

Initial Environmental Examination

November 2013

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

Nam Cha 3 Hydropower Project

Prepared by Northern Power Transmission for the Asian Development Bank.

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INITIAL ENVIRONMENTAL EXAMINATION

Nam Cha 3 Hydropower Project

Muong Nhe District, Dien Bien Province

Prepared and submitted by Northern Power Corporation

Hanoi, March, 2012

ABBREVIATIONS

ADB	- Asian Development Bank
EVN	- Vietnam Electricity
PCC	- People Community Committee
NPC	Northern Power Company
SC	Supervision Consultant
QCVN	- Vietnam Technical Regulation
TCVN	- Vietnam Standards
MONRE	- Ministry of Nature Resource and Environment
IEE	- Initial Environment Examination
EIA	- Environmental Impact Assessment
N	- Latitude
E	- Longitude
VT	Site/ position
N_{lm}	Installation capacity
E_{tb}	Mean annual energy
MNDBT	Full supply water level
MNHL	Confluence water level

WEIGHTS AND MEASURES

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

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EXECUTIVE SUMMARY

Objectives and Approach

The Northern Power Company (NPC) has authorized the Petro Vietnam Power Engineering Consulting Joint Stock Company to study Nam Cha 3 hydropower project. The environmental assessment was implemented by the Petro Vietnam Power Engineering Consulting Joint Stock Company in 2010. NPC has been trying to obtain funding for the project as part of a programme to increase power supply to the rural areas.

As part of 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 Vietnam. 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 Cha 3 hydropower project has been identified for consideration under the programme and further feasibility studies are underway and this environmental assessment study is part of this process.

Nam Cha 3 Hydropower project is located in the Pa Tan commune, Muong Nhe District, Dien Bien province. The project is a small hydropower (6MW) scheme designed to provide electricity to the rural electricity system. Under ADB guidelines Nam Cha 3 is a Category B project, and, as such, an Initial Environmental Examination (IEE) is required. A resettlement plan has also been undertaken as part of the TA. Vietnamese regulations only require hydropower projects with reservoirs larger than 300,000 m³ to have a full Environmental Impact Assessment (EIA). Nam Cha 3 project has a reservoir area of 1,260,000 m³. As such, there is a requirement under Vietnamese regulations to undertake a new EIA report regulations. Currently, EIA is in the process of preparation and will be submitted for Provincial Department of Natural Resource and Environment of Dien Bien Province for assessment and approval according to the regulations of Vietnamese Government.

The project consists of a 21 m high spill way dam and intake works, a tunnel to water to the penstock, the powerhouse and the tail race. Water is taken from the Nam Cha stream and delivered to the powerhouse and returned to the stream some 1.0 km downstream. The water delivery system is designed to provide a maximum 23.63 m³/s for two turbines and supply additional power to the national grid system. In fact, natural flow in Nam Cha stream in dry season is 3 – 6m³/s. In the operation phase, the flow will be changed (flow is approximately 0 m³/s for about 20 hours and approximately 23.6 m³/s for 4 hours). The

flow in downstream of the powerhouse (distant from the powerhouse) will increase due to supplement of underground water and water from other small streams.

In the long dry season months, the natural flow in the river is significantly reduced. For six continuous months the natural flow is less than 0.79 m^3 and the powerhouse will operate for just a few hours a day to supply the evening peak requirement. As a result of the project, for more than 10 months of the year, the Nam Cha stream will experience reduced water flow in the 1.0 km of the stream which has water taken away from it between reservoir and powerhouse. The river immediately below the powerhouse will experience changed conditions in the dry season as all the retained water is used over a short time span of a few hours to generate power.

Environmental concerns and impacts

The project does not have any impact on residential land but does impact on paddy land, terrace land, perennial tree land, unused river land and productive and non-productive agriculture land.

In terms of permanent impacts on land, Nam Cha hydropower project will affect a total of 2.1 hectares of paddy field land, belonging to 9 households (50 members). Besides, the project will require 18.2 hectares of terrace land, perennial tree land and 19.5 hectares of unused river, stream and fallow land.

During construction, the Nam Cha 3 hydropower subproject will temporarily affect land for construction activities, totalling a 4.15 ha of area for the construction yard. The temporarily affected area is unused fallow land in the area of Pa Tan commune.

Construction will take place on some steep and hilly slopes, resulting in landscape scarring and loss of trees. The tunnel, the penstock and the project construction and access roads are on steep land. There is potential for scarring and encroachment on existing land on down hill slopes which would result in siltation of the downstream Nam Cha stream bed.

The project, on one-hand has been designed to maximize the water use and to retain the downstream environmental flow. However, a 1.0 km section of stream between the dam and powerhouse will have no water flow for approximately six months of the year. Reducing water flow in the stream has implications for fish and aquatic life. Therefore, a mitigation measure to retain the water flow for this 1.0 km must be prepared.

Environmental mitigation

The main environmental mitigation measures included in the EMP are as indicated below:

Potential Impact	Mitigation
1 Construction impacts with destruction and scarring of land in steep mountain terrain	Implementation through 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 re-vegetation of disturbed areas.
2 Use of borrow materials	Borrowed materials will not be diverted from cultivable and arable lands but only from permitted and existing quarry areas.
3 Loss of agricultural and forest land	Resettlement plan to be implemented and compensation package to be provided for loss of land & trees.
4 Reduced water flows in the 1.0 km section of the Nam Cha stream (from the dam to the power house).	440 litres/s will be retained in the stream system downstream of the dam to benefit fish and other aquatic life in the dry season.
5 Tree planting programme	In areas, such as the dam site and operations area, trees will be planted on a total of 41 hectares. Planted trees will be local trees. It is estimated that the cost of tree planting will be 40 mil dong per ha.
6 Scouring and erosion of riverbed from tailrace discharge	Repair and/or extend the reinforcement of the downstream riverbed and provide stilling basin.

Aside from the compensation for a small loss of land and for the temporary use of land during the one year construction period, funding is also incorporated in the budget for an environmental cell to strengthen the capacity of the Northern Power Corporation, which is the body that will implement the project on behalf of NPC.

Conclusions

The project will permanently acquire a portion of agricultural land, terrace land, perennial tree land and will temporarily impact fallow land. These impacts will be compensated and assisted at price stipulated by the State as presented in the resettlement plan report. The main impacts identified in the environmental assessment process are impacts on soil, rocks and reduced water flow at the 1.0 km section of Nam Cha stream from the dam to the power plant within the 6 months in dry season, which will affect the aquatic ecosystem life in Nam Cha stream.

The proposed Environmental Management Plan (EMP) attached to this IEE will mitigate the impacts of construction activities. The proposed retention of 440 litres/s water flow for the 1.0 km from the dam to the power house will also help reduce impacts.

The construction process will cause negative impacts on residents in the project areas such as noise and dust pollution, disruption of local residents' lives due to the entry of many workers from other places. However, when the project is operational, it will provide the local residents with power supply, improve access to audio-visual and communicative media and thus increase productivity and improve the living standards of local communities.

It is important, also, that the 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 the subproject implementation agency and the appointment of environmental & resettlement specialists.

I. INTRODUCTION

The Government of Vietnam has requested ADB for a loan to develop a project that can provide reliable and an affordable supply of electricity to remote mountainous and poor communes. The Project will also allow the replacement of thermal power generation with renewable energy.

The ADB Loan 2517-VIE: Renewable Energy Development and Network Expansion and Rehabilitation for Remote Communes Sector Project (or the “Project”), consists of two investment components:

- Component 1 are subprojects that involve the development of small hydroelectric plants.
- Component 2 are subprojects that involve the extension or rehabilitation of rural electricity networks to serve remote poor communities.

Under Component 1, the Project will finance the development of between 5 and 10 small hydropower plants, each with a capacity of less than 7.5 MW in the northern and central provinces of Vietnam. The Project is expected to contribute over 30 MW of combined generation capacity to the national power system, while Component 2 will help extend the medium voltage power network in Vietnam by approximately 800 - 1,000 km. Low voltage transformers will be installed and the low voltage network will be extended by about 2,500 - 3,000 km. Component 2 will be implemented in the Northern, Central and Southern Provinces of the country.

Nam Cha 3 Hydropower Project is one of the sub-projects identified in Component 1 of the Project. The overall study for the Nam Cha 3 Hydropower Project looks at the technical feasibility of the project. This Initial Environmental Examination (IEE) is undertaken as part of project feasibility along with a Resettlement Plan and Ethnic Minorities Development Plan (EMDP). According to ADB’s Safeguard Policy Statement (SPS) June 2009, the sub-project is considered as Environment Category B requiring an initial environmental examination (IEE). This project categorization is based on anticipated environmental impacts of the proposed sub-project.

The Executing Agency (EA) for the project is the Northern Power Company and this report will be submitted to the District Office for Environment and Water Resources to assist in monitoring the project.

Map Project Location in relation to region:

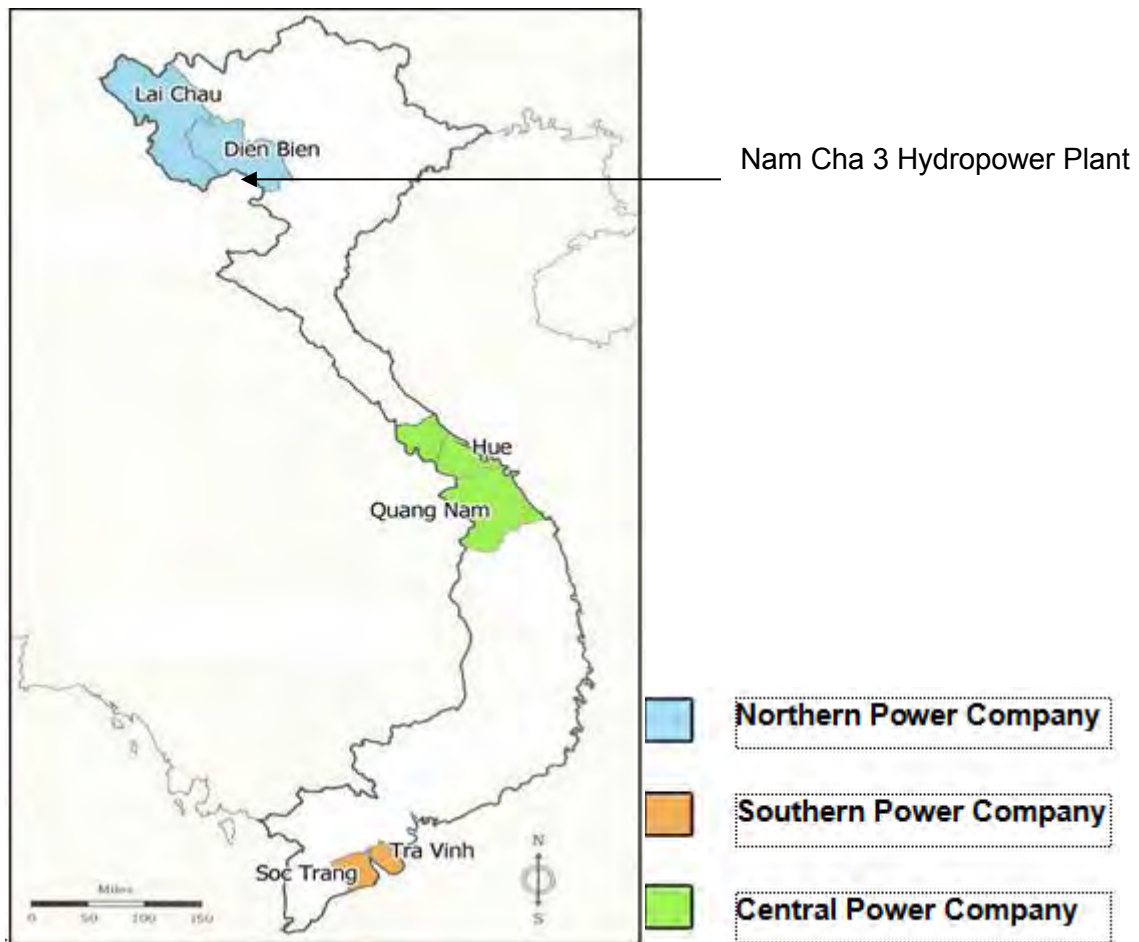


Figure 1: Map of project location

II. DISCRIPTION OF THE PROJECT

A. Type of Project and Legal Requirements

1. ADB Categorisation

Using ADB's Rapid Environmental Assessment form for hydropower (Appendix 1) projects, Nam Cha 3 Hydropower project is deemed to be classified as a Category "B" project, in accordance with ADB Guidelines for Environmental Assessment, 2003. 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 Regulations

Environmental Impact Assessment: The requirements for an 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 environmental assessment.

A Circular issued by the Ministry of Natural Resources and Environment (MONRE) Number 05/2008/TT-BTNMT dated December, 08, 2008 entitled "Guiding Strategic Environmental Assessment, Environmental Impact Assessment and Environmental Protection Commitment"¹ gives detailed guidelines for Strategic Environmental Assessment (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.

The regulations² published in 2008 categorise which type of projects are required to undertake an EIA. With respect to the requirements for environmental assessment of hydropower projects, an "environmental impact assessment" report is only required for hydropower plants having reservoir areas of 300,000 m³ or above and for high voltage transmission lines with a length of over 100 km.

According to new regulations in Viet Nam (since 2008), hydropower projects with its reservoirs volume is less than 300,000m³ have to prepare a report of "Environmental Protection Commitment" while those with reservoir capacity more than 300,000m³ and less than 100,000,000m³ have to prepare a report of "Environmental impact assessment

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

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

(EIA)” to be submitted to the Province People’s Committee for approval, and those with more than 100,000,000 m³ or scope of the project within two or more provinces have to prepare a report “Environmental impact assessment (EIA)” to be submitted to Ministry of Natural Resources and Environment for assessment and approval.

Nam Cha 3 project has a reservoir area of 1,260,000 m³. As such, there is a requirement under Vietnamese regulations to undertake an EIA report and submit to Provincial Department of Natural Resources and Environment of Dien Bien Province for assessment and approval. Currently, EIA is in the process of preparation and will be submitted for Provincial Department of Natural Resources and Environment of Dien Bien Province for assessment and approval according to the regulations of Vietnamese Government.

3. Other Vietnamese Approval Requirements and Regulations

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 CEPs³ and Provincial level environment protection agencies are responsible for certification of registration⁴. 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, 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.

Utilization of Water Resources: The project must obtain approval also for a permit under Water Resources legislation. Article 24 of The Law on Water Resources⁵ 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.

Article 64 of the Act on “the Management of the river basin planning” specifies that the agency managing the planning of river basins is a non business agency of the Ministry of Agriculture and Rural Development (MARD).

Decree No 149/2004⁶, Article 4 defines permit issuance principles. Permits are granted initially for 20 years (Article 7). Permits for smaller projects are usually granted at

³ Article 26 of the LEP

⁴ Article 17c of Decree 21-2008

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

⁶ 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.

Provincial People's Committee level (Article 14). The Permitting authority will also manage the permit and the dossiers of required information for the project.

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 Peoples Committee (Article 18).

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 exploitation organization or individual and the organization or individual having the land use right and this must be certified by the competent People's Committee.

Environmental Flow: Decree No 112/2008⁷ 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 it defined as "the lowest level of flow required for maintaining a river or a river section to ensure the aquatic eco-system'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".

Reservoir construction must conform to 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).

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).

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

⁷ 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.

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

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:

- Cultural Heritage Law June 2001,
- Decree No. 92/2002/ND-CP November 11, 2002 relating to the implementation of some articles of the Law on Cultural Heritage,
- Regulation on exploration of archaeological excavations Decision No. 86/2008/QD-BVHTTDL December 30, 2008 of the Minister of Culture, Sport and Tourism.
- 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 artefacts, 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, Sport and Tourism or the Department of Culture and Information.

B. Location and General Description

1. Project description

The Nam Cha 3 hydropower plant is located in the Nam Cha stream in Pa Tan commune, Muong Nhe district, Dien Bien province. It is 100km north-western from the site to Muong Cha town centre and 53 km to Muong Nhe district centre. The Project is a part of a small micro hydropower plant development plan in Dien Bien until 2020, which was approved in the Decision No 99/QD-UBND on 25 January, 2010 by PPC.

The construction plan includes the establishment of two camps and auxiliary components at the headwork and powerhouse of the dam. The location of the camp at the headwork is arranged along the National Road 131 and 200m towards the downstream (see Map).

The auxiliary components are located along National Road 131, about 500m from the power house.

Coordinates of the dam and power plant are:

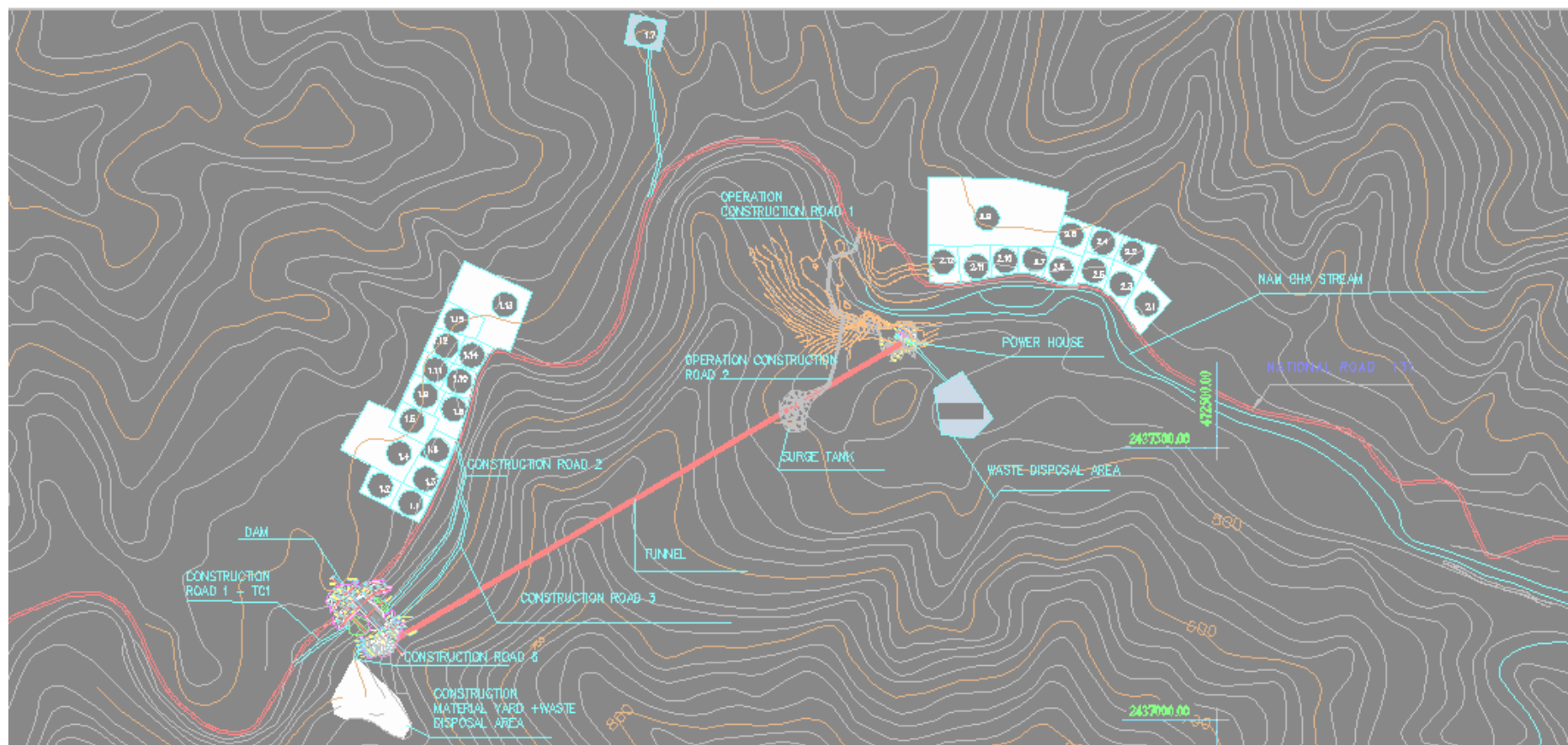
* Dam: 22° 02'00" of Northern latitude, 102°43'11" of Eastern longitude

* Power house: 22⁰02'25" of Northern latitude, 102⁰43'40" of Eastern longitude.

The Nam Cha 3 Hydropower plant has an installation capacity of 6.0 MW and a mean annual energy of 20.574million kWh. The project will contribute to the power development in the Pa Tan and Quang Lam communes in particular and the Muong Nhe district in general. The project will also provide a significant contribution to power network of Dien Bien province.

The National Road 131 from Dien Bien to Lai Chau follows the left bank of the Nam Cha stream (see Map). Only short access roads to the dam and power plant are required.

The different elements of the Nam Cha 3 hydropower plant are presented in the attached Figure 2.



Map notes: 1.1; 2.1 - Concrete batching plant/ 1.2; 2.2 - Steel formwork base/ 1.3, 2.3- Reinforcement base/ 1.4 - Maintenance base and parking area/ 1.5- Laboratory; 1.6, 2.6- A fire station/ 1.7- Blasting materials warehouse/ 1.8 - Hydro-mechanical base; 1.9- water, electric base/ 1.10 - Accommodation and office of NPC; 1.11- Accommodation and office of key consultants/ 1.12, 2.8 - office of the constructor; 1.13, 2.9- Accommodation of workers/ 1.14, 2.10 - Kindergarten/ 1.15 - Health-care center/ 2.4- Cooperative – Erection base/ 2.5 - Parking area/ 2.7 - Base of underground components/ 2.11 - Ambulance station at construction work/ 2.12 - Base of underground components.

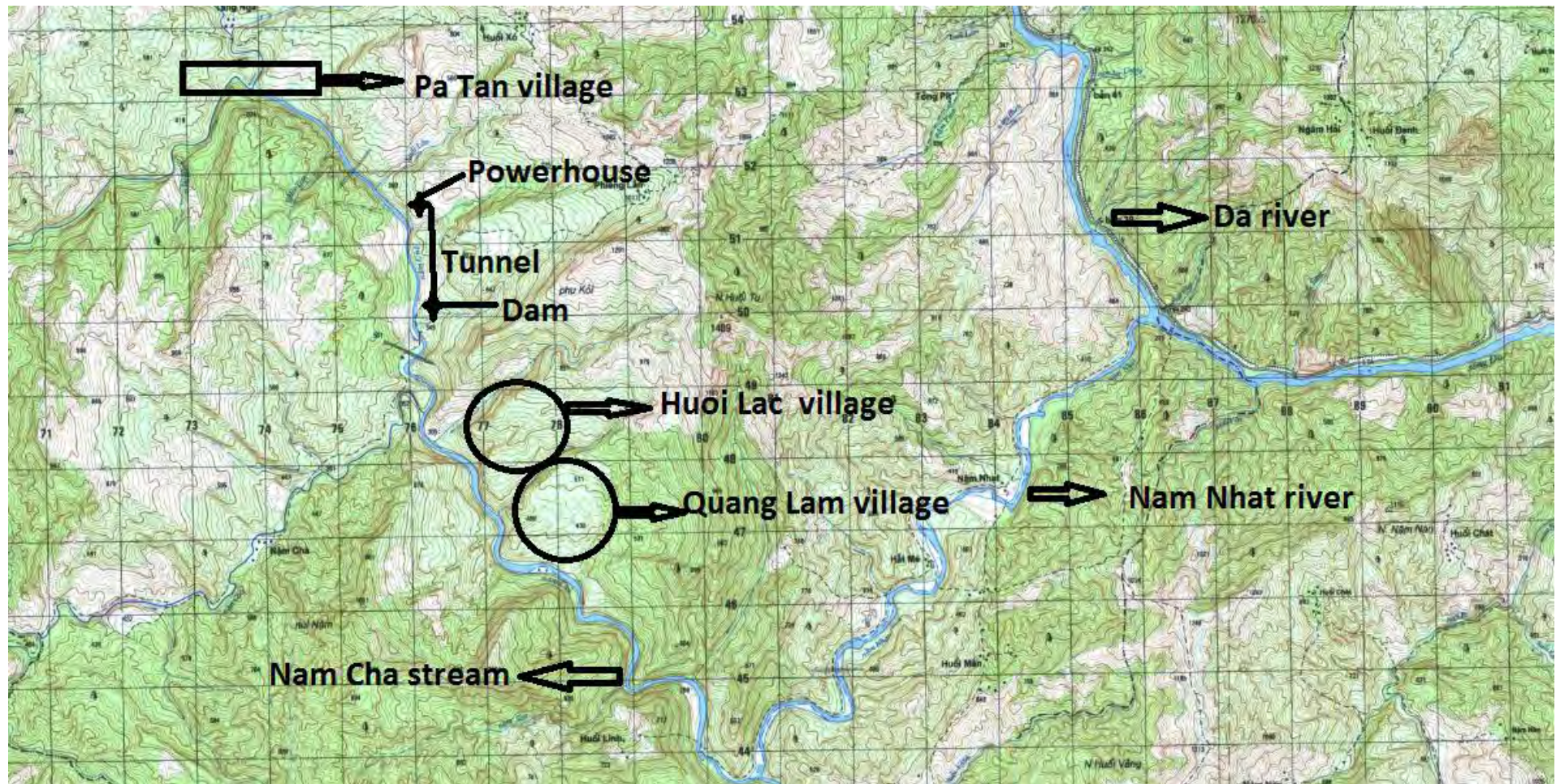


Figure 2: Map of the project

2. Main Construction Components

The Nam Cha 3 hydropower plant is designed as a transmission tunnel plant which includes a dam, spillway, headrace channel, intake gate, cross tunnel (in front of the surge tank), power house, discharge channel, and switch yard station.

The reservoir will have a length of 3.8 km and surface area of 16.59 ha at full supply level. Some crops and forest land will be affected when the water level in the reservoir rises to 464.5m, and peaks at 471.32 m.

The works including plant, pressurizing tower, headrace tunnel, and waste dumps are built in the south of the Nam Cha 3 stream, without any impacts on the residential area and the National Road 131. The distance between the main works and the residential area is relatively far. The distance from the dam to Ta Ham village is 2.2 km, while the distance from the plant area to Pa Tan village is about 2.7 km. The length of the stream section from the dam to the plant is 1.2km.

The reservoir's capacity is large enough for the plant to operate at peak hours. Besides operating during peak hours in the day time, Nam Cha 3 hydropower plant will be operated depending on the ability of water storage in the reservoir and water flow during each period.

Simulations on regulatory processes: on a normal day, water will be stored in the reservoir up to standard water level, in order for the plant to operate at medium capacity. In peak hours, the plant will operate with maximum capacity. Then the water level will be reduced to the minimum water level. This process is repeated for the next cycle.

In the dry season, an amount of approximately 26.63 m³/s of water would be discharged downstream for several hours. Normally, without the project, in the dry season, the water level of the Nam Cha stream is low. Once the plant becomes operational and conducts, discharge will cause water levels in downstream areas to increase rapidly over short periods (several hours). Thus, in the day the water level in the downstream area is changed drastically.

The main parameters are described in the following table:

Table 1: Parameters of the hydropower plant

Order	Figures	Unit	Numeric value
I	Categorization of the construction		III
II	Downstream		
1	Area from downstream to the dam F_{IV}	km ²	254.9
2	Annual average rainfall X_0	mm	1.790.8

Order	Figures	Unit	Numeric value
3	Loss of evaporation ΔZ	mm	425.2
3	Module of annual flow M_0	l/s/ km ²	36.6
4	Annual average flow Q_0	m ³ /s	9.33
5	Gross capacity of the flow W_0	10 ⁶ m ³	257.45
III	Capacity		
1	Design flood $Q_{P=1\%}$ - Dam	m ³ /s	1,581
	Design flood $Q_{P=1\%}$ - Powerhouse	m ³ /s	1,595
2	Check Flood $Q_{P=0,2\%}$ - Dam	m ³ /s	2,298
	Check Flood $Q_{P=0,2\%}$ - powerhouse	m ³ /s	2,318
3	Security flow $Q_{dbP85\%}$	m ³ /s	1,93
4	Maximum capacity through the power house Q_{Tmax}	m ³ /s	23.63
5	Minimum capacity through a machine assembly $Q_{min1assembly}$	m ³ /s	5.91
III	Reservoir		
1	Full supply water level	m	467.00
2	Area of the surface reservoir at full supply level	ha	16.59
3	Minimum water level	m	464.50
	Design flood level (P = 1%)	m	471.32
	Check Flood level (P = 0,2%)	m	472.52
	Gross storage volume	10 ⁶ m ³	1.26
	Active storage volume	10 ⁶ m ³	0.35
	Dead storage volume	10 ⁶ m ³	0.91
IV	Scope of the components of the construction		
1	Dam on the left bank		
	Type		Concrete
	Crest elevation	m	473
	Dam height	m	21
	Crest length	m	10,00
2	Dam on the right bank		
	Type		Concrete
	Crest elevation		473
	Dam height		14.00
	Crest length		15.5
3	Spillway		
	Sill		Free
	Sill elevation	m	467.0
	Total length	m	73.0

Order	Figures	Unit	Numeric value
	Design flood discharge P = 1%	m ³ /s	1,355.21
	Check flood discharge P = 0,2%	m ³ /s	1,957.17
4	Intake gate		
	Type		Tower
	Crest elevation	m	473.0
	Sill elevation	m	457.3
	Floor Elevation	m	456.3
	Size of inlet gateBxH	m	3.0x3.0
4	Headrace Tunnel		
4.1	Without lining		
	Inside diameter	m	4.2
	Length	m	758.55
	Bottom slope	%	2.5
4.2	with lining		
	Inside diameter	m	3.0
	Length	m	314.0
	Bottom slope	%	1.55
4.3	With lining		
	Inside diameter	m	2.2
	Length	m	20.0
	Bottom slope	%	2.5
5	Surge tank		
	Type		2 sections pillar
	Crest elevation TĐA	m	479.00
	Inside diameter	m	3.0÷6.0÷10.0
	Maximum level in TĐA	m	477.95
	Minimum level in TĐA	m	457.39
6	Power house		
	Number of machinery assemblies	assemble	02
	Types of turbines		Francis-horizontal axis
	Diameter BXCT	m	1.24
	Elevation of machinery floor	m	432.87
	Elevation of machinery installation	m	438.70
	Crest elevation of installation	m	433.50
	Powerhouse dimension AxB (plan drawing)	m	34.4x23.3
	Hydraulic pressure head H _{tt}	m	30.5

Order	Figures	Unit	Numeric value
	Maximum hydraulic pressure head H_{\max}	m	37.20
	Minimum hydraulic pressure head H_{\min}	M	30.05
	Installation capacity N_{Im}	MW	6.0
	Firm capacity N_{db}	MW	0.56
	Mean annual energy E_0	10^6KWh	20.547
	Using hours of installation capacity H_{sdNIm}	Hours	3,429
7	Switchyard station 35 KV	Station	01
8	Transmission alignment 35 KV single line	Km	0.2

3. Quantity of soil and rock used in the project

Nam Cha 3 hydropower project will purchase rock in quarry from Truong Tho Limited Company in Pa Tan commune. The quarry of Truong Tho Limited Company is close to the dam site and 131 national highway. It is about 2.5 from Tam Ha village residential area 2.7 km from Pa Tan village.

The volume of soil, rock needed for the whole project is shown in the following table:

Table 2: Quantity of soil and rock to be used in the project

No.	Items	Unit	Quantity
1	Open quarry digging	10^3m^3	128.45
2	Soil and rock banking	10^3m^3	7.75
3	Tunnel digging with Boomer driller	10^3m^3	11.36
4	Tunnel expanding with SIG driller	10^3m^3	3.49
5	All types of concrete	10^3m^3	26.10
	Total	10^3m^3	177.15

4. Components of auxiliary structures

In addition to the above main component, there are auxiliary components of the Nam Cha 3 hydropower plant presented in the following table:

Table 3: Auxiliary components

<i>Order</i>	<i>Components</i>	<i>Figures</i>	<i>Area (ha)</i>
Auxiliary components in headwork area			
1.1	Concrete batching plant	40 m ³ /hour	0.15
1.2	Steel framework base		0.1
1.3	Reinforcement base		0.1
1.4	Maintenance base and parking area		0.39
1.5	Laboratory		0.12
1.6	A fire station		0.05
1.7	Blasting materials warehouse	5 tons	0.05
1.8	Hydro-mechanical base		0.1
1.9	water, electric base		0.06
1.10	Accommodation and office of NPC	20 persons	0.09
1.11	Accommodation and office of key consultants	10 persons	0.07
1.12	Office of the contractor	40 persons	0.05
1.13	Accommodation of workers	300 persons	0.7
1.14	Kindergarten	20 persons	0.05
1.15	Health-care centre	14 beds	0.08
Auxiliary components in the powerhouse			
2.1	Concrete batching plant	10 m ³ /hour	0.1
2.2	Steel formwork base	-	0.1
2.3	Reinforcement base	-	0.1
2.4	Cooperative –Erection base	-	0.37
2.5	Parking area	15 vehicles	0.15
2.6	A fire station	1 vehicles	0.07
2.7	Base of underground components	-	0.19
2.8	Office of the contractor	30 persons	0.05
2.9	Accommodation of workers	200 persons	0.6
2.10	Kindergarten	15 persons	0.05
2.11	Ambulance station at construction work	-	0.02
2.12	Base of underground components	-	0.19

5. Management mechanism of the plant

Operation mechanism of Nam Cha 3 hydropower plant include two major components: production component and administrative management component.

