- Adjusted land price is set after referring the information from the land surveyors, influenced households, construction material dealers and listed price of province. The adjusted price of plants, crops, and architectural structures is also referred to market and construction material dealers. Therefore, this price is reasonable and local people appreciate the pricing assessment as well as adjusted price
- Compensation price varies depending on different land types. Local people shall be compensated reasonably in accordance with legal regulations. The badly influenced households, poverty households whose land is affected shall be paid by cash and supported with other income as per Province's and ADB's policy.
- Sexual and ethnic minorities' strategy is aimed to help women and ethnic people access to information project, express their opinions on project, assessment, price and compensation.
- The draft Resettlement plan shall be notified across villages and commune.

## **B. Grievance Redress Mechanism**

196. A grievance redress mechanism (GRM) will be established before project commencement. The first level and most accessible and immediate avenue to resolve grievances is through the senior site person of the Power Company. Grievances will be resolved through continuous interactions with affected persons and the ESDC will answer queries and resolve grievances regarding various issues, which are the Company's responsibility. Corrective measures will be undertaken at the field-level within seven days. All grievances will be documented with full information of the aggrieved person and the issue and the resolution of complaint.

197. Complainants not satisfied with the response of the Company have the option of using the procedure available under the Civil Law and the Land Law 2003 (Article 138) and Decree 197/2004/ND-CP (Art. 63, 64) which specifies:

- a. Complaints will be sent to the commune Peoples Committee (PC), which must respond to a complainant within 15 days.
- b. If the complainant is not satisfied with resolution of the commune PC, the next level of appeal is to the District PC, which has the responsibility to respond and resolve complaints within 15 days.
- c. If not satisfied with the resolution of the district PC, the complainant can bring the complaint to the provincial PPC.
- d. As a final resort, if not satisfied with resolution of PPC, the complainant can take the case to the District Court.

## **VII. CONCLUSIONS AND RECOMMENDATIONS**

198. The sub-project of Nam Pay Hydropower Plant will be implemented by NPC. The IEE was prepared using the ADB Screening Matrix. There are no impacts on sites of historic or archaeological importance. The project is located near the Nam Pay, Pa Tong, Pa Ca, Na Tong, Nong Tong village on the main Tuan Giao to Tua Chua Road and there is a loss of rice land and forest plantation trees at the upstream of the reservoir, powerhouse and along the energy route. There is no use of water or human activity on the section of the river potentially deprived of water.

199. In addition to the loss of land in Nam Pay, Pa Tong, Pa Ca, Na Tong, Nong Tong villages, the impacts identified in this environmental examination is the impact of the construction phase of the project and of the changed water conditions below the dam. Water will be removed or experience a reduced flow along the 3.5 km stretch of the Nam Pay stream for more than half of the year. Immediately downstream of the hydropower plant, water will be discharged for a few hours daily during the dry season. If the scheme is implemented with full use of the river water flow in the dry season, there would be significant impact on aquatic life. It is proposed to retain a minimum environmental flow in the river of 82 l/sec.

200. The other environmental consideration is to mitigate the impacts of construction activities particularly with the need to build 2.5 km of access roads. With the mitigation and environmental management plan proposed, environmental impacts will be limited.

201. It is important that NPC, as the EA, develops its internal capacity to implement and monitor the mitigating measures in the EMP. This has been designed into the project by requiring the setting up of an ESDC in NPC and the appointment of environmental & resettlement specialists.

202. Except for some negative impacts as commonly observed in other hydropower projects (most of which can be mitigated by proposed measures), Nam Pay will not cause significant adverse impacts but rather significant positive impacts on Tuan Giao District, Dien Bien province and the neighboring areas.

203. This IEE with the associated EMP is regarded as sufficient environmental assessment of this project and a full EIA is not required for ADB purposes.

## **ANNEXES**

- Annex 1: Rapid Environmental Assessment (REA) Checklist
- Annex 2: Approval of EIA from Dien Bien Province under Decision No. 08-xn-NRE on 28/1/2009
- Annex 3: Details of Atmospheric Sampling and Survey
- Annex 4: Details of Water Sampling
- Annex 5: Details of Soil Sampling
- Annex 6: Terms of Reference for ESDC Staff
- Annex 7: Photos of the Nam Pay project site
- Annex 8: Photos of Public Consultation
- Annex 9: Memorandum of the public meeting in November 6, 2010
- Annex 10: Memorandum of the public meeting in November 7, 2010

## ANNEX 1: Rapid Environmental Assessment (REA) Checklist

### Instructions:

- (i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (RSES) for endorsement by Director, RSES and for approval by the Chief Compliance Officer.
- (ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.
- (iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title:

TA 7262-VIE: Capacity Building Of Renewable Energy Development

Sector Division:

