

Appendix A: EIA of Resettlement Sites

Table of content

Abbreviations.....	1
Foreword.....	2
Chapter 1 General overview of resettlement plans.....	2
1.1. Name of project.....	2
1.2. Name of project owner	3
1.3. Estimate the total number of relocated people.....	3
1.4. Capacity of resettlement sites	4
1.5. Resettlement implementation and resettlement sites development.....	5
1.6. Characteristic of resettlement sites.....	7
1.6.1. Trung Son site	7
1.6.2. Muong Ly site	9
1.6.3. Trung Ly site	11
1.6.4. Resettlement sites in Son La Province.....	13
1.7. Planning for agricultural activities after relocated	15
1.8. Resettlement Implementation Schedule	15
Chapter 2 Environmental Baseline.....	19
2.1. Natural and Environmental conditions of resettlement sites	19
2.1.1. Geology, lithology, tectonics and landscape.....	19
2.1.2. Meteorology and hydrology conditions.....	19
2.1.3. Natural environment baseline, sensitivity and capacity	20
2.1.3.1. Air.....	20
2.1.3.2. Water quality	21
2.1.3.3. Soil.....	23
2.1.3.4 Ecological environment in the tentative resettlement sites and vicinities	23
2.1.3.5. Natural preserve zones in resettlement sites	23
2.2. Socio-economic baseline	25
2.2.1 Population, ethnicity and labor	25
2.2.2. Economic baseline.....	26
2.2.2.1. Land use status	26
2.2.2.2. Agricultural Status.....	28
2.2.2.3. Status of industries, handicraft and service sectors	29
2.2.3. Socio-cultural impacts	29
Chapter 3 Environmental assessment for construction resettlement sites.....	33
3.1. Environmental assessment of planed resettlement sites.....	33
3.2. Environmental assessment for construction and operation resettlement sites	34
3.2.1. Environmental assessment for preparation phase	34
3.2.1.1. Preparation activities	34
3.2.1.2. Impacts on natural environment.....	34
3.2.1.3. Socio-economic and cultural impacts.....	35
3.2.2. Construction phase	36
3.2.2.1. Impacts on natural environment.....	36
3.2.2.2. Socio-economic and cultural impacts.....	39
3.2.3. Operation phase.....	41
3.2.3.1. Impacts on natural environment.....	41
3.2.3.2. Socio-economic impacts.....	42
Chapter 4 Mitigation measures	43
4.1. Mitigation measure for preparation phase	43

4.1.1. Mitigation measures related to wastes.....	43
4.1.2. Mitigation measures to reduce other impacts	44
4.2. Mitigation measure for construction phase.....	46
4.2.1. Mitigation measures related to waste.	46
4.2.2. Mitigation measure to reduce other impacts	51
4.3. Mitigation measure for operation phase	56
4.3.1. Mitigation measures related to waste.	56
4.3.2. Other Mitigation Measures not related to wastes.....	57
CONCLUSION	60

List of Tables

Table 1 Number of household has to be relocated to new places.....	3
Table 2. General description of resettlement sites	4
Table 3. Land allocated to affected HH at Trung Son site	8
Table 4. Land allocation to affected HH at Muong Ly site.....	11
Table 5. Land allocation to affected HH at Ban Lin and To Chieng sites	12
Table 6. Land allocation to affected HH at Tan Xuan site.....	14
Table 7. Resettlement Implementation Schedule.....	16
Table 8: Water balance of Trung Son reservoir's basin.....	19
Table 9: Analytical results of air quality near the tentative resettlement sites	20
Table 10: water quality sampling sites.....	21
Table 11. Analytical results of water quality at the project area	22
Table 12: Summary of land by soil type in the proposed resettlement sites.....	23
Table 13: Status of population in the project area in 2006.....	25
Table 14: Land use status in the project area.....	27

List of Maps

Map 1: Archaeological sites in the project area.....	30
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Abbreviations

Abbreviation	Description
BOD ₅	Biological Oxygen Demand
CLIP	Community Livelihood Development Plan
CO _x	Oxide carbon
DARD	Department of Agriculture and Rural Development
DRCC	Development Research and Consultancy Centre
DO	Dissolved Oxygen
DONRE	Department of Natural Resources and Environment
DPs	Displaced Persons
EA	Environmental Assessment
EIA	Environmental Impact Assessment
EMDP	Ethnic Minority Development Plan
EMP	Environment Management Plan
EVN	Electricity of Vietnam
HH	Household
IUCN	International Union for Conservation of Nature & Natural Resources
LURC	Land Use Rights Certificate
MONRE	Ministry of Natural Resources and Environment
NGO	Non-governmental Organization
NO _x	Nitrogen Oxides
PECC4	Power Engineering Consulting Company No. 4
PAH	Project affected household
PHAP	Public Health Action Plan
PMB	Project Management Board
PPC	Provincial People Committee
RLDP	Resettlement Livelihood Development Plan
RP	Resettlement Action Plan
SO _x	Sulphur Oxides
TCVN	Vietnamese Standard
TMB	Trung Son Hydropower Project Management Board
VIA	Viet Nam Institute of Archeology

Foreword

This report is not fully an independent report. However, it will be a supplementary component for project's EIA and EMP. It also contributes to complete the impact gap of environmental assessment for resettlement sites.

The report mainly deals with the impacts that can generate by two phases in construction of resettlement sites (construction and operation). In brief, the mitigation measures to reduce the negative impacts include appropriate technical designs such as tradition-based designs, environmentally-friendly designs for house and associated components...etc and the vital activity will be carried out before construct resettlement sites is all the resettlement activities will be based on local peoples' entitlements through public consultation. Furthermore, the result of resettlement activities will be consulted during project's cycle. (detailed in RLDP report).

Chapter 1

General overview of resettlement plans

1.1. Name of project

Name of project: Trung Son Hydropower Project

Component: Resettlement plans

1.2. Name of project owner

Project owner: Trung Son Hydropower Project Management Board
 Address: 710B, Lac Long Quan, Nhat Tan ward, Ha Noi
 Tel: 043 751 00 596 Fax: 043 751 00 579

1.3. Estimate the total number of relocated people

According to the investment and construction schedule of Trung Son hydropower project made by the Power Engineering Consulting Company No. 4, the resettlement plan will be completed in the year of 2011. The expected number of relocated households is defined by the natural fertility and mobility rate is 3% per year which applicable to each flooded village until the completion of the resettlement process.

Project will affect 29 villages in 6 communes and 1 town that belong to 3 districts. All the commune and town belongs to Thanh Hoa and Son La Province.

The number of household have to be relocated is shown in table 1.

Table 1 Number of household has to be relocated to new places.

No.	Location	Surveyed in 2004		Forecast in 2011	
		HH	Head	HH	Head
	Total	509	2,283	555	2,489
	Thanh Hoa province	327	1,484	356	1,617
I	Quan Hoa district	183	765	199	834
1.	Trung Son commune	183	765	199	834
	- Ta Ban Village	159	668	173	728
	- Xuoc Village	24	97	26	106
II	Muong Lat district	144	817	157	783
1	Muong Ly commune	87	422	95	460
	-Tai Chanh Village	34	169	37	184
	- Nang 1 Village	48	224	52	244
	- Muong 2 Village	5	29	5	32
2	Trung Ly commune	49	261	53	284
	-Pa Bua Village	15	88	16	96
	- Lin Village	18	100	20	109
	- Co Cai Village	16	73	17	80
3	Tam Chung commune	8	36	9	39
	- Pom Khuong Village	8	36	9	39
B	Son La Province	182	799	199	873
I	Moc Chau district	182	799	199	873
1	Tan Xuan commune	177	768	193	839

	- Dong Ta Lao Village	108	476	118	520
	- Tay Ta Lao Village	69	292	75	319
2	Xa Xuan Nha	5	31	5	33
	- Pu Lau Village	5	31	5	33

The survey was identified that majority of affected HH are ethnic minorities (Thai and Muong accounts for 98%; HMong and others are about 2%). Number of HH affected by Trung Son hydropower project is about 11% of total number of HH of three districts. The affected agricultural land area is estimated at about 8% of total agricultural land of the affected communes. The affected HH in Trung Son commune accounts 34.2% of total number of HH in the commune, respectively 10.7% in Muong Ly commune, 3.7% in Trung Ly commune, 1.6% in Tam Chung commune, 26.3% in Tan Xuan commune and 0.15% in Xuan Nha commune.

1.4. Capacity of resettlement sites

PECC4 in 2004 and DRCC in October-2008 carried out its survey and consultation with local authorities and decided that, the following resettlement sites could be developed for the project affected HH (an independent report of PECC4 on the planning the sites for relocation was prepared for the Project Management Board in January-2008 -Volume 3.4 and then updated together with DRCC in October-2008). Through consultation, most of affected people expressed their preference that they want to be resettled within or not far from their current communities. The proposed resettlement sites were discussed and agreed by local authorities and the project affected people (Quan Hoa District stated in the letter no 101/UBND-GPMB dated 05-November-2008 and Muong Lat District stated in a letter no. 462/UBND dated 05-November-2008). The minutes of meetings with local people and local authorities attached with the independent reports of PECC4. The planning of resettlement sites considered (i) forecast of PECC4 and communes for the impacts on land acquisition until the year of 2011; (ii) houses are not in the flooded area but will be isolated by the reservoir. There are three sites proposed in Thanh Hoa province and 01 site proposed in Son La province. All the proposed relocation sites are within the affected communes and in average far from the affected site about 2.0 km. The planning of the relocation sites was reviewed, agreed by two project provinces and approved by EVN.

Table 2. General description of resettlement sites

Names of proposed resettlement site	Location	Key information
1.Trung Son commune with 04 sites: Ta Puc, Co Tong, Keo Dam (Ta Ban village) and Xuoc village	Trung Son commune of Thanh Hoa province	To relocate for about 200 affected HH in Ta Ban and To Xuoc, Come villages in Trung Son commune. - To Ta Puc site: 50 HH with 211 heads. - To Co Tong-Ta Ma site: 84 HH with 350 heads - Keo Dam: 40 HH with 169 heads - To Xuoc, Ban Co Me : 26 HH with 106 heads
2.Muong Ly Commune with 02 sites: Tai Chanh village, Nang Village,	Muong Ly commune of Thanh Hoa province	To relocate for 90 affected HH in Nang 1 village and Tai Chanh village. - To Tai Chanh village site: 37 HH with 182 heads - To Nang village site: 52 HH with 244 heads

		- To Muong 2 village: Just “back and up” 13 Mong HH to the higher elevation.
3. Trung Ly Commune with 02 sites: Lin Village, Chieng Village	Trung Ly commune of Thanh Hoa province	To relocate for 36 affected HH in Lin Village (20 HH) and To Chieng, Co Cai Village(17 HH). - To Lin Village site: 21 HH with 109 heads - To To Chieng – Co Cai sites: 17 HH with 79 heads; - For 16 HH of Mong in Pa Bua Village relocated by “back and up” type.
4. Tan Xuan	Son La province:	To relocate for 159 affected HH of Dong Ta Lao and Tay Ta Lao in Tan Xuan commune. - To Tham Ton 1 : 93 HH - To Pom Hien- Suoi Non : 60 HH - Self-moved households: 6 HH

The distances from the current living places to the resettlement sites are:

- (i) From Ta Ban to Ta Puc site is 05 Km; to Co Tong-Ta Ma site is 04 km; to Keo Dam site is 3.5 Km and from To Xuoc to Come site is 1.5 Km. These 04 sites belong to Ta Ban, To Xuoc and Co Me village.
- (ii) From Nang Village 1 and Tai Chanh Village to Tai Chanh Village is about 0.5 km; to Nang Village is about 2.0 Km; and to Muong 2 Village is about 4.0 Km. These two sites in the localities of Nang 1 Village and Tai Chanh villages.
- (iii) From affected area of Lin Village to Lin’s resettlement site is about 0.5 Km ; and affected area of To Chieng to resettlement site in Co Cai Village about 1.5 Km. These two sites in the localities of Lin Village and To Chieng villages.
- (iv) From Dong Ta Lao to Pom Hien-Suoi Non site is about 2.5 Km. Form Tay Ta Lao to Tham Ton 1 site is about 3.0 Km and to Pom Hien- Suoi Non site is about 2.0 Km. Sites of Pom Hien-Suoi Non. Tham Ton 1 site is in the locality of Tan Xuan commune..