The main activities of these components are:

- Production component: (i) to operate the plant to produce energy in three shifts constantly; (ii) to maintain regularly and periodically hydro-mechanical equipment and hydropower plant; (iii) to monitor the hydro-construction work, seek for and fix small broken parts of the construction and the factory caused by repair in the plant and flood.
- Administrative management component: (i) to manage human resource of direct production works and indirect production works; (ii) to maintain and supply materials, spare parts, and other needs to operate activities of hydro civil works and powerhouse as well as to maintain and fix small broken parts of the construction caused by repair in the plant and flood; (iii) to take care of living condition of workers both physically and spiritually; (iv) to protect materials of the plant, to ensure safety and prevent the plant from outside damage.

Personnel of the management and operation of the plant are as follows:

Table 4: Human resource of the plant

<i>Order</i>	<i>Personnel</i>	<i>Structures</i>	<i>Numbers of persons</i>
1		Executive manager	01
2		Vice-manager	01
3		Team leader of a shift work	03
4		Workers of mechanical component	09
5		Workers of energy network component	09
6		Workers of headwork	02
7		Workers fixing the construction, station and transmission alignment	03
8		Staffs of materials planning and sale department	02
9	Staff of indirect	Financial department	02
10	production	Drivers + fire truck driver	02
11	work	Meals servicers + assistance + reception	02
12		Security guard	03
13		Total workers	39

6. Total area of the construction

Nam Cha 3 hydropower plant is located in Nam Cha stream, Pa Tan commune, Muong Nhe district, Dien Bien province.

There is no available infrastructure in the construction area of Nam Cha 3 that can be utilised for the construction.

All the construction is located on a suitable terrain. The terrain is sloping.

The plan is to establish two camps and auxiliary components at the headwork and powerhouse. The location of the camp at the headwork is arranged along the National Road 131 and 200m towards the downstream.

The auxiliary components are located along National Road 131, about 500m from the powerhouse.

C. Construction Schedule

Nam Cha 3 hydropower plant is expected to be built in 2.5 years, including six months for preparation works and two years for construction activities.

Preparation progress includes the following activities:

- Land clearance, mine exploration
- Construction of access road to the powerhouse
- Building of storages, warehouses, auxiliary components, communication system, electricity and water supply for the construction
- Gathering materials, human resource, machines

Construction stage:

Year 1:

During the first year of project construction, the following activities will be implemented:

- Mobilization by November of the first year.
- Creation of diversion flow through waterway.
- Continue and complete activities of construction preparation.
- Start construction of waterway and excavation of the abutment, start concrete reinforcement in the left bank of the dam.

In the dry season, the following works will be undertaken:

- Excavation of area for waterway.
- From December of the first year to April of the second year, start concrete reinforcement works to all areas of the waterway, start construction of the left bank of dam up to design elevation, and excavate area for the intake gate.

In flood season

- To excavate area of right bank dam to elevation of 480.50m

Year 2:

In the dry season, the diversion flow through the waterway will be created. By November of the second year, damming of the up and downstream will commence, by blocking the stream, diverting the flow through waterway.

To excavate the right bank of the dam, the following works will be done:

- Work on the foundation, to concrete the dam on the right bank, to construct spillway of the river bed.
- Carry out construction of discharge tunnel of sand
- Complete activities of concrete reinforcement of dam, intake tunnel and discharge tunnel of sand, in the end of the third year,
- Complete installation of mechanical equipment in the discharge tunnel of sand and intake gate.

Year 3:

- May: Commission unit 1
- July: Commission unit 2 and to complete the project

III. DESCRIPTION OF ENVIRONMENT

A. Physical Environment

1. Air quality and climate

1.1. Air quality

Air quality data was monitored to comply with Vietnamese regulations. Results of air quality analysis is presented in Table 5 and in Appendix 3.

Table 5: Outputs of air quality analysis

order	parameter	Unit	Outputs of the analysis						QCVN 05:2009/ BTNMT
			Air1	Air 2	Air 3	Air 4	Air 5	Air 6	
1	SO ₂	mg/m ³	0.008	0.012	0.043	0.015	0.007	0.023	350
2	NO ₂	mg/m ³	0.030	0.006	0.005	0.010	0.010	0.018	200
3	CO	mg/m ³	2.3	4.8	1.9	1.6	1.4	2.1	3000
4	TSP _{TB}	mg/m ³	0.014	0.019	0.013	0.015	0.017	0.028	300
5	TSP _{MAX}	mg/m ³	0.024	0.027	0.022	0.033	0.036	0.054	
6	Noise (tb)	dBA	63.8	50.6	59.9	74.3	63.5	46.3	75
7	Noise(max)	dBA	75.2	62.9	71.1	89.7	77.3	52.0	
8	Noise (min)	dBA	53.9	36.8	46.1	41.0	40.3	43.5	

Air 1: Quang Lam Bridge; Air 2: Huoi Lac village; Air 3: Ta Ham village; Air 4: Pa Ham bridge; Air 5: Transportation road connecting Pa Tan commune to Quang Lam commune; Air 6: Paddy rice field under Pa Tan bridge

Conclusions of air quality

At six sampling positions, analysis criteria of all air samples are in compliance with the national technical regulation on ambient air quality. This means that air quality in the construction area is relatively good and does not affect the lives of the people and ecology system in the area.

1.2. Climate conditions

As in other areas in Da river watershed, the climate in the project area (Nam Cha watershed, Muong Ne district) has tropical and monsoonal characteristics. There are two seasons in a year. The weather in the winter season is cool and dry while in the rainy season is hot with lots of rain.

Winter season begins from November to March and the weather is affected by high pressure and cool air from Xibia continental. Nam Cha 3 hydropower watershed is located at the right side of the mountain region in the north and near the border between Vietnam and Laos and upper reaches of Da river, so that the weather in winter is cooler than other areas in the same watershed. The monitoring results showed minimum temperatures are 3.4°C in Lai Chau; and 0.4°C in Muong Te, and -3.3°C in Muong Nhe. There is almost mild drizzle and continuous rain in winter with low rainfall intensity which is good for promoting soil moisture.

The summer season is from April till October. The summer season experiences turbulent weather with typhoons, storms and tropical low pressure, etc. with strong effects on humidity. Due to long periods of hot and dry weather, long and heavy rain may occur over large areas, which create floods not only for Da river but also for Nam Nhat river.

1.3. Rainfall

Because of the effect of geographical conditions, the rainfall distribution in Da watershed is irregular. Areas under effect of the coming southwest monsoon from Hoang Lien Son mountain line and high mountains, to the border of Viet Nam and China. Therefore there will be high levels of rainfall in North-West side of Da watershed. Average rainfall per year is about 2400 – 3400mm. On the contrary, the right side of Da River is sheltered from the wind, thus the amount of rainfall is significantly less. Nam Cha watershed is located on the right of Da river, which has low rainfall area. There is a variation in the average rainfall from the lowland to highland areas. The average annual rainfall is 2438mm at Muong Te; 2546mm at Na Hu; 2204mm at Ma Ky; 2482mm at Ta Tong; 2117mm at Lai Chau; 2130mm at Nam Giang; 2105mm at Muong Mo;; 1680mm at Nam Po; 1641mm at Muong Cha and 1760mm at Muong Nhe where the project located

Annual rainfall can be distributed into two separate seasons, these seasons are the rainy season and dry season. There are different times that rainfall occurs between the two seasons. The rainy season begins in May and ends in September, and the rainfall in this season is about 70-80% of the rainfall in a year. . Heavy rain usually occurs in the months of June, July and August where the monthly rainfall at all stations is over 300mm .The dry season occurs from October to April and has only 20-30% of the total rainfall in a year. The time from December to February has the lowest rainfall, of about 20-50mm. The index of highest and lowest rainfall was 15 - 40 times. The rainfall distribution per month in a year, measured at some stations in and near the Project area are shown in the following table:

Table 6: Monthly rainfall at Nam Cha 3 Subproject Area

Unit: mm

Station	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Year
Mường Tè	26.7	29.5	48.0	130	281	469	623	452	179	107	62.6	28.8	2438
Nà Hừ	30.3	33.9	58.3	139	301	493	624	449	200	123	71.2	23.7	2548
Tà Tổng	30.2	33.9	48.2	121	243	457	621	473	208	135	83.6	29.8	2482
Ma Ký	17.8	39.1	45.4	105	229	382	544	439	196	105	67.9	34.1	2204
Nậm Giàng	31.1	34.2	63.5	156	290	398	512	337	151	82.0	55.0	20.4	2130
Lai Châu	28.9	35.5	60.8	136	268	438	476	371	140	86.3	51.8	23.5	2117
Mường Mô	28.2	34.5	59.1	130	271	426	478	385	125	93	47.8	27.6	2105
Mường Nhé	24.0	27.2	31.4	102	214	306	352	332	161	111	69.2	29.7	1760
Nậm Pô	27.6	29.3	35.9	111	190	307	350	301	143	105	58.4	23.5	1680
Nậm Mức	24.1	27.9	51.5	142	224	320	353	314	128	66.6	32.6	18.0	1701
Mường Chà	22.5	25.7	44.4	110	189	276	360	350	118	80	47.0	18.9	1641

(Source: General Description)

2. Topography condition and soil

- The topography in the area is mountainous, sloping and 400 meter above sea level. The slope of the topography increases towards two sides of the mountain with an average altitude between 25° - 40°. The topography is covered with dense vegetation, particularly in the area of dam.



Figure 3: Location of the Project in the district

- Soil quality data was monitored to comply with Vietnamese regulations. Map of sampling locations is shown in Appendix 5;

Results of soil quality analysis is presented in table 7 and in Appendix 5.

Table 7: Analysis outputs of soil quality

Order	Parameter	unit	Analysis outputs						QCVN 03:2008/ BTNMT	
			Soil 1	Soil 2	Soil 3	Soil 4	Soil5	Soil 6	Agricultural land	Commercial land
1	pH _{KCl}	-	4.75	4.30	4.02	4.45	4.79	4.24	-	-
2	Cu	mg/kg	20.36	9.60	77.55	14.19	31.70	29.26	50	100
3	Pb	mg/kg	15.68	9.56	24.90	16.34	24.15	18.57	70	200
4	Mn	mg/kg	356.5	60.7	492.1	391.3	628.5	383.4	-	-
5	Zn	mg/kg	34.21	27.65	63.6	45.56	39.85	45.65	200	300
6	Lubricant	mg/kg	2	<2	2	<2	4	<2	-	-
7	Total nitrogen	%	0.033	0.018	0.030	0.027	0.041	0.019	-	-
8	Total P ₂ O ₅	%	0.022	0.017	0.045	0.024	0.061	0.056	-	-
9	Total K ₂ O ₅	%	0.009	0.008	0.003	0.010	0.012	0.007	-	-

Notes: Soil 1: discharge channel; Soil 2: paddy rice field under Pa Tan bridge; Soil 3: Quang Lam bridge; Soil 4: Huoi Lac village; Soil 5: Pa Tan CPC; Soil 6: Pa Ham bridge, Ta Ham village.

Conclusion of analysis results of soil quality

The criteria of total nitrogen, P₂O₅ and K₂O₅ is used to analyse soil, following soil classification of Viet Nam.

Total Nitrogen will be compared with national technical regulation TCVN 7373: 2004 – soil quality – indicator value of content of Nitrogen.

According to the national technical regulation, TTVN indicates the value of total nitrogen in six main types of soil is presented in the following table:

Table 8: Nitrogen content of soil

Type of soil	Total nitrogen (N, %)	
	Range	Average
1. Feralsols (red soil)	From 0.065 to 0.530	0.177
2. Alluvial soil	From 0.095 to 0.270	0.141
3. Impoverished grey soil	From 0.030 to 0.121	0.072
4. Alum soil	From 0.145 to 0.420	0.293
5. Saline soil	From 0.045 to 0.205	0.156
6. Cm sandy soil	Scratch to 0.120	0.068

The results of total nitrogen in the six sampling positions fluctuate from 0.018 to 0.041, which means the soil in the project area is poor for planting.

+ Total P_2O_5 content of P_2O_5 will be compared with TCVN 7374: 2004 on soil quality-indicator value of total phosphorus in soil.

Limitation indicator of total phosphorus content in six major types of soil of Vietnam.

Table 9: Phosphorus content of soil

Type	Total phosphorus (P_2O_5 , %)	
	Range	Average
1. Feralsols (red soil)	From 0.02 to 1.00	0.15
2. Alluvial soil	From 0.03 to 2.35	1.05
3. Low quality soil	From 0.03 to 0.40	0.15
4. alum soil	From 1.20 to 0.30	1.20
5. Saline soil	From 1.20 to 2.00	1.35
6. Cm sandy soil	From 0.02 to 0.30	0.12

Results of P_2O_5 fluctuate from 0.017 – 0.061 (%) is categorized in type of impoverished grey soil

+ K_2O : content of K_2O will be compared with TCVN 7375: 2004 on soil quality – indicator value of total kali content in soil.

Limitation indicator of total kali content in six major types of soil.

Table 10: Kali content of soil

Type	Total Kaliform (K_2O_5 %)	
	Range	Average
1. Feralsols (red soil)	From 0.02 to 1.00	0.15
2. Alluvial soil	From 0.03 to 2.35	1.05
3. Low quality soil	From 0,03 to 0.40	0.15
4. Alum soil	From 1.00 to 1.40	1.20
5. Saline soil	From 1.20 to 2.00	1.35
6. Cm sandy soil	From 0.02 to 0.30	0.12

Result of K_2O_5 fluctuate between 0.003 – 0.012 %, which is smaller than value of impoverished soil. The total content of K_2O_5 in the soil in the area is small.

The metals in the soil (Cu, Pb, Zn) are compared with QCVN 03:2008/BTNMT regulated on limited content of metals in soil (regulation column of agriculture land and commercial land). The comparison proves that: the content of metal in sampling soil is under limitation of agriculture land and commercial land.

The content of lubricant in position 1,2,3,4 and 6 is small (<2), only in position 5, is the content of lubricant higher than other positions because the administrative house of CPC is being built in that area.

The soil in the construction is a type of impoverished soil and a signal of pollution is not found.

3. Surface water

Analysis outputs of surface water quality are presented in Table 8 and Appendix 4.

Table 11: Analysis outputs of surface water quality

TT	Parameter	Unit	Analysis output						QCVN 08:2008/ BTNMT (A1)
			SW1	SW 2	SW 3	SW 4	SW 5	SW 6	
1	DO	mg/l	7.3	8.2	7.7	7.4	6.5	6.8	>= 6
2	pH		7.7	7.7	7.7	7.8	7.3	7.8	6 – 8.5
3	TSS	mg/l	3	2	1	4	2	1	20
4	COD		2	3	4	2	4	3	10
5	BOD ₅	mg/l	1.1	1.4	1.7	0.8	1.9	1.4	4
6	Total nitrogen	mg/l	2.173	2.268	2.423	2.104	2.742	2.271	-

TT	Parameter	Unit	Analysis output						QCVN 08:2008/ BTNMT (A1)
			SW1	SW 2	SW 3	SW 4	SW 5	SW 6	
7	Total phosphorus	mg/l	0.113	0.094	0.094	0.117	0.075	0.071	-
8	Fe	mg/l	0.185	0.176	0.176	0.187	0.177	0.174	
9	Total (oils & grease)	mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1
10	Ca ²⁺	mg/l	18.68	18.65	17.89	18.69	17.27	18.67	- 0.5
11	Coliforms	mg/l	160	190	200	150	190	210	2500

Remark: QCVN 08:2008/BTNMT: National technical regulation on surface-water quality.

A1 – good for purpose of domestic water supply and others.

SW 1: discharge channel; SW 2: Huoi Lac village; SW 3: upstream of the reservoir (Quảng Lâm commune); SW 4: Pa Tần bridge; SW 5: left branch of Nậm Chà; SW 6: right branch of Nậm Chà

Conclusions of surface-water quality

- The results of monitoring and analysing the surface water in the Nam Cha stream proves that the quality of the surface water is good. The water is pure, without unusual colours or smells and has a strong flow (because of rocky terrain).
- The results of analysing and comparing criteria (pH, DO...) with column A1 of National technical regulation 08:2008/BTNMT shows that all criteria is under limitation of the regulation. Therefore, surface water (Nam Cha stream) in the construction area of hydropower project meets the quality of domestic water for daily use of people (eg, for bathing) and other purposes (irrigation, preservation of diversification of aquatic organism). Fe was detected in the water sample, possibly naturally occurring in the soil. Coliform was also detected because of the discharge of wastes from sediment and animal wastes.

4. Geology

* *Geography structure*

The studied area is not large and is located in the north-western region of Vietnam. In the current layout plan the areas in upper eastern Laos as well as Muong Te includes loose sediments containing coal at Suoi Bang soil depth and red loose sediment of Nam Po soil depth. They are formed in orogenic conditions in middle Mesozoic.

* **Earthquake risk**

According to the regulations of Viet Nam construction, volume III issued by the Ministry of construction in the year 2008, the construction area is located in seismic level 7 area (in the seismic division map with repeat frequency of $B_i \geq 0.005$ (cycle $T_i \leq 200$ year), frequency of appearance of $P \geq 0,1$ in 20 years). There are no fault lines identified in the project site. The dam is located 100 km away from the nearest fault line - Dien Bien – Lai Chau. The technical design of the dam should consider earthquake intensity $I_{\max} = 8$.

5. Hydrology

The Geographic location and characteristics of the land area has effects on the region's climate. Therefore the rainfall level significantly reduce in the watershed. The rain regulation is not evenly distributed, affecting the flow not only in Da watershed but also in Nam Nhat and Nam Cha watershed. The statistics of the average flow measured at Nam Po and Nam Muc stations given on following table.

Table 12: Specific af average flow – highest, lowest at Nam Po hydrographical station

No	Specific	Unit	Nam Muc	Nam Po	Na Hu
1	River		Nậm Múc	Nậm Mạ	Nậm Bum
2	Observation Period (year)		61-2009	62-75	1968-2009
3	Catchment area	Km ²	2680	475	155
4	Annual average flow Q_0	m ³ /s	85.1	15.2	13.6
5	Annual flow module M_0	l/s/km ²	31.8	31.97	88.0
6	Total flow of year W_0	10 ⁹ m ³	2.684	0.479	0.430
7	Flood season		VI-IX	VI-IX	VI-IX
8	Highest flood peak	m ³ /s	4,480	1,020	560
9	Appear time	-	VII-1994	IX-1976	VIII-1979
10	Flood flow module	m ³ /s/km ²	1.67	2.15	3.61
11	Lowest flow	m ³ /s	7.70	0.96	1.28
12	Appear time	-	V-1980	IV-1969	XII-1998
13	Low flow module	l/s/km ²	2.87	2.02	2.70
14	Index $Q_{\max}:Q_{\min}$ Ratio of Max Flow to Min Flow	-	582	1063	438

(Source:Hydrometeorological Data Center)

The flow of the river throughout the year can be separated into two seasons: the rainy season and the dry season. There is a great contrast in the flow quantity between the two seasons..

- The flood season lasts from June to September, and makes up 60%–82% of the year's flow capacity. July and August has the highest flow capacity in the year. The highest flow measured at Nam Po is $1020 \text{ m}^3/\text{s}$, at Nam Muc is $4480 \text{ m}^3/\text{s}$ and in Na Hu is $560 \text{ m}^3/\text{s}$. They are correlative flow modules $2.15 \text{ m}^3/\text{s}/\text{km}^2$; $1.67 \text{ m}^3/\text{s}/\text{km}^2$; $3.62 \text{ m}^3/\text{s}/\text{km}^2$.
- The dry season lasts from October to May, and makes up 18-40% of year's flow capacity. February to April has the lowest flow capacity of the year. The lowest measured flow in Nam Po was $0.960 \text{ m}^3/\text{s}$, in Nam Muc was $7.70 \text{ m}^3/\text{s}$ and in Na Hu was $1.28 \text{ m}^3/\text{s}$. They are correlative flow modules $2.02 \text{ l/s}/\text{km}^2$, $2.87 \text{ l/s}/\text{km}^2$ and $2.70 \text{ l/s}/\text{km}^2$.
- At the Nam Po gauging station, there is sufficient data from climatic locations consistent with the researched area to act as a similar basin for the calculation of the runoff. The actual data of the basin in 49 years of Nam Po gauging station is set out below:

Table 13: Monthly and annually runoff of Nam Cha 3 route

Years	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Q_{average} year
1961	2.95	2.60	2.08	2.17	2.00	13.30	10.37	25.61	24.56	12.76	5.92	3.92	9.02
1962	2.78	1.96	1.54	1.48	2.55	17.64	16.90	18.27	6.71	6.47	3.86	2.58	6.89
1963	1.35	1.19	1.10	0.91	1.12	6.52	14.15	21.54	7.10	10.72	14.47	3.30	6.96
1964	1.87	1.70	1.14	1.03	2.15	8.61	28.33	16.12	10.93	3.99	2.91	2.39	6.76
1965	1.65	1.42	1.00	1.13	2.96	14.35	14.64	14.10	8.18	15.75	13.33	4.00	7.71
1966	2.38	1.68	1.39	1.13	1.24	20.15	27.83	34.15	18.23	8.57	4.62	2.36	10.31
1967	1.71	1.63	1.26	1.62	1.93	4.50	17.58	21.28	10.72	3.65	2.51	2.50	5.91
1968	2.07	1.72	1.33	3.04	4.84	12.33	19.05	21.44	10.16	6.80	8.95	2.86	7.88
1969	1.81	1.32	0.97	0.78	1.37	8.86	21.79	41.79	11.06	4.12	2.85	1.76	8.21
1970	1.34	1.13	0.86	0.95	3.23	10.18	27.38	12.90	6.45	2.75	1.76	4.06	6.08
1971	1.81	1.56	1.13	1.38	5.51	19.27	29.30	45.45	11.73	4.14	2.75	1.82	10.49
1972	1.50	1.11	1.05	2.13	3.14	6.46	19.81	16.73	9.33	9.97	8.37	5.75	7.11
1973	2.40	1.61	2.06	2.92	7.18	14.37	18.42	20.63	11.07	3.93	2.47	1.63	7.39
1974	1.23	0.94	0.98	1.40	4.67	11.17	19.03	14.80	17.45	10.62	2.45	1.77	7.21
1975	2.01	1.05	0.81	1.40	1.81	11.15	13.90	11.35	5.84	3.72	2.21	1.54	4.73
1976	1.67	2.84	1.27	1.13	4.71	11.58	31.61	33.04	20.80	5.67	6.00	2.83	10.26
1977	2.05	1.70	1.26	1.49	2.28	6.54	27.74	20.02	8.02	6.79	4.19	3.16	7.10
1978	3.14	2.38	1.86	1.70	5.69	15.26	24.22	30.85	16.51	7.89	4.36	3.17	9.75
1979	2.28	2.19	1.86	1.68	2.30	5.98	10.21	16.07	20.62	6.73	3.52	2.47	6.33
1980	1.99	1.58	1.47	1.35	1.60	4.54	19.63	24.96	12.34	5.51	3.26	2.53	6.73

Years	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Q _{average} year
1981	2.12	1.52	1.34	1.64	8.89	11.85	15.33	26.42	15.53	8.46	6.84	3.92	8.65
1982	2.80	2.25	1.70	2.66	2.15	8.51	13.95	32.65	10.88	9.43	4.67	3.20	7.90
1983	2.33	1.91	2.00	1.52	2.53	2.27	6.50	16.26	17.83	6.80	5.59	3.28	5.74
1984	2.72	2.15	1.71	1.71	4.20	8.44	14.21	14.24	11.87	12.13	4.99	3.26	6.80
1985	2.82	2.45	1.92	3.32	3.34	7.47	10.12	28.01	20.03	7.55	9.66	6.04	8.56
1986	4.00	3.14	2.64	3.57	7.83	8.46	22.44	14.13	10.27	8.99	5.01	3.71	7.85
1987	2.93	2.32	2.11	1.84	1.65	3.66	12.13	11.49	10.88	8.80	5.50	3.43	5.56
1988	2.78	2.72	2.08	2.60	5.38	4.37	19.43	27.03	17.93	7.12	4.58	3.48	8.29
1989	2.38	2.06	2.51	2.26	4.45	12.64	11.97	11.07	7.20	5.07	3.32	2.51	5.62
1990	2.93	2.68	3.95	4.08	9.76	28.75	42.81	22.44	9.52	7.21	5.07	3.76	11.91
1991	2.84	2.41	2.12	2.31	2.95	11.82	21.49	19.54	7.44	5.84	4.03	3.10	7.16
1992	2.74	2.70	2.22	2.00	3.14	8.65	27.15	12.01	9.83	6.45	3.97	3.54	7.03
1993	2.69	2.25	2.09	2.33	4.85	6.76	13.24	21.78	16.07	8.33	4.89	3.35	7.39
1994	3.56	2.90	2.88	3.38	5.84	24.15	56.72	32.23	16.15	15.58	8.41	6.61	14.87
1995	6.01	5.31	4.84	4.45	5.22	19.86	35.28	43.61	14.20	8.80	6.85	5.15	13.30
1996	3.28	2.92	3.61	3.61	5.64	6.47	23.43	52.89	19.96	11.73	7.17	5.37	12.17
1997	4.39	3.81	4.21	5.18	4.85	9.61	33.35	31.74	24.52	12.04	6.57	4.78	12.09
1998	4.22	3.64	3.40	3.84	6.04	15.98	23.58	18.51	15.06	6.54	5.13	4.27	9.18
1999	4.41	3.90	3.81	4.23	5.72	14.97	24.23	26.79	21.68	8.52	6.39	5.28	10.83
2000	4.68	4.27	4.68	4.15	9.84	15.85	28.73	23.87	16.18	16.72	8.30	6.96	12.02
2001	6.38	5.43	5.51	5.23	12.29	23.52	33.72	23.19	12.51	11.34	9.07	6.85	12.92
2002	6.38	5.87	5.02	5.07	12.24	21.36	36.76	46.19	15.19	11.65	8.56	6.63	15.08
2003	7.11	4.97	4.29	4.91	4.46	6.89	11.17	19.30	17.28	8.05	5.38	4.75	8.21
2004	4.13	3.91	3.65	5.50	10.90	12.74	17.07	27.24	21.72	10.90	8.56	7.33	11.14
2005	6.37	5.74	5.49	6.33	5.75	16.01	25.28	31.30	17.72	11.18	8.87	7.43	12.29
2006	6.08	5.55	5.01	5.30	5.83	7.92	24.83	20.17	14.28	9.37	6.51	5.37	9.68
2007	4.82	4.27	3.81	5.01	6.24	11.63	22.38	20.12	17.86	10.29	7.51	6.26	10.02
2008	6.19	5.98	5.49	5.67	6.75	22.99	40.83	36.99	25.59	20.38	24.69	12.20	17.81
2009	6.92	6.12	5.66	6.34	7.83	8.84	21.92	21.22	12.91	9.86	7.42	6.58	10.13
Average	3.29	2.83	2.58	2.87	4.87	11.9	22.5	24.4	14.2	8.7	6.2	4.18	9.04

Unit: m³/s

(Source: General Description)

Based on rainfall data, flow in the region and operation capacity to make the parameters of hydropower for 2 units on stream Nam Cha:

Hydropower capacity parameters

<u>Parameter</u>	<u>Unit</u>	<u>Values</u>
Normal Water level	m	467.0
MNC	m	464.5
V_{tb}	$10^6 m^3$	1.259
V_{ch}	$10^6 m^3$	0.910
V_{hi}	$10^6 m^3$	0.349
$Q_{min1\text{ tới}}$	m^3/s	5.91
$Q_{xã}$	m^3/s	3.70
Q_{max}	m^3/s	23.63
H_{tt}	m	30.05
H_{max}	m	37.20
H_{min}	m	30.05
N_{lm}	MW	6.0
N_{db}	MW	0.56
Operation Units	Unit	2
E_0	$10^6 kwh$	20.574
H_{sdNlm}	Giờ	3,429

In the days, the hydrology flow to stream may be smaller than the value of $23.63 m^3/s$. However, the reservoir is responsible for storing water to maintain the flow of $23.63 m^3/s$ for power plant operation with maximum capacity in the peak hours (about 2 hours).

6. Hydropower system in the area

The Nam Cha 3 Hydropower plant is a small hydropower plant which is constructed in Nam Cha stream (Nam Cha stream is branch grade 1 of Nam Nhat river and branch grade 2 of Da River – Figure 2). According to the small hydropower scheme, in the future there will be 4 hydropower plants with the capacity of 1 -6 MW. The system of small hydropower plants constitutes the hydropower ladder system as in the figure below.

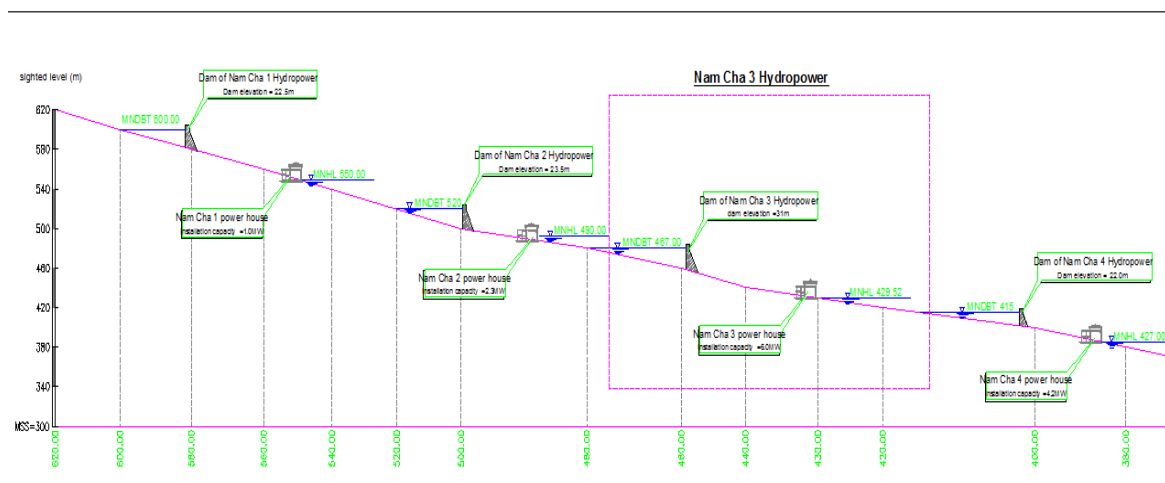


Figure 4: System of hydropower plants in Nam Cha stream

EVN plans to develop four hydropower plants along Nam Cha River. In case these hydropower plants are built, there will be potential cumulative impacts on the environment, such as:

An area of land will be acquired for the construction of these hydropower plants and this land acquisition will also affect trees and vegetation in the area. However, the land acquisition and the impact on trees and vegetation is not significant because the size of these hydropower projects are small, below 6MW.

During the construction of these hydropower plants, the transport of construction materials can cause negative impacts on the environment such as dust and noise. However, according to the safety regulation of the Government, the environmental mitigating measures will be done by the owners.

Environmental flow should be retained by each of the dam to avoid impacts on flora and fauna, particularly aquatic species in the river. In fact the flow of Nam Cha stream in the dry season is 3-6 m³ / s. Hydropower plants will create the environmental flow when they were built and taken into operation. During the dry season, the environmental flow will change significantly (0 m³ / s in 20 hours and 23.6 m³ / s in 4 hours), in addition the environmental flow generated by the series of hydropower plants will be provided water from small streams.

During the rainy days, the dams will release sediments which could affect the downstream areas. The mitigation measures such as creating vegetation cover (tree planting, grass growing) will be implemented to minimize the erosion and deposit runoff.

Cumulative impacts during the construction of the series of dams along Nam Cha River can minimize flooding.

The distance between the hydropower dams is quite large. The Nam Cha 2 is 16km away from Nam Cha 1; Nam Cha 2 is 12km from Nam Cha 3; and Nam Cha 4 is 10km away from Nam Cha 3. All the hydropower projects are required to ensure that the minimum environmental flow is provided.

The series of dams along Nam Cha River will not significantly change the flow regime of the river.

C. Ecological Resources

Protected Areas

Muong Nhe Nature Reserve and the buffer zone of the Reserve are located in the north west corner of the Dien Bien Province on the border with China and Lao in Muong Te and Muong Lay Districts. The Reserve is regarded as one of the priority areas for tiger and elephant conservation. According to the survey on the wild tigers and in the captivity conditions in Vietnam published on 29th December, 2011: According to the survey results at Muong Nhe Nature Reserve the scientists found 2 -5 tigers. In the early 1980s, they found around 200 elephants in Muong Nhe Nature Reserve. However, at this time, the presence of elephants is considered rare in the reserve.

Other important species (white cheeked crested gibbon, gaur, langur and black bear, etc) are present. The Nature Reserve covers a core area of 45,581 ha and includes large areas of protected forest. The buffer zone of the Reserve covers an area of 124,084.51 ha and is located in 6 communes: Sin Thau, Chung Chai and Muong Nhe, Muong Toong, Ke Nam and Quang Lam. The land in these buffer zone communes is mainly grassland and shifting cultivation and shrub with some protected forest or production forest.

The entire project area including the reservoir, dam, and plant areas is located in the region of Pa Tan Commune. The Commune borders the buffer zone of the Muong Nhe Nature Reserve. Distance from centre of the Pa Tan to core areas of nature conservation area is about 70 km. The scope of the research for this report for flora, fauna and aquatic fauna was restricted to the area along the Nam Cha stream in the construction site and downstream areas.