Energy

### A. Basic Project Design Data

1. Dam height, m = 12.5 m
2. Surface area of reservoir, (ha) = 15ha
3. Estimated number of people to be displaced = 18
4. Rated power output, (MW) =75

Other Considerations:

1. Water storage type: ☒ reservoir ☐ run of river ☐ pumped storage
2. River diversion scheme: ☒ trans-basin diversion ☐ in-stream flow regulation  
☐ in-stream diversion
3. Type of power demand to address: ☐ peak load ☒ base load

SCREENING QUESTIONS	Yes	No	REMARKS
<b>B. Project Location</b>			
Is the dam and/or project facilities adjacent to or within any of the following areas?			
• Unregulated river	X		
• Undammed river tributaries below the proposed dam		X	
• Unique or aesthetically valuable land or water form		X	
• Special area for protecting biodiversity		X	
• Protected Area		X	No protected areas are within the project area of environmental influence.
• Buffer zone of protected area		X	NA
• Primary forest		X	All the forest land in the area is secondary growth or plantation forestry
• Range of endangered or threatened animals		X	
• Area used by indigenous peoples	X		The populations in the area are almost all Thai people.
• Cultural heritage site		X	There are no known archaeological, cultural or religious heritage sites located within proximity of the project.
• Wetland		X	Not applicable
• Mangrove		X	Not applicable
• Estuary		X	Not applicable
<b>C. Potential Environmental Impacts</b>			
<b>Will the Project cause.</b>			
• short-term construction impacts such as soil erosion, deterioration of water and air quality, noise and vibration from construction equipment?	X		Temporary Impacts are expected to water quality during construction and for soil erosion in steep terrain,
• disturbance of large areas due to material quarrying?		X	

SCREENING QUESTIONS	Yes	No	REMARKS
<ul style="list-style-type: none"> <li>disposal of large quantities of construction spoils?</li> </ul>		X	Some disposal of construction spoil is required at designated sites close to the dam and powerhouse.
<ul style="list-style-type: none"> <li>clearing of large forested area for ancillary facilities and access road?</li> </ul>		X	Some forest will be destroyed but it is not primary forest, being either secondary growth or plantation
<ul style="list-style-type: none"> <li>impounding of a long river stretch?</li> </ul>		x	This is as small reservoir only 15ha in area. The length of the reservoir upstream is 350m
<ul style="list-style-type: none"> <li>dryness (less than 50% of dry season mean flow) over a long downstream river stretch?</li> </ul>		X	From the dam to the plant is only about 3 km (maintain environmental flow in the stream of water)
<ul style="list-style-type: none"> <li>Construction of permanent access road near or through forests?</li> </ul>		X	Existing tracks are used in the main road
<ul style="list-style-type: none"> <li>creation of barriers for migratory land animals</li> </ul>		X	
<ul style="list-style-type: none"> <li>Loss of precious ecological values due to flooding of agricultural/forest areas, and wild lands and wildlife habitat; destruction of fish spawning/breeding and nursery grounds?</li> </ul>		X	The project is on the small Nam Pay river - loss of agricultural land and paddy
<ul style="list-style-type: none"> <li>Deterioration of downstream water quality due to anoxic water from the reservoir and sediments due to soil erosion?</li> </ul>		X	The reservoir is small. There will be temporary loss of water quality during the construction stage.
<ul style="list-style-type: none"> <li>Significant diversion of water from one basin to another?</li> </ul>		X	
<ul style="list-style-type: none"> <li>Alternating dry and wet downstream conditions due to peaking operation of powerhouse?</li> </ul>		X	There will be peak operation use during the dry season months. Water release is relatively small - maximum of 4.23 m <sup>3</sup> /s. There will be minimum flow retained in the river is 0.82m <sup>3</sup> /s and there is a right bank stream immediately above the powerhouse site.
<ul style="list-style-type: none"> <li>Significant modification of annual flood cycle affecting downstream ecosystem, people's sustenance and livelihoods?</li> </ul>		X	Small water retention
<ul style="list-style-type: none"> <li>Loss or destruction of unique or aesthetically valuable land or water forms?</li> </ul>		X	Small dam in steep valley
<ul style="list-style-type: none"> <li>Proliferation of aquatic weeds in reservoir and downstream impairing dam discharge, irrigation systems, navigation &amp; fisheries, &amp; increasing water loss through transpiration?</li> </ul>		X	Small retention area only