All affected HH will be relocated in the same communes which they are living, so they can continue with their remaining land and other properties outside of the project affected areas as well as other social relationships.

1.5. Resettlement implementation and resettlement sites development

The principles and process for resettlement implementation are as folow:

PAH that have to relocate, may choose to find their own resettlement site, or to move to resettlement sites which they participated to plan and implement.

For resettlement sites prepared by the project, the RP shall provide following characteristics:

- Preparation for resettlement sites includes institutional and technical arrangements to identify the resettlement site that combination of productive potential, location advantages, and other factors are at least comparable to the advantages of the former sites, with an estimate of the time needed to acquire and transfer land and associated resources.
- Arrangements for timely payment of compensation for relocated households at replacement cost, providing sufficient time and money for relocated PAH to construct replacement house consistent with prior living conditions and cultural preferences, and suitable for the size of household, with the house area being not smaller than the standard set forth in the entitlement policy.

- Arrangements to provide suitable house for vulnerable households which unable, or do not desire, to construct their own house.
- Provide prepared house plot and residential area (house and garden) for each relocated PAH;
- Consultation results with relocated PAH to clearly identify their acceptance of proposed relocation sites, and describing measures that implemented to reduce any PAH concerns;
- To Relocate households following plan that proposed, including timetables for site preparation and transfer;
- Legal arrangements for issuing or recognizing land use right certificate and assets on land for relocated households for the remaining land after land acquisition or new land assignment;
- The replacement of infrastructure and lost social services, plans for infrastructures and social services in the host communities, and development works necessary for the resettlement sites. These activities are aim to arrange the living condition of resettlement sites.

The resettlement sites are proposed and sites planned:

The plan and develop resettlement sites are based on following technical standards

- Each relocated household moving to the resettlement sites will be assigned with a house site plot that not smaller than 400m². Depending on the availability of residential land in the resettlement sites, relocated households might be assigned with larger plot. The project will be responsible for ground leveling to ensure house construction as planned. The area of joint garden is not less than 300 m² per HH. The agricultural land is not smaller than 1.5 ha for each HH.
- Each ‘back and up’¹ relocated household will be assigned with a house site plot not smaller than 400m². Depending on the availability of residential land in the resettlement sites, relocating households might be assigned with larger plot. The project will either do the ground leveling for DP or pay them so that they can do it themselves, at DP’s choice. If DP prefers to do the ground leveling DP has to comply with technical requirements as necessary for safety purpose as agreed in the project.
- Ensure that the replaced public infrastructures (power, feeder roads, inter-commune roads, schools, kindergartens, health clinics, clean water systems, sanitation systems, cultural house...) have equal or higher use value.
- Project will design and construct appropriate sewage systems for all resettlement sites, and every house will be equipped one normal toilet and water tank for domestic use. Water tank will be covered by lid and to be cleaned periodically to prevent the source of malaria.
- Strictly do not reuse the former materials especially fibro-cement roofs to construct resettlement sites. When removal former houses, Project notices people to use protective mask and spray water to reduce dust.

¹ The relocated household that will be move out of flooded zone to the higher area in the same place

- Domestic water supply system: water will be diverted directly from stream to suspended tank by steel pipeline and the second water sources will be used is rain. All the equipments use to divert and keep domestic water is satisfied technical standard.
- Scale of structure will consider the population at the resettlement sites, including the host and relocated people.
- In case of a resettlement site that less than 30 relocated households and the distance is less than 1 km from the host community, the project will consider investing in extending or upgrading the existing structures and infrastructures to meet the local demands. The scale, however, will not exceed the stipulated standards for the resettlement sites.
- Public houses of the resettlement sites will be built at grade 4 or equivalent with structure suitable to local natural condition and culture preference and meet the current construction regulations of Vietnam.

1.6. Characteristic of resettlement sites

1.6.1. Trung Son site

(a) Location: The North closes to Xuan Nha commune (Son La province) and Cun Pheo commune (Hoa Binh province); the South closes to Co Me, Ban Puon villages of Trung Son commune; the East closes to Thanh Son commune of Quan Hoa district; and the West closes to Xuan Nha commune of Son La province.

(b) Current status of the site: The total area of this site is about 2,326.6 ha, including:

- Agricultural land already occupied by local people: 235.6 ha
- Forestry land: 908 ha;
- Non-agricultural land 195 ha; and
- Non-use land 988 ha.

Of which:

(i) Ta Ban site with total area of 1,765.4 ha including:

- Agricultural land already occupied by local people: 204.6 ha
- Forestry land: 452 ha;
- Non-agricultural land 191 ha; and
- Non-use land 917.8 ha.

(ii) To Xuoc, Co Me village site with total area of 561.2 ha including:

- Agricultural land already occupied by local people: 31 ha
- Forestry land: 456 ha;
- Non-agricultural land 4 ha; and
- Non-use land 70.2 ha.

Currently without main road to the site, there are roads constructed by program 135 from village to village and mainly for farming purpose. Water use for domestic and other purposes could be from the adjacent creeks such as Suoi Cap, Ta Puc etc.

- There are 15 HH of Ta Puc, Co Tong, Ta Ma villages are living and cultivating near by the site.

(c) Planning for the site.

Total area of the site is 2,326.6 ha; planning for this site is as below.

- Non- agricultural land: 235.2 ha (Residential land: 9.2 ha; Specific purpose use land: 226 ha).
- Agricultural land: 12.2 ha. The remaining 234.2 ha of agricultural land outside of the flooded are of other HH in Ta Ban and To Xuoc of Co Me will be re-distributed to the affected HH.
- Forestry land: 908 ha.

From this, two sites will be developed, including:

(i) Ta Ban site with total area of 1,762.2 ha including:

- Non-Agricultural land: 221 ha (Residential land: 8 ha; Specific purpose use land: 213 ha).
- Agricultural land: 10.2 ha

(ii) To Xuoc, Co Me village: site with total area of 563 ha including:

- Non-Agricultural land: 14.2 ha (Residential land: 2 ha; Specific purpose use land: 12.2 ha).
- Agricultural land: 02 ha.

The land allocation to affected HH at this site is described as in table 6.3 below.

Table 3. Land allocated to affected HH at Trung Son site

Unit: ha

Land type	Current use			Planned			Average per HH
	Total	Ta Ban village	To Xuoc-Co Me village	Total	Ta Ban village	To Xuoc-Co Me village	
Total area	2,326.6	1,765.4	561.2	2,326.6	1,764.4	562.2	
1. Agricultural land	235.6	204.6	31.0	239.2	208.2	31.0	1.139
2. Forestry land	908.0	452.0	456.0	908.0	452.0	456.0	4.324
3. Non-Agricultural land	195.0	191.0	4.0	235.2	221.0	14.2	1.120
4. Non-use land	988.0	917.8	70.2	944.2	883.2	61.0	4.496

- Each affected HH will be allocated with 400 m² of residential land and from 300 m² of garden land.
- Sign contracts for forest protection to the relocates (this will be arranged by the commune authorities and forest protection service of the districts). The income from the contract of forest protection will be followed as a guidance of the Ministry of Agriculture and Rural Development.

At Ta Ban site: The residential site will be about 9.2 ha (in Ta Ban 8.0 ha and Ban Xuoc 1.2 ha). The physical infrastructures and social services will be developed include kindergarten, village class and one community cultural house with 2,000 m²

At To Xuoc site: The residential site will be about 1.2 ha .The physical infrastructures and social services will be developed include kindergarten, village class and one community cultural house with 1,000 m²

- New access road from Co Me bridge to the resettlement site with 4.2 km long and with class A.
- New of rural road type B from Co Tong to Ta Ma – Ta Puc with 9 km long of rural road class B.
- New road from a junction of Xuoc (at Keo Dam) to Suoi Quang wharf and to resettlement Ban Xuoc with 3.5 km long of rural road class B.
- local road at Ta Puc resettlement site of 1 km rural road class B.
- Local at Co Tong-Ta Ma of 2 km rural road class B.
- New 06 km of access road to the farming site road class B.
- Two wharfs for boats crossing the reservoir/ river;
- Power supply (i) Transmission line of 35 kv from Co Tong to Ta Ma of 4 km long; (ii) Transmission line of 0.4 kv of 4 km long and one transformer of 100 KVA for 83 HH; (iii) Transmission line of 35 kv from Ta Puc to To Xuoc of 3.5 km long; (iv) Transmission line of 0.4 kv of 01 km long and two transformers of 35 KVA for 40 HH at Keo Dam site and 26 at Ban Xuoc site.
- Supports to HH to connect with the power grid
- Water supply for domestic and other purposes: (i) construct an water retaining wall on Cap stream and 8 km long of diversion pipe to supply water for domestic and 3 km of pipe to supply water for irrigation of 6.5 ha of rice with two crops at Co Tong-Ta Ma; (ii) construct water retaining wall on Ta Puc stream and 03 km long of diversion pipe to supply water for 60 HH at Ta Puc site and 02 km of pipe for irrigation to 3.5 ha of rice; (iii) construct water retaining wall on Xuoc stream and 03 km long of diversion pipe to supply water for domestic and 01 km of pipe to irrigate for 2.0 ha of rice with two rice crops per year;
- Agricultural site preparation: 12.2 ha will be developed for rice with two crops per year at Ta Puc (3.5 ha), Cap stream (6.7 ha) and Phuoc stream (2 ha).

The affected HH in Ta Ban village still remain with significant area of productive land outside of the flooded area (3 ha in average for HH). Relocated them close to the affected site permit DPs to continue with their remaining land.

- Public works and social services: One class at Co Tong- Ta Ma (100 m²), 02 kindergartens (100 m²), accommodation for teachers (50 m²) and cultural house (100 m²).

1.6.2. Muong Ly site

(a) Location: The North closes to Xuan Nha commune (Son La province) and Cum Pheo commune (Hoa Binh province); the South closes to Xuan Ly of Muong Lat district; the East closes to Trung Son commune of Quan Hoa district; and the West closes to Ban Muong 2 of Muong Ly commune. There are two sites in this commune: (i) Ban Nang site closes to Muong Ly commune center and convenient for supplying water; (ii) Ban Tai Chanh site is about 200 m far from the old Tai Chanh village.

(b) Current status of the site: The total area of this site is about 1,604 ha, including:

- Agricultural land already occupied by local people: 228.6 ha
- Forestry land: 596 ha;
- Non-agricultural land 174 ha; and
- Non-use land 605.4 ha.

Of which:

At Ban Nang site: The total area of this site is about 986 ha, including

- Agricultural land already occupied by local people: 105 ha
- Forestry land: 420 ha;
- Non-agricultural land 82.5 ha; and
- Non-use land 378.5 ha.

At Ban Tai Chanh site: The total area of this site is about 618 ha, including

- Agricultural land already occupied by local people: 68.2 ha
- Forestry land: 359 ha;
- Non-agricultural land 91.5 ha; and
- Non-use land 264.9 ha.

Current status of the sites:

- There are access roads to the site.
- No power available.
- Water use for domestic and other purposes could be from the adjacent creeks.

(c) Planning for the site.