1. Terrestrial flora and fauna

Forest flora:

The Pa Tan village through Ta Ham, Huoi Lac to Quang Lam, located along the Nam Cha stream bridge, are the "evergreen tropical rain" areas and the forest is a forest mixed with bamboo. Due to human activities, these forests have been greatly affected by

shifting cultivation. The vegetation was mostly devastated, except the areas along the Nam Cha stream, Pa Tan, Ta Ham and Huoi Lac.

The vegetation consists mainly of tree species which prefer light and are fast-growing such as *Endospermum chinense*, *Litsea cubeba*, *Litsea mollis*, *Trema orentaris*, *Macaranga* spp., *Sapium* sp, *Qercus* spp. Along streams, species such as Va, Sung, Ngoã, Phay and Nóng, Lầu are also found. This forest has a general coverage reaching up to 0.5%. Overall, the forest does not have any trees big enough for timber collection (tree diameter below 10 cm, height 6-7 m, in many areas, trees were just 2-3m).

The humid, closed rain forest located at altitudes above 700m, (this area is not directly affected by the project) has reached a dense vegetation coverage of about 65% to 70%, with several valuable types of wood such as: *Sindora tonkinensis*, *Sindora siamensis*, *Dacrydium pieriei*, *Erythrophleum fordii*, *Cinnamomum parthenoxylum*, *Michelia mediocris*, *Calophyllum* sp., *Chukrasia tabularis*, *Canarium album* and *Fragrea fragrans*.. Large trees typically have a trunk diameter of 60cm or more. These trees are often illegal logged, therefore in the process of construction workers need to be informed in order to avoid the illegal collection of the wood.

Agricultural trees: In the subproject's construction area, there are food-crop planting land areas of Mong and Thai ethnic minority people. The area is used by local people to cultivate paddy-rice, corn, cassava, sweet-potato, soy-bean, peanut, banana, papaya, and others... for the locally use in the region.

Bird

As surveyed, 111 species belonging to 47 families, 14 orders were recorded in the project area. In composition of bird species, Passeriformes is the largest in species quantity. The details of these species are described in following table.

Table 14: Composition of bird species in Pa Tan and around area

No.	Orders	Families		Species	
		Count	%	Count	%
1	<i>Ciconiiformes</i>	1	2	7	6
2	<i>Falconiformes</i>	2	4	5	5
3	<i>Galliformes</i>	1	2	3	3
4	<i>Gruiformes</i>	2	4	2	2
5	<i>Charadriiformes</i>	2	4	5	5

No.	Orders	Families		Species	
		Count	%	Count	%
6	<i>Columbiformes</i>	1	2	4	4
7	<i>Psittaciformes</i>	1	2	1	1
8	<i>Cuculiformes</i>	1	2	6	5
9	<i>Strigiformes</i>	2	4	4	4
10	<i>Caprimulgiformes</i>	1	2	1	1
11	<i>Trogoniformes</i>	1	2	1	1
12	<i>Coraciiformes</i>	4	10	8	7
13	<i>Piciformes</i>	2	4	7	6
14	<i>Passeriformes</i>	26	56	57	50
	Total: 14 Species	47	100	111	100

Source: Survey data of Vietnam Social Development Consulting Co., October 2010

Fauna

As surveyed, 28 species belonging to 14 families, 7 orders were recorded in the project area. They include Insectivora, Scandentia, Chiroptera, Primatesm, Carnivora, Artiodactyla and Rodentia. The composition of fauna in the project area is presented in Table 15. Among others, Chiroptera, Rodentia and Carnivora are the largest in species quantity. The other groups have low number of species (from 1 to 2 species).

Table 15: Fauna composition in the project area

No.	Orders	Families		Species	
		Quantity	%	Quantity	%
1	Insectivora	1	7	2	7
2	Scandentia	1	7	1	4
3	Chiroptera	4	30	9	32
4	Primatesm	1	7	1	4
5	Carnivora	3	21	6	21
6	Artiodactyla	2	14	2	7
7	Rodentia	2	14	7	25
	Total	14	100	28	100

Source: Survey data of Vietnam Social Development Consulting Co., October 2010

Recently, the number of animals in the forest has been reduced significantly due to the over exploitation of forest and decrease in forest land area. According to local people, boar is the only species which can be seen often in the forest (from February to March).

Reptilia and Amphibia

A total of 36 species of reptilia and amphibia were recorded in the area which belong to 14 families, 3 orders and 2 classes . Reptilia has a bigger number of species and families, especially the water snake, with 8 species (Table 16). In the amphibia class, the order of amphibia have the most number of species, namely 8.

Table 16: Reptilia and Amphibia Composition in Pa Tan and surrounding area

No.	Classes	Orders		Families		Species	
		Count	%	Count	%	Count	%
1	Reptilia	2	67	9	64	21	58
2	Amphibia	1	33	5	36	15	42
Total		3	100	14	100	36	100

Source: Survey data of Vietnam Social Development Consulting Co., October 2010

In the Red Data Book of Vietnam (Fauna chapter), there are 7 species of rare reptilia which need to be preserved. Of which, 2 species are of VU (vulnerable) level (Gekko gecko, Plea steindachaaeri), 1 is CR - Rare (Python molurus) and 4 are EN – Endangered (Ptyas korros, Ptyas mucossus, Bungarus fasciatus, Naja naja). These species are uncommonly seen and live in the more deserted areas of the locality.

2. Aquatic ecology

a) Phytoplankton

- Results of the aquatic phytoplankton survey in Nam Cha stream are presented in the Appendix 6.

Composition: The aquatic survey identified 45 phytoplankton species belonging to 4 families namely Bacillariophyta, Chlorophyta, Cyanophyta and Euglenophyta. Of which, Bacillariophyta has the most number of species (23 equivalent to 51%), followed by Chlorophyta (9 - 20%), Euglenophyta (7 - 16%), and Cyanophyta (6 - 13%) (Figure 5).

In the composition of phytoplankton, the prokaryote Bacillariophyta which makes up the biggest part and has higher density in the stream is the distinct species of natural pure water area – involving few human productive activities. Small Prokaryote Bacillariophyta (belong to such genres of Synedra, Cyclotella and Navicula) and Chlorophyta,

Cyanophyta in fibrous form are the most common families. However, there are also a number of Euglenophyta species (featured by dirty water) available in the project area. Despite of its low density, this type of organisms may affect the quality of the surface water which is used frequently by local people.

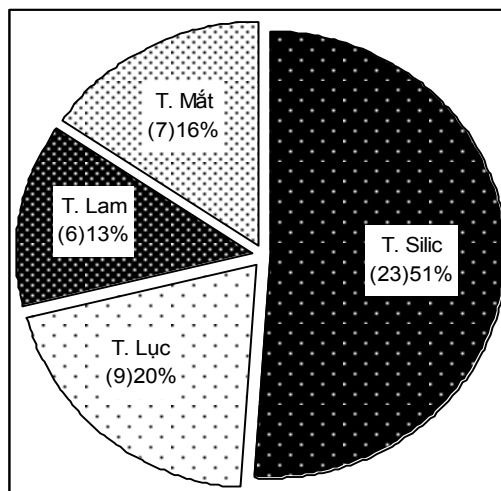


Figure 5: Percentage of phytoplankton species

The density of phytoplankton species is about 1,530.9 Tb/l to 2,778.3 Tb/l, and the average density is 2,239.7 Tb/l. The family that has highest density is Bacillariophyta, followed by Cyanophyta and Chlorophyta. Euglenophyta has the lowest density even zero density in some sampling stations in Huoi Lac village (Table 17).

Table 17: Density of phytoplankton species in some sampling stations in Nam Cha stream

No.	Station	Density of phytoplankton species (TB/L)				
		Total	Bacillariophyta	Chlorophyta	Cyanophyta	Euglenophyta
1	P1	2551.5	453.6	963.9	907.2	226.8
2	P2	2268	680.4	680.4	680.4	226.8
3	P3	2041.2	396.9	793.8	737.1	113.4
4	P4	1530.9	793.8	340.2	340.2	56.7
5	P5	2268	1190.7	396.9	680.4	
6	P6	2778.3	1077.3	567	1077.3	56.7
	Avarage	2239.7	765.5	623.7	737.1	113.4

Position 1 (P1): Downstream of the powerhouse; Position 2 (P2): Nam Cha stream, Nam Cha 3 Hydropower Plant; Position 3 (VT3): Nam Cha stream, along the dam. Sampling coordinate; Position 4 (VT4): near Ta Ham bridge – in the reservoir; Position 5 (VT5): Huoi Lac village (at the end of the reservoir); Position 6 (VT6): under Quang Lam bridge.

b) Zooplankton

- Results of the zooplankton in Nam Cha stream are presented in the Appendix 7.

- *Comments on the results:*

Composition: In the samples collected in Nam Cha stream, it was recorded 30 species of zooplankton belonging to such families as Copepoda, Cladocera, Rotatoria, Ostracoda and ATCT. Among different groups of zooplankton, Copepoda is the most crowded with 9 species, making up 32% of the total while Cladocera, other groups, and Rotatoria has 8, 6 and 5, making up 29%, 21% and 18%, respectively (Figure 6). Majority of zooplankton species prefer natural water except for those of Rotatoria family which often grow in nutritious water (dirty). However, for its density is still low, the surface water monitored is slightly contaminated with inorganic substances.

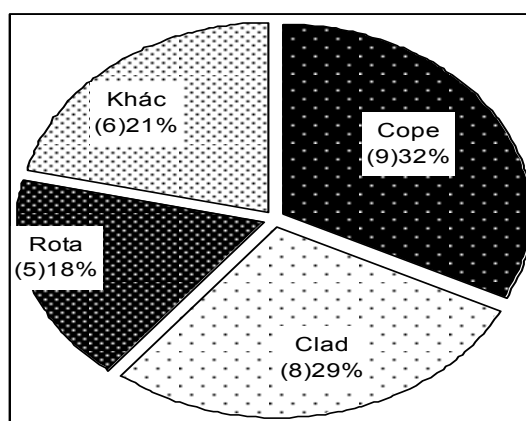


Figure 6: Percentage of zooplankton species

The density of zooplankton species is 1,327.0 to 8,898.0 organisms/m³, 4,272.3 organisms/m³ on average. The highest density is of Copepoda, then Cladocera, Rotatoria and other groups (Table 18).

Table 18: Density of zooplankton species in some sampling stations in Nam Cha stream

No.	Station	Density of zooplankton species(organisms/m ³)				
		Total	Copepoda	Cladocera	Rotatoria	Other
1	P1	8898.0	2612.0	4490.0	1388.0	408.0
2	P2	6061.2	3673.5	1530.6	612.2	244.9

No.	Station	Density of zooplankton species(organisms/m ³)				
		Total	Copepoda	Cladocera	Rotatoria	Other
3	P3	2530.5	1387.7	1061.2		81.6
4	P4	1327.0	694.0	367.0	163.0	102.0
5	P5	2122.0	1449.0	592.0	20.0	61.0
6	P6	4694.8	2571.4	1020.4	776.0	327.0
	Average	4272.3	2064.6	1510.2	493.2	204.1

c) Zoobenthos

- Results of the zoobenthos survey in Nam Cha stream are presented in the Appendix 8.

Comments on the result:

There are 25 species of zoobenthos which belong to such families as Mollusca - Gastropoda, Molusca-Bivalvia, Crustacea- Macrura, and Crustacea- Brachyura. In its composition, Mollusca – Gastropoda dominated in number of species (with 13 species, accounting for 48%); followed by Molusca-Bivalvia, (9 species, 36%); Crustacea- Macrura and Crustacea- Brachyurasau (4 species, 16%) (Figure 7).

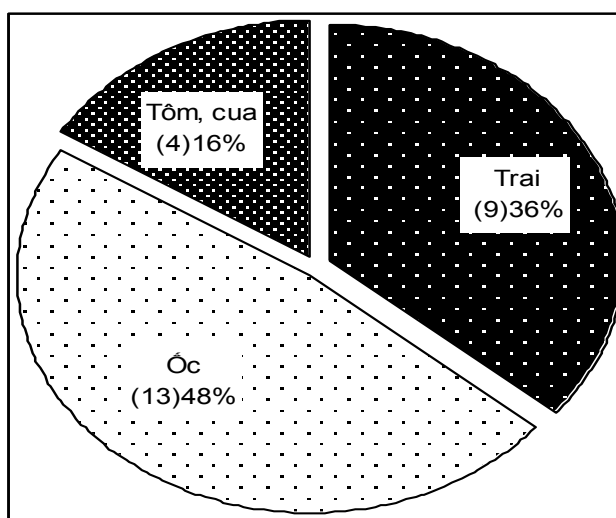


Figure 7: Percentage of zoobenthos species

The density of zoobenthos is 33 to 61 organisms/m² and 46.8 organisms/m² on average. The biomass is 17.6 g/m² to 127.6 g/m² and the average number is 64.4 g/m². Highest density is from Mollusca – Gastropoda group, next is Molusca-Bivalvia and last is the group of Crustacea- Macrura and Crustacea- Brachyurasau (Table 19).

Table 19: Density and biomass zoobenthos species in some sampling stations in Nam Cha stream area

No.	Station	Density and Biomass of zoobenthos							
		Total		Bivalvia		Crustacea		Gastropoda	
		Or./m ²	g/m ²	Or./m ²	g/m ²	Or./m ²	g/m ²	Or./m ²	g/m ²
1	P1	52	89.7	7	9.5	5	0.4	40	79.8
2	P2	46	34.1	7	9.6	3	0.2	36	24.3
3	P3	61	127.6	10	66.9	3	4.3	48	56.4
4	P4	46	80.8	7	14.6	4	0.4	35	65.8
5	P5	43	17.6	6	5.4	4	0.5	33	11.7
6	P6	33	36.3	4	11.6			29	24.7
	Average	46.8	64.4	6.8	19.6	3.2	1.0	36.8	43.8

3. Fish and Fishery

Based on documents, surveys, and interviews with local residents, 17 species of fish (mostly local) appearing in Nam Cha stream (Pa Tan locality) were identified (Table 20).

Table 20: Composition of fish species in Nam Cha stream

Order	Scientific names
I	CYPRINIFORMES
1	Cyprinidae
	Puntius ocellatus Yen.
	Hemiculter leuciscus (Basil)
	Rasbora argyrotaenia (Bleeker)
	Opsariichthys uncirostris (bidens) Gunther
	Opsarius pulchellus (Smith)
2	Cobitidae
	Misgurnus anguillicaudatus (Cantor)
	Cobitis taenia dolychorhynchus N.
II	SILURIFORMES
1	Siluridae
	Parasilurus asotus (L.)
2	Bagridae
	Pseudobagrus fulvidraco (Rich.)
3	Clariidae
	Clarias batrachus (Linnaeus, 1758)

IV	SYMBRANCHIFORMES
1	Flutidae
	Fluta alba
V	PERCIFORMES
1	Ophiocephalidae
	Chana gachua Hamilton-Buchanan
2	Serranidae
	Coreoperca whiteheadi Boulenger
3	Anabantidae
	Anabas testudineus (Bloch)
	Macropodus opercularis L.
4	Eleotridae
	Percottus tonkinensis nsp.
VI	CYPRINODONTIFORMES
1	Cyprinodontidae
	Oryzias latipes

Cyprinus centralus is the largest family. There are no rare fish which are listed as threatened in the Red Data Book of Vietnam. The natural fishes in Nam Cha stream are small, which have little economic value, thus the formation of the dam will not affect the migration or the economic output from fishing sources. Local people in the project area can grow fish in the reservoir to meet the fish needs and economic development.

Apart from natural fish species in stream, there are some types of fish raised in lakes, ponds like Ctenopharyngodon idella, Labeo rohita, Cirrhina molitorella, Mrigan, Aristichthys nobilis, Hypophthalmichthys molitrix, Cyprinus centralus and Oreochromis mossambicus. Fish raised in the ponds behind the powerhouse are utilised primarily for owner household consumption. These ponds were formed from low paddy fields or sunken land area. Farming technique is semi-extensive, producing low output.



Figure 8: Pictures of some types of fish in Nam Cha stream

D. Socio-Economical and Cultural Environment

Nam Cha 3 hydropower plant is located in Nam Cha stream. All the construction components of the power plant including the dam, reservoir and construction components are in the Pa Tan commune in Muong Nhe district – Dien Bien province. The acquired area for the construction components and reservoir is residential land of the Mong people in Ta Ham village and the Thai people in Pa Tan village. The project will provide power for some villages of the Pa Tan and Quang Lam commune, Muong Nhe district.

1. Geographical position and administrative division

The Muong Nhe district was established under the Decree 08/2002/NĐ-CP on 14 January, 2002 on the occasion of amending the administrative border of the two districts, Muong Te and Muong Lay in Lai Chau province (ex-administrative division). Muong Nhe district is bounded with Muong Te district in the east, with Laos and China in the west.

Muong Nhe district includes 16 communes, those are Nà Hỳ, Nà Khoa, Nà Búng, Chà Cang, Pa Tẩn, Mường Toong, Quảng Lâm, Nậm Kè, Mường Nhé, Chung Chải, Sín Thầu, Sen

Thượng, Leng Su Sìn, Nậm Vì, Na Cô Sa, Pá Mỳ. All the 16 communes are categorised as poor communes of program 135 (phase II).

The Pa Tan commune in Muong Nhe district previously belonged to the Cha Cang commune. The Pa Tan commune was administratively established under the Decree 27/2006/NĐ-CP, dated 21 March, 2006. The administrative border of Pa Tan commune's eastern border ranges to Muong Cha district, its western border to Quang Lam commune, its southern border to Cha Cang commune and the northern border to Nam Ke commune (Lai Chau province).

The Quang Lam commune, neighbouring Pa Tan commune, will receive benefits from Nam Cha 3 hydropower plant project. The administrative boundaries of Quang Lam commune: The East is bounded by the communes: Cha Cang, Pa Tan, Muong Nhe district; the South is bounded by the communes: Na Co Sa, Muong Nhe district; the West is bounded by the communes: Nam Ke, Na She Sa, Muong Nhe district; the North is bounded by the communes: Nam Ke and Pa My, Muong Nhe district.

2. Land Use

The total natural area of Muong Nhe district is 249,950.43 ha, including 14,454.80 ha of agriculture area, 216,072.90 ha of forestry land and 15,428.33 ha of abandoned land.

The total natural area of Pa Tan commune is 16,427.71ha, including 653.61ha (average data of 3 years) of productive land.

The total natural area of Quang Lam commune is 10,737.49ha including 542.37ha (average data of 3 years) of productive land.

3. Population and ethnic minority people

- Muong Nhe District: According to statistical data in March 2009, Muong Nhe district has 9,591 households with 52,684 persons.

There are 13 ethnic minority groups living in the district, of which, Mong people account for 69,6% (36,811 persons); Thai people account for 8,3%; Ha Nhi account for 8,8%; Dao people account for 5,4% . Other ethnic groups are Khơ Mú, Cống, Kháng, Kinh, Sila, Sán Chỉ, Xá Phang...

Population density per kilometre: 20,4 persons/km².

Population growth: 2,5%.

- Pa Tan commune: There are nine villages in Pa Tan commune where 2,544 persons of 416 households are living. They are all ethnic minority people of Mong, Dao, Cong, Thai people groups. There are 1,264 male and 1,280 female in total in the commune.

The construction of Nam Cha 3 hydropower plant will acquire land from 9 households of 50 Mong and Thai people. Of which, 5 households with 30 persons in Ta Ham village, and 4 households with 20 persons in Pa Tan will be affected by the project. Each household in Pa Tan village has five persons and each households in Ta Ham village has six to nine persons. The number of households that have more than three children are high, of which some households even have eight to nine children.

In these 9 households, 4 households from Pa Tan commune will lose their land for the construction of the powerhouse, and the other 5 households from Ta ham, will lose their land for the reservoir and dam construction area.

- Quang Lam commune: There are ten villages in the Quang Lam commune where 3,110 persons of 459 households are living. They are all ethnic minority people of Mong (account 90%), Thai, Khang, Kinh and Dao. There are 1567 male and 1543 female in total in the commune.

4. Labour

** Muong Nhe district*

Muong Nhe district: there are 23,986 working people (representing 96% of people at labour age in 2008). About 90,79% of them are working in the agriculture and forestry sector.

** Pa Tan commune*

Pa Tan commune: in 3 years (2009 – 2011), people who were at the labour age accounted for 50% (equivalent 1,275 persons labour) of the total population of the commune, of which most are working in agriculture and forestry . A small number of households in the commune are developing small businesses (according to the communal statistics: There are 12 households in Pa Tan commune developing the small business).

In Pa Tan commune child labour is very common. Labour is not equally distributed in the households, women have to work harder and carry out many tasks such as housework, wood collection, fishing and carrying harvested rice back from the field.

** Quang Lam commune*

- Quang Lam commune: People who are at labour age account for 51% (equivalent 1,586 persons labour) of the total population of the commune. Agriculture is the main source of income in Quang Lam. In addition, some households in the commune area have developed small businesses (there are 17 households developing the small business of goods and services in Quang Lam commune).



Figure 9: Daily activities of children



Fishing activities of women on Nam Cha stream



Rice transportation activities to home of women



Collecting firewood of women

Figure 10: Daily activities of women

5. Infrastructures

Muong Nhe district

- Muong Nhe district: roads in the district need upgrading to ensure that 100% of communes in the district can be accessed by car. 36,42% of villages can be access by car. Irrigation works and water supply construction have been invested in to ensure the proper irrigation of 1.358ha. About 70% of households in the district are supplied with water for domestic use.
- 16/16 communes have a power-grid connection to the communal centre and communal post office.

Pa Tan commune

- Pa Tan commune: Due to the typical terrain, which mostly are mountains and streams, people in Pa Tan struggle in transportation and travelling, especially in the rainy season.
- Transportation roads from the commune centre to villages are so poor, that in three out of nine villages, people can not travel by vehicles.
- There are three concrete irrigation channels in the commune: These concrete irrigation channels are about 7km of length, used for carrying water from the canyon down to the fields along the 131 road. which are located away from streams. The irrigation channels will not be affected when the dam is in operational state. However, there is no irrigation channel in the field located behind the plant, so water for agricultural production will be difficult to access for farmers in Nam Cha.
- The national power grid has not been connected to eight out of nine villages of the commune. Some households in the commune are using electricity from Pico system based in the stream.
- All households (100%) in the commune have no septic latrines, or their latrine is only temporarily established.
- Water supply: 100% households in the commune are using water taken from the ravine for drinking and everyday use. There are 36 community tanks in the commune, and each village has 4 tanks average.

Results of the questionnaire analyses shows that 0/24 households in Ta Ham village are using electricity from the national power grid, and that 24/24 households are using electricity from Pico system. According to the Ta Ham community, there are many disadvantages of using the Pico system such as: (i) Pico system is only used for dry season, (ii) The power supply capacity is not powerful enough for operating large machinery, (iii) the cost for Pico system is very high (a Pico system from 2 - 2.5 million VND will be used for 2 years and changing the ball-bearing monthly cost 50, 000VND). Therefore electricity cost for is high for the locals.

The survey shows that 75/75 households in Pa Tan village are using electricity from national power grid.

All households (100%) are using firewood for cooking.

Quang Lam commune

Traffic system: 3/10 villages have bituminous roads from their village to the centre of the commune. 7/10 villages have dirt road systems which are only accessible in the dry season.

2/10 villages are using the national grid while 8/10 villages are using Pico system for lighting.

10% of households in Quang Lam commune have septic tank latrines, while 90% of households have no toilets or temporary latrines.

100% of the households are using domestic water from streams for daily use.



Figure 11: Community Tank



Figure 12: Pico system

6. Poverty situation

Muong Nhe district

- The average growth of economy is estimated to be 13,6%. The average income per capita is 3.98 million dong/year. The budgetary income of the district in 2008 was approximately 4.030 billion dong. The agricultural density – industry – trade – service is 73,6% - 14,4% - 12%, respectively (data in the year 2008).
- In March 2009, about 6.271 of households with 35.239 person are categorised under the poverty line, presenting 65,38% of total households in the district.

Pa Tan commune

In Pa Tan commune: estimated income per capita is 1,000,000 dong per household. 254 households among 416 households in the commune are categorised as in poverty (presenting 61.05% of households of the commune).

The survey results of Ta Ham and Pa Tan villages shows that: 19/24 households in Ta Ham village are poor . 2/24 households are on the verge if being poor and 3 households are out of poverty. 21/77 households in Pa Tan are poor under the new criteria and 56/77 households are not poor. People in the village suffer from hunger, for four months of a year. The difference of the living standard between Ta Ham village and Pa Tan village is concluded as follows: (i) people in Ta Ham village are nomadic people, all off them (100% villagers) are new immigrants of Pa Tan commune and their basic education are lower than that of the Thai people in Pa Tan village. (ii) production habits of people in Ta Ham village is backward and not as developed as the people in Pa Tan village (currently, people in Ta Ham village are still using sticks for plucking rice while people in Pa Tan village are using machines instead.) Pa Tan village uses electricity from the power grid, therefore it is easier for them to acquire new technology for cultivation and husbandry than people in Ta Ham.



Figure 13: Living condition in Ta Ham village

Quang Lam commune: estimated income per capita is 1,800,000 dong per household. There are 233 among 455 households categorised as in poverty in the commune (presenting 51.21% of households of the commune).

7. Agriculture production

7.1. Cultivation

Muong Nhe district

- Though the paddy rice area in Muong Nhe is large (1,400hecta), people only produce one seasonal crop of rice per year. Moreover, cultivation mainly depends on the natural condition, science and technical methods are not considered, so productivity is not high (3700 kg/ha). Beside paddy rice, people also cultivate other short-term crops like: maize, potato, cassava, groundnuts, bean...
- In the year 2008, total food production of the district reached 11,000 tons and average food production per capita reached 250 kg/capita/year. In the year 2010, total food production of the commune reached 18,987 tons and average food production per capita reached 344.85kg. The area of rice and maize is about 3,711ha (increase1.134ha compared to area of the year 2005).

Pa Tan commune and Quang Lam commune

Local people mainly live on agriculture production. However, the typical terrain of high mountains (slope of 40 degrees), therefore the area of paddy fields are not large. Total productive area in the Pa Tan commune is 653.61 ha (data average of 3 years) and Quang Lam commune's is 526.75 ha (data average of 3 years).

Local people mainly produce rice, maize, potato, cassava, bean, ground nut and some other industrial crop (short-term) such as cotton.

The area of productive crops in the commune is summarised in the table below.

The productivity of those crops is not high due to out-dated cultivation methods , dependence on natural conditions and lack of information. The rice productivity in Pa Tan commune is 15 quintals/360 m² of upland rice and 37 quintals/360 m² of flood rice. The rice productivity in Quang Lam commune is 17 quintals/360 m² of upland rice and 38 quintals/360 m² of flood rice.

The construction of the project will not affect the irrigation canal as well as the water demand for the agricultural purposes. People who grow crops along the stream's banks do not use stream water for production purposes. Instead they use water from the flume which is transferred to the paddy rice through bamboo and plastic pipes.

All affected households (9 households) live on rice cultivation fields. Affected households of Ta Ham village have lower living standards than the affected households of Pa Tan village. The differences in living standards between the two communes are caused by the differences in farming methods, labour types and education level.

The paddy rice in Ta Ham village has been newly reclaimed for single season rice cropping.

Table 21: Area of productive crops in Pa Tan commune and Quang Lam commune

Commune	Years	Area of agriculture crops (ha)						Area of short-term industrial crop (ha)	Total
		one season rice crop	milpa rice	maize	cassava	groundnut	bean	Cotton	
Pa Tan Commune	2009	61	303.28	161.15	60.1	16.925	48.75	9	660.205
	2010	61	293	142	60.1	16.92	60.1	3	636.12
	2011	65.3	303.28	161.15	60.1	16.925	48.75	9	664.505
Quang Lam Commune	2009	42.87	290	102	60	15	12	0	521.87
	2010	52	290	102	60	15	12	0	534
	2011	42.87	292.5	102	60	15	12	0	524.37

Source: The socio-economic data of Quang Lam and Pa Tan communes

7.2. Animal husbandry

- Muong Nhe district: there are totally 120 economic farms including small and micro farms. Growth of cattle is about 4-5%/year. There are nearly 72 thousand heads of cattle and poultry in the district.
- The animal husbandry in the Pa Tan and Quang Lam communes are not developed. Statistical data of cattle and poultry in Quang Lam and Pa Tan commune are presented in the following table:

Table 22: Cattles and poultries in Quang Lam and Pa Tan Commune

	Year	Buffalo	Cow	Goat	Horse	Pig	Poultry
Pa Tan Commune	2009	861	109	85	109	1,625	4,175
	2010	856	105	50	80	1700	5,846
	2011	895	118	102	108	2.785	4,538
Quang Lam Commune	2009	869	189	35	50	598	2,678
	2010	902	187	47	58	650	2,720
	2011	910	270	50	56	690	2,723

Source: The socio-economic data of Quang Lam and Pa Tan communes

8. Aquaculture

- Muong Nhe district: area of aquaculture in the district is negligible, aquaculture is spontaneously developed by some households.
- Pa Tan commune: area of aquaculture in the commune is small, about 4.5ha in total.
- Quang Lam commune: area of aquaculture in the commune is small, about 2.5ha.

9. Forestry

- Muong Nhe district: total area of forestry land of the district is 216.072,9 ha (presenting 86% of natural area of the district). Muong Nhe district has potential of forestry development. Of which:

- o The production forest land is 4,679ha, presenting 7.3% of total forest area of the district
- o The preserved primeval forest is 46,000ha with a high value of timber and preserved animals.

- The rubber plantation is over 700 ha.
 - Other areas of forest is virgin preserved.
- Pa Tan commune: there is 4,976 ha of preserved forest in total, of which 3,275.9 ha is under administrative management of Decree 30A and program 661 is 1,699 ha.
- Quang Lam Commune: Quang Lam is a buffer zone of Muong Nhe Nature Reserve. Currently, Quang Lam has 3,317.7 ha of protected forest, in which 2,719.9 ha is under the protected forest program 661 and 597.8 ha is managed under Decree 30A .

People in the commune are paid 3 million dong from program 661. The amount of this payment is significant to people's income and forestry protection but it is not equivalent to potential of economic development of the forest. Therefore, poverty rate in the communes is still high.

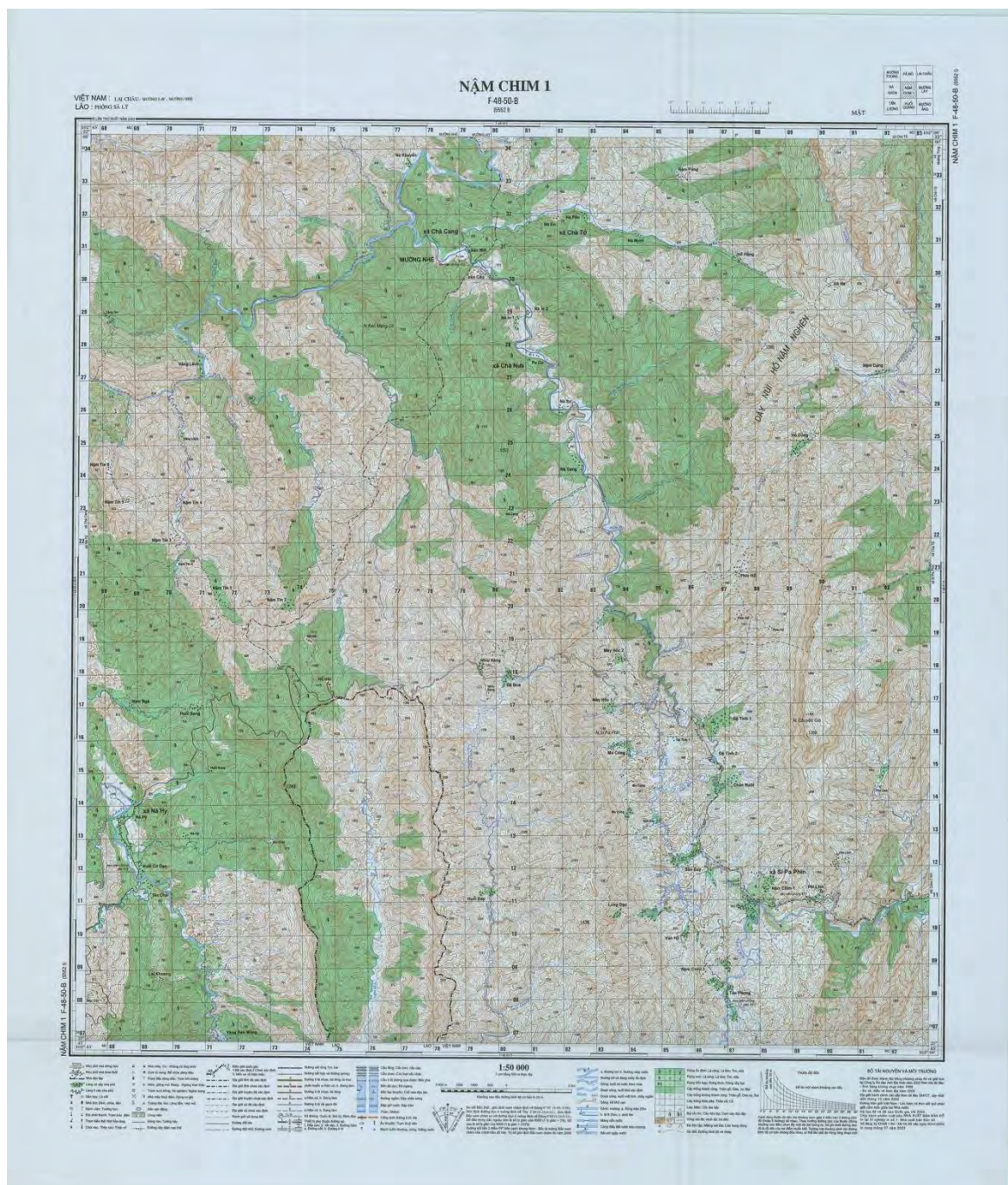


Figure 14: Forest map of Muong Nhe District

10. Education

Most of the schools and classes are built with semi and permanent structures. In Muong Nhe, very few people reached secondary education, totalling a mere 60 villages among 151 (39%).