SCREENING QUESTIONS	Yes	No	REMARKS
<ul style="list-style-type: none"> <li>Scouring of riverbed below dam?</li> </ul>		X	Not applicable
<ul style="list-style-type: none"> <li>Downstream erosion of recipient river in trans-basin diversion?</li> </ul>		X	Not applicable
<ul style="list-style-type: none"> <li>Increased flooding risk of recipient river in trans-basin diversion?</li> </ul>		X	Not applicable
<ul style="list-style-type: none"> <li>Decreased groundwater recharge of downstream areas?</li> </ul>		X	Project is small
<ul style="list-style-type: none"> <li>Draining of downstream wetlands and riparian areas?</li> </ul>		X	Not applicable
<ul style="list-style-type: none"> <li>Decline or change in fisheries below the dam due to reduced peak flows and floods, submersion of river stretches and resultant destruction of fish breeding and nursery grounds, and water quality changes?</li> </ul>		X	Not applicable
<ul style="list-style-type: none"> <li>Loss of migratory fish species due to barrier imposed by the dam?</li> </ul>		X	The dam will form a barrier to fish movements.
<ul style="list-style-type: none"> <li>Formation of sediment deposits at reservoir entrance, creating backwater effect and flooding and water logging upstream?</li> </ul>		X	
<ul style="list-style-type: none"> <li>Significant disruption of river sediment transport downstream due to trapping in reservoir?</li> </ul>		X	Sediment deposits will be flushed through the system in periods of high flow when the dam gates are opened
<ul style="list-style-type: none"> <li>Environmental risk due to potential toxicity of sediments trapped behind the dams?</li> </ul>		X	Not applicable
<ul style="list-style-type: none"> <li>Increased saltwater intrusion in estuary and low lands due to reduced river flows?</li> </ul>		X	Not applicable
<ul style="list-style-type: none"> <li>Significant induced seismicity due to large reservoir size and potential environmental hazard from catastrophic failure of the dam?</li> </ul>		X	Not applicable – small dam
<ul style="list-style-type: none"> <li>Cumulative effects due to its role as part of a cascade of dams/ reservoirs?</li> </ul>		X	Not applicable
<ul style="list-style-type: none"> <li>Depletion of dissolved oxygen by large quantities of decaying plant material, fish mortality due to reduced dissolved oxygen content in water, algal blooms causing successive and temporary eutrophication, growth and proliferation of aquatic weeds?</li> </ul>		X	Not applicable – small reservoir
<ul style="list-style-type: none"> <li>Risks and vulnerabilities related to occupational health &amp; safety due to physical, chemical, biological, &amp; radiological hazards during project construction &amp; operation?</li> </ul>		X	
<ul style="list-style-type: none"> <li>Large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?</li> </ul>		X	Small dam and project
<ul style="list-style-type: none"> <li>Creation of community slums following construction of the hydropower plant and its facilities?</li> </ul>		X	Not applicable – small temporary camps only

SCREENING QUESTIONS	Yes	No	REMARKS
<ul style="list-style-type: none"> <li>Social conflicts if workers from other regions or countries are hired?</li> </ul>	X		Temporary camps for construction in between the main villages will need proper control
<ul style="list-style-type: none"> <li>Uncontrolled human migration into the area, made possible by access roads and transmission lines?</li> </ul>		X	
<ul style="list-style-type: none"> <li>Disproportionate impacts on the poor, women, children or other vulnerable groups?</li> </ul>		X	
<ul style="list-style-type: none"> <li>Community health and safety risks due to the transport, storage, and use and/or disposal of materials likely to create physical, chemical and biological hazards?</li> </ul>		X	
<ul style="list-style-type: none"> <li>Risks to community safety due to both accidental and natural hazards, especially where the structural elements or components of the project (e.g., dams) are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?</li> </ul>		X	

**ANNEX 2: Approval of EIA from Dien Bien Province under Decision No. 08-xn-NRE on 28/1/2009**

**Dien Bien Province's People Committee  
Department of Natural Resources and  
Environment**

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**Socialist Republic of Vietnam  
Independence – Freedom – Happiness**

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No 08/ XN – TNMT

*Dien Bien, January the 28<sup>th</sup>, 2009*

**CERTIFICATE OF THE ENVIRONMENTAL – STANDARDIZED REGISTRATION PAPER**

Of “Constructing Nam Pay hydropower plant” Project

**THE DIRECTOR OF DIEN BIEN PROVINCE'S DEPARTMENT OF NATURAL  
RESOURCES AND ENVIRONMENT CONFIRMS:**

**Article 1.** “Constructing Nam Pay hydropower plant in Mun Chung Commune, Tuan Giao District, Dien Bien Province” Project submitted the content of The environmental – standardized registration paper on January the 3<sup>rd</sup>, 2008.

**Article 2.** The project owner must be responsible for implementing activities in accordance with the contents showed in The environmental – standardized registration paper.

**Article 3.** The project's environmental – standardized registration paper is considered as a foundation for the State management agencies regarding environmental protection to examine the project's execution of protecting the environment.

**Article 4.** After completing all of the environmental work items, the project holder must send a written report to the environmental State agencies to be examined.