The total area of this site is about 1,604 ha, including:

- Agricultural land: 7.5 ha will be reclaimed for farming. The agricultural land outside of the flooded area of the village (231 ha) will be redistributed to the affected and non affected HH. The same plan for 596 ha of forest outside of the flooded area of the village.
- Forestry land: 908 ha;
- Non-agricultural land 194.1 ha (residential land: 3.6 ha and other purposes: 190.5 ha)

At Ban Nang site:

- - Agricultural land: 3.5 ha
- Non-agricultural land 93 ha (residential land: 02 ha and other purposes: 91 ha); and

At Ban Tai Chanh site:

- Agricultural land (village land): 68.2 ha
- Specific use purpose land : 99.5 ha;
- Non-agricultural land 101 ha (residential land: 1.6 ha and other purposes: 99.5 ha); and

- Each residential plot is 400 m² joined with 300 m² of garden land. The agricultural replacement land will be developed for two crops of rice per year.

The land allocation to affected HH at this site is described as in table 4 below.

Table 4. Land allocation to affected HH at Muong Ly site

Unit: ha

Land type	Current use			Planning			average per HH
	Total	Nang village	Tai Chanh village	Total	Nang village	Tai Chanh village	
Total area	1,604.00	986.00	618.00	1,604.00	987.50	616.50	
1. Agricultural land	228.60	105.00	123.60	231.10	106.00	125.10	2.24
2. Forestry land	596.00	438.00	158.00	596.00	438.00	158.00	5.79
3. Non-Agricultural land	174.00	82.50	91.50	194.10	93.00	101.10	
4. Non-use land	605.40	360.50	244.90	582.80	350.50	232.30	

The physical infrastructures will be developed include:

- New access road from Tam Chung to Muong Ly with 4.0 km long and with class A of rural road type;
- New road of 4 km of local roads at the sites (rural road class B);
- The line 35 kV and 0.4 kV from the center of commune to each household, and The line 35Kv and 0.4kV will connect the construction site to each HH.
- Water supply for domestic and other purposes: construct two water retaining walls, one on Tai Chanh (Nun creek) and 2.5 km long of diversion pipe to supply water for irrigation for 4 ha with two rice crops per year, 4 km of pipe for domestic use. One weir on Nay creek with 3 km long of diversion pipe to supply water for irrigation to 3.5 ha of rice with two crops per year, 04 km of pipe for domestic water use
- Agricultural site preparation: 7.5 ha will be developed for rice with two crops per year at Ban Nang and Ban Tai Chanh.
- Physical infrastructures and social services available at the site, including 2 kindergartens with 100 m²; 2 community cultural houses with an area of 120 m².

1.6.3. Trung Ly site

(a) Location: The North closes to Trung Ly commune; the South closes to Ban Lan, Ban Co Cai of Trung Ly commune; the East closes to Pa Bua and the West closes to Ban Ty and Ban Ta Com of Muong Ly commune.

(b) Current status of the site: The total area of this site is about 676 ha, including:

- Agricultural land already under use by local people: 68.2 ha
- Forestry land: 359 ha;
- Non-agricultural land 76.7 ha; and
- Non-use land 172.1 ha; of which:

+ In Ban Lin;

The total area of this site is about 419 ha, including:

- Agricultural land already under use by local people: 34.2 ha
- Forestry land: 255 ha;
- Non-agricultural land 35.2 ha; and
- Non-use land 94.6 ha;

+ In To Chieng, Co Cai Village:

The total area of this site is about 257 ha, including:

- Agricultural land already under use by local people: 34 ha
- Forestry land: 104 ha;
- Non-agricultural land 41.5 ha; and
- Non-use land 77.5 ha;
- There is an access road to the site.
- No power available.
- Water use for domestic and other purposes are available with pipe system. Water is diverting from the adjacent creeks.

(c) Planning for the site.

The total area of this site is about 676 ha, including:

- Agricultural land: 3.6 ha and the agricultural land outside of the flooded area of Ban Lin and To Chieng of Co Cai village (68.6 ha) will be redistributed to the affected and non affected HH. The same plan for 359 ha of forest outside of the flooded area of the village.
- Forestry land: 410 ha;
- Non-agricultural land 88 ha (residential 02 ha and land for other use purposes is 86 ha); and

Planning for Ban Lin site

- Agricultural land: 3.6 ha will be reclaimed for rice of two crops
- Forestry land: 291 ha;
- Non-agricultural land 41 ha (residential 03 ha and land for other use purposes is 38 ha);

Planning for To Chieng - Co Cai site

- Agricultural land: 87 ha; of which 45 ha is the village land
- Non-agricultural land 49 ha (residential 01 ha and land for other use purposes is 48 ha); and
- Each HH will be allocated with 400 m² of residential land and 300 m² of garden land.

The land allocation to affected HH at this site is described as in table 6.5 below.

Table 5. Land allocation to affected HH at Ban Lin and To Chieng sites

Unit: ha

Land type	Current			Planning			average per HH
	Total	Lin Village	To Chieng	Total	Lin Village	To Chieng	
Total area	676.0	419.0	257.0	676.0	419.0	257.0	
1. Agricultural land	68.20	34.20	34.00	68.60	34.60	34.00	1.33
2. Forestry land	359.00	255.00	104.00	359.00	255.00	104.00	7.04
3. Non-Agricultural land	76.70	35.20	41.50	88.00	39.00	49.00	
4. Non-use land	172.10	94.60	77.50	160.40	90.40	70.00	

The physical infrastructures and social services will be developed include:

- New access to the resettlement sites with 3.0 km long and with class B of rural road type;
- The line 35 kV and 0.4 kV from the center of commune to each household, and The line 35Kv and 0.4kV will connect the construction site to each HH..
- Allowance to HH to connect with the power grid.
- Water supply for domestic and other purposes: (i) construct a water retaining wall on Lin stream with the length of about 30 m and 02 km long of irrigation canal to supply water for 3.6 ha of rice with two crops per year and 2.5 km long of diversion pipe to supply water domestic; (ii) construct water retaining wall on Huoi stream and 4.0 km long of diversion pipe to supply water domestic to To Chieng resettlement site.
- Agricultural area (3.6 ha) will be developed for rice with two crops per year and the agricultural land outside of the flooded area will be redistributed to the affected and non affected HH. The same plan for the areas of forest outside of the flooded area of the Ban Lin and To Chieng of Co Cai village.
- One Kindergarten; one primary class and community cultural house with total construction area of about 1,000 m²

1.6.4. Resettlement sites in Son La Province

Site in Tan Xuan commune, Moc Chau district

(a) Current status of the site: The total area of this site is about 887 ha, including:

- Agricultural land already under use by Dong Ta Lao and Tay Ta Lao local people: 150 ha
- Forestry land: 514 ha;
- Non-use land 253 ha;

(b) Planning for the site

The total area of this site is about 887 ha, including:

- Agricultural land: 50 ha (to be reclaimed for annual crops: 48 ha and for two crops of rice: 2 ha).
- Forestry land: from 161 to 342.9 ha in Tham Tom;
- Non agricultural land: 12 ha (residential land 6.8 ha; special use purpose land 5.2 ha)
- Each affected HH will be allocated with 400 m² of residential land; 300 m² of garden land and will be arranged with a contract for forest protection. From the area of 432.9 ha will be prepared and of which, 50 ha will be for annual crops; 04 ha for rice, the remaining will be for forest plantation.

The land allocation to affected HH at this site is described as in table 6 below.

Table 6. Land allocation to affected HH at Tan Xuan site

Unit: ha

Land type	Current use		Planning		Average per HH
	Total	Dong and Tay Ta Lao	Total	Dong, Tay Ta Lao	
Total natural area	884.0	884.0	884.0	884.0	
1. Agricultural land area	147,00	147,00	197,00	197,00	1.03
2. Forestry land area	514,00	514,00	675,00	675,00	3.52
3. Non-agricultural land	0,00	0,00	12,00	12,00	
4. Non-use land are	223,00	223,00			

The physical infrastructures and social services will be developed include:

- New road with 4.0 km long from Tan Xuan commune center to a junction of Cay Da with a rural class A;
- New road with 2.0 km long from a junction of Pom Hien to Tham Ton 1 with a rural class B;
- New local roads in Tham Ton 1: 2,4 Km with a rural class B
- Construction of drainage channel: 0,3 Km
- New road with 6.0 km long to support for farming with a rural class B;
- Construct one bridge to connect Tay Ta Lao to Center of Tan Xuan commune and one wharf to connect with farming sites in Ban Cam to support people continuing with agricultural land which would be limited access road after reservoir creation.
- To supply electricity to Pom Hien- Suoi Non site: Construct a transmission line of 35 kV with 4.5 km and 01 km of 0.4 kV from center of Xuan Nha commune to the relocation site and a transformer 50 KVA.
- To supply electricity to Tham Ton 1 site: Construct a transmission line of 35 kV with 04 km and 2.8 km of 0.4 kV and a transformer 100 KVA.
- Allowance to HH to connect with the power grid.

- Water supply for domestic and other purposes: construct a water retaining wall on the Co Nao stream and 10 km pipe to supply water to cultivation rice area with one crop per year and 4 km of pipe for domestic use.
- 03 kindergarten with an area of 190 m², 03 primary class with an area of 190 m²; accommodation for teachers with an area of 130 m² and 02 community cultural houses with an area of 160 m².

Tham Ton 1 site in Tan Xuan commune are outside but very close to the buffer zone of natural forest (about 03 km) which is currently under the management of Army, but was agreed to give up for developing the resettlement site for the project. The PMB will soon discuss with DARD of Son La province for the regulation of natural forest protection and will soon disseminate the regulation to the relocating HH from Dong Ta Lao and Tay Ta Lao villages.

The water, soils conditions at the proposed relocation sites will be described in details in RLDP.

1.7. Planning for agricultural activities after relocated

PECC4 carried out its survey, consulted with local authorities and local people and proposed the report on the planning for the resettlement sites for the THPMB that:

- Cultivate rice (paddy and hilly) and maize in the area with supporting facilities such as land and irrigation systems as described above.
- Carry out pilot crop for new seedlings (such as rice NX 30; X21; TN 15. Maize of VN 10; VN2 etc) and then apply on the larger areas if successful. Target to the productivities of rice with 4 tons per crop of Winter- Spring season and 3.2 tons per crop of Summer- Autumn season; for maize with 3.5 tons per crop of spring season and 3.0 tons per crop of summer season. Meeting the target to have crop productivity of 759 kg per head/year in average.

1.8. Resettlement Implementation Schedule

Chapter 2

Environmental Baseline

2.1. Natural and Environmental conditions of resettlement sites

2.1.1. Geology, lithology, tectonics and landscape

Resettlement sites will be built at the communes of Trung Son – Quan Hoa district, Trung Ly and Muong Ly of Muong lat district, Thanh Hoa province and the communes of Tan Xuan, Xuan Nha, Moc Chau district, Son La province. Most of these areas are located in the basin of the plant, thus the resettlement areas share similar natural characteristics with those of the project (detailed in project’s EIA and EMP).

The landscape of the resettlement sites include natural forest, production forest, planted forest and part of agricultural plants, the rural community and nonuse land. The area of land acquisition for the construction of resettlement sites is mostly consisted of agricultural plant and unused land.

2.1.2. Meteorology and hydrology conditions

The tentative resettlement sites are located within the basin of the Ma river, in the upper reach part of the plant. Thus the climatic and hydrographic characteristics are typical ones of the entire plant.

The resettlement points of the plant are also influenced by the climatic conditions of the area as a whole. The flows of regional rivers and springs are calculated in detail for the sake of the resettlement proves as follows:

Table 8: Water balance of Trung Son reservoir’s basin

No	Site	Flv (km²)	Qo (l/s)	Note
1	Lượng stream – resettlement site 1	13	240,5	
2	Nàng stream - Resettlement site - 2	12,67	234,4	
3	Tài Chánh stream - Resettlement site 2	12,89	238,5	
4	Lìn stream- Resettlement site 3	12,1	223,9	
5	Co Cài stream- Resettlement site 3	21,2	392,2	
6	Bong stream- Resettlement site 4	12,8	236,8	

(Source: Report on climate and hydrographical conditions prepared by PECC4)

2.1.3. Natural environment baseline, sensitivity and capacity

2.1.3.1. Air

During the field trip to collected data and documents about air samples for the Plant, we also collected samples close to locations of resettlement sites. The resettlement sites are located at the land areas of the affected people which are the high mountainous areas to the west of Thanh Hoa province, to the south of Son La province. It is home to ethnic minority groups whose economy is much dependent on agriculture (planting rice and crop), forestation and industry is underdeveloped. Thus the air environment here is presently free of pollution by industrial waste. Moreover, the region has a quite wide coverage of forest and low population concentration, as the result, the local environment is cleaned by the natural self-cleared mechanism.