- Pa Tan commune: According to the Socio – Economic report 2011 of People's Committee, the kindergarten has 12 officers for 223 students. The primary school has 27 teachers and 429 pupils; The secondary school has a total of 19 teachers and 266 pupils.

The secondary school is well established but material facilities are not qualified. The lodging houses do not meet demands of pupils of 266 pupils (the school hostel with three rooms are only for 90 pupils, other pupils have to established temporary lodging houses nearby the school and along national road 131. latrines were not available for pupils.



Figure 15: Lodging houses of pupils of secondary school in Pa Tan commune

Pa Tan is the only village in the centre of the commune where the transportation system is good, therefore people can travel easily and are able to communicate well in the Kinh language. For other villages, the number of people who can communicate in Kinh language is small (30% estimated by commune officers) due to the location where they live, which is remote and isolated.

According to a socio-economic survey in Ta ham village, 30% of villagers can not communicate in Kinh language. People who can communicate in Kinh language are mainly young children.

- Quang Lam commune: According to the People's Committee Socio – Economic report in 2011, the kindergarten has 17 teachers and 205 children. The primary school has 45 teachers, 37 classes and 429 pupils. The secondary school has 26 teachers, 10 classes and 266 pupils.

11. Health care service

Muong Nhe district: all 16 communes of the district have health care centres. The district hospital has been upgraded and is still receiving on going upgrading. It has 150 beds and three dispensaries (each dispensary is equipped for 10-15 patient beds). The hospital is equipped with high standard technical equipment and well trained doctors.

- Pa Tan commune and Quang Lam commune: The commune medical centre provides regular services of health examination, treatment and distribution of medicine.

An interview with the head of the Pa Tan commune health care centre, Mr. Lo Van Thoong said that in 2010 and 2011, there were no cases of malaria and dengue fever in the commune area. The most common disease was diarrhoea which usually occurs in children. Each year there are around 150,200 cases of diarrhoea in the commune. The main causes of diarrhoea are unsanitary conditions and poor water supply.

12. Tourism and historical monument

- Muong Nhe district has an area of nearly 46,000ha of preserved primeval forest. The forest has a high concentration of valuable wooden plants like: Fokienia hodginsii,... and wild animals. Based on the policies of the province, the district is bordering a nature preserve, bounded with the four communes Nậm Kè, Mường Nhé, Chung Chải, Sín Thầu in cooperation with the Agriculture and Rural development Department of the province. There is tourism potential if the district authority have the right programs and policies in preserving, protecting and developing the forest. Moreover, the cultural value as well as scenery of the area would be good attractions for tourists.
- Pa Tan commune: According to the survey of the field visit and interviews with local people and representatives of authorities, there are no nature preserves or historical monuments in the commune or in the project area.
- Quang Lam commune: Quang Lam is the buffer zone of Muong Nhe Nature Reserve. The project will not affect Quang Lam commune. Quang Lam is the beneficiary commune from Nam Cha 3 hydropower plant project.

IV. SCREENING OF ENVIRONMENT IMPACTS AND MITIGATION

A. Project impacts

The ADB checklist for hydropower projects has been used to screen for potential impact. The checklist is attached in the Appendix 1. Impacts, which were determined as having environmental implications, have been considered further and mitigation has been provided for.

Positive impacts

Results of the consultations with local people show that Nam Cha 3 will have some positive impacts on the community in terms of socio-economic conditions.

A more stable electricity supply will improve the current weak source of electricity to people in Pa Tan village and connect power grid to households of 8 other villages. Opportunity of television watching could be given to more than 2,000 people of 8 villages without electricity. Comfortable life with entertainment and knowledge to gain from television and radio broadcasting will help local farmers to improve their knowledge. Children at school age (2,028 pupils of primary school and secondary school) will have more time to study in the evening as in day time they have to help their family with farming works and housework.

Sustainable supply of electricity will help local people to earn extra income. Products especially handicrafts made by more than 100 Thai women (quilts and clothes) are expected to generate new sources of income while preserving their culture and traditional values.

During the 30 months construction stage of the subproject, up to 600 workers are required and this will create demands of local products.

The construction and operation of the plant in future will require 600 labourers during the construction stage and 30 labourers during the operation stage. An amount of employments would be provided to affected people as priority.

Public services (health care, education) will be improved in terms of quality due to the use of more electric facilities and equipment.

Hydropower is clean and renewable energy, thus avoiding costs to the management of pollution, which would be resulted from the use of alternative thermal power generation. Therefore, it is environmentally friendly. Currently, gas is the main domestic energy source as well as coal accounting for 43.7% and 14.6% respectively. Hydropower accounts

for 35.3% and Vietnam to import a significant amount of energy from China. Increased hydropower will reduce dependence on imports.

Thermal plants are known for emitting great amounts of harmful gases such as carbon dioxide (CO₂), Particle matter (PM), sulphur dioxide (SO₂), carbon monoxide (CO) and Nitrogen Oxides (NO_x), etc. The table below provides an analysis of expected CO₂ amounts from a thermal plant during the period of first 30 years using natural gas and coal as a fuel source. Emission between 0.32 and 0.63 million tonnes of CO₂ are discharged during 30 years of using hydro power rather than fossil fuels.

Table 23: Comparative Analysis of CO₂ Emission using Gas & Coal Generation over 30 Years

	Gas	Coal
Metric tons CO ₂ /Gwh discharge	385	755
Total Discharge (million metric tons CO ₂) generating 833.67 Gwh ⁽¹⁾	0.32	0.63

Note: 1) Assumes generation of 27.79 GWh per year over a 30 year project life = 833.67 Gwh. 2) CO₂ discharge factors from Oxford Resource Group figures

Negative Impacts

Loss of land

Land acquisition will effect the lives of people. To construct the plant, an area of productive land (21,256.05m²) of 5 households of Mong people and 4 households of Thai people (50 persons in total) will be acquired, having negative impacts on their employment and livelihood. During construction, Nam Cha 3 Hydropower project will temporarily affect 41,500 m² of soil for gathering machines, building materials, worker camps and excavation. The temporarily affected area is unused fallow land in the area of Pa Tan commune.

B. Construction Activities, impacts and mitigation

Materials:

The rocks used in the construction process will be purchased from a rock quarry of Truong Tho Co.,Ltd in Pa Tan commune. The quarry near the dam area is in the process of excavation and use. Thus, quarrying for Nam Cha 3 hydropower plants does not affect the project area. However, measures to avoid dust in the process of transporting should be implemented.

Construction Activities:

- The waste during dam and plant construction may pollute surface water (Nam Cha stream). To mitigate potential pollution of surface water, the investor is planning to construct the main works in dry season and carry out embanking 2 banks of the stream from the dam to the plant area.
- The process of building pressurizing tower, pressure pipe can affect the landscape in the area. On the other hand, this category was built at an altitude higher than the ground and stream bed and thus can cause erosion, running off, dropping building materials and construction waste into the stream.
- To mitigate erosion, landslides caused by construction activities a number of mitigation measures will be implemented: (i) Create contour on hillsides or terrace fields, (ii) Plant trees which is fast growing and be able to maintain soil in the construction area (plant, pressurize tower, pressure lines).

Road access and traffic

The road will be connected straight from national road 131 to the dam and the plant area. The portion of National Road 131 from the dam to the plant area is 1.5 km long where 02 households living near national road 131..

Construction site and Camps impacts

- The construction process needs to mobilize a large number of workers (about 500 workers and 100 supervisors and technical officers at rush times). The contractor units will use a part of labour resources available in the local. The number of workers are located in two main camps: camp in the dam area (approximately 200 employees), in the plant area (300 workers). The camps will be located away from residential areas to avoid disturbing local people's lives.
- During the construction of the hydropower plant (30 months), the large number from workers who enter the local community could have influence on the cultural and traditional values of the locality and social problems such as HIV/AIDS, STD transmission, women trafficking, drug use, robbery, etc., would be unavoidable. The increased number of workers would also have a great impact on the use of local natural resources such as land, water, forest products unless the project owner has an appropriate plan to mitigate and manage the arose problems . The illegal forest exploitation and consumption is likely to increase. The contractors will be required to coordinate with local authorities in worker management. Propagandizing and providing awareness on environmental protection and sanitation for workers will be implemented.

- The solid waste and wastewater from the camps have the potential to negatively impact on the environment (water, soil, air). Contractors should establish mobile septic tank toilet (2 sections) in the camp area and dustbins in construction site. Domestic wastewater of workers has to be collected and treated to ensure standards type B in accordance with QCVN 14:2008 / BTNMT before being discharged into the environment;
- The construction processes creates a large amount of dust which diffuses into the environment and affects the quality of the air environment, agricultural productivity and livelihoods of local people. Contractor units will implement the measures to minimize dust content such as: (i) Washing road by water spraying, (ii) Vehicles transporting building materials must be covered by canvas,...
- After completing project, the contractor units must responsible for waste cleaning and returning the inherent ground in construction and temporary camp areas.

C. Impacts of changed conditions in the River System

Human Impacts

People in the project area do not use stream water for drinking and daily use. There are 2 households living along the national road 131 section, which from the dam to plant site will not be effected by water demand because they use spring water (from the high mountain) for drinking and daily use. Beside that the portion of road from their house to the stream bed has a large slope(40%) and many shrubs causing difficulty in using water from Nam Cha stream. Within the area from the dam to the plant there is no household living and farming therefore the water demand will not be affected. The irrigation system of the local people who live near the Nam Cha 3 Hydropower will not be effected because they do not use the water from the stream to irrigate crops, but rather from the spring through plastic water pipes and existing channel systems. However, the project still maintains minimum flow for Nam Cha stream.

Downstream the plant (2.7 km from the plant) is the residential area of the Thai people. Thai people have a habit of bathing in the stream during summer, which is part of their cultural characteristic. Therefore, the construction phase will affect this custom due to the high number of workers in the area. Besides that, they have to face the risk of turbid stream water due to construction activities. Nam Cha 3 Hydropower Project will implement measures to ensure that water quality is not polluted by construction activities, waste and domestic waste water.

In fact, natural flow in Nam Cha stream in dry season is $3 - 6 \text{ m}^3/\text{s}$. In the operation phase, the flow will be changed (flow is approximately $0 \text{ m}^3/\text{s}$ for about 20 hours and

approximately 23.6 m³/s for 4 hours). The flow downstream of the powerhouse (distant from the powerhouse) will increase due to the supplement of underground water and water from other small streams.

Fish impacts

The dam construction will obstruct the movement of fish to upstream. However, according to the survey from the plant to the dam and to the ending point of the dam bed area (about 5km length), there are no fish species that are in the habit of breeding upstream. The construction of the project is likely to have no impact to the fish in project site.

D. Specific Mitigation Measures

Compensation and Resettlement

500 million dong has been allocated to cover the various elements of compensation, resettlement and ethnic development as covered in the RP and EMDP.

Table 24: Area Permanently Affected by Type of Use and Mitigation

No.	Land Use	Area (m ²)	%	Mitigation
1	Residential area	0.00	0	
2	Agriculture	21,256.05	5.32	Compensation as per RP
3	Aquaculture	0.00	0	
4	Terrace, perennial tree	182,513.95	45.71	Compensation as per RP
5	Roads and transport	0	0	Replacement facilities provided
7	Rivers and springs and unused	195,530	48.97	None
	Total	399,300	100.00	

Source: Survey data of Vietnam Social Development Consulting Co., conducted for preparing RP

River water flow

If the project is implemented (assuming in feasible report) and all water in Nam Cha stream is used for power generation purpose, from last November to next March there will be a long period without water in 1.0 km from the dam to the plant area due to the process of water storage for power generation during rush hours in dry season (this is the dry and less rain time). However, as mentioned above, the local people do not live and cultivate from the dam to the plant area so they will not be directly affected by the change of flow regime. During the dry season, water storage in reservoir will be used to generate power in peak hours (estimated water storage can generate power in about 5 to

6 months during the dry season), then water is discharged into the stream area at the outlet downstream of the power plant.

In case of lack of project information and data we can not accurately determine the quantitative impact on ecosystem and habitat. These impacts can be serious in the absence of water (where 1.0 km of streams will be lost flow in a long time of year). The different methods were used to calculate and evaluate minimum environmental flows in different situations. Hydrography and hydraulic methods were used to establish the percentage of natural flow and then put into a water flow of stream. The more complex method is based on simulation of habitat incorporating the needs of stream ecosystem and water use needs of the people. With the available data, we can develop models for environmental impact assessment and determining minimum environmental flow retained in the stream at an acceptable level....

In the case of Vietnam policy does not specified for the water flow need to be retained in the stream when using the stream water for hydropower purposes, the environmental flows are recommended by 10% of the monthly average water flow in dry season and the provision for environmental flow is completely inadequate in relation to existing flows. 10% of the monthly average flow in the dry season amount to 4.44 m³/s, so that 10% of 4.44 m³/s = 0.444 m³/s = 440 l/s).

- Metal grills or screens will be provided to the weir intake. These screens have 2cm gaps and will prevent larger fish from passing downstream into the power water delivery system to the powerhouse.

The people in downstream of the plant

The discharge from the plant will increase downstream water levels dramatically , therefore people need to be informed and warned of the water flow regimes in Nam Cha stream in general and in dry season, particularly when the project goes into operation phase.

- The people downstream of the plant currently are not using water for agriculture. The water source for agriculture is mainly derived from large and small side streams in the region. The Thai people who live downstream are using the stream for bathing will be carefully monitored during the operations phase of the project to identify any disruption of Thai villagers' activities and mitigation will be provided for.

Compensation for Loss of Trees and for tree planting programme

The investor will be responsible for compensation of agricultural and industrial crops affected by the project at compensation rates in accordance with State's regulations.

For the household whose crops and trees are affected will receive land reclamation assistance to restore rice and crops area.

A tree planting programme will be implemented through either the District Peoples Committee or preferably through a private company. It is estimated that 41ha of land will need to be replanted at the project facilities and as part of the programme to rehabilitate the dam area, project roads, construction sites, quarry and soil borrow areas. The costs of planting and rising of trees for one ha of plantation is estimated at VDN 40,000,000 and funds will be included in the budget for this.

Table 25: Cost for compensation of tree and forest land

No	Item	Cost (vnd)
1	Compensation, assistance of affected crops and rice area	350,000,000
2	Compensation of tree	10,000,000
3	Reclamation assistance	40,000,000
4	Rice assistance during reclamation period	80,000,000
5	Trees plant	1,640,000,000
Total		2,120,000,000

Source: Survey data of Vietnam Social Development Consulting Co., conducted for preparing RP

V. ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN AND INSTITUTIONAL REQUIREMENTS

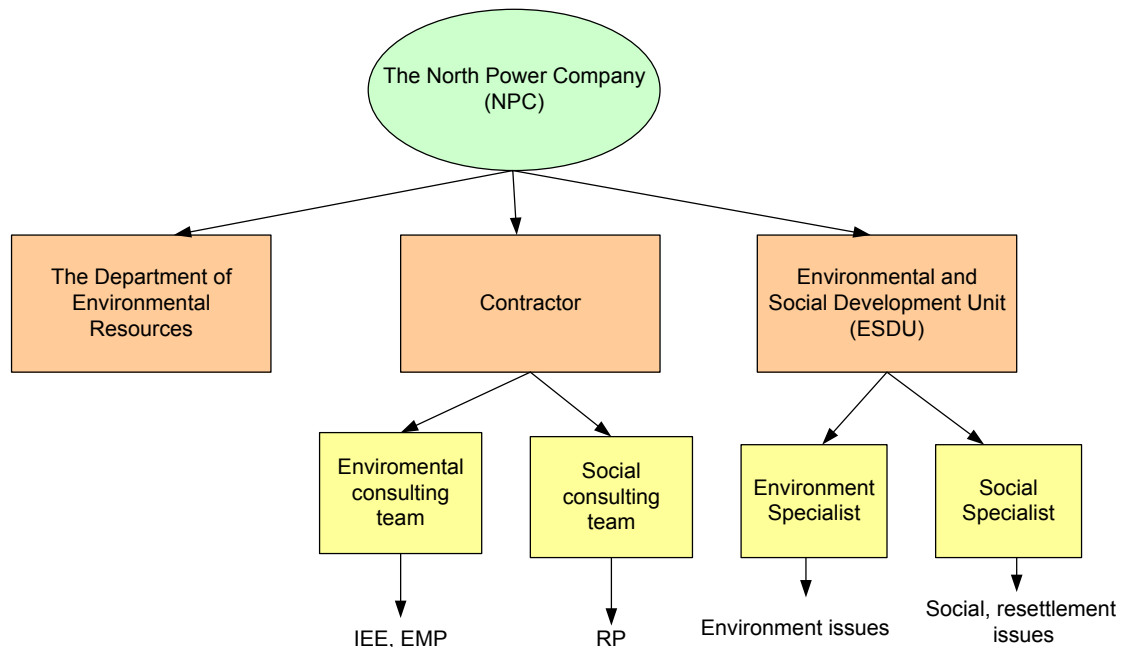


Figure 16: Environmental management diagram of the NPC

- The North Power Company (NPC) will be responsible for ensuring that conditions are included in project construction contract documents. It will also ensure that during the construction phase, environmental mitigation measures, as per 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, for such activities as implementation of environmental monitoring programmes.
- NPC is responsible for selecting contractors. This contractor will prepare environmental management plans for hydroelectric project. Also NPC monitors the implementation of mitigation measures of contractor according to the commitments in the contract documents. NPC is responsible for reporting to the Department of Environmental Resources in the management and environmental monitoring. The environment reports will be done once every three months by the constructor and they will be submitted to NPC; NPC has responsibility to synthesize and submit to Department of Natural Resources and Environment. Beside Nam Cha 3 Hydropower Plant, NPC is also responsible for other hydropower projects under the ADB Loan 2517. NPC should improve the ability and allocate human resources to implement environmental management plans of Nam Cha 3 Hydropower Plant in particular and other plants in general.

- NPC will create an Environmental and Social Development Unit (ESDU). The unit will consist of two members to cover environment, social and resettlement issues. The ESDU will work in close cooperation with the respective field-based office on the day-to-day activities of EMP implementation and the Resettlement Plan implementation. TOR for the environmental specialist is attached in Appendix 2.
- 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 additional external technical assistance and will, therefore, hire the following additional expertise.
- A part time Environmental Implementation Consultant will be directly hired by NPC, to provide technical assistance in implementation of the environment program and the EMP;
- The Implementation Consultant will carry out internal on-the-job training and institutional capacity building for the Environmental and Resettlement Development Cell, thus supporting NPC expertise to implement the EMPs and resettlement plans by itself in future. The cost for the Implementation Consultant is indicated below along with monitoring costs.

Table 26: Estimate for Environment Specialist and Monitoring

No.	Description	Unit	Estimated Amount	
			VND	US \$
Construction Stage				
1	Environment Specialist	Year	117,000,000	5,850
2	Environmental Monitoring & Evaluation	Year	150,000,000	7,500
3	Environment Implementation Consultant part time	Year	117,000,000	5,850
4	Training, Information Capacity building for NPC/ESDC	Once	29,250,000	1,462
Operational Stage				
5	Environment Specialist	Year	78,000,000	3,900
6	Environmental Monitoring & Evaluation	Year	100,000,000	5,000
7	Environment Implementation Consultant part time	Year	78,000,000	3,900
8	Training, Information Capacity building for NPC/ESDC	Once	29,250,000	1,462
	Total		698,500,000	34,924

- The EMP is developed in Table 26 Supervision and implementation of the EMP and Monitoring Program below will be undertaken by the Power Company management in conjunction with proposed implementation specialists.

Table 27: Environmental Management plan

Environmental Aspect & Potential Impact	Remedial Measure	Means of Implementation	Institutional Responsibility	
			Implementation	Supervision
Design /Pre-construction Components				
The project construction may cause loss of agricultural, terrace and perennial tree land	<ul style="list-style-type: none">- 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 Measures to be added in relevant parts of contracts. Proper resettlement planning.	Design consultants & NPC	NPC
The choice of unsuitable construction site, waste dumps, storage sites would cause erosion and landslides	<p>The choice of location of the storage sites, waste dumps, construction design and road construction plan considers the current local tenure status and avoid choosing locations with high vegetative coverage and rugged terrain.</p> <p>Location of waste dumps is defined on the basis of convenience for construction, and away from water sources to minimize the risk of water pollution, makes full use of grading soil, makes roofing with stable slope depending on the waste materials, and makes spoil banks surrounding the waste dumps.</p>	Design unit/Investor and local authorities	Design consultants & NPC	NPC
Excavation of construction materials and development of quarries & borrow areas causing	<ul style="list-style-type: none">- Use of locally available quarry.- Degraded, barren, riverbeds & waste lands to be used for borrow materials.	Proper planning and measures to be added in relevant	Design consultants & NPC.	NPC

Environmental Aspect & Potential Impact	Remedial Measure	Means of Implementation	Institutional Responsibility	
			Implementation	Supervision
loss of alternative land use		section of contract documents.		
Reduced water flows and reduction in water quality in the existing stream course.	<ul style="list-style-type: none"> - Ensure that dam construction is phased to ensure diversion of the river with coffer dams 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 & add measures to relevant sections of contract documents.	Design consultants & design engineers.	NPC
Impacts on aquatic life	Design to keep residual water flow in stream to meet aquatic needs.	Design weir & intake facilities to allow residual flow to the river	Design consultants	
Construction stage				
Soil erosion due to construction of pressurizing tower, pressure pipe	<ul style="list-style-type: none"> - Slopes along access roads & penstock will be provided with catchments, cut-off drains & chutes to minimize soil erosion - Tree planting programme at the temporary construction areas to rehabilitate the landscapes and minimize soil erosion. 	Careful monitoring.	Contractor's Environment Engineer	SC, NPC reports to DONRE,
Temporarily affected land area can be degraded	<ul style="list-style-type: none"> - Do not use cultivated land as temporary area. - Degraded, barren land is used for temporary purpose. - Rehabilitate the area after completing the project. 	Conditions included in contracts. Careful monitoring	Contractor's Environment Engineer	SC, NPC reports to DONRE,

Environmental Aspect & Potential Impact	Remedial Measure	Means of Implementation	Institutional Responsibility	
			Implementation	Supervision
Harmful waste (grease, oil) from machines pollutes water resource and soil environment	<ul style="list-style-type: none"> - To minimize leakage, or permeability of grease into the groundwater, contamination of surface water and groundwater. - Oil storage area must be away from water sources and comply with regulations for storage areas. - The product oil, fat to be collected and handled according to regulations. <p>The remains of grease and oil product must be collected and handled in accordance with the regulations.</p>	Careful monitoring of conditions included in contracts herein.	Contractor's Environment Engineer and NPC	SC and NPC prepare reports to DONRE,
Wastes from camp areas	<ul style="list-style-type: none"> - Local labour will be used. - Camp areas will be set near dam construction area (dam and plant) - Collection and wastewater treatment system will be constructed. - Set dustbins in the camp areas. 	Careful monitoring of website conditions and implementation of contract conditions.	Contractor's Environment Engineer	SC and NPC prepare reports to DONRE,
Vehicles and construction process makes dust, noise and water pollution	<ul style="list-style-type: none"> - Ensure all measures for mitigating the negative environmental impacts are fully implemented as defined in pre-construction phase. - At the gate of the construction site, there should be a station for cleaning vehicles which ensures that all wheels of vehicles coming in and out are properly washed. - Spraying water is very necessary in dusty areas (in construction sites, roads etc.) during hot, dry, windy 	Careful monitoring of conditions included in contracts	Contractor's Environment Engineer and NPC	SC, NPC reports to DONRE,

Environmental Aspect & Potential Impact	Remedial Measure	Means of Implementation	Institutional Responsibility	
			Implementation	Supervision
	<p>weather conditions. Run water spraying truck on sunny day along the construction roads and materials storing areas to ensure dust concentration in the air under permitted standard (Vietnamese Standard 05:2009/BTNMT).</p> <ul style="list-style-type: none"> - Construction roads are stone-paved, especially in. - Road from Highway 131 to the powerhouse should be asphalted, particularly those crossing residential area. - Plant more green trees as much as possible in the area to minimize the dispersal of exhaust, dust and noise. 			
Noise pollution due to the operation of machines	<ul style="list-style-type: none"> - Trucks, machines and other vehicles for construction must work in day time. Operation in the evening needs prior approval from the surrounding residence. - Mechanical vehicles making excessive noise like excavators and bulldozers need to be equipped with a muffler. - Distribute work in noise-polluted places reasonably between workers to protect their health. 	Careful monitoring	Contractor's Environment Engineer	SC, NPC reports to DONRE
Noise pollution due to mine explosion	<p>Quantity of dynamite used does not exceed regulated limit.</p> <ul style="list-style-type: none"> - Announce blasting time by broadcasting on radio, television and bulletin board. 	Careful planning & monitoring	Contractor's Environment Engineer	SC and NPC prepare reports to DONRE,

Environmental Aspect & Potential Impact	Remedial Measure	Means of Implementation	Institutional Responsibility	
			Implementation	Supervision
	<ul style="list-style-type: none"> - Time for blasting will be considered so as to avoid rest time of local inhabitants. - Safety radius is regulated at about 500m far from the centre; - At time for blasting, everybody to have a break except persons who participate directly in the blasting. - The blasting must be conducted in certain times to avoid affecting neighbouring persons and wild-animals. 			
Project construction causes loss of vegetation and crops	<ul style="list-style-type: none"> - Affected trees and crops will be compensated appropriately with the people's consensus. Plant tree in project areas (dam, plant, pressurizing tower...) after completing the project prior to plant indigenous trees. 	Careful monitoring of measures to be implemented	Contractor's Environment Engineer District People's Committee Sub-contractors	SC and NPC prepare reports to DONRE,
During construction labour force has been caused impacts on forest resource and wild animal	<ul style="list-style-type: none"> - Educate workers for forest resource and wild animal protection - Strictly prohibit people from deforesting activities and illegal animal hunting. 	Contractors to enforce measures committed and signed.	Environment Engineer	SC and NPC prepare reports to DONRE,
Work safety	<ul style="list-style-type: none"> - Mine explosion activities must be implemented according to the regulations. - Workers at construction sites have been equipped with safety working clothing: helmet, gloves... 	Measures included in the contract herein and monitoring measures during	Environment Engineer	SC, NPC, EPA

Environmental Aspect & Potential Impact	Remedial Measure	Means of Implementation	Institutional Responsibility	
			Implementation	Supervision
	<ul style="list-style-type: none"> - Educate safety work for construction workers Set health centre and doctors near the construction area to facilitate emergency when accident occurs 	the construction		
Impacts on Infrastructure and community assets	<ul style="list-style-type: none"> - Affected community assets such as national road, school, and communal house,... will compensated and relocated to appropriate location. - Conduct community consultations in the local area 	To be added in the relevant parts included in contract documents.	Design consultants & NPC.	NPC
Impacts on cultural vestige with archaeological and historical value	During construction if found objects with historical, cultural value projects will be stopped and reported to the nearest authorities such as department of culture and information or the Ministry of culture, sports and tourism.	To be added in the relevant parts of contract documents.	Contractor's Environment Engineer	NPC
The process of construction polluting water source of Nam Cha streams affects the custom bathing in the stream of the Thai at the downstream of plant area.	<ul style="list-style-type: none"> - Implement measures to mitigate soil erosion to avoid dropping soil and rock into the stream. - Measures to treat domestic wastewater and construction waste will be implemented. - Ensure the water flow below the plant 	Commitment between NPC contractor and local authorities	Contractor, NPC, EMC	NPC, local authorities
The impact on the epidemic diseases (especially malaria and dengue)	Changes in the living environment can increase the cases of malaria and dengue fever in the region. In order to prevent the outbreak of epidemic diseases, the environmental sanitation measures will be implemented and the number of cases before and	Statistics from the documents of communal healthcare centre	Consultancy on environment and society, NPC	NPC and local authorities

Environmental Aspect & Potential Impact	Remedial Measure	Means of Implementation	Institutional Responsibility	
			Implementation	Supervision
	during the construction phase of the project should be regularly monitored			
Operational Stage				
Reduced water flow in stream effecting aquatic life	<ul style="list-style-type: none"> - Provide guaranteed flow in dry season, and ensure flow of 1.0km to the stream between dam and power house - Regular monitoring of daily water flow below the dam intake. 	Measurements Undertaken by NPC hydrology engineers	NPC Environment Engineer	NPC
Soil erosion and degradation along slopes	Plant green trees and vegetation around project area: dam, operational road, pressurizing tower...	Using sub-contractor or Government agency.	NPC's Environment Engineer	NPC
People in the downstream	Notice to people in downstream area about the plant operating regime and warn people of the changes in water flow	Inform by speakers, radio and at community meetings	Managing Unit of the HP Plant	NPC
Forest planting program for the lost area	41 ha of forest will be planted in the project area (dam, powerhouse, surge tank...)	NPC cooperated with local authorities in the forest planting	NPC	NPC and local authorities

Table 28 : Environmental Monitoring Measures

Aspects/Parameters to be Monitored and Applicable Standard	Location	Means of Monitoring	Schedule/Frequency	Responsibilities for supervision and implementation	Estimated Cost (VND)
Construction stage					
In construction phase: environmental mitigation measures specified in EMP Table	Locations and mitigation measures indicated in the EMP Table	Site visit, interviews with local residents, coordination with concerned agencies	Quarterly random checks and to confirm complaints	EMC and NPC	80,000,000 Include measures In construction contracts
- Noise dB(A) compared to standards specified in TCVN5949-1998 - Dust (mg/l) compared to Standards specified in Standard QCVN 05: 2009/BTNMT	Communal Residential area	Noise measurement	Every 3 months during the construction phase or upon receipt of feedback from local people	Contractor/EMC	30,000,000
Surface water quality in accordance with Standard QCVN08: 2008: BTNMT Parameters to be sampled according to Vietnam Standards	Upstream, downstream of dam, Downstream of Hydro-power plant	Sampled fields	Every 3 months during the construction phase or upon receipt of feedback from local people	Contractor/EMC	25,000,000
Disease surveillance	Project area	Number of cases	6 months/time	NPC	18,000,000

<i>Aspects/Parameters to be Monitored and Applicable Standard</i>	<i>Location</i>	<i>Means of Monitoring</i>	<i>Schedule/Frequency</i>	<i>Responsibilities for supervision and implementation</i>	<i>Estimated Cost (VND)</i>
Operation Stage					
Reduced water flow/Minimum flow (m ³ /s)	Downstream of dam and power house.	Flow measurement; retain environmental flow of about 440 l/s.	Every 3 months during the construction phase or upon receipt of feedback from local people	Project Owner	35,000,000
Impacts on Thai villagers	Downstream of plant	Observation of discharges	Regularly during season at the beginning of operations	NPC Environment Cell	Include in operation budget
Modified forest planting program	Area surrounding the project	- Area of forest restoration	During the forest planting time	NPC and local authorities	20,000,000

VI. PUBLIC CONSULTATION, INFORMATION DISCLOSURE AND GRIEVANCE REDRESS MECHANISM

A. Public consultation

In the implementation of the IEE, the Consultant conducted meetings with authorities of Pa Tan communes, public consultations to disclose information of the subproject to local affected people. Details are presented in Table 29.