<b><u>Recipients:</u></b> <ul style="list-style-type: none"><li>- Northern part I electricity investment &amp; development joint stock company.</li><li>- Dien Bien Province's People Committee</li><li>- Save documents, department environment</li></ul>	<b>Department of Natural Resources and Environment Vice Director</b>  PHAN HIEN
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### ANNEX 3: Details of Atmospheric Sampling and Survey

In the current project site, there is the provincial road going Tua Chua district passing through; the district has no industrial base rather than a small industrial base to serve local needs of people in the district. Overall, vehicle traffic through here is not much; on the other hand, the surface of road here are well treated so the amount of air and noise emission pollution is also limited and reduced the impact on background environment. Only inter-communal civil roads system are aggregate road, sometimes they cause dust upon vehicles pass through but it is mostly deposition dust of less hazardous level.

While the village, where characterized as agricultural ecosystems, vegetation blanket, crops and green maize and rice, the ambient air is fresh.

So, we can confirm that the atmospheric environment of the project site is fresh and clean without impact on people's health.

**Table 20: Survey Result on atmospheric quality parameter**

No.	Sample taking position	SO <sub>2</sub> (mg/m <sup>3</sup> )	CO (mg/m <sup>3</sup> )	NO <sub>2</sub> (mg/m <sup>3</sup> )	Dust (mg/m <sup>3</sup> )	Noise (dBA)
1	Operating road VH1	Trace	1,102	-	0,123	56
2	Operating road VH1	Trace	1,023	-	0,106	62
3	Operating road VH1	0,005	1,351	0,005	0,151	64
4	Operation Management Area	Trace	1,067	-	0,108	52
5	Nam Pay Hydropowe Plant	Trace	1,100	-	0,102	54
6	Nam Pay Hydropowe Plant	Trace	1,105	-	0,111	55
7	Pressure Pipe	Trace	1,098	-	0,100	51
8	Regulating Tower	0,004	1,121	0,005	0,126	53
9	Operating road VH2	0,005	1,128	0,004	0,122	65
- QCVN 05: 2009/BTNMT; - TCVN 5949-1998		<b>50</b>	<b>-</b>	<b>40</b>	<b>140</b>	<b>75</b>

## ANNEX 4: Details of Water Sampling

In terms of mineralization, according to the document of "Water Resources of Vietnam" of Hanoi Agriculture Publishing House, in 2003, Nam Pay stream as well as other streams in the northwestern mountainous region have low degree of mineralization of about 100 to 150 g/m<sup>3</sup>. It caused by the strong separated terrain of many streams and rivers together with high amount of rainfall and it creates good condition for quick water drainage. Mineralization rate of water in the stream also change according to season; in the dry season, the mineralization rate of river water is low of about 20 to 40 mg / l. To determine the chemical composition as well as the scientific name of spring water and groundwater in the studied area, Research Center for Environment and Chemical Safety - Vietnam National Chemical Corporation, has conducted water sampling at different positions for analysis. Laboratory results showed that the chemical composition of groundwater is magnesium bicarbonate and potassium sodium sulfate of low-corrosive degree.

**Table 21: Results on surface water quality analysis**

No.	Parameters	Unit	NM1	NM2	NM3	NM4	NM5	NM6	NM7	NM8	NM9	QCVN
1	pH	mg/l	7,29	7,30	7,28	7,09	7,10	7,12	7,00	6,98	7,05	5,5-9
2	DO	mg/l	5,4	5,3	5,3	5,9	4,9	5,0	5,2	5,2	5,2	≥ 4
3	BOD <sub>5</sub>	mg/l	11	12	12	10	10	11	11	11	12	15
4	COD	mg/l	24	25	24	24	23	20	20	21	22	30
5	NO <sub>3</sub>	mg/l	2,13	2,14	2,12	1,98	2,00	2,02	2,21	2,04	2,32	15
6	PO <sub>4</sub> <sup>3-</sup>	mg/l	0,095	0,095	0,091	0,090	0,100	0,108	0,100	0,0098	0,0098	0,3
7	Fe	mg/l	0,25	0,30	0,35	0,32	0,32	0,29	0,30	0,30	0,32	1,5
8	Hg	mg/l	-	-	-	-	-	-	-	-	-	0,001
9	As	mg/l	-	-	-	-	-	-	-	-	-	0,05
10	Ca <sup>2+</sup>	mg/l	4,01	4,52	5,00	6,00	5,85	5,80	6,00	4,90	5,20	-
11	SS	mg/l	6	7	8	6	6	5	7	7	8	50
12	Oil	mg/l	-	-	-	-	-	-	-	-	-	0,1
13	Coliform	MPN/ 1000	6.000	6.800	6.800	7.00	6.900	6.900	7.200	7.400	7.400	7.500

Note:

NM1: Right shoulder of reservoir ; NM2: Left shoulder of reservoir: NM3: Right shoulder at the end of reservoir; NM4, NM5, NM6: Strem bed of Pa Tong Villiage; NM7, NM8, NM9: Stream bed of Nam Pay Village.