In order to evaluate the air environment in the project area, the Power Engineering Consulting Company No. 4 and the Center for Environmental Research and Community Development have conducted surveys and taken samples for analysis in August of 2007 in the construction sites.

Table 9: Analytical results of air quality near the tentative resettlement sites

Samples	Indicators						
	Hanging dust (mg/m ³)	Dust PM10 (mg/m ³)	Dust Pb (mg/m ³)	NO ₂ (mg/m ³)	CO (mg/m ³)	SO ₂ (mg/m ³)	Noise (dBA)
Chieng Nura village	0,097	0,070	0,00068	0,002121	0,298948	0,011156	29,8
Co Me village	0,088	0,061	0,00062	0,001937	0,363936	0,010527	30,4
Near Chieng bridge	0,114	0,083	0,00091	0,001895	0,489310	0,010678	45,9
Applied standard	0,20	0,15	0,0015	0,20	30	0,35	75
	TCVN 5937-2005						(TCVN 5949-1998)

As comparing the results of observance (table 9) with TCVN, we can conclude as follows:

+ Noise: as compared to TCVN 5949:1998, the area's noise is within the permissible limits.

+ Air quality: as compared to TCVN 5937:2005, the values of ambient air indicators are all lower than the permissible limits. Thus, the local air environment is good.

2.1.3.2. Water quality

In order to assess the quality of water resource at resettlement sites, PECC4 and Center for Environmental Research and Community Development has conducted surveys and collected analytical samples in August 2007 at project sites.

Table 10: water quality sampling sites

Sample code	Sampling site	Date of collection
NTS 1	Near Lát village - Mùòng Lát	31/08/2007
NTS 2	100m from Lat stream- Mùòng Lát	31/08/2007
NTS 3	100m downstream of Chà Lan stream	31/08/2007
NTS 4	Chiềng Nừa village	31/08/2007
NTS 5	Quanh stream - Tà Bán village	31/08/2007

Comparing analyzed results with Vietnamese standard - TCVN 5942 : 1995 shows that all of tested indicators are below the permitted level of the standard, except the Total Suspended Solids (TSS) indicator, which is 8 time higher than standard in volume A and two time in volume B. It may be because the sample was taken at the end of rain season so that TSS is higher than permitted level.

Table 11. Analytical results of water quality at the project area

No	Indicators	Unit	Sample codes									TCVN5942-1995	
			NTS 1	NTS 2	NTS 3	NTS 4	NTS 5	NTS 6	NTS 7	NTS 8	NTS 9	Vol A	Vol B
1	pH	-	7.32	7.36	7.35	7.66	7.48	7.50	7.68	7.41	8.12	6-8.5	5.5-9
2	BOD ₅	mg/l	4.9	4.9	5.1	5.3	5.4	5.2	5.5	6.0	5.6	<4	<25
3	Color	(Pt-Co)	76.211	68.471	62.047	62.296	66.490	59.754	43.218	30.769	45.041	-	-
4	Smell	-	No smell	No smell	No smell	No smell	No smell	No smell	No smell	No smell	No smell	-	-
5	Taste	-	No	No	No	No	No	No	No	No	No	-	-
6	COD	mg/l	8	9	9	8	8	9	10	10	9	<10	<35
7	DO	mg/l	6.43	6.51	6.59	6.79	6.73	6.60	6.51	6.44	6.83	≥6	≥2
8	Total Suspended Solids	mg/l	197	189	152	180	160	165	178	140	196	20	80
9	Fe ²⁺	mg/l	0.124	0.122	0.010	0.012	0.017	0.016	0.029	0.015	0.111	1	2
10	Fe ³⁺	mg/l	0.020	0.021	0.018	0.021	0.022	0.020	0.025	0.023	0.027	1	2
11	NH ₃	mg/l	0.678	0.725	0.790	0.796	0.811	0.823	0.860	0.785	0.925	0.05	1
12	NO ₃ ⁻	mg/l	2.079	3.011	2.246	2.325	2.405	2.487	3.034	3.322	4.065	10	15
13	NO ₂ ⁻	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.01	0.05
14	PO ₄ ³⁻	mg/l	0.285	0.287	0.126	0.132	0.139	0.143	0.152	0.738	0.174	-	-
15	Total mineral level	mg/l	80	86	82	86	88	92	98	177	95	-	-
16	Coli form	MNP/100ml	290	290	230	240	250	280	300	320	360	5000	10000

Note: TCVN5942-1995: Quality standard for surface water: Volume A is applied to water sources which can be used for domestic purposes (but require to be treated as regulations). Volume B is applied to surface water using for other purposes.

2.1.3.3. Soil

Soil in the tentative resettlement sites is consisted of: reddish yellow soil on clay stone, reddish yellow soil on acid magma and light yellow soil on sandy stone.

Table 12: Summary of land by soil type in the proposed resettlement sites

Symbol	Soil type	Ha	
		ha	%
Fs	brown red soil on degenerated stones	4417,38	49,63
Fa	yellow red soil on acid magma	2802,95	31,49
Fq	light yellow soil on sand	221,00	2,48

(Source: Report of resettlement master plan by PECC4)

Soil in this area is characterized by light and medium rich composition. In general soil is poorly nutritional, mixed with stone and distributed on strongly separated terrain with a slop of more than 200, soil layer is thinner than 100cm, easily washable and erosive, thus a majority of forest coverage is left fallow, and some areas are planted with crops and a few perennial trees.

2.1.3.4 Status of the ecological environment in the tentative resettlement sites and vicinities

The flora and fauna of the tentative resettlement sites share the common features with those of the project area and have been described in detail in the project's EIA report.

2.1.3.5. Natural preserve zones in resettlement sites

The tentative resettlement sites are located along the Ma River and main branches so that there is no direct impacts on the three natural reserves of Pu Hu, Hang Kia – Pa Co and Pu Luong. In particular, the resettlement area No. 4 will be moved out of the core zone of the natural preserve of Xuan Nha, so the effects will be minimized.

- *Pu Luong preserve zone*

Pu Luông preserve zone located in Quan Hoa and Ba Thuoc Districts, Western Thanh Hoa, Vietnam Northern Centre. The preserved area includes the West of Pu Luong –Cuc Phuong limestone mountain and North is border to Mai Chau, Tan lac and Lac Son of Hoa Binh Province. Geographic landmark

- 20⁰ 21' - 20⁰ 34' North latitude;

- 105⁰ 02' - 105⁰ 20' Eastern longitude.

The preserve area includes area of 9 communes such as Phú Lê, Phú Xuân, Thanh Xuan, Trung Son, Phu Nghiem in Quan Hoa District and Thanh Son, Thanh Lam, Co Lung and Lung Cao in Ba Thuoc District; with total area is 17,662 hectare, in which including seriously preserved area with 13,320 hectare and ecological rehabilitation zone is 4,342ha.

Proteozoic forests in Pu Luong preserved area is considered as a Tropical evergreen forest.

According to the result of Institute of Forest Research and Plan in 1997 on animal in Pu Luong preserve zone, observed 59 species of animals, 162 species of birds, 28 species of reptiles and 13 species of amphibian (Le Trong Trai and Đò Tuoc 1998; BirdLife and FIPI, 2001). In which *Trachypithecus delacouri* is **seriously threatened** .

As the result of Mai Đình Yên, Nguyen Huu Đúc and Duong Quang Ngoc researchers on Pù Luông preserved zone, identified 55 species of fishes in total in 45 generations and 18 families. In which there are 50 local species and 5 external species..

These 5 species listed in Vietnam Red Book in “V” level are recognized including *Onychostoma laticeps*, *Bangana lemassoni*, *Spinibarbus hollandi*, *Bagarius rutilus* và *Cranoglanis henrici* (Anon. 2000). Especially *B. Rutilus* is in large and *B. Lemassoni* is recognized in Pù Luông.

- ***Pu Hu preserve zone***

The Pù Hu preserve zone is situated in the administrative territory of Xuân Hoa commune, Mường Lát district, Thanh Hoá province with 35,089ha in area, within which forest has 23,849 ha in area. This zone is situated in the basin of Trung Son Hydropower and 30km to the South.

Geographic landmark: 20°23'-20°35' North latitude, 104°44'-105°01' Eastern longitude

Biological diversity: This zone consists of two main types of forest: ordinary green forest at the lower ground distributed at the height of 200m with dominant families such as Fabaceae, Meliaceae, Sapindaceae; ordinary green forest at the lower ground distributed at the height of more than 700m with dominant families of Fagaceae, Moraceae, Lauraceae. Early statistics provides information about 509 vascular plant species.

This zone has several preserve-valued animals such as Tibetan bear *Ursus thibetanus*, Malayan bear *H. malayamus*, Panther *Panthera pardus*, Bull *Bos gaurus* and Gobbins. Though birds have not been surveyed in details, it is recorded that there are two species with preserved value including Yellow-beaked climber *Sitta solangiae*, which is globally in very urgent condition, and Van Nam Flat-beaked laughing-thrush *Paradoxornis atosuperciliaris*, which is globally threaten. (Le Trong Trai, Institute of Forest investigation and planning). The most important point is the discovery of the yellow-beaked climber because this is a very narrow-distributed species. (Sources: Information about existing preserved zones and recommendations in Vietnam - International Birdlife Program and Institute of Forest investigation and planning, Hanoi, 2-2001)

- ***Hang Kia - Pa Co preserve zone***

Hang Kia - Pa Co preserve zone is situated on the administrative territory of Pa Co commune, Hang Kia, Bao La and Pieng Ve, Mai Châu district, Hoa Binh province. It has 7091 ha in area, within which 2681 ha belongs to restricted zone and 4410 ha belongs to the ecological preserved area. A part of this area is situated in the hydropower basin and 40km to the North of the foot of the dam.

Geographic landmark: 20°41'-20°46' North latitude, 104°51'-105°01' Eastern longitude.

Biological diversity: there are three new species of orchid described in this area. There has not been any information about biological diversity of this zone. (Sources: Information about existing preserved zones and recommendations in Vietnam - International Birdlife Program and Institute of Forest investigation and planning, Hanoi, 2-2001)

2.2. Socio-economic baseline

2.2.1 Population, ethnicity and labor

According to a survey in 2006, there are 4,058 households, 22,263 habitants living in five communes: Trung Son (Quan Hoa), Muong Ly, Trung Ly, Tam Chung (Muong Lat) and Xuan Nha (Moc Chau). The population growth rate of the area is about 3%, higher than that in other areas in two provinces Thanh Hoa and Son La.

Labor force in the area is 11,394 people accounting for about 51% of the area's population. Of which, 98% work in agricultural sector and only 2% work in non agricultural sector. The feature should be taken into consideration in preparing plan for restoration of likelihood for affected HH.

Main ethnic minorities in the area are Thai and HMong. There are some Kinh HH in the areas, which are running small business. In general, there is no conflict among HH and ethnics in the area.