Table 29: Community consultation and public disclosure

Methodology	Activities	
Correspondence and meetings with local authorities (District and Commune PCs, Commune Fatherland Front, Women's Union, Youth Union and other organizations)	Date of correspondence	2/11/2010
	Date of meeting	5/11/2010
	Minutes of meeting attached (Yes / No)	No
	Location	Pa Tan PC meeting room
Meetings with Ta Ham and Pa Tan villagers	Date of meeting	6 - 7/11/2010
	Location	Ta Ham village head's house
	Ways of notification	Using loud speaker system, with the help of Women's Union members and village heads who inform the meeting to other people, especially women.
	Agenda attached (Yes/No)	Yes
	Minutes of meeting attached (Yes / No)	Yes (Community consultation minutes are attached in appendix
	Number of participants	39 (List of participants is attached in appendix)
Meetings with Ta Ham villager	Date of meeting	17/1/2012
	Location	Ta Ham village head's house
	Ways of notification	Using loud speaker system, with the help of Women's Union members and village heads who inform the meeting to other people, especially women.
	Agenda attached (Yes/No)	Yes
	Minutes of meeting	Yes (Community consultation minutes are attached in appendix

Methodology	Activities	
	attached (Yes / No)	
	Number of participants	22 (List of participants is attached in appendix)
Meetings with Pa Tan villager	Date of meeting	18/1/2012
	Location	Pa Tan village head's house
	Ways of notification	Using loud speaker system, with the help of Women's Union members and village heads who inform the meeting to other people, especially women.
	Agenda attached (Yes/No)	Yes
	Minutes of meeting attached (Yes / No)	Yes (Community consultation minutes are attached in appendix
	Number of participants	20 (List of participants is attached in appendix)
Meetings with Tra Noi 1,2; Huoi Sai Luong villagers	Date of meeting	19/1/2012
	Location	Quang Lam commune
	Ways of notification	Using loud speaker system, with the help of Women's Union members and village heads who inform the meeting to other people, especially women.
	Agenda attached (Yes/No)	No
	Minutes of meeting attached (Yes / No)	Yes (Community consultation minutes are attached in appendix)
	Number of participants	27 persons

Community consultation contents and results

The consultation and information disclosure to affected persons in Nam Cha 3 project area were conducted with the results as follows:

Table 30: Actions required to be followed up by local people

<i>Description of Issue Raised</i>	<i>By Whom</i>	<i>Reference in IEE/CEP</i>	<i>Required Follow-up Actions</i>
- Designing of subproject - Ensure the implementation of environmental mitigation measures	Commune PCs Village heads	Mitigation measures described in Part 5	- Looking forward to the construction of the subproject to improve local socio-economic development results - Ensure prompt provision of electricity to ethnic minority communes in the remote and mountainous areas
Historical monument, famous landscape	Local people and commune officers	Subproject implementation area	None
Construction sites	Representatives from local authorities	Basic design	Ensure that the alignment strictly follows approved document Cutting down of trees is allowed only in the defined construction area
Construction progress	Local authorities	Construction phase	The progress of the project implementation should be reported on regular basis to the local authorities
Stream water source	Local people	Nam Cha stream	NPC commits themselves not to make the stream water turbid
Impacts of dust, noise, traffic jam	Local people	Dust, noise from construction	The contractors have to carry out the following

<i>Description of Issue Raised</i>	<i>By Whom</i>	<i>Reference in IEE/CEP</i>	<i>Required Follow-up Actions</i>
to local people		machines and vehicles	environmental requirements: (i) regularly spray water on roads adjacent to residential areas; (ii) Vehicles carrying construction materials should be covered; (iii) Reduce speed of vehicles while crossing residential area.
Waste and waste water	Local people	Waste water and waste from the construction and worker activities	<ul style="list-style-type: none"> - Do not allow waste water to flow into the stream - Do not allow waste to be dumped indiscriminately
Mines	Local people	Blasting area	The local people should be informed of the location and space for blasting as well as the completion time of the blasting.
Compensation	Local people	Refer to RP	NPC should implement compensation in a full and prompt manner to affected persons.
Labour force management	Local people	Refer to IEE	Avoid conflicts and fights between the workers and between the workers and young villagers. Do not allow workers to illegally exploit timber products.

B Grievance Redress Mechanism

A grievance redress mechanism (GRM) will be established soon after project commencement. The first level and most accessible and immediate avenue for the fastest resolve of grievances are through the Project Manager of the Power Company. Grievances will be resolved through continuous interactions with affected persons and the PMU 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.

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:

1. Complaints will be sent to the commune Peoples Committee (PC), which must respond to a complainant within 15 days,
2. 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,
3. If not satisfied with the resolution of the district PC, the complainant can bring the complaint to the provincial PPC,
4. As a final resort, if not satisfied with resolution of PPC, the complainant can take the case to the People's Court.

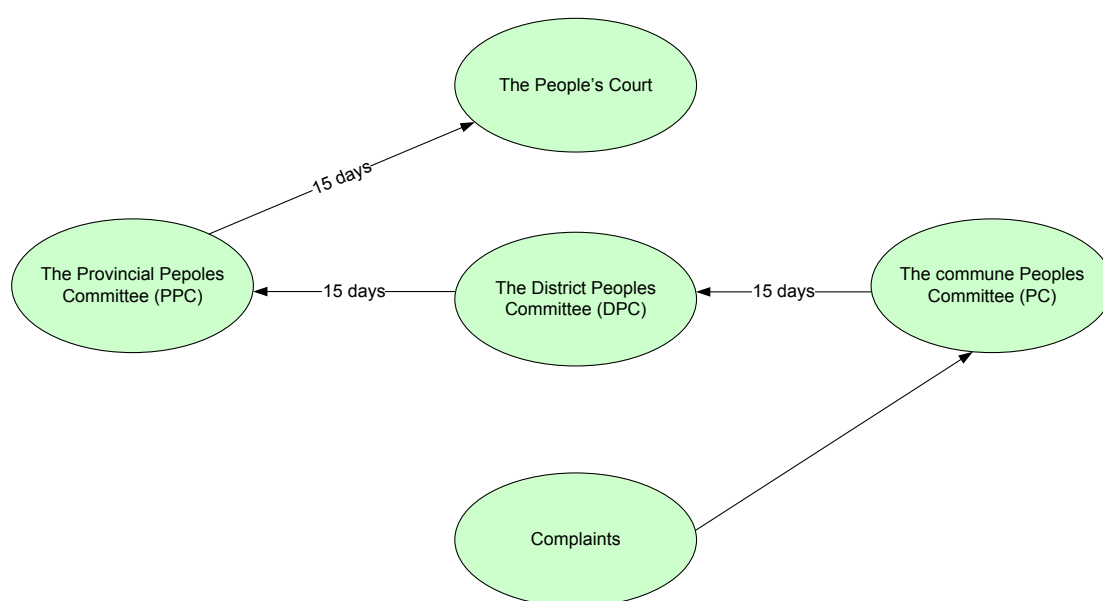


Figure 17: The Diagram of Grievance Redress Mechanism

C. Future Public Consultation Activities

After the subproject gains approval from Dien Bien PPC and the Asian Development Bank (ADB), the Investor will implement further consultation activities as described below.

Table 31: Expected community consultation activities

Activity	Participants	Expected Outcomes	Schedule	Cost Estimate (VND)
Kick-off meeting prior to construction commencement	NPC, the Contractor, affected persons, local authorities representatives at project area	<ul style="list-style-type: none"> - Publicize construction contents and plan - Reach agreement on detailed mitigation alternatives 	1 month prior to construction commencement	4.000.000
Consultation during construction phase	NPC, the Contractor, affected persons, local authorities representatives at project area	<ul style="list-style-type: none"> - Consider negative impacts on local people - Take account of the effectiveness of mitigation measures implementation - Feedback from local people on negative impacts 	2 meetings during the construction phase	8.000.000
Community consultation subsequent to the construction and prior to the operation	NPC, the OMB, affected persons, local authorities representatives at project area	Recommendation of the local people on the ability to restore of local land after adverse impacts	One after the completion of the subproject	4.000.000
Special	NPC, the	In case there are	During	Contingency

<i>Activity</i>	<i>Participants</i>	<i>Expected Outcomes</i>	<i>Schedule</i>	<i>Cost Estimate (VND)</i>
consultation	Contractor (construction phase), the OMB (operation phase), affected persons, local authorities representatives at project area	incidents or grievance in terms of environment	construction and operation phase	budget

VII. CONCLUSIONS AND RECOMMENDATIONS

IEE has been implemented based on ADB's Rapid Environment Assessment Checklist.

The project located near National Road 131, far from residential areas (distance from the project to the nearest residential area is about 2 to 2.5 km) affects the area of paddy land, terrace land, perennial crop land, fallow and unused land. Historical and archaeological sites are not impacted by the project. Nam Cha 3 Hydropower Project does not affect domestic water source of local people as well as cause water shortages in parts of the stream.

Besides the loss of agricultural land of two villages (Pa Tan and Ta Ham), the main impact identified in the environmental examination are construction impacts (air, soil, noise...) and changes of water flow below the dam. If the plant will be constructed, water flow would be reduced within 1.2 km of Nam Cha stream in about six months of a year. This will impact to aquatic life. To minimize impacts on aquatic life a proposal was given that is to proceed to maintain a minimum environmental flow in streams is 440 l / s.

With the mitigation and environmental management plan proposed, environmental impacts will be limited. This IEE proposed and the EMP and Monitoring program attached to the IEE will ensure that the project environmental impacts will successfully be mitigated and no further environmental assessment is required.

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.

SCREENING QUESTIONS	YES	NO	REMARKS
B. Project Location Is the dam and/or project facility adjacent to or within any of the following areas?			
<ul style="list-style-type: none"> Unregulated river 	x		The Nam Cha is a small stream. Water retention in the Nam Cha 3 dam is a maximum of 1.26 million m ³ which is discharged on a daily basis in the dry season.
<ul style="list-style-type: none"> Undammed river tributaries below the proposed dam 		x	Not applicable
<ul style="list-style-type: none"> Unique or aesthetically valuable land or water form 		x	
<ul style="list-style-type: none"> Special area for protecting biodiversity 		x	
<ul style="list-style-type: none"> Protected Area 		x	No protected areas are within the project area of environmental influence.
<ul style="list-style-type: none"> Buffer zone of protected area 		x	The project area adjacent to Lam Quang Commune. Lam Quang belongs to the buffer zone of Muong Nhe conservation area but the project is out of buffer zones of protected areas
<ul style="list-style-type: none"> Primary forest 		x	All the forest land in the area is secondary growth or plantation forestry
<ul style="list-style-type: none"> Range of endangered or threatened animals 		x	The survey showed that there were no endangered or threatened animals in the project area.
<ul style="list-style-type: none"> Area used by indigenous peoples 	x		The population in the area affected is almost all ethnic minority Thai and Mong

SCREENING QUESTIONS	YES	NO	REMARKS
			people.
<ul style="list-style-type: none"> Cultural heritage site 		x	There is no known archaeological, cultural or religious heritage site located within proximity of the project.
<ul style="list-style-type: none"> Wetland 		x	Not applicable
1. Mangrove		x	Not applicable
<ul style="list-style-type: none"> Estuary 		x	Not applicable
C. Potential Environmental Impacts will the project cause			
<ul style="list-style-type: none"> 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,
<ul style="list-style-type: none"> Disturbance of large areas due to material quarrying? 		x	Existing quarries are used and there is only a small quantity of borrow materials required for construction.
<ul style="list-style-type: none"> Disposal of large quantities of construction spoils? 		x	Some disposal of construction spoil is required at designated sites close to the dam and powerhouse.
<ul style="list-style-type: none"> clearing of large forested area for ancillary facilities and access road? 		x	Some forest will be destroyed but it is not primary forest, being either secondary growth or plantation
<ul style="list-style-type: none"> Impounding of a long river stretch? 	x		3.8 km of the river is impounded by the reservoir.
<ul style="list-style-type: none"> Dryness (less than 50% of dry season mean flow) over a long downstream river stretch? 	x		There will be reduced flow in the river over 1.2 km
<ul style="list-style-type: none"> Construction of permanent access road 		x	Access road will be connected

SCREENING QUESTIONS	YES	NO	REMARKS
near or through forests?			from National Highway 131 to the plant area through follow land.
<ul style="list-style-type: none"> creation of barriers for migratory land animals 		x	
<ul style="list-style-type: none"> 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? 		x	The project is on the small Nam Cha stream which has a length of less than 6 km above the dam site
<ul style="list-style-type: none"> Deterioration of downstream water quality due to anoxic water from the reservoir and sediments due to soil erosion? 		x	The reservoir is small & there will be only temporary loss of water quality during the construction stage.
<ul style="list-style-type: none"> Significant diversion of water from one basin to another? 		x	
<ul style="list-style-type: none"> Alternating dry and wet downstream conditions due to peaking operation of powerhouse? 	x		At the time of maximum capacity of operation, the plant will discharge 23.63 m ³ /s of water to downstream. With the above discharge flow, it will change the flow but will not affect plants and crops of the people.
<ul style="list-style-type: none"> Significant modification of annual flood cycle affecting downstream ecosystem, people's sustenance and livelihoods? 		x	Small water retention
<ul style="list-style-type: none"> Loss or destruction of unique or aesthetically valuable land or water forms? 		x	Small dam in steep valley
<ul style="list-style-type: none"> Proliferation of aquatic weeds in reservoir and downstream impairing dam discharge, irrigation systems, 		x	Small retention area only

SCREENING QUESTIONS	YES	NO	REMARKS
navigation & fisheries, & increasing water loss through transpiration?			
<ul style="list-style-type: none"> Scouring of riverbed below dam? 		x	
<ul style="list-style-type: none"> Downstream erosion of Recipient River in trans-basin diversion? 		x	Not applicable
<ul style="list-style-type: none"> Increased flooding risk of Recipient River in trans-basin diversion? 		x	Not applicable
<ul style="list-style-type: none"> Decreased groundwater recharge of downstream areas? 		x	Project is small
<ul style="list-style-type: none"> Draining of downstream wetlands and riparian areas? 		x	Not applicable
<ul style="list-style-type: none"> 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? 		x	Not applicable
<ul style="list-style-type: none"> Loss of migratory fish species due to barrier imposed by the dam? 	x		The dam will form a barrier to fish movements but the stream above the dam site is only 1.2 km and the stream is steep and fish are not important as a food source in the area.
<ul style="list-style-type: none"> Formation of sediment deposits at reservoir entrance, creating backwater effect and flooding and waterlogging upstream? 		x	
<ul style="list-style-type: none"> Significant disruption of river sediment transport downstream due to trapping in reservoir? 		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"> Environmental risk due to potential toxicity of sediments trapped behind 		x	

SCREENING QUESTIONS	YES	NO	REMARKS
the dams?			
<ul style="list-style-type: none"> Increased saltwater intrusion in estuary and low lands due to reduced river flows? 		x	Not applicable
<ul style="list-style-type: none"> Significant induced seismicity due to large reservoir size and potential environmental hazard from catastrophic failure of the dam? 		x	Not applicable – small dam
<ul style="list-style-type: none"> Cumulative effects due to its role as part of a cascade of dams/ reservoirs? 		x	Not applicable
<ul style="list-style-type: none"> 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? 		x	Not applicable – small reservoir and no retention of water for more than 24 hours.
<ul style="list-style-type: none"> Risks and vulnerabilities related to occupational health & safety due to physical, chemical, biological, & radiological hazards during project construction & operation? 		x	
<ul style="list-style-type: none"> Large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)? 		x	Small dam and small project labour force only
<ul style="list-style-type: none"> Creation of community slums following construction of the hydropower plant and its facilities? 		x	Not applicable
<ul style="list-style-type: none"> Social conflicts if workers from other regions or countries are hired? 	x		The number of about 600 workers and staffs may disrupt local people's lives. However, this impact is not

SCREENING QUESTIONS	YES	NO	REMARKS
			significant because the workers camps will be located far from residential areas.
<ul style="list-style-type: none"> Uncontrolled human migration into the area, made possible by access roads and transmission lines? 		x	Not applicable – small scheme only
<ul style="list-style-type: none"> Disproportionate impacts on the poor, women, children or other vulnerable groups? 		x	
<ul style="list-style-type: none"> 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? 		x	
<ul style="list-style-type: none"> 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? 		x	Small downstream safety impact to village from peaking operations of plant.

Appendix 2. Terms of Reference for ESDC Staff

Terms of Reference for NPC/ ESDC Environment Engineer.

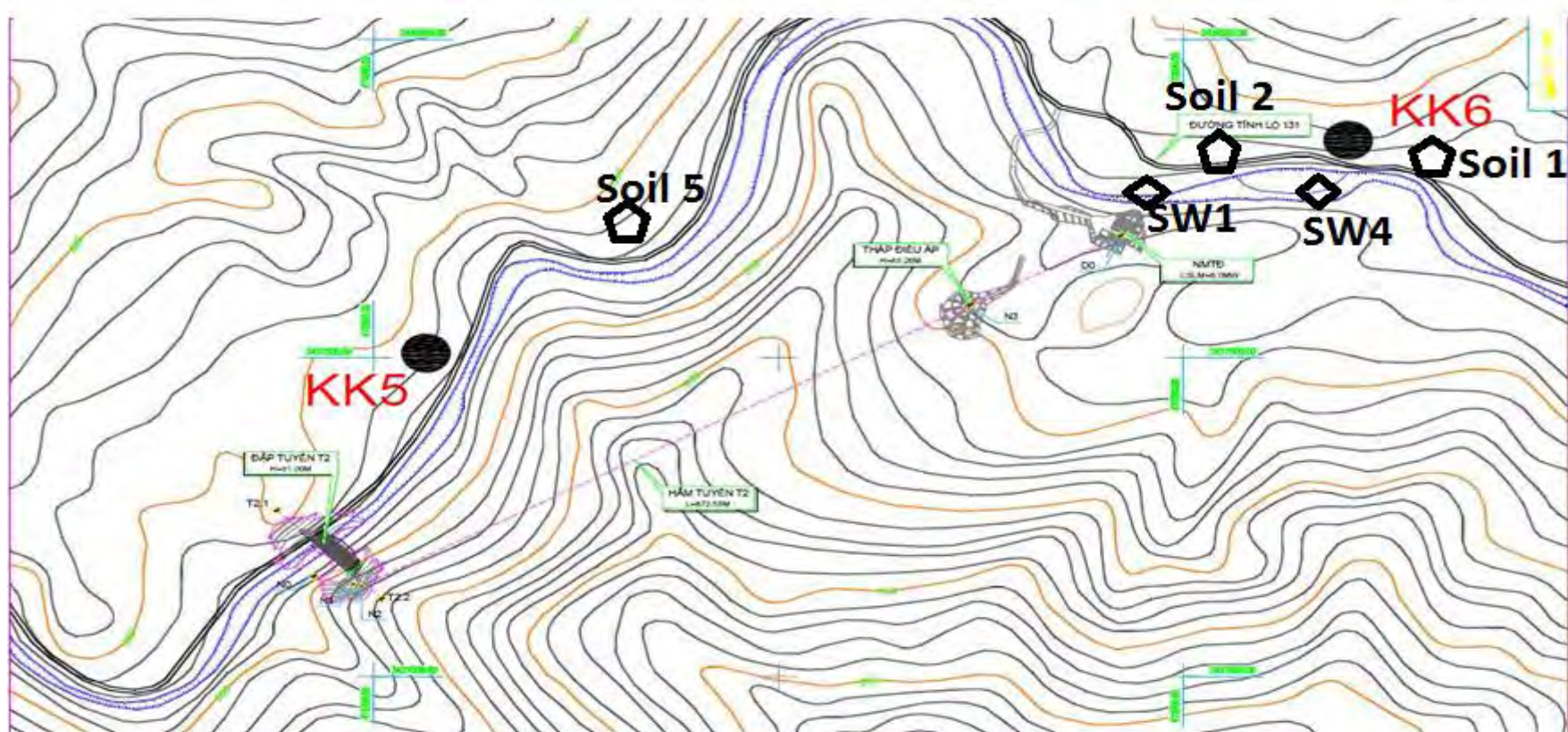
Specific Job Description:

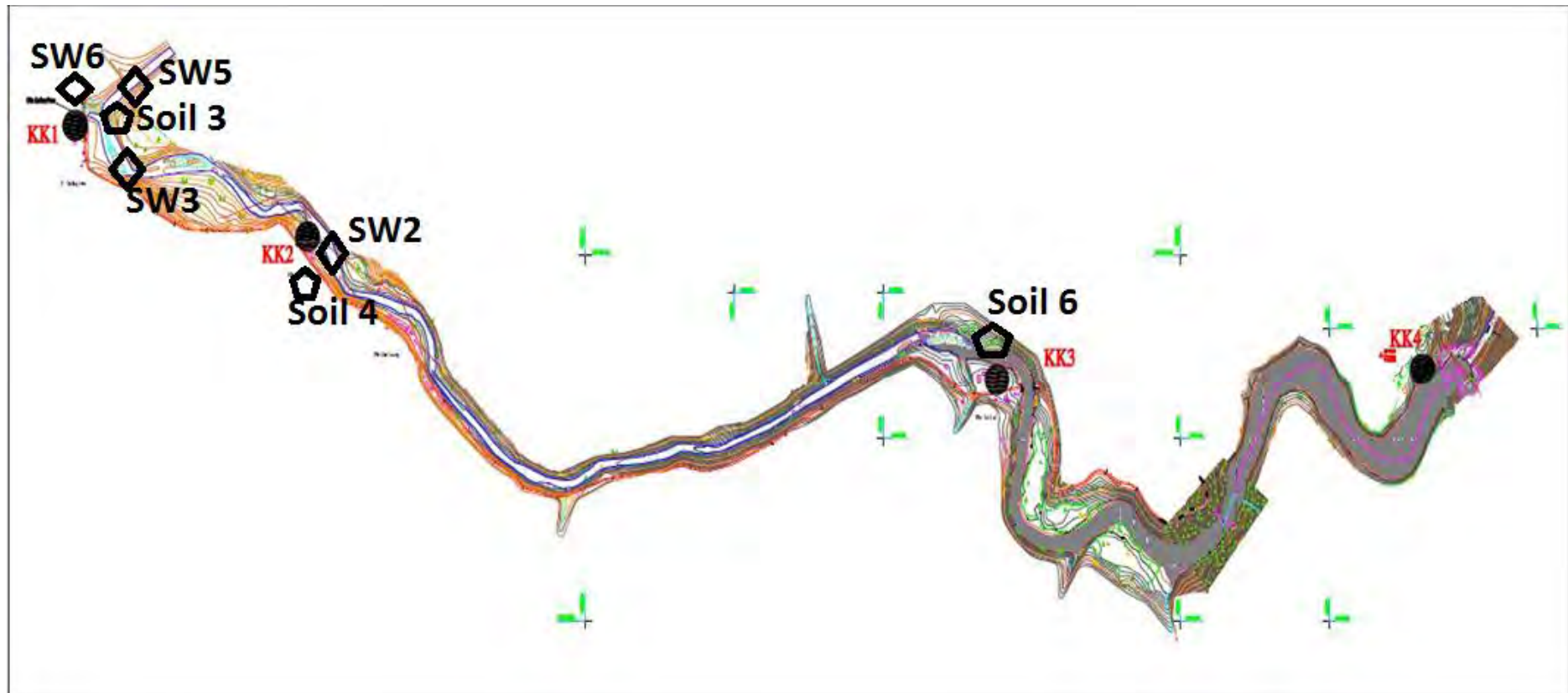
- Responsible on behalf of NPC for ensuring the implementation of the IEE and EMP.
- Facilitate NPC and the design/supervision consultants in the site-specific environmental issues to ensure the least damages and disturbances to the natural environment and social values of the local residents.
- Examine, 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.

Appendix 3: Locations of point sampling



Notes: KK = Air

SW = Surface Water

Appendix 4. Results of air quality analysis and pictures of monitoring positions

TRUNG TÂM NGHIÊN CỨU MÔI TRƯỜNG CỘNG HÒA XÃ HỘI CHỦ NGHĨA VIỆT NAM
PHÒNG THÍ NGHIỆM MÔI TRƯỜNG Độc lập - Tự do - Hạnh phúc

KẾT QUẢ ĐO ĐẠC PHÂN TÍCH

(Chỉ có giá trị trên mẫu thử)

Đơn vị yêu cầu: Công ty Tư vấn Phát triển Xã hội Việt Nam.
Địa điểm: Dự án thủy điện Nậm Chá 3 huyện Mường Nhé, Điện Biên
Loại mẫu: Không khí. Ngày quan trắc, đo đạc: 6/11/2010

Vị trí		Điểm 1	Điểm 2	Điểm 3	Điểm 4	Điểm 5	Điểm 6
Thời gian		9h00 06/11/2010	10h00 06/11/2010	11h00 06/11/2010	12h00 06/11/2010	13h00 06/11/2010	16h20 06/11/2010
Tiếng ồn (dBA)	TB	63.8	50.6	59.9	74.3	63.5	46.3
	max	75.2	62.9	71.1	89.7	77.3	52.0
	min	53.9	36.8	46.1	41.0	40.3	43.5
Bụi lơ lửng (mg/m ³)	TB	0.014	0.019	0.013	0.015	0.017	0.028
	Max	0.024	0.027	0.022	0.033	0.036	0.054
Khí ô nhiễm (mg/m ³)	SO ₂	0.008	0.012	0.043	0.015	0.007	0.023
	NO ₂	0.030	0.006	0.005	0.010	0.010	0.018
	CO	2.3	4.8	1.9	1.6	1.4	2.1

Ghi chú:

Điểm 1 Cầu Quảng Lâm. 102°40.536' E - 22°02.262' N
Điểm 2 Bán Huổi Lắc 102°41.132' E - 22°01.792' N
Điểm 3 Bán Tà Hăm 102°41.261' E - 22°01.832' N
Điểm 4 Cầu Pa Hăm 102°42.362' E - 22°01.868' N
Điểm 5 Công UBND xã Pa Tần 102°44.365' E - 22°02.048' N
Điểm 6 Chân cầu Pa Tần 102°44.856' E - 22°01.750' N

Thay mặt nhóm cán bộ
quan trắc, đo đạc


Trần Xuân Phong

TRUNG TÂM NGHIÊN CỨU MÔI TRƯỜNG

Xác nhận ông Trần Xuân Phong
là cán bộ của Trung tâm.



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THE SOCIALIST REPUBLIC OF VIETNAM
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MEASUREMENT ANALYSIS RESULT

(Valuable on sample only)

Unit requirement: Social Consult Company

Location: Nam Cha 3 hydropower project

Samples: Air Date of sampling: 6/11/2010

Position		Point 1	Point 2	Point 3	Point 4	Point 5	Point 6
Time		9h00 06/11/201	10h00 06/11/201	11h00 06/11/201	12h00 06.11/201	13h00 06/11/201	16h20 06/11/201
Noise (dBA)	averag	63.8	50.6	59.9	74.3	63.5	46.3
	max	75.2	62.9	71.1	89.7	77.3	52.0
	min	53.9	36.8	46.1	41.0	40.3	43.5
Total suspended sediment particulate	averag	0.014	0.019	0.013	0.015	0.017	0.028
	Max	0.024	0.027	0.022	0.033	0.036	0.054
Air pollutio n	SO	0.008	0.012	0.043	0.015	0.007	0.023
	NO	0.030	0.006	0.005	0.010	0.010	0.018
	CO	2.3	4.8	1.9	1.6	1.4	2.1

Notes:

Point 1 - Quang Lam Bridge

Coordinates: N: 102°40.536'' E: 22°02'262'

Point 2- Huoi Lac village

Coordinates: N 102°41.132' E 22°01.792'

Point 3 – Ta Ham village

Coordinates: N 102°41.261' E 22°01.832'

Point 4 – Pa Ham Bridge

Coordinates: N102°42.362' E22°01.868'

Point 5 – Gate of the commune People's
Committee of Pa Tan

Coordinates: N102°44.365' E 22°02.048'

Point 6 – Pa Tan Bridge

Coordinates: N102°44.856' E22°01.750'

**On behalf of the measurement and
observation officers**

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Air 1



Air 2



Air 3



Air 4



Air 5



Air 6

Appendix 5. Results of surface water quality analysis and pictures of monitoring

TRUNG TÂM NGHIÊN CỨU MÔI TRƯỜNG
PHÒNG THÍ NGHIỆM MÔI TRƯỜNG

CỘNG HÒA XÃ HỘI CHỦ NGHĨA VIỆT NAM
Độc lập - Tự do - Hạnh phúc

KẾT QUẢ ĐO ĐẠC PHÂN TÍCH
(Chỉ có giá trị trên mẫu thử)

Đơn vị yêu cầu: Công ty Tư vấn Phát triển Xã hội Việt Nam.
Loại mẫu: Nước mặt. **Ngày quan trắc, đo đạc:** 6/11/2010
Địa điểm: Dự án thủy điện Nậm Chà 3 huyện Mường Nhé, Điện Biên

T T	Địa điểm	DO (mg/l)	pH	TSS (mg/l)	COD (mg/l)	BOD5 (mg/l)	Tổng N (mg/l)	Tổng P (mg/l)	Fe (mg/l)	Tổng đầu mỡ (mg/l)	Ca2+ (mg/l)	Coliform MPN/100ml
1	Nậm Chà, nơi dự kiến là cửa xả	7.3	7.7	3	2	1.1	2.173	0.113	0.185	<0.1	18.68	160
2	Nậm Chà, bán Huổi Lắc.	8.2	7.7	2	3	1.4	2.268	0.106	0.180	<0.1	18.65	190
3	Nậm Chà, khu vực Quảng Lâm.	7.7	7.7	1	4	1.7	2.423	0.094	0.176	<0.1	17.89	200
4	Nậm Chà, chân cầu Pa Tần	7.4	7.8	4	2	0.8	2.104	0.117	0.187	<0.1	18.69	150
5	Nậm Chà, trước điểm nhập lưu Nậm Mi.	6.5	7.3	2	4	1.9	2.742	0.075	0.177	<0.1	17.27	190
6	Nậm Mi, trước điểm nhập lưu Nậm Chà.	6.8	7.8	1	3	1.4	2.271	0.071	0.174	<0.1	18.67	210

Thay mặt nhóm cán bộ
quan trắc, đo đạc



Trần Xuân Phong

TRUNG TÂM NGHIÊN CỨU MÔI TRƯỜNG
Xác nhận ông Trần Xuân Phong
là cán bộ của Trung tâm.



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MEASUREMENT ANALYSIS RESULT

(Valuable on sample only)

Unit requirement: Social Consult Company

Samples: Surface water

Date of sampling: 6/11/2010

Location: Nam Cha 3 hydropower project

No	Locations	DO (mg/l)	pH	TSS (mg/l)	COD (mg/l)	BOD5 (mg/l)	Total nitrogen (mg/l)	Toatal phosphorus (mg/l)	Fc (mg/l)	Total (oils & grease) (mg/l)	Ca2+ (mg/l)	Coliforms MNP/100 ml
1	Nam Cha, area is expected to outlet	7.3	7.7	3	2	1.1	2.173	0.113	0.185	<0.1	18.68	160
2	Nam Cha, Huoi Lac village	8.2	7.7	2	3	1.4	2.268	0.106	0.1 SO	<0.1	18.65	190
3	Nam Cha, Quang Lam area	7.7	7.7	1	4	1.7	2.423	0.094	0.176	<0.1	17.89	200
4	Nam Cha, Pa Tan bridge	7.4	7.8	4	2	0.8	2.104	0.117	0.187	■ 0.1	IN. 69	150
5	Nam Cha, in front of Nam Mi's point of	6.5	7.3	2	1	1.9	2.742	0.075	0.177	• 0.1	17.27	[90
6	Nam Mi, in front of Nam Cha's point of intersection	6.8	7.8	1 3		1.4	2.271	0,071	0.174	<0.1	18.67	210

On behalf of the measurement and observation officers

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SW1



SW2



SW3



SW4



SW5



SW6

Appendix 6. Results of soil quality analysis and pictures of monitoring

TRUNG TÂM NGHIÊN CỨU MÔI TRƯỜNG CỘNG HÒA XÃ HỘI CHỦ NGHĨA VIỆT NAM
PHÒNG THÍ NGHIỆM MÔI TRƯỜNG Độc lập - Tự do - Hạnh phúc

KẾT QUẢ ĐO ĐẠC PHÂN TÍCH

(Chỉ có giá trị trên mẫu thử)

Đơn vị yêu cầu: Công ty Tư vấn Phát triển Xã hội Việt Nam.
 Địa điểm: Dự án thủy điện Nậm Chà 3 huyện Mường Nhé, Điện Biên
 Loại mẫu: Đất. Ngày lấy mẫu: 6/11/2010

T T	Địa điểm	pH _{KCl}	Cu (mg/kg)	Pb (mg/kg)	Mn (mg/kg)	Zn (mg/kg)	Dầu mỡ khoáng (mg/kg)	Tổng N (%)	P ₂ O ₅ tổng số %(P ₂ O ₅)	K ₂ O ₅ tổng số %(K ₂ O ₅)
1	Đ 1	4.75	20.36	15.68	356.5	34.21	2	0.033	0.022	0.009
2	Đ 2	4.30	9.60	9.65	60.7	27.65	<2	0.018	0.017	0.008
3	Đ 3	4.02	77.55	24.90	492.1	63.6	2	0.030	0.045	0.003
4	Đ 4	4.45	14.19	16.34	291.3	45.56	<2	0.027	0.024	0.010
5	Đ 5	4.79	31.70	24.15	628.5	39.85	4	0.041	0.061	0.012
6	Đ 6	4.24	29.26	18.57	383.4	45.65	<2	0.019	0.056	0.007

Ghi chú: Điểm 1 - Cửa xả Tọa độ: 102°42.765' 22°01.674'
 Điểm 2- Ruộng cầu Pa Tân. Tọa độ: 102°44.856' 22°01.750'
 Điểm 3 - Cầu Quảng Lâm Tọa độ: 102°40.536' 22°02.262'
 Điểm 4 - Bản Huồi Lắc Tọa độ: 102°41.132' 22°01.792'
 Điểm 5 - UBND xã Pa Tân Tọa độ: 102°44.106' 22°02.226'
 Điểm 6 - Cầu Pà Hầm bản Tà Hầm Tọa độ: 102°42.362' 22°01.868'

Thay mặt nhóm cán bộ
quan trắc, đo đạc

Phong

Trần Xuân Phong

TRUNG TÂM NGHIÊN CỨU MÔI TRƯỜNG

Xác nhận ông Trần Xuân Phong

là cán bộ của Trung tâm.