## ANNEX 5: Details of Soil Sampling

Land in Dien Bien Province is developed in many kinds of mother stone. More than 70% of land source has the high slope which is only suitable for forestry development. Land source which is suitable for short term trees is red and yellow feralit and mud; moreover, we can plant rice, farm produce and agricultural trees.

**Table 22: Results of soil sampling analysis**

No.	Parameters	Unit	Đ1	Đ2	Đ3	Đ4	Đ5	Đ6	Đ7	Đ8	Đ9	QCVN
1	pH <sub>KCL</sub>	-	5,21	5,0 0	5,12	5,15	5,15	5,10	5,1 8	5,18	5,20	-
2	Total amount of Nitrogen	%	0,13 1	0,1 35	0,13 0	0,133	0,13 4	0,13 4	0,1 30	0,12 9	0,13 0	-
3	Total amount of P <sub>2</sub> O <sub>5</sub>	%	0,12	0,1 6	0,15	0,12	0,13	0,12	0,1 0	0,14	0,12	-
4	Total amount of K <sub>2</sub> O <sub>5</sub>	%	1,65	1,6 8	1,70	1,68	1,71	1,65	1,6 6	1,65	1,69	-
5	Copper	mg/100g	5,2	4,8	4,8	4,5	5,0	5,0	4,8	5,0	5,0	70
6	Lead	mg/100g	2,2	2,5	2,8	2,8	2,5	2,4	2,7	2,8	2,8	50
7	Zinc	mg/100g	20,5	21, 0	20,4	20,5	20,8	21,0	21, 0	20,0	20,8	200
8	Manganese	mg/100g	11,2	11, 0	10,9	10,9	11,0	11,2	11, 2	11,0	11,0	-
9	Mineral Oil	mg/100g	KPH	KP H	KPH	KPH	KPH	KP H	KP H	KP H	KP H	-

Note:

Đ1, Đ2, Đ3: Operating road VH1; Đ4: Operation Management Area; Đ5, Đ6: Nam Pay Hydropower Plant Area; Đ7: Pressure Pipe; Đ8: Regulating tower; Đ9: Operating Road VH2.

## **ANNEX 6: Terms of Reference for ESDC Staff**

### **Terms of Reference for NPC/ ESDC Environment Engineer**

#### **Specific Job Description**

- Responsible on behalf of NPC for ensuring the implementation of the IEE and EMP.
- Facilitate NPC and the design/supervision consultants in the site-specific environmental issues to ensure the least damages and disturbances to the natural environment and social values of the local residents.
- Examine, evaluate and advise persons in adopting suitable, cost-effective, socio-cultural, socially sensitive, and sound engineering project design, where the local residents receive the least disturbance.
- Conduct a cross checking and vetting of design/specification, tender, and contract documents, making them suitably orientated towards the environmental and sound engineering needs for the successful site selection, construction, and post-completion operation and maintenance of the project in an environment friendly manner.
- Recommend revision of Environmental Management and Monitoring Plans to PMU so that the proposed mitigation measures are properly implemented in a cost effective manner.
- Ensure water testing on regular basis, note any changes and adopt suitable measures, accordingly and analyse results and make recommendations to NPC if there is deterioration in water quality.
- Supervise implementation of water quality testing and fish monitoring programmes.
- Provide information as necessary to external consultants.
- Ensure environmental conditions included in contracts are fulfilled by contractors.
- Establish regular contacts and on-going liaison Peoples Committees and Government Departments, local/regional NGOs, local officials, and all other stakeholders connected with the project related environmental issues.
- Collect environment related ecological/social data/information, make computer data entries, carry out the analysis and apply the results.
- Liaison between NPC and the Government Agencies, particularly the Environmental Water Resources Department who must receive 6 monthly reports on compliance with the EMP.

#### **Qualifications**

The ESDC Environmental Engineer is required to at least, to hold a Bachelor's degree and five years work experience in road engineering or as an environmental engineer on construction projects



## ANNEX 7: Photos of the Nam Pay project site

	
<p>The main reservoir area</p>	<p>Dam site construction area with plantation trees</p>
	
<p>View downstream to power house in the valley – secondary forest growth - no human activity or use of water</p>	<p>The soil field located along the provincial road going Tua Chua</p>
 <p> Plant Location</p>	 <p>The villagers in project sites receive their</p>



	<p>drinking water by a pipe system which has been organized through the Commune and pipes water from side streams above the Nam Toong.</p>
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## ANNEX 8: Photos of Public Consultation



## **ANNEX 9: Memorandum of the public meeting in November 6, 2010**

### **SOCIALIST REPUBLIC OF VIETNAM Independence – Freedom - Happiness**

#### **MINUTES ON COMMUNITY ADVISORY**

##### **Project: Nam Pay Hydropower Plant**

The Meeting is executed at the Mun Chung Commune – Tuan Giao District – Dien Bien Province

##### **On Project of Nam Pay Hydropower Plant**

Today, 06 November 2010

At the house of the Head of Pa Ca Village.