Table 13: Status of population in the project area in 2006

No	Items	Number of HH	Number of people	Ethnics		Labor force
				Thai	HMong	
	Total	4,058	22,263	8,489	13,774	11,349
A	Thanh Hoa province	2,813	15,587	5,922	9,665	9,260
I	Quan Hoa district	561	2,529	2,529	0	2,504
1	Trung Son commune	561	2,529	2,529	0	2,504
II	Muong Lat district	2,252	13,058	3,393	9,665	6,756
1	Muong Ly commune	745	4,617	1,154	3,463	2,235
2	Trung Ly commune	955	5,517	1,655	3,862	2,865
3	Tam Trung commune	552	2,924	584	2,340	1,656
B	Son La Province	1,245	6,676	4,109	4,109	2,089
I	Moc Chau district	1,245	6,676	4,109	4,109	2,089
1	Xuan Nha commune	665	3,259	1,956	1,956	968
2	Tan Xuan commune	580	3,417	2,153	2,153	1,121

(Source: PECCA surveyed in March 2007)

In Moc Chau, Muong Lat and Quan Hoa, proportion of labor force working in agricultural and forestry sectors is about 75%. In communes that in the project area, the rate is significantly higher, about 95%. Labor force working in other sectors such as industry and commerce accounts for a very small proportion

2.2.2. Economic baseline

2.2.2.1 Land use status

The commune's statuses for land use in project area are following:

Agricultural land covers 62,471 ha, accounting for 79.25% total natural area, of which 10,407.67 ha is agricultural land (accounting for 16.66%) and 52,045.78 ha is forestry land (accounting for 83.31%).

Table 14: Land use status in the project area

Unit: ha

Types of land	Thanh Hoa province						Son La province
	Total	Quan Hoa	Muong Lat district				Moc Chau
		Trung Son	Total	Trung Ly	Tam Chung	Muong Ly	Xuan Nha
Total area of natural land	78.823,5 ₁	7.934,13	40.846,8 ₂	19.290,3 ₂	13.048,11	8.508,39	30.042,56
1. Agricultural land	62.471,1 ₉	6.311,99	36.071,3 ₇	17.876,5 ₉	10.590,85	7.603,93	20.087,83
1.1. Land of agricultural production	10.407,6 ₇	738,99	5.707,65	3.045,72	1.092,01	1.569,92	3.961,03
1.1.1. Land of yearly plants	10.065,0 ₂	726,71	5.667,85	3.036,86	1.075,07	1.555,92	3.670,46
1.1.2. Land of perennial plants	342,65	12,28	39,80	8,86	16,94	14,00	290,57
1.2. Forestry land	52.045,7 ₈	5.572,30	30.351,9 ₈	14.830,6 ₇	9.491,80	6.029,51	16.121,50
1.3. Aquaculture land	17,74	0,70	11,74	0,20	7,04	4,50	5,30
2. Non-agricultural land	1.496,47	456,80	825,18	317,90	268,44	238,84	214,49
2.1. Residential land	162,40	26,80	75,60	22,50	27,60	25,50	60,00
2.2. Specially used land	263,14	34,00	179,55	79,90	44,00	55,65	49,59
2.3. Land of cemeteries	17,54	9,00	8,54	8,50	0,04		
2.4. Land of rivers, springs and MNCD	1.053,39	387,00	561,49	207,00	196,80	157,69	104,90
3. Unused land	14.855,8 ₅	1.165,34	3.950,27	1.095,83	2.188,82	665,62	9.740,24

(Source: Departments of land survey and statistics of Quan Hoa, Muong Lat and Moc Chau districts in combination with map-based statistics of land utilization by communes with a rate of 1/10.000)

Non-agricultural land covers 1496.47 ha (accounting for 1.9 % total natural area) including 162.4 ha of residential land (accounting for 10.85%), 263.14 ha of specially used land (accounting for 17.58%) and 1,070 ha of other kinds (rivers, springs and cemeteries) accounting for 71.56%.

There is 14,855.85 ha of unused land, accounting for 18.85% total natural area, of which only 266 ha is of flat land and the rest is hilly and mountainous, river and stream areas.

The area of production land of the project region has primarily been handed over to peasant households, including wild land and rotary cultivation land. Statistic data reveals that on average the agricultural land reaches 2.4 ha per household excluding areas that are not on the list of land management bodies of communes and districts, of which the lowest is the commune of

Trung Son with 1.4 ha per household and the highest is the commune of Xuan Nha with 2.61 ha per household.

2.2.2.2. Agricultural Status

a) Cultivation

Agricultural cultivation activities are still the main production activities in the area. Income from agricultural cultivation accounts for about 40% - 60% of total income of HH in the area. Cultivation activities including paddy rice and dry rice, and other cultivated crops such as corn and cassava.

**Paddy rice cultivation:* There are two paddy rice crops per year in the area. In area belong to Thanh Hoa province with high slope topographical condition is not suitable for paddy rice cultivation. There are few belt of land in the size of several ha being cultivated by local HH with one or two crops per year, some of the land belt is only several hundred meters. Cultivation of paddy rice in the area is considered at low standard, much depending on natural condition and having low productivity due to lack of water and investment for intensive cultivation. An exception case is in Xuan Nha commune, where has flat area and abundant water resources. A irrigation system was built to provide water for irrigation of about 60 ha of paddy land.

**Dry land cultivation:* this type of cultivation is popular in the area. In average, each HH has 2 to 3 ha of dry land. Normally, local HH cultivate dry rice, corn and cassava to meet their demand. Due to significant relying on natural condition, plant production is low and not stable

b) Livestock

Livestock is developed without any plan and has not been considered as main income resources in the area. Due to low technical technology and using local breeds which are normally small and slow growth and especially hardly being protected from diseases all result to low economic efficiency of livestock sector. Most of fowls, cattle and poultries are left unbridled.

Currently, in average each of households has 1-2 cows or/and buffalo, some households have 3-4 cows or/and buffalos, 1-2 pigs and 10-15 poultries.

c) Forestry

Forestry is one of the main activities in the area. According to statistical data, the four communes in Thanh Hoa province has 35,924.28 ha of forestry land, accounting for 73.64% of total their natural land, of which production forestry land is 15,243.58 ha (accounting for 42.43% of total forestry land). Total of specific forestry is 12,165 ha (accounting 33.86%) and basin protection forestry is 8,515 ha (accounting for 23.7%). Xuan Nha commune, Son La province manages 16,121 ha of forestry land of which 25 ha is re-planted, accounting for 0.165; specific and basin protection forestry is 16,096 ha, accounting for 99.84% of forestry area.

In general, the region's forestry sector is still underdeveloped and mostly engaged in localizing and protecting forests based on projects implemented in the region. In the past years a lot of households of Trung Ly, Muong Ly and Trung Son communes have built up bamboo plating farm that is of high efficiency and contributes to the improvement of forestry incomes for

the local people. However, incomes from forestry still account for a small proportion as compared to those from agricultural production. **d) Fishery**

The studied communes in the mountainous districts have little water surface area to carry out aquaculture activities, thus, aquatics branch does not have advantages to develop. At present, the project districts have 181.8ha of water surface area to breed aquatics, in which Mộc Châu district has 126.1ha, Quan Hoá district has 39.9ha, Mường Lát district has 15.8ha, mainly breeding freshwater fish. The aquatic products in the project districts occupies small rate compared to the total production value of other economic sectors in the districts. However, freshwater fish breeding has begun developing in recent years, the area of ponds and lakes has increased.

In the future, when Trung Son reservoir is constructed with rather large water surface area, it will create good conditions to develop aquaculture in local communities.

2.2.2.3. Status of industries, handicraft and service sectors

Industrial sectors and small-sized industrial production in the project area are still underdeveloped. The traditional craft products of the region are mostly embroidered products and knitwear of the Thai and Muong ethnic minority groups which are mainly aimed at meeting the requirements of local households. These products have not been used as commodities. The districts of the project area are mostly entangled in the development of processing and exploiting industries.

The service sector is currently not yet developed much partly because it is poorly demanded and swayed by private traders. This also restricts the role of the service sector in stimulating production and consumption demands

2.2.3. Socio-cultural impacts

- *Cultural*

There has been no historic and cultural relics discovered in the resettlement sites (Viet Nam Institute of Archaeology Report, 2008). The resettlement site, especially resettlement site 2 and 3, locate close to Nang 1 relics site. It will receive some bad impacts from resettlement sites. However, before impoundment, TMB will carry out excavation activities for relic sites (VIA , 2008).

- **Education**

At present, all communes in Thanh Hoa province have primary and secondary schools. These schools are in good condition. There are school classrooms in all main villages. In general, the rate of children going to school is low; number of children drop out their school is still high in villages. Primary and secondary school in Xuan Nha commune is well invested (classrooms are constructed as class III) including accommodation for teachers and pupils from far villages.

- ***Public health care***

There is one health care clinic in every commune and physician and 1-2 nurses, which are all local people in each of these communes in the project area. Public health care and family planning programs have been implemented effectively and contributed to reduce some diseases such as malaria, bronchoscope, etc. However, these clinics are poorly equipped so that all serious cases have to be sent to district hospitals.

- **Communication**

According to statistical data of Thanh Hoa and Hoa Binh in 2005, proportion of households who have telephone is very low. The number of telephone in Quan Hoa district was 820 and that figure in Mai Chau was 1460. Telephone service is still not available in some communes resulting difficulties in communication with outside.

- **Radio and television**

The total number of communes out of radio and television cover is still high.

Chapter 3.

Environmental assessment for construction of resettlement sites

3.1. Environmental assessment of planned resettlement sites

- Resettlement sites were planned in the communes of the project area, that close to the previous places of residence and cultivation so that the livelihoods of local people will not be much affected and conveniences are created for the transportation and cultivation of the locals as well as for the management of the local authorities.

- At the resettlement sites, the conditions of cultivation will be improved by investments in the construction of local roads and irrigational canals for convenient commutation and irrigation.

- Under the land use plan for the resettlement sites, on average, each household is provided with 400m² of residential land and 600m² of garden land, 1.3 – 1.8 agricultural land and 0.45 – 3.13 forestry land including production and preventive forest land.

In general, the area of wild land that reclaimed from unused and natural forest land for the agricultural production at resettlement sites are, at least as big as or bigger than that damaged at the reservoir basin, thus there are not significant effects on the area of agricultural land of the locals.

The area of un-flooded land plus that given at the resettlement sites with favorable cultivating conditions will help affected households recover their incomes.

- During the process of resettlement, the affected households will be entitled to various assistances such as farming encouragements, supply of plants and transfer of agricultural techniques in order to improve the standard of agriculture production to help the locals recover incomes and soon get settled down the livelihood.

- On the other hand, in order to improve the incomes of local residents after the course of settlement, preventive and production forests have been handed over to residents. This has positive effects on the ecological environment, flora and fauna resources, especially helps raise local people's awareness on forest protection.

- New infrastructure will be constructed for the resettlement sites (traffic roads, running water supply, electricity network, school and cultural centers...) in compliance with applicable standards of civil works in order to create favorable conditions for the lives, transportation and production of local residents in a better condition.

- The current modes of floating rice and crop cultivation as well as forestry are suitable with the conditions of cultivation of local people, thus they are not required to change career. Therefore the affected people will have more chance to settle down their lives.

- The above mentioned plans of resettlement, apart from ensuring resettled households to have living conditions that are as good as or better than those at their previous places of residences, contributes to the protection of Xuan Nha natural preserve because local people are moved out of the specially core zone of the preserve.

3.2. Environmental assessment for construction and operation resettlement sites

3.2.1. Environmental assessment for preparation phase

3.2.1.1. Preparation activities

The following activities will be carried out during the preparation phase:

- Acquired land for the construction of the resettlement sites, traffic roads, hydraulic work as well as tentative locations of fields.
- Compensating for affected households within the reservoir area, plant floor and areas of which land has been collected for resettlement.
- Carry out clearance activities to remove vegetation, bombs, explosives, OB chemicals remained at the resettlement sites.

3.2.1.2. Impacts on natural environment

- *Impacts on topography, geomorphology and landscapes*

In this phase, there will be few effects on the local topography because the main activities include land clearance and compensation for relocated people which lands are acquired in the reservoir basin and tentative resettlement areas, measure and draw the details of items for the sake of the settlement process.

The activities, such as leveling ground, removal of bombs, explosives and poisonous chemicals, will have certain influences on the local landscapes and geomorphology and also can cause lost of vegetation cover.