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MEASUREMENT ANALYSIS RESULT

(Valuable on sample only)

Unit requirement: Social Consult Company

Location: Nam Cha 3 hydropower project

Samples: Soil Date of sampling: 6/11/2010

No	Locations	pH	Cu (mg/kg)	Pb (mg/kg)	Mn (mg/kg)	Zn (mg/kg)	Mineral oil (mg/kg)	Total nitrogen (%)	Total P ₂ O ₅ %(P ₂ O ₅)	Total K ₂ O ₅ %(K ₂ O ₅)
1	Point 1	4.75	20.36	15.68	356.5	34.21	2	0.033	0.022	0.009
2	Point 2	4.30	9-60	9.65	60.7	27.65	<2	0.018	0.017	0.008
3	Point 3	4.02	77.55	24.90	492.1	63.6	2	0.030	0-045	0.003
4	Point 4	4.45	14.19	16.34	291.3	45.56	<2	0.027	0.024	0.010
5	Point 5	4.79	31.70	24.15	628.5	39.85	4	0.041	0.061	0.012
6	Point 6	4.24	29.26	18.57	383.4	45.65	<2	0.019	0.056	0.007

Notes:

Point 1 - Outlet	Coordinates: 102°42.765' 22°01' 674'
Point 2- Paddy field at Pa Tan Bridge	Coordinates: 102°44.856' 22°01.750'
Point 3 – Quang Lam Bridge	Coordinates: 102°40.536' 22°02.262'
Point 4 – Huoi Lac Village	Coordinates: 102°41.132' 22°01.792'
Point 5 – The commune People' Committee of Pa Tan	Coordinates: 102°40.106' 22°02.226'
Point 6 – Pa Ham Bridge, Ta Ham Village	Coordinates: 102°42.362' 22°01.868'

**On behalf of the measurement and observation
officers**

CENTER FOR ENVIRONMENTAL RESEARCH

Tran Xuan Phong



Soil 1



Soil 2



Soil 3



Soil 4



Soil 5



Soil 6

Appendix 7. Results of phytoplankton analysis

Bảng: Danh sách thực vật nổi các trạm khảo sát khu vực suối Nậm Chà, Pa Tần 11/2010

STT	TÊN THỰC VẬT NỔI	Trạm khảo sát					
		1	2	3	4	5	6
	T. SILIC : BACILLARIOPHYTA						
	Bộ : Discinales						
	Họ : Coscinodiscaceae						
1.	<i>Melosira granulata</i> Ralfs					+	
	Họ : Achnanthaceae						
2.	<i>Cocconeis placentula</i> Ehr					+	
	Họ : Fragilariaceae						
3.	<i>Synedra acus</i> Kutz			+	+		
4.	<i>Synedra. ulna</i> (Mitzsch) Ehr.				+	+	+
5.	<i>Synedra ulna</i> (Nitzsch) Ehr var <i>biceps</i> (kg) Schonf.			+			
6.	<i>Fragillaria construens</i> Grunow	+					+
	Họ : Tabelariaceae						
7.	<i>Diatoma elongatum</i> Ehr		+		+	+	+
	Họ : Naviculaceae						
8.	<i>Navicula placentula</i> Grun				+		
9.	<i>Navicula placentula</i> fo. <i>lanceolata</i>		+			+	
10.	<i>Navicula gastrum</i>					+	
11.	<i>Amphora hendeyi</i> n. sp.		+			+	
12.	<i>Achnanthes coarctata</i>			+			
13.	<i>Cymbella turgida</i> Clever				+		
14.	<i>Cymbella. naviculiformis</i>						+
15.	<i>Cymbella ventricosa</i> Kutz					+	+
16.	<i>Gomphonema sphaerophorum</i> Ehr		+		+	+	+
17.	<i>Gomphonema. olivaceum</i> Ehr				+		+
18.	<i>Nedium affine</i> Ehr.			+			
	Họ : Nitzschiaceae						
19.	<i>Nitzschia recta</i> Hantsch	+		+	+		+
20.	<i>Nitzschia. filiformis</i> Hust.					+	
21.	<i>Nitzschia. philippinarum</i> Ehr	+					
	Họ : Surirellaceae						
22.	<i>Surirella robusta</i> Ehr		+				
23.	<i>Surirella. robusta</i> var. <i>splendida</i>						+
	TẢO LỤC CHLOROPHYTA						
	Bộ : Chlorococcales						
	Họ : Scenedesmaceae						
24.	<i>Scenedesmus. acuminatus</i> var. <i>biceriatus</i>	+					
25.	<i>Actinastrum hantzschii</i>		+	+			
	Bộ : Zygnematales						
	Họ : Zygnemataceae						
26.	<i>Spirogyra ionia</i>	+	+	+		+	+
27.	<i>Spirogyra. prolifica</i>						+

	Họ : Desmidiaceae						
28.	<i>Closterium trigosum</i>		+		+		+
29.	<i>Closterium. porectum</i>					+	
30.	<i>Staurastrum limneticum</i>			+			
31.	<i>Hyalotheca dissiliens (J.E. Smith) Breb.</i>	+					
	Bo Ulotrichales						
	Ho Ulotricaceae						
32.	<i>Ulothrix zonata (Schmide) Bohlin</i>				+		
	TAO LAM CYANOPHYTA						
	Bộ: Chroococcales						
	Họ: Chroococcaceae						
33.	<i>Merismopedia tenuissima</i>	+					+
	Bộ: Nostocales						
	Họ : Oscillatoriaceae						
34.	<i>Lyngbya birgei G.M.S.Smith</i>						+
35.	<i>Oscillatoria limosa Ag</i>		+		+	+	
36.	<i>Oscillatoria. formosa Bory</i>	+		+			+
37.	<i>Oscillatoria. princeps</i>					+	
38.	<i>Phormidium. tenue</i>		+	+			
	TẢO MẮT: EUGLENOPHYTA						
	Bộ: Euglenales						
	Họ: Euglenaceae						
39.	<i>Euglena acus Ehr</i>		+	+	+		
40.	<i>Euglena. hemichromata</i>	+					
41.	<i>Euglena. proxima</i>	+					
42.	<i>Phacus torta Lemm</i>		+				
43.	<i>Phacus. longicauda</i>		+				
44.	<i>Phacus. acuminatus</i>	+					
45.	<i>Strombomonas. fluviatilis var. ettliei</i>						+

Bảng . Mật độ thực vật nổi các trạm thu mẫu khu vực suối Nậm Chà, Pa Tần 11/2010

STT	TÊN TRẠM	MẬT ĐỘ THỰC VẬT NỔI (TB/L)				
		T. số	T. Silic	T. Lục	T. Lam	T. Mắt
1	Bán Pa Tần N 22°01'38.8" E 102°44'55.2"	2551.5	453.6	963.9	907.2	226.8
2	Khu vực tuyến nhà máy N 22°01'48.1" E 102°44'41.2"	2268.0	680.4	680.4	680.4	226.8
3	Tuyến đập hồ chứa Nậm Chà 3 N 22°01'41.8" E 102°42'43.7"	2041.2	396.9	793.8	737.1	113.4
4	Bán Tà Hầm N 22°01'51.6" E 102°42'18.0"	1530.9	793.8	340.2	340.2	56.7
5	Bán Huổi lác N 22°01'58.0" E 102°41'7.8"	2268.0	1190.7	396.9	680.4	
6	Bán Quảng lăm N 22°02'14.9" E 102°40'31.9"	2778.3	1077.3	567.0	1077.3	56.7

Xác nhận của cơ quan
 VIỆN SINH THÁI VÀ TÀI NGUYÊN SINH VẬT
 TRƯỞNG PHÒNG QUẢN LÝ TỔNG HỢP
 Nguyễn Văn Sinh

Người tổng hợp

Phạm Văn Mạnh

BẢNG PHÂN TÍCH MẪU THỰC VẬT NỘI

Hà Nội ngày tháng 11 năm 2010

Đề tài Thủy điện Nậm Chà	Mẫu phân tích	Định tính	Định lượng X
Trạm 4 Bản Tà Hăm N 22°01'51,6'' E 102°42'18.0''	Thời gian thu mẫu 11/2010		
Độ sâu (Thể tích) 490lit	Người thu mẫu Phan Mach		
Dụng cụ thu mẫu: Lưới kiểu Juday N°75	Người phân tích mẫu Phan Van Mach		

50/2 buồng

[illegible]

Người phân tích

List of phytoplankton at the survey station in Nam Cha area.

No	Phytoplankton name	Station survey					
		1	2	3	4	5	6
	BACILLARIOPHYTA						
	Orders : Discinales						
	Families : Coscinodiscaceae						
1.	<i>Melosira granulata</i> Ralfs					+	
	Families : Achnanthaceae						
2.	<i>Cocconeis placentula</i> Ehr					+	
	Families : Fragilariaceae						
3.	<i>Synedra acus</i> Kutz			+	+		
4.	<i>Synedra. ulna</i> (Mitzsch) Ehr.				+	+	+
5.	<i>Synedra ulna</i> (Nitzsch) Ehr var <i>biceps</i> (kg) Schonf.			+			
6.	<i>Fragillaria construens</i> Grunow	+					+
	Families : Tabelariaceae						
7.	<i>Diatoma elongatum</i> Ehr		+		+	+	+
	Families : Naviculaceae						
8.	<i>Navicula placentula</i> Grun				+		
9.	<i>Navicula placentula</i> fo. <i>lanceolata</i>		+			+	
10.	<i>Navicula. gastrum</i>					+	
11.	<i>Amphora hendeyi</i> n. sp.		+			+	
12.	<i>Achnanthes coarctata</i>			+			
13.	<i>Cymbella turgida</i> Clever				+		
14.	<i>Cymbella. naviculiformis</i>						+
15.	<i>Cymbella ventricosa</i> Kutz					+	+
16.	<i>Gomphonema sphaerophorum</i> Ehr		+		+	+	+
17.	<i>Gomphonema. olivaceum</i> Ehr				+		+
18.	<i>Nedium affine</i> Ehr.			+			
	Families : Nitzschiaceae						
19.	<i>Nitzschia recta</i> Hantsch	+		+	+		+
20.	<i>Nitzschia. filiformis</i> Hust.					+	
21.	<i>Nitzschia. philippinarum</i> Ehr	+					
	Families : Surirellaceae						
22.	<i>Surirella robusta</i> Ehr		+				
23.	<i>Surirella. robusta</i> var. <i>splendida</i>						+
	CHLOROPHYTA						
	Orders : Chlorococcales						

	Families : Scenedesmaceae						
24.	<i>Scenedesmus. acuminatus var. biceriatus</i>	+					
25.	<i>Actinastrum hantzschii</i>		+	+			
	Orders: Zygnematales						
	Families : Zygnemataceae						
26.	<i>Spirogyra ionia</i>	+	+	+		+	+
27.	<i>Spirogyra. prolifica</i>						+
	Families : Desmidiaceae						
28.	<i>Closterium trigosum</i>		+		+		+
29.	<i>Closterium. porectum</i>					+	
30.	<i>Staurastrum limneticum</i>			+			
31.	<i>Hyalotheca dissiliens</i> (J.E. Smith) Breb.	+					
	Orders: Ulotrichales						
	Families: Ulotricaceae						
32.	<i>Ulothrix zonata</i> (Schmide) Bohlin				+		
	CYANOPHYTA						
	Orders: Chroococcales						
	Families: Chroococcaceae						
33.	<i>Merismopedia tenuissima</i>	+					+
	Orders: Nostocales						
	Families: Oscillatoriaceae						
34.	<i>Lyngbya birgei</i> G.M.S.Smith						+
35.	<i>Oscillatoria limosa</i> Ag		+		+	+	
36.	<i>Oscillatoria. formosa</i> Bory	+		+			+
37.	<i>Oscillatoria. princeps</i>					+	
38.	<i>Phormidium. tenue</i>		+	+			
	EUGLENOPHYTA						
	Orders: Euglenales						
	Families: Euglenaceae						
39.	<i>Euglena acus</i> Ehr		+	+	+		
40.	<i>Euglena. hemichromata</i>	+					
41.	<i>Euglena. proximo</i>	+					
42.	<i>Phacus torta</i> Lemm		+				
43.	<i>Phacus. longicauda</i>		+				
44.	<i>Phacus. acuminatus</i>	+					
45.	<i>Strombomonas. fluviatilis var. ettliei</i>						+

The density of phytoplankton at the sampling stations in Nam Cha, Pa Tan area 11/2010

No	Location name	Density of Phytoplankton (organism/m ³)				
		Total	Bacillariophyta	Chlorophyta	Cyanophyta	Euglenophyta
1	Pa Tan village N 22°01'38.8" E 102°44'55.2"	2551.5	453.6	963.9	907.2	226.8
2	Powerhouse are N 22°01'48.1" E 102°44'41.2"	2268.0	680.4	680.4	680.4	226.8
3	Dam in the Reservoir Nam Cha 3 N 2°01'41.8" E 02°42'43.7"	2041.2	396.9	793.8	737.1	113.4
4	Ta Ham Village N22°01'51,6" E 102°42'18.0"	1530.9	793.8	340.2	340.2	56.7
5	Huoi Lac Village N 22°01'58.0" E 102°41'7.8"	2268.0	1190.7	396.9	680.4	
6	Quang Lam Village N 2°02'14.9" E 02°40'31.9"	2778.3	1077.3	567.0	1077.3	56.7

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INSTITUTE OF ECOLOGY AND BIOLOGICAL RESOURCES

ANALYSIS TABLE OF PHYTOPLANKTON

DEPARTMENT OF AQUATIC ECOLOGY

Ha Noi, date month year

Subject: Nam Cha Hydropower Plant	Sampling analysis: Qualitative: Quantitative: X
Station 1: Pa Tan village N 22°01'38.8" E 102°44'55.2"	Sampling time: 11/2010
Depth (Volume): 490 l	The simple collector: Phan Mach
Sampling instruments: Juday net N°75	The sample analyst: Phan Mach

No	Phytoplankton name			
1	<i>Fragillaria construens Grunow</i>	4		
2	<i>Nitzschia recta Hantsch</i>	2		
3	<i>Nitzschia philippinarum Ehr</i>	2		
			8	453.6
4	<i>Scenedesmus. acuminatus var. biceriatus</i>	5		
5	<i>Spirogyra ionia</i>	6		
6	<i>Hyalotheca dissiliens (J.E. Smith) Breb.</i>	6		
			17	963.9
7	<i>Merismopedia tenuissima</i>	9		
8	<i>Oscillatoria. formosa Bory</i>	7		
			16	907.2
9	<i>Euglena. hemichromata</i>	2		
10	<i>Euglena. proximo</i>	1		
11	<i>Phacus. acuminatus</i>	1		
			4	226.8
			45	2551.5
3				
3				
2				
11				

The analyst

INSTITUTE OF ECOLOGY AND BIOLOGICAL RESOURCES ANALYSIS TABLE OF PHYTOPLANKTON
DEPARTMENT OF AQUATIC ECOLOGY

Ha Noi, date month year

Subject: Nam Cha Hydropower Plant	Sampling analysis: Qualitative: Quantitative: X
Station 2: Powerhouse are N 22°01'48.1" E 102°44'41.2"	Sampling time: 11/2010
Depth (Volume): 490 l	The simple collector: Phan Mach
Sampling instruments: Juday net N ^o 75	The sample analyst: Phan Van Mach

No	Phytoplankton name			
1	Diatoma elongatum Ehr	6		
2	Navicula placentula fo. lanceolata	2		
3	Amphora hendeyi n. sp.	1		
4	Gomphonema sphaerophorum Ehr	1		
5	Surirella robusta Ehr	2		
			12	680.4
6	Actinastrum hantzschii	4		
7	Spirogyra ionia	6		
8	Closterium trigosum	2		
			12	680.4
9	Oscillatoria limosa Ag	5		
10	Phormidium. tenue	7		
			12	680.4
11	Euglena acus Ehr	2		
12	Phacus torta Lemm	1		
13	Phacus. longicauda	1		
			4	226.8
5			40	2268.0
3				
2				
3				
13				

The analyst

INSTITUTE OF ECOLOGY AND BIOLOGICAL RESOURCES ANALYSIS TABLE OF PHYTOPLANKTON
DEPARTMENT OF AQUATIC ECOLOGY

Ha Noi, date month year

Subject: Nam Cha Hydropower Plant	Sampling analysis: Qualitative: Quantitative: X
Station 3: Dam in the Reservoir Nam Cha 3 N 22°01'41.8" E 102°42'43.7"	Sampling time: 11/2010
Depth (Volume): 490 l	The simple collector: Phan Mach
Sampling instruments: Juday net N°75	The sample analyst: Phan Van Mach

No	Phytoplankton name			
1	<i>Synedra acus</i> Kutz	2		
2	<i>Synedra ulna</i> (Nitzsch) Ehr var <i>biceps</i>	1		
3	<i>Achnanthes coarctata</i>	1		
4	<i>Nedum affine</i> Ehr.	2		
5	<i>Nitzschia recta</i> Hantsch	1		
			7	396.9
6	<i>Actinastrum hantzschii</i>	4		
7	<i>Spirogyra ionia</i>	5		
8	<i>Staurastrum limneticum</i>	5		
			14	793.8
9	<i>Oscillatoria. formosa</i> Bory	6		
10	<i>Phormidium. tenue</i>	7		
			13	737.1
1 1	<i>Euglena acus</i> Ehr	2		
			2	113.4
5			36	2041.2
3				
2				
1				
1 1				

The analyst

INSTITUTE OF ECOLOGY AND BIOLOGICAL RESOURCES
DEPARTMENT OF AQUATIC ECOLOGY

ANALYSIS TABLE OF PHYTOPLANKTON

Ha Noi, date month year

Subject: Nam Cha Hydropower Plant	Sampling analysis: Qualitative: Quantitative: X
Station 4: Ta Ham Village N22°01'51,6" E 102°42'18.0"	Sampling time: 11/2010
Depth (Volume): 490 l	The simple collector: Phan Mach
Sampling instruments: Juday net N ^o 75	The sample analyst: Phan Van Mach

No	Phytoplankton name			
1	<i>Synedra acus Kutz</i>	2		
2	<i>Synedra. ulna (Mitzsch) Ehr.</i>	1		
3	<i>Diatoma elongatum Ehr</i>	4		
4	<i>Navicula placentula Grun</i>	1		
5	<i>Cymbella turgida Clever</i>	1		
6	<i>Gomphonema sphaerophorum Ehr</i>	2		
7	<i>Gomphonema. olivaceum Ehr</i>	1		
8	<i>Nitzschia recta Hantsch</i>	2		
			14	793.8
9	<i>Closterium trigosum</i>	1		
10	<i>Ulothrix zonata (Schmide) Bohlin</i>	5		
			6	340.2
11	<i>Oscillatoria limosa Ag</i>	6		
			6	340.2
12	<i>Euglena acus Ehr</i>	1		
			1	56.7
			27	1530.9

The analyst

INSTITUTE OF ECOLOGY AND BIOLOGICAL RESOURCES
DEPARTMENT OF AQUATIC ECOLOGY

ANALYSIS TABLE OF PHYTOPLANKTON

Ha Noi, date month year

Subject: Nam Cha Hydropower Plant	Sampling analysis: Qualitative: Quantitative: X
Station 5: Huoi Lac Village N 22°01'58.0" E 102°41'7.8"	Sampling time: 11/2010
Depth (Volume): 490 l	The simple collector: Phan Mach
Sampling instruments: Juday net N°75	The sample analyst: Phan Van Mach

No	Phytoplankton name			
1	<i>Melosira granulata</i> Ralfs	6		
2	<i>Cocconeis placentula</i> Ehr	1		
3	<i>Synedra. ulna</i> (Mitzsch) Ehr.	2		
4	<i>Diatoma elongatum</i> Ehr	4		
5	<i>Navicula placentula</i> fo. <i>lanceolata</i>	1		
6	<i>Navicula. gastrum</i>	1		
7	<i>Amphora hendeyi</i> n. sp.	2		
8	<i>Cymbella ventricosa</i> Kutz	1		
9	<i>Gomphonema sphaerophorum</i> Ehr	1		
10	<i>Nitzschia. filiformis</i> Hust.	2		
			21	1190.7
11	<i>Spirogyra ionia</i>	5		
12	<i>Closterium. porectum</i>	2		
			7	396.9
13	<i>Oscillatoria limosa</i> Ag	6		
14	<i>Oscillatoria. princeps</i>	6		
			12	680.4
10			40	2268.0
2				
2				
0				
14				

The analyst

INSTITUTE OF ECOLOGY AND BIOLOGICAL RESOURCES
DEPARTMENT OF AQUATIC ECOLOGY

ANALYSIS TABLE OF PHYTOPLANKTON

Ha Noi, date month year

Subject: Nam Cha Hydropower Plant	Sampling analysis: Qualitative: Quantitative: X
Station 6: Quang Lam Village N 22°02'14.9" E 102°40'31.9"	Sampling time: 11/2010
Depth (Volume): 490 l	The simple collector: Phan Mach
Sampling instruments: Juday net N°75	The sample analyst: Phan Van Mach

No	Phytoplankton name			
1	<i>Synedra. ulna (Mitzsch) Ehr.</i>	1		
2	<i>Fragillaria construens Grunow</i>	4		
3	<i>Diatoma elongatum Ehr</i>	5		
4	<i>Cymbella. naviculiformis</i>	2		
5	<i>Cymbella ventricosa Kutz</i>	1		
6	<i>Gomphonema sphaerophorum Ehr</i>	1		
7	<i>Gomphonema. olivaceum Ehr</i>	1		
8	<i>Nitzschia recta Hantsch</i>	2		
9	<i>Surirella. robusta var. splendida</i>	2		
			19	1077.3
10	<i>Spirogyra ionia</i>	5		
11	<i>Spirogyra. prolifica</i>	4		
12	<i>Closterium trigosum</i>	1		
			10	567.0
13	<i>Merismopedia tenuissima</i>	8		
14	<i>Lyngbya birgei G.M.S.Smith</i>	6		
15	<i>Oscillatoria. formosa Bory</i>	5		
			19	1077.3
16	<i>Strombomonas. fluviatilis van ettlia</i>	1		
			1	56.7
9			49	2778.3
3				
1				
16				

The analyst

Appendix 8. Results of zooplankton analysis



Bảng: Thành phần loài động vật nổi các trạm khảo sát khu vực suối Nậm Chả, Pa Tần 11/2010

STT	Tên khoa học	Trạm khảo sát					
		1	2	3	4	5	6
	Ngành động vật chân khớp - Arthropoda						
	Lớp giáp xác - Crustacea						
	PHÂN LỚP GIÁP XÁC CHÂN CHÈO - COPEPODA						
	Bộ Calanoida						
	Họ Diaptomidae						
1	<i>Mongolodiptomus birulai</i> (Rylop)	+		+	+		
2	<i>Neodiaptomus handeli</i>	+					
3	<i>Phyllodiptomus tunguidus</i>		+				+
	Bộ Cyclopoida						
	Họ Cyclopidae						
4	<i>Mesocyclops leuckarti</i> (Claus)	+	+	+	+	+	+
5	<i>Microcyclops varicans</i> (Sars)		+			+	
6	<i>Thermocyclops hyalinus</i> (Rehberg)	+	+		+	+	+
7	<i>Thermocyclops taihokuensis</i> (Harada)		+				
8	<i>Eucyclops serrulatus</i> (Fischer)	+					+
9	<i>Eucyclops speratus</i> (Lilljeborg)						+
	PHÂN LỚP CHÂN MANG - BRANCHIOPODA						
	Bộ giáp xác râu ngành - Cladocera						
	Họ Bosminidae						
10	<i>Bosmina longirostris</i> (O. F. Mýller)	+	+		+	+	+
	Họ Sididae						
11	<i>Diaphanosoma sarsi</i> Richard		+	+			
12	<i>Diaphanosoma leuchtenbergianum</i> Fischer		+				
	Họ Daphniidae						
13	<i>Daphnia carinata</i>		+			+	
14	<i>Moina dubia</i> de Guerne et Richard	+	+	+	+	+	+
15	<i>Moinodaphnia macleayi</i>					+	
16	<i>Simocerphalus elizabethae</i>	+	+				+
17	<i>Ceriodaphnia rigaudi</i> Richard	+	+	+	+		+
	Họ Chydoridae						
18	<i>Alona rectangula</i>	+					+
19	<i>Chydorus sphaericus</i> sphaericus	+	+				+
	NGÀNH GIUN TRÒN - NEMATHELMINTHES						
	LỚP TRÙNG BÁNH XE - ROTATORIA						

	Bộ Monogononta						
	Họ Asplanchnidae						
20	<i>Asplanchna sieboldi</i> (Leydig)	+	+		+		+
	Họ Rotariidae						
21	<i>Rotaria neptunia</i>					+	+
	Họ Brachionidae						
22	<i>Brachionus quadridentatus</i> Hermann	+					
23	<i>Brachionus calyciflorus</i> Pallas	+	+		+	+	+
24	<i>Platylabus quadricornis</i> (Ehrenberg)						+
	Các nhóm khác						
25	Ostracoda	+					
26	Mollusca		+				
27	Chironomidae	+	+	+	+	+	+
28	Coleoptera	+				+	
29	Hemiptera						+
30	Nematoda					+	

Bảng. Mật độ động vật nổi các trạm khảo sát khu vực suối Nậm Chà, Pa Tần 11/2010

STT	Trạm khảo sát	Mật độ ĐVN (con/m ³)				
		Tổng số	Copepoda	Cladocera	Rotatoria	N.khác
1	Bán Pa Tần N 22°01'38.8" E 102°44'55.2"	8898.0	2612.0	4490.0	1388.0	408.0
2	Khu vực tuyến nhà máy N 22°01'48.1" E 102°44'41.2"	6061.2	3673.5	1530.6	612.2	244.9
3	Tuyến đập hồ chứa Nậm Chà 3 N 22°01'41.8" E 102°42'43.7"	2530.5	1387.7	1061.2		81.6
4	Bán Tà Hầm N 22°01'51.6" E 102°42'18.0"	1327.0	694.0	367.0	163.0	102.0
5	Bán Huổi lác N 22°01'58.0" E 102°41'7.8"	2122.0	1449.0	592.0	20.0	61.0
6	Bán Quảng lăm N 22°02'14.9" E 102°40'31.9"	4694.8	2571.4	1020.4	776.0	327.0



Xác nhận của cơ quan

TRƯỞNG PHÒNG QUẢN LÝ TỔNG HỢP

Nguyễn Văn Sinh

Người tổng hợp

Phạm Văn Mạnh

Phòng sinh thái môi trường nước

BẢNG PHÂN TÍCH MẪU ĐỘNG VẬT NỔI

Đề tài: Thủy điện Nậm Chà	Mẫu phân tích Định tính + Định lượng
Trạm KS: 1 Bản Pa Tần N 22°01'38.8" E 102°44'55.2"	Thời gian thu mẫu 11.2010
Độ dài kéo lưới (thể tích): 10 m (0.49m ³)	Người thu mẫu:
Dụng cụ thu mẫu ĐVĐ: lưới N ^o 45 kiểu Juday	Người phân tích mẫu: Lê Hùng Anh

STT	Tên khoa học	(1/10)	Mật độ (con/m ³)
	Copepoda	128	2612
1	<i>Eucyclops serrulatus</i>	+	
2	<i>Mesocyclops leuckarti</i>	+	
3	<i>Thermocyclops hyalinus</i>	+	
4	<i>Microcyclops varicans</i>	+	
5	<i>Mongolodiaptomus birulai</i>	+	
	Cladocera	220	4490
6	<i>Chydorus sphaericus</i>	+	
7	<i>Alona rectagula</i>	+	
8	<i>Ceriodaphnia rigaudi</i>	+	
9	<i>Bosmina longirostris</i>	+	
10	<i>Scapholeberis kingi</i>	+	
11	<i>Moina dubia</i>	+	
	Rotatoria	68	1388
12	<i>Asplanchna sieboldi</i>	+	
13	<i>Brachionus caliciflorus</i>	+	
14	<i>Rotaria rotaria</i>	+	
	Nhóm khác	20	408
15	Chironomidae	+	
16	Coleoptera	+	
17	Ostracoda	+	
	Tổng số	436	8898
	Tổng số loài trong mẫu	17	
5			
6			
3			
3			
17			

Người phân tích mẫu

Phòng sinh thái môi trường nước

BẢNG PHÂN TÍCH MẪU ĐỘNG VẬT NỔI

Đề tài: Thủy điện Nậm Chà	Mẫu phân tích Định tính + Định lượng
Trạm KS: 2 Nhà máy N 22°01'48.1" E 102°44'41.2"	Thời gian thu mẫu 11.2010
Độ dài kéo lưới (thể tích): 10 m (0.49m ³)	Người thu mẫu:
Dụng cụ thu mẫu ĐVĐ: lưới N ⁰ 45 kiểu Juday	Người phân tích mẫu: Lê Hùng Anh

STT	Tên khoa học	(1/10)	Mật độ (con/m ³)
	Copepoda	180	3673.5
1	<i>Microcyclops varicans</i>	+	
2	<i>Mesocyclops leuckarti</i>	+	
3	<i>Thermocyclops hyalinus</i>	+	
4	<i>Thermocyclops taihokuensis</i>	+	
5	<i>Phyllodiaptomus tunguidus</i>	+	
	Cladocera	75	1530.6
6	<i>Moina dubia</i>	+	
7	<i>Simocephalus elizabethae</i>	+	
8	<i>Diaphanosoma sarsi</i>	+	
9	<i>Ceriodaphnia rigaudi</i>	+	
10	<i>Bosmina longirostris</i>	+	
11	<i>Diaphanosoma leuchtenbergianum</i>	+	
12	<i>Daphnia carinata</i>	+	
13	<i>Chydorus sphaesicus</i>	+	
	Rotatoria	30	612.2
14	<i>Brachionus caliciflorus</i>	+	
15	<i>Asplanchna sieboldi</i>	+	
	Nhóm khác	12	244.9
16	<i>Chironomidae</i>	+	
17	<i>Bivalvia</i>	+	
	Tổng số	297	6061.2
	Tổng số loài trong mẫu	17	
5			
8			
2			
2			
17			

Người phân tích mẫu

BẢNG PHÂN TÍCH MẪU ĐỘNG VẬT NỘI

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Người phân tích mẫu

Phòng sinh thái môi trường nước

BẢNG PHÂN TÍCH MẪU ĐỘNG VẬT NỔI

Đề tài: Thủy điện Nậm Chà	Mẫu phân tích Định tính + Định lượng
Trạm KS: 4 Bản Tà Hầm N 22°01'51,6" E 102°42'18.0"	Thời gian thu mẫu 11.2010
Độ dài kéo lưới (thể tích): 10 m (0.49m3)	Người thu mẫu:
Dụng cụ thu mẫu ĐVD: lưới N°45 kiểu Juday	Người phân tích mẫu: Lê Hùng Anh

STT	Tên khoa học	(1/10)	Mật độ (con/m ³)
	Copepoda	34	694
1	<i>Mongolodiptomus birulai</i>	+	
2	<i>Mesocyclops leuckarti</i>	+	
3	<i>Thermocyclops hyalinus</i>	+	
	Cladocera	18	367
4	<i>Ceriodaphnia rigaudi</i>	+	
5	<i>Bosminopsis longirostris</i>	+	
6	<i>Moina dubia</i>	+	
	Rotatoria	8	163
7	<i>Asplancha sieboldi</i>	+	
8	<i>Brachionus caliciflorus</i>	+	
	Nhóm khác	5	102
9	Chironomidae	+	
	Tổng số	65	1327
	Tổng số loài trong mẫu	9	
3			
3			
2			
1			
9			

Người phân tích mẫu

Phòng sinh thái môi trường nước

BẢNG PHÂN TÍCH MẪU ĐỘNG VẬT NỒI

Đề tài: Thủy điện Nậm Chà	Mẫu phân tích Định tính + Định lượng
Trạm KS: 5 Bản Huồi lác N 22°01'58.0" E 102°41'7.8"	Thời gian thu mẫu 11.2010
Độ dài kéo lưới (thể tích): 10 m (0.49m3)	Người thu mẫu:
Dụng cụ thu mẫu ĐVĐ: lưới N ⁰ 45 kiểu Juday	Người phân tích mẫu: Lê Hùng Anh

STT	Tên khoa học	(1/10)	%	Mật độ (con/m3)
	Copepoda	71	68	1449
1	<i>Thermocyclops hialinus</i>	+		
2	<i>Microcyclops varicans</i>	+		
3	<i>Mesocyclops leuckarti</i>	+		
	Cladocera	29	28	592
4	<i>Moina dubia</i>	+		
5	<i>Bosmina longirostris</i>	+		
6	<i>Daphnia carinata</i>	+		
7	<i>Moinodaphnia macleayi</i>	+		
	Rotatoria	1	1	20
8	<i>Rotaria neptunia</i>	+		
9	<i>Brachionus caliciflorus</i>	+		
	Nhóm khác	3	3	61
10	Chironomidae	+		
11	Coleoptera	+		
12	Nematoda	+		
	Tổng số	104	100	2122
	Tổng số loài trong mẫu	12		
3				
4				
2				
3				
12				

Người phân tích mẫu

Phòng sinh thái môi trường nước

BẢNG PHÂN TÍCH MẪU ĐỘNG VẬT NỔI

Đề tài: Thủy điện Nậm Chà	Mẫu phân tích Định tính + Định lượng
Trạm KS: 6 Quảng lâm N 22°02'14.9" E 102°40'31.9"	Thời gian thu mẫu 6.2010
Độ dài kéo lưới (thể tích): 10 m (0.49m3)	Người thu mẫu:
Dụng cụ thu mẫu ĐVĐ: lưới N°45 kiểu Juday	Người phân tích mẫu: Lê Hùng Anh

STT	Tên khoa học	(1/10)	Mật độ (con/m3)
	Copepoda	126	2571.4
1	<i>Mesocyclops leuckarti</i>	+	
2	<i>Thermocyclops hyalinus</i>	+	
3	<i>Eucyclops serrulatus</i>	+	
4	<i>Phylodiaptomus tunguidus</i>	+	
5	<i>Eucyclops speratus</i>	+	
	Cladocera	50	1020.4
6	<i>Ceriodaphnia rigaudi</i>	+	
7	<i>Moina dubia</i>	+	
8	<i>Chydorus sphaericus</i>	+	
9	<i>Simocephalus elizabethae</i>	+	
10	<i>Alona rectangula</i>	+	
11	<i>Bosmina longirostris</i>	+	
	Rotatoria	38	776
12	<i>Asplanchna sieboldi</i>	+	
13	<i>Brachionus caliciflorus</i>	+	
14	<i>Platyias quadricornis</i>	+	
15	<i>Rotaria neptunula</i>	+	
	Nhóm khác	16	327
16	Chironomidae	+	
17	Hemiptera	+	
	Tổng số	230	4694.8
	Tổng số loài trong mẫu	17	
5			
6			
4			
2			
17			