We have organized the meeting with the participation of people to make the assessment on environment, resettlement and ethnic minorities' development related to **Nam Pay Hydropower Plant**

##### **Participants:**

- |                               |  |
|-------------------------------|--|
| 1. Full name: Lo Van Panh     | Title: Chairman of People's Committee of the Commune               |
| 2. Full name: Lo Van Muon     | Title: Head of Pa Ca Village                                       |
| 3. Full name: Tong Van Lun    | Title: Head of Nam Pay Village                                     |
| 4. Full name: Dieu Van Tuoi   | Title: Officer   |
| 5. Full name: Van Thien       | Title: Land Survey Officials                                       |
| 6. Full name:                 | Title:   |
| 7. Mr./Mrs.: Vu Dinh Thang    | Represented for Resettlement Consultant/Specialist                 |
| 8. Mr./Mrs.: Phan Thuy Ha     | Represented for Environment Consultant/Specialist                  |
| 9. Mr./Mrs.: Pham Thanh Huong | Represented for Gender and ethnic minorities Consultant/Specialist |

Representatives of affected people :.....( enclosed list)

In which: Male: 29 people accounting for 87%

Female: 4 people accounting for 13%

Ethnic minorities: 100% (if any)

##### **Advisory content:**

1. To provide project related information: Enclosed information is available
2. Environmentalists shall state environmental impacts including natural and social impacts of the project site and reduction methods for negative impacts
3. Resettlement specialist shall state the impact upon taking back the land and asset on land, policies of the Government of Socialist Republic of Vietnam and localities, policies of the Project within compensation upon taking back the land and asset on land.
4. Community and ethnic minorities Specialist shall state the ethnic minorities' policies frame of the Project, social impacts during the Project implementation. At the same time, to make the introduction of ethnic minorities' policies of Socialist Republic of Vietnam and localities.

## **Discussion:**

### *1. In terms of environmental issues of the Project and environmental impact mitigation measures*

The transportation of construction material causing dust and noise which can affect on health and safety of residential people. The Contractor shall be responsible for strictly implementing environmental impacts mitigation measures.

It is necessary to water for dust prevention for people

To be comply with inspection regime from the preparation stage to implementation of the Project in accordance with current regulations of the Law and commitment of Employer

### *2. In terms of issued related to land and asset on land return; compensation and policies*

Influenced households expect a satisfactory and reasonable compensation for agricultural products, architectural works and other assets on the land.

They expect a channel for irrigation when the Project is implemented to ensure sufficient irrigation water. Households wish to use electricity freely for years; construct and install clean water system for people ( 3-4 households/one tank) or wish to install transmission pipeline of clean water for people. Also they wish to be taught regarding planting and breeding, creating favorable conditions for vocational training.

### *3. In terms of gender, fragile group and ethnic minority*

When the Project is implemented soon, demands of resident will be satisfied. Especially, demand of clean water will help women have more chance to make assess into the clean water source, ensuring sanitation for their health.

In addition, the construction of the Project will stabilize the power supply, leading to better cultural and information assess, particularly for women and children.

## **Conclusion:**

After the meeting complete, i

ssues related to environment, mitigation measures, and resettlement have been agreed by 100% people

People in the Project site are popularized with compensation and resettlement policies of the Project and all of them come into agreement with these policies

Environmental mitigation measures shall be paid attention to by People's Committee and Relevant Parties for remedy.

The meeting is ended at 15 o'clock in 06 November 2010

## **SIGNATURES OF ATTENDING PARTIES**

<b>Representatives of Employer</b>	<b>Representatives of Community Lo Van Muon</b>	<b>Representatives of Consultant</b>	<b>On behalf of People's Committee</b>
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(Signed)  
Head of Village  
Tong Van Lun  
(Signed)

Lo Van Panh  
(Signed and sealed)

### NAME LIST OF PARTICIPANT IN THE MEETING

Meeting is held in 06 November 2010

At: Mun Chung Commune, Tuan Giao District, Dien Bien Province

Agenda: **Community Advisory on the assessment on environment, resettlement and ethnic minorities' development related to Nam Pay Hydropower Plant**