Measures to mitigate effects on local landscape are presented in chapter 4

- *Effects on air and sound environment*

In this phase, the air and sound environment is almost free from impacts except followings:

- Removal activities can release dust, especially in removing fibro-cement roofs can create hazardous dust and create noise. However, the project's EMP have been solved these problems to minimize impacts on environment so that impacts are less important.

- *Impacts on the ecosystem and forest functions*

- Effects on the ecosystem due to construction of the resettlement sites and reclaimed fields:

The area to be reclaimed for construction resettlement sites is mostly agricultural land (rice, crops and planted forest) which belong to the local residents and unused mountainous and hilly land. Wild animals are mainly of small kinds and wide range of distribution and human friendly. The area is not home to rare and precious animals, thus the land clearance and cutting down of plants will not assert impacts on the resources of creatures and biodiversity.

- Effects on the flora in the vicinities of the resettlement sites:

This stage mainly involves the planning of locations of resettlement and acquisition of land, thus there will be few effects on the local flora system in the vicinities of the resettlement areas.

- Once lands are acquired for the project implementation, part of local population that has been lived in the natural reserve of Xuan Nha will be moved to the resettlement sites. Because these sites are located far from the core zone of the natural preserve of Xuan Nha, such activities as hunting, disafforestation for agricultural development will be restricted, contributing to the protection of rare and precious animals and plants as well as genetic resource.

- Removal of current toilets and breeding facilities can release waste into environment if not manage effectively.

- *Water*

In this phase, the quality of river and stream water will be harmed because the flora coverage is reduced for further steps of the resettlement process and will speed up the erosion and washing of surface materials. And as a result, water will be mudded with hanging solids...

3.2.1.3. Socio-economic and cultural impacts

- *Effects on land use and income of local people*

- The land area of the tentative resettlement sites is consisted of: preventive forest, natural production forest, planted production forest, rice growing land, residential land, building land and unused land (See Realities of resettlement areas presented at chapter 1).

- Upon implementation of the project, 1,644.5ha land will be acquired for land clearance and building the master plan of the resettlement sites. The area of land to be acquired for consultation of the resettlement sites is mainly the unused land and agricultural land of the locals, part of which is natural production forest and planted forest.

The project, in order to minimize the impacts on forest, have not been planned in the areas which land of preventive forest, natural production forest

These forest lands will be handed over to affected households in order for them to improve their incomes.

- Regarding the planted forest area, there will be no further reclaims, rather, the remaining land area of households will be used and the land area of the whole region will be rebalanced in order to assign to affected and local households.

The land acquisition for construction of the resettlement sites will help make use of the area of unused land that is favorable for agro-forestry production but on the other hand it will reduce and loose the land budget for other purposes and incomes of local people will be affected (in area of immigrants). However, as analyzed above (section 3.1: evaluating the planning solutions), the acquisition of land and construction of the resettlement areas will have few influences on the incomes of the local peoples because the area of land to be reclaimed and distributed to resettlement households is mostly unused land, and partly natural production land of which area equal to or bigger than that damaged in the reservoir basin. The area of agricultural land revoked from local people will be allocated to these households with bigger area or equal to the minimum standards under applicable laws.

- Once the irrigation canals and other hydraulic plants are invested and built at the resettlement areas, the locals will have better and more stable cultivating conditions than previously, therefore the increase of planting productivity will be stabilized.

- *Impacts on health*

If bombs and mines as well as explosives remained from wars in the resettlement areas are not totally cleared, they will threaten the life of building workers and affected households when they move to live and work here.

3.2.2. Construction phase

During the construction phase, such activities as leveling and smoothing surfaces, building houses, roads, electric network, hydraulic plants, irrigation canals, reclaimed fields and moving people to the concentration areas... will create environmental impacts both naturally and socially on the tentative resettlement areas. Details are as follows:

3.2.2.1. Impacts on natural environment

- *Air and noise*

- Air

In the construction phase, the air environment will be harmed with dust and emission gases such as CO, SO₂, NO₂,... generated by the operations of equipments, machineries during leveling, digging and transporting soil, stone and materials for the construction of items of the resettlement sites. However, because the resettlement sites are of small size and not concentrated, free of large number of motorbikes, thus the air environment will not be seriously affected.

In addition, it has to note that the sensitivity of environment in the resettlement sites are higher than other places. However, these impacts will be solved effectively by project's EMP.

- Noise

The environment of the project area is affected by noises generated by operations of traffic vehicles, equipments and machines operating on the construction site. Besides, it is also affected by the voices of building workers. However, the few numbers of equipments will not seriously affect the environment of the entire resettlement areas.

• *Water*

In the construction phase, the water environment is mainly affected by waste liquids exhausted from building activities as well as from building cadres and workers.

- Effects by domestic waste water of building cadres and workers:

Domestic waste water is composed of organic substances, hanging materials, detergents and microorganism... once dumped into rivers and stream, they will pollute the water environment and harm aquatic creatures and also reduce accessibility to water for local people.

- Industrial wastewater

Industrial waste water is exhausted from such activities as building, washing vehicles, refilling oil and lubricants, maintaining machineries and means of transports...

Waste water from building, processing materials, washing vehicles and moistening machineries contains a lot of hanging substances, oil and even some kinds of heavy metals that make river and stream water dirty if there is no proper method of collection and treatment.

- Overflowing rainwater

Rainwater overflowing through the construction site of the settlement areas, the reclaimed area will be accompanied by loose stone and soil, face minerals, leaked oil, wasted and abandoned materials (sand, stone, cement, packages and wooden waste...) that increase the content of hanging substances, organics and increase the muddiness of the water environment and reduce water quality.

• *Impacts on resources and soil*

The amount of soil and stone generated from the process of leveling and smoothing the plant surface, reclaimed area and the amount of soil and stone exhausted from digging up and filling holes and foundations of the resettlement areas as well as other works such as internal roads, irrigation plants makes up a quite great amount. It will be dumped into dumping ground, compressed and processed pursuant to applicable standards. After completion of construction, along with dismantling of temporary items at supporting areas, the dumping grounds will also be leveled and

compressed for planting trees in order to mitigate erosion and degradation of land resources.

- ***Ecological environment***

- a) Effects on the ecosystem, forest resources and terrestrial biodiversity.

- There is an increase in the demand on timber used for building houses, burning, food and foodstuff in the region because of the concentration of building workers and building new houses for resettled households.

The increase in the demand on burning wood and food of building workers stimulates the increase in the illegal exploitation of timber, hunting, trading and storing of timber and animals which negatively affects on the surrounding flora and fauna. Of all natural reserves, the natural reserve of Hang Kia – Pa Co is located far from the plant, the exploitation of timber and hunting of wild animals are strictly restricted. Only the natural reserves of Xuan Nha and Pu Hu are subject to strong effects and measures should be taken against these effects.

- Hunting and poaching wild animals: The more developed market of animal products by increase supply demand from workers and additional people from resettlement site, the more it will encourage local people to hunt and catch wild animals. It is difficult to prohibit completely these activities. However, TSHMB will be implemented code conducts in contract for worker for the construction phase to eliminate the root risk on wildlife.

- Exploiting timber: the villages being moved out of the reservoir basin to the concentration areas are mostly home to the ethnic minority groups of Thai and Muong that have a long tradition of residing in stilt houses made from timber. Part of the house structures will be damaged because of being dismantled for movement, and upon arrival in the new residence, local people flock into the forest, especially the natural reserves to collect wood materials in compensation for such damaged part of house structures. This is of significant effect if no proper protective and management measures are taken by local authorities, investors, contractors and heads of building sections.

- Effects on the behaviors of animals by noises:

Wild animals are every sensitive to noises. Thus, upon implementation of the project, animals residing in the plant area and vicinities will be moved to locations that are far from the plant such as high and quiet mountains.

The surrounding forest coverage that is still in good condition will be home to animals when they move out of the project area; they will live in the surrounding forest or nearby natural reserves (mainly flying animals such as birds will move to nearby natural reserves).

b) Aquatic creatures

The construction of the resettlement sites will not affect the immigration of fish and aquatic creatures in local rivers and streams.

The construction of water retaining wall to provide water for irrigational and living purposes will also not seriously affect aquatic creatures and aquaculture benefits because small branches are characterized by few numbers of aquatic creatures and dams are located on the upper stream of these branches.

3.2.2.2. Socio-economic and cultural impacts

- *Local customs, practices, economy and occupations*

According to the implementation plan of the Trung Son hydropower project made by the PECC4, the plan of resettlement must be completed in 2011. The number of households subject to resettlement is forecast on basis of natural and physical rate of population growth of 3%/year calculated for each village of which residents are submerged to the completion of resettlement. The total number of 527 households with 2630 inhabitants including 507 households with 2519 inhabitants moving to the resettlement areas and the other 20 self-moved households with 111 inhabitants is not an insignificant effect on the local households and the resettlement ones in terms of psychology, way of living, customs and practices as well as security and order...

- The psychology, customs and practices of living of local residents:

The affected people have been residing for a long time in the region and there are accustomed to the present ways of living. Once being moved to a new location of the resettlement sites, they will face difficulties in the new life and it takes time for them to adapt to the new living environment. However, with the on site tentative resettlement areas that are located in the same location of residence and not far from the previous places of residence and infrastructure has been fully invested, affected households will soon adapt themselves to the new life and disorder is expected to occur at the beginning of moving to the resettlement areas.

- Economic aspect: as land and plants in the reservoir are submerged, local people's income will be affected. Although the affected households are provided with new places of residence, the area can not be equal to their previous ones, thus effects are unavoidable. Not only the resettled households are subject to income effects but to those whose lands are reallocated also. This is a complicated issue and if it is not properly settled, disputes will occur among the local people and authority as well owners, and as a result, the speed of implementation is affect also. Thus positive mitigating measures must be taken such as compensating the locals, reclaimed wild land, building up farming encouragement programs and providing food. Measures will be discussed in detail in what follows of the report.

- In order to create employment for workers and improve income for affected households, the building unit will recruiter part of local worker to work an get paid

corresponding to their skills, especially jobs that require simple skills and the locals can be able to handle such as: cutting down trees, digging canals...

- *Health of workers and residents in the resettlement sites*

- Impacts by dust and waste gas:

Dust and waste gas have impacts on the respiratory system of building workers on the construction site as well as nearby local residents. These impacts are minor because most resettlement points are located in agricultural or unused land.

- Effects by concentrated workers:

- + Building workers concentrate on the construction site can carry strange diseases and spread to local people.

- + The concentration of a large number of workers on the construction site stimulates the spread of pollutants and creates conditions for the development of disease causing microorganism and increase the threat of generation and spread of germs. If temporary sanitary plants are not properly arranged and organized, the local environmental quality will be reduced.

- Effects by the construction process:

Labor accidents may take place during the building process if workers fail to comply with safety regulations and measures such as traffic accidents and electric shock accidents...

Moreover, deaths and casualties can happen to people living and working near to the construction site in the absence of proper safety and warning measures.

- Effects on environmental problems:

Slides and collapse of soil and stone can happen upon leveling and smoothing of surfaces, building of irrigational canals, traffic roads and water retaining wall ... they can injure drivers of building machineries and vehicles, workers and other people living in the resettlement areas...

- *Effects on local security and order and management of local authorities*

- The movement of a number of more than 507 households will cause certain chaos both to the place of movement and immigration, on local security and order, the relationship between the local community and the resettlement people: disputes can arise when affected people move to the resettlement areas. However, the current households of the resettlement areas are few, and the nationalities of the local community and the immigrants are quite indigenous, who mostly are ethnic groups of Thai and Muong, the resettlement process will have more advantages. However, in order to minimize these conflicts, prior to the implementation of resettlement, meetings should be held to for local people and immigrants to discuss and collect their ideas.

The resettlement areas are located in the communes of the project area, not very far from previous locations of residences and cultivation. Thus the management of local authority does not face serious difficulties.

- Inappropriate allocation of land and houses among resettlement sites can result in conflicts among residents, among investors, local authority and people.