Người phân tích mẫu

The composition of phytoplankton at the sampling stations in Nam Cha, Pa Tan area
11/2010

No	Scientific name	Station survey					
		1	2	3	4	5	6
	Arthropoda						
	Crustacea						
	COPEPODA						
	Orders: Calanoida						
	Families: Diaptomidae						
1	<i>Mongolodiptomus birulai</i> (Rylop)	+		+	+		
2	<i>Neodiptomus handeli</i>	+					
3	<i>Phyllodiptomus tunguidus</i>		+				+
	Orders: Cyclopoida						
	Families: Cyclopidae						
4	<i>Mesocyclops leuckarti</i> (Claus)	+	+	+	+	+	+
5	<i>Microcyclops varicans</i> (Sars)		+			+	
6	<i>Thermocyclops hyalinus</i> (Rehberg)	+	+		+	+	+
7	<i>Thermocyclops taihokuensis</i> (Harada)		+				
8	<i>Eucyclops serrulatus</i> (Fischer)	+					+
9	<i>Eucyclops speratus</i> (Lilljeborg)						+
	BRANCHIOPODA						
	Orders: Cladocera						
	Families: Bosminidae						
10	<i>Bosmina longirostris</i> (O. F. Møller)	+	+		+	+	+
	Families: Sididae						
11	<i>Diaphanosoma sarsi</i> Richard		+	+			
12	<i>Diaphanosoma leuchtenbergianum</i> Fischer		+				
	Families: Daphniidae						
13	<i>Daphnia carinata</i>		+			+	
14	<i>Moina dubia</i> de Guerne et Richard	+	+	+	+	+	+
15	<i>Moinodaphnia macleayi</i>					+	
16	<i>Simocerphalus elizabethae</i>	+	+				+
17	<i>Ceriodaphnia rigaudi</i> Richard	+	+	+	+		+
	Families: Chydoridae						
18	<i>Alona rectangularis</i>	+					+
19	<i>Chydorus sphaericus</i>	+	+				+

	NEMATHELMINTHES						
	ROTATORIA						
	Orders: Monogononta						
	Families: Asplanchnidae						
20	<i>Asplanchna sieboldi</i> (Leydig)	+	+		+		+
	Families: Rotariidae						
21	<i>Rotaria neptunia</i>					+	+
	Families: Brachionidae						
22	<i>Brachionus quadridentatus</i> Hermann	+					
23	<i>Brachionus calyciforus</i> Pallas	+	+		+	+	+
24	<i>Piatyias quadricornis</i> (Ehrenberg)						+
	Others group						
25	Ostracoda	+					
26	Mollusca		+				
27	Chironomidae	+	+	+	+	+	+
28	Coleoptera	+				+	
29	Hemiptera						+
30	Nematoda					+	

The density of zooplankton at the sampling stations in Nam Cha, Pa Tan area 11/2010

No	Station survey	Density of zooplankton (organism/m ³)				
		Total	Copepoda	Cladocera	Rotatoria	Others
1	Pa Tan village N 22°01'38.8" E 102°44'55.2"	8898.0	2612.0	4490.0	1388.0	408.0
2	Powehouse are N 22°01'48.1" E 102°44'41.2"	6061.2	3673.5	1530.6	612.2	244.9
3	Dam in the Reservoir Nam Cha 3 N 22°01'41.8"E 102°42'43.7"	2530.5	1387.7	1061.2		81.6
4	Ta Ham Village N22°01'51,6" E 102°42'18.0"	1327.0	694.0	367.0	163.0	102.0
5	Huoi Lac Village N 22°01'58.0" E 102°41'7.8"	2122.0	1449.0	592.0	20.0	61.0
6	Quang Lam Village N 22°02'14.9" E 102°40'31.9"	4694.8	2571.4	1020.4	776.0	327.0

Certification of company

The synthesis

**DEPARTMENT OF AQUATIC
ECOLOGY**

**TABLE: ANALYSIS SAMPLE OF
ZOOPLANKTON**

Subject: Nam Cha Hydropower Plant	Sampling analysis: Qualitative + quantitative
Station survey 1: Pa Tan village N 22°01'38.8" E 102°44'55.2"	Sampling time: 11/2010
Length of net (Volume): 10m (0.49m ³)	The simple collector:
Sampling Instruments for zooplankton: Juday net N°45	The sample analyst: Le Hung Anh

No	Scientific name	(1/10)		Density (organism /m ³)
	Copepoda	128		2612
1	<i>Eucyclops serrulatus</i>	+		
2	<i>Mesocyclops leuckarti</i>	+		
3	<i>Thermocyclops hyalinus</i>	+		
4	<i>Microcyclops varicans</i>	+		
5	<i>Mongolodiptomus birulai</i>	+		
	Cladocera	220		4490
6	<i>Chydorus sphaericus</i>	+		
7	<i>Alona rectagula</i>	+		
8	<i>Ceriodaphnia rigaudi</i>	+		
9	<i>Bosmina longirostris</i>	+		
10	<i>Scapholeberis kingii</i>	+		
11	<i>Moina dubia</i>	+		
	Rotatoria	68		1388
12	<i>Asplanchna sieboldi</i>	+		
13	<i>Brachionus caliciflorus</i>	+		
14	<i>Rotaria rotaria</i>	+		
	Others group	20		408
15	<i>Chironomidae</i>	+		
16	<i>Coleoptera</i>	+		
17	<i>Ostracoda</i>	+		
	Total	436		8898
	Total species in the sample	17		
5				
6				
3				
17				

**DEPARTMENT OF AQUATIC
ECOLOGY**
**TABLE: ANALYSIS SAMPLE OF
ZOOPLANKTON**

Subject: Nam Cha Hydropower Plant	Sampling analysis: Qualitative + quantitative
Station survey 2: Powerhouse N 22°01'48.1" E 102°44'41.2"	Sampling time: 11/2010
Length of net (Volume): 10m (0.49m ³)	The simple collector:
Sampling Instruments for zooplankton: Juday net N°45	The sample analyst: Le Hung Anh

No	Scientific name	(1/10)		Density (organism /m ³)
	Copepoda	180		3673.5
1	<i>Microcyclops varicans</i>	+		
2	<i>Mesocyclops leuckarti</i>	+		
3	<i>Thermocyclops hyalinus</i>	+		
4	<i>Thermocyclops taihokuensis</i>	+		
5	<i>Phyllodiaptomus tunguidus</i>	+		
	Cladocera	75		1530.6
6	<i>Moina dubia</i>	+		
7	<i>Simocephalus eliiabethae</i>	+		
8	<i>Diaphanosoma sarsi</i>	+		
9	<i>Ceriodaphnia rigaudi</i>	+		
10	<i>Bosmina longirostris</i>	+		
11	<i>Diaphanosoma leuchtenbergianum</i>	+		
12	<i>Daphnia carinata</i>	+		
13	<i>Chydorus sphaericus</i>	+		
	Rotatoria	30		612.2
14	<i>Brachionus caliciflorus</i>	+		
15	<i>Asplanchna sieboldi</i>	+		
	Others group	12		244.9
16	<i>Chironomidae</i>	+		
17	<i>Bivalvia</i>	+		
	Total	297		6061.2
	Total species in the sample	17		
5				
8				
2				
17				

The sample analyst

**DEPARTMENT OF AQUATIC
ECOLOGY**

**TABLE: ANALYSIS SAMPLE OF
ZOOPLANKTON**

Subject: Nam Cha Hydropower Plant	Sampling analysis: Qualitative + quantitative
Station survey 2: Powerhouses N 22°01'48.1" E 102°44'41.2"	Sampling time: 11/2010
Length of net (Volume): 10m (0.49m ³)	The simple collector:
Sampling Instruments for zooplankton: Juday net N°45	The sample analyst: Le Hung Anh

No	Scientific name	(1/10)		Density (organism /m ³)
	Copepoda	180		3673.5
1	<i>Microcyclops varicans</i>	+		
2	<i>Mesocyclops leuckarti</i>	+		
3	<i>Thermocyclops hyalinus</i>	+		
4	<i>Thermocyclops taihokuensis</i>	+		
5	<i>Phyllodiaptomus tunguidus</i>	+		
	Cladocera	75		1530.6
6	<i>Moina dubia</i>	+		
7	<i>Simocephalus eliabethae</i>	+		
8	<i>Diaphanosoma sarsi</i>	+		
9	<i>Ceriodaphnia rigaudi</i>	+		
10	<i>Bosmina longirostris</i>	+		
11	<i>Diaphanosoma leuchtenbergianum</i>	+		
12	<i>Daphnia carinata</i>	+		
13	<i>Chydorus sphaericus</i>	+		
	Rotatoria	30		612.2
14	<i>Brachionus caliciflorus</i>	+		
15	<i>Asplanchna sieboldi</i>	+		
	Others group	12		244.9
16	<i>Chironomidae</i>	+		
17	<i>Bivalvia</i>	+		
	Total	297		6061.2
	Total species in the sample	17		
5				
8				
2				
17				

The sample analyst

**DEPARTMENT OF AQUATIC
ECOLOGY**

**TABLE: ANALYSIS SAMPLE OF
ZOOPLANKTON**

Subject: Nam Cha Hydropower Plant	Sampling analysis: Qualitative + quantitative
Station survey 3: Dam in the Reservoir Nam Cha 3 N 22°01'41.8" E 102°42'43.7"	Sampling time: 11/2010
Length of net (Volume): 10m (0.49m ³)	The simple collector:
Sampling Instruments for zooplankton: Juday net N°45	The sample analyst: Le Hung Anh

No	Scientific name	(1/10)		Density (organism /m ³)
	<i>Copepoda</i>	68		1387.7
1	<i>Mongolodiptomus birulai</i>	+		
2	<i>Mesocyclops leuckarti</i>	+		
	<i>Cladocera</i>	52		1061.2
3	<i>Ceriodaphnia rigaudi</i>	+		
4	<i>Moina dubia</i>	+		
5	<i>Diaphanosoma sarsi</i>	+		
	<i>Rotatoria</i>	0		
		+		
		+		
	<i>Others group</i>	4		81.6
6	<i>Chironomidae</i>	+		
		+		
	Total	124		2530.5
	Total species in the sample	6		
2				
3				
1				
6				

The sample analyst

**DEPARTMENT OF AQUATIC
ECOLOGY**

**TABLE: ANALYSIS SAMPLE OF
ZOOPLANKTON**

Subject: Nam Cha Hydropower Plant	Sampling analysis: Qualitative + quantitative
Station survey 4: Ta Ham Village N22°01'51,6" E 102°42'18.0"	Sampling time: 11/2010
Length of net (Volume): 10m (0.49m ³)	The simple collector:
Sampling Instruments for zooplankton: Juday net N°45	The sample analyst: Le Hung Anh

No	Scientific name	(1/10)		Density (organism /m ³)
	<i>Copepoda</i>	34		694
1	Mongolodiptomus birulai	+		
2	Mesocyclops leuckarti	+		
3	Thermocyclops hyalinus	+		
	<i>Cladocera</i>	18		367
4	Ceriodaphnia rigaudi	+		
5	Bosminopsis longirostris	+		
6	Moina dubia	+		
	<i>Rotatoria</i>	8		163
7	Asplancha sieboldi	+		
8	Brachionus caliciflorus	+		
	<i>Others group</i>	5		102
9	Chironomidae	+		
	Total	65		1327
	Total species in the sample	9		
3				
3				
2				
1				
9				

The sample analyst

**DEPARTMENT OF AQUATIC
ECOLOGY**

**TABLE: ANALYSIS SAMPLE OF
ZOOPLANKTON**

Subject: Nam Cha Hydropower Plant	Sampling analysis: Qualitative + quantitative
Station survey 5: Huoi Lac Village N 22°01'58.0" E 102°41'7.8"	Sampling time: 11/2010
Length of net (Volume): 10m (0.49m ³)	The simple collector:
Sampling Instruments for zooplankton: Juday net N°45	The sample analyst: Le Hung Anh

No	Scientific name	(1/10)		Density (organism /m ³)
	Copepoda	71	68	1449
1	<i>Thermocyclops hialinus</i>	+		
2	<i>Microcyclops varicans</i>	+		
3	<i>Mesocyclops leuckarti</i>	+		
	Cladocera	29	28	592
4	<i>Moina dubia</i>	+		
5	<i>Bosmina longirostris</i>	+		
6	<i>Daphnia carinata</i>	+		
7	<i>Moinodaphnia macleayi</i>	+		
	Rotatoria	1	1	20
8	<i>Rotaria neptunia</i>	+		
9	<i>Brachionus caliciflorus</i>	+		
	Others group	3	3	61
10	<i>Chironomidae</i>	+		
11	<i>Coleoptera</i>	+		
12	<i>Nematoda</i>	+		
	Total	104	100	2122
	Total species in the sample	12		
3				
4				
2				
3				
12				

The sample analyst

**DEPARTMENT OF AQUATIC
ECOLOGY**

**TABLE: ANALYSIS SAMPLE OF
ZOOPLANKTON**

Subject: Nam Cha Hydropower Plant	Sampling analysis: Qualitative + quantitative
Station survey 6: Quang Lam Village N 22°02'14.9" E 102°40'31.9"	Sampling time: 11/2010
Length of net (Volume): 10m (0.49m ³)	The simple collector:
Sampling Instruments for zooplankton: Juday net N°45	The sample analyst: Le Hung Anh

No	Scientific name	(1/10)		Density (organism /m ³)
	Copepoda	126		2571.4
1	<i>Mesocyclops leuckarti</i>	+		
2	<i>Thermocyclops hyalinus</i>	+		
3	<i>Eucyclops serrulatus</i>	+		
4	<i>Phylodiaptomus tunguidus</i>	+		
5	<i>Eucyclops speratus</i>	+		
	Cladocera	50		1020.4
6	<i>Ceriodaphnia rigaudi</i>	+		
7	<i>Moina dubia</i>	+		
8	<i>Chydorus sphaesicus</i>	+		
9	<i>Simocephalus elizabethae</i>	+		
10	<i>Alona rectangula</i>	+		
11	<i>Bosmina longirostris</i>	+		
	Rotatoria	38		776
12	<i>Asplanchna sieboldi</i>	+		
13	<i>Brachionus calyciflorus</i>	+		
14	<i>Platylabus quadricornis</i>	+		
15	<i>Rotaria neptunula</i>	+		
	Others group	16		327
16	<i>Chironomidae</i>	+		
17	<i>Hemiptera</i>	+		
	Total	230		4694.8
	Total species in the sample	17		
5				
6				
4				
2				
17				

The sample analyst

Appendix 9. Results of bottom fauna analysis



Bảng : Danh sách thành phần động vật đáy suối Nậm Chà, Pa Tần 11/2010

STT	Tên loài ĐVĐ	Trạm khảo sát					
		1	2	3	4	5	6
	NGÀNH THÂN MỀM - MOLLUSCA						
	LỚP HAI MẢNH VỎ - BIVALVIA						
	Bộ Mytiloida						
	1. Họ Amblemidae						
1.	<i>Lamprotula contritus</i> (Heude)			+			
2.	<i>Oxyaia diespiter</i> (Mabille)			+	+		
	2. Họ Unionidae						
3.	<i>Lanceolaria grayi</i> (Griffith et Pidgeo)			+			
4.	<i>Nodularia dorii</i> (Wattebled)		+				+
5.	<i>Sinanodonta elliptica</i> (Heude)			+			
	Bộ Veneroida						
	3. Họ Corbiculidae						
6.	<i>Corbicula cyreniformis</i> Prime						
7.	<i>Corbicula lamarckiana</i> Prime				+		
8.	<i>Corbicula leviuscula</i> Prime	+					
9.	<i>Corbicula messageri</i> Bavey et Dautzenberg		+	+	+	+	+
10.	<i>Corbicula moreletiana</i> (Prime)	+					
	LỚP CHÂN BỤNG - GASTROPODA						
	Bộ Basommatophora						
	4. Họ Lymnaeidae						
11.	<i>Lymnaea swinhoei</i> Adams	+	+	+		+	+
12.	<i>Lymnaea viridis</i> Quoy et Gaimard			+		+	
	5. Họ Planorbidae						
13.	<i>Gyraulus heudei</i> (Clessin)					+	
	Bộ Mesogastropoda						
	6. Họ Ampullariidae						
14.	<i>Pomacea canaliculata</i> (Lamarck)	+		+	+		
	7. Họ Fluminicolidae						
15.	<i>Lithoglyphopsis tokinianus</i> (Bavay et Dautzenberg)		+	+	+		
	8. Họ Pachychilidae						
16.	<i>Brotia siamensis</i> (Brot)	+	+	+	+	+	+
17.	<i>Semisulcospira aubryana</i> (Heude)	+			+		
	9. Họ Stenothyridae						
18.	<i>Stenothyra messageri</i> Bavey et Dautzenberg			+	+	+	
	10. Họ Thiariidae						
19.	<i>Melanoides tuberculatus</i> (Muller)	+	+	+	+	+	+
20.	<i>Tarebia granifera</i> (Lamarck)	+	+	+			+
21.	<i>Thiara scabra</i> (Muller)		+		+	+	+
	11. Họ Viviparidae						



22.	<i>Angulyagra polyzonata</i> (Frauenfeld)	+	+	+	+	+	+
23.	<i>Sinotaia aeruginosa</i> (Reeve)	+		+	+	+	+
NGÀNH CHÂN KHỚP - ARTHROPODA							
PHỤ NGÀNH GIÁP XÁC- CRUSTACEA							
LỚP MALACOSTRACA							
Bộ Decapoda							
12. Họ Atyidae							
24.	<i>Caridina flavilineata</i> Dang	+	+	+	+	+	
25.	<i>Neocaridina vietnamensis</i> Dang	+					
13. Họ Palaemonidae							
26.	<i>Macrobrachium hainanense</i> Parisi	+			+		
14. Họ Parathelphusidae							
27.	<i>Somaniathelphusa dugasti</i> (Rathbun)			+			
		13	10	17	14	11	9

Bảng: Mật độ và sinh khối ĐVĐ các trạm khảo sát sông suối Nậm Chà, Pa Tần 11/2010

STT	Trạm khảo sát	Mật độ và sinh khối ĐVĐ							
		Tổng số		Bivalvia		Crustacea		Gastropoda	
		Con/m ²	g/m ²	Con/m ²	g/m ²	Con/m ²	g/m ²	Con/m ²	g/m ²
1	Bản Pa Tần N 22°01'38.8" E 102°44'55.2"	52	89.7	7	9.5	5	0.4	40	79.8
2	Khu vực tuyến nhà máy N 22°01'48.1" E 102°44'41.2"	46	34.1	7	9.6	3	0.2	36	24.3
3	Tuyến đập hồ chứa Nậm Chà 3 N 22°01'41.8" E 102°42'43.7"	61	127.6	10	66.9	3	4.3	48	56.4
4	Bản Tà Hăm N 22°01'51.6" E 102°42'18.0"	46	80.8	7	14.6	4	0.4	35	65.8
5	Bản Huổi lác N 22°01'58.0" E 102°41'7.8"	43	17.6	6	5.4	4	0.5	33	11.7
6	Bản Quảng lâm N 22°02'14.9" E 102°40'31.9"	33	36.3	4	11.6			29	24.7



TRƯỞNG PHÒNG QUẢN LÝ TỔNG HỢP

Nguyễn Văn Sinh

Người tổng hợp

Phạm Văn Minh

BẢNG PHÂN TÍCH ĐỘNG VẬT ĐÁY

Đề tài: Thủy điện Nậm Chà	Mẫu phân tích Định tính + Định lượng
Trạm KS: 1Bán Pa Tản N 22°01'38.8" E 102°44'55.2"	Thời gian thu mẫu: 11.2010
Độ dài kéo lưới (diện tích): 4 m (1m2)	Người thu mẫu: Phan Mạch
Dụng cụ thu mẫu ĐVĐ: lưới kéo tam giác	Người phân tích mẫu: Đỗ Văn Từ

[illegible]

Người phân tích mẫu

BẢNG PHÂN TÍCH ĐỘNG VẬT ĐÁY

Đề tài: Thủy điện Nậm Chà	Mẫu phân tích Định tính + Định lượng
Trạm KS: 2 Nhà máy N 22°01'48.1" E 102°44'41.2"	Thời gian thu mẫu: 11.2010
Độ dài kéo lưới (diện tích): 4 m (1m2)	Người thu mẫu: Phan Mạch
Dụng cụ thu mẫu ĐVĐ: lưới kéo tam giác	Người phân tích mẫu: Đỗ Văn Tứ

[illegible]

Người phân tích mẫu

BẢNG PHÂN TÍCH ĐỘNG VẬT ĐÁY

[illegible]

Người phân tích mẫu

BẢNG PHÂN TÍCH ĐỘNG VẬT ĐÁY

Đề tài: Thủy điện Nậm Chà	Mẫu phân tích Định tính + Định lượng
Trạm KS: 4Bản Tà Hầm N 22°01'51,6" E 102°42'18.0"	Thời gian thu mẫu: 11.2010
Độ dài kéo lưới (diện tích): 4 m (1m2)	Người thu mẫu: Phan Mạch
Dụng cụ thu mẫu ĐVĐ: lưới kéo tam giác	Người phân tích mẫu: Đỗ Văn Tứ

[illegible]

Người phân tích mẫu

BẢNG PHÂN TÍCH ĐỘNG VẬT ĐÁY

Table: The list of bottom fauna at the sampling stations in Nam Cha, Pa Tan area 11/2010

No	Bottom fauna name	Station survey					
		1	2	3	4	5	6
	MOLLUSCA						
	BIVALVIA						
	Orders: Mytiloida						
	1. Families: Amblemiidae						
1.	<i>Lamprotula contritus</i> (Heude)			+			
2.	<i>Oxynaia diespiter</i> (Mabille)			+	+		
	2. Families: Unionidae						
3.	<i>Lanceolaria grayi</i> (Griffith et Pidgeo)			+			
4.	<i>Nodularia dorii</i> (Wattebled)		+				+
5.	<i>Sinanodonla elliptica</i> (Heude)			+			
	Orders: Veneroida						
	3. Families: Corbiculidae						
6.	<i>Corbicula cyreniformis</i> Prime						
7.	<i>Corbicula lamarckiana</i> Prime				+		
8.	<i>Corbicula leviuscula</i> Prime	+					
9.	<i>Corbicula messengeri</i> Bavey et Dautzenberg		+	+	+	+	+
10.	<i>Corbicula moreletiana</i> (Prime)	+					
	GASTROPODA						
	Orders: Basommatophora						
	4. Families: Lymnaeidae						
11.	<i>Lymnaea swinhoei</i> Adams	+	+	+		+	+
12.	<i>Lymnaea viridis</i> Quoy et Gaimard			+		+	
	5. Families: Planorbidae						
13.	<i>Gyraulus heudei</i> (Clessin)					+	
	Orders: Mesogastropoda						
	6. Families: Ampullariidae						
14.	<i>Pomacea canaliculata</i> (Lamarck)	+		+	+		
	7. Families: Fluminicolidae						
15.	<i>Lithoglyphopsis tokinianus</i> (Bavay et Dautzenberg)		+	+	+		
	8. Families: Pachychilidae						
16.	<i>Brotia siamensis</i> (Brot)	+	+	+	+	+	+

17.	<i>Semisulcospira aubryana</i> (Heude)	+			+		
	9. Families: Stenothyridae						
18.	<i>Stenothyra messengeri Bavey et Dautzenberg</i>			+	+	+	
	10. Families: Thiaridae						
19.	<i>Melanoides tuberculatus</i> (Muller)	+	+	+	+	+	+
20.	<i>Tarebia granifera</i> (Lamarck)	+	+	+			+
21.	<i>Thiara scabra</i> (Muller)		+		+	+	+
	11. Families: Viviparidae						
22.	<i>Angulyagrappolyzonata</i> (Frauenfeld)	+	+	+	+	+	+
23.	<i>Sinotaia aeruginosa</i> (Reeve)	+		+	+	+	+
	ARTHROPODA						
	CRUSTACEA						
	MALACOSTRACA						
	Orders: Decapoda						
	12. Families: Atyidae						
24.	<i>Caridina flavilineata</i> Dang	+	+	+	+	+	
25.	<i>Neocaridina vietnamensis</i> Dang	+					
	13. Families: Palaemonidae						
26.	<i>Macrobrachium hainanense</i> Parisi	+			+		
	14. Families: Parathelphusidae						
27.	<i>Somaniathelphusa dugasti</i> (Rathbun)			+			
		13	10	17	14	11	9

The density and biomass of bottom fauna at the sampling stations in Nam Cha, Pa Tan area 11/2010

No	Location name	Density and biomass of bottom fauna							
		Total		Biavalvia		Crustacea		Gastropoda	
		organism/m ³	g/m ²	organism/m ³	g/m ²	organism/m ³	g/m ²	organism/m ³	g/m ²
1	Pa Tan village N 22°01'38.8" E 102°44'55.2"	52	89.7	7	9.5	5	0.4	40	79.8
2	Powerhouse N 22°01'48.1" E 102°44'41.2"	46	34.1	7	9.6	3	0.2	36	24.3
3	Dam in the Reservoir Nam Cha 3 N 22°01'41.8" E 102°42'43.7"	61	127.6	10	66.9	3	4.3	48	56.4
4	Ta Ham Village N22°01'51,6" E 102°42'18.0"	46	80.8	7	14.6	4	0.4	35	65.8
5	Huoi Lac Village N 22°01'58.0" E 102°41'7.8"	43	17.6	6	5.4	4	0.5	33	11.7
6	Quang Lam Village N 22°02'14.9" E 102°40'31.9"	33	36.3	4	11.6			29	24.7

TABLE: ANALYSIS SAMPLE OF BOTTOM FAUNA

[illegible]

TABLE: ANALYSIS SAMPLE OF BOTTOM FAUNA

[illegible]Initial Environment Evaluation – **Appendices**

DEPARTMENT OF AQUATIC ECOLOGY**TABLE: ANALYSIS SAMPLE OF BOTTOM FAUNA**

Subject: Nam Cha Hydropower Plant	Sampling analysis: Qualitative + quantitative
Station survey 3: Dam in the Reservoir Nam Cha 3 N 22°01'41.8" E 102°42'43.7"	Sampling time: 11/2010
Length of net (Volume): 12m (1m ²)	The simple collector: Phan Mach
Sampling Instruments for bottom fauna: Triangle trawl	The sample analyst: Đỗ Văn Tứ

No	Scientific name	Density (organism /m ³)	Biomass (g)	%
	Crustacea	3	4.3	5
1	<i>Caridina Jlavilineata</i> Dang	2	0.1	
2	<i>Somaniathelphusa dugasti</i> (Rathbun)	1	4.2	
	Gastropoda	48	56.39	79
3	<i>Angulyagrapolyzonata</i> (Frauenfeld)	7	6.2	
4	<i>Brotia siamensis</i> (Brot)	12	15.3	
5	<i>Lithoglyphopsis tokinianus</i>	4	0.04	
6	<i>Lymnaea swinhoei</i> Adams	2	0.4	
7	<i>Lymnaea viridis</i> Quoy et Gaimard	4	0.8	
8	<i>Melanoides tuberculatus</i> (Muller)	9	1.5	
9	<i>Pomacea canaliculata</i> (Lamarck)	1	26.4	
10	<i>Sinoiaia aeruginosa</i> (Reeve)	4	5.3	
11	<i>Stenothyra messengeri</i> Bavey et Dautzenberg	3	0.05	
12	<i>Tarebia grani/era</i> (Lamarck)	2	0.4	
	Bivalvia	10	66.9	16
13	<i>Corbicula messengeri</i> Bavey et Dautzenberg	5	6.4	
14	<i>Lanceolaria grayi</i> (Griffith et Pidgeo)	1	5.3	
15	<i>Lamprotula conrictus</i> (Heude)	1	19.7	
16	<i>Oxynaia diespiter</i> (Mabille)	2	8.7	
17	<i>Sinanodonta elliptica</i> (Heude)	1	26.8	
	Total	61	127.59	100
	Total species of the sample	17		

The sample analyst

DEPARTMENT OF AQUATIC ECOLOGY**TABLE: ANALYSIS SAMPLE OF BOTTOM FAUNA**

Subject: Nam Cha Hydropower Plant	Sampling analysis: Qualitative + quantitative
Station survey 4: Ta Ham Village N22°01'51,6" E 102°42'18.0"	Sampling time: 11/2010
Length of net (Volume): 12m (1m ²)	The simple collector: Phan Mach
Sampling Instruments for bottom fauna: Triangle trawl	The sample analyst: Đỗ Văn Tứ


No	Scientific name	Density (organism /m ³)	Biomass (g)	%
	Crustacea	4	0.4	9
1	<i>Caridina flavilineata</i> Dang	3	0.2	
2	<i>Macrobrachium hainamense</i> Parisi	1	0.2	
	Gastropoda	35	65.81	76
3	<i>Angulyagrappolyzonata</i> (Frauenfeld)	3	3.3	
4	<i>Brotia siamensis</i> (Brot)	9	14.2	
5	<i>Lithoglyphopsis tokinianus</i>	3	0.03	
6	<i>Melanoides tuberculatus</i> (Muller)	4	1	
7	<i>Pomacea canaliculata</i> (Lamarck)	1	35.4	
8	<i>Semisulcospira aubryana</i> (Heude)	6	7.4	
9	<i>Sinotaia aeruginosa</i> (Reeve)	4	4.3	
10	<i>Stenothyra messengeri</i> Bavey et Dautzenberg	4	0.08	
11	<i>Thiara scabra</i> (Muller)	1	0.1	
	Bivalvia	7	14.6	15
12	<i>Corbicula lamarckiana</i> Prime	2	4.3	
13	<i>Corbicula messengeri</i> Bavey et Dautzenberg	4	5.3	
14	<i>Oxynaias diesther</i> (Mabille)	1	5	
	Insect	0	0	0
	Total	46	80.81	100
	Total species of the sample	14		

The sample analyst

TABLE: ANALYSIS SAMPLE OF BOTTOM FAUNA

TABLE: ANALYSIS SAMPLE OF BOTTOM FAUNA

Appendix 10. Minutes of community consultation meeting



CỘNG HOÀ XÃ HỘI CHỦ NGHĨA VIỆT NAM
ĐỘC LẬP - TỰ DO - HẠNH PHÚC

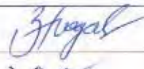



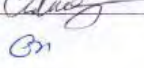


BIÊN BẢN HỌP THAM VẤN CỘNG ĐỒNG

Nội dung: V/v phổ biến thông tin về tác động môi trường của Công trình nhà máy Thủy điện tại xã Pa Tần, huyện Mường Nhé, tỉnh Điện Biên





Hôm nay, ngày 7...tháng 11...năm 2010

I. Thành phần tham dự:

Phía cộng đồng địa phương (danh sách đính kèm)

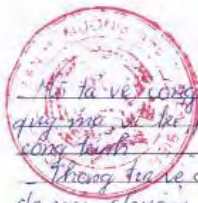
STT	Họ và tên	Chức vụ	Ký tên
1	Luông Văn Phìn	bi thư đảng ủy	
2	Vang Văn Chiến	CT MTTQ	
3	Lo Văn Tin	CT HĐND	
4	Vang Thi Ra	CT Hội phụ nữ xã	
5	Khang A Phai	Trưởng bản Tà Hăm	
7	Chảo U Loang	Phó Chủ tịch UBND	
8	Chảo San On		

Phía Công ty Tư vấn Phát triển Xã hội Việt Nam (SocialConsult)

STT	Họ và tên	Chức vụ	Ký tên
1	Đỗ Thu Hằng		
2	Đỗ Thu Hiền		
3	Trần Anh Quân		
4	Phạm Văn Hải		

II. Nội dung phổ biến thông tin

Biên bản tham vấn cộng đồng
Công trình Nhà máy Thủy điện Nậm Chà 3



hà và về công trình thủy điện Nậm Chá 3, các hạng mục công trình, quy mô, vị trí, thường an xây dựng, kế hoạch xây dựng các hạng mục công trình.

Thống kê về các tác động môi trường tiềm tàng (tác hại và tích cực) do các chuẩn bị dự án thi công và vận hành Dự án.

Các biện pháp giảm thiểu các tác động tiêu cực tiềm tàng tới môi trường về môi nước (không khí, tiếng ồn, bụi, nước mặt, thềm thực vật, động vật, đời sống người dân...) của công trình thủy điện Nậm Chá 3.

Kế hoạch thực hiện các biện pháp giảm thiểu tác động, trách nhiệm thực hiện, kinh phí, thời gian thực hiện.

Kế hoạch thực hiện (kế hoạch xây lắp, kế hoạch thực hiện các biện pháp giảm thiểu).

Cung cấp cho người tham dự các tài liệu về thông tin thủy điện Nậm Chá 3.

III - Kết quả tham vấn

1 - Về kế hoạch triển khai dự án

UBND, Ủy ban MTTQ và người dân trong xã nhất trí ủng hộ việc triển khai xây dựng công trình thủy điện trên địa bàn xã và mong Dự án được triển khai để người dân trong xã được sử dụng điện.