No.	Full name	Age	Ethnic Group	Gender		Signature	Note
				Male	Female		
1	Lo Van So	48	Thai	x		Signed	
2	Tong Van Kham	53	Thai	x		Signed	
3	Tong Van Lun	50	Thai	x		Signed	
4	Lo Van Yen	25	Thai	x		Signed	
5	Lo Thi Phu	60	Thai		x	Signed	
6	Lo Thi Mon	52	Thai		x	Signed	
7	Tong Van Hau	38	Thai	x		Signed	
8	Quang Van Yen	60	Thai	x		Signed	
9	Lo Thi Dau	43	Thai		x	Signed	
10	Lo Van Huan	51	Thai	x		Signed	
11	Ca Van Xien	29	Thai	x		Signed	
12	Ca Van Pong	30	Thai	x		Signed	
13	Tong Van Huan	60	Thai	x		Signed	
14	Lo Van Coc	50	Thai	x		Signed	
15	Ca Thi Lun	44	Thai		x	Signed	
16	Lo Van Minh	31	Thai	x		Signed	
17	Lo Van Panh	60	Thai	x		Signed	
18	Lo Van Danh	55	Thai	x		Signed	
19	Lo Van Toan	29	Thai	x		Signed	
20	Lo Van Than	32	Thai	x		Signed	
21	Lo Van Tuan	27	Thai	x		Signed	
22	Quang Van Oi	43	Thai	x		Signed	
23	Quang Van Banh	40	Thai	x		Signed	
24	Lo Van Man	50	Thai	x		Signed	
25	Lo Van Quoc	25	Thai	x		Signed	
26	Lo Van Chanh	44	Thai	x		Signed	
27	Lo Van Vui	52	Thai	x		Signed	
28	Lo Van Muoi	40	Thai	x		Signed	

29	Quang Van Ngoai	35	Thai	x		<i>Signed</i>	
30	Lo Van Sang	32	Thai	x		<i>Signed</i>	
31	Lo Van Phong	49	Thai	x		<i>Signed</i>	
32	Quang Van Ngoai		Thai	x		<i>Signed</i>	
33	Ca Van Trong	27	Thai	x		<i>Signed</i>	
34	Lo Van Muon	30	Thai	x		<i>Signed</i>	

## **ANNEX 10: Memorandum of the public meeting in November 7, 2010**

**SOCIALIST REPUBLIC OF VIETNAM**

**Independence – Freedom - Happiness**

**MINUTES ON COMMUNITY ADVISORY**

**Project: Nam Pay Hydropower Plant**

The Meeting is executed at the Mun Chung Commune – Tuan Giao District – Dien Bien Province

On **Project of Nam Pay Hydropower Plant**

Today, 07 November 2010

At the Primary School

We have organized the meeting with the participation of people to make the assessment on environment, resettlement and ethnic minorities' development related to **Nam Pay Hydropower Plant**

Participants:

1. Full name: Lo Van Panh      Title: Chairman of People's Committee of the Commune
2. Full name: Quang Van Lun      Title: Head of Pa Tong Village
3. Full name: Lo Van Hia      Title: Head of Na Tong Village
4. Full name: Quang Van Pinh      Title: Head of Nong Tong Village
5. Full name: Dieu Van Tuoi      Title: Officials
6. Full name: Van Thien      Title: Land Survey Officials
7. Mr./Mrs.: Vu Dinh Thang      Represented for Resettlement Consultant/Specialist
8. Mr./Mrs.: Phan Thuy Ha      Represented for Environment Consultant/Specialist
9. Mr./Mrs.: Pham Thanh Huong      Represented for Gender and ethnic minorities Consultant/Specialist

Representatives of affected people :.....( enclosed list)

In which: Male: 26 people accounting for 61%

Female: 16 people accounting for 39%

Ethnic minorities: 100% (if any)

### **Advisory content:**

1. To provide project related information: Enclosed information is available
2. Environmentalists shall state environmental impacts including natural and social impacts of the project site and reduction methods for negative impacts

3. Resettlement specialist shall state the impact upon taking back the land and asset on land, policies of the Government of Socialist Republic of Vietnam and localities, policies of the Project within compensation upon taking back the land and asset on land.

4. Community and ethnic minorities Specialist shall state the ethnic minorities' policies frame of the Project, social impacts during the Project implementation. At the same time, to make the introduction of ethnic minorities' policies of Socialist Republic of Vietnam and localities.

**Discussion:**

*1. In terms of environmental issues of the Project and environmental impact mitigation measures*

The transportation of construction material shall cause dust and noise which can affect on health and safety of residential people. The Contractor shall be responsible for strictly implementing environmental impacts mitigation measures.