- The intensive concentration of workers on the construction site (mostly men) can cause residential disorder of the project area and temporarily increase population density as well as the number of temporary residents in the locality which make it difficult for the management of inhabitants and may result in conflicts among groups of workers, among workers with local people and develop social evils (drug addiction and prostitutes...); as a result, there are lots of challenges on controlling local security and order as well as social management

- *Transportation*

When carry out construction the resettlement sites, some kinds of vehicles are used to delivery equipments, machineries and materials. These activities can increase the density and flow of vehicles so can affect the traffic activities of road lines and even can cause depression to foundations of traffic lines which to the construction site and internal roads of the project area (inter-communal and inter-village roads). Currently local roads are mostly soil covered and trails, thus they will be muddier by the operations of such vehicles.

In order to minimize the effects on traffic activities in the region, it is necessary to have an appropriate control. Oversized vehicles, equipments and machineries must be carried by specific trucks and only run in night time. Transportation of machineries, equipments and materials should be restricted during rainy season.

3.2.3. Operation phase

3.2.3.1. Impacts on natural environment

In this phase, construction activities have been completed and affected households have been provided with land for cultivation and these activities will increase in plant surface coverage. Thus, impacts on the natural environment are almost minor.

In particular, the ecosystem, flora and fauna, forest resources and biodiversity of the region and vicinities can be affected because residents of resettlement sites access natural forests and nature preserves for hunting and cutting down timber for their livelihood. This results in immeasurable aftermaths. Thus, measures must be tighten by the close cooperation among investors, local authority, management board of natural reserves as well as other stakeholders. The supervisory program is included in project EIA and EMP reports.

Regarding the soil and water environment: in order to restrict the erosion of soil and increase total suspended solids in water, it is necessary to implement appropriate measures for cultivation and land use. Thus, during the resettlement process, the affected households will be entitled to such farming expansion encouragements as: being provided with seed plants and

advanced farming techniques... in order to improve their standard of cultivation and soon settle down to the new lives.

3.2.3.2. Socio-economic impacts

- *Health and Livelihood in resettlement sites*

- Goals of resettlement and compensation plan: the affected residents will have the new lives that are, at least, as good as or better than their previous ones with properly sanitary environment. This will be a very significant effect of the project once the resettlement program is well implemented.

- Because some “back and up” relocated people that located close to the reservoir, they may be affected by bad smells and gases caused by the disintegration of submerged biomass. In order to minimize these effects, the project has proposed a program to clean the reservoir bed (see main EIA reports).

- *National security, local security and local authorities; customs, cultural and religious for people.*

The emigration of a large number of 507 households has various impacts on local security and order, especially in the stage of movement. However, once this has been well done, security matters will be settled and management tasks will be much more convenient for local authorities and people.

Upon completion of resettlement process, local customs and praises, culture and belief will be recovered and well-organized. Because, project will also construct community centers at planned locations.

Chapter 4 Mitigation measures

4.1. Mitigation measure for preparation phase

4.1.1. Mitigation measures related to wastes

No	Impact source	Mitigation Measures	Mitigation area	Result	Applicability	Reference to Regulations/Standards
1	Mitigation measure to reduce solid waste					
	- Vegetation clearance for construction resettlement sites and reclaimed lands	- The tentative sites for the construction resettlement areas and reclaimed fields are mostly planted agricultural plants and crops, According to RLDP these plants will be harvested by land owner before acquisition deadline. Part of these sites is unused land and covered by shrubbery and grass, thus the amount of plants have to cut down is not significant and can be collected and burned or collected to the common dumping ground of the resettlement areas. After dumping, it is necessary to bury such wastes in order to minimize bad smell and pollution to water sources. - Encourage people to use the plants made by clearance activities.	- Tentative areas for building resettlement sites. - Tentative sites for reclaimed fields.	Reduce bad smell and pollution to the air environment and negative impacts on human health; restricting pollution to the shallow ground water or rivers and streams near to the dumping ground.	Applicable	
	- To remove graves and tombs	- After removal tombs and grave, it will be treated by spraying flour lime.	Tentative resettlement sites and current graveyard of relocated household	Reduce disease sources, bad smell and also reduce waste water from graves can release into environment	Applicable	

Environmental Assessment for construction resettlement sites - TSHPMB

	- Removal of toilets and breeding facilities	After removal activities is totally completed, it will be treated by flour lime.	Area of relocated household	Reduce bad smell and also reduce waste water from toilets and breeding facilities can release into environment	Applicable	
	- Removal of fibro-cement roofs	- Spray with water when removal, especially in dry and windy time. Use gauze mask, glasses, helmets... when remove roofs and other associated facilities.	Relocated household's land	Reduce waste and dust	Applicable	

4.1.2. Mitigation measures to reduce other impacts

No	Impact source	Mitigation measure	Mitigation area	Result	Applicability	Reference to Regulations/Standards
1	Mitigation measure to reduce impacts on natural environment					
	- Cutting down of plants for construction of resettlement areas and reclaiming of fields.	- The clearance activities are carried out only within the acquisition land. Cutting down out of this area is strictly prohibited in order to protect the vegetation coverage and restrict changes to land surfaces that are vulnerable to soil erosion, reduce impacts on the ecosystem. - To plant forest in compensation for the area of forest that has been acquired for land clearance and construction of the resettlement sites and reclaiming of fields.	- Tentative areas for building resettlement sites. - Tentative areas for reclaimed fields.	- Reduce impacts on the surface and vegetation coverage contributing to minimize the erosion of soil nutrition, increase of water muddiness and protecting the ecosystem.	Applicable with tight supervision of owners and commitments to comply of contractors as well as support by local authority.	- Law on forest protection and development. - Plating forest trees in compensation for the area that has been acquired according to The Plan of forest development of Thanh Hoa and Son La province.
2	Mitigation measure to reduce socio-economic impacts					
A	Measures to reduce	- Compensate for damages to plants,	Acquisition	Ensuring local	applicable	

Environmental Assessment for construction resettlement sites - TSHPMB

No	Impact source	Mitigation measure	Mitigation area	Result	Applicability	Reference to Regulations/Standards
	impacts on economy and income of local people	<p>crops, land and properties of local people pursuant to applicable regulations.</p> <ul style="list-style-type: none"> - Balancing the land of the resettlement areas and reallocating to these households equal to or more than the minimum standard specified by laws so that they are subject to stable income and lives. - Prior to acquire land, meetings should be held in order to popularize the state's orientations and party's policies as well as project targets... and ideological work so that local people kindly understand and support. 	land for construction of resettlement sites	residents' income		
B	Measures to mitigate impacts on health of workers and relocated people					
	- Bombs, mines and explosives remained in wars	<ul style="list-style-type: none"> - Documents are submitted by project owners to relevant institutions for approval of construction sites and to have permission to hire professional units before construction time to clear bombs, mines and explosives remained in wars. - Signboards should be posted in areas that detected bombs, mines and explosives 	Areas of building resettlement sites and reclaimed fields.	- Reduce accidents and risks to building workers and local people in case of detecting bombs, mines and explosives as well as in moving to the new residential quarter	This is a compulsory requirement to be implemented by the project owner prior to construction of the resettlement sites.	

4.2. Mitigation measure for construction phase

4.2.1. Mitigation measures related to waste.

No	Impact source	Mitigation measure	Mitigation area	Result	applicability	Reference to Regulations/Standards
1	Mitigation measures for emission, dust and noise					
a	Mitigation measures for emission gas					
	Emission by transports, building machineries and equipments	<ul style="list-style-type: none"> - Trucks and machineries used must satisfy technical and environmental safety standards approved by Registry Agency. - Stop operate machine of vehicles when stop time over 5 minutes. 	Areas of construction resettlement sites and reclaimed fields.	Such emission as CO, SO2 and NO2, will be reduced to permissible limits.	Of high feasibility as noted in the contract by the owner	TCVN5939:2005, TCVN6438:2001
b	Mitigation measures to reduce dust					
	<ul style="list-style-type: none"> - Dust generated from transportation and loading of construction materials - Due to the leveling and smoothening of surfaces, digging up and filling of building items: building residential houses, rural roads, canal system and running water supply system... 	<ul style="list-style-type: none"> - Spray water 2 times/day on access roads, especially roads running through camps and residential areas during dry season. - Every week, the contractors have to collect the dropped materials in the range of 100 m far from construction site 's gate. - Materials trucks outside of the construction site strictly be covered so that building materials are not dropped. 	- Roads which building materials are mainly carried.	Minimizing the contents of dust dumped into the air environment	applicable	TCVN5939:2005, TCVN6438:2001
c	Mitigation measures to reduce noise					
	- Operations of transports, building	- Vehicles and equipments must satisfy standards of the Registry	Areas of building	Once working schedule and	High applicable	TCVN5948:1999

Environmental Assessment for construction resettlement sites - TSHPMB

No	Impact source	Mitigation measure	Mitigation area	Result	applicability	Reference to Regulations/Standards
	machines and equipments - Voices of workers	Agency prior to operating. - Regular maintenance is provided to construction machineries and equipments and noises caused by trucks and machineries are ensured not to exceed permissible limits. - Appropriate working schedule and vehicle control regulations should be arranged. - to limit the construction activities such as pilling concrete piles can generate bad nose at night time. - Encourage the drivers use hooter in appropriate cases only.	resettlement sites and reclaimed fields, along traffic roads.	vehicles control regulations are set up, it will reduce the over concentration of machineries at a moment of time, traffic jam, damages to roads, restrict resonant noises and reduce impacts on health of workers and local people.		
2	Mitigation measures to reduce liquid waste.					
a	Domestic sewage					
	- Common domestic waste water (bathing, cooking, washing water...) - Toilet and other	- Toilets are built in every camp of workers, and water available for toilets - Common domestic sewage will be collected to septic tanks.	The workers' camps	Sewage must undergo appropriate treatment process and satisfy	applicable	Level II of TCVN6772:2000

Environmental Assessment for construction resettlement sites - TSHPMB

No	Impact source	Mitigation measure	Mitigation area	Result	applicability	Reference to Regulations/Standards
	activities waste water	- Waste water dumped from septic tanks after undergoing treatment will be run through the sewage system that cover by plants before release to the environment.		specified standards before release into rivers.		
b	Construction sewage					
	- Lubricants dumped by regular maintenance of building machineries and equipments - Waste water of vehicle washing and maintaining areas	- Oil and lubricants at maintenance centers will be collected and carried to recycling stations or used as materials for other production stages or dumped into specified areas. Dumping into the open air or any water sources is strictly prohibited. - Washing machine water will be collected to tanks to separate mud, soil and lubricants before dumping into sewage system.	- Maintenance centers	Waste water dumped into the environment is free of oil and lubricants and satisfies specified standards.	Because repairing and maintaining activities are concentrated at maintenance centers, collection of wastes can be well-implemented.	TCVN5945:2005
3	Mitigation measures to reduce solid waste					
a	Domestic waste					

Environmental Assessment for construction resettlement sites - TSHPMB

No	Impact source	Mitigation measure	Mitigation area	Result	applicability	Reference to Regulations/Standards
	- Domestic rubbish by building workers: the number of workers is few, thus the amount of domestic rubbish is minor.	- Recycle bins are provided by contractors and implementing units in order to collect waste - Rubbish is collected daily and dumped into the common waste ground of the project	Workers' camps	Complying with procedures of domestic rubbish dumping and treatment: everyday after being buried, rubbish must be covered by a locum thick layer of land (around 10 cm) to restrict bad smell and prevent insects. Trees must be planted after completing the construction process.	applicable	The project's common ground must be built pursuant to Vietnam standard on design and construction of dumping grounds TCXDVN261:2001
b	Construction waste					
	- Stone and soil removed	- Reuse removed materials to	Areas of	Reduce loose	Applicable	

Environmental Assessment for construction resettlement sites - TSHPMB

No	Impact source	Mitigation measure	Mitigation area	Result	applicability	Reference to Regulations/Standards
	<p>from leveling and smoothening of building space.</p> <ul style="list-style-type: none"> - Redundant stone and soil from digging and filling activities - Building materials dropped and removed 	<p>leveling ground for resettlement sites.</p> <ul style="list-style-type: none"> - Stone and soil removed upon leveling and smoothening will be concentrated in dumping ground. Big sized stone and soil will be banked outside, loose stone and soil is put inside and then compression is made in order to prevent erosion and washing by currents of water which results in water pollution and determination of soil resources. - Redundant materials such as packages, sawdust, wood knots, and pieces of metal as well as clothes... are collected and used to clean machineries, cooking or sold to wastes traders... - Materials (that can not reuse) will be collected and gathered in 	<p>building resettlement sites and reclaimed fields</p>	<p>stone and soil as cell as materials from being dropped and swept by flows that can pollute water</p>		

No	Impact source	Mitigation measure	Mitigation area	Result	applicability	Reference to Regulations/Standards
		dumping ground and buried with other domestic wastes.				