Đề nghị chủ đầu tư chủ thực hiện công trình theo đúng vị trí, cầu phân như đã được bày.

2 - Khu di tích và khu bảo tồn thiên nhiên

Liên lạc ban xã không có khu di tích lịch sử hay khu bảo tồn thiên nhiên nào.

3 - Tiến độ thực hiện dự án

Trong quá trình triển khai công trình, đại diện của chủ dự án là Tổng Công ty Thủy điện miền Bắc (Ban QLDA phát triển điện lực) phải thường xuyên báo cáo tiến độ với UBND xã và đại diện các thôn bản trong khu vực.

4 - Các biện pháp giảm thiểu

Đồng ý với các biện pháp giảm thiểu mà chủ đầu tư đã đưa ra. Ngoài ra người dân địa phương còn có 1 số ý kiến sau:

Trong quá trình triển khai và khai thác công trình chủ đầu tư cần thực hiện đúng các biện pháp giảm thiểu ô nhiễm không khí, tiếng ồn, bụi và nguồn nước mặt như đã cam kết.

Về giám sát thực hiện các công tác của chủ đầu tư trong triển khai dự án sẽ cử UBND và người dân địa phương theo dõi thường xuyên. Nếu có những vấn đề về môi trường, chủ đầu tư cần có biện pháp khắc phục nhanh chóng.

Đề nghị trái lại phải đặt đá chủ đầu tư bóc lớp đất mặt bên bờ mìn bên phải để đất đá loại bỏ sau đó lại lại lớp đất mặt bên bờ mìn bên phải.

Nó mìn cần thông báo trên địa phương báo cho chính quyền địa phương và người dân được biết thời gian bắt đầu và kết thúc công tác.

Nó mìn tại khu vực trước khu triển hành nó mìn cần có biển

thông báo nguy hiểm và vật cản để tránh người dân chưa biết

thông tin về nó mìn đi vào khu vực đó. Đồng thời cần có người

theo dõi ngăn cản những người đi vào khu vực nó mìn.

An toàn giao thông, đường quốc lộ, tên địa bàn xã là đường quốc
 lộ, các xe ô tô chở người và hàng hóa lưu thông qua các đoạn của
 cầu đi chậm và đảm bảo an toàn, lưu thông để tránh xảy ra tai nạn
 Chủ đầu tư cần quản lý tốt công nhân để tránh xảy ra các tai nạn và
 đảm bảo công nhân chấp hành luật lao động, an toàn, xung đột với thành niên
 trong bản
 không để đầu mối chảy vào đê và ruộng của bà con
 Xã Nam Chà và xã Pa Tân, giữ vì thi chủ đầu tư cần phải thuê
 thuê các biện pháp để tránh ô nhiễm nguồn nước trong tương hợp nguồn
 nước xã Nam Chà và xã Pa Tân, nhất là trong xây dựng thi chủ đầu tư phải
 có trách nhiệm là thường xuyên khai thác và khai thác
 nguồn nước
 Sau khi dự án hoàn thành cần trả lại mặt bằng như trước
 trạng ban đầu

Biên bản được lập vào hồi 12 giờ 00 phút cùng ngày và được thông qua các thành viên tham
 dự cùng nghe, nhất trí, biên bản được lập 02 bản gồm 03 trang

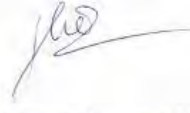
Đại diện

UBHD xã Pa Tân

 CHỦ TỊCH
 Lương Văn Phấn

Đại diện

Công ty Tư vấn Phát triển Xã hội Việt Nam


 Đỗ Thị Thu Hiền

Biên bản tham vấn cộng đồng
 Công trình Nhà máy Thủy điện Nậm Chà 3

The socialist republic of Vietnam
Independence – Freedom – Happiness

Dien Bien, 7th November, 2010

MINUTES OF THE CONSULTATIVE MEETING ON
Environment, resettlement, compensation and assistance

I. Participants

Representative Pa Tan

Mr Luong Van Phin – Party’s secretary of the commune

....

Representative of mass organisations of Pa Tan commune

Mr Vang Van Chieng – Chairman of the Fatherland front

Mr Lo Van In – Chairman of the People’s committee

Ms Vang Thi Ha - Chairwomen of Women’s association

Mr Chao U Loang – vice-Chairman of the people’s Committee

Representatives of village leaders:

Pa Tan village, Mr Poong Van Pan

Ta Ham Village, Mr Hang A Pua

Representative of 11 households of Pa Tan village and 33 households of Ta Ham village
(list of these households are enclosed)

Representatives of investor and consultant agency of project preparation:

Mr Nguyen Viet Quang , – Viet Nam Electricity group - NPC

Mr Dao Minh Huong , Viet Nam electricity groups - NPC

Mr Tran Anh Quan, Vietnam Social Development Consulting Co. Company

Mr Tran Xuan Phong, Vietnam Social Development Consulting Co. Company

Mr Pham Van Mach, Vietnam Social Development Consulting Co. Company

Ms Ngo Thanh Tung, Vietnam Social Development Consulting Co. Company

Ms Do Thu Hang, Vietnam Social Development Consulting Co. Company

Ms Do Thu Hien, Vietnam Social Development Consulting Co. Company

II – Information disclosure

Description of the construction of Nam Cha 3 hydropower plant including scope of the construction, location, technical solution of the construction, implementation schedule of the construction components

Information disclosure of potential impacts (both negative and positive sites) during the progress of preparation, construction and operation of the project

Mitigative measures to minimize negative impacts on environment (air, noise, sediments, surface water, vegetable carpet, animals, people's livelihood...) caused by the construction of Nam Cha 3 hydropower plant

Implementation plan of mitigative measures: impacts, responsibility, monitoring indicators, budget, schedule

Implementation schedule (installation plan, implementation plan of mitigative measures).

Distribution of document of Nam Cha 3 hydropower plant profile to all participants

III – Results of the Consultative meeting**1 – Location of the plant**

Nam Cha CPC, Fatherland front committee, and people in the commune agreed on the construction of hydropower plant in the commune and expected that the construction would be carried soon to provide electricity to people in the commune

The constructor was requested to carry out the project properly following the content of the present (location, components...)

2. Monument and nature preservation

There is not any area of monument or nature preservation zone in the commune.

3. Implementation progress of the project

During the construction progress, representatives of the constructor, Viet Nam Electricity – NPC are required to update and report progress of the construction regularly to CPCCPC and representatives of villages in the area.

4. Mitigative measures

Mitigative measures given by the constructor were agreed. In addition, people proposed some other ideas:

During the implementation stage, the constructor (CP1) should apply mitigative measures to reduce pollution of air, noise, sediments, and surface water complying the commitment,

Monitoring activities during the implementation of the commitment will be carried out regularly by CPC and people. Any environmental problems (if any) will be timely solved by the constructor.

About two dump-grounds of rubbles, the constructor need to excavate and save the top layer of the soil before discharging the waste of rubbles. The top layer will be put on the top of these dump ground so people can cultivate on.

Mine blasting: local authorities and people need to be informed about time of starting and ending of mine blasting. In the area, where mine blasting will be carried out, signal boards and barricade need to be provided in advance to keep people away from the blasting area. Construction staff must be sent to protect people entering the blasting area.

Traffic safety: transportation roads in the commune are bendy, therefore vehicles transporting construction materials should blow the horn to avoid accident.

The constructor should provide good management to their workers to avoid social problems like thief, drugs, prostitution and conflict with the youth of the villages.

Lubricant should be kept away from fields of people.

Nam Cha stream is where people come for bathing and washing, so the constructor should apply mitigative measures to avoid pollution in the water source. If the water source in Nam Cha stream is polluted by construction activities of the project, the constructor is in charge to compensate to people and restore the water source.

When the construction is completed, the conditions of the area should be recovered at least as equal prior to the project.

This Minute including 03 pages is made at 12:00 on the day and agreed by all participants.

DỰ ÁN CÔNG TRÌNH NHÀ MÁY THỦY ĐIỆN NẬM CHÀ 3**Biên Bản Tham Ván Cộng đồng về các vấn đề môi trường**Xã/Phường Pa Tân, Huyện/Quận Mường Nhé, Tỉnh Điện BiênNgày 18 Tháng 1 Năm 2012**I. THÀNH PHẦN THAM DỰ**

Đại diện Chủ đầu tư Dự án Công trình Thủy điện Nậm Chà 3, gồm:

- 1.
- 2.
- 3.

Đại diện Đơn vị Tư vấn (Social Consult – Công ty Tư vấn Phát triển Xã hội Việt Nam)

1. Phan Thị Anh Đào
2. Trần Anh Quân
3. Đỗ Thị Blue Hiền

Đại diện chính quyền và tổ chức đoàn thể xã/phường Pa Tân bao gồm:

1. Lương Văn Phin – Bí thư Đảng ủy - Chủ tịch xã Pa Tân
2. Văng Văn Chông – Chủ tịch Ủy ban MTTQ xã Pa Tân
3. Văng Thị Hã – Chủ tịch Hội phụ nữ xã Pa Tân
- 4.

Và người dân của các tổ dân phố thuộc khu vực dự án xã/phường Pa Tân

Danh sách hộ dân tham gia và ký nhận về sự tham gia được đính kèm.

II. NỘI DUNG THAM VẤN:**1. Đại diện Đơn vị Tư vấn cung cấp thông tin cho người tham dự bao gồm:**

- Mô tả về dự án Công trình Thủy điện Nậm Chà 3.....
- Các tác động tích cực và tiêu cực của dự án.....
- Kế hoạch và các biện pháp giảm thiểu các tác động tiêu cực tới môi trường trong giai đoạn của dự án.....
- Tập thể tham vấn đối với các hộ bị ảnh hưởng.....
- và tiếp thu ý kiến, thắc mắc của người dân về các vấn đề môi trường do dự án triển khai.....

III. KẾT QUẢ THAM VẤN:

1 – Ý kiến về các tác động tiềm tàng của Dự án đến môi trường tự nhiên và môi trường xã hội

- UBND, UBNDTTQ xã La Tân và cộng đồng dân cư trong khu vực dự án ủng hộ và nhất trí triển khai công trình Thủy điện nằm chia 3 tại địa bàn xã
- Các tác động tiêu cực trong giai đoạn giải phóng mặt bằng, thi công và vận hành cần có biện pháp giảm thiểu tích cực nhất là việc thu hồi đất canh tác
- Các tác động tích cực đặc biệt là việc hưởng lợi khi hoàn thành dự án được người dân rất ủng hộ
- Đề nghị tạo điều kiện cho bà con được sử dụng điện như

2 – Ý kiến về các biện pháp giảm thiểu tác động môi trường

- Việc thực hiện các biện pháp giảm thiểu các tác động đến môi trường như nỗ lực thu hồi đất, quá trình thi công cần thực hiện đúng theo cam kết
- Thực hiện nghiêm chỉnh, đo đạc chính xác nhất là các ảnh hưởng về đất đai, cây cối
- Việc thực hiện các biện pháp giảm thiểu tác động môi trường phải có sự giám sát của chính quyền và đại diện người dân

3 – Kế hoạch thực hiện

- Quá trình xây dựng kế hoạch thực hiện quản lý và giám sát môi trường cần có sự tham gia của người dân địa phương
- Kế hoạch thực hiện dự án và kế hoạch quản lý môi trường phải được công khai và thông báo cho người dân

4 – Sự tham gia của người dân trong quản lý môi trường

- Người dân đề nghị tham gia vào công tác giám sát việc thực hiện các biện pháp giảm thiểu môi trường.
- Với xây dựng kế hoạch giảm thiểu tác động cần thu thập ý kiến đóng góp của người dân.

5 – Cơ chế giải quyết khiếu nại

- Công khai, minh bạch cơ chế giải quyết khiếu nại.
- Giải quyết chính xác, nhanh chóng khi có đơn khiếu nại.

Cuộc họp kết thúc lúc giờ cùng ngày. Đại diện chính quyền Xã, thôn, đại diện các tổ chức đoàn thể, và đại diện người dân tham dự cuộc họp cùng đọc và thống nhất với nội dung biên bản cuộc họp và cùng ký tên dưới đây.

Chủ đầu tư Dự án

(Ký tên, đóng dấu)

Đại diện UBND Xã/Phường Pa Jai

(Ký tên, đóng dấu)



CHỦ TỊCH

Lương Văn Phin

Đại diện các trưởng thôn

Đại diện UBMTTQ



NAM CHA 3 HYDROPOWER PLANT PROJECT**Minutes of Consultation with community on Environmental issues**

Commune: Pa Tan, District: Muong Nhe, Province: Dien Bien

18th January, 2012

I. PARTICIPANTS

Authorized representatives of Investor (Nam Cha 3 Hydropower Plant Project), including:

- ?

Authorized representatives of consultancy unit (Vietnam Social Consult Company), including:

- Pham Thi Anh Dao
- Tran Anh Quan
- Do Thi Thu Hien

Authorized representatives of authorities and of mass organizations of Pa Tan commune, including:

- Luong Van Phin, CPC Chairman
- Vang Van Chien, Chairman of Fatherland Front of Pa Tan commune
- Vang Thi Ha, Chairman of Veterans Association of Pa Tan commune

II. CONSULTATIVE CONTENTS:

1. Description of Nam Cha 3 Hydropower Plant Project.
2. Impacts on the environment (positive and negative) during the construction and operation process of Nam Cha 3 Hydropower Plant Project.
3. Measures for mitigating negative impacts on the environment during the construction and operation process of Nam Cha 3 Hydropower Plant Project.
4. Consulting and collecting suggestions of the commune authorities on measures to mitigate negative impacts on the environment

III. CONSULTATIVE OUTCOMES:

- 1. Opinions about the potential impacts of the project on the natural and social environment.**

Authorized representatives of local authorities and mass organizations absolutely support the project. They also proposed measures to mitigate negative impacts on the environment and will create favourable conditions for the implementation of the project.

Negative impacts during the period of land clearance, implementation and operation should be minimized, especially the acquisition of arable land.

Positive impacts from the project are supported by the local people.

It was suggested that local people should have the opportunity to use a safe and stable source of power.

2. Opinions about the mitigate measures of environmental impacts

The implementation of the mitigate measures of environmental impacts such as blasting, land acquisition, construction should be done under the commitment.

The IOL and DMS must be done exactly, especially on the impacts on land and trees.

The implementation of the mitigate measures of environmental impacts must be monitored by the local authority and representatives of local people.

3. Implementation plan

The building of the environment management plan should have the participation of local people.

The implementation plan and environment management plan must be publicized and informed to the people.

The participation of local people in environment management plan.

People are suggested to participate into the environment management and mitigate measures of negative impacts.

The building of the environment mitigate plan should have the opinions of local people.

4. Grievance redress mechanism

People understand the grievance resolution process during the implementation of the Project. When problem arises, people need to inform the authorized representatives of Commune People's Committee and independent monitoring unit in order to resolve grievance quickly, timely and precisely to ensure people's entitlement. The process of grievance resolution must be publicized and transparent.

The meeting ended at of the same day. Authorized representatives of commune and village authorities and of mass organizations unanimously read and agreed upon the contents of minutes and signed here under:

Authorized representatives of PMU

Authorized representatives of CPC

(Signed, stamped)

DỰ ÁN CÔNG TRÌNH NHÀ MÁY THỦY ĐIỆN NẬM CHÀ 3**Biên Bản Tham Vấn Cộng đồng về các vấn đề môi trường**Xã/Phường Bản Tà Hầm Huyện/Quận Mường Nhé, Tỉnh Điện Biên

Ngày Tháng Năm

I. THÀNH PHẦN THAM DỰ

Đại diện Chủ đầu tư Dự án Công trình Thủy điện Nậm Chà 3, gồm:

- 1.
- 2.
- 3.

Đại diện Đơn vị Tư vấn (Social Consult – Công ty Tư vấn Phát triển Xã hội Việt Nam)

1. Phan Thị Anh Đào
2. Trần Anh Quân
3. Đỗ Thị Thu Hiền

Đại diện chính quyền và tổ chức đoàn thể xã/phường Bản Tà Hầm..... bao gồm:

1. Lương Văn Phìn - Bí thư Đảng ủy - Chủ tịch xã Pa Tân
2. Văng Văn Chông - Chủ tịch ủy ban MTTQ xã Pa Tân
3. Boong Văn Sườn - Trưởng bản Tà Hầm
- 4.

Và người dân của các tổ dân phố thuộc khu vực dự án xã/phường Bản Tà Hầm.....

Danh sách hộ dân tham gia và ký nhận về sự tham gia được đính kèm.

II. NỘI DUNG THAM VẤN:**1. Đại diện Đơn vị Tư vấn cung cấp thông tin cho người tham dự bao gồm:**

- Mô tả về dự án công trình Thủy điện Nậm Chà 3.
- Các tác động tiêu cực và tích cực của dự án.
- Kế hoạch và các biện pháp giảm thiểu các tác động tiêu cực tới môi trường địa phương trong các giai đoạn của dự án.
- Tiếp thu ý kiến đóng góp và giải đáp thắc mắc cho người dân.

III. KẾT QUẢ THAM VẤN:

1 – Ý kiến về các tác động tiềm tàng của Dự án đến môi trường tự nhiên và môi trường xã hội

- Người dân trong Bản Tả Hầm ủng hộ và nhất trí việc triển khai dự án Công trình Thủy điện Nậm Chả 3 tại bản.
- Các tác động tiêu cực trong giai đoạn giải phóng mặt bằng, thi công và vận hành cần có biện pháp giảm thiểu tích cực nhất là việc thu hồi đất canh tác.
- Khuyến khích các tác động tích cực của dự án nhất là môi trường từ dự án cho dân bản.

2 – Ý kiến về các biện pháp giảm thiểu tác động môi trường

- Việc thực hiện các biện pháp giảm thiểu các tác động tiêu cực tới môi trường phải thực hiện theo đúng cam kết của chủ dự án.
- Công tác kiểm tra, thiết lập chỉ tiêu nhất là về đất đai, cây cối phải chính xác.
- Khi có sự cố về môi trường chủ đầu tư cần nhanh chóng tìm hiểu nguyên nhân và có biện pháp khắc phục tích cực.

3 – Kế hoạch thực hiện

- Quá trình xây dựng kế hoạch thực hiện quản lý và giám sát môi trường cần có sự tham gia của người dân địa phương.
- Kế hoạch thực hiện dự án và kế hoạch quản lý môi trường phải được công khai và thông báo cho người dân.

4 – Sự tham gia của người dân trong quản lý môi trường

- Người dân mong muốn tham gia vào công tác giám sát việc thực hiện các biện pháp giảm thiểu môi trường.
- Việc xây dựng kế hoạch giảm thiểu tác động cần thu thập ý kiến đóng góp của người dân.

5 – Cơ chế giải quyết khiếu nại

- Công khai minh bạch cơ chế giải quyết khiếu nại.
- Giải quyết chính xác, nhanh chóng khi có tồn khiếu nại của nhân dân.

Cuộc họp kết thúc lúc giờ cùng ngày. Đại diện chính quyền Xã, thôn, đại diện các tổ chức đoàn thể, và đại diện người dân tham dự cuộc họp cùng đọc và thống nhất với nội dung biên bản cuộc họp và cùng ký tên dưới đây.

Chủ đầu tư Dự án

(Ký tên, đóng dấu)

Đại diện UBND Xã/Phường Pa Tân

(Ký tên, đóng dấu)



Lương Văn Phin

Đại diện các trưởng thôn

Đại diện UBMTTQ



NAM CHA 3 HYDROPOWER PLANT PROJECT**Minutes of Consultation with community on Environmental issues**

Village: Ta Ham, District: Muong Nhe, Province: Dien Bien

I. PARTICIPANTS

Authorized representatives of Investor (Nam Cha 3 Hydropower Plant Project), including:

Authorized representatives of consultancy unit (Vietnam Social Consult Company), including:

- Pham Thi Anh Dao
- Tran Anh Quan
- Do Thi Thu Hien

Authorized representatives of authorities and of mass organizations of Pa Tan commune, including:

- Luong Van Phin, CPC Chairman
- Vang Van Chien, Chairman of Fatherland Front of Pa Tan commune
- Poong Van Suon, Ta Ham Village leader

II. CONSULTATIVE CONTENTS:

1. Description of Nam Cha 3 Hydropower Plant Project.
2. Impacts on the environment (positive and negative) during the construction and operation process of Nam Cha 3 Hydropower Plant Project.
3. Measures for mitigating negative impacts on the environment during the construction and operation process of Nam Cha 3 Hydropower Plant Project.
4. Consulting and collecting suggestions of the commune authorities on measures to mitigate negative impacts on the environment

III. CONSULTATIVE OUTCOMES:**1. Opinions about the potential impacts of the Project on the natural and social environment.**

People in Ta Ham village absolutely support the project. They also proposed measures to mitigate negative impacts on the environment and will create favourable conditions for the implementation of the project.

Negative impacts during the period of land clearance, implementation and operation should be minimized, especially the acquisition of arable land.

Positive impacts from the project are supported by the local people.

2. Opinions about the mitigate measures of environmental impacts

The implementation of the mitigate measures of environmental impacts such as blasting, land acquisition, construction should be done under the commitment of the Owner.

The IOL and DMS must be done exactly, especially the impacts on land and trees.

When there are environmental problems, PMU has to quickly find the reasons and solutions.

3. Implementation plan

The building of the environment management plan should have the participation of local people.

The implementation plan and environment management plan must be publicized and informed to the people.

4. The participation of local people in environment management plan

People hope to participate into the environment management and mitigate measures of negative impacts.

The building of the environment mitigate plan should have the opinions of local people.

5. Grievance redress mechanism

People understand the grievance resolution process during the implementation of the Project. When problem arises, people need to inform the authorized representatives of Commune People's Committee and independent monitoring unit in order to resolve grievance quickly, timely and precisely to ensure people's entitlement. The process of grievance resolution must be publicized and transparent.

The meeting ended at of the same day. Authorized representatives of commune and village authorities and of mass organizations unanimously read and agreed upon the contents of minutes and signed here under:

**Authorized representatives of PMU
of CPC**

Authorized representatives

(Signed, stamped)

DỰ ÁN CÔNG TRÌNH NHÀ MÁY THỦY ĐIỆN NẬM CHÀ 3**Biên Bản Tham Vấn Cộng đồng về các vấn đề môi trường**Xã/Phường Quảng Lâm, Huyện/Quận Huế, Tỉnh Điện Biên

Ngày Tháng Năm

I. THÀNH PHẦN THAM DỰ

Đại diện Chủ đầu tư Dự án Công trình Thủy điện Nậm Chà 3, gồm:

- 1.
- 2.
- 3.

Đại diện Đơn vị Tư vấn (Social Consult – Công ty Tư vấn Phát triển Xã hội Việt Nam)

1. Phan Thị Anh Đào
2. Trần Anh Quân
3. Đỗ Thị Thu Hiền

Đại diện chính quyền và tổ chức đoàn thể xã/phường Quảng Lâm bao gồm:

1. Lũng Văn Sơn - Phó chủ tịch uỷ ban nhân dân xã
2. Giảng A Xĩa - Chủ tịch uỷ ban nhân dân xã
- 3.
- 4.

Và người dân của các tổ dân phố thuộc khu vực dự án xã/phường Quảng Lâm

Danh sách hộ dân tham gia và ký nhận về sự tham gia được đính kèm.

II. NỘI DUNG THAM VẤN:**1. Đại diện Đơn vị Tư vấn cung cấp thông tin cho người tham dự bao gồm:**

- Mục tiêu ảnh hưởng và các tác động (tiêu cực và tích cực) của dự án Công trình Thủy điện Nậm Chà 3 đối với địa phương kế hoạch và các biện pháp giảm thiểu các tác động tới môi trường tự nhiên và môi trường xã hội bởi hoạt động xây dựng Dự án.
- Sự tham gia của người dân trong quá trình giám sát và quản lý môi trường.

III. KẾT QUẢ THAM VẤN:

1 – Ý kiến về các tác động tiềm tàng của Dự án đến môi trường tự nhiên và môi trường xã hội

- Dự án không thu hồi đất đai canh tác của xã Quảng Lâm.
- Dự án khi hoàn thành sẽ tạo điều kiện cho một số bản của xã Quảng Lâm hưởng lợi từ dự án. Một số bản đó sẽ được nối điện từ nhà máy.
- Đời sống sinh hoạt, học tập của người dân xã sản xuất kinh doanh sẽ được cải thiện khi có điện.
- Thông tin văn hoá, xã hội được phổ biến tới người dân qua tivi, đài.

2 – Ý kiến về các biện pháp giảm thiểu tác động môi trường

- Người dân đề nghị tạo điều kiện cho nhiều bản của xã Quảng Lâm được sử dụng điện của dự án.
- Các tác động tiêu cực của dự án tới môi trường phải có các biện pháp giảm thiểu.
- Khi có các sự cố về môi trường chủ đầu tư cần có biện pháp khắc phục nhanh chóng.
- Luôn tuyên truyền công nhân Dự án là người dân địa phương để hạn chế xả rác, tạo công ăn việc làm.

3 – Kế hoạch thực hiện

- Người dân kiến nghị cần xây nhanh tiến độ thực hiện Dự án để người dân sớm được sử dụng điện.
- Kế hoạch thực hiện dự án và kế hoạch quản lý môi trường phải được công khai và thông báo cho người dân.

4 – Sự tham gia của người dân trong quản lý môi trường

- Cần có đơn vị giám sát độc lập thường trực tại địa phương để phối hợp với chính quyền và người dân địa phương trong quá trình giám sát các tác động đến môi trường, biện pháp giảm thiểu và xử lý vi phạm của nhà thầu trong công tác bảo vệ môi trường.

5 – Cơ chế giải quyết khiếu nại

- Công khai, minh bạch cơ chế giải quyết khiếu nại.
- Giải quyết nhanh chóng, chính xác khi có đơn khiếu nại.

Cuộc họp kết thúc lúc giờ cùng ngày. Đại diện chính quyền Xã, thôn, đại diện các tổ chức đoàn thể, và đại diện người dân tham dự cuộc họp cùng đọc và thống nhất với nội dung biên bản cuộc họp và cùng ký tên dưới đây.

Chủ đầu tư Dự án

(Ký tên, đóng dấu)

Đại diện UBND Xã/Phường *Quang Lâm*

(Ký tên, đóng dấu)

KT. CHỦ TỊCH
PHÓ CHỦ TỊCH

Đại diện UBMTTQ

Đại diện các trưởng thôn *Lương Văn Sơn*

NAM CHA 3 HYDROPOWER PLANT PROJECT**Minutes of Consultation with community on Environmental issues**

Commune: Quang Lam, District: Muong Nhe, Province: Dien Bien

I. PARTICIPANTS

Authorized representatives of Investor (Nam Cha 3 Hydropower Plant Project), including:

Authorized representatives of consultancy unit (Vietnam Social Consult Company), including:

- Pham Thi Anh Dao
- Tran Anh Quan
- Do Thi Thu Hien

Authorized representatives of authorities and of mass organizations of Pa Tan commune, including:

- Lung Van Son, Vice CPC Chairman
- Giang A Xia, CPC Chairman

II. CONSULTATIVE CONTENTS:

1. Impacts on the environment (positive and negative) during the construction and operation process of Nam Cha 3 Hydropower Plant Project.
2. Measures for mitigating negative impacts on the environment during the construction and operation process of Nam Cha 3 Hydropower Plant Project.
3. The participation of affected people in the environmental management and monitoring process.

III. CONSULTATIVE OUTCOMES:**1. Opinions about the potential impacts of the Project on the natural and social environment.**

The project does not acquire arable land of Quang Lam commune.

When the project is completed, it will give positive opportunities for Quang Lam's people to use power. Some villages will be connected with the power from the powerhouse.

The living standard, production and business of local people will be improved when there is power.

Cultural and social information will be publicized to local people via mass media like television, radio.

2. Opinions about the mitigate measures of environmental impacts

Local people requested that some villages in Quang Lam commune should be provided with power.

Negative impacts during the period of land clearance, implementation and operation should be minimized, especially the acquisition of arable land.

When there are environmental problems, PMU has to quickly find the reasons and solutions.

The project should recruit local people to create jobs and income for them.

3. Implementation plan

The project's schedule should be executed on time so that people will soon have chance to use power.

The implementation plan and environment management plan must be publicized and informed to the people.

4. The participation of local people in environment management plan

There should have an independent monitoring consultancy in affected area. They will coordinate with local authorities, people in the monitoring of environment management and mitigate measures of negative impacts.

5. Grievance redress mechanism

People understand the grievance resolution process during the implementation of the Project. When problem arises, people need to inform the authorized representatives of Commune People's Committee and independent monitoring unit in order to resolve grievance quickly, timely and precisely to ensure people's entitlement. The process of grievance resolution must be publicized and transparent.

The meeting ended at of the same day. Authorized representatives of commune and village authorities and of mass organizations unanimously read and agreed upon the contents of minutes and signed here under:

Authorized representatives of PMU

Authorized representatives of CPC

(Signed, stamped)

C. TY TƯ VẤN PHÁT TRIỂN XÃ HỘI VIỆT NAM
MST: 0102854466

Mẫu số: C40b-HD
(Ban hành theo QĐ số: 19/2006/QĐ-BTC
ngày 30/03/2006 của Bộ trưởng BTC)

DANH SÁCH THAM VẤN

- Nội dung công việc: *Tham vấn cộng đồng*
- Địa điểm: *Bản Cũ Hầm*
- Thời gian thực hiện: *17/1/2012*

Số:

TT	Họ và tên	Giới	Địa chỉ	Chữ ký
1	Hàng A Dưa	Nam	bản Ta Hầm	Dưa
2	Hàng A Di	Nam	bản Ta Hầm	Di
3	Hàng A Chua	Nam	bản Ta Hầm	Chua
4	Vũ A Nhai	Nam	bản Ta Hầm	Nhai
5	Hàng A Sưa	Nam	bản Ta Hầm	Sưa
6	Lân A Chua	Nam	bản Ta Hầm	Chua
7	Lân A Pô	Nam	bản Ta Hầm	Pô
8	Lân A Phia	Nam	bản Ta Hầm	Phia
9	Hàng A Chua	Nam	bản Ta Hầm	Chua
10	Lân Thi Lu	Nam	bản Ta Hầm	Lu
11	Hàng A Lã	Nam	bản Ta Hầm	Lã
12	Lân A Dưa	Nam	bản Ta Hầm	Dưa
13	Hàng A Sưa	Nam	bản Ta Hầm	Sưa
14	Vũ Thi Chua	Nữ	bản Ta Hầm	Chua
15	Lân Thi Sưa	Nữ	bản Ta Hầm	Sưa
16	Sử Thi Chua	Nữ	bản Ta Hầm	Chua
17	Hàng A Phia	Nam	bản Ta Hầm	Phia
18	Vũ Thi Chua	Nữ	bản Ta Hầm	Chua
19	Hàng A Chua	Nam	bản Ta Hầm	Chua
20	Lân A Lôi	Nam	bản Ta Hầm	Lôi
21	Hàng A Sưa	Nam	bản Ta Hầm	Sưa
22	Vũ A Dưa	Nam	bản Ta Hầm	Dưa
	Cộng			

Xác nhận CHỦ TỊCH



Lương Văn Phin

Người lập biểu

pho

Hàng A pho

C.TY TƯ VẤN PHÁT TRIỂN XÃ HỘI VIỆT NAM
MST: 0102854466

Mẫu số: C40b-HD
(Ban hành theo QĐ số: 19/2006/QĐ-BTC
ngày 30/03/2006 của Bộ trưởng BTC)

DANH SÁCH THAM VẤN

Số:

- Nội dung công việc: Tham vấn môi trường
.....
- Địa điểm: UBND xã Quãng Lân
.....
- Thời gian thực hiện: 19/11/2012
.....

TT	Họ và tên	Giới	Địa chỉ	Chữ ký
1	Giăng A Xa	Nam	Bản Chà Nơ 1,2	Xa
2	Thào A Thanh	Nam	Bản Huộc Sỏi Lông	Thào
2	Giăng A Phua	Nam	Bản Chà Nơ 1,2	
3	Thào A Nha	Nam	nt	
4	Thào A Phong	Nam	nt	
5	Văng A Dơ	Nam	nt	
6	Di Thi May	Nữ	nt	
7	Giăng A Sủ	Nam	"	
8	Giăng A Lư	Nam	"	
9	Liêu Thi Mỹ	Nữ	"	
10	Giăng A Thanh	Nam	"	
11	Giăng A Chui	Nam	"	
12	Văng A Khua	Nam	"	
13	Di A Khua	Nam	"	
14	Sung A Chao	Nam	"	
15	Thào A Trang	Nam	Bản Huộc Sỏi Lông	
16	Thào A Lênh	Nam	nt	
17	Văng A Chinh	Nam	nt	
18	Thào A Già	Nam	nt	
19	Liêu A Tinh	Nam	nt	
20	Thào A Sung	Nam	nt	
21	Thào A Nha	Nam	nt	
22	Thào A Sinh	Nam	nt	
23	Thào A Thanh	Nam	nt	
24	Thào A Cui	Nam	nt	
25	Sung A Dung	Nam	nt	
26	Thùng A Pao	Nam	nt	
27			nt	
28	Cộng			

Xác nhận
KT CHỦ TỊCH
PHÓ CHỦ TỊCH



Lương Văn Sơn

Người lập biểu - Trưởng ban.

Xa
Giăng A Xa

Appendix 10. Pictures of consultation meetings**Consultations with local authorities****Household In-depth Interviews**



Consultations with local people in the subproject area