It is necessary to water for dust prevention for people

To be comply with inspection regime from the preparation stage to implementation of the Project in accordance with current regulations of the Law and commitment of Employer

*2. In terms of issued related to land and asset on land return; compensation and policies*

Households expect to be properly and equally compensated

Three households under the relocation want to relocate and build house by themselves

They expect to be supported in establishment of fresh water

They expect to be guided in terms of cultivation method and intensive farming to increase the productivity

They expect that broken road due to the transportation of the materials for the project shall be repaired

*3. In terms of gender, fragile group and ethnic minority*

Upon being supported in fresh water supply, sanitation and health of people especially for Women and children

Stable power system; to promote the accessibility to information and culture to improve the awareness of people

**Conclusion:**

Issues related to environment, mitigation measures, and resettlement have been agreed by 100% people

People in the Project site are popularized with compensation and resettlement policies of the Project and all of them come into agreement with these policies

Environmental mitigation measures shall be paid attention to by People's Committee and Relevant Parties for remedy.

The meeting is ended at 10 o'clock in 07 November 2010



### PARTIES SIGN THEIR NAME

Representatives of Employer	Representatives of Community	Representatives of Consultant	On behalf of People's Committee
	Lo Van Hiu (Signed) Head of Village Quang Van Binh (Signed)		Lo Van Panh (Signed and sealed)

### NAME LIST OF PARTICIPANT IN THE MEETING

Meeting is held in 07 November 2010

At: Mun Chung Commune, Tuan Giao District, Dien Bien Province

Agenda: **Community Advisory on the assessment on environment, resettlement and ethnic minorities' development related to Nam Pay Hydropower Plant**

No.	Full name	Age	Ethnic Group	Gender		Signature	Note
				Male	Female		
1	Ca Van Cun	55	Thai	x		Signed	
2	Ca Thi Xien	50	Thai		x	Signed	
3	Ca Van Tu	51	Thai	x		Signed	
4	Quang Van Anh	1934	Thai	x		Signed	
5	Lo Van Ruoc	1963	Thai	x		Signed	
6	Quang Van Menh	67	Thai	x		Signed	
7	Quang Van Xom	27	Thai	x		Signed	
8	Quang Van Lun	54	Thai	x		Signed	
9	Quang Van Hinh	28	Thai	x		Signed	
10	Luong Van To	28	Thai	x		Signed	
11	Luong Van Phanb	25	Thai	x		Signed	
12	Quang Thi Choi	35	Thai		x	Signed	
13	Lo Van Tuong	52	Thai	x		Signed	
14	Deo Van Cuong	24	Thai	x		Signed	
15	Lo Van Don	25	Thai	x		Signed	

16	Deo Van Tien	28	Thai	x		<i>Signed</i>	
17	Ca Van Panh	64	Thai	x		<i>Signed</i>	
18	Quang Van Phuc	50	Thai	x		<i>Signed</i>	
19	Lo Van Cu	38	Thai	x		<i>Signed</i>	
20	Lo Van Hoa	42	Thai	x		<i>Signed</i>	
21	Ca Van Nguong	42	Thai	x		<i>Signed</i>	

### NAME LIST OF PARTICIPANT IN THE MEETING (Continued)

Meeting is held in 07 November 2010

At: Mun Chung Commune, Tuan Giao District, Dien Bien Province

Agenda: ***Community Advisory on the assessment on environment, resettlement and ethnic minorities' development related to Nam Pay Hydropower Plant***

No.	Full name	Age	Ethnic Group	Gender		Signature	Note
				Male	Female		
22	Le Thi My	52	Thai		x	<i>Signed</i>	
23	Dieng Thi Na	70	Thai		x	<i>Signed</i>	
24	Deo Thi Phun	33	Thai		x	<i>Signed</i>	
25	Ca Thi Xien	50	Thai		x	<i>Signed</i>	
26	Ca Thi Nhon	42	Thai		x	<i>Signed</i>	
27	Lieng Thi Xeng	34	Thai		x	<i>Signed</i>	
28	Dieng Thi Chon	28	Thai		x	<i>Signed</i>	
29	Quang Thi Choi	48	Thai		x	<i>Signed</i>	
30	Quang Thi Hoa	36	Thai		x	<i>Signed</i>	
31	Lo Thi Thien	39	Thai		x	<i>Signed</i>	
32	Quang Thi Na	50	Thai		x	<i>Signed</i>	
33	Ca Thi Khoan	13	Thai		x	<i>Signed</i>	
34	Lo Thi Huong	73	Thai		x	<i>Signed</i>	
35	Lo Van Pang	54	Thai	x		<i>Signed</i>	
36	Lo Van Xien	47	Thai	x		<i>Signed</i>	
37	Quang Van Mon	70	Thai	x		<i>Signed</i>	
38	Ca Van Panh	64	Thai	x		<i>Signed</i>	
39	Deo Van Cuong	25	Thai	x		<i>Signed</i>	
40	Lo Van Huong	45	Thai	x		<i>Signed</i>	
41	Lo Van Pieng		Thai	x		<i>Signed</i>	
42	Lo Thi Thien		Thai		x	<i>Signed</i>	