4.2.2. Mitigation measure to reduce other impacts

No	Impact sources	Mitigation measure	Mitigation area	Result	applicability	Reference to Regulations/Standards
1	Mitigation measures to reduce impacts on natural environment					
a	<i>For impacts on the ecosystem and fauna and flora resources</i>					
	<ul style="list-style-type: none"> - Noises - The high concentration of workers on the construction site will increase illegal activities that affect on forest resources and the ecosystem - The exploitation of timber for rebuild houses in the resettlement sites 	<ul style="list-style-type: none"> - Strictly implement with noise mitigating measures in order to minimize the impacts of noises. - The owner, contractors and building units should take strict measures to manage there workers and cooperate with the management board of natural reserves in forest protection. Prohibiting all activities that affect forest resources and protective efforts (exploiting, hunting, storing and trading of wood, rare and precious animals as well as other forest products. - Local authority should take proper measures to manage restaurants, especially food stalls that are involved in providing forest products. - In order to meet the requirements of timber to 	<ul style="list-style-type: none"> - The resettlement sites, natural preserves, communes of project area and vicinities 	<ul style="list-style-type: none"> Reduce negative impacts on forest resources, protecting the biodiversity of natural preserves and vicinities 	<ul style="list-style-type: none"> Being applicable but close cooperation between the owner and local authority as well as the management board of natural preserves is required 	

Environmental Assessment for construction resettlement sites - TSHPMB

No	Impact sources	Mitigation measure	Mitigation area	Result	applicability	Reference to Regulations/Standards
		rebuild houses of resettlement households, the exploitation of timber is prohibited in the areas reserved for the above households. The owner and local authority should be in close cooperation in order to ensure that local people do not make exploitation out of permissible area. - Strictly Implement the code conducts for workers and contractors (detailed in project's EMP and EIA)				
2	Mitigation measure to reduce impacts on socio-economic environment					
<i>a</i>	<i>For impacts on psychology, customs and practices, life, economy and employment of local community</i>					
	- Land acquisition will have influences on the economy and reduce income of local people - Impacts on psychology, life, customs and cultivation habits cause by move to new places	- Compensation programs should be well implemented, specifically as follows: - Providing residential, agricultural and forestry land to the affected households and local people with equal or higher areas than the minimum standard specified by laws. - Building traffic system and irrigation canals to ensure favorable transportation and irrigation with the aim of stabilizing production and improving productivity. - Providing foods assistance in the first stage of	The resettlement sites and the communes of the project area and vicinities	To improve incomes and soon restore livelihoods and productions for relocated households and local people.	applicable	

Environmental Assessment for construction resettlement sites - TSHPMB

No	Impact sources	Mitigation measure	Mitigation area	Result	applicability	Reference to Regulations/Standards
	(resettlement sites)	resettlement and developing forestry encouragements such as seed plants, agricultural materials and production techniques pursuant to applicable laws so that the affected households can restore their productions. Besides, other assistance will also be provided like supporting movement efforts... - Creating employment for local laborers to improve their incomes				
<i>b</i>	<i>Mitigation measure to reduce impacts on workers and local people's health</i>					
	- Dust and emission - Overcrowded concentration of workers on the construction site, strange diseases can be spread to local people . - Accidents and risks during the building process	- Strictly implement approved measures in order to mitigate emission, dust and noises. - cooperating with local healthcare centers in preventing diseases and making regular medical checkup for workers - The contractors are committed to complying applicable labor safety and sanitation regulations (detailed in contract with contractors) - During the construction phase, the project area must be secured 24 hour/day protection with strictly control over authorized people and	Resettlement sites	Improve health and reduce accidents and risks to building workers and local people	Applicable	

Environmental Assessment for construction resettlement sites - TSHPMB

No	Impact sources	Mitigation measure	Mitigation area	Result	applicability	Reference to Regulations/Standards
		<p>vehicles in order to restrict risks and accidents happening to local people</p> <ul style="list-style-type: none"> - Workers on the construction site must be trained on labor safety and be provided with labor protection equipments. All workers are required to use suitable protection wears. - Only start working after all machineries and equipments have been tested and satisfy labor safety and sanitation standards. - Place signboards in dangerous roads, erosion-prone and construction sites. 				
<i>c</i>	<i>Mitigation measures for impacts on local security and orders, the management of local authority</i>					
	<p>- The over concentration of workers in construction sites increase population density, also raise disputes and social evils which cause difficulties for</p>	<p>-The owner, contractors and heads of building units are required to register temporary residence for their workers and cooperate with local authority in manage these workers in order to prevent disputes and social evils.</p> <p>- Before construction resettlement site, meetings should be held to gather suggestions of local people and emigrants in order to minimize disputes arising among emigrants and local people</p>	<p>The resettlement sites</p>	<p>Reduce disputes arising among workers, between workers with local residents as well as among</p>	<p>When the land clearance and compensation are well implemented by the board; land and houses are distributed in a</p>	<p>Carry out compensation and resettlement pursuant to the approved planning. In compliance with regulations and policies of the state and relevant institutions presented in the compensation</p>

Environmental Assessment for construction resettlement sites - TSHPMB

No	Impact sources	Mitigation measure	Mitigation area	Result	applicability	Reference to Regulations/Standards
	<p>management efforts</p> <p>- The movement of people to resettlement sites can create disputes and conflicts between emigrants and local people, affect local security and order as well as management efforts of local authority</p> <p>- The unfair allocation of land and houses in the resettlement sites may result in disputes among local people, the owner, local authority and emigrants.</p>	<p>- Land and houses should be allocated in a fair manner pursuant to the approved planning (detailed in RLDP). Before that, meetings should be held to discuss the method of allocation and people's agreement. Allocation should be implemented under the method that are supported by most of people (with high agreement).</p> <p>- The compensation process will be strictly audited pursuant to the supervisory program mentioned in project's EMP and EIA.</p> <p>- The Board of land clearance and compensation is responsible for handling all claims raised by local people during the relocate and resettlement process.</p>		<p>community groups</p> <p>- Disputes and disagreement should be avoided among people upon the allocation of land and houses in the resettlement sites</p>	<p>transparent manner with the high agreement of concerned people, these impacts will be minimized.</p>	<p>regulations and report of master plan of resettlement</p>

4.3. Mitigation measure for operation phase

4.3.1. Mitigation measures related to waste.

In this phase, because construction activities have been completed, There is almost no wastes generated, except for domestic wastes of the residents in the resettlement areas.

4.3.2. Other Mitigation Measures not related to wastes

No	Impact sources	Mitigation measure	Mitigation area	Result	Applicability	Reference to Regulations/Standards
1	Mitigation measures to reduce impacts on natural environment					
<i>a</i>	<i>Impacts on ecological, fauna and flora resources</i>					
	- Exploitation of firewood, timber and hunting of animals for living purposes as well as disafforestation for cultivation land	- The project owner should cooperate with local authorities, the management board of natural reserves and relevant institutions to strictly supervise on illegal activities of construction workers and resettlement residents in order to timely prevent negative impacts on forest, fauna and flora resources.	- The resettlement sites, natural preserve zones and vicinities	Limiting negative impacts on forest resources and protecting the biodiversity of natural preserves and vicinities.	Applicable but requiring the close cooperation between the owner, local authorities and the management board of natural preserves.	
b	For impacts on soil and water					

Environmental Assessment for construction resettlement sites - TSHPMB

	- Cultivation activities of Relocated residents	- According to the report of damages and resettlement planning, evaluations have been carried out the eco-adaptation of plants and appropriate plan of planting has been proposed on basis of concrete conditions of the area - Agricultural and forestry encouragement: providing assistance in seed plants and exchange advanced agricultural techniques for local people to improve their standard of production and restrict the deterioration of soil resources.	The resettlement sites	Reduce soil erosion and TSS (Total suspended solids) concentration in water	applicable	
2	Mitigation measure to reduce socio-economic impacts					
<i>a</i>	<i>Impacts on relocated people's livelihood</i>					

Environmental Assessment for construction resettlement sites - TSHPMB

	<p>- relocation and resettlement activities</p>	<p>- Well-implemented the approved compensation and assistance program.</p> <p>- Strictly supervising the resettlement compensation and assistance pursuant to applicable laws.</p> <p>- Carrying sociological research before and after compensation, assistance and resettlement (may be 6 or 12 months later) in order to make timely policies for prevention of unexpected negative issues.</p>	<p>The resettlement sites</p>	<p>Once the mitigation measures are well carried out, the relocated people will be entitled to new lives that are as good as or better than their previous ones</p>	<p>applicable</p>	
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CONCLUSION

The Trung Son hydropower project is multipurpose project as part from the main target of generating power with a capacity of 260MW. it also plays an important role in preventing floods for the downstream area with a capacity of 112 million m³ and provides irrigation water to the downstream of the Ma river for prevention of saline water intrusion during dry seasons. Moreover, the construction of a reservoir will increase the water area for aquaculture, development of waterway traffic, improvement of local income and investment capital for other fields...

Apart from positive impacts, the building of the reservoir also has negative impacts on the natural and socio-economic environment of the communes and districts in the project area. Of which the most significant is the acquisition of around 3634.88 ha of land for construction of the Plant which cause 432 households with 2,187 persons (according to data of 2004) residing in the 6 communes in flooded area. These area belong to Trung Son of Quan Hoa district; Trung lý, Mượ̀ng lý and Tam Chung of Mượ̀ng Lát district, Thanh Họ́a province and Xuân Nha and Tân Xuân communes of Moc Chau district, Son La province

Project owner that aims to minimize negative impacts and ensure the livelihood for affected households has deployed the compensation, assistance and planning programs. In partnership with the Institute for Agricultural design and Planning of the Ministry of Agriculture and rural development, the PECC 4 has carried out studies and built up the master plan of resettlement and compensation for households affected by Trung Son hydropower plant pursuant to State's regulations.

According the approved plan, the resettlement is expected to complete in 2011. Up to now the number of affected households is around 527, 20 of which have received compensation and self-moved and the other 507 households are of concentration resettlement. The 4 tentative resettlement sites are as follows: resettlement sites No. 1 locating in Trung Son commune, resettlement site No. 2 locating in Muong Ly commune, resettlement site No. 3 locating in Trung Ly commune of Thanh Hoa province and resettlement site No. 4 locating in Xuan Nha commune of Son La province. See chapters 1 and 2 for detailed size of these resettlement sites.

The construction of resettlement sites will generate both positive and negative impacts on the resettled residents and the locals as well. These impacts are consisted of those on the natural and socio-economic environment, including impacts on soil and air environment, incomes, health and lives of residents. Of which the most worth mentioning is that the acquisition of civil land for construction of resettlement sites will reduce the income of local people and the immigration

to the resettlement areas will have effects on the psychology, customs and practices of the local people as well as the relations between them and the resettlement residents. In order to minimize these impacts and ensure that affected people can enjoy lives that are as good as or better than those at their previous places of residence, Specific mitigation measures have been proposed to minimize each impact and more details were presented in the chapter 4 of the report.

